EIS 1303

AB017972

Environmental impact statement : extensions to an existing stockpiling area at Hall Quarry, NSW

ENVIRONMENTAL IMPACT STATEMENT

EXTENSIONS TO AN EXISTING STOCKPILING AREA at HALL QUARRY, NSW

for

BORAL RESOURCES (COUNTRY) PTY LIMITED

BORAL COUNTRY CONCRETE & QUARRIES

Boral Resources (Country) Pty. Limited
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ENVIRONMENTAL IMPACT STATEMENT

EXTENSIONS TO AN EXISTING STOCKPILING AREA at HALL QUARRY, NSW

Prepared By:

Stephen Bergmark BSc (Hons)
Environmental Geologist
Boral Resources (Country) Pty Limited

November 1996

FORM 2

SUBMISSION OF ENVIRONMENTAL IMPACT STATEMENT (EIS)

PREPARED UNDER THE ENVIRONMENTAL PLANNING AND ASSESSMENT ACT 1979 - SECTION 77

EIS PREPARED BY

Name: Stephen Lee Bergmark

Qualifications: B.Sc.(Hons.)

Address: Boral Resources (Country) Pty Limited
PO Box 42
Wentworthville NSW 2145

in respect of:

DEVELOPMENT APPLICATION

Applicant Name: Boral Resources (Country) Pty Limited
trading as Boral Country - Concrete and Quarries

Applicant Address: PO Box 42
Wentworthville NSW 2145

Land to be developed: Address: Hall Quarry
Kaveneys Road
Hall NSW 2618

Lot No.DP/MPS,Vol/Fol etc.: Lot 100, DP864182
(Formerly Lot 1 DP576060)
Parish of Jeir
Shire of Yass

Proposed Development: INCREASING THE SIZE OF AN EXISTING STOCKPILE AREA

ENVIRONMENTAL IMPACT STATEMENT

An environmental impact statement (EIS) is attached

CERTIFICATE

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

- it is in accordance with clauses 51 and 52 of the Environmental Planning and Assessment Regulation 1994, and
- it is true in all material particulars and does not, by its presentation or omission of information, materially mislead.

Signature: 

Name: Stephen Lee Bergmark

Date: 11/12/96

SB3.MMB

CONTENTS Page No.

SECTION 1

Summary

1. SUMMARY

1.1 Introduction

Boral Resources (Country) Pty Limited, trading as Boral Country Concrete and Quarries, has submitted a Development Application to Yass Shire Council for modifications to its existing operations at Hall quarry. The quarry is located adjacent to the Barton Highway, approximately 14 kilometres south of Murrumbateman.

Boral has been operating Hall quarry with a development consent from Yass Shire Council since 1972. The development consent was amended by Council in November 1990 and a new consent granted on 17 March, 1994. The current development consent allows for production of up to 350,000 tonnes of crushed rock products, per annum, from the property known as Lot 100, DP 864182, (formerly Lot 1 DP 576060) Parish of Jeir, Shire of Yass.

The proposed modifications to the operation consist of:

- **Increasing the size of an existing product stockpile area.**

The modifications to the quarry operation are considered essential to ensure that space is available to stockpile large volumes of quality tested rock products which are produced to supply large infrastructure projects in the ACT and Sub-Region.

1.2 Existing Stockpiling Operations

Hall quarry currently produces 160,000 tonnes of crushed rock products per annum. The rock is won by drilling and blasting and processed through a crushing and screening plant which has a capacity of 300 tonnes per hour.

After the rock is crushed and shaped it is sorted, by screening, into sized fractions and deposited into receiving bins in the screenhouse. Small amounts of product can be stored in these bins, however, due to the production capabilities of the crushing plant the stored product must eventually be unloaded into haul trucks and transported to specific stockpiles in the two existing stockpile areas.

Material is loaded from these stockpiles into road registered trucks for transport to market destinations.

The existing stockpiles are contained within two locations:

Stockpile Area No.1 - 1.5 hectares
Stockpile Area No.2 - 1.4 hectares

This area of stockpiling space is considered insufficient for current and future

operations.

1.3 Proposed Modifications to the Operation

It is proposed to expand Stockpile Area No.2 by an area of 1.8 hectares. After filling, shaping and levelling the land an additional 0.9 - 1.0 hectares of stockpiling area will be available to the quarry.

The stockpile area will be bunded and landscaped for noise and visual attenuation.

Other aspects of the quarry operation such as the rate of production, traffic movements, extraction or processing operations, equipment levels and hours of operation will not change as a result of this application.

1.4 Environmental Issues and Protection Measures

Environmental issues identified with establishing an additional stockpiling area are as follows:

- noise impact at nearby residences
- visual impact from external viewpoints
- impact on the quarry's water management programme
- erosion and sedimentation impacts
- air quality impacts
- impact on fauna, flora and archaeology

An extensive range of environmental protection measures has been incorporated into the proposed development plans ensuring that the development continues to meet, or exceed, community and legislative requirements.

The measures dealt with in the EIS include:

Noise
The proposal includes a range of noise mitigation measures, specifically, enclosing the new stockpile area within a earth bund wall. Mobile plant will continue to operate with properly maintained noise control equipment. Computer modelling of the existing and proposed operations indicate that the NSW Environment Protection Authority's (EPA) noise control criteria will be satisfied at all surrounding residences.

Visual
The project has been designed to make the maximum used of screening provided by existing vegetation and topography. Glimpses of the stockpile area will be obtained from the section of Kaveneys Road to the south-west of the

quarry, however, once fully vegetated the area will not be easily discernible from the road. Although some initial earthworks will be visible from two residences to the southwest of the quarry, no actual stockpiling operations will be visible from any residence.

Water Management and Erosion Control
Aspects of water management and erosion control have been examined and measures proposed to ensure there is no degradation of water quality or erosion of landforms during construction or operation of the stockpile area.

Air Quality
Dust modelling has shown that the level of dust deposited at surrounding residences will not change significantly and will remain within EPA guidelines.

Fauna, Flora and Archaeology
No rare or endangered flora or fauna were identified on the property nor was any habitat recorded as being suitable for rare or endangered fauna. No aboriginal sites or artefacts were identified on the property.

Progressive rehabilitation and tree plantings will assist in creating additional habitats on the property.

1.5 Project Justification

Hall quarry is an efficient and commercially viable operation and has been so for over twenty years. The operation produces a wide range of high quality quarry products. The modifications to the existing operation will enable the quarry to operate more efficiently and ensure that it remains competitive in the regional market.

Safeguards have been incorporated into the project design to either eliminate, or reduce to acceptable levels, environmental impacts.

1.6 Alternatives

Should the proposed modifications not proceed, the quarry will continue to operate in its present form. The competitiveness of the quarry will progressively decline as demand increases for higher volumes of material and more specialised quarry products which need to be stockpiled separately.

There are no other sites remaining on the property which satisfy environmental and commercial criteria for establishing a new stockpiling area or expanding the existing areas. The proposed location for the expansion of Stockpile Area No.2

satisfies these criteria for the following reasons:

- Its location provides considerable environmental protection by way of visual screening, low elevation and acoustic protection.

- The site is located in close proximity to the weighbridge so that control of vehicle movements, and site security, can be maintained.

- The site is continuous with an existing stockpile area which will help to minimise the disruption to quarry operations during the construction phase. As haulage routes and sediment control structures are already in place there will be no disturbance to vegetated pasture and scrub outside the actual area to form the stockpile extension.

1.7 Conclusions

Boral Resources (Country) Pty Limited is a division of Boral Limited, a leading Australian Company, and has a commitment to providing high quality construction materials to country regions of New South Wales at competitive prices. The Company has devoted considerable resources to achieving high environmental standards and good community relations. The proposed development and commitments made in the EIS will ensure the future operations at Hall quarry continue to comply with the high environmental standards expected by government departments and the local community.

SECTION 2

Introduction

2. INTRODUCTION AND BACKGROUND

2.1 The Proponent

The proponent of the Development Application is Boral Resources (Country) Pty Limited trading as Boral Country Concrete and Quarries, a fully owned subsidiary of Boral Limited. Boral Limited is a large diversified Australian-owned company, involved in the supply of construction and building materials, manufacturing, and a variety of other industries. The proponent, hereinafter referred to as Boral, operates numerous quarries and concrete plants in country areas of New South Wales.

2.2 Property Details

The proposed development will be situated on land owned by Boral Resources (Country) Pty Limited known as **Lot 100, DP864128** (formerly Lot 1 DP 576060), Parish of Jeir, Shire of Yass (Figures 2.1 and 2.2). The property located approximately 14 kilometres south of Murrumbateman and from the Barton Highway via Kaveneys Road.

2.3 Reason for the Application

Boral has been operating Hall quarry with a development consent from Yass Shire Council since 1972 and proposes modifications to the operation which will be assessed for approval under the Environmental Planning and Assessment Act, 1979, (EPA Act). These modifications consist of:

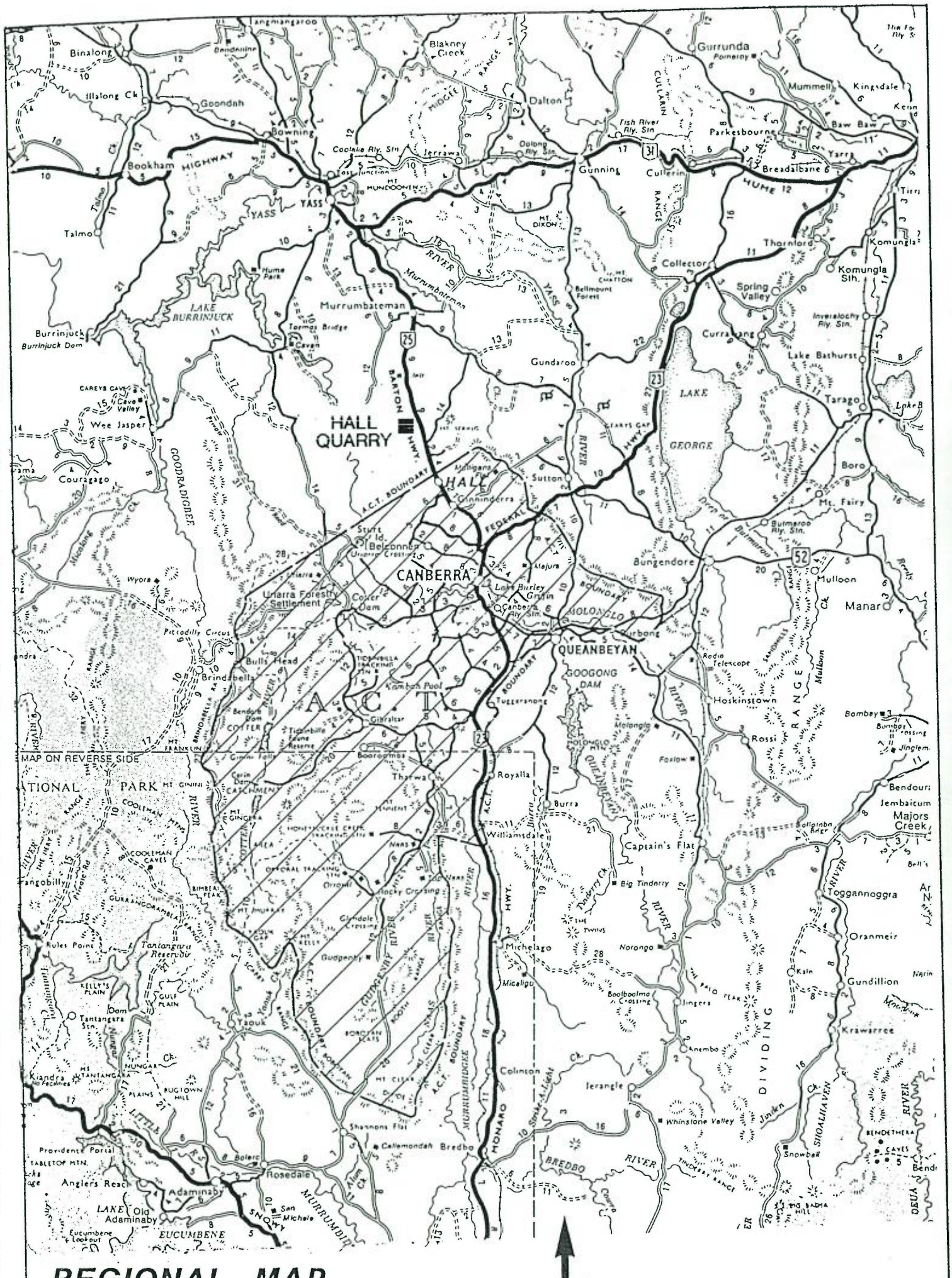
- **Increasing the size of an existing product stockpile area.**

This Environmental Impact Statement (EIS) is a supporting document accompanying a Development Application to (DA) Yass Shire Council for the above modifications to the Development Consent for quarrying operations at Hall quarry.

The existing quarry operations are located on land owned by Boral Resources (Country) Pty Limited. Boral proposes to expand the southern stockpile area, (Stockpile Area No.2), by an area of 1.8 hectares. The earthworks, levelling and landscaping will be contained wholly within land owned by Boral (Figure 2.3).

The improved production efficiency, through the provision of this area, will ensure that low production costs are realised through having the ability to operate the new crushing plant at its optimum rate of production. The space created will allow the quarry to stockpile large volumes of product required for major infrastructure projects in the ACT and Sub-Region.

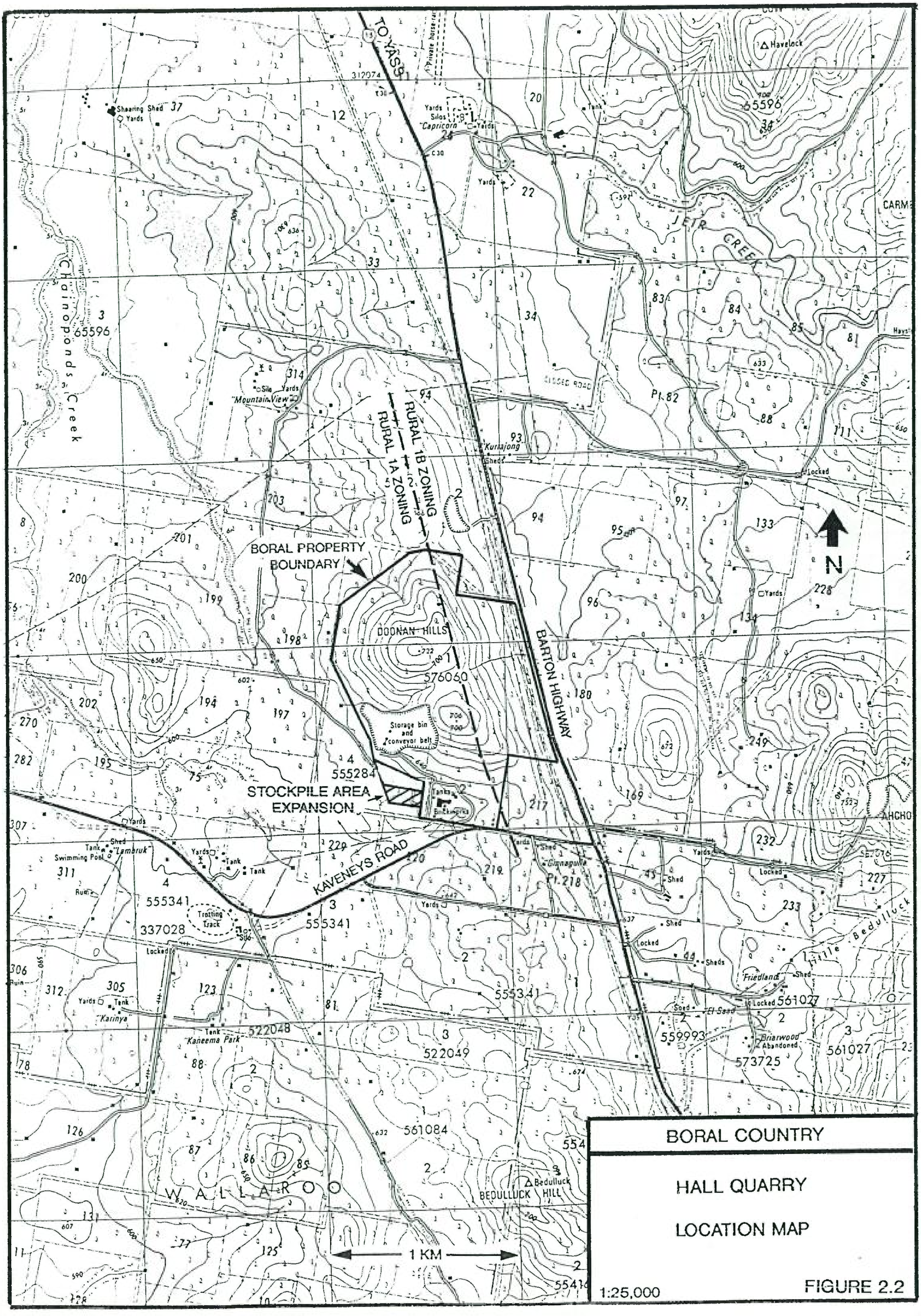
The EIS examines the proposed extension to Stockpile Area No.2 and any associated environmental impacts. **Other aspects of the quarry operation such**



REGIONAL MAP

LOCATION OF HALL QUARRY

FIGURE 2.1



BORAL COUNTRY

HALL QUARRY

LOCATION MAP

1:25,000

FIGURE 2.2


BORAL PROPERTY BOUNDARY
STOCKPILE AREA
NO.2 (COMPLETED)
BOUNDARY
PROPOSED
EXTENSION AREA
KAVENEYS ROAD
BARTON HWY
N

FIGURE 2.3

as the rate of production, traffic movements, extraction or processing operations and hours of operation will not change as a result of this application.

2.3 Environmental Planning and Assessment Procedures

The Boral property at Hall, and the adjoining land subject of this Application, is zoned Rural 1(a), with the exception of land within 400 metres of the Barton Highway which is zoned Rural 1(b), under the Yass Shire Council Local Environmental Plan 1987. The Rural 1(a) zoning (Figure 2.2) allows extractive industries with the consent of Council, however, extractive industries are a prohibited activity within the Rural 1(b) zoning. Boral's operations will be confined to areas where zoning permits extractive industry.

Boral holds a current development consent (94/29) for the existing extraction, processing and stockpiling operations on the property. A separate development consent (96/55) is held for the operation of the existing Stockpile Area No.2. Accordingly, these aspects of the operation do not constitute a component of this DA.

The form and content of this EIS are in accordance with the requirements of Clause 52 (1) of the Environmental Planning and Assessment Regulations 1994. Consultations have been held with the Director of the Department of Planning and Urban Affairs pursuant to Clause 52 of the Regulations and the document has been prepared in accordance with the Director's requirements.

This document will be publicly exhibited for a period of at least 28 days. Submissions from members of the public, in connection with this DA for an extension to the stockpiling area, should be forwarded to the Yass Shire Council. Council will forward copies of the submissions to the Department of Planning and Urban Affairs for comment and the submissions will be considered by Council in its determination of the Application.

2.4 Environmental Assessment

Boral Resources (Country) Pty Limited has undertaken to carry out environmental investigations for the proposed extension to the stockpiling area. Yass Shire Council requested the DA be accompanied by a Environmental Impact Statement. The main environmental studies that have been carried out as part of this assessment are listed below:

- *Flora and Fauna Survey* - this study was undertaken to determine the nature and extent of major vegetation associations, fauna habitat and fauna on the site likely to be affected by the development, and to assess the resulting impacts. Vegetation associations were assessed for their importance to the area and their conservation value. Particular attention was paid to determining the presence, if any, of endangered flora and

fauna in the study area. Measures to ameliorate the impact on vegetation communities and fauna are also presented. The results of the study are provided in Sections 5 and 6 and in Appendix 4.

- *Noise* - this study determined the background noise levels in the surrounding area and modelled the expected noise from the extension to the stockpiling area. The model was based on actual noise measurements of the quarry vehicles operating on the site. Safeguards and operational controls required to achieve acceptable noise levels have been identified and reported in Section 6.1. The Noise Impact Statement is contained in full as Appendix 2.

- *Landscaping and Visual impact* - the stockpile area will be developed to ensure maximum screening of the development was possible by retaining the bulk of existing vegetation and establishing the floor of the stockpile area at a level which will not be visible from any residence.

2.5 Need for the Project

The modifications to the existing operations at Hall quarry are necessary to operate the quarry at its optimum rate of production thereby maximising efficiency and reducing production costs. The additional stockpiling space is required to store large volumes of specification material for high volume, short duration contracts, in a manner which will ensure that contamination with other quarry products does not occur.

SECTION 3

Description of the Existing Operations

3. EXISTING OPERATIONS

Hall quarry is a highly efficient extractive industry which has been operated by Boral since 1972. The quarry currently produces approximately 160,000 tonnes of crushed rock products per annum and has development consent for the production of up to 350,000 tonnes per annum to cater for future requirements of the region.

The range of products produced at the quarry including various sizes of concrete aggregate, asphalt aggregate and cover aggregate, prepared road base and fine crushed rock.

Products include:

- roadbase 20mm
- sub-base 40mm
- non-specification road bases -50mm
- aggregate 7mm, 10mm, 14mm, 20mm
- fines -6mm

Details of operational aspects of the quarry such as drilling, blasting, extraction area design and operation of the crushing plant, along with associated environmental impact and amelioration measures, have been discussed in the original Environmental Impact Statement for the quarry. As these aspects of the operation are not relevant to, and will not change as a result of, this Application they will not be further addressed in this document.

With reserves of rock in excess of 50 years and the recent installation of a modern, high-volume processing plant, Hall quarry will undoubtedly be a major source of quarry products for the ACT and Sub-region well into the 21st century.

3.1 Existing Stockpiling Operations

Stockpile Area No.1

The existing product stockpiles in Area No.1 are confined to four small areas to the north of the crushing plant (Figures 3.1 and 3.2). The combined total area of available stockpiling space is 1.5 hectares which allows for the maximum storage of approximately 16,000 cubic metres (23,000 tonnes) of product on the ground at any given time (1 m^3 of aggregate is approximately 1.4 tonnes).

Stockpile Area No.2

Located to the south of the weighbridge, construction of this stockpiling area was completed in early August 1996 and resulted in an increase in the available space for stockpiles of 1.4 hectares (Figure 3.1 and 3.3). This allowed the quarry to stockpile an additional 14,000 cubic metres (20,000 tonnes) of product on the ground.

