

EIS 755 Vol 1

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Mining, rehabilitation and environmental management plan for  
the Carwell Creek Quarry, Kandos

NSW DEPT PRIMARY INDUSTRIES



AB019422

NSW DEPARTMENT OF  
MINERALS AND ENERGY

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# **Mining, Rehabilitation and Environmental Management Plan for the**



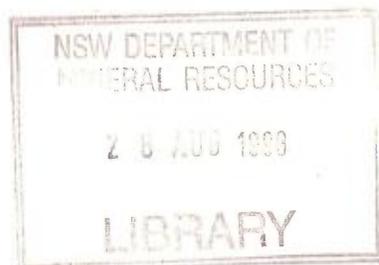
Prepared by:  **R.W. Corkery & Co Pty Limited.**





# Mining, Rehabilitation and Environmental Management Plan for the Carwell Creek Quarry, Kandos - Volume 1

EIS 755



Prepared by:

R. W. Corkery & Co. Pty Limited  
Geological and Environmental Consultants  
P.O. Box 80  
ORANGE N.S.W. 2800

On behalf of:

Australian Cement Limited  
KANDOS N.S.W. 2848

Telephone: (063) 62 5411  
Facsimile: (063) 61 3622

Telephone: (063) 79 4007  
Facsimile: (063) 79 4029

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## EXECUTIVE SUMMARY

### INTRODUCTION

This Mining, Rehabilitation and Environmental Management Plan (herein called the Management Plan) has been prepared to satisfy a condition of Australian Cement Limited's mining and mineral leases for their quarrying operations at Carwell Creek, Kandos. The Management Plan presents the Company's plans and objectives for the known life of proven reserves. The Management Plan is to be reviewed throughout the life of operations and subsequent reports will be made on the progress of quarrying, rehabilitation and environmental monitoring.

The Company is one of the largest of the six Australian Cement producers, with approximately 20 per cent of the Australian market share of cement and lime sales.

The Company has been involved with the manufacture of cement at Kandos since 1913. The development of the town of Kandos and the development of the Company's quarries and cement manufacturing plant have been very much intertwined over this 75 year period. This mutual dependence has seen many local residents employed, quite a number for all their working lives. Currently there are a total of 260 employees at the Company's cement plant, quarry and colliery. Employment directly related to the quarry operations totals 22.

The limestone resource at Carwell Creek, over which the Company holds mining tenements, contains high grade limestone of consistent purity. Proven reserves of high grade and low grade limestone identified are sufficient for approximately 56 years of cement production, at the current rate of 650 000 tonnes per annum.

### OPERATIONAL DETAILS

The Company's current limestone quarrying operations are undertaken at the No. 2 Quarry using conventional benched open cut quarrying involving blasting, front-end loaders and trucks. The No. 2 Quarry will be worked to completion of known reserves, extending to the north and west and then retreating southward.

Reserves of high grade and low grade limestone are identified for selective quarrying and blending to provide a suitable cement-making limestone with  $\text{CaCO}_3$  of 80 per cent.

Initially overburden waste, in excess of blending requirements, is to be dumped out-of-pit. Later, overburden waste will be disposed of within the worked out northern end of No. 2 Quarry.

Run-of-quarry materials are loaded by front-end loaders into quarry haul trucks for transport to either the crushing plant adjacent to the disused No. 1 Quarry or to overburden dumps. Quarrying is undertaken during daylight hours only, from 7.30 am to 4.00 pm, Monday to Friday. Quarrying is occasionally undertaken on weekends to meet production shortfalls. In the final 5 years of operating No. 2 Quarry, it is proposed to



progressively extend southward along the strike of the limestone deposit into an area termed the No. 3 Quarry.

The Company's proven reserves of high grade and low grade limestone have been identified within the No. 2 and No. 3 Quarry areas. There are other reserves of limestone within the Company's leases at Carwell Creek and further high grade limestone within the disused No. 1 Quarry. There are however, no long term plans to develop these and this Management Plan addresses only proven reserves sufficient for needs at least until the year 2040.

The quarry crushing plant is located adjacent to the disused No. 1 Quarry, at Carwell Creek some 4.5 km west of the township of Kandos. Limestone trucked to the crushing plant is crushed and screened (primary and secondary crushing) and conveyed by aerial cableway to the cement plant. The nominal production rate is 650 000 tonnes per annum. Operations at the crushing plant are also undertaken between 7.30 am to 4.00 pm, 5 days per week, with contingency for operations 6.00 am to 6.30 pm, on any day of the week.

#### **LAND USE AND REHABILITATION OBJECTIVES**

The Company's land at Carwell Creek is predominantly grassland with remnants of native tree and shrub communities. The land use immediately surrounding the Company's land comprises sheep and cattle grazing. An agreement has been reached between the Company and the adjacent Carwell property owners requiring certain undertakings by the Company for rehabilitation and environmental controls sympathetic to the surrounding grazing land use.

The rehabilitation of quarry disturbed areas is undertaken in accordance with the prescribed conditions of the mining leases and as recommended by the Soil Conservation Service of N.S.W.

The overall objectives of rehabilitation are:

- (i) long term stability and safety of landforms - the quarry and waste dumps;
- (ii) reinstatement of quarry disturbed lands within the lease areas to a post quarrying landuse capability commensurate with the surrounding grazing landuse;
- (iii) measures to minimise the impacts of quarry development on surrounding landuse during the quarry life, including:
  - erosion control;
  - tree screening to reduce visual impact;
  - eradication of noxious weeds and vermin.

The Company will continue, as far as practicable, to undertake rehabilitation progressively, reflecting the anticipated 56 years of future development of No. 2 Quarry and No. 3 Quarry.



## ENVIRONMENTAL MONITORING

Environmental monitoring is undertaken by the Company to quantify the degree of impact (if any) the quarrying and crushing operations at Carwell Creek are having on the surrounding environment.

This Management Plan and subsequent Annual Reports, provide a mechanism for presenting and reviewing the results of environmental monitoring.

Monitoring undertaken by the Company since 1980 comprises: noise and dust monitoring of the quarrying and crushing operations; surface and groundwater monitoring, and blast monitoring. These results are presented and discussed in this document. Environmental impacts of the operations at non-Company owned neighbouring residences are minimal and within tolerable levels. The local community's expectation of environmental quality is intimately associated with other socio-economic benefits ensuing from the Company's operations at Kandos.

The level of future monitoring will reflect the level of consequential impact likely over the life of operations. Groundwater monitoring will, for instance, be ongoing on a regular basis as the No. 2 Quarry is deepened. Blasting will be monitored and blasting practice reviewed if necessary as the No. 2 Quarry extends to the north and northwest.

Other future environmental monitoring will be undertaken on an as required basis and will be responsive to any future community complaints (if any).



## SECTION 1

### INTRODUCTION

#### 1.1 SCOPE

Australian Cement Limited (herein to be referred to as "the Company") holds mining leases for the mining of limestone at Carwell Creek situated approximately 5 km due west of Kandos. Limestone deposits of the Carwell Creek Limestone have been quarried by the Company (and its predecessor companies) for the manufacture of cement at Kandos since 1913.

In 1985 the Company sought government approvals to extend the development of its No. 2 Quarry at Carwell Creek. Development consent from Rylstone Shire Council and a mining lease from the Department of Minerals and Energy were subsequently granted in 1986 - Mining Lease 1169, dated 8th July 1986.

A condition of the granted lease (attached in Appendix 1 of this document) requires that the Company prepare a Mining, Rehabilitation and Environmental Management Plan for the approval of the Minister for Minerals and Energy. It is anticipated that such a condition, requiring preparation of a Management Plan, will be included in all future renewals of existing leases held by the Company at Carwell Creek.

In addition, conditions of Council's development consent require the Company to undertake and report on environmental monitoring and rehabilitation of its quarrying operations with respect to Mining Lease 1169.

This document has been prepared as a Mining Rehabilitation and Environmental Management Plan (herein to be referred to as the "Management Plan") for the long term quarry development on all mining leases held by the Company at Carwell Creek.

The Management Plan has been prepared with due regard to both draft guidelines supplied by the Department of Minerals and Energy and that Department's Rehabilitation Policy. The Department's policy on rehabilitation is essentially that "land which has been disturbed by mining is to be reinstated to a stable landform that is appropriate to the surrounding land fabric of the local region, suitable for the preparation of a subsequent land use, the maintenance requirements of which are commensurate with normal practices for the land use".

It is recognised that the Management Plan will specifically serve as:

- (i) a management tool for the entire operation for the Company and consultants;
- (ii) a means of identifying and concentrating on the more significant rehabilitation and environmental aspects;



- (iii) a basis for systematic interaction and agreement on objectives with government authorities over time and irrespective of personnel changes.

The Management Plan provides a useful means of reporting by way of a comprehensive document on mining, rehabilitation and environmental management to regulatory government bodies. Such government bodies include:

Department of Minerals and Energy  
State Pollution Control Commission  
Soil Conservation Service  
Department of Water Resources  
Rylstone Shire Council

The Management Plan has been prepared for the approval of the Minister for Minerals and Energy. It is understood that the Department of Minerals and Energy will be responsible for:

- (i) overseeing the Management Plan and co-ordinating the involvement where appropriate of other government bodies; and
- (ii) ensuring that the Company's mining and rehabilitation are performed in a satisfactory manner in compliance with the lease conditions.

The Company's objectives are to satisfy, as far as practicable, the government's rehabilitation and environmental requirements. However, these expectations must be practical and achievable bearing in mind the existing status of the land, borne from a history of 75 years of approved quarrying activity.

## 1.2 FORMAT OF THE MANAGEMENT PLAN

The Management Plan is presented as a two volume document. Volume 1 comprises text on the Management Plan comprising the following sections:

<b>Section 1</b>	Introduction
<b>Section 2</b>	Quarrying Operations
<b>Section 3</b>	Quarry Crushing Operations and Infrastructure
<b>Section 4</b>	Environmental Monitoring and Management
<b>Appendix 1</b>	Conditions of Mining Lease 1169
<b>Appendix 2</b>	Development Consents from Rylstone Shire Council

Volume 2 comprises all plans, illustrations and plates appropriate to the Management Plan.

The Management Plan will be subject to review over the remaining quarry life, anticipated to exceed 56 years based on current limestone reserve estimates. The format has therefore been prepared to allow for subsequent review and reporting.

It is recognised that modifications to the Management Plan may be required in such circumstances as:

- Changed quarrying condition;



- Operational requirements and changes in reserves status;
- Impacts on the surrounding district and community should these become apparent.

### **1.3 THE COMPANY**

Australian Cement Limited (ACL) is the operating company of Australian and Kandos Cement Holdings Ltd (A & K). Since 1974, A & K has been owned jointly 50/50 by CSR Limited and Pioneer Concrete Services Ltd.

The principal operations of the Company involve the manufacture, distribution and sale of cement. In addition to the Kandos cement works and the colliery, the Company owns and operates cement works at Geelong and Traralgon in Victoria. Its cement distribution depots are located in Sydney, Melbourne, Adelaide, Canberra and Newcastle as well as a number of country centres in Victoria and New South Wales.

The Company is one of the largest of the six Australian cement producers, with approximately 20 per cent of the Australian market share of cement and lime sales. It produces approximately 22 per cent of the cement requirements of New South Wales and markets 34 per cent of the State's requirements.

### **1.4 HISTORY OF OPERATIONS**

The Company, and before its formation its predecessor companies, has been involved with the manufacture of cement at Kandos since 1913. At that time a company called the Cement Lime and Coal Company Limited N.S.W., was founded to develop the known limestone and coal reserves of the area for the purpose of manufacturing cement at this location.

In its initial stages, that company constructed the basic infrastructure necessary for the cement manufacturing activities. These included a rail siding, water storage, a power house and an aerial cableway between the site of the cement works and the quarry.

Operations commenced at the Carwell Creek Quarry in December 1915 following completion of the aerial cableway. Limestone, extracted from the quarry face using explosives, was then manually broken down before being shovelled into horse drawn skips pulled along the rail line running from the quarry face to the aerial cableway.

Over the years, greater mechanisation was introduced to the quarry. The second aerial cableway was completed in 1923. With electric power supply to the quarry in the early 1920's an electric shovel and electric locomotives were installed for greater efficiency. This type of equipment operated until 1970, when motor driven equipment began to be introduced.





The originally quarried area known as No. 1 Quarry, was gradually phased out of production with the opening in 1952 of the No. 2 Quarry which has operated continuously since then.

The seventy year history of the Company's operations at the Carwell Creek quarry therefore is not one of dramatic change, but rather one of evolutionary change in the type of equipment operated and the techniques of extraction used. This change has occurred where necessary in response to obsolescence of equipment and improving techniques in quarrying methods. The basic activities of extraction, crushing and transportation of limestone remain unchanged.

## 1.5 SOCIO-ECONOMIC ASPECTS

The new activity in the area and the consequent influx of people necessitated the establishment of a settlement and in 1914, the first subdivision of land for the township of "Candos" was approved by Rylstone Shire Council. The original name of the township was based on the initials of the surnames of six of the ten members of the first Board of Directors of the company. At the request of the Postmaster General however, this name was subsequently changed to avoid confusion with the town of Chandos in South Australia. Street names in the initial subdivisions were those of the original Board members.

The development of the town of Kandos and the development of the Company's quarries and cement manufacturing plant are very much intertwined. This mutual dependence has seen many local residents employed in the plant, with quite a number employed there all their working lives. At present there are 260 employees at the Company's cement plant, quarry and colliery. Total annual labour cost for the Company's Kandos employees is \$4.5 million, with an additional \$1.5 million for the colliery.

Local contractors and small businesses also service the quarrying and cement manufacturing operations. In addition, approximately 40 people are employed by local contractors for Company-related purposes. Approximately \$1 million is paid annually to contractors for these services.

The Company in turn has contributed to the town of Kandos, and to the Shire, in the form of money, materials, labour and equipment for a variety of community purposes. Assistance has been, and is being given to schools and colleges, sporting and service clubs and many other community facilities and services. An apprentice training scheme and work experience programme are conducted for young people.



## 1.6 BACKGROUND OF APPROVALS AND LICENCES

The Company holds 24 mining leases and 28 private mining leases for the mining of limestone at Carwell Creek. The Company's existing leases cover approximately 388 ha in area of which approximately 85 ha are currently under some form of development such as quarrying, waste rock emplacement, roads and facilities. Table 1.1 summarises the status of these mining tenements. The Department of Minerals and Energy has proposed all the Company's leases at Carwell Creek be consolidated as one lease of unlimited depth restriction (in accordance with Part V-A of the Mining Act, 1973).

The mining lease applications (MLA's) shown on Table 1.1 have been lodged by the Company over areas under existing mining titles. These mining lease applications do not constitute an expansion of quarrying activity. Rather, the objective of these is to remove various limitations and anomalies, and thereby bring all mining and mining purpose titles under a common status for ease of administration.

Mining Lease 1169 has been most recently granted (8th July 1986) to provide for the northern extension of the existing No. 2 Quarry. The conditions of Mining Lease 1169 are attached as Appendix 1.

