• B[illegible]dale Place, 142 Bundall Road
Surfers Paradise Qld 4217
Australia

• PO Box 5017
Gold Coast Mail Centre Qld 4217
Australia

• EMail bp@gc.design.net.au

• **Telephone**
International: +61 7 5574 0511
National: (07) 5574 0511

• **Facsimile**
Civil: (07) 5574 0011
Structural: (07) 5574 0505

BURCHILL PARTNERS
PTY LIMITED
ACN 010 140 495

SUBDIVISION 96/590

HAP:klt
Let/14031

Our Ref: C1495/15

6 November 1996

GCCC RECEIVED
4 DEC 1996
ATT No. 96/62621
FILE No. 665/96/590
FORWARD COPY SENT

The Chief Executive Officer
Gold Coast City Council
PO Box 5042
GOLD COAST MC QLD 9729

ATTENTION: MS D CHOW

Dear Sir,

RE: JEFFERSON PROPERTIES PTY LTD
PROPOSED 2 LOT MANAGEMENT SUBDIVISION
LOT 904 RP 895147 PAR BARROW

Reference is made to the above and on behalf of our client, Jefferson Properties Pty Ltd, we lodge the attached 2 lot management subdivision proposal.

Lot 904 is a balance area of Forest Hills Estate and is zoned part Rural and part Residential.

It is proposed to create a 2 lot management subdivision, the boundaries of which follow the zoning boundaries.

To assist in processing we attach a copy of the registered plan and plan C1495/15:00:03 showing the zoning boundaries and existing adjoining Res A subdivision.

Plan C1495/15:00:04 shows the proposed 2 lot subdivision and the proposed access to Lot 1 viz off Wimbledon Way. This will involve Lot 1 temporarily being zoned largely Rural and a very small area zoned Residential A, which coincides generally with the easement access to the existing water reservoir.

We look forward to Council's approval of the application and await your reply.

Yours faithfully,
BURCHILL PARTNERS PTY LIMITED

H A PARKER
Director

cc Jefferson Properties Pty Ltd
John Marendy & Associates

$420
REC 1350850

560/20 1032

• **Brisbane Office**
Telephone: (07) 3832 1155
Facsimile: (07) 3832 1685

• **Overseas Offices**
Tokyo - Japan
Johor Bahru - Malaysia

• **Directors**
H.A. Parker
E.J. Bate
R.M. Windsor
J.C. Stone
G.G. Buntine

• **Associate Directors**
D.T. Kleimeyer
A.F. Payne
B.R. Jones

• **Associates**
D.N. Dover
J.M. Leman

ACEA
The Association of Consulting Engineers Australia

Civil and Structural Consulting Engineers and Planners

CITY OF GOLD COAST

Gold Coast City Council

P O BOX 5042 GOLD COAST MC 9729

APPLICATION NO.: 96/590 b

FEES: $420

PLANNING & SUBDIVISION APPLICATION

NERANG OFFICE
Enquires: Planning Enquiries Telephone 075 760259
Subdivision Enquiries Telephone 075 760303
Facsimile: 075 760492

SURFERS PARADISE OFFICE
Enquiries Team 1 - 075 816061 (Facsimile 075 816071)
Team 2 - 075 816062 (Facsimile 075 816072)
Team 3 - 075 816063 (Facsimile 075 816073)
Team 4 - 075 816064 (Facsimile 075 816074)
Team 5 - 075 816065 (Facsimile 075 816075)

Please ensure Schedule A is attached to this application

1.0 DETAILS OF LAND

1.1 Real Property Description: LOT 904 RP 895147

Parish of BARROW County of WARD

1.2 Area of Land (if more than one allotment give area of each and total area) 44.7 Ha

1.3 If applicable, metes and bounds description of the land for each existing and proposed zone to be provided (please attach).

1.4 Location of Land

No. _____ Street WIMBLEDON WAY Suburb OXENFORD Postcode _____

1.5 Length of Each Road Frontage

Road Name W'DON WAY Length 18.0 Road Name WHITE CITY DR Length 18.2m

Road Name EMERSON WAY Length 16m Road Name _____ Length _____

2.0 APPLICANT

Name JEFFERSON PROPERTIES PLC

Applicants or Authorised Agents Address for the service of notices C/- BURCHILL PARTNERS PLC

BOX 5017 GCMC 4217 Telephone No. 55 740511

I acknowledge that under Section 8.5 of the Local Government (Planning & Environment) Act, a person who furnishes a document that is false or misleading in a material particular, whether by way of a statement in or omission from the document commits an offence against this Act.

Signature/s John Fook Date: 7-11-96

3.0 CONSENT OF OWNER/S - The application must be accompanied by the written consent of the owner (and where applicable the consent of the Body Corporate) if the application is made by a person other than the owner of the premises.

I/We APPLICANT IS OWNER of

Address _____

Telephone No. _____

hereby consent to this application.

Basis of Ownership (e.g. registered proprietor, registered lessee from the Crown) _____

Where the owner is a Company, the consent is to be given by the duly authorised persons of the Company under the Company Seal.

Signature/s _____ Date: 7-11-96

JEFFERSON PROPERTIES PTY. LTD. The Common Seal of

4.2 If the land is not being used, list the previous use of the land. N/A

4.3 Are there any existing buildings to be retained? No ☐ Yes ☐ No

5.0 STRATEGIC PLAN, ZONE & REGULATORY MAP AND PLANNING CONSENT INFORMATION

5.1 In what designation is the land included on the Strategic Plan? PART URBAN RESIDENTIAL PART EXTRACTIVE IND/OPEN SPACE

5.2 From what zone is the land to be excluded (if applicable)? N/A Area

5.3 In what zone is the land proposed to be included (and if applicable, the notation to be made on the relevant zoning map)? N/A Area

5.4 Is the land affected by any Development Control Plan? Give details ALBERT CORRIDOR DCP

5.5 Is the land affected by any Regulatory Map? Give details No

5.6 Are there are existing Town Planning Consent Permits relating to the land? ☐ Yes ☒ No

If yes, please give details

6.0 PROPOSED USE AND/OR PROPOSED SUBDIVISION

6.1 Describe the proposed use of the land and buildings to be erected. AS ALLOWABLE BY THE ZONE

6.2 Proposed Development Parameters (where applicable)

(i)	Gross Floor Area		(vii)	Residential Density	
(ii)	Total Use Area		(viii)	Maximum number of units	
(iii)	Site Coverage		(ix)	Number of Bedrooms	
(iv)	Number of Storeys		(x)	Car parking provisions	
(v)	Building Height		(xi)	Number of persons proposed to be employed	
(vi)	Plot Ratio		(xii)	A description of the nature of the machinery to be used if its combined power load is greater than 1.5 kw.	

6.3 Proposed Subdivision Parameters

(i)	Number of Allotments - Dry	2	(vi)	Area and length of Road/s	—
(ii)	Number of Allotments - Wet	/	(vii)	Area of Park	/
(iii)	~~Average~~ Area of Allotments	22.35 ha	(viii)	Percentage Park Area to Total Area	—
(iv)	Minimum Area of Allotments	5.35 ha	(ix)	Area of Other Public Place	/
(v)	Area subject to flooding	/	(x)	Contour/drainage plans	
			(xi)	Existing features, improvements, vegetation etc.	

7.0 EXISTING EASEMENTS AND PROPOSED RESUMPTIONS

7.1 Is the site affected by existing easements or proposed resumptions ☐ Yes ☑ No
If yes, please attached appropriate documentation.

8.0 PROPOSED AMENDMENT OF CONDITIONS ATTACHED TO AN APPROVAL

8.1 Is it proposed to amend a condition or conditions attached to an Approval to amend the Planning Scheme? ☐ Yes ☑ No
If yes, please provide details of the condition/s proposed to be amended and make reference to the previous Council decision and file reference number. (If space insufficient, attached separate sheet)

_____

_____

9.0 PROPOSED MODIFICATION OR RELAXATION

9.1 Is it proposed to seek consideration of a relaxation or modification of a Planning Scheme provision? ☐ Yes ☑ No

If yes, please provide details of each relaxation and/or modification being sought and the grounds upon which the application is made. (If space insufficient, attached separate sheet)

_____

_____

10.0 TREE PRESERVATION BY-LAW

10.1 Show the following details on site plan:

(i) (a) location and intent towards every tree with a girth of 40 cm or more, their species, height and girth and any environmentally significant stands of vegetation (ex Gold Coast area).

(b) location and intent towards every tree with a girth of 50 cm or more, or greater than 4 metres in height, their species, height and girth and any environmentally significant stands of vegetation (ex Albert Shire area).

(ii) trees which are to be retained, relocated on site or onto an approved site and trees which the applicant agrees may be removed by Council for transplanting onto other sites;

(iii) the proposed position of buildings, structures, roadworks, service locations and indication of cut and/or fill areas and depth; and

(iv) location of any trees and vegetation stands adjacent to or adjoining the site which could be affected by the proposed development.

10.2 Is it proposed to clear vegetation on site? ☐ Yes ☑ No

If yes, has approval been granted? ☐ Yes ☐ No

Date of Approval _____

10.3 The reason for wishing to remove tree or trees (please attached accompanying submission)

11.0 SITE CONTAMINATION

11.1 If Section 8(3A) of the Act and Regulation 18 of Local Government (Planning & Environment) Regulations apply the application must be accompanied by a Site Contamination Report.

11.2 Is a site contamination report accompanying this application? ☐ Yes ☑ No

11.3 NOTE: Council may require a Site Contamination Report -

(i) where the existing use of the land or, in the case of vacant land, an immediate preceding use of the land, is or was for an industrial purpose and the proposed use of the land is for residential, recreational, educational or similar purpose; or

(ii) where Council has evidence that any previous use of the land may have caused contamination.

12.0 ENVIRONMENTAL IMPACT

If Section 8.2 of the Act and Regulation 16 and 17 of the Regulations apply, the application must be accompanied by an Environmental Impact Statement. Council can not accept an application if it does not include such a Statement.

NOTE: Where an application is made for a proposal not referred to above and Council is of the opinion that the implementation of the proposal may have a deleterious effect on the environment, Council will require the applicant to provide such reports and statements as required by the Local Government (Planning & Environment) Act 1990 and Regulations.

12.1 Is the proposed development of a type or activity, or located within an area contained within the List of Designated Developments as provided for in Schedule 1 and 2 of Regulation 16 of the Local Government (Planning & Environment) Regulations?

If yes, note the Designated Development type._____ ☐ Yes ☐ No

12.3 Have the Terms of Reference for the Environmental Impact Statement been approved by the Chief Executive?

☐ Yes ☐ No

12.4 Has an Environmental Impact Statement been lodged with this application? ☐ Yes ☐ No

12.5 Has it been determined that the development or subdivision is of a minor or ancillary nature not requiring an EIS?

If yes, please supply details. ☐ Yes ☐ No

13.0 CONSENT TO COUNCIL TO REPRODUCE AND/OR COPY DOCUMENTS AND PLANS AND AUTHORITY TO ENTER PROPERTY

13.1 Authority completed and attached with application forms.

Applicant's Signature _____

Agent

14.0 CHECK LIST

To enable your application to be processed, please ensure you have included the following with your application:

Initial Lodgement

- Completed application form - one (1) original plus seven (7) photocopies
- Application fees as per Council's Schedule of Fees and Charges
- Consent to reproduce and/or copy documents and plans and authority to enter property.
- Development and/or subdivision plans, reports or studies submitted to the Council in connection with this application shall be prepared and identified in accordance with the relevant provisions of Part 17 of the Planning Scheme.

  Eight (8) copies of all supporting documentation and/or plans.
- Supporting information and documentation, for example, site plan, planning reports, environmental impact study, contamination report etc.

  Eight (8) copies of all supporting documentation.
- Staged Subdivision - Where it is proposed to subdivide land in stages the application is to be accompanied by a staged subdivision plan, which is to include the following:
  (a) the boundaries of the whole of the subject land and the boundaries of each of the proposed stages;
  (b) by numbers, each stage of the proposed subdivision in the proposed sequence;
  (c) the number of the proposed allotments intended to be created in each stage and the total number proposed for the whole o the subject land.
- Supporting documentation from any other relevant party having jurisdiction over or adjacent to the proposed development, for example, the Department of Transport, Department of Environment and Heritage, Department of Housing, Local Government and Planning.

  One (1) set of supporting documentation
- Plans - Eight (8) sets of ALL plans, including subdivision plans.

After closing date for objections (where applicable)

- Submit Statutory Declaration regarding public advertising within twenty-one (21) days from closing date.

Gold Coast City Council

PLANNING & SUBDIVISION APPLICATION FOR CITY OF GOLD COAST

Chief Executive Officer
Council of the City of Gold Coast
P O Box 5042
GOLD COAST MC 9729

Application is hereby made to the City of Gold Coast for the particular application as indicated below:

☐ **TO AMEND A PLANNING SCHEME**
Local Government (Planning & Environment) Act Section 4.3

- ☐ Zone or Rezone land
- ☐ Rezone in stages
- ☐ Staged rezoning
- ☐ Amend conditions attached to an Approval under Section 4.4, 4.7 or 4.9 (Previous Approval Council file no .....)
- ☐ Amend a Use (where specified in respect of the particular zoning or as noted on the relevant zoning map)
- ☐ Amend a Regulatory Map
- ☐ Amend a Development Control Plan Map

☐ **FOR TOWN PLANNING CONSENT**
Local Government (Planning & Environment) Act Section 4.12

For the issue of a Town Planning Consent Permit to carry out the following:

_____

_____

☑ **TO SUBDIVIDE LAND, CREATE AN ACCESS EASEMENT OR FOR APPROVAL OF A PLAN OF AMALGAMATION, SUBDIVIDE IN ACCORDANCE WITH THE PROVISIONS OF THE BUILDING UNITS AND GROUP TITLES ACT**

- ☑ To subdivide land into allotments
- ☐ To subdivide land by lease
- ☐ For a staged subdivision
- ☐ To open road
- ☐ To subdivide land incorporating a lake
- ☐ To subdivide land incorporating a Canal or Harbour
- ☐ To have approved a plan of amalgamation
- ☐ To create an access easement
- ☐ To subdivide or resubdivide land into lots and common property in accordance with the provisions of the Building Units and Group Titles Act
- ☐ Amalgamation of Group Title lots
- ☐ Extinguishment of a Group Titles Plan

Gold Coast City Council

PLANNING & SUBDIVISION APPLICATION FOR CITY OF GOLD COAST

Application is hereby made to the City of Gold Coast for the particular application as indicated below:

☐ **FOR APPROVAL OF PERMITTED DEVELOPMENT SUBJECT TO CONDITIONS**

Local Government (Planning & Environment) Act Section 4.11

For approval of Permitted Development subject to conditions to carry out the following:

_____

_____

☐ **FOR RELAXATION OR MODIFICATION OF SCHEME PROVISIONS, SPECIAL APPROVALS DEVELOPMENT TO BE DEEMED PERMITTED DEVELOPMENT IN GENERAL INDUSTRY ZONE, MODIFICATION OF CERTAIN APPLICATIONS AND APPROVALS**

- ☐ Relaxation or modification of Scheme provisions
- ☐ Certain development deemed Permitted Development in General Industry Zone
- ☐ Modification of certain applications and approvals
- ☐ Special approvals

  - ☐ Partial 4 Storeys
  - ☐ Vehicular Access to Sites
  - ☐ Changes to Natural Ground Level
  - ☐ Aesthetics of Development
  - ☐ Noise Nuisance
  - ☐ Wind Nuisance
  - ☐ Development in Vicinity of Airports
  - ☐ Redetermination of Foreshore Seawall Line
  - ☐ Approval Temporary Development
  - ☐ Building/Structures in, on or over water or on tidal land
  - ☐ Provisions of any Development Control Plan
  - ☐ Applications for Industry Certificates of Compliance (ex Albert Shire area only)

☐ **COMBINED APPLICATION**

Local Government (Planning & Environment) Act Section 4.11

- ☐ Zoning or Rezoning land
- ☐ Issue of a Town Planning Consent Permit
- ☐ Amend a Regulatory Map
- ☐ Amend a Development Control Plan Map
- ☐ The Subdivision of Land
- ☐ Other _____

OTHER APPLICATIONS RELATING TO PREVIOUSLY KNOWN ALBERT SHIRE COUNCIL

☐ **CONSIDERATION IN PRINCIPLE**

☐ Consent ☐ Rezoning ☐ Subdivision

☐ **REGISTRATION OF NON CONFORMING USE**

CONSENT TO REPRODUCE AND/OR COPY DOCUMENTS AND PLANS
CONSENT TO ENTER SUBJECT LAND

Gold Coast City Council

To Chief Executive Officer
Council of the City of Gold Coast
P O Box 5042
GOLD COAST MC 9729

(A) AUTHORITY TO REPRODUCE PLANS

I H. A. PARKER

of Burchill Pines P/L

being the author of

(a) Plans/Diagrams/Drawings numbered C1495/15.00.03 & C1495/15.00.04 dated Nov/96

(b) A Report/Submission dated 6th Nov/96

regarding an application by JEFFERSON PROPERTIES P/L

to subdivide Lot 904 Par Barrow

hereby consent to the lodgement of the above with the Council of the City of Gold Coast. I also consent to the Council of the City of Gold Coast copying or reproducing such documents and papers for any reason whatsoever having regard to the normal functions and duties of Council and without limiting these reasons to provide copies to any objector or any person enquiring about the application referred to above.