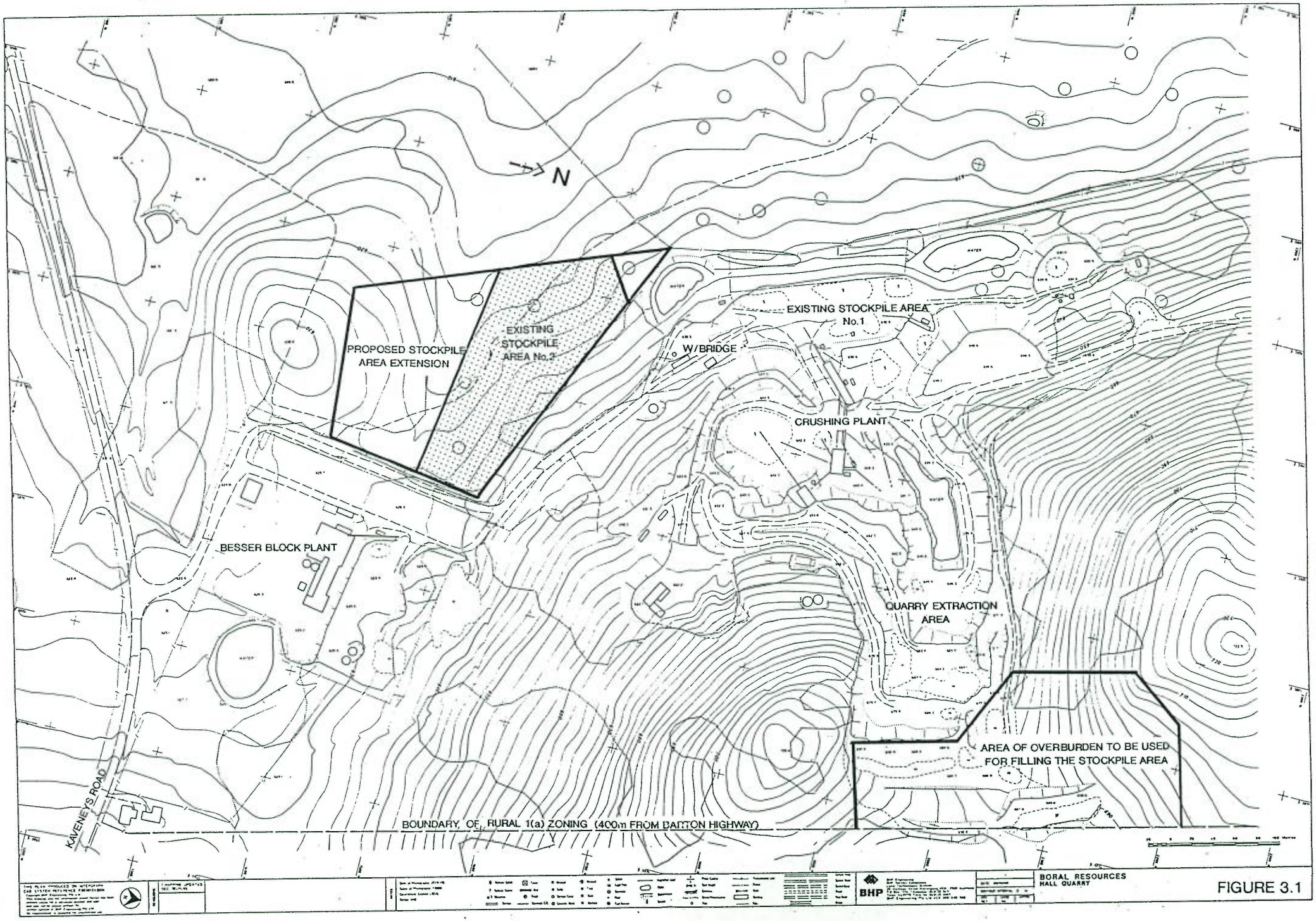
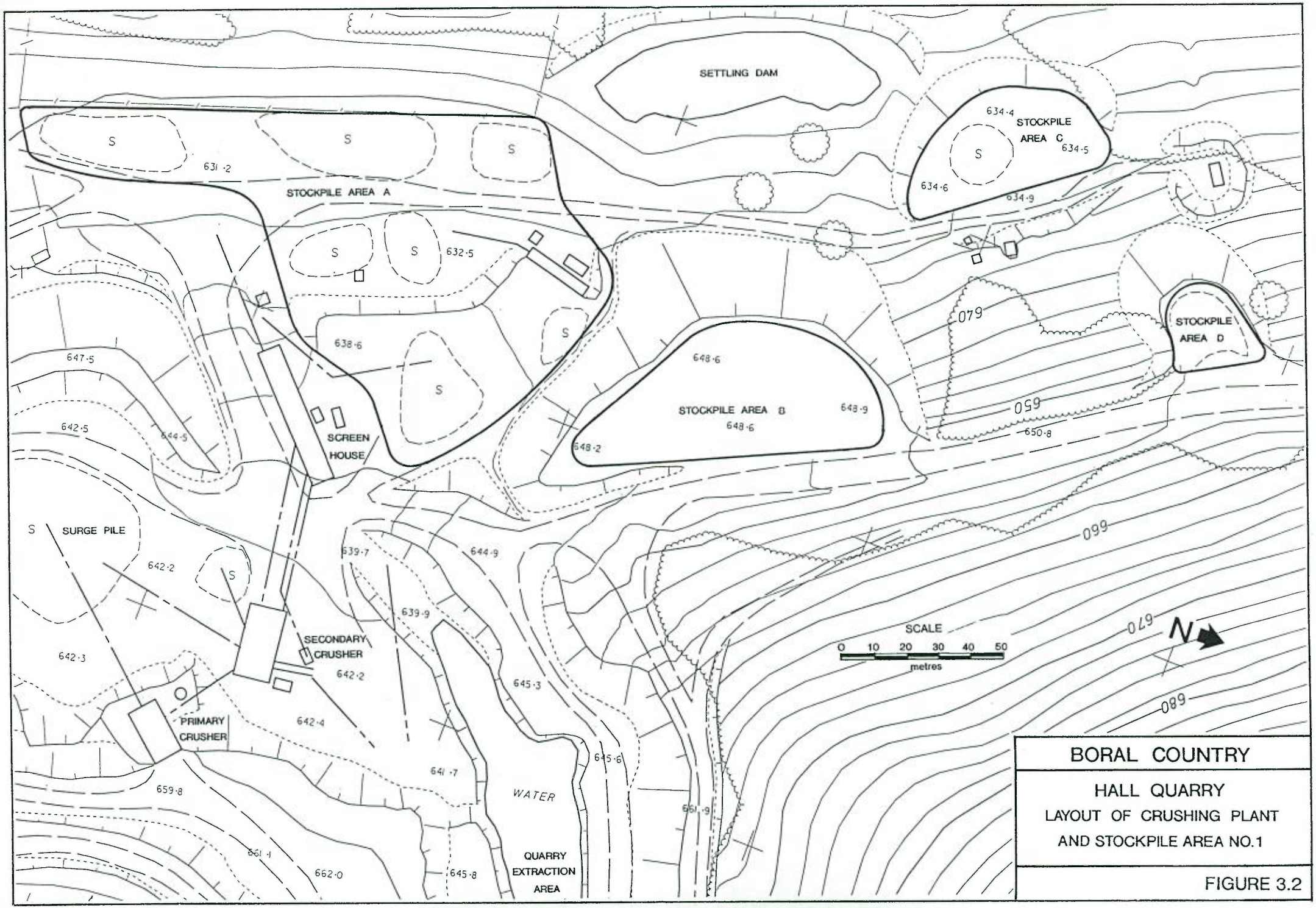

N
PROPOSED STOCKPILE AREA EXTENSION
EXISTING STOCKPILE AREA No.2
EXISTING STOCKPILE AREA No.1
W/BRIDGE
CRUSHING PLANT
BESSER BLOCK PLANT
QUARRY EXTRACTION AREA
AREA OF OVERBURDEN TO BE USED FOR FILLING THE STOCKPILE AREA
KAVENEYS ROAD
BOUNDARY OF RURAL 1(a) ZONING (400m FROM BARTON HIGHWAY)
BHP
BORAL RESOURCES HALL QUARRY

FIGURE 3.1

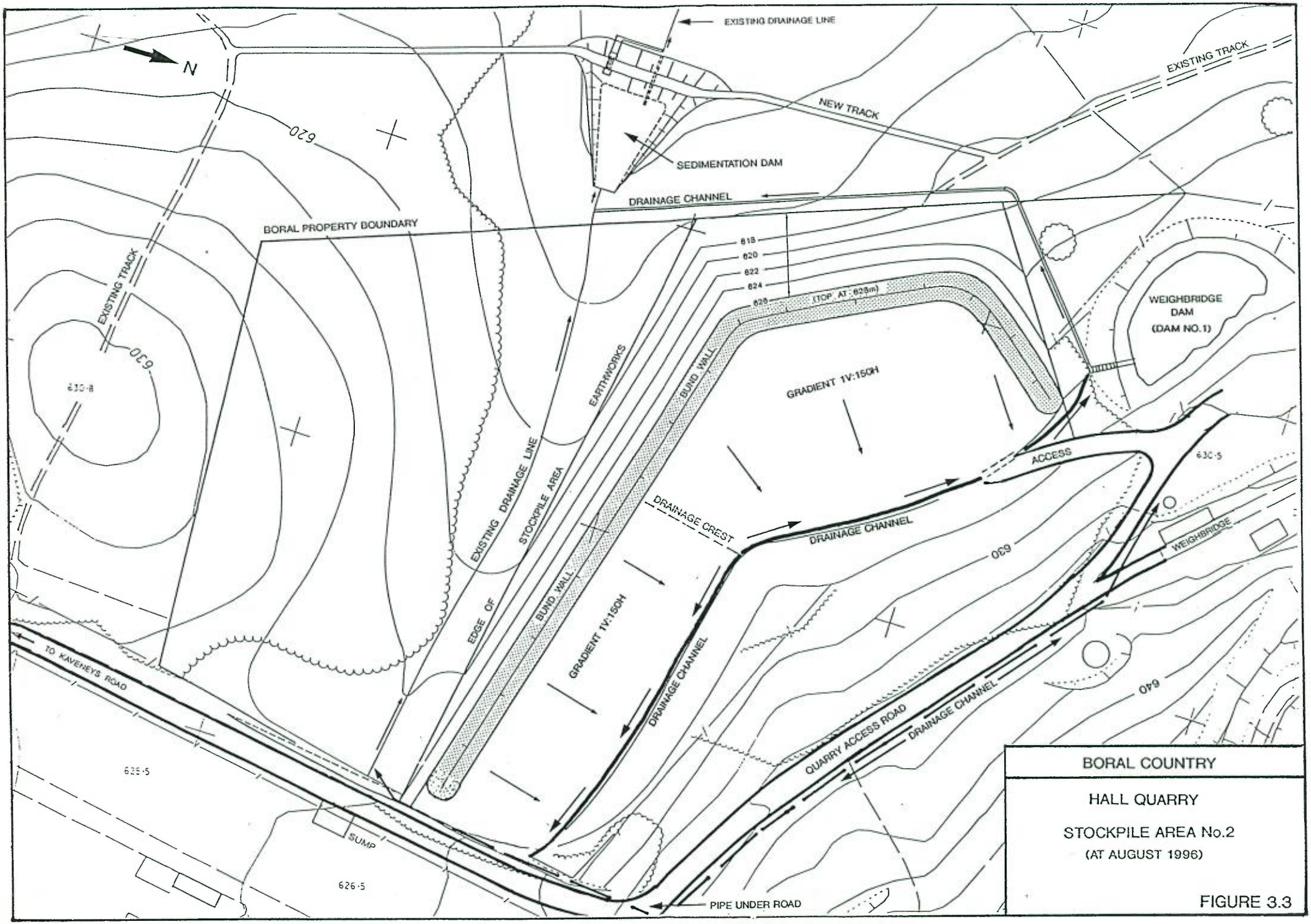


BORAL COUNTRY

HALL QUARRY

LAYOUT OF CRUSHING PLANT AND STOCKPILE AREA NO.1

FIGURE 3.2


N
EXISTING DRAINAGE LINE
EXISTING TRACK
NEW TRACK
SEDIMENTATION DAM
DRAINAGE CHANNEL
BORAL PROPERTY BOUNDARY
620
630
630·8
618
620
622
624
626
(TOP AT: 626m)
BUND WALL
EARTHWORKS
EXISTING DRAINAGE LINE
STOCKPILE AREA
EDGE OF
GRADIENT 1V:150H
WEIGHBRIDGE DAM (DAM NO.1)
ACCESS
630·5
DRAINAGE CREST
WEIGHBRIDGE
639
640
TO KAVENEYS ROAD
625·5
SUMP
626·5
QUARRY ACCESS ROAD
PIPE UNDER ROAD
BORAL COUNTRY
HALL QUARRY
STOCKPILE AREA No.2
(AT AUGUST 1996)
FIGURE 3.3

As there are between 8 and 10 different rock products continually produced at the quarry, a maximum of only 4,000 to 6,000 cubic metres (5,500 to 8,500 tonnes) of any one product can be stockpiled at any time. This is considered insufficient to meet the demand of future contracts which will increasingly call for the supply of large volumes of a specialised product (or products) over short periods of time. It is not uncommon for a quarry to be required to produce 30,000 to 50,000 tonnes of a particular product (such as a mixed 10mm/20mm product) in advance of the supply commencement date for a major road project. Hall quarry could currently stockpile the lower end of such a supply contract but could only do so at the expense of all other customers as no space would be available to stockpile other products.

Quarry products supplied to large infrastructure projects are normally required to conform to rigid engineering specifications and can not be contaminated with other products. Accordingly, the quarry will need to produce such materials in advance, and stockpile them separately, so that the risk of contamination is minimised and to ensure that normal production is maintained for regular customers.

It is for these reasons that an expansion of Stockpile Area No.2 is considered essential for the quarry to maintain its competitiveness in the regional market.

3.2 Existing Mobile Equipment

Stockpile area operations utilise a range of mobile equipment as described in Table 3.1.

Table 3.1 - Existing Equipment

Mobile Plant in Quarry and Stockpile Area
1 x Kawasaki 95Z front end loader
1 x Volvo R32, 35 tonne dump truck
1 x 25-35 tonne Excavator with Rockbreaker (brought in as required)

Stockpile area
1 x Caterpillar 966D front end loader (sales loader)
1 x 20 tonne Kockums dump truck (stockpile truck)
1 x Kawasaki 80Z front end loader (blending plant loader)
1 x International water cart

There are no plans to alter these equipment levels in the foreseeable future.

3.3 Hours of Operation

Existing hours of operation for both quarrying and processing are:

6.30am to 6.30pm Monday to Friday
6.30am to 1.00pm Saturday

There will be no change to these hours with this application.

3.4 Environmental Management

Environmental management procedures at Hall quarry are designed to ensure compliance with the existing conditions of consent, EPA licence conditions and government legislation and requirements.

The existing quarry is licensed under the Pollution Control Act (1970), the Clean Air Act (1961), and the Noise Control Act (1975). The current licence number is 004082 and is valid to the end of August 1997.

Monitoring of dust deposition and noise occurs on a regular basis.

Environmental controls are further discussed in Section 6.

SECTION 4

Description of the Proposal

4. DESCRIPTION OF THE PROPOSAL

4.1 Objectives of the Proposal

The proposed development consists of constructing an extension to Stockpile Area No.2 on land owned by Boral. There will be no increase in traffic movements or the rate of production, nor will there be any changes to equipment levels, extraction operations or operation of the crushing plant.

The advantages of developing a larger stockpile area are summarised below:

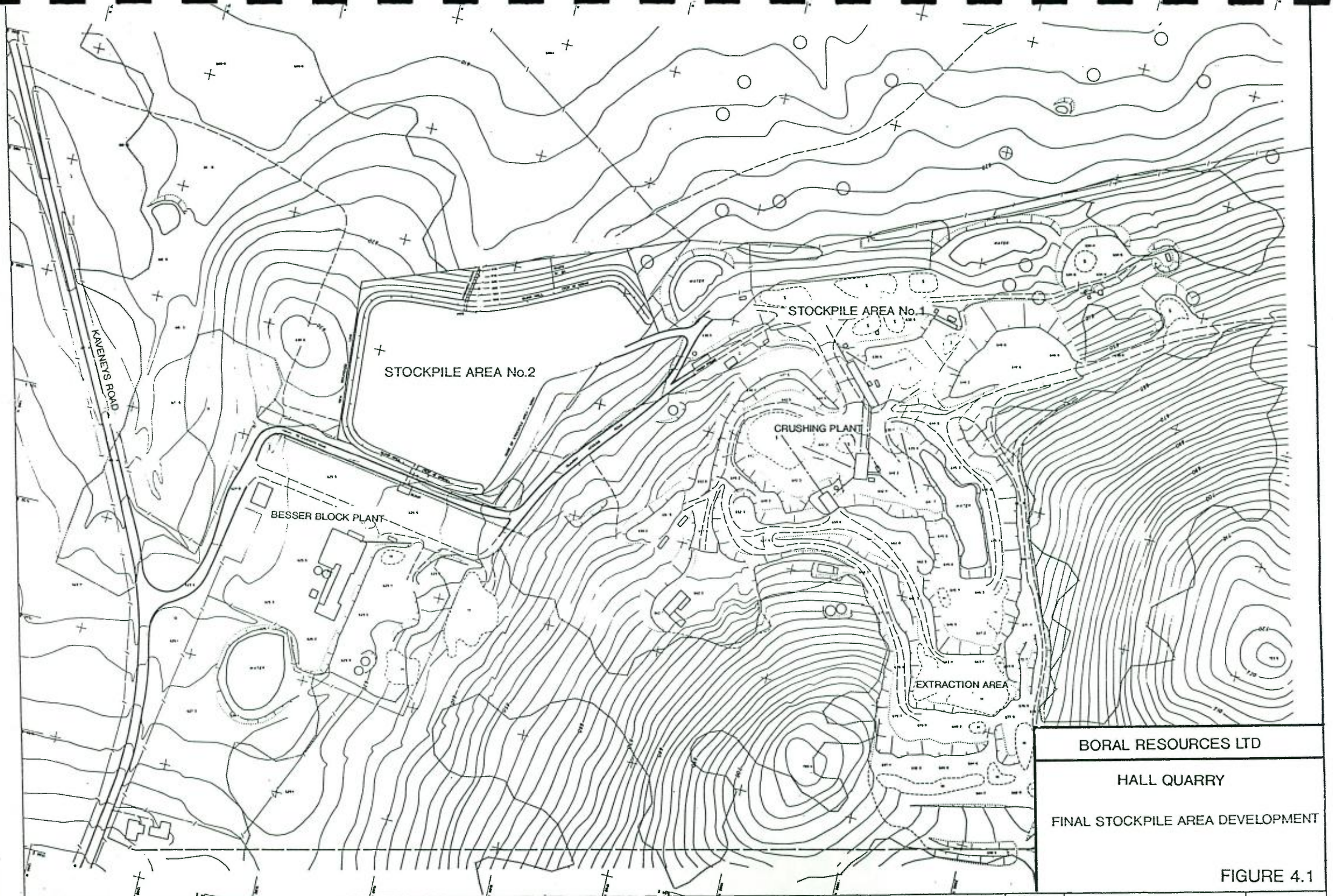
- Provision of space to stockpile large quantities of specification product required for short term, high volume contracts.
- Stockpiles can be properly spaced to prevent contamination of product between adjoining piles.
- Improved cost efficiency of the operation through operation of the new crushing plant at optimum rates and less time spent moving and managing individual stockpiles of material.

4.2 Site Layout

The proposed extension to Stockpile Area No.2 will be developed by filling the southern side of a shallow valley immediately adjacent to the southern edge of the exiting stockpile area. The valley will be filled to the existing stockpile area floor level of 626 metres. This is the level of the quarry access road as it passes the Boral Besser block plant (Figure 4.1 and Photo No.1). The location from which the photographs were taken are shown in (Figure 4.2). The floor of the final stockpile area will be sloped so that water drains to each corner of the area at a gradient of approximately 1V:150H.

The western flank of the filled area will be battered at a maximum gradient of 1V:3H which is considered a stable slope on which vegetation can easily be propagated (Figures 4.3 - 4.5). The western flank of the existing section of Stockpile Area No.2 is illustrated in Photo No.2.

A 2 metre high bund wall will be constructed around the perimeter of the stockpile area for the purposes of noise and visual attenuation. The bund wall will have sides sloped at 1V:2.5H and will be planted with vegetation for further visual screening.



BORAL RESOURCES LTD

HALL QUARRY

FINAL STOCKPILE AREA DEVELOPMENT

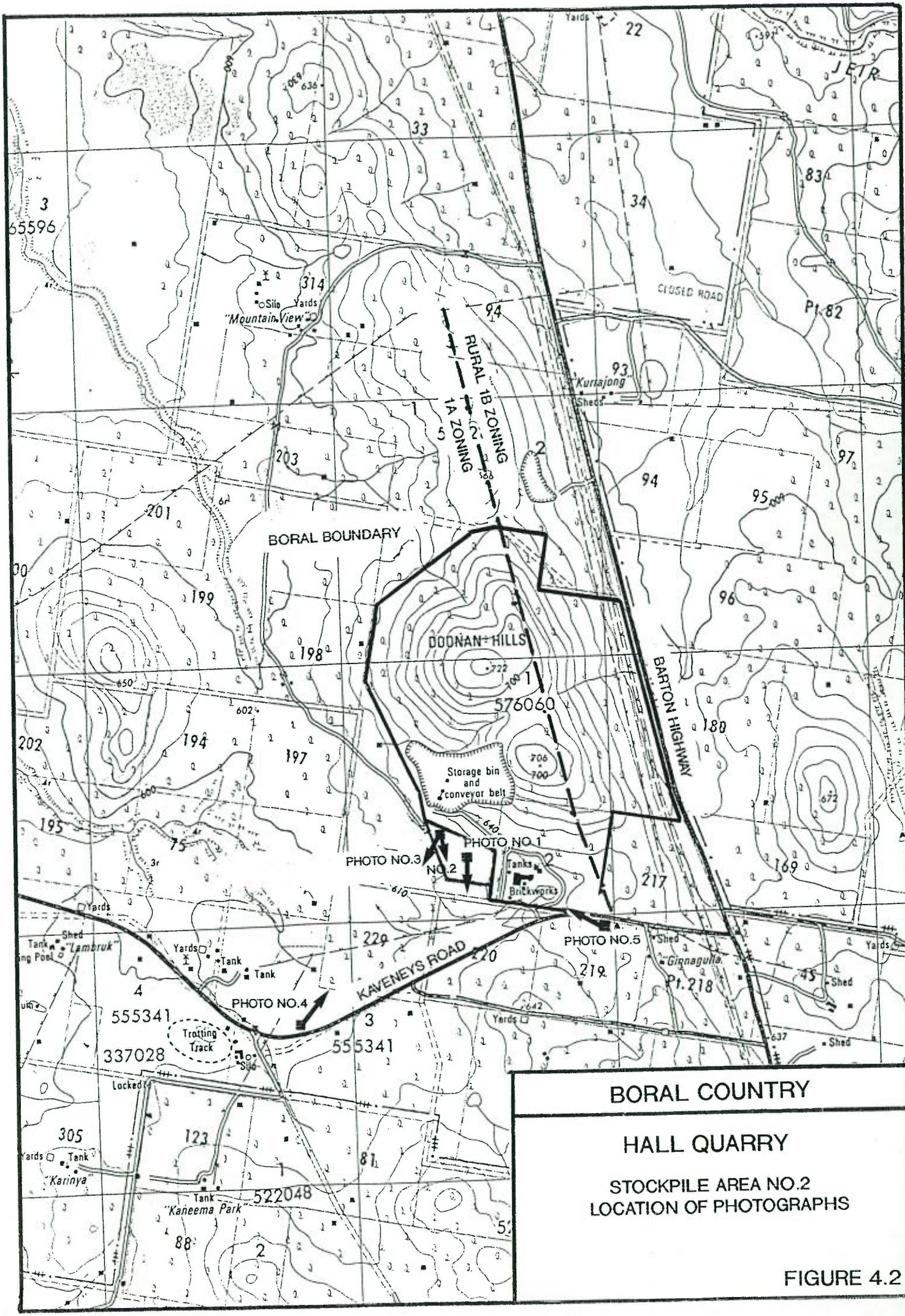
FIGURE 4.1

BORAL RESOURCES
HALL QUARRY
1:1000 TOPOGRAPHIC MAPPING

F003-01-024

Photo No.1 Land to be filled to form the stockpile area.

Photo No.2 Western flank of the existing section of Stockpile Area No.2 showing the 1V:3H batter and recent grass seeding.

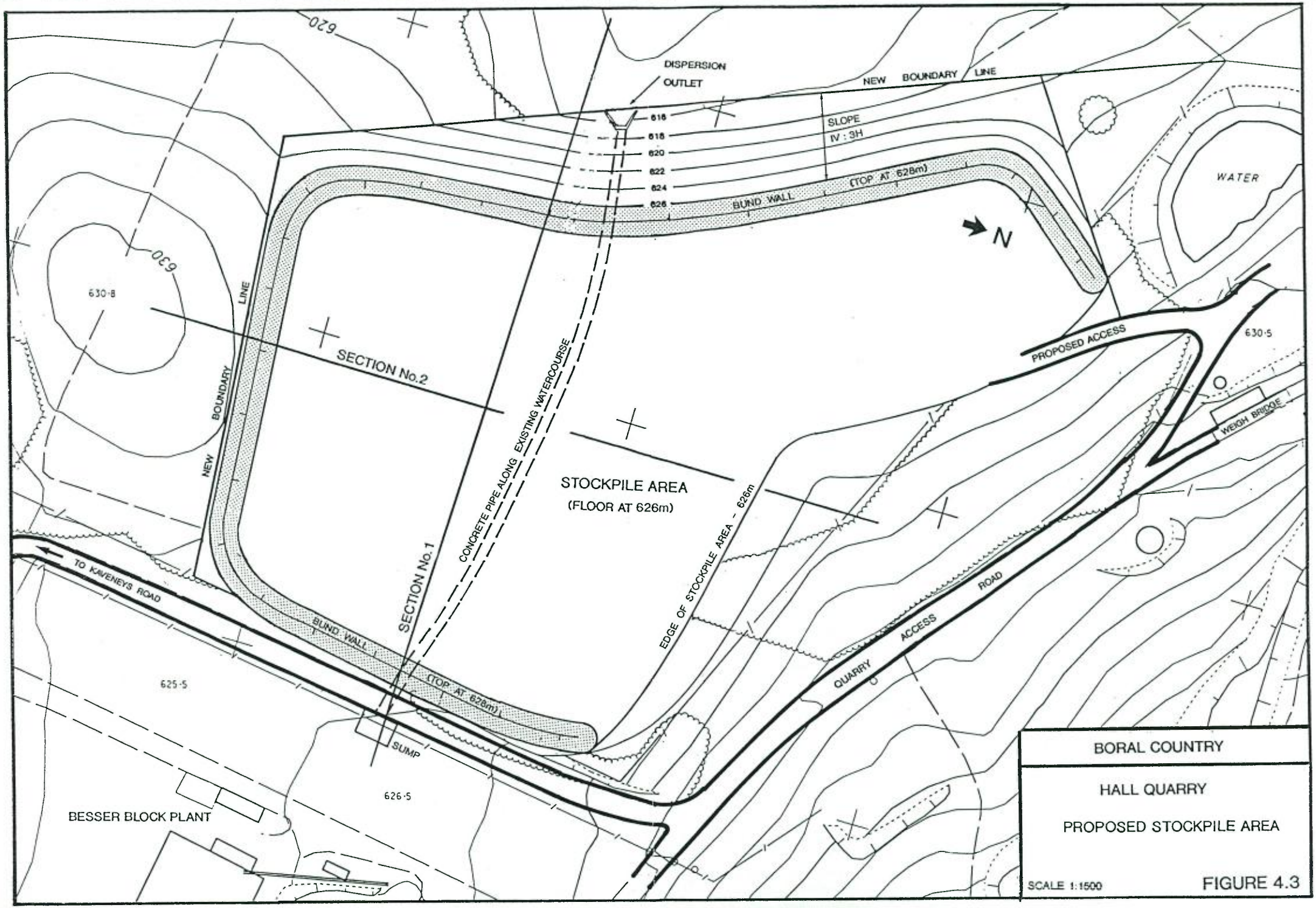


BORAL COUNTRY

HALL QUARRY

STOCKPILE AREA NO.2
LOCATION OF PHOTOGRAPHS

FIGURE 4.2


620
630
630·8
DISPERSION
OUTLET
NEW BOUNDARY LINE
SLOPE
IV : 3H
616
618
620
622
624
626
BUND WALL
(TOP AT 628m)
WATER
N
SECTION No.2
NEW BOUNDARY LINE
CONCRETE PIPE ALONG EXISTING WATERCOURSE
STOCKPILE AREA
(FLOOR AT 626m)
PROPOSED ACCESS
630·5
WEIGH BRIDGE
EDGE OF STOCKPILE AREA - 626m
SECTION No.1
TO KAVENEYS ROAD
BUND WALL
(TOP AT 628m)
QUARRY ACCESS ROAD
625·5
SUMP
626·5
BESSER BLOCK PLANT
BORAL COUNTRY
HALL QUARRY
PROPOSED STOCKPILE AREA
SCALE 1:1500
FIGURE 4.3