The Company's operations within the leases at Carwell Creek are undertaken under deemed planning approvals by virtue of continued use rights. Subsequent development approvals have been received from Rylstone Shire Council for:

- (i) Future extension of the No. 2 Quarry to the south (referred to as the No. 3 Quarry);
- (ii) Extension of the No. 2 Quarry to the north and west within ML 1169;
- (iii) Revisions to operating procedures and upgrading of equipment at the Company's quarry crushing facility.

(Conditions of development consents for (ii) and (iii) are attached in Appendix 2).

The Company's operations at Carwell Creek are prescribed as scheduled premises under one or more of the following Acts administered by the State Pollution Control Commission:

- the Clean Air Act, 1961;
- the Clean Waters Act, 1970; and
- the Noise Control Act, 1975.

This Management Plan has also been written in support of applications to the State Pollution Control Commission for Pollution Control Approvals for:

- (i) the extension of the No. 2 Quarry to the north and west within ML 1169;
- (ii) the revisions to operating procedures and upgrading of equipment at the Company's quarry crushing facility.



TABLE 1.1  
 Australian Cement Limited  
 Mining Tenements at Carwell Creek, Kandos

Tenements	Renewal Status	Area (ha)	Portion	Surface Exemption	Depth Restriction	Minerals/Purpose
PLL 374 (Act '24)	06.11.94	4.034	PML 3	NII	30 m	limestone
PLL 386 (Act '24)	21.09.95	1.036	PML 6	NII	60 m	limestone
PLL 396 (Act '24)	12.02.96	1.06	PML 7	NII	30 m below m.s.l.	limestone
PLL 397 (Act '24)	21.03.96	0.537	PML 9	NII	30 m	limestone
PLL 423 (Act '24)	09.06.97	1.07	PML 14	NII	30 m	limestone
PLL 424 (Act '24)	09.06.97	1.06	PML 15	NII	30 m	limestone
PLL 425 (Act '24)	09.06.97	0.865	PML 17	NII	30 m below m.s.l.	limestone
PLL 426 (Act '24)	09.06.97	0.8043	PML 16	NII	30 m below m.s.l.	limestone
PLL 427 (Act '24)	09.06.97	0.996	PML 18	NII	30 m	limestone
PLL 428 (Act '24)	09.06.97	0.099	PML 19	NII	30 m	limestone
PLL 429 (Act '24)	09.06.97	0.77	PML 20	NII	30 m below m.s.l.	limestone
PLL 430 (Act '24)	09.06.97	0.409	PML 21	NII	30 m below m.s.l.	limestone
PLL 431 (Act '24)	09.06.96	1.042	PML 22	NII	30 m	limestone
ML 4207 (Act '06)	18.06.97	0.569	ML 5	NII	30 m below m.s.l.	limestone
ML 4208 (Act '06)	18.06.97	0.865	ML 6	NII	30 m	limestone
PLL 434 (Act '24)	12.11.97	1.709	PML 30	NII	30 m below m.s.l.	limestone
PLL 493 (Act '24)	02.12.99	5.372	PML 42	NII	NII	limestone, ironstone
PLL 536 (Act '24)	06.12.2001	1.775	PML 43	NII	NII	limestone
MPL 1000 (Act '06)	17.01.2002	1.128	ML 12	NII	10 m	road
MPL 1001 (Act '06)	17.01.2002	0.953	ML 13	NII	10 m	road
PLL 3174 (Act '06)	30.10.2003	1.618	PML 39A	NII	NII	limestone
PLL 616 (Act '24)	30.10.2003	2.7 (ex rood)	PML 44	NII	NII	limestone
PLL 3256 (Act '06)	27.04.2006	2.468	PML 45	NII	NII	limestone
PLL 3257 (Act '06)	27.04.2006	0.622	PML 46	NII	NII	limestone
PLL 3258 (Act '06)	27.04.2006	1.644	PML 47	NII	NII	limestone
MPL 1080 (Act '06)	29.08.86 (pending)	0.771	ML 8	NII	0.3 m	road
PLL 1050 (Act '24)	21.10.2001	11.073	PML 57	NII	NII	limestone, ironstone
ML 5690 (Act '06)	14.10.2000	0.733	ML 34	NII	30 m	limestone
ML 6020 (Act '06)	26.10.87 (pending)	0.764	-	NII	NII	limestone
PLL 488 (Act '24)	17.08.99	16.09	-	7.62 m (ex 0.951 ha)	NII	limestone, ironstone
ML 4249 (Act '06)	23.11.97	0.175	ML 4	7.62 m (ex 0.116 ha)	30 m	limestone
PLL 337 (Act '24)	01.09.82	4.046	PML 2	NII	30 m	limestone
ML 88 (Act '73)	05.11.96	7.949	-	NII	45.7 m	limestone, marble
ML 79 (Act '73)	08.10.96	2.55	-	NII	NII	limestone, marble
ML 84 (Act '73)	24.10.96	14.02	-	NII	80 m	limestone, marble
ML 89 (Act '73)	05.11.96	14.27	-	NII	30 m	limestone
PLL 369 (Act '24)	18.05.94	10.926	PMLS	NII	60 m	limestone
PLL 380 (Act '24)	02.02.95	16.184	-	7.62 m (ex 0.304 ha)	100 m	limestone
PLL 379 (Act '24)	02.01.95	0.809	PML 41	NII	100 m below m.s.l.	limestone
ML 450 (Act '73)	22.06.98	16.19	-	NII	120 m	limestone, marble
ML 1112 (Act '73)	07.03.2005	90.5	-	NII	30 m	limestone, calcite, marble
ML 1113 (Act '73)	07.03.2005	2.34	-	NII	30 m	limestone, calcite, marble
ML 1037 (Act '73)	26.01.2004	4.52	-	NII	30 m	calcite, limestone
ML 1038 (Act '73)	26.01.2004	0.1501	-	NII	30 m	calcite, limestone
MPL 2049 (Act '06)	07.06.87	2.1	PML 33	NII	15.2 m	railway and removal of limestone
PLL 379 (Act '24)	02.01.95	0.809	PML 41	NII	100 m below m.s.l.	limestone
ML 3077 (Act '06)	19.12.2004	7.884	ML 7	9 m (ex 0.3085 ha)	NII	limestone
MPL 524 (Act '06)	03.11.2005	0.053	ML 9	NII	7.62 m	machinery, pipeline and removal of overburden
ML 1008 (Act '06)	13.08.93	4.046	ML 1	NII	100 m	limestone
ML 1578 (Act '06)	20.10.95	0.1593	ML 2	NII	NII	limestone
MPL 538 (Act '06)	15.03.87	11.89	PML 31	NII	7.62 m	road and removal of overburden
ML 1039 (Act '73)	26.01.2004	0.103	-	NII	30 m	calcite, limestone, marble
ML 1040 (Act '73)	26.01.2004	5.36	Part 96	NII	30 m	calcite, limestone, marble
ML 1041 (Act '73)	26.01.2004	0.681	-	NII	30 m	calcite, limestone, marble
ML 1042 (Act '73)	26.01.2004	8.87	Part 107	NII	30 m	calcite, limestone, marble
ML 1043 (Act '73)	26.01.2004	7.23	-	NII	30 m	calcite, limestone, marble
ML 1044 (Act '73)	26.01.2004	0.832	Part 101	NII	30 m	calcite, limestone, marble
ML 1169 (Act '73)	08.07.2006	33	05833	NII	NII	calcite, limestone, marble
MLA 256 Orange	16.10.84 (pending)	50.6	-	-	-	limestone
MLA 304 Orange	05.02.87 (pending)	7.0	Part 100, 101, 107	-	-	limestone
MLA 287 Orange	07.10.86 (pending)	4.034	PML 3	-	-	remove depth restriction
MLA 288 Orange	07.10.86 (pending)	1.036	PML 6	-	-	remove depth restriction
MLA 289 Orange	07.10.86 (pending)	1.06	PML 15	-	-	remove depth restriction
MLA 290 Orange	07.10.86 (pending)	1.042	PML 22	-	-	remove depth restriction
MLA 291 Orange	07.10.86 (pending)	0.865	ML 6	-	-	remove depth restriction
MLA 301 Orange	07.10.86 (pending)	0.771	ML 8	-	-	add removal of limestone
MLA 292 Orange	07.10.86 (pending)	0.175	ML 4	-	-	remove depth restriction
MLA 293 Orange	07.10.86 (pending)	7.949	Mining Lease 88	-	-	remove depth restriction
MLA 300 Orange	07.10.86 (pending)	10.926	PML 5	-	-	remove depth restriction
MLA 294 Orange	07.10.86 (pending)	90.5	Mining Lease 1112	-	-	remove depth restriction
MLA 295 Orange	07.10.86 (pending)	4.52	Mining Lease 1037	-	-	remove depth restriction
MLA 299 Orange	07.10.86 (pending)	2.1	PML 33	-	-	remove depth restriction
MLA 296 Orange	07.10.86 (pending)	0.103	Mining Lease 1039	-	-	remove depth restriction
MLA 297 Orange	07.10.86 (pending)	5.36	Part 96	-	-	remove depth restriction
MLA 298 Orange	07.10.86 (pending)	8.87	Part 107	-	-	remove depth restriction

REFERENCE

ML (Act '06) : Mineral Lease  
 ML (Act '73) : Mining Lease  
 PLL : Private Lands Lease

MPL : Mining Purposes Lease  
 MLA : Mining Lease Application

m.s.l. : mean sea level

MINUTE PAPER

SUBJECT: MREMP CARWELL CREEK QUARRY, KANDOS

I have reviewed the matters in the MREMP (Feb 1989, R.W. Corkery and Co., Report 231/2) concerning water quality issues. Overall there is little likelihood of any serious long-term water pollution arising from this limestone quarry. In general the important issues have been well addressed, however I am concerned about the following matters:

(1) Surface water quality monitoring data presented in Table 4.1 is of doubtful quality. A quick check of the data (comparison of equivalent concentrations of cations versus anions) shows very poor ionic balance. The cause of this would probably be delayed (and therefore incorrectly low) bicarbonate analysis. Additionally the electrical conductivity values in Table 4.1 relate very poorly to the chemical results - when the reported cation concentrations are used to roughly estimate the expected conductivity the following values are obtained:

Samples KW-1, KW-2 in the range 1600 to 1800 uS/cm (not 3500)

Samples KW-3, KW-4 in the range 1100 to 1300 uS/cm (not 800)

These problems in themselves are not particularly serious however it demonstrates that much more care with chemical analysis and reviewing and reporting of results are required.

(2) Surface water sampling sites appear to be inadequate. It is recommended that an extra site be included on Carwell Creek immediately upstream of the junction with Orchard Creek. As quarries and stockpiles are (and will be) predominantly in the Orchard Creek catchment it is important that monitoring of the net effect of the mine on Carwell Creek be properly conducted and this will require comparison of the water upstream and downstream of the Orchard Creek junction. (Sample site KW-1 is too far upstream to do this satisfactorily).

(3) Trace metal analyses reported in Table 4.1 show slightly elevated lead levels - in fact KW-1 and KW-2 are above the Clean Waters limit. Analysis of filtered water for lead should also be carried out. This would probably show that lead is in the suspended matter - good sediment control should be able to contain this source of pollution. The presence of lead in the waters should be confirmed by independent analysis.

(4) Sediment control measures are inadequately addressed. Large quantities of broken waste rock and low-grade ore will be exposed to rainfall run-off; containment of sediment likely to enter Orchard Ck is important until rehabilitation is carried out. There are insufficient details of catch dams and diversion drains to minimise this potential impact on water quality. Details of the "grassed silt trap", through which all water pumped out of Quarry 2 is passed, as well as procedures for maintaining the trap, are needed.

*Fredrickson*  
P Fredrickson, Scientific Officer,  
Mineral Resources Development Laboratory  
9 May 1989 (revised 16 May)

D Bedford, RME, Orange

cc. Env Geology

# MINUTE PAPER

PAPERS:-

SUBJECT:- M.R.E.M.P. for Australian Cement Ltd.

Glen,

The Australian Cement Ltd, M.R.E.M.P. is attached.

Would you please pass on this copy to the Lab. to allow time for assessment and comments - forward to Paul Frederickson.

At this stage other bodies invited are, Water Resources, S.P.C.C., S.C.S. and Shire Council.

I'll be in touch later re agenda etc.

  
D.J. Bedford

REGIONAL MINING ENGINEER

21st March, 1989

Mr G Toyer,  
ENVIRONMENTAL GEOLOGIST

*R. Buchanan*

# MINUTE PAPER

PAPERS:-

SUBJECT:-

## MREMP FOR CARWELL CREEK QUARRY (AUSTRALIAN CEMENT)

I have reviewed the Mining, Rehabilitation and Environmental Management Plan for the Carwell Creek Quarry. The plan is well presented and all aspects raised in the Department's guidelines to management plans have been addressed.

I would have liked a bit more detail on the soil management <sup>and</sup> revegetation since the stabilisation and rehabilitation of the overburden dumps are probably the most important environmental concern in the management plan. Some of the photos of "rehabilitated" overburden dumps (Plates 7 and 8) show a decidedly "stony" terrain.

Also the company's policy of housing some of its workers right next to the crushing plant (nine residences within 300 metres of the plant) seems ill-advised.

Two minor points:

- ° Plan 8 - reference legend to low-grade stockpile and overburden unsuitable for re-use is incorrect.
- ° Plan 11 - KW<sub>4</sub> is labelled incorrectly as KW3 on Carwell Creek.

*Noted  
W. H. Paul  
27.4.89*

*cc D. Bedford R716*



R Buchanan  
Environmental Geology

26 April 1989

Paul Frederickson  
MRDL



## Department of Minerals and Energy

Mr G Toyer  
Environmental Geologist  
Department of Minerals and Energy  
Level 29  
8 - 18 Bent Street  
SYDNEY NSW 2000 00

P.O. BOX 53,  
ORANGE. 2800.

20th March, 1989.

Dear Glen,

Please find enclosed a copy of the Mining, Rehabilitation and Environmental Management Plan (M.R.E.M.P.) for the mining operations of Australian Cement Limited at Kandos.

The document has been submitted for approval by this Department as a requirement of the Mining Lease conditions.

The operations are effected by other statutory requirements, and in this respect, the Department seeks your involvement in reviewing this plan. To this end, an onsite inspection and meeting has been arranged for Thursday, May 25th, commencing at 9 a.m.

If, however, there are any issues of major concern arising out of the "Plan", it would be appreciated if you would discuss those matters with me before this meeting.

Your assistance in this process is appreciated.

Yours faithfully,

A handwritten signature in dark ink, appearing to be 'D.J. Bedford', written over a faint circular stamp.

D.J. Bedford  
REGIONAL MINING ENGINEER

## 1.7 OPERATIONAL DETAILS

### 1.7.1 Working Hours

There are no restrictions on hours of operations at the Company's quarry sites.

The working hours currently observed are presented in Table 1.2.