DATED this 6th day of Nov 1996

Signed: [signature]

NOTE The person signing this document hereby guarantees by their execution of this consent that where they are a member or employee of a firm or a corporation they have prepared these plans whilst employed or engaged by such firm or corporation, and that firm or corporation has consented to the lodgement of the documents referred to above with the Council of the City of Gold Coast and the dealing by the Council of the City of Gold Coast with such documents and papers as outlined above.

(B) AUTHORITY TO ENTER SUBJECT LAND

I/we hereby authorise the duly appointed employees of the Local Government to enter the subject land at any time during normal business hours to carry out inspections relating to this matter.

APPLICANT [signature] DATE 7-11-96 X

LAND OWNER ______________ DATE ______

TOWN PLANNING APPLICATION DOCUMENTATION CHECKLIST

APPLICATION FORM

Section 1

	Checked
RPD	
Street Address	

Section 2

	Checked
Name of Applicant	
Signature	
Date	

Section 3

	Checked
Name of Ownership (Check that it is the same as on the Rates record)	
Signature/s (signature/s of all owners are required)	
Company seal, if applicable	
Date	

Section 4 to 13

Question #	Yes	No	Question #	Yes	No
Question 4			Question 9		
Question 5			Question 10		
Question 6			Question 11		
Question 7			Question 12		
Question 8			Question 13		

SCHEDULE A

	Checked
Has this section been completed?	

APPLICATION CONSENTS

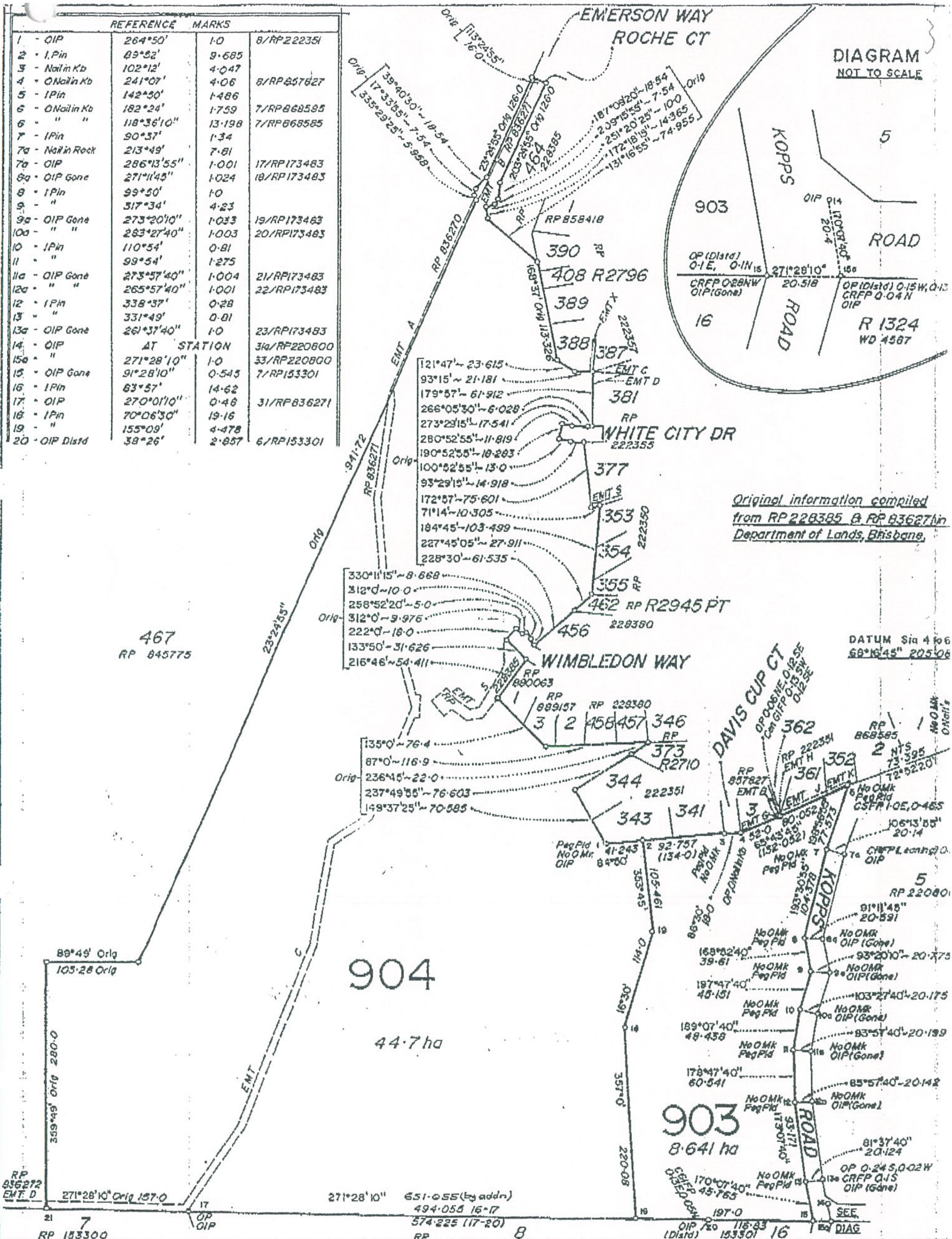
	Checked
a) Authority to reproduce plans, has this section been signed and dated?	
b) Authority to enter subject land, has this section been signed and dated?	

895147

PLAN MUST BE DRAWN WITHIN BLACK [illegible]ES

895147

REFERENCE	MARKS		
1 - OIP	264°50'	1·0	8/RP222351
2 - I.Pin	89°52'	9·685	
3 - Nail in Kb	102°12'	4·047	
4 - ONail in Kb	241°07'	4·06	8/RP857827
5 - IPin	142°50'	1·486	
6 - ONail in Kb	182°24'	1·759	7/RP868585
6 " "	118°36'10"	13·198	7/RP868585
7 - IPin	90°37'	1·34	
7a - Nail in Rock	213°49'	7·81	
7a - OIP	286°13'55"	1·001	17/RP173483
8a - OIP Gone	271°11'45"	1·024	18/RP173483
8 - IPin	99°50'	1·0	
9 - "	317°34'	4·23	
9a - OIP Gone	273°20'10"	1·033	19/RP173483
10a - " "	283°27'40"	1·003	20/RP173483
10 - IPin	110°54'	0·81	
11 - "	99°54'	1·275	
11a - OIP Gone	273°57'40"	1·004	21/RP173483
12a - " "	265°57'40"	1·001	22/RP173483
12 - IPin	338°37'	0·28	
13 - "	331°49'	0·81	
13a - OIP Gone	261°37'40"	1·0	23/RP173483
14 - OIP	AT STATION		31a/RP220800
15a - "	271°28'10"	1·0	33/RP220800
15 - OIP Gone	91°28'10"	0·545	7/RP153301
16 - IPin	83°57'	14·62	
17 - OIP	270°01'10"	0·46	31/RP836271
18 - IPin	70°06'30"	19·16	
19 - "	155°09'	4·478	
20 - OIP Distd	38°26'	2·857	6/RP153301



I, JOHN PETER MARENDY hereby certify that I have surveyed the land comprised in this plan by ALAN LOUIS ORR, SURVEYING ASSOCIATE for whose work I accept responsibility and that the plan is accurate, that the said survey was performed in accordance with the Surveyors Act 1977 and the Surveyors Regulation 1992 and that the said survey was completed on 18-8-95

~~Director &~~ Licensed Surveyor

~~Director~~ Date 25/8/95

PLAN OF Lots 903 and 904

895147

Cancelling Lot 466 on RP 228385

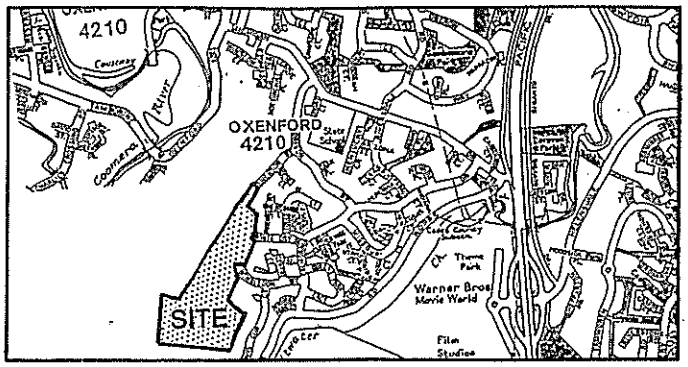
ORIGINAL POR 42

NO SURVEY RECORDS DEPOSITED

PARISH	BARROW
COUNTY	Ward
~~TOWN~~/LOCALITY	OXENFORD
LOCAL GOVERNMENT	CITY OF GOLD CO[AST]
LANDS REGION	SOUTH COAS[T]
~~MINING DISTRICT~~	

MERIDIAN	MAP REF	SCALE	ENDORSED	ARCHIVED
RP 228385	9542-234 -23421	1:4000	J.C. 15/9/1995.	BRISBANE

REGISTERED PLAN 8951[47]



LOCALITY PLAN
N.T.S

EMERSON WAY

467
RP.845775

(RES A)

WHITE CITY ROAD

EXISTING ZONING BOUNDARY

WIMBLEDON WAY

LOT 904
RP.895147

(RURAL)

PROPOSED SUBDIVISION

LOT 904 on RP.895147
Parish of BARROW

for

JEFFERSON PROPERTIES P/L

prepared by
BURCHILL PARTNERS PTY LIMITED
Evandale Place, 142 Bundall Road, Surfers Paradise, Qld, AUS., PO Box 5017, Gold Coast Mail Centre Qld 4217
Tel: 07 5574 0511 Fax: 07 5574 0011

NOTE: THIS DRAWING IS FOR DISCUSSION PURPOSES ONLY AND IS SUBJECT TO DETAIL SURVEY, HYDRAULICS, SOILS INVESTIGATIONS, DESIGN AND RELEVANT AUTHORITY APPROVALS.

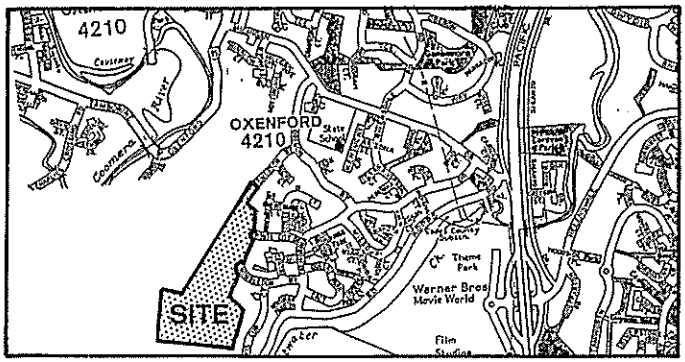
ZONING BOUNDARIES

N

0 50 100 150 200 250

SCALE 1 : 5000

NOV1996 GC1495/15:00:03



LOCALITY PLAN
N.T.S

EMERSON WAY

467
RP.845775

LOT 2
(RES A)

WHITE CITY ROAD

EXISTING ZONING
BOUNDARY

WIMBLEDON WAY

LOT 1
(RURAL)

DEVELOPMENT SUMMARY	
TOTAL SITE AREA	44.7ha
LOT 1	39.2ha
LOT 2	5.5ha
NEW ROAD	0 ha
PARK	0 ha

PROPOSED SUBDIVISION

LOT 904 on RP.895147
Parish of BARROW

for

JEFFERSON PROPERTIES P/L

prepared by
BURCHILL PARTNERS PTY LIMITED
Evandale Place, 142 Bundall Road, Surfers Paradise, Qld, AUS., PO Box 5017, Gold Coast Mail Centre Qld 4217
Tel: 07 5574 0511 Fax: 07 5574 0011

NOTE: THIS DRAWING IS FOR DISCUSSION PURPOSES ONLY AND IS SUBJECT TO DETAIL SURVEY, HYDRAULICS, SOILS INVESTIGATIONS, DESIGN AND RELEVANT AUTHORITY APPROVALS.

PROPOSED MANAGEMENT LOT SUBDIVISION

N

0 50 100 150 200 250

SCALE 1 : 5000

 NOV1996 GC1495/15:00:04

ITEM 4.3

APPLICATION NO.	:	665/96/590
APPLICATION DATE	:	5 December 1996
APPLICANT	:	Jefferson Properties Pty Ltd
LOCATION	:	Lot 904 on Registered Plan 895147, Wimbledon Way, Oxenford
PROPOSAL	:	Two Lot Subdivision, currently Multi-Zoned. Total area 44.7 hectares.

COMMENTS

City Projects - Bryan Case

No comments - not in Coomera Charrette area.

Plumbing and Drainage Services - Keith Farrelly

Separate services are to be provided for each lot.

Services - sewer, water and stormwater to be contained within each lot.

Planning Officer - Jake Storey

Why do lots on Wimbledon Way have both Residential A and Rural zoning?

Perhaps boundaries or zones need to be shifted.

City Arboriculturist - Joe Hance

Multi-zone classification should include parameters as for "Rural" and "Future Urban" zones. As such, compliance with ASC Chapter 30 Tree Preservation Local Laws should be implemented.

Assessment Support - Allan Lush

See Allan Lush.

Environment Protection - Steve Price

W3 A stormwater management plan is to be submitted for approval by the Environment Protection Section.

W7 Erosion and sedimentation controls required.

Continued:-

ITEM 4.3
665/96/590 Continued

WD2 Disposal of cleared vegetation to be in accordance with the requirements of Council's Environment Protection Section.

- Appears that the incorrect site analysis plan has been included. What is the RL height? Possible acid sulphate soil implications.

DISCUSSION

Several officers enquired as to why some of the lots on Wimbledon Way are shown as having a zoning line going through them (Rural and Residential A).

16 December 1996
D Burman
Nerang
(07) 5582 8487
C1495/15
665/96/590

Burchill & Partners Pty Ltd
Attn: H A Parker
PO Box 5017
GOLD COAST MAIL CENTRE QLD 4217

Dear Sir

2 LOT MANAGEMENT SUBDIVISION LOT 904 RP 895147, WIMBLEDON WAY, OXENFORD

I refer to your subdivision application lodged with Council on 4 December 1996. There currently exists a development agreement over the subject property restricting the subdivision of any part of the subject property until such time as the adjoining extractive industry operations have ceased.

In particular clause 8.2 of this development agreement stipulates that "the Council shall not be required to consider an application made contrary to the provisions of clause 8.1".

Council is not in a position to assess a subdivision application over the subject property until such time as the extractive uses referred to in the development agreement have ceased.

Should you wish to clarify any issues contained in the above letter please do not hesitate to contact Mr Dean Burman on (07) 5582 8487.

Yours faithfully

for Ian Glew
MANAGER STATUTORY PLANNING

cc/g:share/subdivisions/claudine/dean/dec16.doc

23 December 1996
Mr D Burman
Nerang
(07) 5582 8487

665/96/590

Department of Mines & Energy
ATT: Michael O'Flynn
GPO Box 194
BRISBANE QLD 4001

Dear Sir

PROPOSED SUBDIVISION LOT 904 RP 895147 WIMBLEDON WAY, OXENFORD

Council is currently in receipt of a subdivision application for two (2) lots for management purposes (refer attachment). The subject property currently has a zoning of rural and residential A.

The subject property is adjacent to a property that is zoned extractive industry. Council seeks your comments on the proposed subdivision and the legal basis of such comments. (eg policies, etc).

Council currently has concerns in relation to the potential land use conflict that may arise between the existing extractive industry and any proposed residential use and the impact that this may have on the mineral resources in the locality.

Your comments on this matter, as a matter of urgency, would be greatly appreciated.

Should you have any further queries please do not hesitate to contact Mr Dean Burman on the above number.

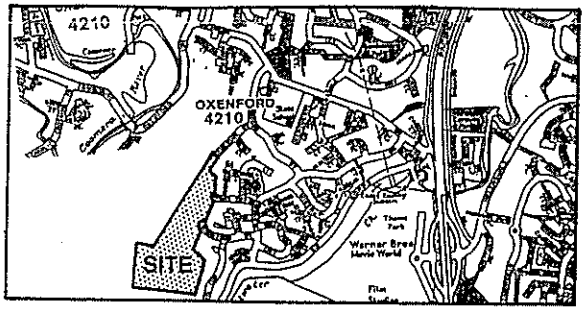
Yours faithfully

for Ian Glew
MANAGER STATUTORY PLANNING

nb/g:winword/letters/dean/dec004.doc

665/96/590

~~666/96/589~~



LOCALITY PLAN
N.T.S

EMERSON WAY

467
RP.845775

LOT 2
(RES A)

WHITE CITY ROAD

EXISTING ZONING
BOUNDARY

WIMBLEDON WAY

LOT 1
(RURAL)

DEVELOPMENT SUMMARY	
TOTAL SITE AREA	44.7ha
LOT 1	39.2ha
LOT 2	5.5ha
NEW ROAD	0 ha
PARK	0 ha

PROPOSED SUBDIVISION

LOT 904 on RP.895147
Parish of BARROW

for

JEFFERSON PROPERTIES P/L

prepared by
BURCHILL PARTNERS PTY LIMITED
Emerald Place, 142 Bundall Road, Surfers Paradise, Qld.
ALSL, PO Box 3017, Gold Coast Mail Centre Qld 4217
Tel: 07 5574 0511 Fax: 07 5574 0011

NOTE: THIS DRAWING IS FOR DISCUSSION PURPOSES ONLY AND IS SUBJECT TO DETAIL SURVEY, HYDRAULICS, SOILS INVESTIGATIONS, DESIGN AND RELEVANT AUTHORITY APPROVALS.