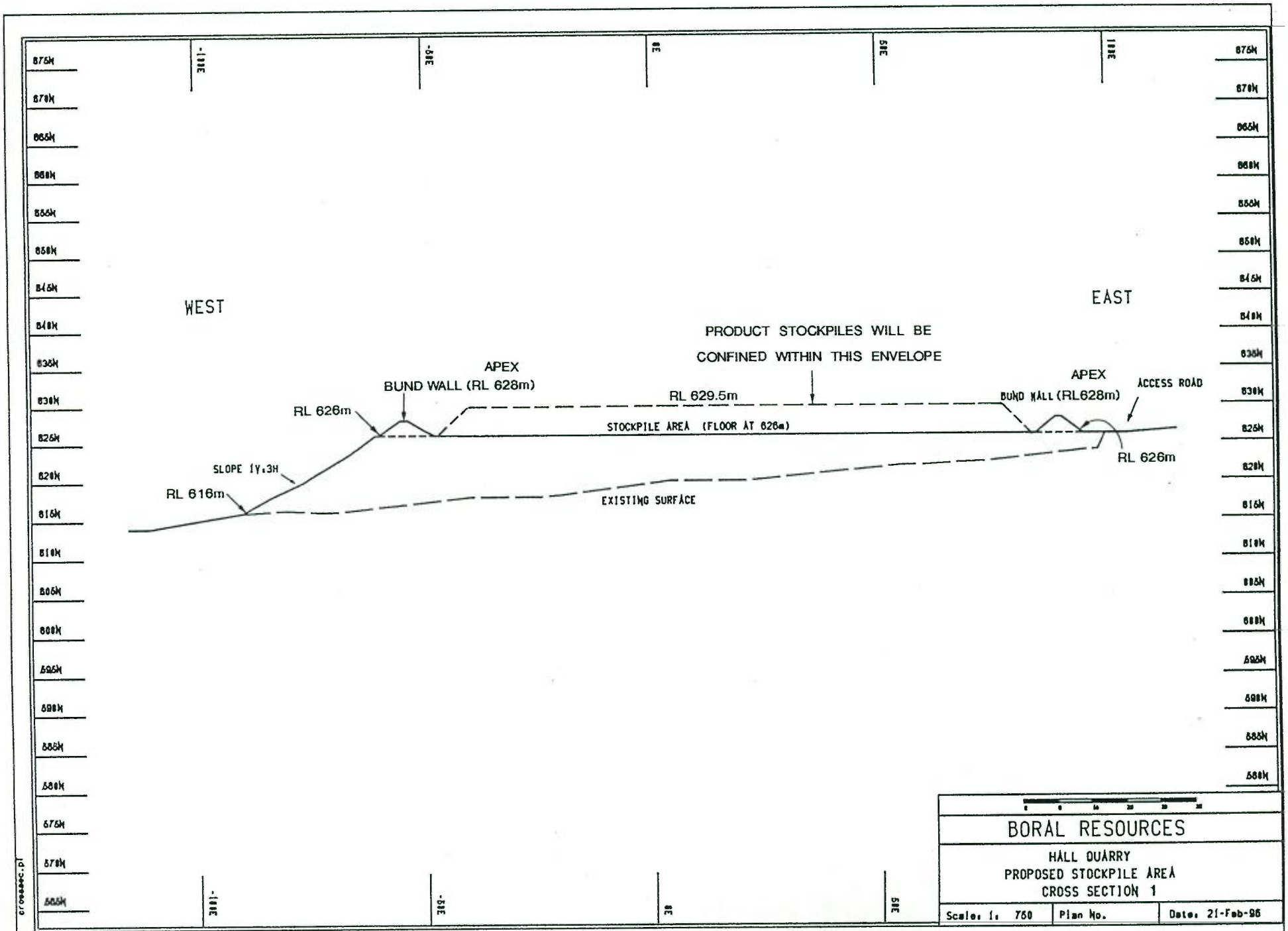

WEST
EAST
PRODUCT STOCKPILES WILL BE
CONFINED WITHIN THIS ENVELOPE
APEX
BUND WALL (RL 628m)
RL 626m
RL 629.5m
STOCKPILE AREA (FLOOR AT 626m)
APEX
BUND WALL (RL628m)
ACCESS ROAD
RL 626m
SLOPE 1V:3H
RL 616m
EXISTING SURFACE
BORAL RESOURCES
HALL QUARRY
PROPOSED STOCKPILE AREA
CROSS SECTION 1
Scale: 1: 750
Plan No.
Date: 21-Feb-96
SURPAC SOFTWARE INTERNATIONAL, AUSTRALIA

FIGURE 4.4

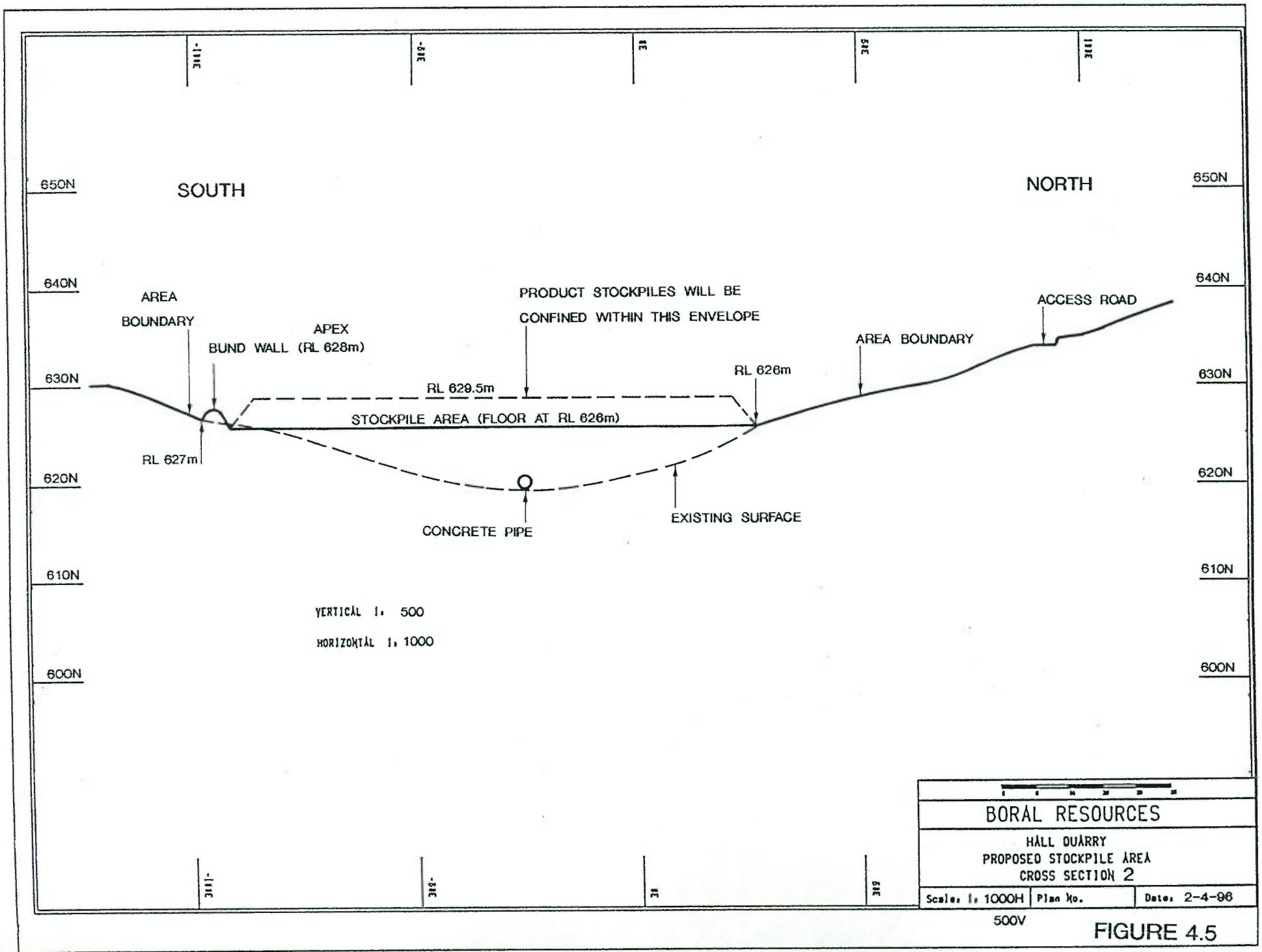

SOUTH
NORTH
650N
640N
630N
620N
610N
600N
AREA BOUNDARY
BUND WALL (RL 628m)
APEX
PRODUCT STOCKPILES WILL BE CONFINED WITHIN THIS ENVELOPE
RL 629.5m
STOCKPILE AREA (FLOOR AT RL 626m)
RL 626m
AREA BOUNDARY
ACCESS ROAD
RL 627m
CONCRETE PIPE
EXISTING SURFACE
VERTICAL 1: 500
HORIZONTAL 1: 1000
BORAL RESOURCES
HALL QUARRY
PROPOSED STOCKPILE AREA
CROSS SECTION 2
Scale: 1: 1000H
Plan No.
Date: 2-4-96
500V

FIGURE 4.5

4.3 Materials to be Stockpiled

The proposed stockpile area will primarily be used for the stockpiling of clean aggregate products and specification road bases such as DGB20 which contain minimal fine material. Crusher dust, as well as non-specification road base and road gravel products containing weathered rock and clay materials, will be stored in Stockpile Area No.1. Run-off from this area of the quarry drains to the established sedimentation ponds from which water is pumped for use in other quarry operations.

4.4 Development Schedule

It is proposed to develop the stockpile area over a period of 1 to 2 months. The total surface area to be disturbed will be an area of 1.8 hectares, approximately 0.9 - 1.0 hectares of which will be actual stockpiling space after the sides have been battered back to 1V:3H.

The material used in filling and levelling the site will be derived from stripping overburden from the next area of extraction operations behind the upper quarry face (Figure 3.1). Development consent has previously been granted for extraction operations in this area.

The western edge of the development will be battered back to 1V:3H and landscaped with grass (propagated through seed) and native trees and shrubs which will be planted as seedlings. The southern edge of the development will be level with the existing ground.

A two metre high bund wall will be constructed around the perimeter of the floor of the stockpile area. The wall will be landscaped and planted with trees and shrubs.

4.5 Water Management

There are three aspects of water management for the proposed stockpile area extension which need to be addressed:

- rainfall run-off via the existing intermittent water course
- rainfall run-off during construction
- rainfall run-off from the stockpile area once operational

Existing Water Flow

The section of land on which the stockpile area is to be constructed contains an east-west running watercourse or seepage line. The watercourse flows only after heavy rainfall, however, sections of flat land adjacent to the channel

remain boggy for longer periods of time. The channel drains rainfall run-off from an area of 5.1 hectares. The catchment consists of the Besser block plant and the land to the northeast of the plant.

The development of the stockpile area will result in the filling of the watercourse and, accordingly, a piped system will need to be installed to ensure the flow of this run-off is not impeded.

It is proposed to excavate a channel along the course of the drainage line and fill the channel with a suitable drainage aggregate such as -75mm/+40mm blend. A concrete pipe with internal diameter of 300mm will be bedded into the layer of drainage aggregate. The pipe will then be covered with a further layer of drainage aggregate and then covered with the fill material which will be used to extend the stockpile area. The use of the coarse drainage aggregate will ensure there is minimal disturbance to the existing water table as ground water which would normally discharge into the watercourse will still be able to flow in the formed channel on which the concrete pipes have been layed.

Run-off During Construction

The greatest potential for the proposed development to cause sedimentation and erosion exists during the construction phase and until final batters have been stabilised with grass.

Fabric filter fencing will be installed around the perimeter of the development so that any fine sediment is removed from the run-off before it reaches the clean water flowing through the pipes and into the drainage channel. Clean run-off from uphill of the site will be diverted around the development. The filter fencing will remain in place until all final batters have been stabilised with grass.

Prior to the construction of the first Stage of Stockpile Area No.2, Boral constructed a sedimentation dam below the stockpile area (Photo No.3). This dam was sized to have a detention capacity of 1000 cubic metres as recommended by the Soil Conservation Service and will act as a final settling pond for water flowing from the site and the existing section of the stockpile area.

Run-off From the Operational Stockpile Area

The stockpile area will be dissected by a N-S aligned crest and an E-W aligned crest with the stockpile area sloping to the four corners of the stockpile area at a gradient of approximately 1V:150H. Water flowing to the northeast and southeast will be channelled to the east into the piped system described above while water flowing to the northwest and southwest will be channelled into the sediment dam as illustrated in Figure 4.6.

Photo No.3 Existing sedimentation dam (Dam No.3) constructed below Stockpile Area No.2

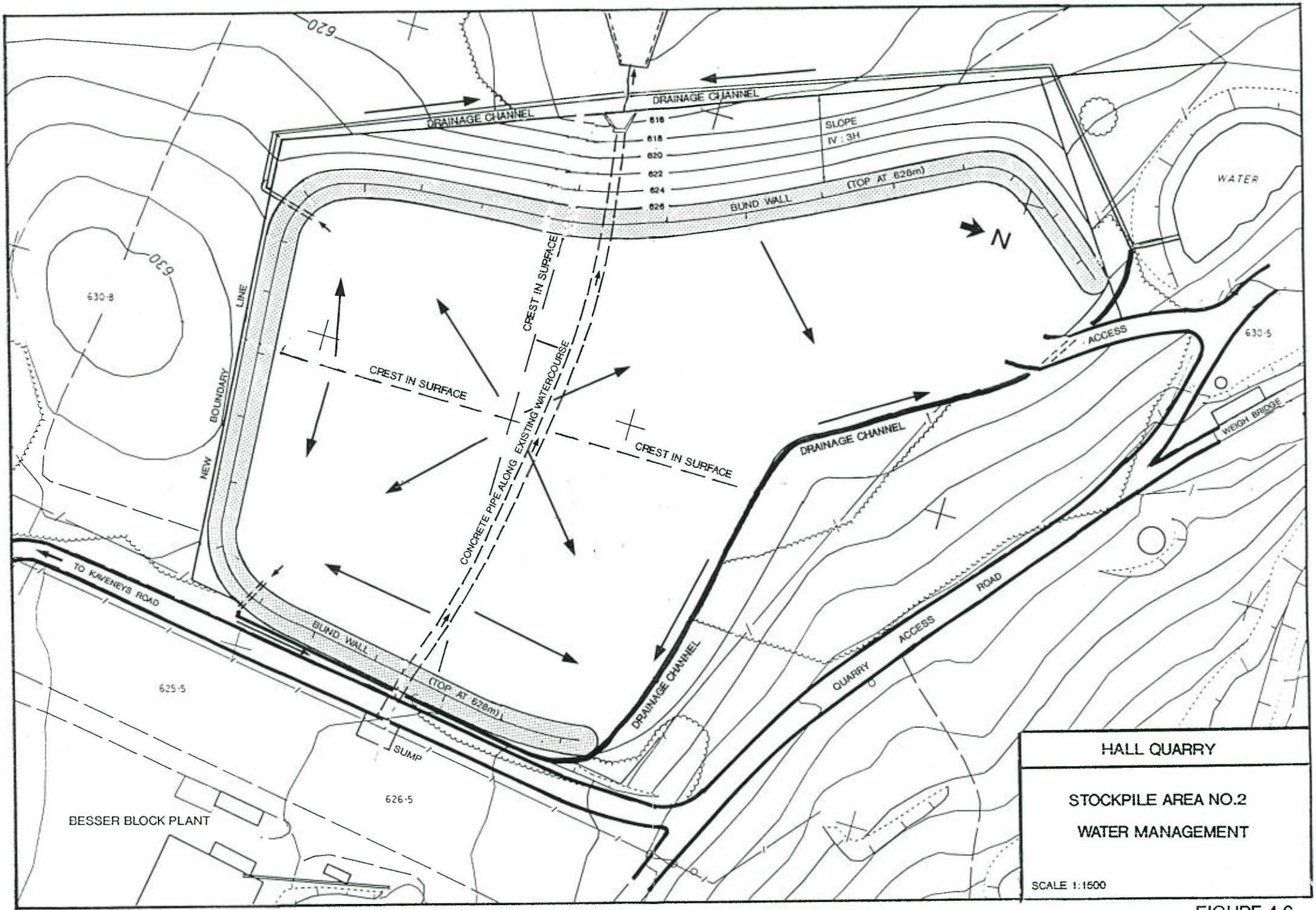

620
630
630·8
DRAINAGE CHANNEL
DRAINAGE CHANNEL
616
618
620
622
624
626
SLOPE
IV : 3H
BUND WALL
(TOP AT 628m)
WATER
N
CREST IN SURFACE
CREST IN SURFACE
CREST IN SURFACE
CONCRETE PIPE ALONG EXISTING WATERCOURSE
NEW BOUNDARY LINE
ACCESS
630·5
WEIGH BRIDGE
DRAINAGE CHANNEL
TO KAVENEYS ROAD
BUND WALL
(TOP AT 628m)
625·5
SUMP
626·5
DRAINAGE CHANNEL
QUARRY ACCESS ROAD
BESSER BLOCK PLANT
HALL QUARRY
STOCKPILE AREA NO.2
WATER MANAGEMENT
SCALE 1:1500

FIGURE 4.6

All water leaving the stockpile area will be directed into the existing sedimentation dam below the stockpile area which will slowly drain into the natural watercourse which flows to the west.

Sedimentation in the run-off will be minimal as the stockpiles in this area will be dominantly clean aggregate and specification road base containing minimal fine material. Non specification road base and road gravel products, which contain weathered rock and clay materials, will be stored in the existing stockpile area run-off from which drains to other existing sedimentation ponds. Water from these dams is pumped to either a large tank, which supplies water to irrigation lines, or to the crushing plant and weighbridge for dust suppression purposes.

4.6 Mobile Equipment

The ongoing quarry development will utilise the existing mobile plant equipment (see Section 3.2). Equipment levels are not expected to change with this Application.

4.7 Landscaping

The sides of the stockpile area and the flanks of the bund wall will be covered with topsoil and sown with a grass seed mix, recommended by the Soil Conservation Service, which has been used with success elsewhere in the quarry. The seed mix contains the following species:

PASTURE SPECIES FOR REHABILITATION	
Species	Application Rate
Couch	4 kg/ha
Woolly Vetch	4 kg/ha
Cocksfoot	5 kg/ha
White Clover	2 kg/ha
Soft Brome	4 kg/ha
Cereal Rye (Rye Corn)	10 kg/ha
Starterphos Fertiliser	200 kg/ha

Pasture species will be either broadcasted or hydromulched depending on access for vehicles.

The pasture may need to be refertilised again in six months after spreading with 125 kg/ha of superphosphate, however this will be dependant on growth rates. The pasture mix has been extremely successful in previous revegetation programs at Hall Quarry and was used on the western flank of the existing section of Stockpile Area No.2.

Tree and Shrub Planting

Tubestock will be planted to create a visual screen to the stockpile area. Vegetation species selection will be based on;

* previous success in revegetation programs at Hall Quarry,
* provision of habitat for Regent Honeyeater, Superb Parrot, and other native animals; and,
* species endemic to the area.

Trees and shrubs will be in the form of tubestock and would be planted in March or August to September, when moisture is available.

The favoured tree species of the Regent Honeyeater and the Superb Parrot were considered in selecting species combinations. Eucalypts such as White Box, Yellow Box, and Blakely's Red Gum are favoured by both birds, and will be implemented in the revegetation plan.

No sightings of either of the birds have been made at the quarry, however hey are known to overfly the area. By including these species in the rehabilitation plan, Boral is providing another food source base for these "endangered" and "threatened" species.

Details on the plant species to be used in landscaping are presented below:

Tree Species to be Used in Landscaping		
Scientific Name	**Common Name**	**Mature Height (m)**
Casuarina glauca	Swamp Oak	15+
Eucalyptus blakelyi	Blakely's Red Gum	15+
E. melliodora	Yellow Box	15+
E. albens	White Box	15+
Callistemon citrinus	Crimson Bottlebrush	3-6
C. paludosus	Lemon Bottlebrush	3-6
Grevillea rosmarinifolia	Rosemary Grevillea	3

Planting Procedure

Trees/shrubs will be planted in the form of tubestock and will have tree guards placed around them for protection from feral animals and harsh climatic conditions. Tree/shrub tubestock will be planted in the rip lines which have been cut two to three weeks in advance.

SECTION 5

Description of the Existing Environment

5. DESCRIPTION OF THE EXISTING ENVIRONMENT

5.1 Local Context

Hall quarry is located on the western side of the Barton Highway approximately 14 kilometres south of Murrumbateman and 40 kilometres south of Yass.

Population centres within a 15 kilometre radius of the quarry include Hall (ACT) and Murrumbateman.

5.2 Planning Controls

The proposed development is situated within the Shire of Yass. Yass Shire Council is the consent authority for this development.

The subject land is zoned Rural Agricultural 1(a) as outlined in the Yass Shire Council Local Environmental Plan 1987. This zoning permits extractive industry with the consent of Council.

5.3 ACT and Sub-Region Planning Strategy

This Strategy was devised to provide a framework for considering development needs for the ACT and Sub-Region. The "Sub-Region" includes the City of Queanbeyan and the Shires of Gunning, Yass and Yarralumla. This Strategy is in draft form only at the time of preparing this EIS.

The specific tasks identified in the Strategy were to:

- plan to meet the immediate to long term needs for the urban and industrial development
- identify significant natural and cultural environmental resources and appropriate measures of protection
- develop planning guidelines for, and improve communication and co-ordination between, agencies and government involved in the extraction of non-metallic mineral resources
- establish the availability of water resources for further development in the region
- co-ordinate planning of cross-border road linkages

The specific areas relating to the Development Application, for an extension to the stockpiling area at Hall quarry, are discussed in the following sections.

Urban Development

Hall quarry is located at the northern end of an area identified as a potential future urban area. This area, designated Gooromon - Jeir in the Strategy, has been provisionally designated as the first "new town" in NSW and will be part of the long term strategy to cater for an increase in the population of the Canberra region from 300,000 to 600,000. (Refer to Figure 5.1)

Hall quarry is ideally situated to supply construction materials to large scale development in this area. The quarry's immediate location and direct access to the Barton Highway means that the raw materials can be supplied to the area without heavy vehicles being required to traverse existing urban areas of Canberra or other population centres in the Sub-Region.

Natural and Cultural Environmental Resources

Hall quarry is located adjacent to the Barton Highway which has been identified as a National Capital approach route. The Strategy Plan calls for the protection of visual corridors along such arterial routes in order to preserve the visual amenity of the corridor, retain views of the regional landscape and compliment the rural landscape setting of the National Capital.

The visual amenity of the Barton Highway can be preserved by retaining significant vegetation and screening development from highway travellers.

Hall quarry is screened from the Barton Highway by the topography of Doonan Hills. The proposed stockpile area extension will not be visible from any section of the Barton Highway over the life of the quarry.

Investigations into fauna, flora and archaeology on the property and have found there to be no ecological or cultural sites of significance that will be disturbed by the operation.

Extractive Industries

The Strategy has established guidelines for local authorities to deal with extractive industry development applications. The aim is to ensure that valuable resources are not sterilised, extraction sites are rehabilitated and that damage to roads from heavy vehicle haulage is minimised.

Hall quarry is a valuable resource of construction material which has an approximate life of 60 years based on forecast demands for the region. The quarry is located in close proximity to Canberra and within an area designated for potential future urban growth. The quarry could supply the construction materials necessary for building of required infrastructure.

The quarry pays an appropriate Section 94 road maintenance levy to Yass Shire Council to compensate for damage to local roads.