**TABLE 1.2**  
**Working Hours - Carwell Creek Quarry**

Activity	Period	
*Quarrying - drilling - excavation loading - waste disposal	7.30 am - 4.00 pm	Monday to Friday
	7.30 am - 4.00 pm	Monday to Friday
	7.30 am - 4.00 pm	Monday to Friday
Blasting	Midday or 4.00 pm	Monday to Friday (average frequency of 1 per week, maximum 2 per week)
Internal Trucking	7.30 am - 4.00 pm	Monday to Friday
Crushing and Aerial Ropeway	7.30 am - 4.00 pm (normal)	5 days
	6.00 am - 6.30 pm (contingency)	7 days

\* Quarrying activities are occasionally undertaken on weekends from 7.30 am to 4.00 pm

### 1.7.2 Employment

As of January 1989 there are a total of 260 employees at the Company's cement plant, quarry and colliery. The total labour cost for the Company's Kandos cement plant and quarry is \$4.5 million per annum, with an additional \$1.5 million per annum for the colliery.

Local contractors and small businesses also service the quarrying and cement manufacturing operations. Approximately 40 persons are estimated to be employed by local contractors for Company related purposes. Approximately \$1 million is paid annually to contractors for these services.

Employment directly related to quarry operations total 22, comprising:

- 16 earthmoving and quarry employees
- 3 maintenance employees
- 3 management and administrative staff





## 1.8 LANDUSE AND REHABILITATION OBJECTIVES

The Company will continue to incorporate rehabilitation procedures within the mining leases at Carwell Creek. The rehabilitation will be undertaken progressively as far as practicable, reflecting the anticipated 50 years of future development of No. 2 Quarry and No. 3 Quarry. Hence rehabilitation will not be dramatic but as campaigns staged throughout the quarry life.

The overall objectives of rehabilitation are:

- (i) long term stability and safety of landforms - the quarry and waste dumps;
- (ii) reinstatement of quarry disturbed lands within the lease areas to a post quarrying landuse capability commensurate with the surrounding grazing land use;
- (iii) measures to minimise the impacts of quarry development on surrounding land use during the mine life, including:
  - erosion control;
  - tree screening to reduce visual impact;
  - eradication of noxious weeds and vermin.

? iv) *water resources*  
The Company's land at Carwell Creek is predominantly grassland with remnants of native tree and shrub growth. Scattered trees occur mostly in the steeper parts of the lease areas comprising remnants of the original eucalypt dry sclerophyll forest. Some natural regeneration of trees and shrubs has occurred in parts of the Company's land which were originally cleared for grazing.

The land immediately to the north, southeast and northwest of the No. 2 Quarry is part of the Carwell property. Carwell homestead is situated 1.3 km to the northwest of the quarry and can be seen from the quarry. The Carwell land near the quarry is predominantly cleared and fenced and used for grazing of stock. The Horner residence 700 m to the west of No. 2 Quarry and on the other side of Carwell Creek is the closest homestead and can also be seen from the quarry. Sheep and cattle graze on this property in the general vicinity of the quarry. South of No. 3 Quarry is the Fittler property, a small grazing property owned by the Company.

Negotiations with the owners of the Carwell property have taken place over a period of 10 years, concerning the effects of the Company's quarrying activities on the environment of the Carwell property. Specific concern was for the northern extension of No. 2 Quarry within the Mining Lease 1169. A legal document, agreed to by both parties in 1986, has resolved any potential conflicts arising from quarrying activities on No. 2 Quarry. The agreement required the Company to undertake certain rehabilitation and environmental control procedures including:

- to limit its quarrying expansion to the present extension and not to apply for any additional mining leases over the Carwell property.
- to construct a fence and gates around the areas of the proposed extension.



- to plant and maintain a tree screen in the buffer zone around the perimeter of the area to be fenced.
- to comply strictly with conditions of all mining or mineral leases held which affect Carwell.
- to retain Australian Groundwater Consultants Pty Ltd to review the effects of quarrying on groundwater. Any recommendations made are to be followed by the Company.
- to discharge water pumped from No. 2 Quarry on to the Carwell property.
- to equip a bore on the proposed lease area to provide stock water.

These procedures are being adhered to by the company.

Rehabilitation of quarry disturbed areas is undertaken in accordance with the prescribed conditions of the mining leases and as recommended by the Soil Conservation Service. Detailed rehabilitation is presented in subsequent Sections of the Management Plan.

On the completion of quarrying, No. 2 Quarry will remain as a benched water-filled depression in the southern part, with the northern end partly filled and re-contoured. There will be insufficient waste material to completely backfill and re-contour the whole quarry site. Some rehabilitation of berms will be undertaken. The adjoining landowners (Messrs Coggins) who will ultimately assume control of the No. 2 Quarry area under an agreement with the Company, have expressed a desire that the No. 2 Quarry be retained as a water storage.

There are two out-of-pit overburden dumps, termed the Eastern Overburden Dump and the Western Overburden Dump. Progressive rehabilitation has been undertaken at both dumps. The Western Overburden Dump is defined with an area for selective storage of low grade limestone potentially suitable for later blending with product limestone. Low grade limestone in excess of standing requirements and other waste comprising footwall conglomerate and dolomite, comprise the majority of material to be emplaced in the southern area of the Western Overburden Dump and subsequently rehabilitated. This low grade limestone is however not sterilised from future reuse if required.

Once the northern end of No. 2 Quarry is mined out, waste emplacement will proceed extending from the Eastern Overburden Dump and partially infilling the void of the pit. This infilling will be progressively contoured and rehabilitated.

## **1.9 MANAGEMENT AND IMPLEMENTATION**

This Management Plan has been prepared from information supplied by the Company and their geological consultants.

The Mining Manager for Australian Cement Limited at Kandos (Mr Laurie Ireland) has direct responsibility for rehabilitation and environmental management of the Company's Carwell mining leases.



The following personnel provided input to the preparation of the Management Plan:

- Mr A. Prince - Quarry Superintendent, Australian Cement Limited at Kandos
- Mr G. Lee - Mining and Geological Consultant, Peter H. Stitt & Associates Pty Ltd

Mr G.J. Summerhayes (B.Appl.Sc., M.Env.Sc.), Senior Environmental Geologist with R.W. Corkery & Co. Pty Limited, compiled the Management Plan. This involved field investigations during 1988, review of environmental monitoring procedures and results, and review of rehabilitation programmes.

This Management Plan refers to, and incorporates information previously reported by:

- Wilkinson-Murray Consulting Pty Ltd (1980) relating to noise, blasting and dust monitoring;
- Australian Portland Cement Limited (1985) relating to environmental assessment of quarrying activities;
- Peter H. Stitt and Associates Pty Ltd (1984 and 1987) with respect to detailed reserve estimates and long term quarry development of No. 3 Quarry and No. 2 Quarry;
- Australian Groundwater Consultants Pty Ltd (1987) with respect to groundwater and hydrogeological assessment;
- Longworth and McKenzie Pty Ltd (1987) with respect to an environmental assessment of crushing activities.

The following government authorities will be consulted throughout the implementation of the Management Plan:

Department of Minerals and Energy  
State Pollution Control Commission  
Soil Conservation Service  
Department of Water Resources  
Rylstone Shire Council



## SECTION 2

### QUARRYING OPERATIONS

#### 2.1 QUARRYING OBJECTIVES

The Carwell Creek Limestone deposits are situated approximately 5 km due west from Kandos. Plan 1 shows the local setting of the Company's land and Plan 2 the extent of the Company's mining tenements over the deposits.

The following statements on quarrying objectives, reserves and quarry development are sourced from reports by the Company's geological and mining consultants (Peter H. Stitt and Associates Pty Ltd), namely:

- Report No. 4/84 - "Submission to the Department of Mineral Resources for Quarrying Approval in the proposed No. 3 Limestone Quarry at Carwell Creek, Kandos, N.S.W. June 1984.
- Report No. 18/87 - "Submission to the Department of Mineral Resources for future quarrying in the existing No. 2 Limestone Quarry at Carwell Creek, Kandos, N.S.W." November 1987.

These two reports present a detailed and comprehensive assessment of reserves and for the Company's plans for the long term quarry development for the next 56 years.

These reports provide a benchmark for future development. The status of proven reserves and of projections of quarry development reported in this Management Plan, is therefore that of November, 1987 in the case of No. 2 Quarry.

Plan 3 displays the site layout of the Company's principal quarrying operations. Three existing quarries are shown:

- No. 1 Quarry is disused (see Plate 1). Further limestone reserves are possible here, but there are no plans for quarrying.
- No. 2 Quarry is currently worked (see Plate 2).
- "Old Charbon Quarry" is disused. The quarry located is south of Carwell Creek within PML 27 and PML 37. The Company has lodged a mining lease application (MLA 294) over the "Old Charbon Quarry" and further development of limestone is considered a long term proposition in this area.

Notations on Plan 3 indicate the Company's long term planning for quarrying and rehabilitation at Carwell Creek.

The No. 1 Quarry, the "Old Charbon Quarry" and the "Ironstone Area" all contain additional resources of Carwell Creek Limestone which have as yet not been fully quantified, nor have detailed extraction plans been prepared.



Mining Lease 1169 was granted on the 8th July 1986 to allow for the orderly extension of the active No. 2 Quarry face in a northerly, westerly, and to a lesser extent, easterly direction. The lease extended the life of the No. 2 Quarry to a minimum of 36 years.

The proposed southerly extension of No. 2 Quarry, designated the No. 3 Quarry, is illustrated on Plan 3. Development consent and mining lease(s) have been granted for the No. 3 Quarry. Plate 3 provides a view of the No. 3 Quarry area proposed.

It is the Company's intention to continue quarrying in No. 2 Quarry, using a conventional benched quarry operation, until all mineable reserves are exhausted. No. 2 Quarry will be worked to completion while retreating to the south.

Initially waste is to be dumped out-of-pit, but later waste overburden will be returned to the worked out northern end of the No. 2 Quarry.

In the final 5 years of operating No. 2 Quarry it is proposed to progressively open No. 3 Quarry by developing the 618 m and 604 m benches. This will allow the orderly progression of quarrying from No. 2 Quarry to No. 3 Quarry. Disposal of waste rock from No. 3 Quarry development would continue to the northern end of No. 2 Quarry and the Western Overburden Dump.

The reserves of high grade and low grade limestone are presented under Section 2.2.3. In practice, both materials will be identified, selectively utilised and blended to provide a suitable cement making limestone with  $\text{CaCO}_3$  of 80 per cent.

Run-of-quarry materials are loaded by front-end loaders into quarry haul trucks for transport to either the crushing plant adjacent to the No. 1 Quarry or to overburden dumps. The distance from the north end of No. 2 Quarry to the crusher is approximately 2.7 km along the internal private quarry haul road. Waste removal and disposal is generally undertaken in campaigns throughout the year.

## **2.2 LOCAL GEOLOGY AND LIMESTONE RESERVES**

### **2.2.1 Geology**

The Carwell Creek Limestone is regionally described by Lishmund et al, 1986, as being associated with rocks of the Tabberaberan Tectonic Stage, of early to middle Devonian age. The deposit is part of the Kandos Formation which comprises limestone, limestone pebble conglomerate, sandstones, calcareous shales, and tuffs with none of the units having any great areal extent. The rocks are moderately deformed and dip to the west. The limestone is partly recrystallised and some dolomitization has occurred.

Geological mapping and an extensive programme of diamond drilling drill holes has delineated the deposit within the Company's leases (particularly of the No. 2 Quarry area) for the purposes of quarry planning. Three geological sections are displayed on Plan 4. The sections are representative of:



- the northern end of No. 2 Quarry;
- the southern extent of the No. 2 Quarry; and
- the southern end of the proposed No. 3 Quarry.

The limestone crops out on the eastern and western limbs of a major anticline, with secondary folding and faulting. Beneath the Carwell Creek Limestone, and forming the footwall on the eastern side of No. 2 Quarry, is a conglomerate unit.

The Carwell Creek Limestone varies between 75 and 100 m true thickness. It varies from thinly bedded towards the top and bottom of the unit, to massive near the middle. Minor shale and siltstone units are interbedded. This unit is currently being quarried for "high grade" limestone.

Fault displacement of high grade limestone in the Carwell Creek Limestone unit in the northern end of No. 2 Quarry has caused a repetition of the stratigraphic sequence. As a consequence the quantity of limestone available for quarrying is increased above that which would have been otherwise available from a simple dipping limestone bed.

Overlying the Carwell Creek Limestone is a unit of calcareous shales with interbedded tuffs and limestones. The unit forms the hanging wall on the western side of the No. 2 Quarry. A quantity of it is to be stripped to give access to high grade limestone on the lower benches of the quarry. These calcareous shales are used as "low grade limestone". All units dip to the west at between 35° and 60°.

The stratigraphic succession within the quarry sequence from foot wall to hanging wall is set out in Table 2.1.

### 2.2.2 Quarry Materials Characterisation

The chemical requirements for limestone feed to the raw mix for the Company's cement plant are generally:

CaCO <sub>3</sub>	80 per cent
MgCO <sub>3</sub>	2.5 per cent (maximum)
Al <sub>2</sub> O <sub>3</sub>	2.0 per cent (maximum)
SO <sub>3</sub>	0.4 per cent (maximum)

In addition, phosphorous and flourine should be low.

Table 2.2 sets out the typical chemical variations with respect to CaCO<sub>3</sub>, MgCO<sub>3</sub>, Al<sub>2</sub>O<sub>3</sub> for the four main rock types which occur in the quarry sequence within No. 2 Quarry, that is tuff, claystone, calcareous shale (low grade resource) and limestone (high grade resource).

The variation in chemical characteristics from one unit to another dictates to a large extent quarry planning and selective handling/mining to optimise the limestone feed mix. Knowledge of these chemical characteristics allow for maximum utilisation of the quarried resource.



TABLE 2.1

Stratigraphic Succession within Quarry Sequence

Unit	Typical Thickness (m)	Lithological Description		Comments
Conglomerate	-	Forms the footwall to the highgrade limestone. Composed of grey, green and brown shale and chert pebbles in brown or grey sandy and silty matrix. Pebbles range from 5 to 60 mm.	<p>OLDEST (Footwall)</p> <p>Carwell Creek Limestone</p> <p>YOUNGEST (Hanging Wall)</p>	Only top section of unit intersected by drilling.
× Limestone 1 (high grade)	20 - 40	Generally +90 % CaCO <sub>3</sub> . Massive to well bedded, dark grey to pale buff-grey in the more massive beds. The unit is often highly fossiliferous, possibly reefal.		Unit tends to increase in thickness towards the north, where it has a true thickness of approx. 100 m.
Claystone	1 - 2	White to pale grey, slightly to non-calcareous with calcite veins. Unit is reasonably persistent.		
× Limestone 2 (high grade)	25 - 40	As for Limestone 1 (high grade) unit.		
Claystone	1 - 2	Pale grey, massive, non-calcareous with only minor calcareous zones. Occurs only at northern end of quarry.		
Calcareous Shale 1	15 - 25	Well bedded grey to dark grey calcareous shale. Sometimes highly fossiliferous. Unit generally grades 50-60% CaCO <sub>3</sub> . In some holes is transitional to underlying high grade limestone over distance of up to 5 m.		
Tuff 1	10	A graded tuffaceous bed with angular clasts up to 50 mm diameter. Pale grey. Often calcareous at base with some limestone in calcareous matrix, but grades up to non-calcareous with feldspar and quartz fragments.		
Calcareous Shale 2	5 - 7	As for Calcareous Shale 1 unit.		
Tuff 2	5 - 7	As for Tuff 1, but fine grained and with lower carbonate content. Unit grades up into overlying shale.		
Calcareous Shale 3	-	As for Calcareous Shale 2 unit except this unit includes some beds locally referred to as "flaggy limestone" which contains 60 to 80% CaCO <sub>3</sub> .		Only bottom section of unit intersected by drilling.