PROPOSED MANAGEMENT LOT SUBDIVISION

0 50 100 150 200 250
SCALE 1 : 5000

NOV1996 GC1495/15:00:04

3 December 1996
Mr D Burman
Nerang
(07) 5582 8487

665/96/590

Nerang Pastoral Co Pty Ltd
PO Box 179
OXENFORD QLD 4210

Dear Sir

PROPOSED SUBDIVISION AT WIMBLEDON WAY, FOREST HILLS

Council is currently in receipt of a subdivision application for a two lot management subdivision on a property adjoining your land. Council would appreciate any comments you may have on the subdivision.

A development agreement exists over the subject property and in particular clause 8.2 of a development agreement stipulates that 'the Coucnil shall not be required to consider an application made contrary to the provisions of clause 8.1'.

Council would also appreciate if you could supply information in relation to the longevity of the extractive industry on your property and any other information you believe may assist Council in the assessment of the subdivision application.

Should you have any further queries please do not hesitate to contact Mr Dean Burman on the above number.

Yours faithfully

for Ian Glew
MANAGER STATUTORY PLANNING

nb/g:winword/letters/dean/dec005.doc

DEPARTMENT OF MINES AND ENERGY

OUR REF. 7005 YOUR REF. 665/96/590

CONTACT OFFICER: Mr A W Stephens

TELEPHONE: (07) 3237 1443 FAX: (07) 3237 0470

Queensland Minerals & Energy Centre, 61 Mary Street, Brisbane QLD 4000
G.P.O. Box 194, Brisbane QLD 4001

QUEENSLAND GOVERNMENT

7 January 1997

Chief Executive Officer
PO Box 5042
Gold Coast MC Q 9729

Dear Sir

I refer to your letter of 23 December inviting comments on a subdivision application over Lot 904 RP 895147 Wimbledon Way, Oxenford.

Residential development or other incompatible land uses within the vicinity of existing extractive industry operations can impede the effective operation of the sites, impair the full use of resources, cause land use conflict, and cause premature closure of sites. Such landuses in the vicinity of potential deposits can sterilise important resources required for the future. Consequently it is essential that applications for development approval, which have the potential to impact on existing extractive operations or potential resources, be scrutinised on that basis.

Urban development, with its need for visual amenity and protection from noise, vibration and dust emissions, should not be allowed to encroach on pre-existing extractive industry operations.

The maintenance of adequate buffering is fundamental if land use conflict between operating extractive sites and incompatible land uses, particularly residential, is to be minimised for the duration of their operating lives. There is a current trend towards performance based assessment of buffer zone requirements. Nevertheless, on the basis of air emissions, the Victorian Planning Guide for Extractive Industry (1991) recommends a buffer distance of 500 m for quarry hardrock blasting and 200 m for hardrock quarrying without blasting. In the absence of an official guide for Queensland, these distances are appropriate.

Because of its small size, it is not possible to have a suitable internal buffer within Lot 467 RP 845775. It is therefore recommended that urban development not be allowed to encroach further on Lot 467.

Although noise, vibration and dust can be controlled to a large degree by technology or ameliorated by topography, impairment of visual amenity is not so easily constrained in the

short term. Should Council regard the topographic situation as negating adherence to the proposed standard buffer distances above, use of proposed Lot 2 for development should not result in residences having views over the adjacent Lot 467 RP 845775 that is zoned extractive industry.

The new proposal should be rejected unless the development proponent can show that visual amenity will not be impaired or that noise, vibration and dust under the existing operating conditions on Lot 467 will not impact on the new development.

Yours sincerely

A W Stephens
Principal Advisor (Extractive Industry)
Mineral Resources Branch

NUCRUSH PTY. LTD.
A.C.N. 010 119 981
Registered Office Hart Street, Upper Coomera. Ph: (07) 5573 1388 Fax: (07) 5573 2908
PO Box 179, Oxenford, Qld. 4210

13

FNL 23/1

13th January, 1997

GCCC RECEIVED SUB1
22 JAN 1997
ATT No. ( ) A97/2759
REFER TO SUB2
FILE No. ( ) 665/96/590
( )
FORWARD COPY SENT
FILE REQUEST

FNL 23/1

Chief Executive Officer
Gold Coast City Council
PO Box 5042
GOLD COAST MC QLD 9729

ATTENTION; MR DEAN BURNAM

Dear Sir,

RE URBAN ENCROACHMENT - BUFFER LAND OXENFORD QUARRY

We submit the following information regarding our quarrying activities in response to a proposed subdivision by Jefferson Properties at Wimbledon Way, Forest Hills, Oxenford.

1. In situ reserves contained within the Extractive Industry zoning indicate a quarry life of approximately 60 years based on current and projected production rates.

2. Key Dates: are as follows:

12.9.89	Development Agreement between Midland Credit Ltd and Albert Shire Council.
12.9.89	Deed of Novation between Midland Credit Ltd., Albert Shire Council and Nerang Pastoral Co. Pty.Ltd.
25.9.89	Nerang Pastoral Co. Pty.Ltd. purchase of Lot 463 on RP228373 from Midland Credit Ltd. (settlement)
17.3.92	Quarry Rezoning Agreement between Nerang Pastoral Co. Pty.Ltd. and Albert Shire Council.
26.6.92	Rezoning Gazettal
16.3.93	Primary Crusher Commenced production

13.4.94 Commissioned Secondary Circuit

01.9.96 Commissioned Tertiary Circuit

3. Our quarry, because of its regional significance, its independence and its location close to the market place needs to be protected from urban encroachment. The resource must be protected and conserved so it is available to help satisfy the demand for quarry products in S.E. Qld.

The Quarry has contained reserves indicating a life of 60 years. It contains two rock types, greywacke and quartzite which collectively can satisfy the vast majority of the construction industry's needs for concrete aggregate and road construction materials.

The Quarry is of regional significance. Our customer base extends from Brunswick Heads in NSW to Toowoomba. We provide rock products throughout the whole Gold Coast, Beaudesert and Brisbane regions.

As we are an independent company (as opposed to the larger national or multi-national companies) we act as 'moderators' in the market place. Independent companies in the quarrying and concrete industry help to provide competition, price regulation and they also supply other independent or emerging businesses with rock products, who otherwise may have difficulty in sourcing raw material.

In the absence of independent quarrying companies monopolies can develop which are not always in the best interests of the community.

Urban encroachment is the single biggest threat to the quarrying industry. The consequence of such encroachment (after long, bitter and antagonistic battles) is often ultimately closure of the quarry or severe curtailment of operations.

Furthermore, as quarries are forced further and further away from the construction activity they service, the cost of road haulage escalates. More truck kilometres also means more road wear and traffic congestion. The price of quarry products in S.E. Qld is amongst the lowest in Australia. This is mainly because there is a competitive quarrying industry with resources close to the markets.

4. If the subdivision went ahead (or any subdivision in the quarantined buffer land) we would be forced into a breach of the Environmental Protection Act because of the effect of noise, dust and blast vibrations from our quarry. We have conducted monitoring of the quarantined land which shows we would significantly exceed the proposed environmental protection policy limits for noise. A copy of the study is enclosed. (Appendix 1)

Furthermore blast vibration monitoring has confirmed that the threshold limit for potential structural damage to buildings would be being neared. We would also exceed the recommended thresholds for airblast overpressure, probably on all blasts.

The Department of Environment have issued some draft guidelines for Extractive Industry and Crushing and Screening plants. They suggest a distance of at least 1000m be maintained between quarrying operations and residential developments. (copy attached Appendix 2)

We are presently employing best practice techniques to comply with existing legislation on the above. While we are constantly striving to improve our performance it would be impossible for us to comply if houses were built so close to our Quarry.

If we were forced into breaching the Environmental Protection Act we would also be in breach of our Quarry Rezoning Agreement with Council as we have obligations under this agreement to conform to the environmental legislation. Again we would have to consider our legal position with all parties concerned.

5. Of even greater concern is the safety aspect of houses close to quarries.

Our quarrying operations would be almost adjacent to the proposed subdivision. Blasting could occur within 100m or so of houses. As a mining engineer with 15 years experience, this is a most appalling prospect. It would be grossly negligent to knowingly allow people to live so near a major quarrying operation.

The issue of dust fallout is also extremely relevant. It is an extremely emotive issue. Health issues would certainly be raised were development to proceed.

6. The Division line that delineates the quarantined buffer land in the Development Agreement dated 12.9.89 was not an arbitrary one. Much work was done over a period of time by specialist consultants engaged by the Albert Shire Council, Midland Credit or Nerang Pastoral Co. Pty.Ltd. to try to predict that point where the affect on the amenity of the adjoining land would be low. Noise and dust fallout modelling was carried out. The predicted results which ultimately determined the position of the division line have proved to be fairly accurate. Our monitoring to date and the fairly low number of complaints from residences in the Forest Hills area confirms this.

The general concept was to maintain a buffer with an undeveloped ridgeline between the quarrying operations and housing development in Forest Hills. This has worked well and has had a significant effect in minimising the effects of quarry noise and dust. (Appendix 3)

7. The Council also insisted that Nerang Pastoral Co. Pty.Ltd. purchase from Midland Credit several blocks of land in Roche Court, to further act as buffer against future quarrying operations in the north east corner of the quarry site. We were also required to expand our buffer zone on the south side of our site over another ridge line. In both cases we complied . If a subdivision were to proceed it would be closer to the quarry than the land we were required to purchase as buffer!

8. There is a landscape protection designation over the land that Jefferson Properties want to subdivide. Under Section 2.6.4.12 (c) of the G.C.C.C. Town Plan an environmental impact statement is required. The effect of our quarrying operation on the subdivision and the effect of the subdivision on our quarrying operations would obviously have to be considered in detail as well as other environmental issues.

Our company has embarked on a program to establish whether our buffer lands which will remain development free can act as a sustainable wildlife habitat. (copy of paper enclosed Appendix 4). While there is obvious merit in this as a public relations exercise for quarries, we have noticed a dramatic increase in wildlife within or near our quarry boundaries.

Wildlife that is being displaced by urban development appears to be using our quarry lands and the quarantined buffer land as a refuge.

The animals do not appear to be overly concerned with our quarrying, especially as our operations cease in the evening. This phenomena has been observed by other quarrying companies overseas. In the USA for instance many quarries are now designated as environmentally significant because their buffer lands have become havens for wildlife displaced by urban and rural development.

We have engaged a wildlife consultant to conduct a survey of the area to ascertain what types of animals inhabit the area and the respective populations.

This information will help us in planning our quarrying operations. We are also represented on the Gold Coast City Council's Nature Conservation Strategy Key Stakeholder Group.

We want to use the information to assist in the creation of a sustainable wildlife habitat for native animals displaced by urban encroachment. Our buffer land and the quarantined buffer land under threat from subdivision could be used to achieve this. The collective area should be large enough to sustain populations of wallaby for example provided a link or corridor can be maintained into the Nerang State Forest. There is a unique opportunity to preserve the quarantined land and create a wildlife haven in tandem with the quarry's buffer land. This could provide a sustainable solution to land use conflict between quarries and residential development. Most certainly this is a solution which is receiving considerable attention overseas.

Yours faithfully
NUCRUSH PTY.LTD.

Dugald Gray
GENERAL MANAGER

encls:

Ref:GCC1

APPENDIX 1

Facsimile Message

Our reference no:	50/003/0010/4/72
Date:	09 January 1997
To:	**Nucrush Pty Ltd**
Facsimile no:	**(07) 5573 0271**
Attention:	**Mr Dugold Grey**
From:	Mr George Scott
Position:	Environmental Field Officer
Telephone:	(07) 3810 6355
Pages including this one:	8
Subject:	**Environmental Noise Survey Report No L-0199-96/97**

Dear Dugold

Please find attached a copy of the final report for the Noise Survey conducted on the 16 August 1996 as discussed with Mr Paul Harrison and yourself. This report replaces the original which was misplaced.

Yours Sincerely

George Scott

.....

Sending Officer:

.....

Stewart Bell
Manager
Occupational Hygiene, Environment & Chemistry Centre

for the Director

SIMTARS

Head Office:-

2 Smith Street
Redbank Q 4301

Address Mail To:
The Director
SIMTARS
PO Box 467
GOODNA Q 4300

Telephone
07 3810 6333
+61 7 3810 6333
Facsimile
07 3810 6363
+61 7 3810 6363

Mackay Office:-

169 Sydney Street
MACKAY Q 4740
Address Mail To:
PO Box 453
MACKAY Q 4740

Telephone
079 574077
Facsimile
079 574422

CompuServe
EMAIL No.
100241,1022

Registered Laboratories Nos 2679,2681 2683,3400

Quality System Certified to AS3902/ISO9002 Reg. No. 6039

DISAT Registered Research Agency No. 0177

SIMTARS

Occupational Hygiene, Environment and Chemistry Centre

2 Smith Street, REDBANK, QLD 4301, Australia
Postal Address: PO Box 467, GOODNA, QLD, 4300 Australia

Phone (07) 3810 6333
Fax (07) 3810 6363
International Fax (617) 3810 6363

Laboratory Test Report

REPORT NO:	L-0199-96/97
ISSUE DATE:	21 August 1996
SIMTARS FILE REF:	50/003/0010/4/72
CLIENT/CUSTOMER NAME:	Nucrush Pty Ltd
APPLICANT/CUSTOMER REFERENCE:	
JOB DESCRIPTION:	Preliminary Environmental Noise Survey at Oxenford Quarry
DATE RECEIVED/SURVEY DATE:	16 August 1996
SAMPLE/S COLLECTED BY:	Mr Rex Marshall and Mr Liam Wilson of SIMTARS

CHECKED BY: APPROVED SIGNATORY:

Quality System Certified to AS3902/ISO9002 Registration No 6039

TABLE OF CONTENTS

EXECUTIVE SUMMARY

Introduction

Oxenford Quarry management were concerned that residential development was being considered for the ridge immediately to the east of the quarry. The area currently represented a buffer zone (not owned by the quarry operators) between the quarry and the nearby residential area surrounding Emerson Way, Rosehall Place, White City Drive, Centre Court and Wimbledon Way. Further residential development within the buffer zone could result in conflict between future residents of the development and the quarry operators over noise and dust levels emanating from the quarrying operations and impacting on these residents.

Strategy

Noise levels at a number of sites on the eastern boundary ridge and level 72 noise levels of the quarry were monitored on 16 August 1996 between the hours of 10:50 am and 3:40 pm.

Results

Measured noise levels in dB(A) are detailed in the table below:

Date	*Site*	*Activities*	*Time*	*Measured* $L_{A90,15\ min}$	*Measured* $L_{A10,15\ min}$	*Maximum allowable* $L_{A10,15\ min}$
16 August 1996	1	No quarry activity, maintenance	10:50 - 11:05	47	63	
16 August 1996	1	Drilling rig operating	11:45 - 12:00	65	79	
16 August 1996	2	Drilling rig operating	13:10 - 13:25	42	52	47
16 August 1996	3	Drilling rig operating	13:50 - 14:05	41	49	46
16 August 1996	4	Drilling rig operating	14:55 - 15:10	45	56	50
16 August 1996	5	Drilling rig operating	15:22 - 15:37	43	48	48

Conclusion

Noise levels currently exceed the maximum allowable at both the current residences and significantly exceed those sites within the current buffer zone that may be zoned residential in future.

Recommendation

Oppose residential development within the current buffer zone.

GLOSSARY OF TERMS

A-weighted sound pressure (p_A) - the root-mean-square (r.m.s.) sound pressure determined by the use o frequency-weighting network 'A'.

Sound pressure level (L_p) - the root-mean-square (r.m.s.) sound pressure in decibels.

A-weighted sound pressure level (L_{pA}) - the level of A-weighted sound pressure in decibels.

Background Level ($L_{Abg,T}$) - the A-weighted sound pressure level obtained by using time-weighting 'F' that is equa to or exceeded for 90 percent of the time interval (T) considered in the absence of the noise source(s) unde investigation.
$L_{A90,T}$ is commonly taken to be an approximation of $L_{Abg,T}$.

$L_{A10,T}$ Level - the A-weighted sound pressure level obtained by using time-weighting 'F' that is equal to c exceeded for 10 percent of the time interval (T).

$L_{A90,T}$ Level - the A-weighted sound pressure level obtained by using time-weighting 'F' that is equal to c exceeded for 90 percent of the time interval (T). $L_{A90,T}$ is commonly taken to be an approximation of backgroun $L_{Abg,T}$.

Measurement time interval (T) - that time interval during which the A-weighted sound pressure is measured.

Occupational Hygiene, Environment and Chemistry Centre

REPORT NO: L-0199-96/97

INTRODUCTION

SIMTARS was contracted to perform a preliminary environmental noise survey along the eastern boundary ridge and level 72 of Oxenford Quarry, Maudlands Road, Oxenford operated by Nucrush Pty Ltd. while drilling operations were being conducted. Quarry management were concerned that residential development was being considered for the ridge immediately to the east of the quarry. The area currently represented a buffer zone (not owned by the quarry operators) between the quarry and the nearby residential area surrounding Emerson Way, Rosehall Place White City Drive, Centre Court and Wimbledon Way. Further residential development within the buffer zone could result in conflict between future residents of the development and the quarry operators over noise and dust levels emanating from the quarrying operations and impacting on these residents.