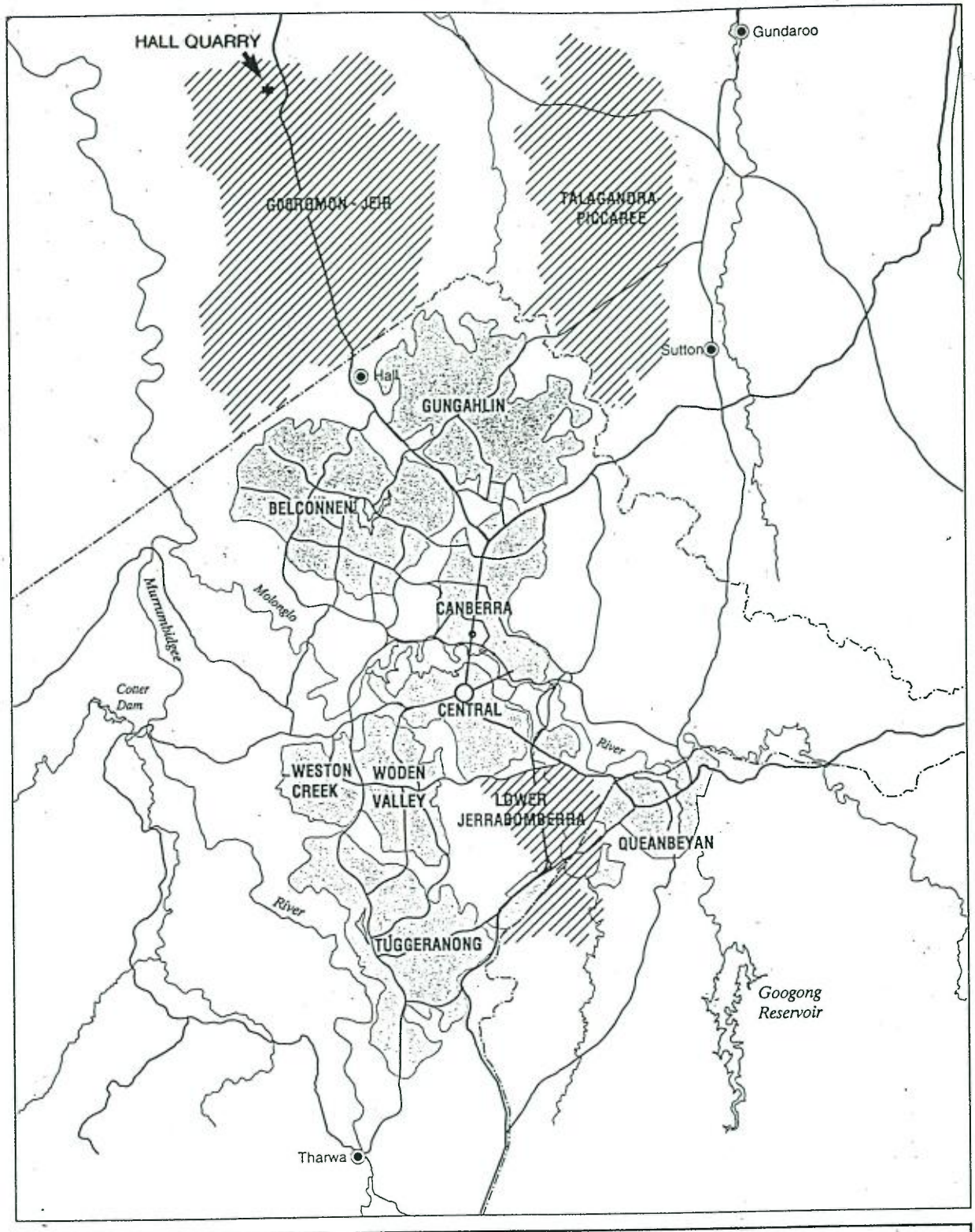

HALL QUARRY
Gundaroo
GOORGMON - JEIR
TALAGANDRA-PICCAREE
Sutton
Hall
GUNGAHLIN
BELCONNEN
Murrumbidgee
Molonglo
CANBERRA
Cotter Dam
CENTRAL
River
WESTON CREEK
WODEN VALLEY
LOWER JERRABOMBERRA
QUEANBEYAN
River
TUGGERANONG
Googong Reservoir
Tharwa
Existing and committed urban areas
Recommended to be retained for urban uses
ACT & SUB-REGION
0
5
10km
METROPOLITAN GROWTH OPTIONS
Urban development options

FIGURE 5.1

Availability of Water Resources
Hall quarry is not located within any protected water catchment or within any river corridor or wetland identified in the Strategy.

Cross-Border Road Linkages
The Strategy identifies the NSW Department of Planning, the Roads and Traffic Authority and Yass Shire Council as the authorities in NSW to develop a co-ordinated planning strategy for road linkages. This Application will not result in any increase in the numbers of heavy vehicles using the local and classified road network. In the course of preparing the original EIS for Hall quarry all of the appropriate authorities were consulted and recommendations made regarding road transport. These recommendations were addressed at the time and subsequently acted upon following the granting of Consent in 1994.

5.4 Topography and Drainage

The proposed stockpile area extension will be developed on a flat to gently undulating section of land which forms a shallow valley immediately to the south of the existing Stockpile Area No.2. An intermittent watercourse lies within the area to be developed and conveys rainfall run-off water from uphill of the Besser Block Plant. The watercourse flows from east to west and drops, over a distance of 200 metres, from a height of 626 metres in the east to 615 metres at the western boundary. The northern side of the area rises to the existing quarry access road at 627 metres while the southern boundary is marked by a small hill with a top at 631 metres.

5.5 Soils and Fill

A comprehensive soil study was conducted over the Boral property by the Queanbeyan office of the Department of Conservation and Land Management. The full report is contained in Appendix 5 of the original Environmental Impact Statement, accompanying the Development Application for the overall quarry operation. A summary of the findings is presented below.

Four soil types have been identified on the property and represent a hillslope assemblage typical of that derived from the acid volcanic rocks found throughout the region. The soil are lithosols, red podzolics, stony red podzolics and yellow podzolics. Their distribution within the property is broadly related to their location in the landscape. Lithosols occur on the rocky ridgetops and steeper sideslopes, the stony red podzolics on the less steep mid and upper slopes, the red podzolics on mid slopes and the yellow podzolics on the lower slopes and drainage lines. The dominant soil type which is present in the proposed stockpile area is the yellow podzolic and the soil type to be used as fill in the area is the stony red podzolic soil. This will be derived from the quarry's extraction area. A description of both soil types is presented below;

Table 5.1 - Stony Red Podzolic Soil Description		
Soil Type:	Stony red podzolic	
Occurrence:	Less steep sideslopes and parts of crest not occupied by lithosols	
Parent material:	Acid volcanics; common surface stone, very little outcrop	
Depth (cm)	**Horizon**	**Description**
0-15	A1	Dark brown sandy loam; many fine roots and worm channels; fine crumb structure; 10% stone and rock; moist soft consistency; pH 6.0; gradual boundary to
15-45	A2	Grey brown light sandy clay loam; few fine roots; 5-10% stone and rock; massive structure, earthy fabric; moist soft consistency; pH 5.8; clear boundary to
45-90	B2	Dull reddish-brown medium clay; faint grey mottling; 5-10% stone and rock; moderate polyhedral structure, smooth ped fabric; moist firm consistency; pH 6.5; gradual boundary to
90+	C	Firm weathered rock.
Notes:	1. Depth varies from 60 to 120cm, depending largely on degree of weathering of underlying rock.	
	2. Stone content varies considerably, from 5% to 30% of volume.	
	3. The depth of the A1 horizon averages 15cm, but can be up to 20cm thick.	

Table 5.2 - Yellow Podzolic Soil Description		
Soil Type:	Yellow podzolic	
Occurrence:	Gentle lower slopes and drainage lines	
Parent material:	Colluvium and alluvium	
Depth (cm)	**Horizon**	**Description**
0-20	A1	Dark grey brown clay loam; many fine roots and worm channels; strong crumb structure; moist soft consistence; pH 6.0; gradual boundary to
20-50	A2	Grey brown clay loam; few fine roots; massive structure, earthy fabric; moist soft consistence; pH 6.0; clear boundary to
50+	B2	Yellow brown medium clay; common red and grey mottling; moderate sub-angular blocky structure, smooth ped fabric; wet firm consistence; pH 7.0.

Soil Erosion Potential

With the good grass cover that presently exists on the property, soil erosion rates are low. However, with the removal of the vegetation cover, the potential for erosion increases significantly. The soils with the highest erosion potential are the yellow podzolics which have a moderately dispersible subsoil. These soils, which make up the land on which the stockpile area will be extended, will not be

disturbed by development of the stockpile area, rather, they will be covered by the stony red podzolic soil transported from the extraction area to be used as fill in forming the stockpile area. The stony red podzolics have a lower erosion potential as the B horizon is less dispersible. However, the exposure of any of the soil types in stockpiles or as formed batters, to raindrop impact and run-off, will lead to sediment production. Accordingly, sediment control measures will be utilised to minimise any such impacts.

Topsoil Suitability

The average depth of the organic rich A1 horizon over the property is 10 - 15 centimetres. This soil layer is regarded as having a high nutrient value, however, the quality in the stony red podzolic soil is lessened due to the high stone content. Where possible, this material will be stockpiled separately and used in progressive rehabilitation and landscaping works. The topsoil associated with the yellow podzolics is of good quality and will be collected for reuse wherever possible.

5.6 Flora and Fauna

A comprehensive fauna and flora survey has been conducted over the quarry area and the surrounding Boral property for the quarry's original Environmental Impact Statement. A further inspection was made of the subject area by Ms Isobel Crawford of Australian Botanical Surveys for this report. The report for this study is contained in Appendix 4 of this document.

5.6.1 Vegetation

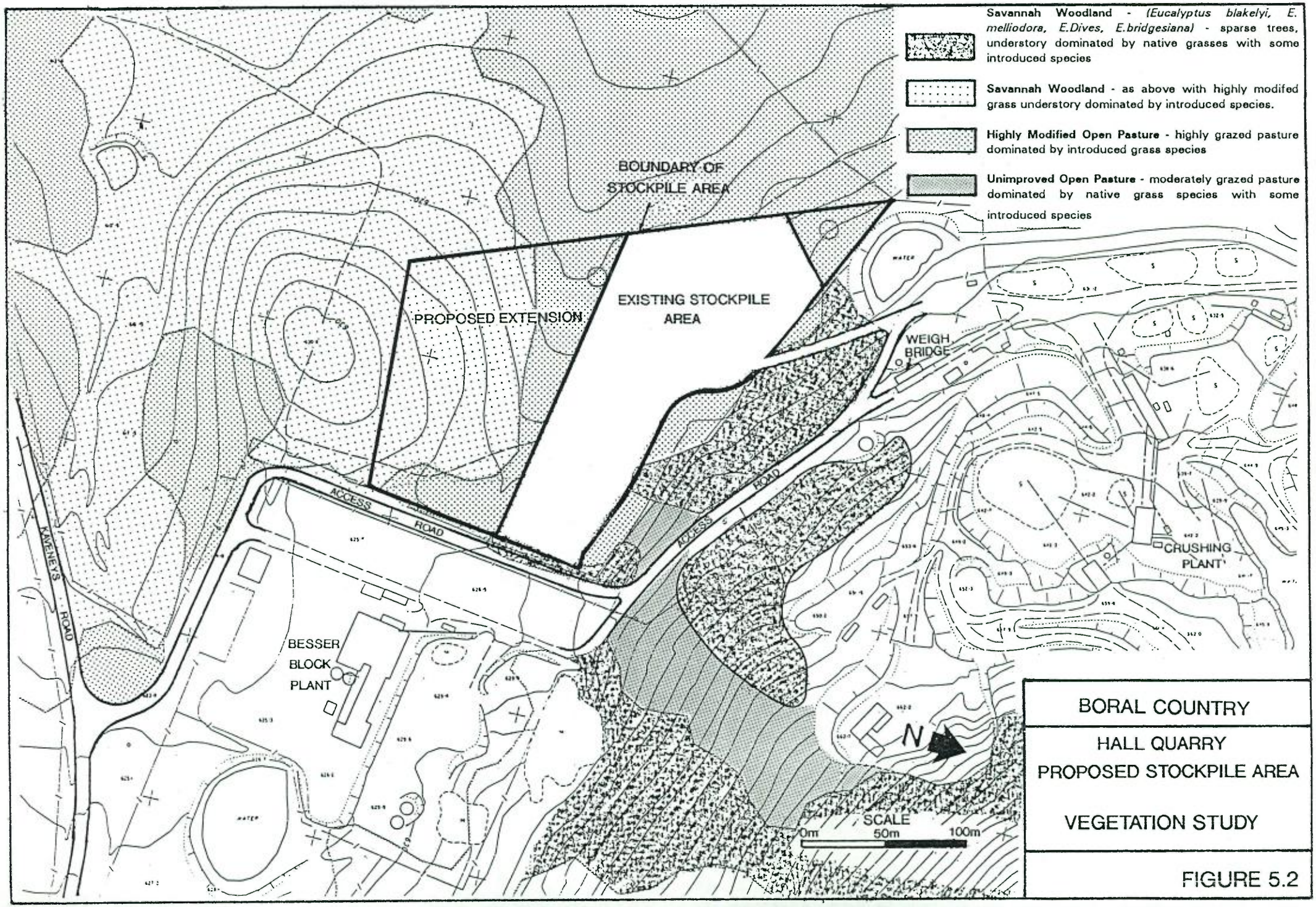
The vegetation of the study area has been highly modified by clearing and pasture improvement for grazing. The site has been cleared and subject to grazing for more than a century. There were no rare or vulnerable plant species identified in the study.

Approximately 90 percent of the study area has been heavily grazed and used extensively as cattle and sheep camps. The associated high nitrogen levels and heavy grazing have favoured the establishment of thistles and other weeds.

Two main vegetation units were recognised within the study area. These units, which are shown in Figure 5.2, were mapped with ground traverses and using recent colour aerial photographs of the area. The plant communities are described as follows:

Highly Modified Open Pasture

The highly modified pasture is present in the lower slope and flat areas of


Savannah Woodland - (Eucalyptus blakelyi, E. melliodora, E.Dives, E.bridgesiana) - sparse trees, understory dominated by native grasses with some introduced species
Savannah Woodland - as above with highly modifed grass understory dominated by introduced species.
Highly Modified Open Pasture - highly grazed pasture dominated by introduced grass species
Unimproved Open Pasture - moderately grazed pasture dominated by native grass species with some introduced species
BOUNDARY OF STOCKPILE AREA
PROPOSED EXTENSION
EXISTING STOCKPILE AREA
WEIGH BRIDGE
ACCESS ROAD
ACCESS ROAD
KAMENEYS ROAD
BESSER BLOCK PLANT
CRUSHING PLANT
N
SCALE
0m
50m
100m
BORAL COUNTRY
HALL QUARRY
PROPOSED STOCKPILE AREA
VEGETATION STUDY
FIGURE 5.2

the study area and, due to pasture improvement and grazing, consists mostly of introduced grass species. The pasture improvement has introduced species such as Phalaris *(Phalaris aquatica)*, Soft Brome *(Bromus molliformis)* and Clover *(Trifolium spp)*. Patches of Spear Thistle *(Carthamus vulgare)* are scattered throughout the paddocks and Rush species (Juncus sp.) are present in the watercourse. Occasional, scattered mature Blakely's Red Gum *(Eucalyptus blakelyi)* trees occur in these paddocks.

Savanna Woodland

This community is confined to the southern and northern slopes of the study area which are generally rocky and less suitable for pasture improvement. The vegetation consists of sparse tree cover with areas where the understorey is mainly introduced grass species.

The tree species consist of Yellow Box *(E. melliodora)*, Red Stringybark *(E. macraorhyncha)*, and occasional Candlebark *(E. rubida)*. The dominant grass species in the southern woodland pocket are those mentioned in the Open Pasture Community. The northern woodland pocket, between the quarry access road and the existing section of Stockpile Area No.2, has been less affected by grazing with the result that native species such as *Bothriochloa macra, Microlaena stipoides* and Slender Spear Grass *(Stipa scabra ssp. falcate)* dominate over the previously mentioned introduced species.

5.6.2 Fauna

Fauna habitat in the area consists of the following: highly modified pasture, intermittent drainage channel dominated by modified pasture; modified pasture with scattered trees; sparse woodland; rock outcrops; and dams constructed as settling ponds. Trees in the study area are of various ages ranging from mature, generally without nesting hollows, to saplings and seedlings clustered around parent plants.

No endangered fauna species were recorded during the survey or are known to utilise the area. A comprehensive survey, included in the Environmental Impact Statement for the original Development Application, also failed to detect any endangered fauna.

No habitat, suitable for endangered fauna, is present on the site.

Birds

A total of thirty species of birds have been observed on the site. Two species of waterbirds, Australian Wood Duck *(Chenonetta jubata)* and Eurasian Coots *(Fulica atra)*, were observed on the settling ponds. Other birds identified included species of Raptors and small birds such as Thornbills *(Acanthiza chysorrhoa and A. lineata)* and Spotted Pardalotes

(Pardalotus punctatus).

A pair of Peregrine Falcons *(Falco peregrinus)* have been known to nest in the disused northern quarry since 1991. Other falcons have since been observed nesting in the main quarry. Although uncommon, Peregrine Falcons are not listed on Schedule 12 as endangered fauna. The species has a worldwide distribution and is widespread, but uncommon, over all of Australia. The falcons would not utilise the study area for nesting but may occasionally hunt there for small marsupials.

Mammals

In addition to introduced mammals (cattle, sheep, rabbits, foxes and mice), a small number of common native mammals was observed or detected on the presence of nests, scats and scratchings. These included Eastern Grey Kangaroo *(Macropus giganteus)* and, Common Brushtail Possum *(Trichosurus vulpecula)*. Although not observed, a number of species of bats *(Microchiroptera)* are likely to commonly occur in the study area.

Reptiles

No reptiles were observed during habitat searches. While common reptiles are likely to occur on the site from time to time it is considered that the site contains no suitable habitat for endangered reptiles.

Amphibians

Two species of frog were heard calling from dams in the area. These were the Common Eastern Froglet *(Crinia signifera)* and the Whistling Tree Frog *(Litoria verreauxii)*. It is likely that other common species would use the area from time to time.

5.7 Air Quality

The air quality in the area around Hall quarry is typical of a local rural environment. The local air quality is periodically, and usually only locally, affected by the following influences:

- rural activities such as burning off or ploughing
- windborne dust emanating from local gravel roads
- dust and fume generation along the Barton Highway
- dust generation from the existing quarry operation

Dust deposition gauges were installed in three locations around the quarry in June 1993. An additional two gauges were installed in July 1993. The location of gauges are illustrated in Figure 6.1. It has been found that dust deposition levels will vary considerably with the changing seasons with higher levels in summer due to longer periods between rainfalls and less moisture in the ground. The results for

dust monitoring over 1995 and 1996 are presented in Table 5.4.

The EPA considers that residential areas would begin to experience dust related nuisance impacts when annual average dust deposition levels exceed 4 grams per square metre per month. When considering results from dust deposition gauges it is important to note that the EPA criterion is an annual average of monthly records and not individual monthly readings.

The results for the dust deposition gauges for January 1995 to August 1996 are presented in Table 5.4 and represent ambient dust levels with the quarry operating at its present production rate of 160,000 tonnes per annum.

The EPA criteria for dust fallout is presented in Table 5.3.

Table 5.3 - Environmental Protection Authority Criteria for Dust Fallout		
Existing dust fallout level (g/m^2/month)	Maximum acceptable increase over existing fallout levels - (g/m^2/month)	
	Residential	Other
2	2	2
3	1	2
4	0	1

From the results in Table 5.4 it can be seen that the quarry complied with EPA guidelines for a rural area for all sites for 1995 and 1996 to date. The readings from Gauge No.3 and No.4 are ocasionally slightly high for a residential area but are acceptable for a rural area. Both of these gauges are remotely located from quarry operations and accordingly, the higher readings are more likely due to surrounding rural activities than from any quarry activity.

A dust impact assessment for the operation has been undertaken by Nigel Holmes and Associates and is presented in full in Appendix 3. The results of the dust assessment are discussed in Section 6.2.

5.8 Archaeological Heritage

The site has been cleared many years ago and has been used extensively for grazing purposes. It is considered highly unlikely that there are aboriginal sites or relics on the property. A comprehensive archaeological study was conducted on the adjacent Boral property for inclusion in the quarry's EIS. This study failed to located any aboriginal sites but did locate a single quartz flake which could be interpreted as being aboriginal in origin.

Table 5.4 - Dust Deposition Data in the Vicinity of Hall Quarry - 1995									
Month	**Gauge D1**			**Gauge D2**			**Gauge D3**		
	Ash ($g/m^2/mth$)	Combustible Matter ($g/m^2/mth$)	Insoluble Solids ($g/m^2/mth$)	Ash ($g/m^2/mth$)	Combustible Matter ($g/m^2/mth$)	Insoluble Solids ($g/m^2/mth$)	Ash ($g/m^2/mth$)	Combustible Matter ($g/m^2/mth$)	Insoluble Solids ($g/m^2/mth$)
January 95	2.17	0.98	3.15	1.94	0.51	2.45	1.45	1.20	2.65
February	0.75	0.95	1.70	0.95	1.00	1.95	1.08	1.07	2.15
March	0.99	0.31	1.30	1.59	0.42	2.01	1.18	0.64	1.82
April	3.51 **	9.22 **	12.73 **	4.39	0.99	5.38	1.63	0.82	2.45
May	5.64	1.39	7.03	2.64	0.98	3.62	3.63	1.31	7.03
June	0.95	0.24	1.19	1.02	0.43	1.45	0.95	0.28	1.23
July	3.85	2.17	6.02	3.23	0.94	4.17	2.42	0.85	3.27
August	1.51	1.09	2.60	1.25	0.61	1.86	0.97	0.78	1.75
September	1.40	0.68	2.08	1.22	0.85	2.07	1.24	1.06	2.30
October	1.41	1.18	2.59	2.00	1.20	3.20	1.35	1.10	2.45
November	1.38	1.14	2.52	1.69	1.22	2.91	1.69	1.40	3.09
December	0.55	1.04	1.59	1.05	0.94	1.99	0.85	1.14	1.99
TOTAL	**20.60**	**11.17**	**31.77**	**22.97**	**10.09**	**33.06**	**18.44**	**11.65**	**30.09**
MONTHLY AVERAGE	**1.87**	**1.10**	**2.89**	**1.91**	**0.84**	**2.75**	**1.54**	**0.97**	**2.51**

** Sample contaminated by insects and not included in annual average

Table 5.4 - Dust Deposition Data in the Vicinity of Hall Quarry - 1995						
Month	Gauge D4			Gauge D5		
	Ash ($g/m^2/mth$)	Combustible Matter ($g/m^2/mth$)	Insoluble Solids ($g/m^2/mth$)	Ash ($g/m^2/mth$)	Combustible Matter ($g/m^2/mth$)	Insoluble Solids ($g/m^2/mth$)
January 95	4.24	2.90	7.14	2.26	1.91	4.17
February	2.83	0.45	3.28	1.38	1.03	2.41
March	2.47	1.19	3.66	4.32	0.28	4.60
April	2.51	1.76	4.27	2.03	0.96	2.99
May	2.09	1.59	3.68	2.18	0.90	3.08
June	2.01	1.14	3.15	1.05	1.73	2.78
July	4.87	1.05	5.92	4.39	0.98	5.37
August	1.41	1.38	2.79	1.81	0.91	2.72
September	3.52**	5.02**	8.54**	2.17	1.15	3.32
October	2.73	2.49	5.22	2.05	0.98	3.03
November	3.20	2.97	6.17	2.12	1.55	3.67
December	1.05	1.57	2.62	1.54	0.57	2.11
TOTAL	**29.41**	**18.49**	**47.90**	**27.30**	**12.95**	**40.25**
MONTHLY AVERAGE	**2.67**	**1.68**	**4.35**	**2.27**	**1.08**	**3.35**

** Sample contaminated by insects and not included in annual average

Dust Deposition Data in the Vicinity of Hall Quarry - 1996									
Month	**Gauge D1**			**Gauge D2**			**Gauge D3**		
	Ash ($g/m^2/mth$)	Combustible Matter ($g/m^2/mth$)	Insoluble Solids ($g/m^2/mth$)	Ash ($g/m^2/mth$)	Combustible Matter ($g/m^2/mth$)	Insoluble Solids ($g/m^2/mth$)	Ash ($g/m^2/mth$)	Combustible Matter ($g/m^2/mth$)	Insoluble Solids ($g/m^2/mth$)
January 96	1.59	1.41	3.00	1.57	0.91	2.48	1.57	1.26	2.83
February	2.23	1.62	3.85	2.71	1.34	4.05	5.52	4.79	10.31
March	1.26	0.60	1.86	2.02	0.86	2.88	2.92	5.92	8.84
April	1.93	0.97	2.90	1.62	0.82	2.44	1.79	0.90	2.69
May	1.03	0.70	1.73	1.69	0.79	2.48	2.04	1.02	3.06
June	2.01	0.82	2.83	1.34	0.70	2.04	1.75	0.75	2.50
July	2.73	1.22	3.95	1.14	0.69	1.83	1.67	0.67	2.34
August	1.09	0.67	1.76	2.20	1.14	3.34	2.65	0.89	3.54
September									
October									
November									
December									
TOTAL *	**13.87**	**8.01**	**21.88**	**14.29**	**7.25**	**12.54**	**19.91**	**16.20**	**36.11**
ANNUAL * **AVERAGE**	**1.73**	**1.00**	**2.73**	**1.79**	**0.91**	**2.69**	**2.49**	**2.02**	**4.51**

* Results to date

** Sample contaminated by insects and not included in annual average

Dust Deposition Data in the Vicinity of Hall Quarry - 1995						
Month	**Gauge D4**			**Gauge D5**		
	Ash ($g/m^2/mth$)	Combustible Matter ($g/m^2/mth$)	Insoluble Solids ($g/m^2/mth$)	Ash ($g/m^2/mth$)	Combustible Matter ($g/m^2/mth$)	Insoluble Solids ($g/m^2/mth$)
January 96	2.26	1.76	4.02	1.67	1.26	2.93
February	5.42**	10.62**	16.04**	2.70	1.30	4.00
March	2.11	1.39	3.50	2.08	1.08	3.16
April	1.96	1.29	3.25	2.52	1.03	3.55
May	2.57	1.50	4.07	2.89	0.99	3.88
June	7.17	2.01	9.18	2.77	0.86	3.63
July	3.49	2.38	5.87	3.52	1.12	4.64
August	1.43	1.34	2.77	2.83	0.34	3.17
September						
October						
November						
December						
TOTAL *	**20.99**	**11.67**	**32.66**	**20.97**	**7.98**	**28.95**
ANNUAL * AVERAGE	**3.00**	**1.67**	**4.67**	**2.62**	**1.00**	**3.62**

* Results to date

** Sample contaminated by insects and not included in annual average

An inspection of the trees in the study area failed to identify any trees containing scars which could be considered aboriginal in origin. No artefacts where located on the ground.