TABLE 2.2  
Chemical Variation in Major Rock Units Within No. 2 Quarry\*

Rock Type Component	Tuff	Claystone	Calcareous Shale	Limestone (high grade)
CaCO <sub>3</sub>	21.5	11.6	56.0	91.8
MgCO <sub>3</sub>	2.6	3.2	3.5	1.9
Al <sub>2</sub> O <sub>3</sub>	9.7	12.6	5.9	1.0
SO <sub>3</sub>	0.4	0.5	0.9	0.2

\*All values are mean percentages

The following points are noteworthy:

- The **tuff** is typically low in CaCO<sub>3</sub> and high in Al<sub>2</sub>O<sub>3</sub> and generally undesirable for cement making.
- The **claystone** is not ideal cement making material due to MgCO<sub>3</sub> and SO<sub>3</sub> contents but it is a relatively small component of the quarry sequence and difficult to selectively mine and reject.
- The **calcareous shale** averages 56 per cent CaCO<sub>3</sub> but varies in the range 32 to 75 per cent. The MgCO<sub>3</sub> and sulphur is preferentially removed in the weathered surface material and therefore provides top quality low grade blending material which can be selectively mined.
- The surface calcareous shale does exhibit variation due to the variable presence of clay zones. SO<sub>3</sub> content, present as pyrite, is more persistent in the darker grey carbon rich shales.
- The **limestone** is typically high grade and of consistent high purity.

It is pointed out that "low grade", for reserve estimation purposes, comprises a blend of tuff, claystone and calcareous shale, as it would be recovered by non-selective mining of all overburden on the high grade limestone.

### 2.2.3 Reserves

Reserves within the Carwell Creek Limestone deposit have been established by comprehensive and detailed geological investigation undertaken by Peter H. Stitt and Associates Pty Ltd, the Company's geological and mining consultant. Sufficient geological knowledge is available for both the No. 2 Quarry and No. 3 Quarry to state reserves as Proven Reserves as set out by the Aus.I.M.M. guidelines.





- **The No. 2 Quarry**

Reserves of high grade limestone are 18.4 million tonnes with a mean grade of 90.3 per cent CaCO<sub>3</sub> and 2.51 per cent MgCO<sub>3</sub>.

Reserves of low grade limestone are 9.6 million tonnes with a mean grade of 44.3 per cent CaCO<sub>3</sub> and 3.11 per cent MgCO<sub>3</sub>. This reserve includes all rock types occurring as overburden to the high grade limestone, both weathered and fresh. Only 5.3 million tonnes of low grade limestone will be utilised to blend with high grade limestone.

- **The No. 3 Quarry**

Reserves of high grade limestone are 10.7 million tonnes with a mean grade of 89.0 per cent CaCO<sub>3</sub> and 2.63 per cent MgCO<sub>3</sub>.

Reserves of low grade limestone are 4.0 million tonnes with a mean grade of 41.7 per cent CaCO<sub>3</sub> and 2.54 per cent MgCO<sub>3</sub>. Of this, 2.53 million tonnes will be utilised to blend with high grade limestone.

At the current rate of consumption of 650 000 tonnes per annum, proven reserves of limestone would be sufficient for 56 years of cement production - comprising 36 years of mining at the No. 2 Quarry to completion, and subsequently 20 years of mining at the No. 3 Quarry to completion.

There are other reserves of limestone within the Company's leases at Carwell Creek and further high grade limestone within the old No. 1 Quarry. There are, however, no long term plans to develop these and this Management Plan addresses only proven reserves sufficient for needs at least until the year 2040.

## 2.3 QUARRYING METHOD AND SEQUENCE

Operations commenced in No. 2 Quarry during the early 1950's with the quarrying of outcropping high grade limestone. Subsequent development has been undertaken using conventional benched open cut quarrying up to the present.

Quarrying, that is the excavation and removal of overburden and high grade limestone, is undertaken by drilling and blasting, excavation and loading to haul trucks. Table 2.3 provides a list of current quarrying equipment.



**TABLE 2.3**  
**Quarrying Equipment - Carwell No. 2 Quarry**

Equipment	Function	Noise Level dB(A) at 7 m
<u>Loaders</u> 1 x Clark 275C 1 x Komatsu WA600	excavation, loading trucks	84-87
<u>Rock Drills*</u> 1 x Gardner-Denver HDC-F 1 x Atlas Copco 601	pre-blast rock drilling	81-85
<u>Rock Breaker</u> 1 x Broom Wade 160 CFM compressor and jackhammer	breaking large rocks	88
<u>Trucks</u> 5 x Diamond T haul trucks 1 x 35 t Euclid dump truck 1 x 30 t Euclid dump truck	hauling limestone transporting and tipping of low grade and overburden	- -
<u>Water Cart</u> 1 x Euclid (20,000 l)	road watering	-

\*Fitted with down the hole hammer

Representative sections through the No. 2 Quarry and No. 3 Quarry are shown on Plan 4. These sections indicate final pit limits and the location of exploration drill holes used to establish overburden to limestone ratios for future quarry planning.

Plan 5 and Plan 6 show the development of No. 2 Quarry and No. 3 Quarry respectively to completion of proven mineable reserves.

The quarry plans have been prepared using design criteria based on current practice in the No. 2 Quarry. These criteria are presented in Table 2.4.



**TABLE 2.4**  
**Quarry Design Criteria**

Bench Face Height (max.)	14 m
Face Slope	25° from vertical
Berm Widths	5 m
Completed Face Height and Slope (hanging wall)	14 m at 25°
Completed Face Height and Slope (footwall)	28 m at 45°
Haul Road Width	15 m
Haul Road Gradient (max.)	1 in 15
Ramps Width (between benches)	15 m
Ramps Gradient (max.)	1 in 10

Haul roads and ramps are located in the hanging wall because of greater stability of the exposed ends of dipping rock strata, as opposed to the dip slope on the footwall with inherent weakness in dipping bedding planes.

Development of the northern end of No. 2 Quarry will experience high overburden ratios on top benches which will however be compensated by more favourable ratios on lower benches and by simultaneous production from a number of benches. In the southern half of the No. 2 Quarry the natural surface falls away to the west following the dip of overlying overburden, thereby maintaining favourable overburden ratios.

In the No. 3 Quarry the natural ground surface rises to the west and western advancement of the quarry wall significantly increases overburden ratios.

### **No. 2 Quarry Development**

Table 2.5 provides a bench by bench assessment of the No. 2 Quarry development showing the utilisation of high grade and low grade limestone.

This is summarised for the whole No. 2 Quarry as:

18.4 million tonnes of high grade

5.3 million tonnes of low grade

to give 23.7 million tonnes of 80 per cent CaCO<sub>3</sub> and 2.68 per cent MgCO<sub>3</sub>

It is anticipated that this should be sufficient for 36 years supply at the current consumption of 650 000 tonnes per annum.

Table 2.5 shows that on completion of No. 2 Quarry 4.3 million tonnes of low grade limestone will remain unutilised.



**TABLE 2.5**  
**No. 2 Quarry Development**

Bench (m,AHD)	Tonnes of High Grade Limestone Produced	Tonnes of Low Grade Consumed to make 80% CaCO <sub>3</sub> Production	Tonnes of Low Grade Stockpiled*	Cumulative Tonnes of Low Grade Stockpiled
+ 618	Nil	Nil	105 000	105 000
618-604	452 000	130 000	1 282 000	1 387 000
604-590	2 001 000	577 000	2 547 000	3 934 000
590-576	4 834 000	1 395 000	1 650 000	5 584 000
576-564	5 524 000	1 594 000	-82 000	5 502 000
564-552	5 557 000	1 603 000	-1 176 000	4 326 000
Subtotal	18 400 000	5 300 000		
Total 80% CaCO <sub>3</sub> Product = 23 700 000 tonnes				
Plus other waste rock				1 100 000
Total rock not utilised				5 426 000

\*Note: Negative values indicate requirements are drawn from stockpiles for blending.

**TABLE 2.6**  
**No. 3 Quarry Development**

Bench (m,AHD)	Tonnes of High Grade Limestone Produced	Tonnes of Low Grade Consumed to make 80% CaCO <sub>3</sub> Production	Tonnes of Low Grade Stockpiled*	Cumulative Tonnes of Low Grade Stockpiled
+ 618	316 000	74 000	501 000	501 000
618-604	1 240 000	288 000	1 340 000	1 841 000
604-590	2 424 000	570 000	833 000	2 674 000
590-576	2 988 000	702 000	-276 000	2 398 000
576-564	2 246 000	528 000	-528 000	1 870 000
564-552	1 540 000	362 000	-362 000	1 508 000
Subtotal	10 750 000	2 530 000		
Total 80% CaCO <sub>3</sub> Product = 13 280 000 tonnes				
Plus other waste rock				528 000
Total rock not utilised				2 036 000

\*Note: Negative values indicate requirements are drawn from stockpiles for blending.



The aim of the Company's quarry development is therefore selective extraction and handling of low grade overburden rocks and selective emplacement of the available material discarded. In particular, the surface or weathered low grade limestone is premium quality blending material and its utilisation will be maximised.

It is also notable that an allowance has been made for removal of 240 000 m<sup>3</sup> of soil material (as topsoil and clay from limestone caverns) to be subsequently utilised for rehabilitation.

### **No. 3 Quarry Development**

Table 2.6 provides a bench by bench assessment of the No. 3 Quarry development. This is summarised for the whole No. 3 Quarry as:

10.75 million tonnes of high grade  
2.53 million tonnes of low grade  
to give 13.28 million tonnes of 80 per cent CaCO<sub>3</sub> and 2.1 per cent MgCO<sub>3</sub>

It is anticipated that this should be sufficient for 20 years supply at the current consumption of 650 000 tonnes per annum.

Table 2.6 shows that on completion of No. 3 Quarry 1.5 million tonnes of low grade limestone will remain unutilised.

An allowance has been made for removal of 184 000 m<sup>3</sup> of soil (as topsoil and clay from limestone caverns) and 182 000 m<sup>3</sup> of alluvial deposits (clay and silt) from the northern end of No. 3 Quarry. The soil and alluvial material will be used for subsequent rehabilitation.

## **2.4 WASTE ROCK DISPOSAL**

### **2.4.1 Materials Characterisation and Quantities**

Waste rock excavated during the quarrying operations and subsequently disposed of can be variously termed:

- (i) overburden comprising rock units (tuff, claystone and calcareous shale) grouped under the term "low grade limestone", which is in excess of blending requirements to produce cement raw material;
- (ii) other waste comprising footwall conglomerate and dolomite.

Note that soil material (as topsoil and clay encountered in limestone caverns) and alluvial material (silt and clay encountered in the northern extremity of No. 3 Quarry) is not classified as waste, but is selectively handled and stockpiled for subsequent rehabilitation.



### Overburden Waste

Chemical characterisation of overburden waste is reported earlier in Section 1.3.2. The weighted mean grade for overburden waste is 44.3 per cent  $\text{CaCO}_3$  and 3.11 per cent  $\text{MgCO}_3$ . Some of the overburden waste can be identified as unsuitable for cement raw material and will be selectively dumped. Since low grade limestone will be generated at a level in excess of requirements, there is sufficient scope to reject stone high in  $\text{MgCO}_3$ ,  $\text{SO}_3$  and  $\text{Al}_2\text{O}_3$ . On completion of quarrying in No. 2 Quarry it can be expected that approximately 4.3 million tonnes of low grade limestone will remain unutilised in waste dumps. This material could be available for blending with high grade production from another quarry at some future date. Similarly at completion of quarrying in No. 3 Quarry, it can be expected that 1.5 million tonnes of low grade limestone will remain unutilised in waste dumps.

### Other Waste

Footwall conglomerate underlies the Carwell Creek Limestone. It is estimated that some 1 million tonnes of this material will be removed from No. 2 Quarry to create berms on the quarry footwall, and to gain access to the eastern most limestone block in the lower levels.

It is estimated that 0.5 million tonnes of footwall conglomerate will similarly be removed from the No. 3 Quarry.

Dolomite has been identified in drilling along the (western) hanging wall of No. 2 Quarry in an area disturbed by faulting. An allowance has been made for 100 000 tonnes of dolomite (containing 10 per cent or more of  $\text{MgCO}_3$  to be dumped as waste.

## 2.4.2 Waste Disposal Sequencing

### No. 2 Quarry

The waste rock disposal sequence for No. 2 Quarry will be to dump material removed from the northern end of the quarry on the Eastern Overburden Dump (see Plate 4) and material removed from the western side on the Western Overburden Dump, locations of which are shown on Plan 7 and 8 respectively.

Premium quality low grade limestone not used immediately for blending is stockpiled at the northern end of the Western Overburden Dump (See Plan 8 and Plate 5).

Other waste rock is dumped in the southern end of the Western Overburden Dump, from where recovery is impossible (see Plate 6).

Overburden waste, potentially suitable for cement manufacture but in excess of No. 2 Quarry blending requirements, is dumped in the accessible main areas of the Eastern and Western Overburden Dumps.

The Eastern Overburden Dump is shown in detail on Plan 7 showing the surface contour of the dump upon completion. This has a capacity of 2.1 million tonnes of waste from the northern half of No. 2 Quarry.



The Western Overburden Dump is shown in detail on Plan 8 showing the surface contour of the dump upon completion of its maximum capacity of 4.5 million tonnes. Waste placed in this dump is anticipated to be 3.3 million tonnes. The Western Overburden Dump therefore affords excess capacity as a contingency.

### **No. 3 Quarry**

Approximately 2 million tonnes of waste rock (comprising overburden waste and other waste) generated from the No. 3 Quarry development will be disposed of within the northern end of the worked out No. 2 Quarry.

## **2.5 REHABILITATION AND SOIL MANAGEMENT**

### **2.5.1 Quarry Areas**

On completion of quarrying, the No. 2 Quarry will remain as a benched depression in the southern part, with the northern end partly filled and re-contoured. There will be insufficient material to completely re-contour the whole quarry site.

Plan 7 shows contours of the No. 2 Quarry after rehabilitation. The northern end will be partially infilled with waste rock and re-contoured so that all in-pit slopes are less than 1 in 4 and blend with the natural landscape.

Around this northern perimeter and along the western side, sufficient room has been allowed for a tree screen and access road within the fenced boundary of the mining lease. This tree screen and access road are included as part of an approximate 50 m barrier.