METHODOLOGY

Noise levels were measured using *Australian Standard AS 1055.1 - 1989, AS 1055.2 - 1989* and the Department of Environment and Heritage *Noise Measurement Manual (1995)* as guides.

At five sites the A-weighted sound pressure level (L_{pA}) was monitored for fifteen minute periods and the maximum over each sampling interval of 1 second denoted $L_{Amax,T}$, was logged. A Rion NA29E Octave Band Sound Level meter mounted on a tripod was used. Temperature, wind speed and direction were measured concurrently. The sites were chosen to lie between the major noise source and residences or possible future residences. From the the $L_{A10,T}$ and $L_{A90,T}$ were derived for T = 15 minutes.

Background noise levels were assumed from the derived $L_{A90,T}$ values.

The location of each site is described below:

Site 1: Quarry Level 72 ridge.

Site 2: Buffer zone ridge adjacent to Wimbledon Way.

Site 3: 22 Wimbledon Way.

Site 4: Buffer zone ridge adjacent to White City Drive.

Site 5: 14 White City Drive.

GUIDELINES

The Queensland Environmental Protection Act 1994 *Environmental Protection (Interim) Regulation 1995*, maximum noise level guidelines are shown in Table 1 below.

TABLE 1: Maximum Allowable Increases In Noise Levels Above Background

Time of day	*Noise level for noise sensitive place dB(A)*	*Noise level for commercial place dB(A)*
7 am - 6 pm	5	10
6 pm - 10 pm	5	10
10 pm - 7 am	3	8

The Queensland *Draft Environmental Protection (Noise) Policy 1996* noise criteria to be considered for noise caused by the carrying out of an activity, in the event of a complaint are shown in Table 2 below.

TABLE 2: Maximum Allowable Noise Levels

Time of day	*At an affected noise-sensitive place*	*At an affected commercial place*	*At an affected industrial place*
7 am - 10 pm	background level plus 5 dB(A)	-	-
10 pm - 7 am	background level plus 3 dB(A)	-	-
At all times	-	55 dB(A) at the most affected boundary of the place	65 dB(A) at the most affected boundary of the place

RESULTS

$L_{A10,15\ min}$ and $L_{A90,15\ min}$ results are shown in Table 3 below.

TABLE 3: $L_{A10,15\ min}$ and $L_{A90,15\ min}$ Results dB(A)

Date	*Site*	*Activities*	*Time*	*Measured $L_{A90,15\ min}$*	*Measured $L_{A10,15\ min}$*	*Maximum allowable $L_{A10,15\ min}$*
16 August 1996	1	No quarry activity, maintenance	10:50 - 11:05	47	63	
16 August 1996	1	Drilling rig operating	11:45 - 12:00	65	79	
16 August 1996	2	Drilling rig operating	13:10 - 13:25	42	52	47
16 August 1996	3	Drilling rig operating	13:50 - 14:05	41	49	46
16 August 1996	4	Drilling rig operating	14:55 - 15:10	45	56	50
16 August 1996	5	Drilling rig operating	15:22 - 15:37	43	48	48

Acoustic descriptions of each noise sample are shown in Table 4 below.

TABLE 4: Acoustic Descriptions of Noise Samples

Date	*Site*	*Activity*	*Acoustic Description*
16 August 1996	1	No quarry activity, maintenance	Major noise source - Trees in breeze, birds, road traffic noise from Tamborine and Maudlands Road Maintenance activities not audible
16 August 1996	1	Drilling rig operating	Major noise source - Drilling rig Trees in breeze and road traffic noise barely audible

Date	Site	Activity	Acoustic Description
16 August 1996	2	Drilling rig operating	Major noise source - Drilling rig
16 August 1996	3	Drilling rig operating	Major noise source - Drilling rig, trees in breeze
16 August 1996	4	Drilling rig operating	Major noise source - Drilling rig Trees in breeze, birds and road traffic noise from Pacific Highway audible
16 August 1996	5	Drilling rig operating	Major noise source - Road traffic noise from Pacific Highway Trees in breeze and birds audible Drilling rig not audible

DISCUSSION

Both the current environmental regulations and the proposed environmental protection policy in relation to nois state that the noise level ($L_{A10,15\ min}$) for a noise sensitive place cannot be allowed to exceed five decibels (A weighted) above background noise levels from 7 am to 6 pm (see Tables 1 and 2). A residential area would b regarded as a noise sensitive place.

In this exercise we have taken $L_{A90,15\ min}$ at each site to approximate background noise since the opportunity measure actual background did not present itself. The true background is likely to be equal to or slightly less tha this figure.

$L_{A10,15\ min}$ at Sites 3 (22 Wimbledon Way) and Site 5 (14 White City Drive) where there are existing residenc exceeded, or were at least equal to, the maximum allowable noise level. These residences are on the eastern si of the ridge forming the quarry buffer zone out of line-of-site of the quarry itself. Thus there is already a conce relating to noise nuisance outside the buffer zone.

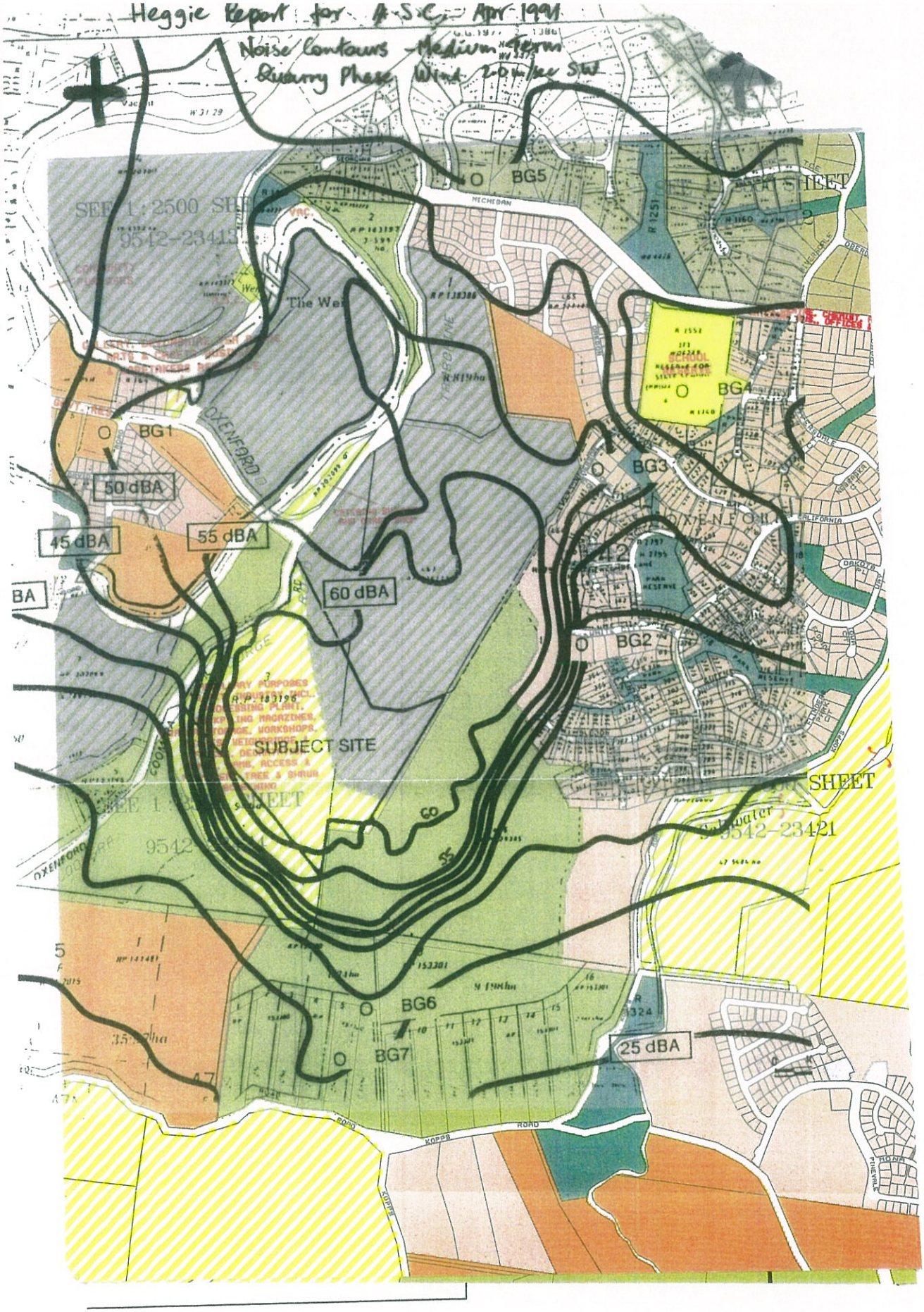
$L_{A10,15\ min}$ at Sites 2 (buffer zone adjacent to 22 Wimbledon Way) and Site 4 (buffer zone adjacent to 14 White C Drive) were up to six decibels (A-weighted) above the maximum level allowable. If residences were to constructed along the top of the ridge currently forming the buffer zone they would be subjected to at least the noise levels. Currently, the ridge is vegetated, affording some degree of noise attenuation. The clearing of the trees for residential development could expose the new residences (and possibly the existing ones) to higher noi levels than measured here. The 79 dB(A) measured on the operating ridge during drilling operations would have less opportunity for attenuation without the vegetation barrier.

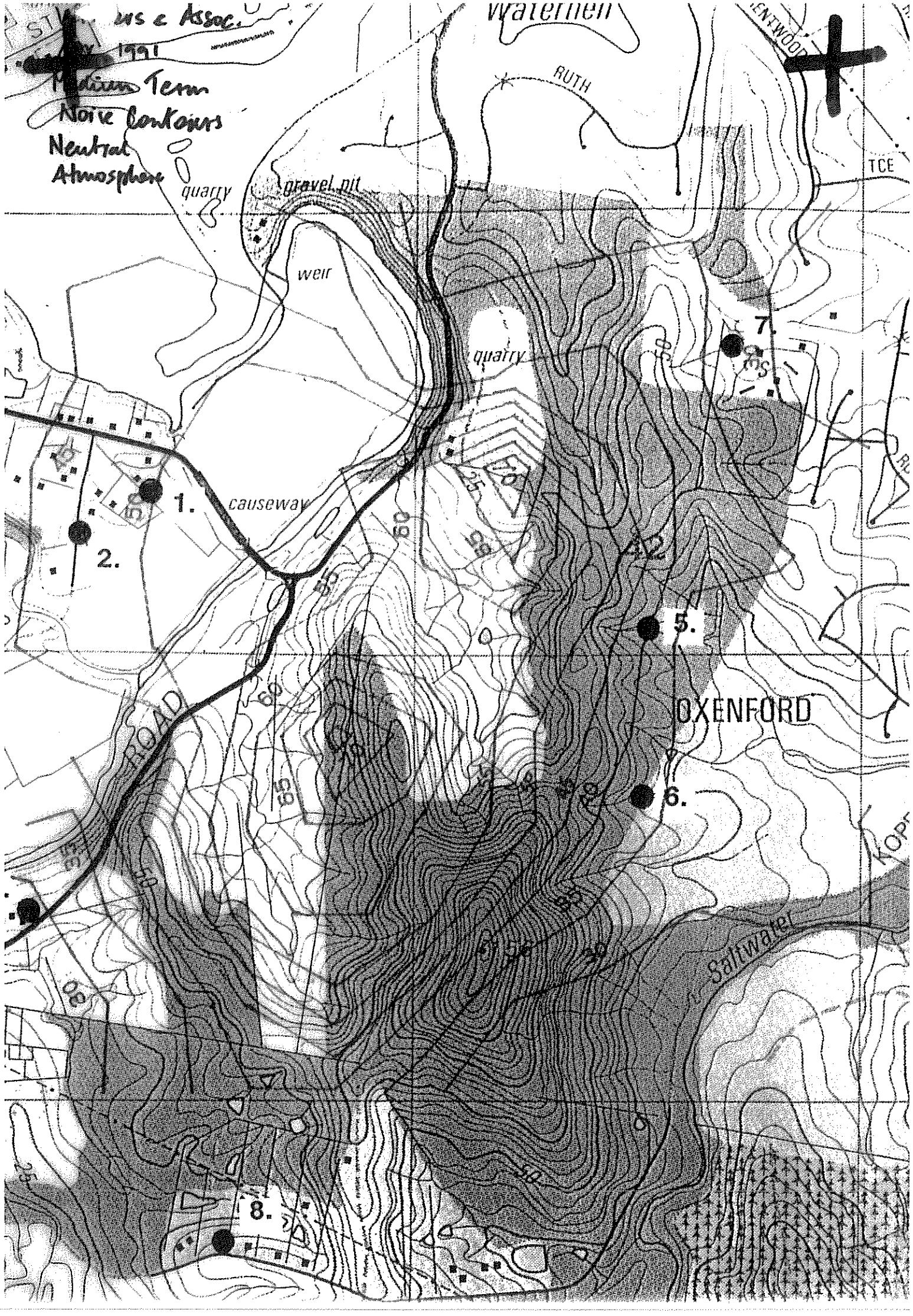
CONCLUSION

Noise levels currently exceed the maximum allowable at both the current residences and significantly exceed those sites within the current buffer zone that may be zoned residential in future.

RECOMMENDATION

Oppose residential development within the current buffer zone.


Heggie Report for A.S.C. Apr 1991
Noise Contours - Medium Term
Quarry Phase Wind Turbine Site
BG1
BG2
BG3
BG4
BG5
BG6
BG7
50 dBA
45 dBA
55 dBA
60 dBA
25 dBA
SUBJECT SITE
OXENFORD
KOPPS ROAD


Waterfall
RUTH
TCE
quarry
gravel pit
weir
quarry
causeway
1.
2.
5.
6.
7.
8.
OXENFORD
ROAD
Saltwater

"C"

APPENDIX 2

Department of Environment and Heritage

Draft For Discussion Purposes

Crushing, Screening and Washing Plants

Environmental Guideline

August 1994

- Buffer zones discussed on page 12

Consistent with the principles of ecologically sustainable development, the Queensland Government has adopted a policy of waste minimisation. The primary objectives are:

- reduction of hazards to human health and to the environment posed by wastes
- reduction in the overall quantity and toxicity of waste generated by households, and industrial, commercial and trade operators
- more efficient use and conservation of resources, particularly non-renewable resources
- reduction in the need for waste treatment and disposal facilities and in overall waste disposal costs
- improvement in cost efficiency within industry through reduced waste disposal and raw material costs and through efficient energy use.

Waste minimisation will result in more effective pollution control by reducing at source the quantities of waste products and by-products. Costs associated with pollution control can thus be reduced. All waste producers are encouraged to include waste prevention and minimisation in environmental management practice.

EPA Act. - pushing for:-

Noise:- • Background + 3dBA for early warning - could affect
* concrete / asphalt plants

1 Introduction

The Department of Environment and Heritage is the lead agency for environmental management in Queensland. The Environmental Protection Act 1994 provides that responsibility for pollution control is to be shared with local governments. The schedule of activities prepared in consultation with industry, local governments and government departments specifies the areas for which local governments will be responsible (Attachment 1).

Operators must ensure that they take all practical measures, in accordance with all applicable Acts or Ordinances, to prevent, control, or reduce contamination of the environment and to control and regulate the disposal of wastes off the site in a manner which complies with statutory regulations.

Some companies have initiated their own environmental awareness campaigns for staff and have developed company-based environmental management plans. These initiatives are designed to encourage environmental awareness within the company, to improve awareness of measures that may prevent pollution from liquid wastes, noise and odour and contamination of the site, and to provide advice on steps that should be taken when contamination does occur. The Department of Environment and Heritage encourages the industry as a whole to pursue similar strategies to ensure a better environment for future generations, free of unacceptable risk to public health and to the environment.

2 Purpose of guideline

This guideline aims to provide decision-making authorities and industry with the knowledge to minimise water and air pollution and noise nuisance. It can be used by administering authorities as a guide in reviewing development and building applications and for assessing complaints.

This guideline identifies environmental problems associated with the premises. It is intended for industry, local government and community use, and is designed to:

- highlight potential contamination problems
- help administering authorities to include environmental management in planning decisions
- suggest management strategies for preventing and controlling pollution
- help industry to manage waste streams
- stress environmental effects of blasting on residential and commercial development
- emphasise environmental and social constraints associated with the impact of extraction from land and waterbeds.

If suggestions in the guideline are adopted by industry, savings in operational costs and improvement in overall efficiency may result.

3 Scope of guideline

The guideline contains a list of statutory requirements related to environmental protection, process description, waste assessment, contaminated land issues and recommended environmental management strategies for extractive industries.

The guideline describes methods of extraction and processing in hard rock quarries, sand, gravel, clay, loams and soil. Potential sources of wastes and noise are identified in relation to these methods and processing. Practical measures are discussed and management strategies suggested.

Contents

Guideline users should note that all the control measures discussed in this guideline will not necessarily be required wherever operations (in hard rock quarry, sand, clay, loams or soil extraction sites) and processing (in crushing, screening and washing plants) are carried out or proposed. Most control measures can be used to improve existing and proposed premises. Some are more appropriate when designing or siting proposed premises.