However, should aboriginal sites or relics ever be discovered, the appropriate authorities will be notified so that protection or recovery measures could be arranged. The Company will co-operate fully with the National Parks and Wildlife Service of NSW in this regard.

5.9 Landuse

Land uses in the area around the Hall quarry fall into several categories:

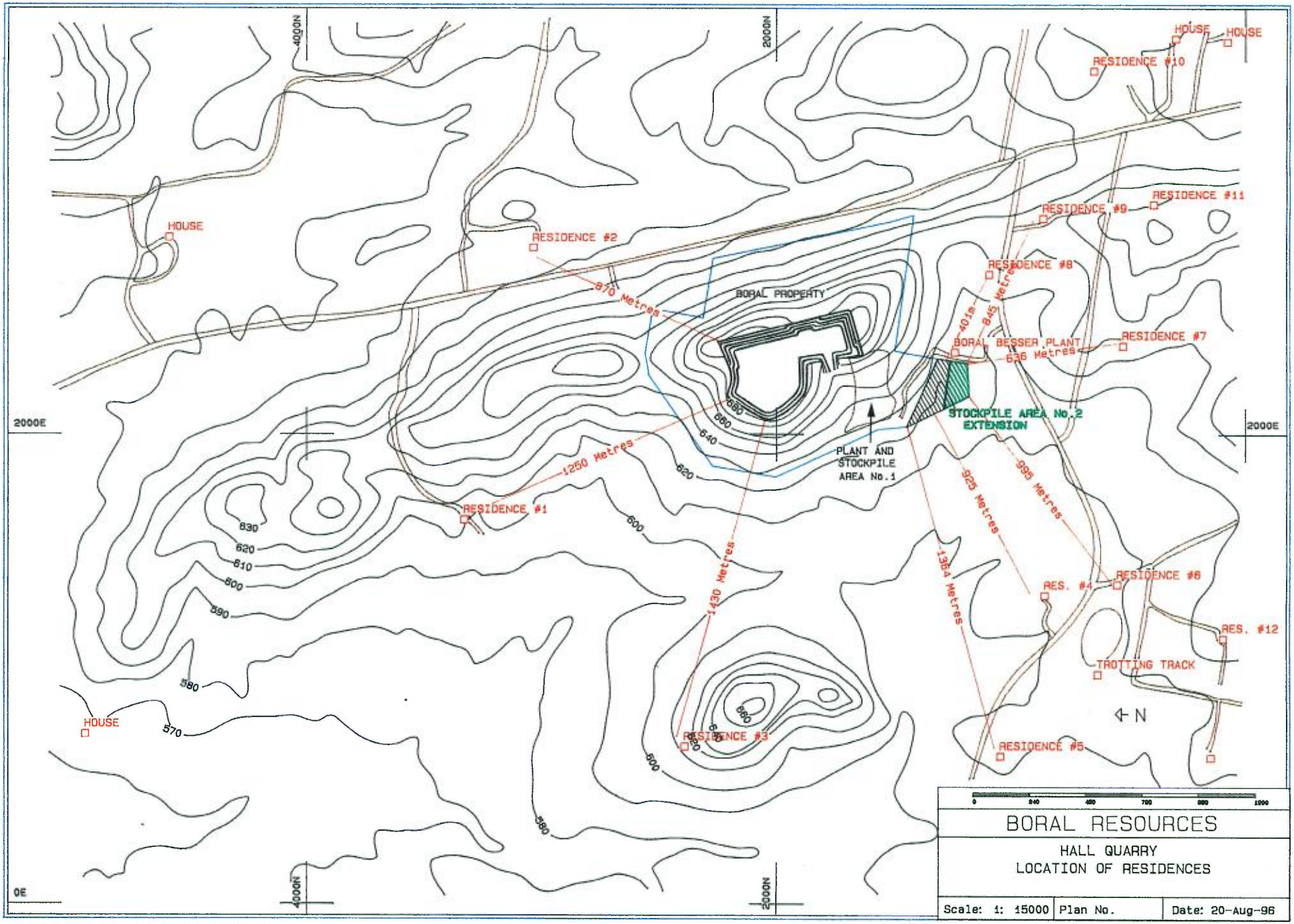
Residential

Thirteen residences are located within 2 kilometres of the quarry and processing area. The location of these residences is shown in Figure 5.3. Distances and directions from the closest point of quarry development are listed in the following Table.

Table 5.4 - Location of Surrounding Residences

Residence	Name	Direction (Mag)	Distance*
No.1	Mountain View	334°	1250 m
No.2	Kurrajong	30°	925 m
No.3	Silver Wattle	281°	1430 m
No.4	---	229°	925 m
No.5	Lambruk	242°	1364 m
No.6	---	217°	996 m
No.7	---	178°	638 m
No.8	Boral	146°	401 m
No.9	Ginnagulla	140°	845 m
No.10	---	137°	1400 m
No.11	---	155°	1150 m
No.12	Kaneema Park	213°	1650 m
No.13	Karinya	225°	1950 m

* *All distances are from the closest point of present or future quarry/stockpile area development to the individual residence.*



residend.pf

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FIGURE 5.3

Agricultural
Sheep and cattle grazing is the principal landuse in the vicinity the quarry. Sheep are run on a number of properties around the quarry for wool and meat and agisted on Boral's land. A fine wool merino stud operates approximately 3km west of the quarry. A number of piggeries also operate in the area.

Pasture in the area is predominantly improved with a combination of clovers, Phalaris, Rye and Cocksfoot.

A number of vineyards operate in the Yass Shire around Murrumbateman producing quality wines for the Australian market. The closest vineyard to the quarry is approximately 2 kilometres to the north.

Industrial
Lot 2 of Boral's property contains a concrete block plant operated by Boral Besser. This operation and the quarry represent the only medium industrial developments in the area.

5.10 Landscape Qualities

The area around the quarry generally consists of shallow to steeply undulating hills and flat paddocks which have been mostly cleared for grazing and other agricultural uses. The lack of urban development has resulted in a pleasant rural landscape.

5.10.1 External Views of the Site

While various aspects of the quarry operation are visible from a number of residents and sections of Kaveneys Road, operations within the proposed stockpile area extension will not be visible from any residence or from the Kaveneys Road. However, views of the earthworks which will make up the extension will be visible, in part, from a few residences and sections of Kaveneys Road. The degree of visual impact of the stockpile area is discussed in detail in Section 6.3 of this document.

5.11 Access

The proposed stockpile area extension will be accessed from the quarry, via the existing haul road leading from the carparking area adjacent to the weighbridge.

Access to the stockpile area will not be possible by any other route. This is for security reasons to ensure control of all truck movements, within the quarry area, is maintained by the weighbridge.

SECTION 6

Environmental Interactions and Controls

6. ENVIRONMENTAL INTERACTIONS AND CONTROLS

Hall quarry has been operated by Boral for twenty years, supplying crushed rock products to the Yass and Gunning areas and areas of the ACT. The Company is satisfied that the hard rock resource at Hall quarry satisfies the criteria of:

- high quality rock
- abundant reserves
- conveniently located to major markets
- environmental acceptability

It should be recognised that all quarries, along with most developments, have some impact on the environment. Hall quarry, however, stands out as one that has acceptable minimum impact on the environment.

Environmental issues identified as being associated with the overall quarry operation have been identified and addressed in the EIS submitted in 1993.

Environmental issues associated with the expansion of Stockpile Area No.2 consist of:

- noise impact at nearby residences
- visual impact of the development from external view points
- impact on the quarry's water management programme
- erosion and sedimentation impacts
- air quality impacts
- impacts on flora and faunal habitats

A range of protection measures has been incorporated into the development plans ensuring that the development meets or exceeds community and legislative requirements. The proposed measures are discussed in this section.

6.1 Noise Effects

Noise impacts associated with the proposed stockpile area are the subject of a separate Noise Impact Statement, prepared by Boral's Noise Control Engineer and contained in full as Appendix 2.

A computer model known as the Environmental Noise Model (ENM), which was produced in conjunction with the NSW EPA, was used to simulate and assess the cumulative noise emissions arising from the operation of all mobile plant utilised in stockpile area operations including the loading of highway trucks. The computer model incorporated natural topographic features around the stockpile area as well as a 2 metre high bund wall which will be constructed around the perimeter of the site.

The background noise levels for the various residences around the stockpile area

are presented below:

Table 6.1 - Background Noise Levels		
Residence	Distance from Stockpile Area	Background Noise Level - dB(A)
4	925 m	30 to 38 (average 34)
6	996 m	30 to 38 (average 34)
7	638 m	35 to 40 (average 37)
8	401 m	36
9	845 m	43

The background noise levels measured, in the absence of quarrying, was typical of a rural area. However influences such as traffic on the Barton Highway, wind, livestock and bird activities, and the operation of Boral Besser block plant meant that the background levels fluctuated considerably. The background survey at residence 9 was influenced significantly by traffic on the Barton Highway. The above background levels were taken from the quarry's original EIS for which development consent was granted.

The EPA guidelines for noise would set a planning limit at 5 dB(A) above the background level at each residence, however, in granting development Consent for the operation Council set a noise level planning limit of 40 dB(A).

Noise at Adjoining Residences

The noise impact of all mobile equipment involved in stockpiling and loading operations, was calculated for both existing and proposed situations. The residents most affected by the proposal are located to the south and west of the quarry. These residences are Nos. 4, 6, 7, 8 and 9 on Figure 5.3. The results of the noise calculations are presented below:

Table 6.2 - Noise Levels at Closest Residences			
Residence	Stockpile Area No.1 dB(A)	Existing Stage of Stockpile Area No.2 dB(A)	Proposed Extension to Stockpile Area No.2 dB(A)
4	33	31	31
6	35	30	31
7	32	34	35
8	39	41	41
9	31	34	34

The calculations assume that the front-end loader, the haul truck and the delivery truck are operating simultaneously and at full power. This is, however, an unlikely situation and would represent a worst case scenario. Both stockpile areas will be used by the quarry, however, operations will mostly occur in one or the other at any given time.

The results table shows that operations in the proposed stockpile area extension will increase only marginally compared with those from the existing section of Stockpile Area No.2. These increases are not expected to be perceptible by the residents.

The increase in noise at residences 7 and 9 will not cause the total noise level to exceed the 40 dB(A) planning limit set by Yass Shire Council. The predicted noise level at Residence 8 (two dwellings side by side) will exceed the Council planning limit by 1 dB(A) but would comply with the EPA planning limit of 41 dB(A).

It should be noted that both the dwellings which have been designated as Residence 8 are owned by Boral.

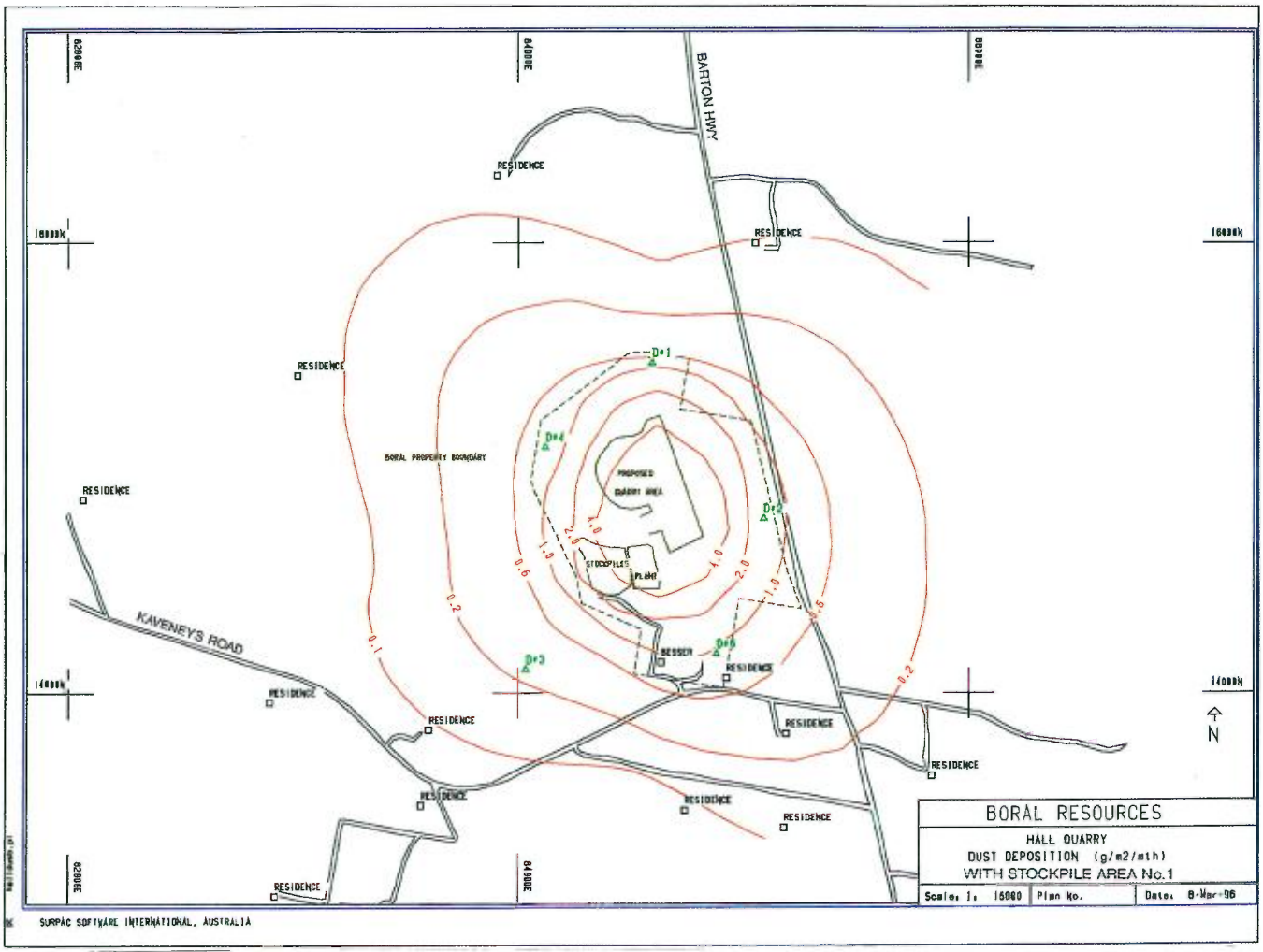
6.2 Impact of Dust on Air Quality

Dust modelling for the development of the whole of Stockpile Area No.2 was undertaken by Nigel Holmes and Associates. The modelling predicted that the increase in dust concentration and deposition levels, due to quarry operations in Stockpile Area No.2, would remain below the EPA long term air quality goals at all residences. Figure 6.1 shows the location of dust gauges and the predicted dust deposition due to quarrying activities with and without Stockpile Area No.2.

The principal sources of dust associated with stockpiling/loading operations and associated minimisation measures for the Hall quarry operation are identified in Table 6.3.

Table 6.3 - Sources of Dust and Mitigation Measures

Source	Mitigation Measures
Haul and access roads	Road wetting when conditions are dry and/or windy
Offloading product onto stockpiles	Material is sprayed with water as it is discharged from screenhouse into haul trucks. Material will generally remain moist over the short haulage distance to the stockpile area.
Stockpiles and sales loading	Stockpiles, loading pad and roadways wetted down in dry and/or windy conditions. Truck loads will be sprayed prior to leaving the quarry. Permanent sprinklers to be installed around stockpile area.


BARTON HWY
RESIDENCE
BORAL PROPERTY BOUNDARY
PROPOSED QUARRY AREA
STOCKPILES
PLANT
KAVENEYS ROAD
BESSER
D#1
D#2
D#3
D#4
D#5
0.1
0.2
0.5
1.0
2.0
4.0
N
BORAL RESOURCES
HALL QUARRY
DUST DEPOSITION (g/m2/mth)
WITH STOCKPILE AREA No.1
Scale: 1: 16000
Plan No.
Date: 8-Mar-96
SURPAC SOFTWARE INTERNATIONAL, AUSTRALIA

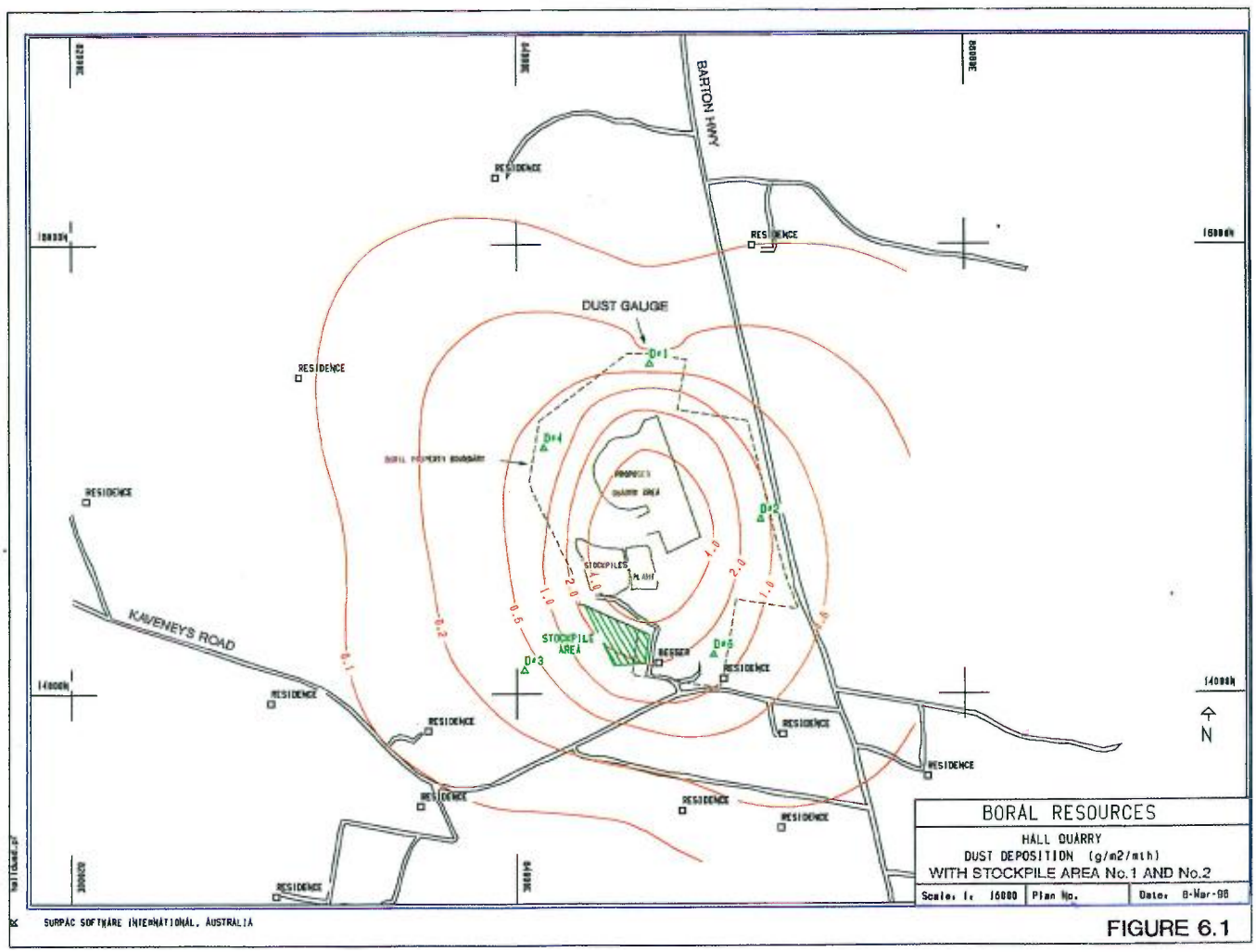

BARTON HWY
DUST GAUGE
RESIDENCE
BORAL PROPERTY BOUNDARY
PROPOSED QUARRY AREA
STOCKPILES
PLANT
STOCKPILE AREA
KAVENEYS ROAD
BESSER
D#1
D#2
D#3
D#4
D#5
0.1
0.2
0.5
1.0
2.0
N
BORAL RESOURCES
HALL QUARRY
DUST DEPOSITION (g/m2/mth)
WITH STOCKPILE AREA No.1 AND No.2
Scale: 1: 16000
Plan No.
Date: 8-Mar-96
SURPAC SOFTWARE INTERNATIONAL, AUSTRALIA

FIGURE 6.1

Of the dust sources described above, it is considered that truck movements along the haul road between the screenhouse and the stockpile area will be the dominant source of dust. Haul road wetting and spraying of stockpiles will continue to be an integral part of the Hall operation. Boral will install a fixed sprinkler line to the stockpile area for this purpose.

The results of the dust modelling for the full development of Stockpile Area No.2 (Appendix 3) concluded that the operation of the stockpile area would increase the level of dust deposition at the closest residences (8 and 7) by 0.1 grams/m^2/month. This increase is considered to be well within EPA guidelines and all surrounding residences will continue to experience dust depositional levels below the EPA limit of 4 grams/m^2/month. It was therefore concluded that the proposed additional stockpile area will not cause a significant deterioration in air quality in the vicinity of the quarry.

6.3 Visual Impact

Potential visual impacts were assessed for development of the stockpile area. The factors considered were:

- The visual exposure of the site from a number of significant viewing points.
- The visual effects of the site based on gradient, aspect and visual exposure.

Visual impacts are affected by a range of factors, particularly the distance of the viewing point from the quarry, the orientation of the observer, the proportion of the view affected, the likely number of observers, and the change in visual character, that is, form, shape, pattern, line, colour and texture which would occur.

These factors have been used to categorise visual impacts into varying levels of significance and are described in Table 6.4.

Table 6.4 - Levels of Visual Impact

Visual Impact	Significance
Low	Minor changes in shape of the topography may be evident. Tree screening will obscure most of the development.
Medium	Small areas of the operation will be visible with more noticeable changes in the topography as the stockpile area develops. Tree screening will continue to obscure much of the development.
High	Portions of the stockpile area will be visible with a direct line of sight. Tree screening will be less effective. Observation points are generally at a similar or higher level than the subject area.

The major visual effects of the final stockpile area development will be the filling and flattening of the shallow valley between the quarry's access road and the Besser block plant, construction of the bund wall and short term colour contrasts associated with the removal of vegetation and the placement of fill material.

The fill material has a pale brown to grey colour which will contrast, in the short term, with the surrounding scattered forest and grassy slopes until such time as planted vegetation takes hold. The perception of this impact will be reduced by the progressive grassing of slopes and planting of tree screens as the area is developed.

Potential visual impacts of the quarry development are summarised in Table 6.5. These were derived by combining the visual effects of the stockpile area components with the parameters already discussed.

Table 6.5 - Potential Visual Impact

Viewing Location	Haul Road	Earthworks and Landscaped Flanks	Stockpile Area Operations
RESIDENTIAL			
No.1	NS	NS	NS
No.2	NS	NS	NS
No.3	NS	NS	NS
No.4	L	L	NS
No.5	L	NS	NS
No.6	L	L	NS
No.7	NS	NS	NS
No.8	NS	NS	NS
No.9	NS	NS	NS
No.10	NS	NS	NS
No.11	NS	NS	NS
No.12	NS	NS	NS
No.13	NS	NS	NS
ROADS			
Barton Highway	NS	NS	NS
Kaveneys Road			
(E of Quarry)	NS	NS	NS
(SW of Quarry)	L	L	NS
(S of Quarry)	NS	NS	NS
(W of Quarry)	NS	NS	NS

Key NS - Not Seen
L - Low
M - Medium
H - High

It can be seen from Table 6.5 and Photos 4 and 5 (Figure 4.2 illustrates the location of the photographs) that only glimpses of the proposed stockpile area

Photo No.4 Looking towards Stockpile Area No.2 from Kaveneys Road, south-west of the quarry in the vicinity of Residence No.6. Note that the earthworks are visible, however, the photo was taken prior to grass seeding. (Refer to Photo No.3 on Page 19).The proposed extension will be more difficult to see as it will be screened by the vegetation in the foreground.

Photo No.5 View towards stockpile area from Kaveneys Road, east of the quarry. The development will be completely screened by exisitng vegetation.

extension will be seen from any section of Kaveneys Road and the surrounding residences. Very minor views of the battered back western flank of the stockpile area will be visible from Residences 4 and 6, however, once grassed and planted with trees the visual impact will be negligible. Actual stockpiling operations will not be visible from any residence.

This can be achieved by confining the development to the shallow valley, not breaking the skyline and retaining most of the existing vegetation.

6.4 Water Quality Impacts

The modifications to the existing operation at Hall quarry are not expected to impact significantly on existing acceptable water quality results at the property boundary. There will be no toxic or petroleum based materials stored in the stockpile area at any time.

Water overflowing from the stockpile area will flow into a sedimentation dam before dispersing onto surrounding pasture.