The southern end of No. 2 Quarry will merge with the No. 3 Quarry. On completion of quarrying these will remain as a benched water filled depression. It is anticipated that water will rise to about 580 m level before overflowing into the valley north of No. 2 Quarry. That is, the quarry floor will contain water to a depth of approximately 28 m.

The depth to which the void will fill with water is yet to be confirmed from ongoing groundwater studies although it is predicted that it will stabilise at approximately 580 m AHD.

It is anticipated that the walls of the quarries will remain geotechnically stable. Spreading of soil and planting of native trees and shrubs will be undertaken on the berms of the completed quarry. This rehabilitation will take place on the 590, 604 and 618 m berms only and above the anticipated 580 m water level.

### **2.5.2 Waste Dumps**

The objective of rehabilitation of the waste dumps is to provide a stable, erosion free landform, by progressively topsoiling and sowing with grass cover, as final configuration is reached. The rehabilitation of the Eastern overburden Dump will be final priority.



### **Eastern Overburden Dump**

Rehabilitation of the Eastern Overburden Dump is partially completed (see Plate 7). Plan 7 shows the final dump surface will be contoured to slopes not exceeding 1:3 (vertical:horizontal) and blend into the surrounding landscape as shown. Plan 9 shows an idealised section through the completed dump. The out-of-pit dumping will continue, progressing to the west and extend as in-pit dumping, thus partially filling the worked out north eastern corner of the No. 2 Quarry. Drainage from this dump will be directed into the existing quarry and handled through the quarry pumping system which is eventually discharged to Orchard Creek.

### **Western Overburden Dump**

Rehabilitation of some areas of the Western Overburden Dump is already completed (see Plans 3 and 8 and Plate 8). Rehabilitation of subsequent areas will be undertaken progressively in campaigns throughout the remaining life of No. 2 Quarry. Soil is to be prestripped ahead of the advancing dump.

Slopes will generally be less than 1:3 (vertical:horizontal). However the southern-most slope of the dump will be similar to (approximately 1:2 (vertical:horizontal)) the slope of the natural ground on either side of the completed dump.

Waste will be tipped along the advancing face at the angle of repose until completion. This slope will then be rounded off at the crown by bulldozer and soil pushed over the face. Broadcast seeding of grass and native shrubs will then be undertaken. Plan 9 provides an idealised section through the completed dump.

It is to be noted that the final landform in Plans 7 and 8 assumes the worst case of total capacity of the dumping area being realised. Should the actual volume dumped be substantially less over the quarry life, the same rehabilitation procedures will be employed, but final heights will be reduced.

The planned configuration of the Western Overburden Dump will allow the placement of low grade limestone at the northern end (see Plan 9). This would enable later retrieval of the material if required.

### **2.5.3 Soil Management**

Soil material to be stockpiled for subsequent rehabilitation use comprises:

- (i) topsoil prestripped from quarry development and from beneath advancing overburden dump areas where available;
- (ii) alluvial material (silt and clay) to be removed from the northern end of proposed No. 3 Quarry;
- (iii) clay material from limestone caverns encountered during quarry development and selectively handled.





Soil samples were taken at three sites to determine soil nutrient status. The sites were:

- Site 1: topsoil stockpiled on the ridge west of the No. 2 Quarry.
- Site 2: quarry clay stockpiled on the Western Overburden Dump.
- Site 3: topsoil stockpiled on the Western Overburden Dump.

Plan 3 shows the location of the sampling sites and the analytical results are shown on Table 2.7. Soil nutrient status of the soils indicate:

- all soils and clay are deficient in phosphorous and may be improved by fertiliser application of 250 kg/ha of Single Superphosphate;
- all soils and clay are high in calcium carbonate (as would be expected) and need no lime;
- the pit clay and waste dump topsoil is deficient in organic matter and may be improved with fertiliser application of 125 kg/ha of Nitram;
- all soils have neutral pH and acceptable balance of exchangeable cations;
- the status of all trace metals in soils and clay is adequate.

**TABLE 2.7**  
**Soils Nutrient Status**

Site *	Site 1 Quarry Topsoil	Site 2 Quarry Clay	Waste Dump Topsoil	Ideal Criteria
Nitrate ppm	35	2	3	>20
Phosphorus ppm	13	8	10	35-40
Potassium ppm	475	214	324	>150
pH in Water	6.9	7.8	7.2	6.5-7.0
pH in CaCl <sub>2</sub>	6.6	7.3	6.8	6.5-7.0
Sodium meq%	0.7	0.7	0.7	1-2
Potassium meq%	8.6	3	5.9	2-5
Calcium meq%	83.7	90	81	65-80
Magnesium meq%	7	6	12	10-15
Aluminium meq%	<0.05	<0.05	<0.05	<1
CEC meq%	14.3	21.1	13.5	
Ca/Mg Ratio	12	14.6	6.9	>2:1
Exch Sodium %	0.69	0.71	0.74	
Organic Matter %	2.47	1	2.48	>3
TSS %	0.038	0.031	0.014	<0.06
Copper ppm	1.8	1.4	1.4	0.3-5.0
Zinc ppm	2.2	1	1.2	0.3-10.0
Iron ppm	26	11	21	2-100
Manganese ppm	5	6.2	10	2-50
Boron ppm	0.2	0.2	0.2	>0.5

\*See Plan 3 for site location

The clay material from the quarry will provide an adequate top dressing material for rehabilitation purposes with the addition of fertilisers at the rates mentioned above.



All soil material is stored in stockpiles and windrows no greater than 1 m in height.

#### 2.5.4 Revegetation

Revegetation procedures used on site involve:

- (i) shaping to final contours;
- (ii) tyning of the surface to 0.15 m depth;
- (iii) application of fertiliser and topsoil to a depth of 0.15 m;
- (iv) sowing of grass species, according to the recommended sowing rate shown in Table 2.8;
- (v) topsoil spreading and grass sowing is to be undertaken in campaigns during autumn months.

Plate 7 and Plate 8 provide views of established revegetation on overburden dump areas.

**TABLE 2.8**  
**Revegetation Programme**  
**Grass Species and Sowing Rates\***

Species	Sowing Rate kg/ha
<u>Legumes</u>	
Subterranean Clover ( <i>Woogenellup</i> )	8
White Clover ( <i>Haifa</i> )	0.5
<u>Grasses</u>	
Phalaris ( <i>Serossa</i> )	1
Cocksfoot ( <i>Carrie</i> )	2

\* Reference: Pastures for the Central Tablelands (Draft) - Soil Conservation of New South Wales

In 1987-88 the Company undertook a programme of tree planting around the perimeter of the mining lease north of No. 2 Quarry. The trees have been planted in two rows at 5 m spacing. Tree species planted were recommended by the Forestry Commission. Yellow box (*Eucalyptus melliodora*) and *Melaleuca wilsonii* have been most successfully planted with heights averaging 1 to 2 m.

This tree planting programme was in satisfaction of the Company's agreement with the landowners of the adjoining Carwell property. The trees provide a vegetative screen to the extension of the No. 2 Quarry north and west. The trees will be maintained and



supplemented throughout the quarry life. Further planting will be undertaken particularly on the northern ridge once the quarry limit has been established.

Native trees and shrubs will to be planted on berms as the quarry attains final configuration.

### **2.5.5 Eradication Programmes**

The Company regularly undertakes programmes for the eradication of noxious weeds within the mining lease area in accordance with the requirement of the Pastures Protection Board.

Over the last 5 years an average of \$4 000 per annum has been expended by the Company on spraying of noxious weeds, in particular blackberry and St. John's Wort. Rabbit eradication is also undertaken.

These programmes will continue on an as required basis throughout the remaining quarry life.



## SECTION 3

### CRUSHING OPERATIONS AND INFRASTRUCTURE

#### 3.1 INTRODUCTION

The quarry crushing site is located adjacent to the disused No. 1 Quarry, at Carwell Creek some 4.5 km west of the township of Kandos (see Plans 1 and 2). Vegetation surrounding the site is mostly remnant native bushland with some areas of scattered timber and grazing land to the northeast. The old No. 1 Quarry is cut into the wall of a small valley formed by Carwell Creek in a topographically hilly terrain. The population density of the area is low and nearby residences (other than those owned by Australian Cement Limited) are no closer than 2.5 km from the crushing site.

Within the Company's property itself are situated ten residences at distances ranging from 150 m to 900 m from the plant. These residences are owned by the Company and occupied by Company employees and their families. The closest nine residences are all within 300 m of the plant and have no noise-attenuating landforms between them and the plant.

#### 3.2 CRUSHING OPERATIONS

Supply of crushed stone from the Carwell Creek area to the cement works commenced in 1916 after completion of the first aerial ropeway. Greater mechanisation was introduced to the crushing facilities at No. 1 Quarry over the years with a Traylor Crusher and a second aerial ropeway installed in 1923.

The production of stone from No. 1 Quarry was phased by 1960. The facilities at No. 1 Quarry, including crushing, workshops and offices and aerial cableways saw a gradual evolutionary change in procedures.

During 1988 significant revisions to operating practices at the crushing site were undertaken with the installation of a new secondary crusher and screen, and a reclaim conveyor system for the stockpile. Plan 10 provides a flowsheet for current crushing, screening and materials handling. Plan 10 also shows the layout of the crushing plant. Normal limestone production through the crusher is approximately 4 000 tonnes per week. Plate 9 shows the crushing plant and delivery of limestone by trucks from the quarry.

The upgrading introduced in 1988 entailed maintaining the production of limestone of 650 000 tonnes per annum while reducing working hours from 7.00 am to 6.00 pm, 7 days per week, to essentially a five day forty hour week, 7.30 am to 4.00 pm. Contingency crushing and aerial cableway transport of materials may be undertaken occasionally when necessary from 6.00 am to 6.30 pm, 7 days per week.



During 1989 the Company proposes to undertake major maintenance of the sixty year old aerial cableway system. It is anticipated this maintenance will include a cableway replacement, at the cost of \$12 million, and increase in bucket numbers to 180.

### **3.3 INFRASTRUCTURE**

#### **3.3.1 On-site Facilities**

Other facilities at the No. 1 Quarry site include vehicle maintenance workshops, offices and employees amenities buildings.

#### **3.3.2 Water Supplies**

Water supply for the crushing plant, office amenities and domestic use of Carwell residences is provided by a well adjacent to the bed of Carwell Creek.

Water is pumped from the well to a 75 000 litre capacity holding tank. The water is then gravity fed for use in:

- wet scrubbers and sprays at the crushing plant;
- cooling water for the primary crusher;
- showers and toilets;
- road watering.

The crushing plant is supplied with water at the rate of 4 000 litres/hour.

#### **3.3.3 Aerial Cableway**

Transport of crushed limestone from the quarry to the cement works is solely via the two existing aerial cableways, a distance of approximately 4.5 km. The location of the cableways and cement works is shown on Plan 1. No limestone is trucked out of the quarry.

#### **3.3.4 Road**

Vehicular access to the quarries is via the local road network and private roads as shown on Plan 1. Access from the south and east is via the main Kandos-Ilford road and then Quarry Road. Quarry Road is a public road until it reaches the eastern boundary of ACL's mining lease area, where for a distance of approximately 2 km, it links up with a private road traversing ACL property.



The main quarry entry is off this section of private road. This entry links up with the internal network of quarry roads within the immediate quarry area.

North of ACL's mining lease area, Quarry Road continues to its junction with Cudgegong Road. Access to the quarries from the west and north then is via Cudgegong Road, Quarry Road and the stretch of APCL road. This route however, is rarely used for access to the quarries.

Traffic movements to and from the quarry therefore involve only the bringing in of supplies and materials necessary for quarrying activities, employee movements (a bus leaves Kandos each morning and returns at night), service calls and visitors. On average there are approximately 15-20 return trips per day. On weekends traffic movements drop to about 5-10 return trips per day.

Quarry Road is unsealed along the majority of its distance. The road formation is however wide and trafficable for all uses under all weather conditions. The road is maintained by the Company to Council's standards.

The Company hold mining tenements over sections of the road below which are possible limestone resources. There are no plans for the development of these resources in the foreseeable future. Should the Company seek to develop these resources (possibly after 2040), the Company will provide alternative access of equivalent standard. Any such proposal would be subject of a separate future development application.

### **3.4 PLANT DECOMMISSIONING AND REHABILITATION**

It is expected that crushing operations, vehicle maintenance and all current activities at the site will continue for the foreseeable future and for as long as limestone is won from the Carwell Creek area.

The limestone resource is finite however, and at some distant time the crushing plant will be decommissioned. The plant will be disassembled and either used at other Company operations or auctioned. Much of the equipment and the site itself may at that time be considered of heritage significance for conservation, and subsequently be left intact.

It is unlikely that rehabilitation of the crushing site to a subsequent grazing landuse would be justifiable, but rather the site will be left in a safe condition and suitable for a future industrial landuse capability.



## SECTION 4

### ENVIRONMENTAL MONITORING AND MANAGEMENT

#### 4.1 OBJECTIVES

Environmental monitoring is undertaken to quantitatively determine the degree of impact the quarrying and crushing operations are having on the surrounding environment. Assessment of these results can establish if environmental management systems are being successfully applied in the short term and if these management systems need to be amended or can be scaled down in the medium to long term.

Appropriate environmental monitoring, apart from satisfying necessary statutory requirements, demonstrates to the local community the Company's continuing commitment to protection of the environment and to minimise impacts upon surrounding landowners.

This Management Plan and subsequent Annual Reports provide a mechanism for presenting and reviewing the results of environmental monitoring. The level of monitoring must however be rationalised against the level of consequential impact likely over the life of the operations.

It is pertinent here to note the Company's long history of quarrying and cement manufacturing in the Kandos area. Throughout this history the Company has fostered commendable community relations by conciliation and where feasible by implementing appropriate control procedures. The local community's expectation of environmental quality is intimately associated with other socio-economic benefits ensuing from the Company's operations at Kandos.

The closest non-Company owned residences to the Carwell Creek quarrying and crushing operations are shown on Plan 1, these are:

- the Horner residence, 700 m west of the No. 2 Quarry limit (see Plate 10);
- the Carwell residence, 1 300 m northwest of the No. 2 Quarry limit (see Plate 11).

#### 4.2 WATER MANAGEMENT

##### Surface Waters

Carwell Creek is the major stream system draining the catchment of the Company's operations. As shown on Plan 1, Carwell Creek flows just south of the crushing plant facility at No. 1 Quarry, before flowing north, on the western side of the No. 2 and No. 3 Quarry areas.



No. 2 and No. 3 Quarry areas are situated on a ridge which slopes down to alluvial flats. Maximum slopes in this section are 15°. This section is drained by Orchard Creek which is a non perennial stream rising to the east. Initially this creek runs west before swinging to the north and joining Carwell Creek about 200 m south of the Cudgegong bridge.

An environmental assessment of the Company's Carwell Creek operations was undertaken in 1980 by Wilkinson-Murray Consulting Pty Ltd. This study also examined water management.