4 Related guidelines

The following guidelines give information on related topics:

- *Audible alarms and signals*
- *Brick, tile, pipe and pottery work*
- *Building design to contain noise*
- *Construction and building sites*
- *Electricity generating equipment (other than power stations)*
- *Engineering and mechanical workshops*
- *Noise and vibration from blasting (explosives)*
- *Motor vehicle and mechanical equipment repair workshops*
- *Petroleum products distribution and sales*
- *Pumps and air compressors*
- *Setting and assessing general noise limits*
- *Setting and assessing noise limits for motor vehicles on commercial and industrial premises*

5 Definitions

Bund: Water-tight wall which is designed to contain any liquids likely to be released from tanks or other items of equipment in the event of leaks, accidental damage or incorrect operation.

Administering authorities: State Government departments, local governments, or other bodies with legislative responsibility for pollution control.

Extractive materials: Extracted materials which are not defined as "minerals" under Section 1.8 of the Mineral Resources Act. Commercial winning of these materials is carried out by extractive industries.

Dredge: A vessel fitted with bucket, grab or suction dredging machinery for underwater excavation.

Face: A wall of rock, usually near vertical, either naturally formed or as is more often the case, formed by blasting or direct excavating.

Local government: Local government or a joint board constituted under the *Local Government Act 1936* for an area of Queensland, or the Brisbane City Council constituted under the *City of Brisbane Act 1924*, as the case may require.

Occupier: In relation to premises or any part of premises, the person in occupation or control of the premises whether or not that person is entitled to possession of the premises. If no person is in occupation or control, the person entitled to possession of the premises or that part of the premises is the occupier.

Peak particle velocity: The vector sum of the velocity (ground vibration) components on three dimension axes.

Plaster shooting: The breaking of rocks by firing capped charges placed against boulders.

Pollution: Direct or indirect alteration of the environment causing contamination or degradation. See the Environmental Protection Act for definitions of 'contaminant', 'contamination', 'degradation' and 'environment'. Full definitions of these terms are complex. They are essential for legal enforcement of the Act.

Popping: The breaking of a rock by firing a small charge within a blasthole which has been drilled into it.

Primary crusher: Machine which receives rock directly from the quarry and reduces the size of the rock by mechanical fracturing.

Return interval: The period of time over which an event is expected to recur on the basis of statistics of previous events.

Screen: Piece of equipment used to separate crushed rock into components with certain particle size ranges. This consists of at least one tray or deck with numerous holes of particular size. Larger particles cannot pass through the holes and are diverted from the rest of the material. Multiple deck screens, with decks of decreasing hole sizes, produce several streams of material separated into a range of particle sizes.

Screening: Separating crushed rock into components with certain particle size ranges by using a screen.

Secondary crusher: Machine which receives rock which has been partly crushed in the primary crusher and the minus sieve fraction which has passed holes in the primary screen placed before the primary crusher (if such an option is used) and further reduces the size of the rock.

Sedimentation pond: Pond or dam used to hold back contaminated stormwater run off for a specified period of time. The size should be determined based on the area of the catchment, the maximum rainfall for the design return interval, and the time required for adequate settling of suspended particles in the run off. It must be able to hold the run off for sufficient time to allow adequate settling to take place.

6 Relevant environmental legislation

This section outlines the statutory requirements of occupiers of premises under the main environment Acts.

Regarding the localisation of extractive resources, following environmental legislation applies:

- Local Government (Planning and Environmental) Act - for winning of extractive materials from land which is administrated by Local Government (approval, environmental impact, enforcement).
- Water Resources Act - for winning of extractive materials from non-tidal watercourses and lakes (approval, environmental impact, enforcement).
- Forestry Act - for winning extractive materials from Crown Land, state forest and timber reserve (approval, environmental impact, enforcement).
- Harbours Act - for winning extractive materials from marine land or harbour works (approval, environmental impact, enforcement).
- Mineral Resources Act - for mining of minerals, defined under Section 1.8 of the Act, from land (approval, environmental impact, rehabilitation, enforcement). Note, that the meaning of "land" includes also land beneath waters (see more details under Section 1.8 of the Act). Although the act applies for mineral resources, it should be noted, that depending on utilising of the resources the same deposit may be classified either as mineral or extractive resources (see Section 1.8 of the Mineral Resources Act). For instance, limestone is classified as a mineral if is mined in block or slab forms for building purposes or utilised for its chemical properties. Other uses determine limestone as an extractive material. The consequence of that is discussed further in the guideline.

An initial advice on the approval of development proposals and determination whether an Environmental Impact Statement is required, may be obtained from local governments, the Department of Transport, Department of Primary Industries or Department of Minerals and Energy.

Environmental Protection Act

The Environmental Protection Act replaces the *Clean Waters Act 1971*, the *Clean Air Act 1963* and the *Noise Abatement Act 1978*.

Before beginning construction of an environmentally relevant activity (see attachment 3), the occupier must obtain approval from the administering authority. Approvals and licences may be conditional on:

- certain works being carried out
- certain equipment being installed
- certain operating procedures being followed.

Local Government (Planning and Environment) Act

Any application for a designated development under the Act must be made to the local government for approval and may need to contain an environmental impact statement. The applicant should liaise with the local government initially, and then apply to the Department of Housing, Local Government and Planning for the terms of reference for the environmental impact statement. These will be determined by the Department of Housing, Local Government and Planning in consultation with the Department of Environment and Heritage, the local government and other referral agencies.

The local government can request that any application for rezoning, subdivision or change in current use of land used for a 'prescribed purpose' be accompanied by a Site Contamination Report (SCR). In order to obtain an SCR from the Department of Environment and Heritage, an investigation should be undertaken by an appropriately qualified consultant (listed in a schedule in the Contaminated Site Regulations) and the report on those investigations must be forwarded to the Department for assessment. The SCR will be issued only when a site no longer poses a risk to public health or the environment.

Contaminated Land Act

Section 13 prohibits land contamination by any person unless it has been approved by the chief executive officer or has been authorised under any Act, e.g. by licence. The Contaminated Land Section of the Department of Environment and Heritage must be notified of contaminated sites within 30 days of discovery by the owner, occupier or person who caused or permitted contamination. Contaminated sites are recorded by the Department in a register to which the public has access. Attachment 2 lists 'prescribed purpose' land uses which could result in contaminated sites. The Department of Environment and Heritage must be notified by local governments and government departments of all land used for any prescribed purpose, which will then be entered into the register as 'probable' contaminated sites.

Notices requiring the clean-up of contaminated land can be issued, particularly if there is a health or environmental risk.

Mineral Resources Act

This act deals with the approval, control and development process associated with mining activities based on an exploration permit, mineral development licence or mining lease. One of its objectives is to encourage environmental responsibility for prospecting, exploring and mining. Although presently, the Mineral Resources Act does not apply to extractive materials, they are recommended to be included in a new version of this Act.

In accordance with the act, the Department of Minerals & Energy has introduced a

policy which aims to assist the mining industry in meeting the environmental responsibility and achieve industry self-regulation. The policy deals with the concept of mining rehabilitation and mining wastes through a system of financial incentives applied for by lease holders. It is mandatory, that an application for granting a mining lease should be accompanied by an Environmental Management Overview Strategy (EMOS). EMOS is an environmental management planning document which considers possible environmental impacts and develops control strategies to mitigate these impacts. An Environmental Impact Statement (EIS) must be undertaken if required by the Minister of Minerals & Energy.

Before commencing mining activities a Plan of Operations should be also approved. This plan describes the mining project, progressive rehabilitation programs and environmental protection for a period of up to five years. The Plan of Operations and EMOS, comprises issues associated with:

- land and water resources,
- air quality,
- noise,
- conservation values,
- heritage and cultural values,
- social,
- research,
- environmental monitoring.

Detailed information and guidelines on environmental management planning documents, financial incentives regarding the environmental management performance, interpretation and implementation of the act and policy are available from the Department of Minerals & Energy.

Refuse Management Regulations

The local government is responsible for administering these regulations, which require occupiers to provide efficient and nuisance-free storage for domestic, commercial and industrial refuse, and specify requirements for the safe removal, collection and disposal of refuse.

7 Process description

The term, extractive industries refers to winning of coarse aggregate, sand, clay, loam, soil and rock. However, some clay, sand and rock may be classed as mining industries. The resources affiliation to extractive or mining industries is determined by the resources utilisation pursuant to Section 1.8 of the Mineral Resources Act. Therefore, environmental management in this guideline is focussed on extractive materials and omit such mining methods (e.g. cutting rock into blocks) and processing (e.g. heavy mineral sand concentration) which are not utilised in extractive industries.

The most common utilisations of extractive materials are:

- coarse aggregate - concrete, roadworks and railway ballast
- sand - concrete and filling works
- clay, loam, - mud bricks, filling and landscaping works
- soil - agriculture, gardening and landscaping.

Hard rock quarries

Typical operations in hard quarries involves:

- removal of overburden - this involves the stripping of soil, vegetation and decomposed or waste rock. Frequently such material can be stockpiled for future

site rehabilitation
- drilling, blasting, secondary blasting (or other methods of oversize rock reduction) - holes are drilled to diameter and patterns determined by the rock hardness, cracks and fissure planes of the deposit and then explosives are loaded and blasted in arranged delay sequences. Prior to carting the blasted rock to the primary crusher it is generally necessary to reduce the rock size compatible to the jaw capacity of the primary crusher. Typically, secondary blasting or impact hydraulic hammers are used
- transportation of extracted rock to a processing site
- rock crushing, screening and sometimes washing - jaw or cone crushers are commonly involved in primary or secondary crushing. These operations reduce the rock size, but sometimes further rock size reduction is required in grinding actions performed by cone crushers which produce aggregate particles of approximate cubic shape and minimising elongated, flaky shape. Aggregate screening is usually carried out on multiple-deck screens of steel wire or plastic rubber mesh. The screening aim is to classify aggregates according to their required size. Washing the aggregate may be necessary to remove residual dust or unwanted minerals (e.g biotite in granite) which may affect the future utilisation of aggregates
- forwarding stockpiled aggregates
- rehabilitation of disturbed areas to achieve designated land-use.

Sand and gravel extraction
Extraction methods of sand and gravel depend on the location of the resource and availability of water. The most common are extractions from the river bed, on or in the vicinity of river banks, or from sites on the flood plain. Wet methods usually utilise draglines and dredges to extract products and barges or floating conveyors to transport them to processing plants, while power shovels, front-end loaders, draglines or bucket wheels are typically used in dry excavations with a haul to processing sites.

Clay, loam and soil
Operations in clay extraction sites include the soil and overburden removal, its stockpiling for further rehabilitation operations, clay extraction and its transportation, and finally rehabilitation of disturbed areas. Both the overburden and clay deposit may require loosening prior excavation. Rippers, scrapers, bulldozers, front-end loaders, draglines and single bucket excavators are mostly used in these operations.

Clay from extractive industries is mainly used for lining (dams, waste water lagoon, municipal solid wastes), cement manufacture, mud bricks or filling purposes. More information on clay extraction/mining and processing can be found in the *Brick, tile, pipe and pottery work* guideline.

A comprehensive description of the activities/processes in your industry will help identify ways to improve the industry's environmental management plan. Any information your association thinks is relevant to this section would be appreciated.

8 Waste assessment: generation, handling and disposal

To fulfil the requirements of the government policy on waste minimisation, a detailed account of sources and quantities of waste should be prepared for internal use by the management. This account is needed to identify all potential sources of pollution and for monitoring purposes. Methods of handling and disposal of waste should also be identified.

All types of waste — gaseous, liquid and solid — should be included in the assessment. It is envisaged that the production of wastes will be monitored and reported on annually (see Section 10.5).

8.1 Airborne wastes

Extraction of materials, crushing, screening and washing plants are potentially major sources of dust. Although unlikely to be a health risk outside the premises, the quantities of dust produced can be a significant nuisance to surrounding land users. Dust is produced from a number of activities in hard rock quarries and crushing, screening and washing plants including:

- land clearing and removal of topsoil and overburden
- rock drilling
- operation of crushing and screening equipment
- vehicles on access roads and haul roads
- stockpiles and exposed areas of the site and
- blasting.

In addition, blasting produces harmful gases which are present in fumes.
Burning of vegetation after land clearing may also be a source of smoke nuisance.

Clays are usually reasonably wet when extracted and loaded. If split clay dries out in the pit or in an access way, it will be reduced to a fine powder and blow freely in the wind. During rehabilitation to new or original contours the reworking of dry overburden or poor grade clays can readily generate dust.

Overburden removal in land based sand and gravel extraction creates similar problems to hard rock quarries and clay extraction. Dredging, which is a wet operation does not cause a significant air pollution problem (except discharged gases from exhaust of diesel engines).

8.2 Liquid wastes

The potential should be considered for polluting surface or sub-surface waters by fallout or by effluent containing substances which may disturb the aquatic environment, are aesthetically displeasing, or are harmful to aquatic life or humans.
Water quality can be affected by extractive industries through:

- increased turbidity, directly induced by extraction or indirectly through erosion of banks, leaching from stockpiles close to watercourses, flow from inadequately designed or constructed tailings ponds or submergence when the river is in flood
- run-off of wastes and drainage from processing and storage sites of waters containing dissolved solids
- uncontrolled release of untreated effluent into watercourses
- discharge from tailings or settlement ponds of treated waters which still contain undesirable chemicals such as flocculants.

Quarrying generally increases the area of impervious and erodable surfaces, reducing the ground's ability to absorb rainfall. This may lead to increased sediment loads in stormwater run off. Oxygen depletion, nutrient enrichment, increased turbidity, siltation, mortality of aquatic organisms, and a reduction in aesthetic amenity may result in surface waters. Increased flow can erode natural drainage paths adding to turbidity and siltation problems, further damaging the downstream ecosystem and reducing the quality of surface waters.

Stormwater accumulating in below-ground workings for extended periods may become mineralised. As a result groundwaters may become contaminated from dissolved mineral leachate from working areas or chemical storage areas. When such water is pumped out it could adversely affect watercourses. The extent of this potential problem will depend on geology and hydrology of the quarry. Any clay introduced into a stream or waterway will cause turbidity of that watercourse.

Sand and gravel extraction from waterbeds generate main impact on the aquatic environment. Disruption of habitats and breeding ground of native fauna - both marine and terrestrial may occur. The extraction process can produce large amounts of suspended solids that increase turbidity and generally degrade the aquatic environment.

Extraction can cause river diversions where large amounts of material are removed from flood channels or off-channel ponds. New patterns of erosion and deposition, changes in tidal hydrodynamics, sediment transport discontinuity and salt intrusion may also occur.

Potentially harmful or toxic substances such as industrial chemicals, fuels, greases and oils originating from work and storage areas may also pollute watercourses if not effectively managed.

8.3 Solid wastes

Sludge

Settling ponds will gradually fill with settled sediment and, depending on pond size and quarry design and life span, may require de-sludging from time to time. Settling pits serving washing plants and vehicle washdown areas will require regular de-sludging. Sludge collected will contain a mixture of organic and inorganic particles. The size and proportion of particles varies greatly and will depend on factors including extraction site geology, rainfall patterns and upstream water pollution control measures. Generally, a significant proportion of the particles are very fine and are susceptible to erosion and re-suspension.

Dust

Dust from dry collection equipment serving rock drills and crushing and screening equipment is very fine and can easily become entrained and cause nuisance to neighbours. Some quarry products have specifications which permit inclusion of this dust in the final blend. Dust which cannot be used must be disposed of appropriately.

Waste rock

Waste rock is a by-product of processing. Waste rock and the overburden typically present the most amount of solid wastes.

8.4 Non-process wastes

Non-process wastes originate from kitchens and offices, and from general maintenance of gardens. Waste prevention and reduction, and separation of wastes for recycling or composting apply equally to these non-process wastes.

Any information regarding waste handling and disposal that your association thinks is relevant to this section would be appreciated.

9 Noise sources and current practice

Extractive sites are typified by continual changing of the site's topography and the location of some equipment, particularly rock drills, front-end loaders, dredgers and another equipment. Haul roads often have to be relocated as work progresses.

As a consequence, noise levels at nearby locations may vary greatly during the life time of the site. Therefore, each stage of the development needs to be carefully planned to ensure compliance with noise level criteria.

To illustrate situations, noise levels at 250m from a range of quarry sources are given in Table 1. Noise levels are presented in terms of the average maximum A-weighted sound pressure level, $L_{Amax,T}$, recorded over representative time period T. Ranges in level occur due to different source power ratings, screening effects from structures and topography, and weather conditions. For comparison, between 7am and 6pm, background levels in rural and urban areas can vary from 30 to 50dB(A).

Table 1: Typical noise levels at 250m. (T) or (I) after a noise indicates tonal or impulsive character is likely. No adjustment has been made to account for this noise character.

Sources	Noise Levels at 250m $L_{A10,\ 15\ min}$ dB(A)
Crushing and screening plant:	
Primary crusher	63 (I)
Secondary crusher	57 (I)
Screens	58
Drilling:	
Rock drill	68 (T)
Front-end loader:	
Engine/exhaust noise	55
Rocks in hopper	63 (I)
Gravel in truck trays	51 (I)
Haul trucks:	
Air starter	52
Engine/exhaust noise	61
Truck horn	55
Reversing beepers	55
Empty Truck on site access road:	
Engine/exhaust noise	71
Tray rattle	54 (I)
Exhaust brakes	68
Loaded product truck on access road:	
Engine/exhaust noise	70

The use of explosives for blasting can cause personal and structural effects which sometimes result in complaints. Noise and vibration caused by blasting can reach annoying levels if the blasting operation is not properly controlled. Similarly, blasting can cause damage to structures, particularly if the resulting ground vibration produces

structural vibration.