The normal EPA guidelines for water quality are defined in terms of the following water quality criteria:

- non-filterable residue (NFR) <50 mg/L
- grease and oil visually free
- pH 6.5 - 8.5

6.4.1 Impact on Ground Water Flow

The existing ground water level at the site is very close to the surface as evident by the boggy ground along the drainage line. However, the effect on the water table of infilling the shallow valley is expected to be largely negligible. As the fill material will comprise a high percentage of fine weathered rock and clay it is expected to be largely impermeable. Accordingly, existing ground water flow under the filled area would continue along its defined path or be raised to the interface between natural ground level and the base of the fill.

In order to maintain this flow it is proposed to excavate a shallow channel along the length of the existing drainage line and fill the excavation with coarse drainage rock (+40mm). A concrete pipe will be bedded on top of the drainage rock to convey rainfall runoff and ground water flow from the stockpile area surface and the normal catchment of the natural drainage line. The pipe will be covered with more drainage rock before being covered with the bulk fill material.

These actions will ensure that both upstream drainage and ground water flow

under the fill area is maintained and that perched water tables are not generated on the flank of the stockpile area.

6.5 Erosion and Sedimentation Control

Boral is committed to effective erosion and sedimentation control. Soils on the site are considered to have a moderate to high susceptibility to soil erosion and, accordingly, it is necessary to continually monitor the effectiveness of the management controls that are in place. Remedial action can then take place as a problem is identified.

Measures that are currently in place and will continue to be utilised include:

- The maintenance of an effective water management system.
- The minimisation of disturbed and exposed areas. Vegetation removal will be kept to a minimum.
- Temporary erosion and sedimentation control structures such as hay bales, temporary coarse grit traps and fabric silt fencing will be put in place prior to any clearing of vegetation or soil stripping.
- Vegetation of earthworks would be undertaken as soon as possible after construction. Species which have been found to be most successful include a mix of fast growing, short lived grasses and more hardy varieties.

6.5.1 Stockpiling of Topsoil

Topsoil from both the extraction area and the proposed stockpile area will be stripped to a depth of 10cm. This will result in the recovery of approximately 1,800 cubic metres of topsoil.

The topsoil will be stored in stockpiles with dimensions of approximately 40m (L) x 15m (W) x 3m (H) adjacent to the western boundary of the property. The stockpiles will have sides battered at approximately 1V:2.5H and will be contained within fabric filter fencing to contain any sediment in rainfall runoff. The topsoil will be progressively spread to a depth of 10 - 20 cm, on the flanks of the stockpile area, as sections are completed. After spreading the topsoil the sections will be immediately sown with grass seed.

As the construction is expected to be completed within a period of 6 - 8 weeks, the topsoil will not need to be stockpiled for excessive periods of time. Any excess topsoil will be transported to the northern quarry area and used in the rehabilitation of that site. This rehabilitation is currently being undertaken.

6.6 Flora

The extension of the stockpile area will result in the loss of 1.8 hectares of grazing pasture and the clearing of 10 mature, and approximately 26 immature/sapling *Eucalyptus* trees (Figure 6.2).

The stockpile area has been designed to minimise the destruction of trees, particularly in areas where retention of the vegetation will screen the operation from public vantage points. Vegetation clearing will be limited to that essential for the development of the stockpile area.

Any vegetation cleared will be chipped on site and mulched into the top soil for use in the ongoing rehabilitation process.

Indirect impacts on vegetation may occur downslope of disturbed areas and along access roads. Erosion from disturbed areas may lead to downslope siltation and the spread of weeds. Weed infestation may also occur along access roads due to increased nutrient levels and the transport of weed seeds along drainage channels. The erosion and sedimentation measures described in Section 6.5 will ensure that downslope siltation and the associated spread of weeds does not occur.

Boral will undertake to regularly control the growth of weeds on its property. Appropriate advice will be sought from the Weed Control Section of NSW Agriculture to ensure a suitable control programme is carried out.

Revegetation of the stockpile area, at the completion of quarrying operations, will most likely be aimed at establishing grassland/pasture with clumps of forest vegetation.

6.6.1 SEPP 46 - Protection of Native Vegetation

The proposed development will result in the clearing of 2 hectares of highly modified pasture. This area of land containing 10 mature and approximately 26 immature/sapling *Eucalyptus* trees. The stockpile area has been designed so as not to impact on areas of dominantly native grassland and/or dense tree growth.

It is considered that the vegetation to be removed for this development does not qualify for protection under SEPP 46.

6.6.2 Impact on Agricultural Land

Boral accepts that the land on which the proposed stockpile area is to be developed has high grazing productivity and the loss of such pasture is regrettable. However, Boral has spent considerable time evaluating the

BORAL COUNTRY

HALL QUARRY

TREES TO BE REMOVED FROM STOCKPILE AREA

FIGURE 6.2

remainder of its land holdings and has failed to identify a suitable location for a stockpile area. This is due primarily to the steepness of the topography on the property (mostly greater than 10 degrees) and the need for the stockpile area to be located in close proximity of the existing infrastructure.

Accordingly, Boral has no option other than to develop the remaining section of its flat-lying land, located close to the weighbridge and crushing plant. The actual section of land to be developed was chosen as it would allow maximum visual screening from Kaveneys Road and surrounding residences. Any other parcel of land, which could be purchased from the adjoining landowner, would have similar grazing productivity but would be highly visible from surrounding vantage points.

At the conclusion of quarrying the most likely rehabilitation proposal for the site would be to return the site to grazing pasture containing clumped native trees.

6.7 Impact on Fauna

No threatened or endangered species were detected on the property nor is there any suitable habitat for such species. Accordingly, the project is unlikely to have a significant impact on fauna.

It is possible that the Superb Parrot *(Polytelis swainsonii)*, Regent Honeyeater *(Xanthomyza phyrgia)* and the White-striped Mastiff Bat *(Tadarida australia)* may forage in or over the area at some time. However, the occurrence of these species would, at best, be highly transitory and they would not be reliant on the study area. The main area of the property likely to be disturbed by the development of the stockpile area consists of modified open pasture. The bulk of mature trees on the flanks of the study area will not be directly affected by the proposal.

Ongoing rehabilitation and visual screening of the site, involving numerous plantings of indigenous trees and shrubs, will considerably enhance the habitat value of the study area in the long term.

6.7.1 Eight Point Test Concerning Threatened Species

No threatened species, nor habitat capable of supporting threatened species, has been identified on the site of the proposed stockpile area. Accordingly, the Eight Point Test under the Threatened Species Act 1995 is not relevant to this development.

Comments by the flora/fauna consultant on the non-relevance of the test are contained in Appendix 4.

6.7.2 SEPP 44 - Preservation of Koala Habitat

The site of the proposed stockpile area constitutes neither "core" nor "potential" koala habitat under SEPP 44. The Eucalyptus species on the site would not normally be considered as primary or secondary food trees for Koalas and are not listed in Schedule 2 of SEPP 44.

SECTION 7

Project Justification

7. PROJECT JUSTIFICATION

Hall quarry is an efficient and commercially viable operation and has been so for over twenty years. The operation produces a wide range of high quality quarry products. The modifications to the existing operation will enable the quarry to operate more efficiently and ensure that it remains competitive in the regional market.

Safeguards have been incorporated into the project design to either eliminate, or reduce to acceptable levels, environmental impacts. The main impacts and safeguards are as follows:

Air and Water
Controls presently in operation at the quarry will continue to ensure compliance with the NSW Environment Protection Authority's regulations and licence conditions. In particular, Boral will address aspects of water management for the proposed stockpile area to ensure water quality is maintained and soil erosion is minimised. Likely dust emissions from the stockpile area have been modelled and the effects on local air quality are expected to be minimal.

Visual
The project has been designed to take advantage of existing vegetation screening. Further planting will be undertaken to provide additional screening.

Noise
All mobile equipment is currently fitted with silencers and maintained in good mechanical order. A vegetated bund wall will be constructed around the stockpile area to further reduce noise impact. The operation is scheduled under the Noise Control Act and noise levels will continue to comply with EPA regulations.

There will be benefits to Boral when the project is implemented. These include:

- the ability to produce and stockpile large volumes of specification materials (30,000 - 50,000 tonnes) in advance, to supply high volume contracts which are generally of short duration (3 - 6 months).

- allow spacing between stockpiles to ensure there is no risk of product contamination

- assurance there is sufficient stockpiling space available to operate the crushing plant at its optimum rate, thereby reducing the amount of time that the plant will need to operate to produce the required volumes of material.

7.1 Consequences of Not Carrying Out the Modifications

Should the proposed modifications to the Hall quarry operation not receive development consent then the quarry will continue to operate using the existing stockpile area. The operation's competitiveness will decrease over time as demand rises for specialised products and increased volumes of material for which the quarry will not have the available space to manage the stockpiles.

7.2 Environmental Monitoring

This statement has identified the environmental constraints associated with the proposed development and has formulated means of ensuring that the impacts are minimised and that all legislative requirements are adhered to.

Ongoing quantitative verification procedures are necessary to ensure that all planning requirements are met in regard to noise and dust levels.

Boral has undertaken to establish environmental procedures for the operation, some of which are continuations of baseline monitoring studies. The environmental monitoring procedures proposed by Boral will also be required as part of the conditions of the Environment Protection Authority's licensing requirements for the site.

Noise

Noise monitoring will be periodically undertaken at adjacent residences to ensure that Environment Protection Authority requirements are adhered to. This will occur most frequently in the initial phase of development as operational noise levels become known and then will become less frequent as the development advances. Each new critical phase of development will be accompanied by noise monitoring to ensure the changed noise regime meets requirements.

Dust Monitoring

Boral will continue to monitor dust deposition levels at 5 locations around the quarry. These results are complied and assessed on an annual basis and reported to Yass Shire Council by means of an annual environmental compliance audit for the quarry operation as a whole.

7.3 Ecological Sustainable Development

The national strategy for ecologically sustainable development (ESD) details the Federal Government policy which seeks to achieve economic development in an environmentally sustainable manner. The four principles of ESD are listed in

Schedule 2 of the Environmental Planning and Assessment Regulation (1994) as follows:

- *The precautionary principle - namely that if there are threats of a serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to protect environmental degregation;*

- *Inter-generational equality - namely that the present generation should ensure that the health, diversity and productivity of the environment is maintained or enhanced for the benefit of future generations;*

- *Conservation of biological diversity and ecological integrity; and*

- *Improved valuation and pricing of environmental resources.*

The Precautionary Principle

The potential threats to the environment from the expansion of the stockpiling area at Hall quarry have been assessed as minor and of a short to medium term nature. There is no scientific uncertainty regarding potential impacts due to this development and accordingly, the precautionary principle does not apply in this instance.

Inter-generational Equality

Although the development of the stockpiling area will destroy approximately 1.8 hectares of pasture, suitable for grazing, the same area of land will be available at the completion of quarrying to be regenerated as pasture or a combination of pasture and woodland.

The overall health of the environment will not be significantly affected by the proposal due to the proposed ameliorative measures and the rehabilitation plans.

Conservation of Biological Diversity and Ecological Integrity

A flora and fauna impact assessment has confirmed that past, current and future quarrying activities are not expected to reduce species diversity in the local area nor detrimentally impact on ecological integrity. The stockpile area development will specifically avoid the area which contains the greatest density of mature trees.

Improved Valuation and Pricing of Environmental Resources

Environmental resources can be defined to include natural resources such as flora, fauna, rivers rock outcrops, and the human-built resources such as roads and other infrastructure. Extractive materials, whether they be derived from hard rock quarries or sand and gravel operations, are generally considered to be high volume, low cost commodities. However, there is a value added to the final product due to the cost of extraction and processing, transport of product, ongoing environmental

monitoring and assessment, rehabilitation and road use contributions.

Due to increasingly tight legislation controls by State and Local Governments, it is reasonable to expect that quarry products, including those from Hall quarry will increase in value over the medium to long term.

7.4 Conclusions

This Environmental Impact Statement has not identified any adverse environmental impact which would preclude the extension of Stockpile Area No.2 at Hall quarry from receiving development consent.

Boral Resources (Country) Pty Limited is committed to ensuring that Hall quarry operates to the highest environmental standards. The Company has devoted considerable resources to achieving such standards, as well as developing good community relations, both of which are important for successful future operations.

APPENDIX 1

Correspondence with Government Departments

New South Wales Government
Department of Urban Affairs and Planning

Mr Stephen Bergmark
Environmental Geologist
Boral Resources (Country) Pty Ltd
PO Box 42
WENTWORTHVILLE NSW 2145

Contact: Gordon Kirkby

Our Reference: Q93/00030/001

Your Reference:

10 SEP 1996

Dear Mr Bergmark,

Proposed Expansion of Stockpile Area, Hall Quarry, Yass Shire

Thank you for your letter 14 August 1996 seeking consultation with the Director- General for the preparation of an environmental impact statement (EIS) for the above development.

The Director-General has no specific requirements under clause 52 of the Environmental Planning and Assessment Regulation 1994 (the Regulation) in regard to the form and content of the EIS.

Attachment No. 1 is a guide to the type of information most likely to be relevant to the development you propose.

The EIS shall be prepared in accordance with clauses 50 and 51 of the Regulation. Statutory requirements for the form and content of the EIS are listed in Attachment No. 2.

In preparing your EIS you should approach Yass Shire Council and take into account any comments Council may apply to its determination of the proposal. You should also take into account the draft ACT and Sub-Region Planning Strategy.

Yours sincerely,

for David Mutton
Acting Manager
Major Assessments and Hazards Branch
As Delegate for the Director-General

Governor Macquarie Tower
1 Farrer Place, Sydney 2000
Box 3927 GPO, Sydney 2001

Telephone: (02) 9391 2000
Facsimile: (02) 9391 2111

Yass Shire Council

Your Reference:

Our Reference: File 1763P

Contact: Mr M Grayson

Phone: 06 226 9241

Address all correspondence to:

THE GENERAL MANAGER
P.O. BOX 6
YASS, N.S.W. 2582

29 October 1996

Boral Quarries
PO Box 42
WENTWORTHVILLE NSW 2145

Attention: Steve Bergmark

Dear Sir

re: Proposed stockpile extension to quarry off Kaveneys Road, Hall

Further to your recent letter concerning the proposed stock pile extension, please be advised that Council would suggest that the assessment include the following matters:

- Flora and Fauna assessment
- Air, noise and water assessment of both existing levels and proposed impacts
- Visual impact
- Vegetation clearing
- Assessment of any additional truck movements or increase in capacity of the quarry crushing plant or material to be quarried.

This is not an exhaustive list and Council reserves the right to make further comments upon its assessment of the development application. Any further comments may be referred to Mark Grayson on 06 226 9241.

Yours faithfully

GA Ponton
DIRECTOR OF PLANNING

-2 SEP 1996

EPA

Environment
Protection
Authority
New South Wales

Suite 4
Robert Lowe Building
30 Lowe Street
PO Box 622
Queanbeyan
NSW 2620

Telephone .06. 299 3330
Facsimile .06. 299 3525

Mr Steve Bergmark
Environmental Geologist
Boral Resources (Country) Pty Limited
PO Box 42
WENTWORTHVILLE NSW 2145

Our Reference: 290048A02

Your Reference: Hall Quarry

Contact: Nigel Sargent

Dear Mr Bergmark

I refer to your letter dated 14 August 1996 and the on site meeting on 22 August 1996 (between yourself representing Boral Country, Cathy Trindall, Yass Shire Council and Nigel Sargent, Environment Protection Authority (EPA)) concerning the proposed expansion of the stockpile area at the Hall Quarry.

The EPA has inspected the proposed site and will require the following issues to be adequately addressed in the Environmental Impact Statement (EIS).

NOISE

The proposed stockpile area will be in an elevated position some 150 metres closer to potentially affected residences. The EIS must predict how the construction, maintenance and operation of the proposed stockpile area will impact on residences and how attenuation management will ensure compliance with the requirements of the EPA's Environmental Noise Control Manual.

WATER MANAGEMENT

The EIS will need to address how surface and subsurface water flows will be influenced by the construction and operation of the proposed stockpile area.

The proposed stockpile area is elevated when compared to the surrounding landscape, hence the EIS will need to address in detail the methodology proposed to control erosion and pollution from the site.

The location of the stockpile area also crosses a defined drainage line. The EIS must address how construction of the stockpile area will influence both surface flows and the hydraulic characteristics of any subsurface aquifers.

DUST MANAGEMENT

The EIS must demonstrate that the additional stockpile area will not increase the potential for nuisance dust to affect nearby residences and properties.

If you require any further information concerning this matter, please contact Nigel Sargent at this office on (06) 2993330.

Yours faithfully

Ross Carter
Head Regional Operations Unit
Southern Tablelands
for **Director-General**

APPENDIX 2

Noise Impact Statement

BORAL COUNTRY CONCRETE & QUARRIES

Boral Resources (Country) Pty. Limited
A.C.N. 000 187 002
Greystanes Road South Wentworthville
PO Box 42 Wentworthville NSW 2145 Australia
Telephone: (02) 9688 9777 Fax: (02) 9688 9959

NOISE IMPACT STATEMENT

EXTENSIONS TO AN EXISTING STOCKPILING AREA at HALL QUARRY, NSW

Prepared By:

JW Cotterill, B.E. M.A.A.S.
Noise Control Engineer
Boral Resources (Country) Pty Limited

NOVEMBER 1996

Noise Impact Statement - Extension of quarry Stockpile Area No.2 - Hall Quarry

1.0 Introduction

Boral Resources (Country) Pty Limited owns and operates a hard rock quarry, adjacent to the Barton Highway, 16 kilometres north west of Canberra at Hall NSW. The quarry is operating under a development consent from Yass Shire Council which was granted in 1994.

Due to a need for additional aggregate storage area the Company intends to extend the quarry's Stockpile Area No.2 onto land near the Boral Besser plant. This requires an application to Council for development consent.

Construction of Stockpile Area No.2 has been planned in two stages. Stage 1 was completed in early August 1996 and is now operational. This noise impact statement will form part of an Environmental Impact Statement which is being prepared to support an application to Council for development of Stage 2 of the stockpile area.

The statement has been prepared in accordance with AS 1055, 1989 "Description and Measurement of Environmental Noise Parts 1, 2 and 3 and with reference to the Environment Protection Authority Noise Control Manual and the Noise Control Act, 1975, NSW.

2.0 Project Description

The Company proposes to extend the stockpile area into approximately 1.8 hectares of land immediately adjacent to its southern edge. The stockpile area floor will remain at RL 626 m and be surrounded on the south, east and west by a 2 metre high earth bund. It is intended that the Stockpile Area No.1 will continue to be used , however, both stockpile areas will not be worked at the same time. The details of the proposed extension are shown on the Location Map and Site Map on pages 2 and 3.

As a result of the extension of the stockpile area the operating range of the sales front-end loader, stockpile truck and delivery trucks will be moved towards the south. The sound power levels of the equipment operating in the stockpile area is given below:-

Description	Sound Power Level dB(A)
front-end loader (sales)	108
stockpile truck	106
delivery truck	105

3.0 Noise Impact

The noise impact of all equipment operating in the stockpile area was calculated for the existing and proposed situations. The residences most affected by the proposal are the closest to the west and south of the quarry i.e. residences 4, 6 , 7 , 8 a) & b) and 9 (refer Location Map). The results of the noise calculations are given below:-

Residence	Noise Level at Closest Residences dB(A)		
	Stockpile Area No.1	Existing Stage of Stockpile Area No.2	Proposed Extension to Stockpile Area No.2
4	33	31	31
6	35	30	31
7	32	34	35
8 a) & b)	39	41	41
9	31	34	34

Calculations assume that the front-end loader, stockpile truck and delivery truck are operating simultaneously and at full power. This is an unlikely situation and therefore the scenario given represents a worst case.

The table shows that noise levels for the proposed extension to Stockpile Area No.2 will only differ marginally compared with those of the existing stage of Stockpile Area No.2. The increase at residence 6 of 0.5 dB(A) and at residence 7 of 0.6 dB(A) will barely be detectable at each residence.

Operation in the extension to Stockpile Area No.2 will not cause the noise level at residence 4, 6, 7, 9 to exceed the 40 dB(A) planning limit set by the Yass Shire Council.

The total noise level at residences 8 a) and b) will exceed the 40 dB(A) planning limit but will below the acceptable background noise level of 45 dB(A) recommended by the Environment Protection Authority in the Environmental Noise Control Manual Chapter 21. Residences 8 a) and b) are owned by Boral.

4.0 Conclusion

The noise impact of the proposed extension to Stockpile Area No.2 at Hall quarry will increase the total noise level only marginally at residences 6 and 7 over that of the existing stage 1. The increases in noise will be barely detectable at these residences.

J.W.Cotterill
Noise Control Engineer
Boral Resources (Country) Pty Limited

Appendix

The calculations made for the existing and proposed stockpile areas area as follows:-

Stockpile Area No.1

Residence 4

PROGRAM ENM SOURCE RANKING
SINGLE POINT CALCULATION

X= 1338.0 Y= 893.3 Z= 601.5

SOURCE TITLE	dB(A)
1 BORAL COUNTRY - HALL - STOCKPILE FRONT END LOADER EXIST	30.6
3 BORAL COUNTRY - HALL - STOCKPILE TRUCK EXISTING	28.1
2 BORAL COUNTRY - HALL - ROAD TRUCK EXISTING	24.8
TOTAL	33.2

Residence 6

PROGRAM ENM SOURCE RANKING
SINGLE POINT CALCULATION

X= 1352.1 Y= 562.0 Z= 601.5

SOURCE TITLE	dB(A)
1 BORAL COUNTRY - HALL - STOCKPILE FRONT END LOADER EXIST	31.8
3 BORAL COUNTRY - HALL - STOCKPILE TRUCK EXISTING	29.7
2 BORAL COUNTRY - HALL - ROAD TRUCK EXISTING	28.9
TOTAL	35.1

Residence 7

PROGRAM ENM SOURCE RANKING
SINGLE POINT CALCULATION

X= 2384.9 Y= 555.0 Z= 639.5

SOURCE TITLE	dB(A)
1 BORAL COUNTRY - HALL - STOCKPILE FRONT END LOADER EXIST	28.5
3 BORAL COUNTRY - HALL - STOCKPILE TRUCK EXISTING	26.4
2 BORAL COUNTRY - HALL - ROAD TRUCK EXISTING	24.2
TOTAL	31.5

Residence 8

PROGRAM ENM SOURCE RANKING
SINGLE POINT CALCULATION

X= 2691.7 Y= 1082.3 Z= 636.5

SOURCE TITLE	dB(A)
1 BORAL COUNTRY - HALL - STOCKPILE FRONT END LOADER EXIST	35.2
3 BORAL COUNTRY - HALL - STOCKPILE TRUCK EXISTING	33.6
2 BORAL COUNTRY - HALL - ROAD TRUCK EXISTING	32.6
TOTAL	38.7

Residence 9

PROGRAM ENM SOURCE RANKING
SINGLE POINT CALCULATION

X= 2926.4 Y= 849.9 Z= 646.5

SOURCE TITLE	dB(A)
1 BORAL COUNTRY - HALL - STOCKPILE FRONT END LOADER EXIST	28.4
3 BORAL COUNTRY - HALL - STOCKPILE TRUCK EXISTING	26.0
2 BORAL COUNTRY - HALL - ROAD TRUCK EXISTING	24.0
TOTAL	31.3

Stockpile Area No.2 Existing Stage 1

Residence 4

PROGRAM ENM SOURCE RANKING
SINGLE POINT CALCULATION

X= 1338.0 Y= 893.3 Z= 601.5

SOURCE TITLE	dB(A)
1 BORAL COUNTRY - HALL - STOCKPILE FRONT END LOADER PROPOSED	28.5
3 BORAL COUNTRY - HALL - STOCKPILE TRUCK PROPOSED	26.1
2 BORAL COUNTRY - HALL - ROAD TRUCK PROPOSED	22.8
TOTAL	31.2

Residence 6

PROGRAM ENM SOURCE RANKING
SINGLE POINT CALCULATION

X= 1352.1 Y= 562.0 Z= 601.5

SOURCE TITLE	dB(A)
1 BORAL COUNTRY - HALL - STOCKPILE FRONT END LOADER PROPOSED	27.5
3 BORAL COUNTRY - HALL - STOCKPILE ROAD TRUCK PROPOSED	24.9
2 BORAL COUNTRY - HALL - ROAD TRUCK PROPOSED	21.2
TOTAL	30.0

Residence 7

PROGRAM ENM SOURCE RANKING
SINGLE POINT CALCULATION

X= 2384.9 Y= 555.0 Z= 639.5

SOURCE TITLE	dB(A)
1 BORAL COUNTRY - HALL - STOCKPILE FRONT END LOADER PROPOSED	31.4
3 BORAL COUNTRY - HALL - STOCKPILE ROAD TRUCK PROPOSED	29.3
2 BORAL COUNTRY - HALL - ROAD TRUCK PROPOSED	26.9
TOTAL	34.3

Residence 8

PROGRAM ENM SOURCE RANKING

SINGLE POINT CALCULATION

X= 2691.7 Y= 1082.3 Z= 636.5

SOURCE TITLE	dB(A)
1 BORAL COUNTRY - HALL - STOCKPILE FRONT END LOADER PROPOSED	37.6
3 BORAL COUNTRY - HALL - STOCKPILE ROAD TRUCK PROPOSED	35.6
2 BORAL COUNTRY - HALL - ROAD TRUCK PROPOSED	34.2
TOTAL	40.8

Residence 9

PROGRAM ENM SOURCE RANKING

SINGLE POINT CALCULATION

X= 2926.4 Y= 849.9 Z= 646.5

SOURCE TITLE	dB(A)
1 BORAL COUNTRY - HALL - STOCKPILE FRONT END LOADER PROPOSED	31.0
3 BORAL COUNTRY - HALL - STOCKPILE ROAD TRUCK PROPOSED	28.6
2 BORAL COUNTRY - HALL - ROAD TRUCK PROPOSED	26.3
TOTAL	33.8