Surface runoff is not significantly affected by the quarry operation. The total catchment above the quarry area is 110 km<sup>2</sup>. The catchment area containing the quarry is 1.1 km<sup>2</sup> or one percent of the total. *So what?*

Water management for quarrying activities is based upon collection of runoff from disturbed quarry areas in a sump within the quarry floor. Decanted water is then pumped to the southern end of No. 2 Quarry and discharged into Orchard Creek via a grassed silt trap. The discharged water fills pools within the creek and recharges to groundwater in dry periods. The Wilkinson-Murray report concluded that discharge would not constitute any adverse impact on downstream users. Indeed the Company's agreement with the owners of the Carwell property recognises the advantages to adjoining landuse of this discharge, especially during dry periods.

The pumping capacity from the quarry sump is currently 40 000 l per hour. This capacity is above normal pumping requirements and pumping is undertaken intermittently on an as required basis. During 1989 the Company proposes to substantially increase this pumping capacity to 130 000 l per hour as a contingency against high runoff events and local flooding of the pit.

The Company recognises that quarry development in the transitional area from No. 2 Quarry south to No. 3 Quarry will need to address the management of flow along Orchard Creek from upstream catchments. Orchard Creek intersects the No. 2 Quarry and proposed No. 3 Quarry. Detailed design of water management structures has as yet not been investigated. Currently, Orchard Creek is diverted by a concrete boxed culvert. It is possible that the drainage line will be further reinforced with a culvert structure and a land bridge remain between Quarry No. 2 and No. 3 to ensure the passage of stream waters. This will be addressed in subsequent Reports on the Management Plan closer to the time of No. 3 Quarry development.

Monitoring of surface water quality was recently undertaken on 29th November 1988 at four sites, shown on Plan 11. The sites were:

- KW-1: on Carwell Creek upstream of the Company's operations;
- KW-2: decanted water discharged from No. 2 Quarry;
- KW-3: on Orchard Creek 200 m downstream from the point of discharge;
- KW-4: on Carwell Creek at the Cudgegong Road bridge, downstream of the Company's operations. Results of analyses are shown on Table 4.1. These results indicate:





- pH for all waters is neutral.
- electrical conductivity of waters upstream and of waters within the quarry is high reflecting the high carbonate content (which is to be expected). The waters downstream are of low salinity and appear unaffected by discharge.
- trace metal concentrations of all waters are well below Schedule II limits of the Clean Waters Act, 1970.
- suspended sediment levels are relatively low and indicate that the pumping and discharge procedures have no impact upon sediment levels of receiving waters.

### Groundwaters

Groundwater investigations programmes in the vicinity of the Company's No. 2 Quarry have been ongoing since 1982, following an agreement between the Company and the Carwell property owners to retain Australian Groundwater Consultants Pty Ltd (AGC).

The objective of the groundwater investigations is to assess the impact of long term quarrying on local groundwater levels, particularly the integrity of water supplies in existing water holes on Carwell Creek and of a spring on Orchard Creek.

AGC has established three groundwater monitoring bores and recorded groundwater levels from these and from water holes shown on Plan 11.

The most recent report from AGC (Report 3009, May 1987) has evaluated the monitoring data available, and concludes:

- (i) The present data record shows a regular pattern of behaviour of groundwater levels related to natural processes of rainfall recharge and drainage.
- (ii) This data therefore provides a good record of background groundwater behaviour prior to deeper level quarrying at No. 2 Quarry.
- (iii) There is no clear evidence that quarrying activity is (currently) affecting the water resources on the Carwell property.
- (iv) Two boreholes (KB1 and KB2) and the two waterholes on Carwell Creek have water levels below the quarry base and therefore cannot be affected by quarrying activity.
- (v) Monitoring of borehole KB4 should be maintained to relate any changes during subsequent quarry lowering to the long term predictive model.
- (vi) More reliable recording of quarry pumping is to be undertaken by the use of a flow meter and hour meter on the pump. (This has subsequently been implemented by the Company.)

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TABLE 4.1  
Surface Water Quality

*don't match w/ ion conc*

Date Sampled		pH	E.C.	HCO <sub>3</sub>	Cl	SO <sub>4</sub>	Ca	Mg	K	Na	S.S.	NO <sub>3</sub>
Site	Units		uS/cm	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l
<b>*SPCC Limits</b>		-	-	-	250	250	-	-	-	-	50	10
<hr/>												
<b>29.11.88</b>												
KW-1		7.4	3 500	165	80	40	99	97	4.3	75	25	0.8
KW-2	quarry H <sub>2</sub> O	7.3	3 550	240	45	40	215	61	2.4	44	40	0.5
KW-3	Orchard Ck.	7.5	790	210	35	40	101	60	3.1	45	45	1.0
KW-4	bridge	6.9	790	130	35	40	90	60	3.7	60	10	0.7

*analytical problem*

Date Sampled		As	Cu	Pb	UNFILTERED Zn	Mn	Cd	Fe
Site	Units	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	mg/l
<b>*SPCC Limits</b>		50	1 000	50	5 000	50	10	0.3
<hr/>								
<b>29.11.88</b>								
KW-1	upstream fr. ops.	<5	266	76	860	38.3	5.36	0.36
KW-2		<5	136	69	4.34	13.2	3.87	0.02
KW-3		<5	108	26	7.29	183	3.95	0.76
KW-4	downstream	<5	4.89	31	3.67	169	4.92	0.45

\*State Pollution Control Commission, Schedule II - Clean Waters Act, 1970

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Previous assessment by AGC of groundwater quality indicates this to be rich in calcium carbonate, magnesium and sulphate, but of potable quality suitable to all but some specialised industrial uses.

Assessment of the groundwater regime in the vicinity of the Carwell Creek quarries will be reviewed by AGC on an ongoing basis throughout quarry life. These assessments will be reported in summary form in subsequent reports on the Management Plan.

### 4.3 NOISE MONITORING

#### 4.3.1 Quarry Operations

The principal sources of noise from quarry operations are:

- (i) drilling and excavation equipment;
- (ii) limestone and overburden transport by trucks;
- (iii) tipping of overburden on the emplacements and shaping by bulldozer.

Activities (i) and (ii) are solely within the confines of the formed quarry. The quarry rim provides acoustic shielding to the north and west in the direction of the nearest residences. Waste overburden handling is undertaken on the more exposed locations of the emplacements. These waste handling activities are undertaken irregularly in campaigns.

Noise monitoring of normal quarrying operations was carried out on the morning and midday of 29th November 1988, at two locations shown on Plan 11:

N10 - at the gate to "Carwell";

N11 - on the access to the Horner residence.

The results are presented in Table 4.2.

The line of sight from sites N10 and N11 to the rim of the No. 2 Quarry is interrupted only by tree cover. There is no direct line of sight into the active quarry (nor to operating equipment) due to the ridgeline forming the northern and northwestern rim of the quarry.

The noise levels were monitored in accordance with Australian Standard AS1055.1-1984 using a Bruel and Kjaer integrating peak sound level meter Type 2225. The meter was regularly calibrated using a Bruel and Kjaer sound level calibrator Type 4230. A series of readings were taken at approximately 2 second intervals for a period of 10 minutes using the fast response mode of the meter. All readings are "A" scale readings. Meteorological conditions were observed and wind speed and direction measured.

Notations were made of noise sources which were audible and discernible at the time of measurements.



**TABLE 4.2**  
**Sound Level Measurements in the Vicinity of**  
**No. 2 Quarry at Carwell Creek, Kandos**

Site No.*	Location	Early Morning			Midday		
		L <sub>90</sub> dB(A)	L <sub>eq</sub> dB(A)	L <sub>10</sub> dB(A)	L <sub>90</sub> dB(A)	L <sub>eq</sub> dB(A)	L <sub>10</sub> dB(A)
N10 (Carwell Residence)	1 000 m NW	30	33 (a, c)	35	35	37 (a, d, b, c)	41
N11 (Horner Residence)	600 m W	33	35 (a, c, e)	38	35	39 (a, b, c)	43

<b>Field Conditions</b>	Date:	29.9.88	29.9.88
	Time:	8.30 am to 8.45 am	11.15 am to 11.30 am
	Temp:	18-20°C	24°C
	Cloud Cover:	clear	20%
	Wind Speed:	still	1.3-1.7 m/s
	Wind Direction:	-	southwest

\* See Figure 11 for location

NOTE: L<sub>90</sub> Sound level exceeded 90% of the sampling time.  
 L<sub>eq</sub> Level of continuous noise which emits the same energy as a fluctuating sound over a fixed period  
 L<sub>10</sub> Sound level exceeded 10% of the sampling time

Noise Sources (given in order of audibility)

- (a) birds
- (b) wind in trees
- (c) quarry noise
- (d) cattle
- (e) traffic

The data was statistically analysed into L<sub>90</sub>, L<sub>eq</sub> and L<sub>10</sub> classes. L<sub>90</sub> is the sound level exceeded 90 per cent of the sampling time, L<sub>eq</sub> is the sound level of continuous noise which emits the same energy as the fluctuating sound over a fixed period and L<sub>10</sub> is the sound level exceeded 10 per cent of the sampling time. L<sub>90</sub> is considered to be representative of ambient background noise levels from all sources.



The  $L_{10}$  sound level is used for the purposes of assessing the impact of noise from the site activities on surrounding residences.

The State Pollution Control Commission recommends limits on continuous site noise at residences in rural areas to protect environmental amenity. The Commission's two broad objectives are:

- (i) that noise from any single source does not greatly intrude above the prevailing background noise level;
- (ii) that the background noise level does not exceed the level appropriate for the particular locality and landuse.

The Commission's recommended "acceptable" noise limit for rural residences (other than Company owned residences) are presented in Table 4.3.

**TABLE 4.3**  
**Recommended Noise Levels at Residences**

Noise Source	Time Period	Recommended Limit $L_{10}$	
		Acceptable	Maximum
Continuous Site Noise (at residences) in rural areas	7 am to 7 pm (Monday to Saturday)	45 dB(A)	50 dB(A)
	7 pm to 10 pm (Monday to Friday)	40 dB(A)	45 dB(A)
	10 pm to 7 am (Monday to Friday)	35 dB(A)	40 dB(A)
	7 pm Saturday to 7 am Sunday	35 dB(A)	40 dB(A)

The results of monitoring undertaken on the 29th November 1988 (see Table 4.2) indicate that the recommended noise levels were satisfied. It is possible that during adverse meteorological conditions (temperature inversions and light winds from the east and southeast) the "acceptable" limits may be exceeded. It is unlikely however, that noise levels would exceed the "maximum" levels, even under the worst case conditions. It is noteworthy that quarry operations are undertaken during daylight hours from 7.30 am to 4.00 pm, Monday to Friday.



#### 4.3.2 Crushing Operations

The principal activities which generate noise at the crushing plant at No. 1 Quarry include:

- (i) trucks accessing the site;
- (ii) (enclosed) truck discharging into the hopper
- (iii) the (primary) jaw crusher;
- (iv) screen and conveyors;
- (v) secondary crusher;
- (vi) tipping from the conveyor to the stockpile;
- (vii) (enclosed) tipping from the conveyor to hoppers and buckets (enclosed) of the aerial cableway.

These operations are illustrated on Plan 10.

The crushing plant is located in a rural area with low density housing. There are no adjacent properties within 600 m of the plant except a State Forest to the east and south-east which lies within 200 m. Ridgelines at least 10 m higher than the plant surround the site on all sides and are covered by light to medium timber. These ridgelines are within the ACL property boundary or the State Forest. As such they form a substantial noise reduction barrier between the plant and adjacent private properties.

Longworth and McKenzie Pty Ltd (1987) predicted that the attenuating affects of surrounding terrain would reduce noise from the upgraded crushing plant to less than 45 dB(A) at the nearest non-Company owned residence.

With the ACL property itself are situated ten residences at Carwell Village. These are owned by the Company and are occupied by Company employees and their families. The closest nine residences are all within 300 m of the plant and have no landforms between them and the plant to attenuate noise.

Monitoring of noise levels was undertaken in 1987 by Longworth and McKenzie Pty Ltd, prior to the upgrading of the crushing plant. Noise measurements were taken at nine sites in the vicinity of the crushing plant at Carwell Village, when both the crusher and cableway were in operation. The nine locations are shown on Plan 11, and results are shown on Table 4.4.



**TABLE 4.4**  
**Existing and Predicted Noise Levels**  
**in the Vicinity of Carwell Crushing Plant+**

Location	*Measured 12.05.87				**Predicted (post-upgrade)	
	L min	L max	L <sub>10</sub>	L <sub>90</sub>	L <sub>10</sub>	L <sub>90</sub>
N1	69	86	84	70	-	-
N2	68	85	75	69	-	-
N3	59	82	77	65	-	-
N4	57	79	70	61	-	-
N5	56	73	64	56	-	-
N6 #	47	61	57	52	72	64
N7 #	45	55	51	46	65	54
N8 #	58	71	65	60	80	68
N9 #	44	50	46	45	67	55

- + Source: Longworth and McKenzie Pty Ltd, 1987
- \* Noise measured using a Bruel & Kjaer Type 2218 Sound Level Meter
- \*\* Predicted noise levels (after installation of secondary crusher and screen)
- # Sites adjacent to Carwell Village residences
- Prediction not carried out

Prior to the plant upgrade (of 1988) the noise levels at the closest Company residence (N8) were less than 60 dB(A)(L<sub>90</sub>)/65 dB(A)(L<sub>10</sub>). Predictions by Longworth and McKenzie (1987) of noise levels after the crushing plant upgrade are shown in Table 4.4. The general background noise level (L<sub>90</sub>) was anticipated to rise by approximately 10 dB(A) at the nearest Carwell residences. Plan 11 shows noise level contours immediately around the crusher measured by Longworth and McKenzie and presented in their report in 1987.

It is likely that the upgrade of the crushing plant in 1988 therefore saw an increase in noise levels at the Carwell residences, but also a reduction in hours of operation from a seven-day operation to a normal five-day, 40 hour week. The increase in noise during weekly daytime operations is compensated by the reduction in weekend operations.

The noise levels at Company owned residences at Carwell exceed the maximum levels recommended by the State Pollution Control Commission for protection of environmental amenity. However, these occupiers are pre-conditioned to the high background noise during the day and are employed in the industry.

These residences are situated within the Company's mining leases and the noise requirements of the Mines Inspection Act, which are set at 90 dB(A) for the protection of occupational health and safety, are met.



#### 4.4 BLAST MONITORING

The only previous quantitative assessment of impacts of blasting at residences from quarrying at the Company's Carwell leases was undertaken by Wilkinson & Murray Consulting Pty Ltd (1980). The results of blast monitoring and blast predictions made by Wilkinson & Murray are presented in Table 4.5.

The monitored ground vibration levels, and those predicted from future quarrying are significantly below the State Pollution Control Commission's specified limit of 5 mm/sec for peak particle velocity.

The Carwell homestead has been identified as being of historical significance in the Rylstone Environmental Study and is classified by the National Trust. Maximum ground vibration levels for such historic buildings are specified by the State Pollution Control Commission to be 2 mm/sec. This limit is satisfied by the predictions shown in Table 4.5.