When properly initiated, explosives are rapidly and violently converted into gases at very high temperatures and pressures. The energy released in detonation (in the form of high pressure pulses and ground vibration) acts equally in all directions. However, it tends to escape through the path of least resistance.

Noise limits and assessment
Reference should be made to the Department of Environment and Heritage guideline entitled *Setting and assessing general noise limits* for definitions of the noise parameters used in this section and a general explanation on how to determine noise limits and assess noise levels.

For proposed extractive industries and processing plants, or extensions to existing premises, a special allowance in terms of noise limit should be applied to allow for the fact that these sites cannot necessarily be located in suitably zoned parcels of land, but are restricted to locations where deposits are found. The special allowance is further justified because it is not a permanent operation, but rather a long term intermittent, temporary operation. Therefore, the possibility of the background noise level being subject to creep is minimal unless other quarries are operating simultaneously nearby.

The special allowance is only applicable between 7am and 6pm Monday to Saturday. This measure ensures that extractive sites will be virtually inaudible in residential or commercial areas outside these hours.

Tonal and impulsive adjustments are important for noise from quarries. Impulsive noise is common from crushers, extractive equipment, and during repair work. Tonal adjustment may be needed for noise from rock drills, pumps and air compressors. Up to 5dB(A) for each characteristic may have to be added to measured noise levels to adequately reflect annoyance.

In a case of blasting, the overpressure signal contains both audible components and infrasound components which cannot be heard by humans because they occur at low frequencies. However, these low-frequency components can cause annoyance, because they result in rattling windows and loose objects such as plates.

The most severe cases of airblast are caused by unconfined charges. It is estimated that airblast overpressure for unconfined surface charges is 5 - 6 fold greater than comparable for fully confined blasthole charges. Serious problems associated with high pressure levels and fly rock are represented by secondary blasting.

In general, the sound pressure level depends on the detonated mass charge and a distance from the charge. A significant factor is also explosives strength. Stronger explosives develop greater energy and they also increase airblast pressure and vibration values. Moreover, weather conditions will affect the transmission of airblast. Wind will increase the airblast downwind by up to 6 dB and reduce the airblast upwind by to 6 dB. Clouds, temperature inversions, humidity and wind shear may also reflect or focus the airblast onto remote sites.

The most generally accepted airblast limit for human discomfort is 120-125 dB(lin) at the point of concern and 133 dB(lin) to avoid structural damage. Because these values have only the informative meaning in Australian Standard, local governments are encouraged to consider making a model By-law over use of explosives. A model by-law

has been developed for local governments (with their input) and is available from the Explosive Inspectorate of the Department of Minerals and Energy. More information on airblast overpressure and vibration can be found in the "*Noise and Vibration from Blasting (explosives)*" guideline.

10 Environmental management practice

Compliance with applicable legislation and efficient production are best achieved when sound environmental management practice is in place. There are many elements of environmental management practice; the most important should be included in the guideline.

10.1 Planning issues

The planning stage of any industrial activity is the best time to design the operation in a way which conforms to the legislative requirements, and to examine all options for preventing waste and contamination as well as site rehabilitation. Detailed planning of the activity may also reveal that some waste streams can be completely avoided.

10.1.1 Waste prevention

A full examination of the process by-products and wastes should be carried out to identify options for waste prevention. In some cases, raw material substitution may lead to changes in the process. Often, reuse or recycling of by-products results in reduction of wastes. Recovery of valuable materials from waste streams can be economically and environmentally sensible. Some waste prevention and reduction options for consideration during the planning stage are:

- change processes or equipment
- improve controls of process
- improve materials handling and cleaning operations
- improve maintenance and repair of equipment
- recycle waste internally
- reuse waste on site
- recover materials from waste streams.

10.1.2 Site selection

Site selection is the critical environmental issue for extractive industries. Careful site selection can lead to substantially reduced environmental nuisance. Relevant site information should include:

- closeness to housing developments and to land zoned to permit housing or other land uses not compatible with the proposed development
- site hydrology — flood liability, site drainage and closeness to watercourses and groundwater resources used for domestic, agricultural or town water supply
- prevailing wind conditions
- landform and the likely direction of drift of odour or noise
- site geology — ground permeability, and the likelihood of leaks/spillages passing through to groundwater
- adequate land area to house all projected activities
- erosion hazard
- local road network
- corridors for power and other services.

Since extractive industries are to a large extent pre-determined by the location of deposits, land use control in the surrounding areas is particularly important in minimising impacts. Residential development on or near reserves of natural resources should be avoided.

The Department of Minerals and Energy provides advice to local governments on the location of mineral resources and advises on development proposals which may in any way affect the utilisation of mineral resources or preclude the future utilisation of mineral resources. Any proposal involving urban and rural type residential development on or within 2km of mineral resources or construction of rail/road transport facilities, pipelines, electric power lines, industrial estates and public facilities on mineral resources should be referred to DME (see Impact Assessment in Queensland - Policies and Administrative Arrangements).

In areas likely to be disturbed by construction of the proposed development, the site description should include data on plants and animals, such as:

- major plant communities
- the status and conservation significance of vegetation
- the occurrence of any rare or threatened species
- the presence of any introduced species.

Heritage and sacred sites listings should be checked before a decision on the proposed development is made.

10.1.3 Buffer zones

Buffer zones are particularly important as measures to separate conflicting land uses and to minimise any ill-effects of new developments in environmentally sensitive areas. Even if other control measures are used, odour, dust and noise emissions may still occur. Adequate buffer distances from nearby land uses are the best way of avoiding nuisance from air and noise pollution. Occupiers should include buffers in management strategies and local governments should include them in town planning approvals to provide basic protection from complaints for businesses allowed within zones. New buffer zones should be created as part of the proposed development.

Buffer distances are cheap control options if additional land does not have to be purchased. Zoning buffers could be green space, or business uses which can occupy land near residential areas without causing problems themselves.

Planning and design must allow for changing conditions. The use of buffers needs to be balanced against possible future changes to the surrounding land use. For example, future development may bring neighbours closer to the development/land use, and other control measures may become necessary if separations are reduced too much.

Local governments strategic plans and land use zoning schemes should establish appropriate zoning buffers. The objective should be to provide basic protection from complaints for businesses allowed within zones. It is recommended that proposed hard rock quarries and crushing, screening and washing plants should be at least 1000 m from residences and other sensitive uses. Greater distances may be required for large sites where clear line of sight exists to residential areas, or if work outside of normal working hours is planned. Similarly, proposed residential development should be at least 1000 m from existing hard rock quarries and crushing, screening and washing plants. It is often impossible to ensure the similar buffer zones for sand and gravel extraction from waterbeds. Therefore additional environmental impact measures should be considered in such a case.

Prospective occupiers should use buffer distances as prime management strategies. It is recommended to seek advice from accredited environmental and acoustical consultants on the effectiveness of available buffer distances and the need for further

control measures in a case of conflicting land uses.

To minimise the transport of silt to watercourses by stormwater run off, a buffer distance of at least 100 m should be maintained between watercourses and on-site activities (except sand and gravel extraction from waterbeds). This area should be kept well-vegetated and should not be used for stockpiling topsoil, overburden or quarry products.

10.1.4 Visual environment

The choice of aesthetically pleasing colours and finishes will enhance the look of premises. Features such as trees, shrubs, rock walls and grassed slopes incorporated into the landscaping will not only help with the visual impact, but also diminish the effect of operational lighting beyond the boundaries of the premises. Plantings may also assist in dust control.

Noise may not be reduced by plantings. However, earth banks may reduce noise if the source is close to the banks and the banks are high enough.

Endemic species are recommended for plantings as they will provide a habitat for birds and animals native to the area. Early plantings should be organised at new sites.

It is recommended to use stockpiles of topsoil and overburden as visual and noise barriers. Because they are mostly temporary in nature, product stockpiles should not be relied on as permanent noise barriers. However, if they are formed as a part of safety barriers against entering post-mined areas, the need for early planting on them and barriers features as a permanent noise barrier, should be favourable considered.

Extractive activities on rivers can visually degrade the landscape.Dredges, floating suction lines and other equipment are aesthetically displeasing when viewed from the river. Any screening is generally effective only from ground level and not from above, unless layout is carefully controlled. Another aspect of affecting the visual amenity of the area is gravel and sand stockpiling, an essential part of the industry. If these piles are located too close to waterways, turbidity can result. This increases visual pollution as well as disturbing ecological balance in the waterways. Turbidity is also increased by dredging, particularly when draglines and grabs are used in rivers.

Processing plants have already reduced visual amenity. Scarring of the landscape is most apparent from high-level lookouts. Care should be taken to assess and minimise activities, structures or wastes that are visually offensive or impair the natural beauty of the environment or its ecological systems, flora and fauna. Areas within a river system near bridges and other points of access should be left relatively undisturbed or rehabilitated quickly.

10.1.5 Contaminated land issues

Once waste streams, process operations, raw materials, fuel supplies and product ranges have been identified, the methods of storing and handling materials and ways of segregating, treating and disposing of wastes must be addressed to minimise the potential for land contamination and air and water pollution. Underground tanks can leak into soils for long periods before being detected, leading to high clean-up costs.

10.2 Management strategies

Management strategies should be developed co-operatively by industry and local

governments to reflect good pollution control practices and to conform to environmental regulations. Techniques and procedures to integrate the preferred waste management options should be adopted wherever possible. Waste minimisation aims directly at the source of the waste generation and attempts to eliminate waste before it is produced, or to reduce its quantity. Disposal of wastes should occur only after all preventive and minimisation measures have been taken.

The occupier should develop management strategies for proposed and existing premises. The aims should be:

- to minimise the quantities of wastes generated
- to prevent pollution arising from storage, handling and disposal of wastes
- to manage process operations, including fuel and raw material storage, so that contamination of land is avoided or minimised
- to prevent nuisance pollution such as odours, dust and smoke
- to minimise environmental health risks
- to improve efficiency of processes through energy savings.

Particular attention should be given to safety distances between explosives stored in magazines and public facilities, distances for electric detonators subject to the radio frequency radiation as well as routes for the conveyance of explosives on public roads. These provisions can be found in the referred to Australian Standards.

Does your association have information which details any management strategies already adopted by the industry? For example, do you have any practical examples of waste-minimisation techniques or energy-efficient devices used in the industry? Your advice would be appreciated.

Opportunities for recycling exist in all types of industry, in commercial and government organisations and for public groups. Operators should nominate a staff member to supervise the recycling schemes.

Rehabilitation of disturbed areas

Extractive industries should not be allowed to lead to pollution or misuse of land. They should not inhibit or pre-empt more desirable land use or unnecessarily pre-empt alternative uses of natural resources.

Extractive industries inevitably create large changes in land form, but offer many choices for site use once extraction is completed. Rehabilitation of an extractive industry site should be directed towards the optimum form of land use, either restoring the original landscape and vegetation or establishing on the site an alternative beneficial land use, e.g. for agriculture, recreation or settlement.

In general, there are three options of rehabilitation programs:

- sites requiring little or no restoration due to a variety circumstances such as utilisation of pits for a specific use. This may require stabilisation and revegetation and monitoring of water quality
- restoration work after a site is depleted. A rehabilitation project following excavation generally involves grading and planting and should seek to avoid leaving banks of overburden that are too steep or high, remnants of unusable land and water areas that are too shallow. It should eliminate waste land and undesirable features such as stagnant water or muddy flats resulting from fluctuation of the water table
- progressive rehabilitation. It should be the most accepted approach among operators and administering authorities interested in developing a rehabilitation program.

Elimination of waste heaps and more efficient use of waste material are pointed out as a result of such a program. Progressive rehabilitation reduces noise, dust, visual conflicts by appropriate screening and the creation of undesirable pits. It involves grading, planting and seeding depleted areas as soon as practicable. Plant species native to the area should be used to revegetation unless there is the another need.

The management strategy should determine a pattern of excavation to assist in the development of planned land forms and excavate these areas first to permit placement of waste rock and overburden. Well planed stockpiling of overburden will minimise handling. The monitoring programs to control the effectiveness of the environmental performance should be developed.

Although Extractive industries are not administered by Department of Minerals and Energy (except safety aspects), the department has issued a range of guidelines on mine planning and water management. These guidelines are available from Department of Minerals and Energy and may be easily adopted to extractive industries.

10.3 Compliance with environmental statutory requirements

Industrial operators should identify their obligations under environmental legislation. Operators should examine management systems to minimise the risk of contamination of soils from raw materials and processes.

10.3.1 Air emissions

Companies are issued with licences which specify allowable emission levels and may also contain other conditions such as process control and monitoring requirements.

Practical control measures

Proposed hard rock quarries, sand, gravel and clay extraction sites, as well as crushing, screening and washing plants, and extensions to existing premises should be designed to comply with the environmental quality objectives for nuisance dust and suspended particles given by the Department of Environment and Heritage. Note that the dust level is the total limit for dust from all sources regardless of whether the dust is due to one particular industrial operation or many independent operations. Consequently, existing dust levels should be monitored and taken into account during the design phase.
The control measures discussed below should be considered to minimise the effects of extractive industries and processing plants on neighbours.

Land Clearing

Where practicable, avoid burning waste vegetation from land clearing activities. Investigate the applicability of the following alternatives.

- sawmillers and commercial and private fire wood collectors may be able to remove a significant proportion of unwanted timber
- chipping or mulching can be used to convert most unwanted vegetation into a useful product
- chips and mulch can be stockpiled for later use in stabilisation and revegetation of disturbed areas and stockpiles of topsoil and overburden
- Some local governments are providing centralised facilities for mulching and chipping waste timber. Material obtained is useful for maintenance of council parks and gardens or can be sold to the public.

Where no practical market or use exists, and burning is the only option, controlled air burners such as pit burners should be used to increase combustion efficiency and reduce smoke emissions. It should be noted that the remaining ash is an important

source of nutrients and might enhance the revegetation efficiency in the rehabilitation of post-mined areas.

Removal of topsoil and overburden

- liaise with neighbours to find the most suitable time to work and then complete the job as quickly as possible
- water as much as possible without making conditions too boggy for machinery
- work when winds are light and blowing away from the nearest neighbours
- in areas where drinking water is collected from roofs, it may be appropriate to assist neighbours with roof cleaning after completion of major earthworks and stabilisation of disturbed areas
- Re-vegetate stockpiles of topsoil and overburden that will not be used for some time, especially those that will serve as noise barriers. This will minimise wind generated dust emissions, control erosion and stormwater contamination, and may improve the site's visual amenity.
- keep pace between the development and rehabilitation area.

Rock drilling

- use rock drills that are fitted with dust collection equipment
- dispose of collected dust in a way that will prevent it from becoming airborne
- use a sharpened drill bit, it reduces a drilling time and decrease duration of noise and dust emission.

Crushing and screening equipment

- Install water sprays or dry collection systems at major dust sources. Sources generally needing control are crushers, conveyor belt transfer points, screens and product discharge points.
- Regulate water application rates carefully to minimise dust emissions but prevent clogging of screens due to over watering. The correct rate will depend on the type of equipment being used and the nature of the rock being processed. Expert advice should be sought when designing water spray systems.
- Discharge dry collection systems to atmosphere through fabric filters to ensure that the very fine dust produced is effectively contained. Collected dust should be disposed of in a way that will prevent it from becoming airborne.
- Minimise the drop height for crusher dust and other fine material from the end of conveyor belts to the stockpiles by using flexible or telescopic spouts. Dead boxes on the ends of the spouts will reduce the exit velocity and further reduce dust generation.
- place conveyors' cleaning devices in spots which prevent scrubbed dust from becoming airborne
- clean regularly the area under conveyors (especially below rollers)
- maintain equipment so it operates efficiently.

Haul roads and access roads

- Keep haul roads and unsealed sections of access roads damp during operating hours to reduce dust generation by vehicles. Fixed water sprays or water trucks are suitable for this purpose.
- Use speed bumps and warning signs to enforce speed limits. Vehicle speed has a major bearing on the amount of road dust generated.
- ensure that contamination of surface waters or groundwater does not occur when proprietary products are used for dust suppression
- Do not use waste oil for dust suppression. Oil is toxic to many organisms and should

be kept out of the environment. Waste oil should ideally be recycled, but if this is not practicable it should be disposed of at a land fill site in a manner approved by the local government.
- seal access roads from the public road to the weighbridge and visitors car park
- cover loads on road trucks with tarps or spray with water prior to leaving the site to prevent dust from blowing off trucks while on public roads
- Wash tyres and under-bodies of trucks before driving onto sealed roads to reduce the amount of mud deposited onto sealed roads. Mud creates a dust nuisance on sealed roads when it dries and is ground to a fine powder by subsequent vehicle movements.
- avoid over-watering unsealed sections of access roads as this increases the amount of mud dragged out on tyres and under-body areas of road trucks
- wash or sweep sealed roads regularly to remove material spilled from road trucks or dragged out on tyres and under-bodies.