Stockpile Area No.2 Proposed Stage 2

Residence 4

PROGRAM ENM SOURCE RANKING
SINGLE POINT CALCULATION

X= 1338.0 Y= 893.3 Z= 601.5

SOURCE TITLE	dB(A)
1 BORAL COUNTRY - HALL - FRONT END LOADER STOCKPILE NO.2	27.8
3 BORAL COUNTRY - HALL - STOCKPILE TRUCK STOCKPILE NO.2	25.6
2 BORAL COUNTRY - HALL - ROAD TRUCK STOCKPILE NO.2	22.5
TOTAL	30.6

Residence 6

PROGRAM ENM SOURCE RANKING
SINGLE POINT CALCULATION

X= 1352.1 Y= 562.0 Z= 601.5

SOURCE TITLE	dB(A)
1 BORAL COUNTRY - HALL - FRONT END LOADER STOCKPILE NO.2	27.9
3 BORAL COUNTRY - HALL - STOCKPILE TRUCK STOCKPILE NO.2	25.5
2 BORAL COUNTRY - HALL - ROAD TRUCK STOCKPILE NO.2	21.9
TOTAL	30.5

Residence 7

PROGRAM ENM SOURCE RANKING
SINGLE POINT CALCULATION

X= 2384.9 Y= 555.0 Z= 639.5

SOURCE TITLE	dB(A)
1 BORAL COUNTRY - HALL - FRONT END LOADER STOCKPILE NO.2	32.0
3 BORAL COUNTRY - HALL - STOCKPILE TRUCK STOCKPILE NO.2	29.9
2 BORAL COUNTRY - HALL - ROAD TRUCK STOCKPILE NO.2	27.5
TOTAL	34.9

Residence 8

PROGRAM ENM SOURCE RANKING
SINGLE POINT CALCULATION

X= 2691.7 Y= 1082.3 Z= 636.5

SOURCE TITLE	dB(A)
1 BORAL COUNTRY - HALL - FRONT END LOADER STOCKPILE NO.2	37.6
3 BORAL COUNTRY - HALL - STOCKPILE TRUCK STOCKPILE NO.2	35.6
2 BORAL COUNTRY - HALL - ROAD TRUCK STOCKPILE NO.2	34.2
TOTAL	40.8

Residence 9

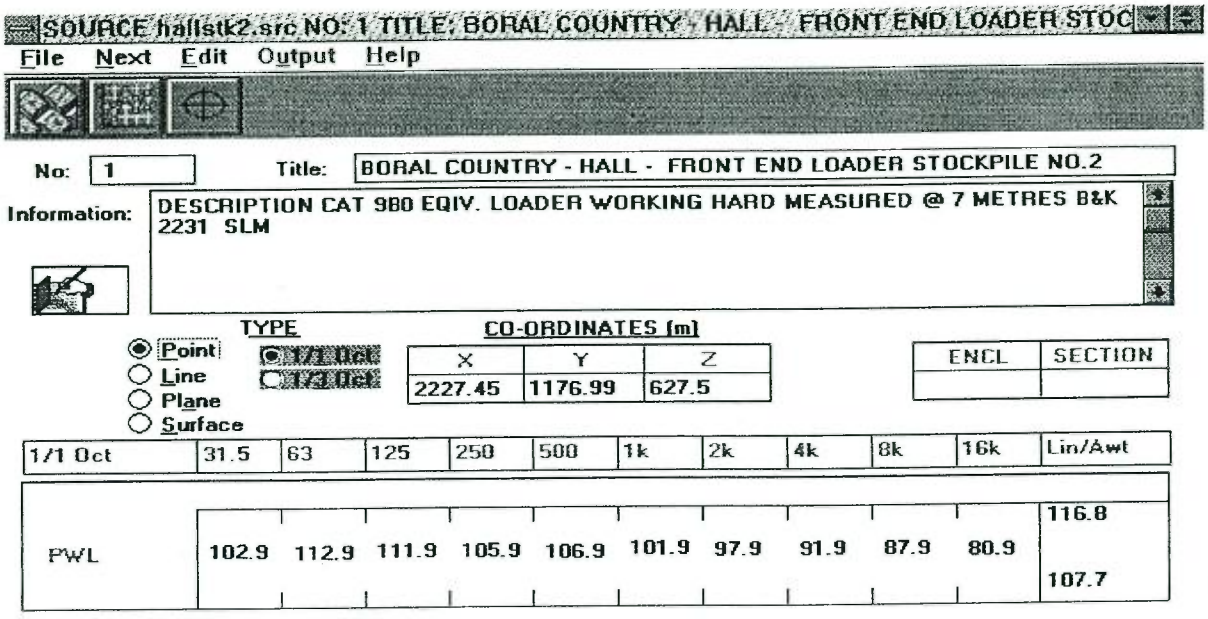
PROGRAM ENM SOURCE RANKING
SINGLE POINT CALCULATION

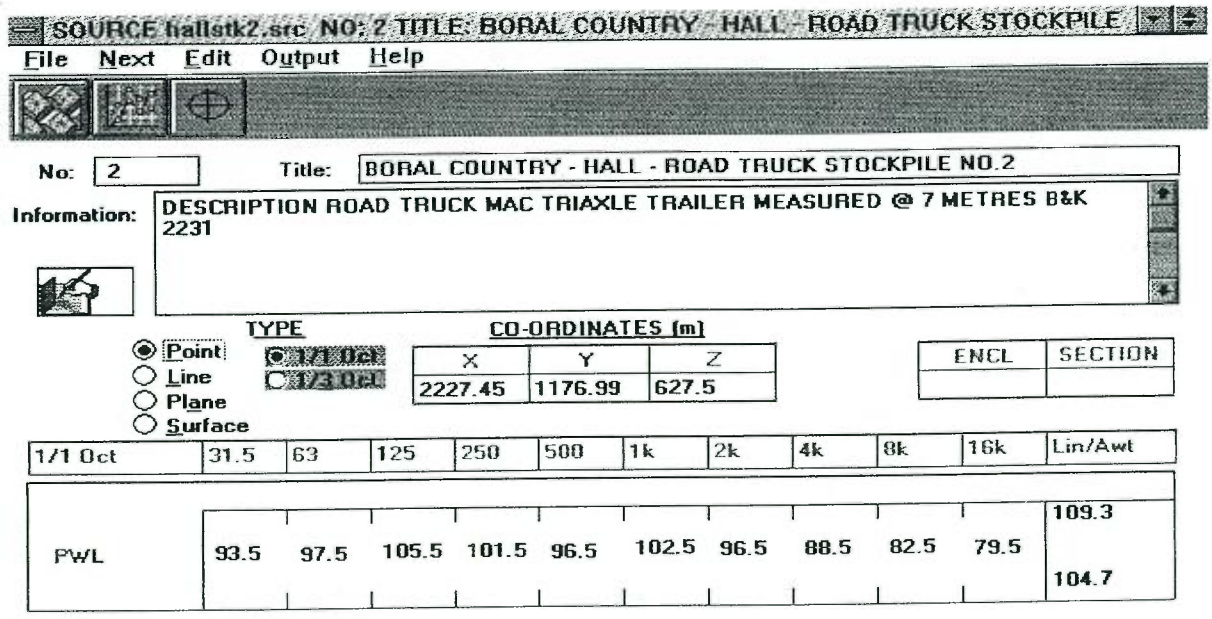
X= 2926.4 Y= 849.9 Z= 646.5

SOURCE TITLE	dB(A)
1 BORAL COUNTRY - HALL - FRONT END LOADER STOCKPILE NO.2	31.1
3 BORAL COUNTRY - HALL - STOCKPILE TRUCK STOCKPILE NO.2	28.8
2 BORAL COUNTRY - HALL - ROAD TRUCK STOCKPILE NO.2	25.7
TOTAL	33.8

Equipment Sound Power Levels

The sound power levels of the equipment to be used in the proposed extension to the stockpile area, in octave bands is as follows:-





SOURCE hallstk2.src NO: 3 TITLE: BORAL COUNTRY - HALL - STOCKPILE TRUCK STOCP

File Next Edit Output Help

No: 3 Title: BORAL COUNTRY - HALL - STOCKPILE TRUCK STOCPILE NO.2

Information: DESCRIPTION STOCKPILE TRUCK MEASURED @ 7METRES B&K2231 S.L.M.

TYPE

- (•) Point
- ( ) Line
- ( ) Plane
- ( ) Surface

- (•) 1/1 Oct
- ( ) 1/3 Oct

CO-ORDINATES (m)

X	Y	Z
2227.45	1176.99	627.5

ENCL	SECTION

1/1 Oct	31.5	63	125	250	500	1k	2k	4k	8k	16k	Lin/Awt
PWL	98.9	103.9	109.9	104.9	103.9	100.9	97.9	91.9	83.9	79.9	113.1 106.1

APPENDIX 3

Dust Modelling

AIR QUALITY ASSESSMENT:

HALL QUARRY ADDITIONAL STOCKPILE

Prepared

for

Boral Resources

by

Nigel Holmes & Associates
2B/14 Glen Street
Eastwood NSW 2122
Phone (02) 874-8644

5 March 1996

CONTENTS

FIGURES

(Figures at end)

TABLES

1.0 INTRODUCTION

This brief report has been prepared by Nigel Holmes & Associates on behalf of Boral Resources (Country) Pty Limited. Its purpose is to assess the air quality impacts associated with the proposed development of an additional stockpile area at Boral's existing Hall quarry, south of Yass, New South Wales (see **Figure 1**).

The report forms an addendum to a previous air quality study of the expansion of the quarry operation (**Nigel Holmes & Associates, 1993**). Details of the plant operation and dust emissions estimates were provided in that report and will not be reproduced in full here. However in the interests of clarity, relevant information from the previous study has been included.

As in previous study, the estimated dust emissions have been used with a long-term dust dispersion model to calculate annual average dust deposition rates and concentrations at a grid of points surrounding the quarry. Dust impacts have been assessed by comparing estimated dust concentrations and fallout levels with relevant air quality criteria.

2.0 DESCRIPTION OF THE PROPOSAL

The location of the quarry is shown in **Figures 1** and **2**. The location of the proposed stockpile is shown in **Figure 3**. The stockpile area is approximately 2.9 ha. There will be additional haulage of product to and from the new stockpile area involving a round trip of approximately 800 m. It has been assumed that the product loading and unloading will be equally split between the existing and the new stockpiles.

The area will be developed in two stages over a period of approximately three years. There will be a period of about four months over which approximately 250,000 tonne (t) of overburden will be transported from the extraction area shown in **Figure 3** to the stockpile area.

3.0 AIR QUALITY CRITERIA

The effects of dust on health and amenity can be assessed by comparing dust deposition rates and dust concentrations with recognised air quality criteria established as a result of research both in New South Wales and overseas. To cover the full range of possible adverse impacts it is necessary to make reference to criteria for both long-term (annual average) and short-term (24-hour) periods.

3.1 Short-term criteria

Concentration

In assessing the acceptability of mining and extractive industry projects the Environment Protection Authority of New South Wales (EPA) formerly referred to the US EPA primary and secondary ambient 24-hour air quality standards, which are 260 and 150 $\mu g/m^3$ respectively. These have been changed recently to make specific reference to the particle sizes of the dust as it is now recognised that it is the fine,

respirable particles which have the most significant health impact. The air quality goal now refers to a concentration of 150 $\mu g/m^3$ for sub-ten micrometre particles (PM_{10}).

Deposition
There are no air quality criteria for short-term dust deposition rates.

3.2 Long-term criteria

Concentration
The NSW EPA refer to the National Health and Medical Research Council (NH&MRC) (Australia) 90 $\mu g/m^3$ annual average goal for total suspended particulate matter (TSP) when assessing long-term dust impacts. This level is recommended as the maximum permissible level that should be allowed in urban environments. The 90 $\mu g/m^3$ annual TSP goal is now supplemented with the US EPA 50 $\mu g/m^3$ annual goal for PM_{10}.

Deposition
In the past the NSW EPA have considered that residential areas would begin to experience dust-related nuisance impacts when annual average dust (insoluble solids) deposition levels exceeded 4 g/m^2/month, and that dust impacts would be at unacceptable levels when they reached 10 g/m^2/month (**SPCC 1983**). More recently, the EPA (**Dean et al., 1990**) has refined these criteria. **Table 1** shows the maximum acceptable increase in dust deposition over the existing dust levels. For example, in residential areas with annual average deposition levels of between 1 and 2 g/m^2/month an increase of up to 2 g/m^2/month would be permitted before it was considered that a significant degradation of air quality had occurred.

The criteria for dust fallout levels are set to protect against nuisance impacts and apply for areas where there is a sensitive land use.

TABLE 1 -ENVIRONMENT PROTECTION AUTHORITY CRITERIA FOR DUST FALLOUT

Existing dust fallout level (g/m^2/month)	Maximum acceptable increase over existing fallout levels - (g/m^2/month)	
	Residential	Other
2	2	2
3	1	2
4	0	1

4.0 EXISTING AIR QUALITY

Dust deposition gauges have been installed at the five sites shown in **Figure 4** and data collected in 1994 and 1995 are presented in **Table 2**. Apart from Gauge D3, which has the lowest deposition rate, the sites are all within the quarry area. Gauge D4 showed

TABLE 2- DUST (INSOLUBLE SOLIDS) DEPOSITION DATA IN VICINITY OF HALL QUARRY - (g/m^2/month)

Date	Gauge				
	1	2	3	4	5
1994					
January	10.16	1.76	1.02	1.61	1.86
February	2.24	2.97	2.01	1.85	2.59
March	1.58	2.05	1.78	1.34	1.34
April	0.79	1.71	1.61	2.40	3.99
May	2.09	3.11	2.41	3.06	3.36
June	1.43	1.05	1.23	2.70	2.11
July	ND	ND	ND	ND	ND
August	1.00	0.81	0.78	1.05	2.98
September	5.52	4.02	2.50	2.86	5.85
October	2.96	3.00	2.79	3.63	3.57
November	ND	6.04	6.26	7.90	6.99
December	4.32	3.58	4.17	6.54	5.16
Annual Average	3.21	2.74	2.41	3.17	3.62
1995					
January	3.15	2.45	2.65	7.14	4.17
February	1.70	1.95	2.15	3.28	2.41
March	1.30	2.01	1.82	3.66	4.60
April	12.73*	5.38	2.45	4.27	2.99
May	7.03	3.62	7.03	3.68	3.08
June	1.19	1.45	1.23	3.15	2.78
July	5.02	4.17	3.27	5.92	5.37
August	2.60	1.86	1.75	2.79	2.72
September	2.08	2.07	2.30	8.54*	3.32
October	2.59	3.20	2.45	5.22	3.03
November	2.52	2.91	3.09	6.17	3.67
December	1.59	1.99	1.99	2.62	2.11
Annual Average	2.89	2.75	2.51	4.35	3.35

* Sample contaminated and data not included in annual average
ND no sample

the highest deposition rate with an annual average value of 4.35 g/m^2/month in 1995. Otherwise the deposition levels are below the EPA goal. The data indicate that dust levels outside the quarry area are likely to be in the range of 2-3 g/m^2/month. Increases of between 1 and 2 g/m^2/month would therefore be acceptable. Note that the crushing plant commenced operation in September 1995, therefore only the dust data from October 1995 will reflect the increase in activity at the quarry.

5.0 EMISSIONS INVENTORY

Dust emissions were previously estimated by analysing the quarry operations assuming an annual production rate of 350 000 t/y and an exposed quarry floor area of 6 ha. This was taken to represent the "worst-case". The additional emissions from the new stockpile area, the extra haulage and the emissions associated with the establishment of the stockpile area have been estimated and are included in **Table 3.** It should be noted that the establishment of the stockpile area will take place over a period of several months. These emissions are therefore of a short-term nature. Details of the calculations of the additional dust emissions are included in **Appendix A.**

6.0 APPROACH TO PREDICTING AIR QUALITY IMPACTS

As in the prior report, air quality impacts have been assessed using the computer-based dispersion model known as DUSTGLC.

The scenario which has been assessed is the quarry operating in normal mode with the new stockpile in place.

Examination of **Table 3** shows that during the establishment of the stockpile area there will be additional emissions of 1818 kg due to the loading and unloading of overburden. In addition there will be 12000 kg of dust emitted during haulage of overburden, however this will be replaced by an emission of 8000 kg of dust due to haulage of product to the stockpile area. The extra emission which occur during the establishment of the stockpile area are therefore estimated to be 5818 kg. This represents an approximately 3% increase in overall emissions which would be barely perceptible. This has not been included in the modelling runs.

TABLE 3 - INVENTORY OF DUST EMISSIONS AFTER APPLICATION OF CONTROLS

ACTIVITY	ESTIMATED EMISSION OF DUST (kg/y)
Scrapers on overburden	3920
Blasting	198
Drilling	576
FEL loading trucks	348
Road haulage	
- from pit to process area and	30 000
- from process area to weighbridge	7350
Dumping rock to feed bin	348
Crushing	
- Primary and secondary	9800
- Tertiary	65 000
Screening	16 800
Conveyors and transfer points	959
Loadout to highway trucks	348
Wind erosion from stockpile and quarry area	24 878
loading and unloading from stockpile	696
Wind erosion from new stockpile area	13 972
Road haulage to and from new stockpile area	8000
Extraction of overburden for stockpile area*	909
Road haulage during establishment of stockpile area*	12 000
Dumping of overburden at new stockpile area*	909
TOTAL	**183 193**

* Note that these emissions are short term and are expected to take place over a period of a few months. They have not been included in the total emissions estimate.

7.0 PREDICTED AIR QUALITY IMPACTS

Figures 5 and **6** show the predicted dust deposition and concentration levels respectively in the vicinity of the quarry for the "worst-case" situation with the new stockpile area in use. As expected, the predicted levels are a little higher than those in the original study (**Nigel Holmes & Associates, 1993**). The closest non-company owned residence is predicted to experience an increase in dust deposition levels of 0.4 g/m^2/month compare to 0.3 g/m^2/month in the previous study. All company owned residences are still predicted to experience increases in dust concentrations due to quarrying activities which are below 10 $\mu g/m^3$.

These predicted increases are well within acceptable limits and it is therefore concluded that the proposed additional stockpile will not cause a significant deterioration in air quality in the vicinity of the quarry.

8.0 REFERENCES

Dean M., Holmes N. and Mitchell P. (1990)
"Air Pollution From Surface Coal Mining Community Perception, Measurement and Modelling", Proceedings of the International Clean Air Conference 1990, Auckland , New Zealand, March 25-30, p 215-222.

Nigel Holmes & Associates (1993)
"Air Quality Assessment: Hall Quarry, Near Yass" Prepared by Nigel Holmes & Associates for Boral Resources Pty Ltd, 20 October, 1993.

SPCC (1983)
"Air Pollution from Coal Mining and Related Developments", ISBN 0 7240 5936 9.

US EPA (1985)
"Compilation of air pollutant emission factors", United States Environmental Protection Agency, Office of Air and Radiation, Office of Air Quality Planning and Standards, Research Triangle Park, North Carolina, 27711.

APPENDIX A
DUST EMISSION ESTIMATES

ESTIMATED DUST EMISSIONS

This appendix provides estimates of dust emissions from each of the additional quarry operations considered in this report.

ESTABLISHMENT OF STOCKPILE AREA

Front end loader loading trucks with overburden

The emission factor (in kg of dust per tonne of overburden loaded) for loading feed rock into 50 tonne rear-end dump trucks is given by Equation 1 (**US EPA 1985**) as follows,

$$E = \frac{k.(0.00090).(\frac{s}{5}).(\frac{U}{2.2}).(\frac{H}{1.5})}{(\frac{M}{2})^2.(\frac{Y}{4.6})^{0.33}} \quad (1)$$

where,

k	=	particle size multiplier (taken as 0.73 for batch dropping operations and sizes < 30 μm,
s	=	material silt content (taken as 13 %),
H	=	drop height (taken as 2 m),
U	=	average wind speed (taken as 2.6 m/s)
M	=	material moisture content (1.8%), and
Y	=	the capacity of the dumping device (taken as 3.5 cubic metre).

Using Equation 1 and the parameters listed above the dust emission factor is 0.0036 kg/t. It has been assumed that approximately 250,000 t of overburden are required to establish the new stockpile area. The dust from this source is estimated to be 909 kg/y.

A similar amount of dust would be generated during dumping of the overburden at the stockpile site.

Road Haulage

Overburden from the extraction area has to be transported to the stockpile area involving a round trip of approximately 1.2 km on unsealed roads. Assuming 250 000 tonnes of overburden are transported in 50 tonne trucks then the number of trips will be 10 000. Using the SPCC dust emission factor of 2.0 kg of dust per vehicle-km (after the application of water to suppress dust) the amount of dust from haulage of overburden will be 12 000 kg .

OPERATIONAL PHASE OF STOCKPILE AREA

Road Haulage

Additional road haulage of rock to the new stockpile would involve a 0.8 km round trip with half the total annual production of 350,000 t. Using 35 t dump trucks, the total number of round trips would be 5000. Assuming an emission rate of 2.0 kg/km the total emissions would be 8000 kg.

Wind erosion from exposed areas and from stockpiles

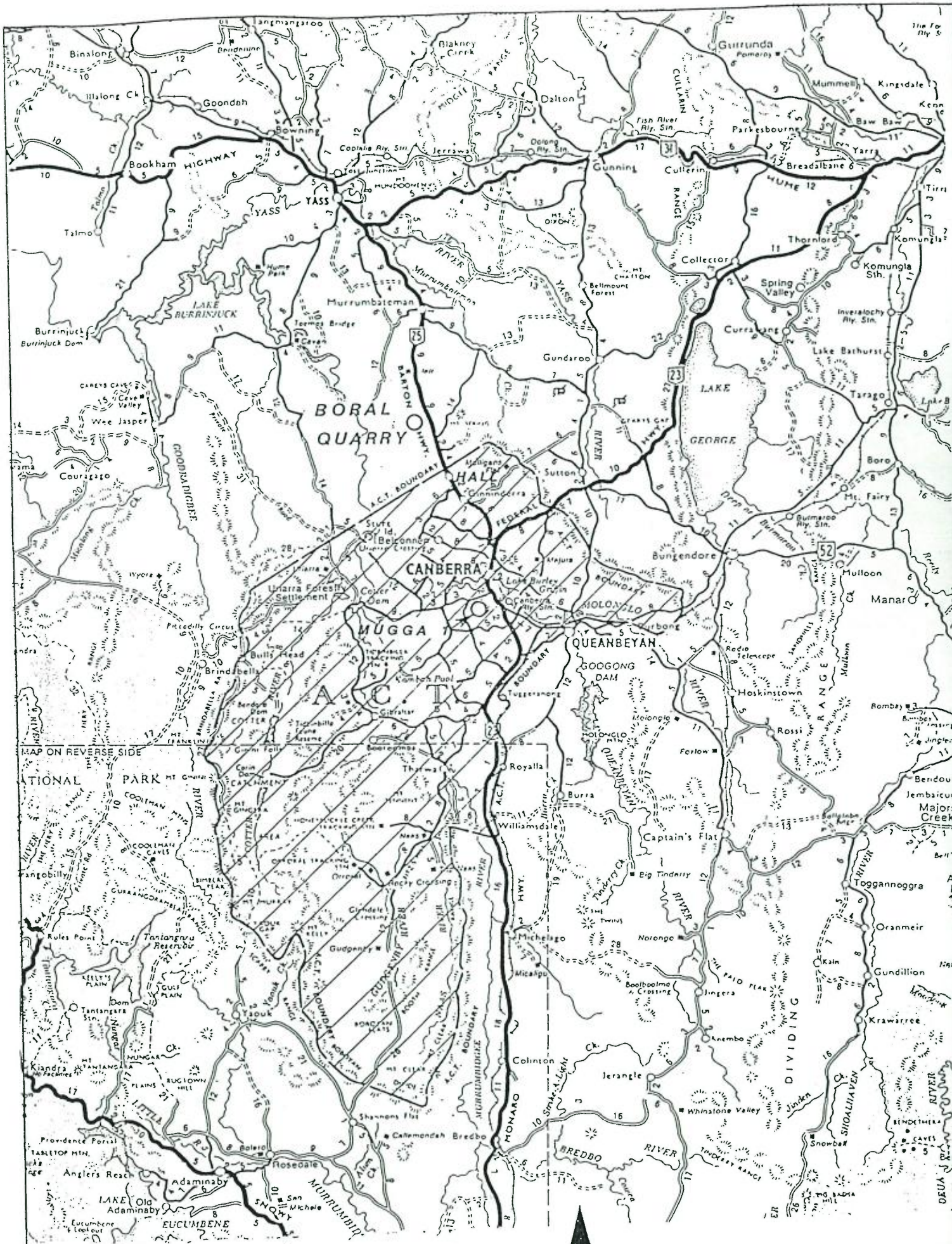
The **US EPA (1985)** equation for wind erosion from stockpile area (in kg/ha/day) is:

$$E = 1.9\left(\frac{s}{1.5}\right)\frac{(365-p)}{235}\frac{f}{15} \qquad (3)$$

where,

p	=	the mean number of days with rainfall greater than 0.25 mm (taken as 91), and;
f	=	the percentage of time the unobstructed wind speed exceeds 5.4 m/s at the mean height of the stockpile (taken as 14.3 % from examination of meteorological data).
s	=	silt content (taken as 15%) for exposed areas