The levels of airblast overpressure of the monitoring and predictions made in 1980, exceeded the limits subsequently published by the State Pollution Control Commission of 115 dB(Linear).

The Company has, since 1980, implemented a number of recommendations made by Wilkinson-Murray to reduce airblast overpressure by altering the blasting practice. It is expected that this has reduced the levels below those predicted in Table 4.5.

The Company proposes to further assess its blasting practice during the next 12 months and will seek the assistance of the Department of Minerals and Energy in implementing a monitoring programme.

#### 4.5 DUST MONITORING

##### 4.5.1 Quarrying Operations

Principal sources of dust during the quarrying operations include:

- (i) Drilling and blasting;
- (ii) Excavation and loading of trucks;
- (iii) Truck movements.

Activities (i) and (ii) are undertaken within the confines of the quarry perimeter. The dust falls out quickly and the quarry affords some protection from prevailing winds. Blasting is undertaken normally once a week.

Since 1980 the Company has used a new Gardner Denver DHC-F quarry drill with a dust extraction system. This has considerably reduced dust from this activity.





**TABLE 4.5**  
**Blast Measurement and Prediction**

Blast No. and Description	Measured Result			Estimate at Residence**						Prediction from Final Quarry Limit***			
				Carwell			Horner			Carwell		Horner	
No. Description	Dist (m)	O/P (dBL)	Vib (mm/s)	Dist (m)	O/P (dBL)	Vib (mm/s)	Dist (m)	O/P (dBL)	Vib (mm/s)	O/P (dBL)	Vib (mm/s)	O/P (dBL)	Vib (mm/s)
1 Bench	800	113	0.60	1 300	109	0.35	700	114	0.65	112	0.55	117	1.80
2 Bench	800	112	0.35	1 300	108	0.20	700	113	0.35	111	0.35	116	0.90
3 Secondary	1 100	118	<0.05	1 600	115	<0.05	900	120	<0.05	120	<0.05	125	<0.05
4 Toe	800	122	0.10	1 300	118	0.05	700	123	0.10	121	0.10	126	0.25
5 Bench*	1 100	122	0.40	1 600	119	0.25	900	124	0.45	124	0.45	129	1.40
6 Bench	1 100	115	0.45	1 600	112	0.30	900	117	0.50	117	0.50	125	1.60
7 Secondary	800	115	<0.05	1 300	111	<0.05	700	116	<0.05	114	<0.05	119	<0.05
8 Bench	1 400	109	0.80	1 400	109	0.80	700	115	1.35	113	1.35	118	3.50

- \* Blow-out of blast attributed to limestone cave
- \*\* The blast measured at a common location northwest of the quarry, was estimated at the Carwell and Horner residences
- \*\*\* The blast measured was extrapolated to the proposed quarry limit and predictions made at the two residences

On the basis of these predictions, Wilkinson Murray (1980) recommended changes to the blast design to ensure that the high levels predicted are reduced to acceptable levels.



In recognition of potential dust generation, the Company has had the haul road from the crusher to the No. 2 Quarry tar-sealed. Within the quarry itself and on other unsealed internal access roads regular watering to the point of loading is undertaken using a 20 000 litre Euclid water cart.

An assessment of air quality in the vicinity of No. 2 Quarry was undertaken by Wilkinson-Murray (1980). Six dust deposit gauges were set up to measure deposition rates. The locations of the dust gauges are shown on Plan 11. The results are summarised in Table 4.6, together with comparative data from Lithgow.

**TABLE 4.6**  
**Dust Monitoring around No. 2 Quarry**

Period	Dust Deposition Rates (grams/m <sup>2</sup> /month)	
	Insoluble Solids	Ash
<u>Carwell Quarry</u>		
February - March 1980	1.5 - 8.0	1.0 - 2.0
<u>Lithgow</u>		
January - March 1978	1.0 - 4.0	0.5 - 3.0
April - June 1978	0.5 - 2.5	0.3 - 0.8
July - September 1978	0.5 - 5.0	0.3 - 3.0

Source: Wilkinson Murray Consulting Pty Ltd (1980)

Although dust measurements at the quarry were limited to the late summer period only, the Wilkinson-Murray report concludes:

"It can be seen in this case that the rates (of dust deposition as indicated in the ash results) around the quarry are similar to those within Lithgow, indicating that dust generation within the quarry is probably having an insignificant effect upon dust generation within adjacent areas and that the deposition rates are not abnormal.

Furthermore, the ash deposits at all six monitoring locations are similar, taking into account the accuracy of the measurements made. This suggests that deposition rates are not being dominated by local influences, such as nearby drilling of blast holes, operation of haul trucks or movement of road traffic within the area.



In summary, whilst dust is obviously being generated by quarry activity, we consider it is not having a significant effect upon dust deposition rates within the area and do not consider further controls necessary."

While the State Pollution Control Commission does not specify recommended limits for dust deposition, it is considered that dust deposition rates above 4 grams/m<sup>2</sup>/month are likely to be noticeable and attract complaints from neighbours.

#### 4.5.2 Crushing Operations

Dust controls on the crushing operations are subject to requirements of the State Pollution Control Commission for protection of environmental amenity at non-Company owned neighbouring residences, and the requirements of the Mines Inspection Act, 1901.

Upgrading of the crushing plant in 1988 involved the addition of a secondary crusher and screen. These were installed with effective dust control measures including a combination of dust covers and a dust collector connected to the screen, crusher and all transfer points. Misting sprays are present on the receival hopper and the discharge from the hopper.

A survey of dust levels was undertaken by Longworth and McKenzie Pty Ltd in July/August 1987, prior to the upgrading of the crushing plant. The high volume sampler gravimetric method of determination of total suspended particulates (Australian Standard AS2724.3,1984) was used as a short sampling time was required and larger particles were unlikely to reach the property boundaries.

Two samplers were installed (A7 and A8 as shown on Plan 11) and the readings taken are shown in Table 4.7. Typical local yearly wind patterns are shown on Plan 11. For the period of dust monitoring undertaken the winds were from the southwest more often than any other direction, while in an average year the wind is calm or light southeasterly for nearly 50 per cent of the time in the morning and light to moderate southeast to southwesterly for about 60 per cent of the time in the afternoons. Generally, in relation to prevailing winds, residences on the Australian Cement Limited property are not downwind of the crushing plant.

Reasonably low dust levels were recorded for site A7 which was generally upwind of the crushing plant.

Site A8 was located in a relatively exposed position with regard to unvegetated ground and was located downwind of the major plant. The levels found at this position were consistent with typical levels of emission from quarry crushing plant.

The National Health and Medical Research Council for Australia (NHMRC) recommends a mean annual concentration of total suspended particulates of 90 ug/m<sup>3</sup> as the maximum permissible level in residential air to protect public health.



**TABLE 4.7**  
**Air Quality Monitoring (total suspended particulates)**  
**in the vicinity of Carwell Crushing Plant<sup>+</sup>**

Site	Wind Direction over Sampling Period									
	Percentage									
	g/ m <sup>3</sup> x10 <sup>-6</sup>	N	NE	E	SE	S	SW	W	NW	Calm
<b>Site A7*</b>										
30.7.1987 - 03.8.1987	53.0	-	-	-	-	-	-	-	-	-
03.8.1987 - 07.8.1987	-	0	10	8	2	7	69	1	3	0
07.8.1987 - 11.8.1987	32.0	-	-	-	-	-	-	-	-	-
11.8.1987 - 14.8.1987	72.0	-	-	-	-	-	-	-	-	-
14.8.1987 - 18.8.1987	31.0	6	14	1	0	4	28	18	3	25
18.8.1987 - 21.8.1987	22.0	2	7	0	2	4	28	14	12	31
<b>Site A8*</b>										
24.7.1987 - 29.7.1987	109.0	-	-	-	-	-	-	-	-	-
30.7.1987 - 03.8.1987	64.5	-	-	-	-	-	-	-	-	-
03.8.1987 - 07.8.1987	73.4	0	10	8	2	7	69	1	3	0
07.8.1987 - 11.8.1987	258.4	-	-	-	-	-	-	-	-	-
11.8.1987 - 14.8.1987	128.1	-	-	-	-	-	-	-	-	-
14.8.1987 - 18.8.1987	113.2	6	14	1	0	4	28	18	3	25
18.8.1987 - 21.8.1987	178.0	2	7	0	2	4	28	14	12	31

+ Source: Longworth and McKenzie (1987)

- Data not reported due to faulty equipment

\* See plan 11 for site location

The residences at Carwell, within the ACL property are not downwind of crushing plant with respect to the prevailing wind, however due to the proximity the level of dust deposition at the residences could be expected to be high on occasions, and above the NHMRC permissible level.

Residences external to Company property are unlikely to be affected by any increase in dust emission levels which may occur subsequent to the crushing plant upgrade as they are not in close proximity to the site. The closest residence is some 2.5 km from the crushing plant in a westerly direction, whilst other nearby residences are respectively 3 km to the northwest, 3.5 km to the northeast, 3 km to the east and 4.5 km to the southeast. Kandos township is located some 4.5 km to the east.



#### 4.6 VISUAL ACCESS MANAGEMENT

The existing quarries are generally obscured from public view although traffic on the private road (Quarry Road) and within the mining lease boundaries can obtain glimpses of No. 1 Quarry through the trees. From Cudgegong Road a disturbance of the ridge line is all that can be seen of No. 2 Quarry. The quarrying method, whereby minimal disturbance is caused ahead of the advancing quarry face, ensures that most activity is carried out behind the advancing quarry wall. Dust from blasting can be seen from Cudgegong Road when this occurs approximately once a week.

As No. 2 Quarry advances to the north and west, the crest of the quarry rim will lower as the natural surface drops. This will increase the visual impact to public travelling east on Cudgegong Road who will, from the approach to the Carwell Creek bridge, be able to see the bench at the 600 m level of the quarry when the quarry is at its maximum extent.

From due north of No. 2 Quarry on Cudgegong Road a limited length of view down the quarry above the 580 m level will be possible.

From the Horner and Carwell residences views to the quarry activities are broken by existing tree cover and restricted to the final batter of the quarry's finished configuration.

The Company has planted a two-row tree screen adjacent to the lease boundary fence. These were planted in 1987-1988 and have achieved a height averaging 1 to 2 m. The trees are maintained and any unsuccessful plantings are replaced. Further supplementary planting of trees will be undertaken along the final northern rim of the No. 2 Quarry, as this final configuration is approached.

It is also to be noted that some revegetation (tree and shrub planting) will take place on the top berms of the finished No. 2 Quarry. This will soften the distant views of the quarry from Cudgegong Road in the long term and after quarrying ceases.



## REFERENCES

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*Environmental Assessment of Kandos Quarry, May 1980*



# APPENDICES

# APPENDIX 1

Mining Lease No. 1169 (Orange)

Conditions of Authority

- granted 8th July 1986



## CONDITIONS OF AUTHORITY - 1986

16. Upon the expiry or sooner determination of the authority the registered holder shall remove all machinery and buildings and the subject area shall be left in a clean and tidy condition to the satisfaction of the Secretary.
17. The registered holder shall ensure that run off from any worked area including the overflow from any depression or ponded area shall be discharged in such a manner that it will not cause erosion.
18. All trees, shrubs and undergrowth which the registered holder cuts down, removes or damages for the purpose of the operations shall be disposed of by the registered holder as directed by and to the satisfaction of the Secretary.
19. Upon completion of operations or the sooner determination of this authority the registered holder shall rehabilitate any areas disturbed to the satisfaction of the Minister.
20. **Roads, Tracks, Fences, Transmission and Telephone Lines**
  - (a) The registered holder shall not excavate within 15 metres of the boundaries of any road unless with the approval of the Minister first had and obtained and subject to such conditions as he may stipulate.
  - (d) Notwithstanding that the registered holder shall have complied with this condition the registered holder shall pay to the local Council, the Department of Lands, the Commissioner for Western Lands or the Commissioner for Main Roads the cost incurred by such council or Department or Commissioners of making good any damage to any road caused by operations carried on by or under the authority of the registered holder or any person claiming through or under the registered holder.
  - (e) AND THE REGISTERED HOLDER HEREBY COVENANTS with the said Council that the registered holder will pay to the said Council the cost incurred by the Council of making good any such damage caused as aforesaid and the registered holder hereby covenants with the said Commissioners that the registered holder will pay to the said Commissioners the cost incurred by the said Commissioners of making good any such damage caused as aforesaid.

AND IT IS HEREBY AGREED AND DECLARED that the amount to be paid by the registered holder under the provision of this clause shall include in addition to the cost of all necessary labour and materials all costs and expenses reasonably incurred in and about the making of surveys and preparation of plans and specifications and estimates the supervision and inspection of the works and all administrative and overhead costs and expenses of the Council or the Department of Lands or the Commissioner for Western Lands or the Commissioner for Main Roads as the case may be related or attributable to the works undertaken to make good any damage

caused to any road. A certificate under the hand of the Town or Shire Clerk of the local Council or the Secretary for Lands the Commissioner for Western Lands or the Commissioner for Main Roads or the person for the time being acting as such Clerk, Secretary or Commissioner as to the amount of the cost of making good any damage to any road shall in all respects and for all purposes be conclusive evidence of the amount of such cost and of the due determination thereof.

23. The registered holder shall not interfere in any way with any fences on or adjacent to the subject area unless with the approval in writing of the owner thereof or the Minister first had an obtained and subject to such conditions as the Minister may stipulate.
25. The registered holder shall so conduct the operations as not to interfere with or impair the stability or efficiency of any telephone or power transmission line traversing the subject area.
28. In the event of operations being conducted on the surface of any road or track within the subject area or causing any interference to such road or track the registered holder shall provide suitable alternative access at his own expense and shall allow free and uninterrupted access along such alternative access at all times and if required so to do by the Minister the registered holder shall restore the surface of the road or track to its original position and condition upon the completion of operations or whenever so directed.
31. The registered holder shall not interfere with any Crown Improvements unless with the approval in writing of the Minister first had and obtained and subject to such conditions as he may stipulate.
33. The registered holder shall not ringbark cut down fell or destroy or cause or allow to be ringbarked cut-down felled or destroyed any tree situated within or within 21 metres of the bed or bank of any prescribed stream or watercourse unless with the approval in writing of the Catchment Areas Protection Board first had and obtained.
35. The registered holder shall conduct operations in such a manner as not to cause or aggravate soil erosion and the registered holder shall observe and perform any instruction given or which may be given by the Secretary with a view to minimising or preventing soil erosion.
36. The operations shall be carried out in such a manner as to interfere as little as possible with natural flora or fauna.
52. **Prohibition of Firearms**  
The registered holder shall not allow any firearms to be brought onto the subject area.
53. **Catchment Areas**

- (a) Operations and/or works shall be carried out in such a manner as not to cause any pollution of the Catchment Area/s.
  - (b) If the registered holder is using or about to use any process which in the opinion of the Minister is likely to cause contamination of the waters of the said Catchment Area/s the registered holder shall refrain from using or cease using as the case may require such process within twenty-four (24) hours of the receipt by the registered holder of a notice in writing requiring the registered holder so to do.
  - (c) The registered holder shall comply with any regulations now in force or hereafter to be in force for the protection from pollution of the said Catchment Area/s.
56. (d) The registered holder shall provide and maintain to the satisfaction of the Minister efficient means to prevent the contamination pollution or siltation of any stream or watercourse or catchment area or any undue interference to fish or their environment and shall observe any instruction given or which may be given by the Minister with a view to preventing or minimising the contamination pollution or siltation of any stream watercourse or catchment area or any undue interference to fish or their environment.
62. The registered holder shall not keep nor permit to be kept on the subject area any dog unless chained up or kept under proper control.
100. The registered holder shall take all precautions against causing an outbreak of fire and shall comply with the provisions of and regulations under the Bush Fires Act, 1949, as amended and shall not burn off any grass, foliage or herbage unless with the consent of the owner or occupier and the local fire authority.
108. The registered holder shall not deposit any refuse except in properly constructed containers which shall be regularly removed by the registered holder from the subject area and the registered holder shall maintain the area in a clean and tidy condition at all times.
109. Any gates within the subject area or any other gates used by the registered holder shall be closed or left open in accordance with the requirements of the owner occupier.
128. **Control of noxious weeds**
- The registered holder shall observe any instructions given or which may be given by any responsible authority with a view to the eradication of noxious weeds.
134. (a) A security in the sum of \$..... shall be lodged with the Minister by the registered holder for the purpose of ensuring the fulfilment by the registered holder of his obligations under this authority. If the registered holder fails to fulfil any one or more of such obligations the said sum may be applied at the discretion of the Minister towards the cost of fulfilling such obligations.