Stockpiles
- keep stockpiles of dusty materials damp by using water sprays
- orientate stockpiles so that they offer the minimum cross-sectional area to prevailing winds that blow towards neighbours
- Use proprietary surface binding agents to reduce wind generated dust emissions from long-term product storage stockpiles. Select and use such products carefully to avoid contamination of surface waters or groundwater.
- perform rehabilitation activities in these stockpile's sections which are no longer in use

Miscellaneous
- make one person responsible for emission control measures
- inspect dust suppression equipment regularly and repair defects promptly
- keep spares on site for critical items of control equipment such as water pumps for dust suppression sprays and filter bags for dust collection equipment
- Monitor dust fallout and suspend solids concentrations around the site to determine the effectiveness of control measures. Use dust deposition gauges as described in *Australian Standard A.S. 2724-1* for fallout monitoring.

10.3.2 Water discharges

Only licensed premises are allowed to discharge wastes to waters of the state. Before obtaining the licence, written evidence is required that:
- the discharge cannot be directed to a local government sewerage system
- the proposal does not contravene town planning provisions.

Licences may or may not be granted. If granted, treatment of the waste to a certain standard will be required.

Practical control measures

Control measures for water pollution should be incorporated into management strategies in the planning and design stage. Management strategies are, in principle, similar for all extractive industries and processing plants, although the various control measures employed will depend upon the location, topography, soil type and size and layout of the premises.

A design return interval of one in 10 years should be adopted for the design of collection, storage and treatment of rain falling onto the site on land. The design should assume that all rain falling onto disturbed or working areas will be collected and

treated. The system should be designed for the ultimate size and capacity of the working area. Control measures discussed below should be considered when designing proposed extractive industry, or expansions to existing premises, and when solving problems at existing premises.

Minimise land disturbance and erosion

- Aim to minimise land disturbance from the earliest point in the planning and design process. It is important to meet the integrated local and regional land and water planning objectives.
- identify erodable areas on operational plans covering the life of the site development
- Limit clearing of vegetation for any one year to the area equivalent of one year's excavation. Vegetation remaining uncleared helps to bind the soil and reduce the erosion potential of the site. It also limits wind generated dust emissions and provides a visual and noise barrier for the site.
- Spread topsoil over disturbed land to aid re-vegetation. Establish suitable quick growing pasture grasses and plants, preferably native to the area. Hay, straw or wood chips and mulches can aid stabilisation. Fibre or nylon meshes may assist re-vegetation on slopes.
- contour and stabilise drains and channels using stone or masonry linings, fibre or nylon mesh, concrete or vegetation as appropriate
- use pipes or energy dissipating chutes where grades are steep
- protect drainage lines using culverts or bridge crossings
- promote non-erosive sheet flow of water from sedimentation pond overflows and spillway by selection of appropriate grades
- limit maximum slope as far as possible in order to decrease the water velocity
- overfill land voids approximately by 10% of the filling's depth because of the subsidence
- perform the rehabilitation to a condition which is self-sustaining unless there are requirements which are consistent with an agreed post-extractive use.

All working areas and access ways should be kept damp at all times the pit is being worked or regularly treated with a binding agent. Erosion of clay heaps and overburden areas should be prevented and all surface run off from these areas and the pit should be contained and diverted to silt traps to prevent any clay suspension causing turbidity in any watercourse. Flocculants may be added to the settling pond to accelerate the settling of mud. Alternatively, settling ponds should be of adequate size to allow for sufficient retention periods to ensure settling.

Collect contaminated run off

- Use drains or banks to divert upstream stormwater run off away from disturbed areas, working areas and stockpiles of topsoil, overburden and quarry products. This will limit the amount of water entering the site and minimise contamination of stormwater.
- intercept groundwater with cut-off drains
- use drains, banks and contour furrows within the site to direct contaminated run off to collection and treatment areas
- Use hay bails or silt fences at exits from small catchments or roadside drains. These treatment techniques are suitable only for small, non-concentrated flows. They capture the major sediment load prior to discharge to major drains.
- Do not allow stormwater to lay in below-ground workings. Such water can dissolve minerals from the rock and may require special treatment. Prompt removal will overcome this problem. Sloped floors at the bottom of the workings will make pumping out easier.

- collect contaminated run off from major site drainage channels in sedimentation ponds which provide for settling of suspended sediments.

Treat collected run off

- Design sedimentation ponds with a sedimentation period of between two and four hours. This will generally be sufficient treatment for coarse-medium sized sediments suspended in run off. The specific sedimentation period required for each site will depend on the nature of the contaminants and the effluent standard set in conditions attached to the discharge licence, see below.
- Use sedimentation pond water for dust suppression on working surfaces, haul roads, crushing and screening equipment and product storage areas. This reduces the quantity of water requiring ultimate disposal.
- seek advice from the Department of Environment and Heritage before using chemical dosing to improve sedimentation as the resulting sludge may be difficult to handle or potentially hazardous
- Check sedimentation pond water for acidity regularly. Depending on the geology of the site, mineral or soil leachate or run off from working areas may make the water acidic. Neutralise with chemicals such as lime or dolomite, for sodic contamination apply gypsum before releasing the water off-site.
- Use clay liners under sedimentation ponds to avoid contamination of groundwater. Do not locate sedimentation ponds in areas of groundwater recharge.
- Check groundwater quality when earthworks and excavations cause it to accumulate on the site. Disposal of groundwater direct to surface waters may be unacceptable because of high concentrations of salt or other contaminants, naturally occurring or from human activities.

Dispose of treated run off

Discharge to sewer

This is not generally an option because quarries are not usually located in sewered areas. In any event, local governments are unlikely to approve connection because the volumes of waste involved may cause overloading of sewerage systems and large volumes of organic waste that utilises the disolved oxygen in the water, may upset microbial systems at treatment plants.

Disposal on land

This is a satisfactory method but the volume of run off requiring disposal may prevent use of this option. Under present legislation in Queensland, disposal of wastes on land does not require any specific permits or licences. Many factors need to be considered in the design of a land disposal scheme. These include:

- the quality of the wastewater being applied
- the properties of the soil
- the rate of application
- the susceptibility of nearby groundwater resources
- storage requirements for wet weather.

Discharge to surface waters

This option will only be considered if documentary evidence is given that the local government will not accept the discharge to its sewerage system and land disposal is not practical. Discharge to surface waters should be considered as a last resort. It will need to be licensed by the chief executive, Department of Environment and Heritage,

who will set licence conditions, including the quality of the effluent discharged.

Effluent standards to be met for discharge to surface waters will be determined in accordance with the Department of Environment and Heritage's *Environmental Protection Policy for water, 1994*. The effluent standard will depend on local circumstances, such as the geology of the site, the nature and flows of the surface waters, existing water quality, environmental values and the availability of practicable control measures.

Sand and gravel extraction from water beds

Control of water quality comes through the choice of processing plant, layout of site and choice of operating procedures. This may involve:

- use of suction dredges in place of draglines, bucket wheels or similar open systems
- preventing run-off and drainage from passing directly into river
- securing settlement ponds, tailings dams and stockpiles against inundation, by using safety banks
- maintaining adequate bank height and angle
- use of recycled closed-water systems for process water
- use of electrical instead of internal combustion engines in powered equipment
- investigation and planned retention of features in watercourses, such as reed beds which benefit water quality.

Washing plants

- discharge wastewater to settling pits to remove suspended sediment
- where practical, recycle water from the settling pit overflow to the inlet of the washing plant
- discharge unwanted overflow from settling pits to the sedimentation ponds
- use two parallel sets of settling pits so that one can be de-sludged while the other is serving the washing plant.

Chemical and fuel storage

- adopt management procedures at chemical, fuel, lubricant and explosives storage areas which aim to minimise pollution risk
- provide bunds around liquid storage areas to prevent liquids reaching watercourses in the event of accidents or leaks
- seal storage areas and areas inside bunds to prevent contamination of groundwater
- divert upstream run off away from storage areas
- store ammonium nitrate under cover to prevent contamination of stormwater
- Design for the need to contain contaminated firewater in the event of fires. In some cases it may be appropriate to allow fires to burn out rather than flooding with firewater. Work out emergency response plans in advance to deal with this issue.

Vehicle washdown

Incorporate settling pits in vehicle and heavy equipment washdown areas and truck tyre and under-body cleaning stations to trap sediment removed during washing.

10.3.3 Solid waste disposal

Disposal of industrial solid waste is arranged in several ways, including disposal to the local council landfill. However, no licensing system for the disposal of solid waste applies at present. Where a contractor is used to dispose of waste (solid and liquid), note that unless the contractor accepts the responsibility for the waste under a written contract, the waste generator can be accountable for the ultimate placement of the waste and any harmful effects on the environment.

Companies should be aware of the implications of the Contaminated Land Act (refer to Section 6) and are encouraged to investigate and implement the best solid waste disposal practice.

Control measures discussed below should be considered to prevent environmental problems from de-sludging and sludge disposal.

- Do not remove sludge from sedimentation ponds while they are discharging to surface waters. Use parallel ponds so that one pond can be de-sludged while run off is directed to the other.
- stockpile removed sludge such that drainage will not enter surface waters and leachate will not contaminate groundwater
- use upstream drains or diversion banks to prevent erosion or washoff of stockpiled sludge
- Do not allow stockpiles to dry out to the point where they become a source of wind generated dust emissions. Use water sprays as appropriate. Vegetate stockpiles that will not be used for some time.
- Analyse dried sludge to determine if it is suitable for blending into topsoil for site rehabilitation or can only be used as fill. Check particularly for chemical residues if chemicals were used to aid sedimentation.

Control measures discussed below should be considered to prevent environmental problems from dust re-use or disposal.

- store dust in sealed containers until it is used or disposed of
- Blend as much dust as possible into quarry products with appropriate specifications. Take care to prevent dust from escaping to the atmosphere during blending.
- Dispose of unusable dust on-site by burial in thin layers in trenches in overburden stockpiles or backfilled areas. Cover the bottom of the trenches with water before dumping is commenced and deposit the dust carefully from as low a height as possible. Damp down on completion of dumping and cover promptly.

10.3.4 Noise emissions

Authorised officers should also be familiar with the following Australian Standards:

- AS 1055.1-1989 and AS 1055.2-1989 Acoustics — Description and Measurement of Environmental Noise: Part 1 — General Procedures, and Part 2 — Application to Specific Situations
- AS 2659.1-1988 Guide to the Use of Sound-Measuring Equipment: Part 1 — Portable Sound Level Meters
- AS 2659-1990 Sound Level Meters: Part 1 — Non-integrating.
- AS2187.1-1984: Explosives - Storage, Transport and Use
  Part 1 - Storage and land Transport
  AS2187.1-1993: Part 2 - Use of Explosives

The following measures can be used to minimise the impact of noise on surrounding sensitive areas.

Operating hours

Noise complaints may result from early or late operations and from weekend activities. Maximising distances between emission sources and land uses needing maximum protection such as existing or possible housing areas is the best way of avoiding problems. This could mean selecting sites well away from zone boundaries. Generally, greater distances will be required when work is done before 7am and after 6pm Monday to Saturday, and on Sunday and public holidays.

Blasting should generally be permitted only between 9.00 am and 5.00 pm, Monday to

Saturday. Tables 2 and 3 give compliance noise levels (to protect bise sensitve areas and commercial premises) for existing and proposed sources of noise.

Sometimes an administering authority may impose the permitted working times, distances from banks and service facilities, batters of excavations, prohibited areas, noise levels and set the maximum capacity of dredging.

Existing premises

The following noise control measures should be considered:

- noise barriers such as screens around noisy equipment and operations
- where possible, visual signals and portable telephones or beepers to replace hooters and telephone bells
- vehicle movement, especially trucks, limited to normal working hours
- diesel forklift engines, other noisy vehicles and air-powered tools fitted with efficient exhaust mufflers
- maintenance of equipment and prompt attention to loose or rattling covers, worn bearings and broken equipment
- mechanical equipment located on mounts designed to isolate structure-borne vibration and noise
- use hydraulic rock drills in preference to pneumatic drills because they are quieter
- line rock/steel impact areas with resilient material such as heavy rubber
- use rubber or synthetic material for screen decks where practical.

Type and extent of control measures will be site specific in all cases. Noise affecting nearby premises will vary from site to site and background noise levels will be different. Acoustical consultants can best advise on appropriate control measures for a particular situation. If acceptable noise levels cannot be achieved, restricted operating hours should be considered.

Blasting operations need to be carefully designed and carried out.
The following actions will be found effective in aiding in noise mitigation:

Vibration mitigation

- reducing the maximum instantaneous charge to the lowest possible size by using delays with sequential timing
- Ensuring that all blast holes are spaced so that the explosive force is just sufficient for the purpose of fragmentation. The energy factor should be used when analysing blast designs that use more than one type of explosive within the shoot
- monitoring a factual blast pattern and its consistency with the planned pattern
- correcting the designed amount of explosives in case of founding differences between the factual and planned pattern
- Considering bottom priming (placement of a primer in the bottom part of blastholes). The most notable advantages of bottom priming using in-hole delay detonators as compared with detonating cord downlines are reduced vibration, airblast and fly rock apart from additional technical benefits
- removing broken rock and excessive toe before blasting main blastholes
- optimising blast design throughout altering blasting parameters and monitoring vibration data
- optimising the length of sub-drilling
- providing the sufficient relief (a free face) for subsequently fired blastholes due to optimising the initiation delay patterns.

Airblast overpressure

- stemming all blast holes with a suitable material (eg coarse crushed aggregate) to prevent the venting of gases
- covering the exposed detonating cord with at least 300 mm of soil
- eliminating secondary blasting - any large rock should be broken with impact hammers or rock breakers
- orientating quarry faces where possible so that they do not face directly towards residences or sensitive areas
- reducing the maximum instantaneous charge to the lowest possible size by using delays with sequential timing
- providing the sufficient control for the length of subdrilling, and energy for toe breaking in order to eliminate extra shots
- optimising blast geometry and initiation sequences
- ensuring that blastholes are not overfilled by explosives
- Monitoring the face and ground structure (in the adjacent area to blastholes' area) for cracks, cavities and faults. If this structure is shattered, consider redesigning of the amount and selection of explosives which have low energy factors. Deck loads are also appropriate where ground/face structures are weakened.
- Ensuring the correct blasthole inclination. Blasthole deviations may result in excessive noise, vibration and fly rock, generating from the area of the inadequate toe burden.

Fly rock precautions

- Examining the rock structure in the proximity of blastholes. If the structure is weakened, the application of deck loading or/and a protective cover (blasting mats, conveyor belting and truck tyres) or buffer blasting should be considered.
- redesigning the amount and type of explosives (an energy factor) where borehole deviations, the overburdened zone, weakened and/or irregular face structure are found
- examining the correct amount of explosives within the column length to avoid overcharging, especially if boreholes pass the stratum with voids or/and cracks
- monitoring the correct length of stemming column which is normally equal to or greater than burden (or 25 times the blasthole diameter)
- using sufficiently interlocking stemming materials without any larger rock
- Providing the sufficient relief (a free face) for subsequently fired blastholes due to appropriate initiation sequences. This imposes a horizontal movement of blasted rockmass instead near vertical. The design process should take a delay scatter into consideration if a large number of blastholes in multirows is going to be blasted;
- orientating faces, where possible, away from the area of concern.

Table 2. Compliance noise limits, based on $L_{Abg,T}$ levels, for existing sources or premises to protect established or possible noise sensitive areas or commercial premises. $L_{A90,T}$ levels may be substituted for $L_{Abg,T}$ levels.

Time periods	Noise sensitive areas		Commercial premises	
	$L_{Abg,T}$ dB(A)	Compliance limit dB(A)	$L_{Abg,T}$ dB(A)	Compliance limit dB(A)
Monday to Saturday: 7am - 6pm	50 or greater	55	60 or greater	70
	30 - 49	$L_{Abg,T}$ + 5	40 - 59	$L_{Abg,T}$ + 10
	less than 30	35	less than 40	50

Monday to Saturday: 6am - 7am 6pm - 10pm Sunday & Public Holidays: 7am - 10pm	45 or greater 30 - 44 less than 30	50 $L_{Abg,T}$ + 5 35	As above	As above
Monday to Saturday: before 6am and after 10pm Sunday & Public Holidays: before 7am and after 10pm	40 or greater 30 - 39 less than 30	43 $L_{Abg,T}$ + 3 33	50 or greater 40 - 49 less than 40	58 $L_{Abg,T}$ + 8 48

NOTE: Where background levels are higher than compliance limits, compliance limits will be background levels.

New premises

Noise control measures mentioned above can be incorporated more cheaply and efficiently into the proposed development during the design stage. Other measures worth considering are:

- installation of noisy equipment in one or more plant rooms or specially designed enclosures
- positioning of noisy operations and equipment as far away as possible from current or future noise-sensitive areas
- location of vehicle parking away from noise-sensitive areas
- use of the layout of the buildings and the natural topography as noise barriers where possible.
- preserve and take advantage of existing topographical features which may act as visual noise barriers
- seek advice on blasting from consultants or from explosive inspectors in the Department of Minerals and Energy before the approval for a new hard quarry is issued.

It is recommended that mining and quarrying companies introduce a system of blast management in which regular monitoring of airblast overpressure and ground vibration are taken and analysed.

If a company does not have staff with the necessary expertise to carry out the monitoring, acoustical consultants should be engaged. They can later be employed to train company personnel in the work.