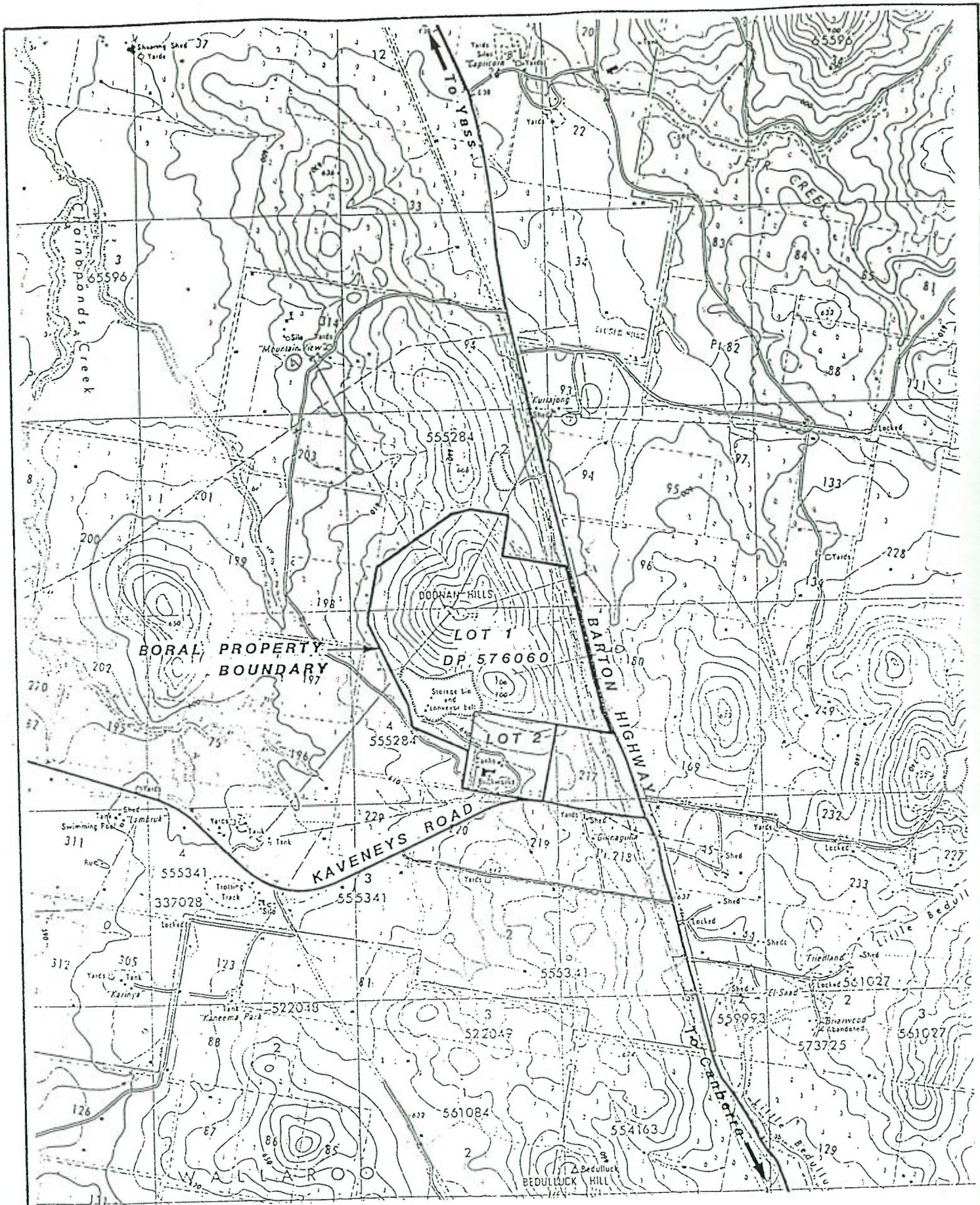
Using the parameters with Equation 2 gives an estimated wind erosion emission rate of 13.2 kg/ha/day. Assuming an area of 2.9 ha for the new stockpile site, the estimated wind erosion will be 13,972 kg/y.



REGIONAL MAP

LOCATION OF HALL QUARRY

FIGURE : 1



SCALE

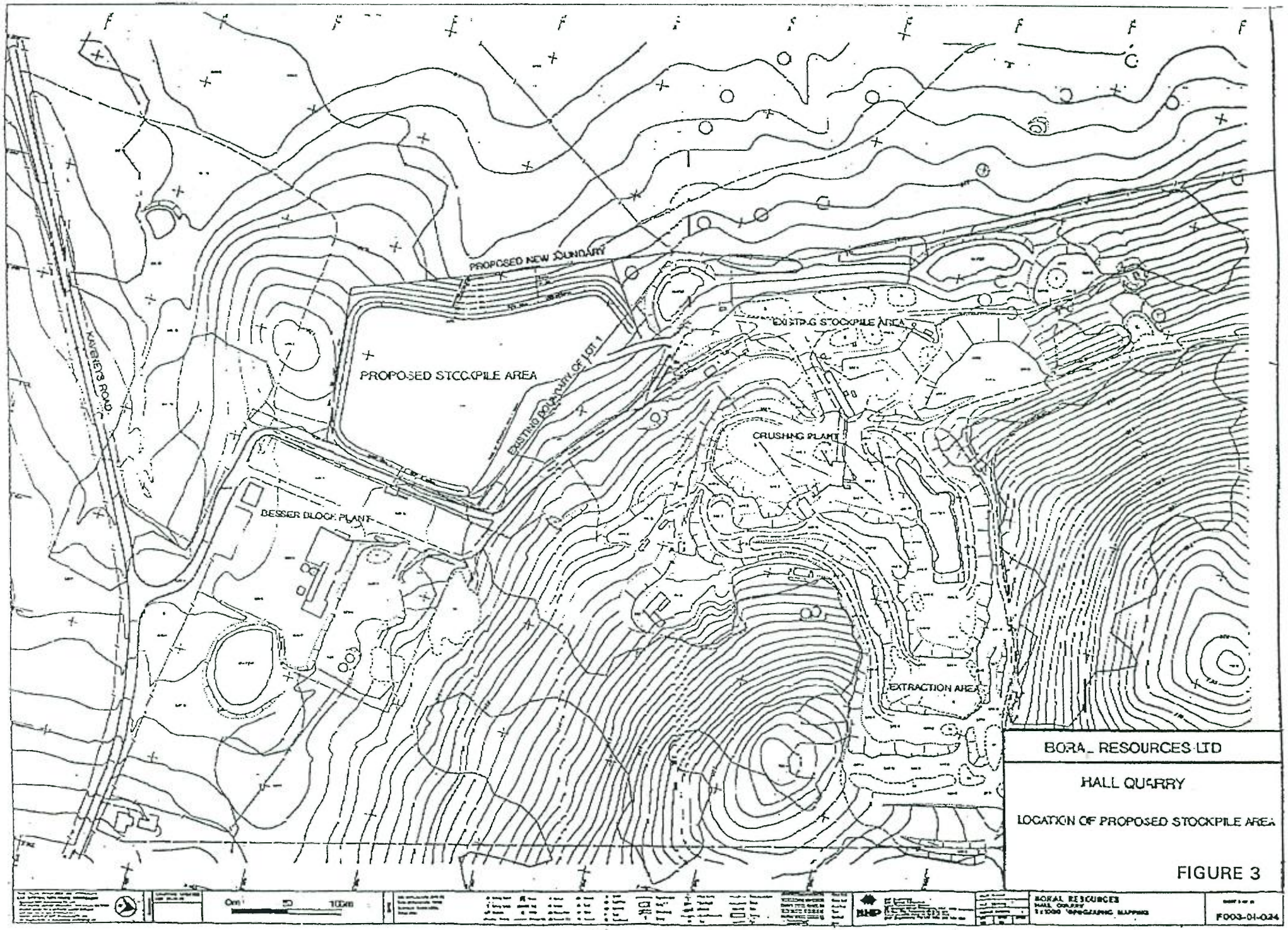
0 0.5 1 2

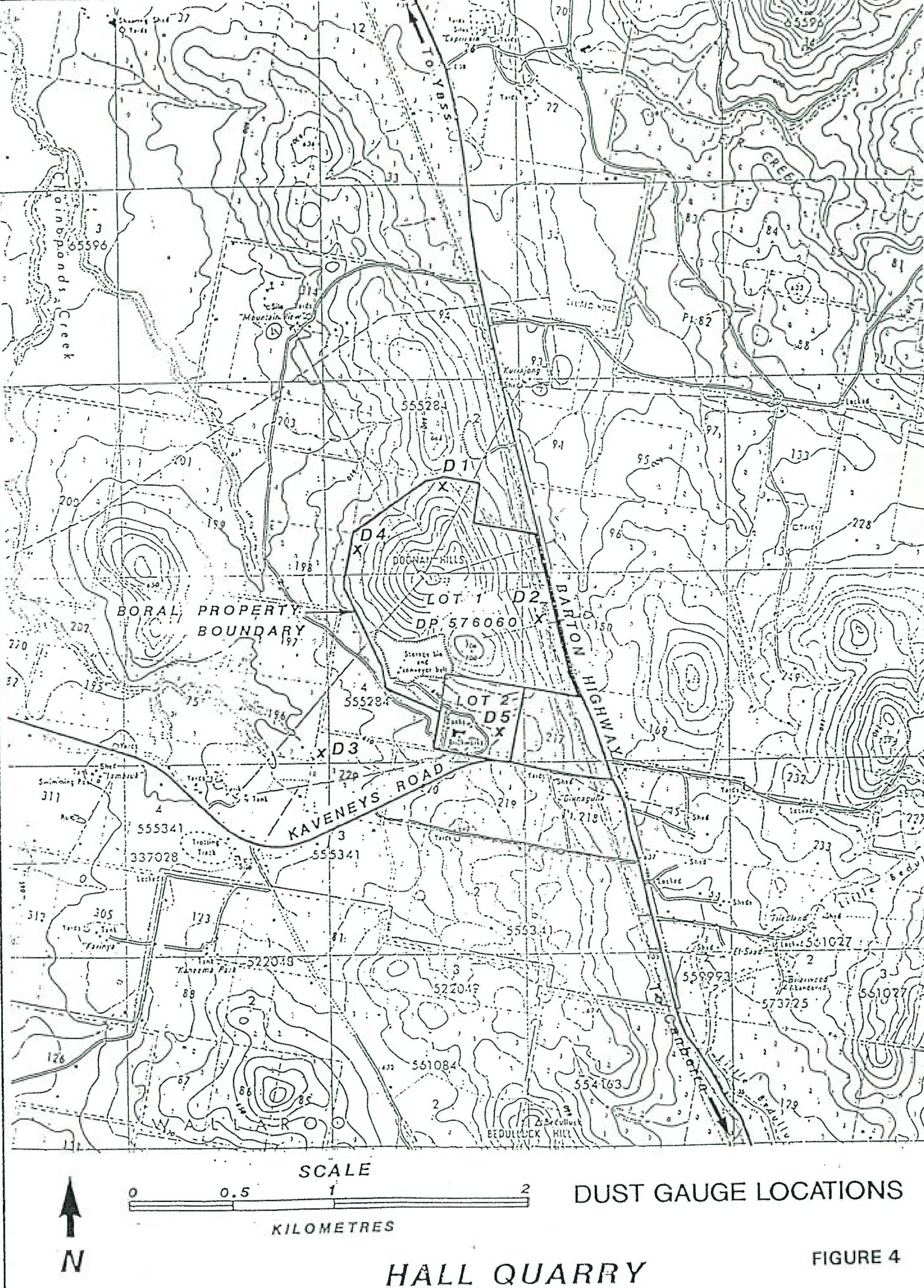
KILOMETRES

N

LOCALITY MAP

HALL QUARRY FIGURE : 2


PROPOSED NEW BOUNDARY
EXISTING STOCKPILE AREA
PROPOSED STOCKPILE AREA
KARRETS ROAD
EXISTING BOUNDARY OF LOT 1
CRUSHING PLANT
BESSER BLOCK PLANT
EXTRACTION AREA
BORAL RESOURCES LTD
HALL QUARRY
LOCATION OF PROPOSED STOCKPILE AREA
FIGURE 3



DUST GAUGE LOCATIONS

FIGURE 4

HALL QUARRY

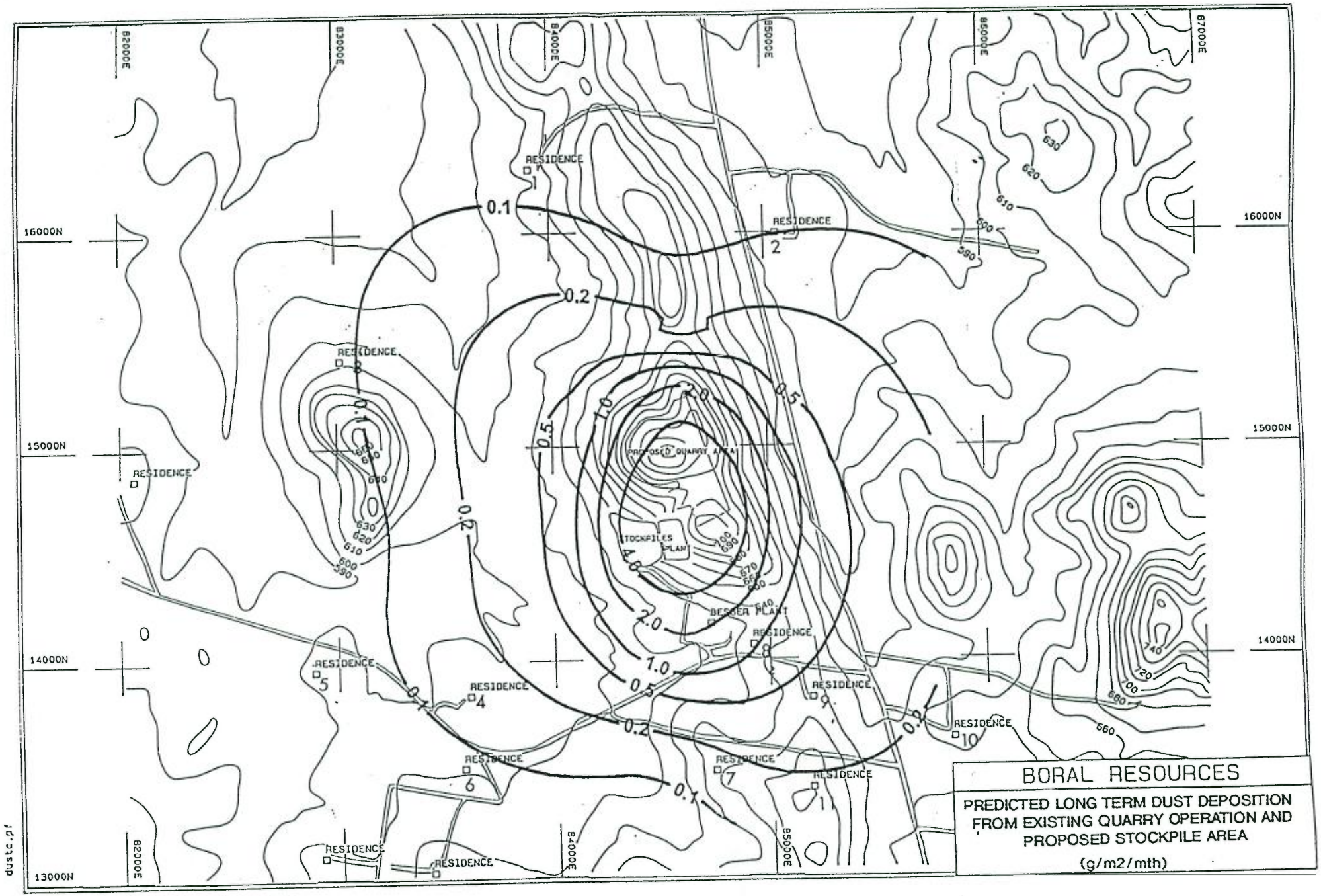

BORAL RESOURCES
PREDICTED LONG TERM DUST DEPOSITION
FROM EXISTING QUARRY OPERATION AND
PROPOSED STOCKPILE AREA
(g/m2/mth)
PROPOSED QUARRY AREA
STOCKPILES
PLANT
DESSER PLANT
RESIDENCE
16000N
15000N
14000N
13000N
82000E
83000E
84000E
85000E
86000E
87000E
0.1
0.2
0.5
1.0
2.0
4.0
SURPAC SOFTWARE INTERNATIONAL, AUSTRALIA
dustc.pf

FIGURE 5

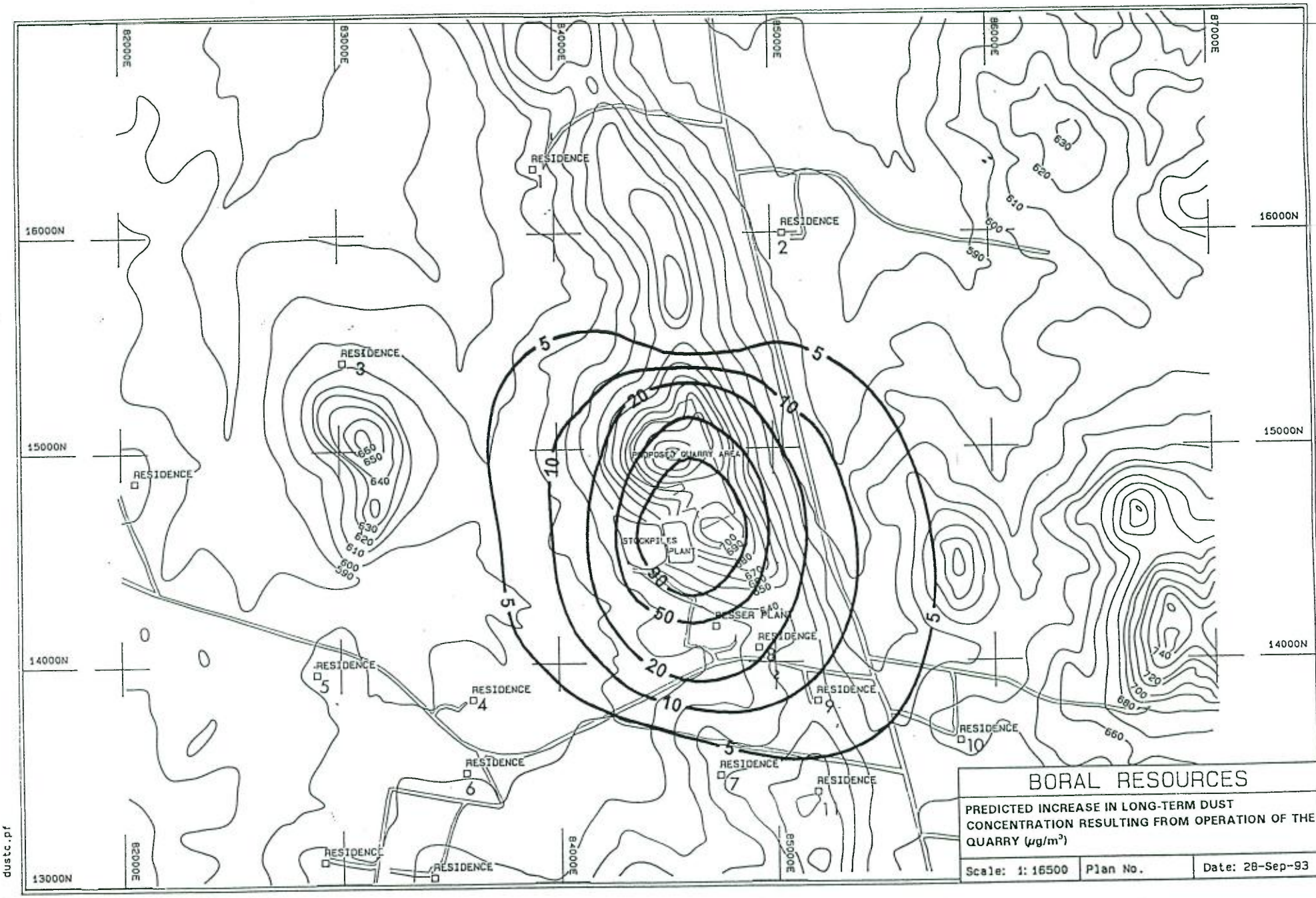

BORAL RESOURCES
PREDICTED INCREASE IN LONG-TERM DUST CONCENTRATION RESULTING FROM OPERATION OF THE QUARRY (µg/m³)
Scale: 1:16500
Plan No.
Date: 28-Sep-93
PROPOSED QUARRY AREA
STOCKPILES
PLANT
RESIDENCE 1
RESIDENCE 2
RESIDENCE 3
RESIDENCE 4
RESIDENCE 5
RESIDENCE 6
RESIDENCE 7
RESIDENCE 8
RESIDENCE 9
RESIDENCE 10
RESIDENCE 11
RESIDENCE
16000N
15000N
14000N
13000N
82000E
83000E
84000E
85000E
86000E
87000E
5
10
20
50
100
dustc.pf
SURPAC SOFTWARE INTERNATIONAL, AUSTRALIA

FIGURE 6

APPENDIX 4

Flora and Fauna Assessment

Report to Boral Country on a visit to the Boral Hall Quarry, to survey vegetation and habitats of threatened fauna in the proposed stockpile area, 12 April 1996.

Isobel Crawford
Australian Botanical Surveys,
POB 31,
O'Connor 2602

'phone/fax 06 2571860

The vegetation on the proposed stockpile area

The names of introduced plant species are asterisked. The vegetation on the proposed stockpile area is Yellow Box - Blakely's Red Gum *Eucalyptus melliodora - E. blakelyi* open woodland with no shrubs. The ground layer is dominated by introduced pasture species (Soft Brome **Bromus molliformis*, Sub Clover **Trifolium subterraneum*, Narrow-leaved Clover **T. angustifolium* and Phalaris **Phalarisaquatica)* plus two of the native species able to survive pasture improvement and grazing (*Bothriochloa macra* and *Microlaena stipoides).* In the seepage line through the site, the following grasses and other herbs dominate: Yorkshire Fog **Holcus lanatus*, White Clover **Trifolium repens*, Ryegrass **Lolium* sp., **Phalaris aquatica*, Spear Thistle *Cirsium *vulgare*, Jointed Rush **Juncus articulatus*, Blown Grass *Agrostis avenacea* var. *avenacea* and *Juncus subsecundus*.

There is one Red Stringy Bark *E. macrorhyncha* on the site (? marking the south- west corner). The presence of this essentially forest species suggests that the site is on what was the forest - woodland boundary (woodland typically occurring below open forest in this landscape).

There are two Candlebarks *E. rubida* in the north-western corner of the area, below the dam. They appear to have been planted.

The trees occur over the whole area, and not just on the southern third as indicated on the map accompanying the Statement of Environmental Effects. The Blakely's Red Gums can tolerate poorly drained soils and so occur in the seepage lines, whereas the Yellow Box need better drained soils and so occur higher up.

The small number of big, old eucalypts on the site (less then ten) are fine healthy trees, apart from one dying Yellow Box close to the road and one Blakely's Red Gum in the seepage line from the Besser Block Plant.

In summary, apart from the good quality old eucalypts on the site, the vegetation is all too typical of that on agricultural lands of the Tablelands and Western Slopes of New South Wales. The shrub layer has been removed totally, the ground layer has been 'highly modified' so that only a small number of fertiliser- and grazing-tolerant native grasses and other herbs remain among the encroaching pasture grasses and weeds.

Fauna habitats for threatened species in the proposed stockpile area

In New South Wales animal species categorised at the state level as 'threatened' (i.e. extinct, endangered or vulnerable) are now listed on Schedule 1 or 2 of the *Threatened Species Act* 1995. There is not yet a list of threatened plants for New South Wales, but none of the species from this region likely to be on such a list was recorded, nor is there habitat suitable. Of the two threatened animal species which could possibly make use of the site, the Regent Honeyeater *Xanthomyza phrygia* and the Superb Parrot *Polytelis swainsonii* , the Superb Parrot is the more likely to do so, based on existing records.

Because of this a special effort was made to search for habitat suitable for this species, which visits the Hall and Murrumbateman area to breed in the spring and summer. It requires tree hollows for nesting and feeds on the ground (in this region) on the seeds of grasses (including wheat and other stock food) and of other plants. For more detail of their habitat requirements, see the excellent summary in the 1993 'Hall Quarry Vegetation and Fauna Habitat Assessment ' by M. S. Davis. As noted by Davis, the Superb Parrot has not been recorded to forage in heavily grazed paddocks, and for this reason I consider that there is no foraging habitat suitable for this species in the proposed stockpile area. No suitable hollows were observed in the large eucalypts (the Blakely's Red Gums are the most likely to form hollows, as are most of the smooth barked eucalypts) on the site, so I consider that there is no nesting habitat available on the site for this species.

Impact of the proposed extension to the quarry on threatened species or on habitat suitable for threatened fauna

As stated above, I consider that there is no habitat on the site suitable for any threatened species. It therefore follows that the proposed extension to the quarry is most unlikely to have 'a significant effect on threatened species, populations or ecological communities, or their habitats' (Threatened Species Act S5A *et al.*).

It also follows that there should be no requirement to do an 'eight point test concerning threatened species' as requested by Yass Council' recent letter to Boral. This should be checked with Dr Michael Saxon at the Zone Office of NSW National Parks & Wildlife Service in Queanbeyan ('phone 2989715) because I make no claim to be infallible, and I may have misconstrued the new legislation.