Company personnel should be given training in public relations to ensure that good relationships are maintained with neighbouring residents. When changes in blasting operations are planned, residents should be informed and the environmental implications explained. Blast monitoring should be carried out on a rotational basis on residential premises. Company management should be informed of all complaints and should take appropriate actions as soon as possible.

Table 3. Compliance noise limits, based on $L_{Abg,T}$ levels, for proposed sources or premises to protect established noise sensitive areas or commercial premises. $L_{A90,T}$ levels may be substituted for $L_{Abg,T}$ levels.

Time periods	Noise sensitive areas		Commercial premises	
	$L_{Abg,T}$ dB(A)	Compliance limit dB(A)	$L_{Abg,T}$ dB(A)	Compliance limit dB(A)

Monday to Saturday: 7am - 6pm	50 or greater	53	60 or greater	67
	30 - 49	$L_{Abg,T}$ + 3	40 - 59	$L_{Abg,T}$ + 7
	less than 30	33	less than 40	47
Monday to Saturday: 6am - 7am 6pm - 10pm Sunday & Public Holidays: 7am - 10pm	45 or greater	48		
	30 - 44	$L_{Abg,T}$ + 3	As above	As above
	less than 30	33		
Monday to Saturday: before 6am and after 10pm Sunday & Public Holidays: before 7am and after 10pm	40 or greater	42	50 or greater	55
	30 - 39	$L_{Abg,T}$ + 2	40 - 49	$L_{Abg,T}$ + 5
	less than 30	32	less than 40	45

NOTE: Where background levels are higher than compliance limits, compliance limits will be background levels.

10.4 Training of employees

Training of employees is a vital part of any environmental management practice. Staff should be aware of the environmental management program at varying levels of detail, depending on their duties. Training programs should contain common elements such as familiarisation with the company environmental policy, commitment to waste prevention, and raw materials conservation. Employees should be encouraged to suggest new ideas.

Operators should be aware of their obligations to employees as specified by the *Workplace Health and Safety Act 1989*. The safety of extractive operations is controlled by the Department of Minerals and Energy through provisions in the Mining Act and its regulations, Explosives Act and Australian Standards.

Staff training needs associated with environmental management practice in crushing and screening industry need to be identified. Any information your association thinks is relevant to this section would be appreciated.

10.5 Internal auditing and reporting

An environmental management program may contain more elements than those outlined in this guideline. Each company should design and fully describe a detailed program for each operation.

The program's effectiveness is checked by internal auditing and reporting. Internal auditing usually consists of an assessment of current practice and base data about environmental management. Monitoring of progress can be achieved through annual auditing. Internal reports based on audits will help operators to judge the effectiveness of the environmental management plan.

11 Transportation issues

Transport of hazardous or toxic materials is controlled under the *Carriage of Dangerous Goods by Road Act 1984* administered by the Department of Transport. Vehicles and vessels should be appropriately labelled and all necessary safety precautions taken. The transport off-site of any contaminated soil requires prior approval under the Contaminated Land Act.

The introduction of a National Hazardous Waste Manifest system was foreshadowed in 1992. The system would involve close control and tracking of hazardous waste movement.

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Further information

Advice on aspects of this guideline or other matters relating to waste disposal or the control of land, water, air or noise pollution may be obtained from the local district office of the Department of Environment and Heritage (consult the local telephone directory). Industry associations may also have information such as codes of practice. Alternatively, contact:

Division of Environment
Department of Environment and Heritage
160 Ann Street
BRISBANE
PO Box 155,I
BRISBANE ALBERT STREET QLD 4002
Telephone (07) 227 6267
Facsimile (07) 227 7237

Crushed Stone Producers Association of Queensland
GPO Box 1390
Brisbane Qld 4001

or

Brisbane Sand and Gravel Producers Association
GPO Box 1390
Brisbane Qld 4001

Attachment 1: Schedule of activities — local governments' jurisdiction

- Incineration of clean or uncontaminated paper and cardboard (Class 1 incinerators)
- The cremation of animal or human bodies (including incinerators owned by the local government and other than State-owned incinerators). Any Class 2 or Class 3 incinerators (excluding their use for the disposal of general refuse and biomedical wastes)
- The manufacturing or fabricating of wood products (other than in a saw mill, timber processing or fabricating plant, or wood chipping plant) including:
  joineries;
  carpentry and cabinet making processes;
  finishing and coating wood surfaces with paint or any other protective or decorative material
- The processing of oil, natural gas or hydrocarbon derivatives in a gas works
- Fibreglassing - using 10t or less of resin per year
- Extracting rock (other than rock mined in block or slab form for building purposes);
  sand (other than foundry sand);
  clay (excluding clay used for its ceramic properties, kaolin and bentonite);
  gravel, loam, or other material from pits or quarries;
  5000t or less per year
- Screening, washing, crushing, milling, sizing or separation of material from mining, quarrying or dredging, or material extracted from a pit
  5000t or less per year
- * The finishing, galvanising, plating or anodising of metal products;
  spray painting, powder coating and enamelling processes in which a surface coating is applied to metal such as cans, coils and drums
- * The forming of metal including plate, wire and rods; and forging, extending and rolling of metal;
- * Engineering and mechanical processes including:
  boiler and electrical machine manufacturing; or
  the construction of vehicles, agricultural and other machinery
- * Abrasive blasting in which equipment or structures are cleaned by abrasive blasting
- Meat or egg production in intensive poultry farms including:
  fertile egg production;
  hatcheries;
  started pullet production;
  layer production; and
  chicken meat production
- * Pet food manufacturing or processing or stockfeed manufacturing or processing (other than an abattoir, slaughter house, rendering works or animal glue or gelatine works)
- The activity of keeping an aviary or apiary
- The activity of keeping an animal pound or boarding kennel
- Construction, building or demolition site activities - other than Crown land
- The batching of concrete
- The activity of asphalt and bitumen manufacture
- The repair, service, maintenance and wrecking of mechanical equipment, including but not limited to:
  engine tuning;
  brake and clutch debonding works;
  radiator repair works; and
  service stations with petroleum product storage less than 300 000L (however, responsibility for the management of contaminated sites will remain with the Department of Environment and Heritage)
- The landing and departure of helicopters not being part of an aerodrome used for general aviation
- The racing of motor vehicles on racing circuits other than international circuits
- The mooring of boats at commercial marinas - other than for private use
- * Ship or boat building and repair or maintenance
- * Printing including but not limited to stationery, magazines, newspapers, and advertising materials
- The operation of mobile or stationary refrigeration, airconditioning, compressors, ventilation, fan equipment or pumps

* *These industries are to be devolved except where an industry has State or regional economic significance or the scale, intensity or location of the operation, has regional pollution potential.*

Attachment 2: Contaminated Land Act — schedule of prescribed purposes

- Agricultural fertiliser manufacture
- Asbestos production and manufacture
- Battery manufacture and recycling
- Chemical manufacture and formulation
- Chemical storage in excess of a total of 10t of chemicals (being chemicals designated as dangerous goods under the Australian Code for the Transport of Dangerous Goods by Road and Rail)
- Commercial waste storage or treatment
- Defence establishments and training areas
- Drum reconditioning wastes
- Dry cleaning establishments
- Electroplating
- Explosives production and storage
- Fuel depots and storage areas
- Galvanisers
- Gas works
- Gun, pistol and rifle clubs
- Hazardous waste landfills
- Industrial cleaners
- Lime burners
- Metal founders
- Metal sprayers
- Metal treaters and picklers
- Mining and extractive industries
- Paint manufacture and formulation
- Pest controllers (being areas where pest control chemicals are stored or vehicles and tanks used in connection with pest control are washed)
- Pesticide manufacture and formulation
- Petroleum and petrochemical industries
- Pharmaceutical manufacture and formulation
- Printers
- Railway yards
- Sanitary landfill sites
- Scrap yards
- Service stations
- Smelting and refining
- Tannery or fellmongery or hide curing works
- Wood treatment and preservation sites

APPENDIX 5

AUGUST, 1996

OXENFORD QUARRY

NOTES ON PREVIOUS NOISE AND DUST PREDICTIONS

URBAN ENCROACHMENT - NOISE AND DUST PREDICTIONS

Several studies were undertaken prior to quarrying operations commencing and in the lead up to the court case between Albert Shire Council and Nerang Pastoral Co. Pty.Ltd. in 1991.

They ultimately were used to help establish the Division Line. The principal findings in relation to the area under subdivisional threat are summarised below.

1. **WINDERS REPORT 1991** (prepared by Nerang Pastoral Co. Pty.Ltd.)

Noise contours (predicted by an ENM noise model) showed the quarantined ResA area to the NE of the quarry would be subjected to noise from medium term quarrying operations of 42 dB(A) to 54 dBA.

This assumed neutral atmosphere conditions and drill rig position mid pit.

2. **HEGGIE REPORT 1991** (prepared for ASC)

This report went into greater detail on modelling than the Winders report. Noise impact assessments took into account a 'worst care' 2.0 m/sec wind speed from the SW. A Noise exceedance analysis was undertaken and concluded that significant exceedances could occur in the Forest Hills area.

For a 2.0 m/sec SW wind, noise levels predicted for the quarantined land zoned ResA were:-

42 - 60 dBA

3. **RECENT STUDIES**

Nucrush have conducted noise surveys on an annual basis using SIMTARS as consultants. We also use a simple hand held noise meter for 'spot' surveys as required. The results of both types of survey work generally confirm the predictions of the earlier reports.

During drilling and hauling on 8/8/96 using a hand held noise meter instantaneous result of 60 dBA were regularly received in the ridge line under threat.

The most recent moise survey study was conducted by SIMTARS in August 1996. The survey determined the noise levels at the ResA section of the quarantined buffer land resulting from a drill rig operating at our quarry.

DUST ANALYSIS

Heggies report predicted dust levels up to 120 g/m3 annual 24 hour averaged mean total suspended particulates. The National Health and Medical Research Council (NH & MRC) recommends a maximum permissible annual mean total suspended particulate level in Urban environments of 90 g/m3 (i.e. a possible 30% exceedance is possible based on the Heggie report).

The Winders report suggest a lower figure closer to about 60 g/m3 (averaged annual 24 hour mean total).

APPENDIX 4

JULY 1996

NUCRUSH PTY LTD

OXENFORD QUARRY

WILDLIFE HABITAT MANAGEMENT PROGRAM

1. MISSION STATEMENT

Oxenford Quarries will fulfil key elements of community and corporate environmental management expectations by preserving and enhancing wildlife habitats around its quarry site.

The Company will strive to ensure wildlife habitats and corridors are of sufficient size to support sustainable wildlife populations. The Company will enlist the support of all stakeholders who have a genuine commitment to assisting business in achieving sustainable development goals.

2. BACKGROUND TO THE PROGRAM

- Oxenford Quarry is a newly established quarry in the Upper Coomera Valley. The quarry has an estimated life of 60 years.

- The quarry and adjoining buffer lands owned by the Company occupy an area of approximately 85ha. Only about 45ha of this land will be subject to progressive extraction over the next 60 years. The remaining 40ha of land includes buffer land and ancillary uses to extractive industry such as processing areas, stockpiles, water dams, sedimentation dams and site buildings.

- An area of land of approximately 45ha adjoining the quarry to the east has been quarantined by an agreement between the Forest Hills developer, the Council and Nucrush, for the useful life of the quarry. This land is very steep in places and consists of heavily wooded bushland with some very large and mature trees. A 'new owner' is threatening to subdivide part of this land.

- The quarry owned buffer lands comprise some land which has historically undergone clearing for cattle grazing. A further proportion consists of wooded bushland. Some small remnant rainforest environments also exist.

- The Company has invested significant resources to establish a quarry environment which equals or exceeds best practice standards. A range of civil works, operational planning and development, water management and environmental management methods have been employed to achieve this.

- Urban development and encroachment around the Oxenford Quarry site is increasing at a high rate. The growth expectations for the Upper Coomera area according to the Gold Coast City Council Development Control Plan are:

- The effects of urban encroachment on the operational ability of a quarry and ultimately its long term survival are well known and well documented. As urban encroachment increases noise, dust, blasting, road transport and general environmental issues intensify. The government administering authority is often caught in the middle of acrimonious dispute which increases in intensity and ill feeling between the quarry and the local community. The disputes become battles which are vicious and drawn out. Ironically the environment can be one of the greatest victims of such battles.

- The Company has noticed a significant increase in the amount of wildlife in and around its quarry over the last two years. Initially, we thought that the increases could be because of our development of dams and wetlands and tree and vegetation growth in and around our quarry.

- We believe this is most certainly assisting in attracting wildlife but increasingly it is becoming clear that our buffer land is becoming a refuge, a haven, for wildlife displaced by urban encroachment. The buffer and quarantined land around our quarry is increasingly becoming the only undeveloped property in the area. In sixty years time it may be the only undeveloped land.

- The irony for us is that many people wish to believe that quarries lead to the devastation of local wildlife populations. We know that just the opposite is true.

- In developing our management plan to enhance wildlife habitats in buffer and quarantined land surrounding our quarry, we recently happened upon an article from the U.S.A. - an article based on a paper written by the Vice President of one of America's largest quarrying companies - Vulcan Materials. An extract of the paper is included below because it describes the American experience which mirrors almost perfectly our experience and observations.

"WILDLIFE HABITAT ENHANCEMENT"

Our quarry sites are typically on the outskirts of metropolitan areas. Sometimes they are in areas with few or even no neighbours. At least, they start out that way. Around many of our plants the property we don't own - property that used to be woods - has been developed into subdivisions (housing acreage) and shopping centres. Increasingly, our buffer zones are the only undeveloped properties left in some areas. Consequently they are a haven for wildlife.

At first we didn't realise the significance of this until we were challenged for a zoning permit on an operation in the State of Virginia by an outraged citizens group who claimed that "our operation would be devastating to the local wildlife population, especially birds and mammals".

We knew that just the opposite was occurring and that we were attracting wildlife to our quarries. We saw the possibility that would make wildlife habitat enhancement a company wide, and even an industry wide goal.

We worked with an independent organisation, the Wildlife Habitat Council (W.H.C.) to help establish a wildlife habitat program.

We have seen nothing but positive results from our program. Currently we have 27 of our operations certified by W.H.C., more than any other corporation in America.

Bill Grayson
Vice Chairman
Vulcan Materials Company U.S.A.

"McPherson Memorial Lecture" extract from "Looking After Corporate Health"
United Kingdom 1995.

3. ELEMENTS FOR A PLAN

- There is great benefit for our quarrying company to be insulated from the threat of urban encroachment. This we openly admit. But there are also great benefits for the community. (Especially those people that live on the border of the quarry). If our buffer lands and adjoining quarantined land is not developed then less conflict will occur leading to a greater quality of life.

  But most significantly there are enormous benefits for wildlife - wildlife displace by urban development. The buffer and quarantined land can provide a safe haven, a retreat, especially at night when quarrying activities cease.

- There are many challenges to realise the overall benefits that wildlife habitat management could bring - are bringing to some quarries, some Councils, some communities and some wildlife populations in other parts of the world.

  One of the problems is that there is little or no 'administrative infrastructure' to assist companies who want to enhance or preserve wildlife habitat. There is much talk and a lot of 'feel good' discussion about ecologically sustainable development by stakeholders, but very little positive actions to make it a workable reality.

Some of our observations are:

- Local Government is unsure how to assist unless land can be rezoned and companies are very hesitant about this. In many cases such as our quarry, it would be unworkable as some of the available wildlife habitat is used for ancillary purposes and water management.

- Some parts of government legislation are actively hostile to such proposals. Land tax for instance (and the effect on Council rates) is a massive disincentive to the retention of buffer and environmentally important land. Our Company has lobbied for years for changes to this and have often met with a very hostile government response. In some cases our valuations were increased!

- Australian environmental groups have not yet matured into groups with clearly stated objectives. There is much dissent within groups in the 'conservation industry' on which directions to pursue. Clear statements defining their true aims and ambitions are almost non-existent. Consequently it is impossible for a company like ourselves to form a relationship with a group. Because we are unsure of their ultimate motives and credentials. Many members of conservation groups have clear personal agendas to undermine and ultimately destroy businesses like ourselves. Secondly, the philosophical direction of a conservastion group can change, often dramatically. Many conservation groups have shown, some at government level, that their word cannot be trusted. Their justification is often 'that the ends justifies the means'.

  Thirdly it is not clear whether a conservation group actually has the competence, skills and community support to advise companies like ourselves.

Fourthly, some groups do not want to involve themselves with business; they see it as betraying their 'cause'.

In the U.K. and U.S.A. we are told that sufficient groups with excellent credentials and clear motives do now exist. The Wildlife Habitat Council mentioned in the Vulcan Materials paper is one. Australian business needs conservation groups that they can work with - it is likely that business may be the driving force to achieve this.

- The size of habitats and linking of green corridors appears to be essential for sustainable wildlife populations. In our case this is a matter of urgency. Local Council officers feel that the sustainability of our proposed wildlife habitat would be greatly enhances for the provision of a 'green corridor' of sufficient size connecting to the Nerang State Forest. Suppression of feral animals is also an issue.

- A Landscape Protection Order presently exists over the threatened quarantined land adjoining our quarry. This may provide an opportunity for Council to exercise some land use control, expecialy if a Wildlife Habitat Ehcnacement program is establishd for the land within and adjoining the quarry.

- The Company intends to enlist the support of an Institution such as Griffith University to monitor wildlife as part of a long term program. Phd students in Environmental Science courses may be able to assist the in the program.