For the purpose of this clause the registered holder shall be deemed to have failed to fulfil the obligations of this authority if he fails to comply with any condition or provision hereof, any provision of the Act or regulations made thereunder or any condition or direction imposed or given pursuant to a condition or provision hereof or of any provision of the Act or regulations made thereunder.

- (b) The registered holder shall provide the security required by sub-clause (a) hereof in one of the following forms:
- (i) cash,
  - (ii) an interest-bearing deposit in the name of the Minister in such form and with such institution as may from time to time be approved by the Minister,
  - (iii) a banker's certificate or bond in such form and given by such surety as may from time to time be approved by the Minister.
135. Within a period of three months from the date of this authority, or within such further time as the Minister may allow, the registered holder shall serve on each owner or occupier of the private land and on each occupier of the Crown land held under a pastoral lease, and on each mineral owner (other than the Crown) within the subject area, a notice in writing indicating that this authority has been granted, and whether the authority includes the surface. The notice shall be accompanied by an adequate plan and description of the subject area.
- If there are ten or more owners or occupiers affected, the registered holder may serve the notice by publication in a newspaper circulating in the region where the subject area is situated. The notice shall indicate that this authority has been granted, state whether the authority includes the surface, and shall contain an adequate plan and description of the subject area.
136. The registered holder shall restrict mining operations on the subject area to open-cutting, and shall not adopt any other method of mining, unless with the approval of the Minister first had and obtained and subject to such conditions as he may stipulate.
137. The registered holder shall not open cut more than ten hectares of the surface of the subject area at any one time, unless with the approval of the Minister first had and obtained and subject to such conditions as he may stipulate.
138. Operations shall be conducted in such a manner as not to cause any danger to persons and stock and the registered holder shall provide and maintain adequate protection, to the satisfaction of the Minister, around each excavation opened up or used by the registered holder.
139. The registered holder shall carry out all operations in such a manner as to conform strictly with the provisions of the Clean Waters Act, the Clean Air Act, the Noise Control Act and the Regulations under those Acts.

140. The registered holder shall not fell trees, strip bark or cut timber on any private land, or Crown land held under a pastoral lease, within the subject area, except with the approval of the Warden and subject to payment to the owner of the trees, bark or timber of compensation assessed by the Warden under the Mining Act, 1973, and on any other land subject of this authority shall not cut, destroy, ringbark or remove any timber or other vegetative cover except such as directly obstructs or prevents the carrying on of the operations hereby authorised.
141. The registered holder shall not interfere with the flow of water in any stream or watercourse, except for the purpose of obtaining water for the operation of a treatment plant.
142. The registered holder shall not interfere with any well, water pump, dam or pipeline, without the consent of the owner and occupier first had and obtained.
143. The registered holder shall:
- (a) ensure that at least six (6) competent workmen are efficiently employed on the subject area on each week day, except Saturday or any week day that is a public holiday,
- or
- (b) expend on operations, carried out in the course of prospecting or mining the subject area, an amount of not less than one hundred and five thousand dollars (\$105,000.00) during each year of the term of the authority.
- Costs or expenses incurred which are not, in the opinion of the Minister, directly associated with the prospecting or mining operations, shall not be accounted expenditure for the purposes of this condition. The Minister may, at any time or times after a period of two years from the date on which this authority has effect or from the date on which the renewal of this authority has effect, as the case may be, by instrument in writing served on the holder of the authority, increase or decrease the amount of expenditure required under this condition, provided that not more than one variation in the amount of expenditure shall be made in any period of two years.
144. (a) Where a Regional Mining Engineer is of the opinion that any condition of this authority relating to the working of the subject area, or any provision of the Mining Act, 1973 relating to the working of the subject area is not being complied with by the registered holder, he may in writing direct the registered holder:
- (i) to cease working the subject area in contravention of that condition or Act; and
  - (ii) to carry out within a specified time works at the expense of the registered holder necessary to rectify or remedy the situation.

- (b) Where a Regional Mining Engineer issues any direction to the registered holder pursuant to paragraph (a) of this condition the registered holder shall comply with the direction.
145. (a) Where the registered holder desires to commence prospecting operations in the subject area the registered holder shall notify the Secretary in writing and shall comply with such additional conditions as the Minister may impose, including any condition requiring the lodgement of an additional security for rehabilitation of the area affected by such operations.
- (b) Where the registered holder notifies the Secretary pursuant to paragraph (a) the registered holder shall furnish with that notification details of the type of prospecting methods that would be adopted and the extent and location of the area that would be affected by them.
146. All operations including the removal and disposal of materials, shall be carried out in such a manner as will not cause sedimentation or erosion of any watercourse or its flood plain.
147. The registered holder shall make adequate provision for the long term stability of any stockpiling, disposal areas and tailings dams and for the prevention of leachate or other pollutants from any treatment plant entering surface water or groundwater.
148. (a) All topsoil and subsoil which is disturbed or which will be covered by overburden and ore stockpiles, shall be removed separately and, where practicable, immediately replaced over backfilled areas. Where this is not possible, such topsoil and subsoil must be stockpiled separately for later replacement by the registered holder.
- (b) All such topsoil and subsoil removed shall be deposited over replaced overburden and residues so that, as far as may be practicable, there is a minimum thickness of twenty centimetres of subsoil overlain by a minimum thickness of ten centimetres of topsoil.
149. Upon abandonment of operations the registered holder shall either fill in with the agreement of the Minister or securely protect all open cuts or workings opened up or used by the registered holder in such a manner as may be satisfactory to the Minister.
150. Waste rock dumps shall, upon conclusion of operations, be graded by the registered holder to form undulating or flat sloping areas and shall be vegetated with grass, shrubs or indigenous trees, unless otherwise directed by the Minister. In other areas the registered holder, when the surface of the land has been disturbed or covered, shall contour and vegetate such lands unless otherwise directed by the Minister.
151. (a) The registered holder shall within 24 months of the date of the grant of this authority furnish to the Minister a rehabilitation and environmental management plan (hereinafter referred to as "the plan") which shall describe

the methods to be adopted by the registered holder to protect the environment of the subject area including:

- (i) A description of the method of controlling the disposal of mine waste;
  - (ii) a description of the method for minimising air noise and water pollution and erosion arising from the subject area;
  - (iii) a description of the method of rehabilitating the subject area.
- (b) (i) On submission of the plan the Minister may approve the plan or return it for amendment and resubmission by the registered holder.
- (ii) Where the Minister returns the plan under (b) (i) above he shall by notice in writing inform the registered holder of the amendment required and the time within which the plan is to be resubmitted and the registered holder shall comply with that notice.
- (c) The registered holder shall at the end of each succeeding period of 12 months from the date of the Minister's approval of the plan, submit a written report to the Minister indicating how the plan has been implemented on the subject area in the preceding 12 months. The registered holder shall also indicate in the report whether the plan should be amended in order to better protect the environment of the subject area.
- (d) (i) Upon receiving a recommendation for amendment of the plan under clause (c) or whenever it appears to the Minister that the plan should be amended in any particular, he shall cause to be served on the registered holder a notice specifying the proposed amendment and stating that representations with respect to the proposed amendment may be made to the Minister within the period specified in the notice.
- (ii) A registered holder when served with a notice under (d) (i) above may within the period specified in the notice, by instrument in writing lodged with the Secretary make such representations with respect to the proposed amendment referred to in the notice as the registered holder thinks fit.
- (iii) The Minister shall take or cause to be taken such steps including the amendment of the plan as the Minister deems appropriate in connection with any representations made under (d) (ii) above.
- (e) The registered holder shall conduct all mining operations under this authority in accordance with the provisions of the plan as approved by the Minister.
152. Upon cancellation (in part or in full) or expiry, full documentation shall be submitted of the following:

- (i) Plans and sections showing the extent of working on the area cancelled or subject to expiry.
- (ii) Records of tonnage and grade mined since the last annual report.
- (iii) Records of concentrate and/or finished product since the last annual report.
- (iv) Geological information including details of any remaining mineralisation.

153. The registered holder, within 12 months of the date of grant of this lease or within such further period as the Minister may allow, shall plant and maintain trees along the northern and western boundaries of the subject area so as to screen, to the satisfaction of the Minister, the operations from Cudgegong Road.



## APPENDIX 2

Rylstone Shire Council's  
Development Consent for:

- (i) Quarrying (within ML 1169)  
dated 15th July 1987
- (ii) Installation of Secondary Crusher (at Carwell)  
dated 23rd December 1987

XXXXXXXXXX  
79.1205

PLEASE REPLY TO  
THE SHIRE CLERK  
PO BOX 42



IN REPLY PLEASE QUOTE:

NO:

EEH:mb

PHONE REFERENCE  
PLEASE CONTACT:

Miss Hartens

Rylstone, N.S.W., 2849  
1st July 1987

Environmental Planning & Assessment Act

NOTICE TO APPLICANT OF DETERMINATION OF A DEVELOPMENT APPLICATION

TO: Australian Portland Cement  
OF: KANDOS 2848 being the applicant in respect of development application number....~~2822~~...

Pursuant to section 92 of the Act notice is hereby given of the determination by the consent authority of the development application no..~~2822~~..... relating to the land described as follows:  
Portions 34 44 97 105 106 150 Parish of Wells - quarrying

The development application has been determined by -

- a) ~~granting of consent~~
- b) granting of consent subject to the conditions specified in this notice;
- c) ~~refusing of consent~~

The conditions of the consent are set out as follows:

SEE OVER

The reasons for \*the imposition of the conditions/the refusal are set out as follows:

- NOTES:
- 1) To ascertain the date upon which the consent becomes effective refer to section 93 of the Act.
  - 2) To ascertain the extent to which the consent is liable to lapse refer to section 99 of the Act.
  - 3) Section 97 of the Act confers on an applicant who is dissatisfied with the determination of a consent authority a right of appeal to the Land and Environment Court exercisable within 12 months after receipt of this notice.

.....  
Shire Clerk.

.....  
Date

\*Delete whichever is unapplicable.

1. That the applicant shall meet the requirements of all public authorities having statutory responsibilities in respect of the proposed application. ✓
2. That the applicant shall obtain from the State Pollution Control Commission all statutory approvals required under the Clean Air Act 1961, Clean Waters Act 1970 and Noise Control Act 1975.
3. That the applicant shall carry out all operating and monitoring means means described and specified in the Statement of Environmental Effects to prevent, minimise or ameliorate adverse environmental impact.
4. That the applicant shall furnish to the Council copies of all required approvals from Government Departments and other statutory authorities.
5. That the applicant shall within two years of this consent or such further period as the Council may agree, prepare and submit to the Council for its consideration a fully detailed landscaping and land use proposal covering all portions of the land affected by the development.
6. The applicant shall consult and comply with the requirements of the Soil Conservation Service of NSW in respect of all erosion control. The applicant shall consult with the Soil Conservation Service of NSW concerning appropriate vegetative species selection, seedling establishment, soil testing and fertiliser selection and application for all landscaping and erosion control. The applicant shall institute programmes for the control of noxious plants and animals on their site.
7. Present approval is for the transport of limestone by aerial ropeway. Should an alternative method be required this shall be the subject of a fresh development application to Council for consideration.
8. a) Council be reimbursed \$25,149.89 for expenses incurred over a period of time for the past maintenance of Quarry Road and levied as once only special levy.  
b) Australian Portland Cement Limited be wholly responsible for maintenance of the private haul road and Quarry Road from MR 215 to the Cudgegong Road. The road is to be maintained to Council's satisfaction.  
c) Until such time as the Australian Portland Cement Limited shall require the use of the road for the purpose of its mining leases in a way which would be incompatible with public access, the status quo remain on access and use of the Quarry Road.  
d) If mining of the private access road is undertaken, an alternative access to an appropriate standard is to be provided by the applicant to Council's requirements.
9. The applicant shall at its convenience provide Council at no cost with coarse reject material as may be required for Council road construction purposes. Council is to be responsible for the loading and transport of the material. If the quantity of material supplied to Council each year exceeds 3,000 tonnes, Council shall reimburse Australian Portland Cement for any royalty expenses incurred in excess of 3 000 tonnes.
10. That the applicant shall consult and comply with the reasonable requirements of the Council concerning means to prevent and fight bushfires including the provision of adequate fire tracks within the lease area and the provision of appropriate firefighting facilities and staff.
11. That the applicant shall within six months of the receipt of development consent, institute and implement a comprehensive monitoring programme for air, water and noise emissions.
12. That the applicant shall provide Council with a copy of the reports submitted to other statutory authorities on request.

ADDRESS REPLY TO  
THE SHIRE CLERK  
PO BOX 47



IN REPLY PLEASE QUOTE

NO:

EEM:mb

PHONE REFERENCE  
PLEASE CONTACT:

Miss Martens

Rylstone, N.S.W. 2849

Environmental Planning & Assessment Act 23rd December 1987

NOTICE TO APPLICANT OF DETERMINATION OF A DEVELOPMENT APPLICATION

TO: Australian Cement Ltd  
OF: KANDOS 2848 being the applicant in respect of development application number...2822.1178

Pursuant to section 92 of the Act notice is hereby given of the determination by the consent authority of the development application no. ~~1178.2822.~~ relating to the land described as follows:

Portion 108 Parish of Wells and Portion 143 Parish of Rylstone - installation of secondary crusher at Kandosa Quarry and modify facilities at Kandosa Works

The development application has been determined by -

- \* a) ~~granting of consent unconditionally~~
- \* b) granting of consent subject to the conditions specified in this notice;
- \* c) ~~refusing of consent~~

The conditions of the consent are set out as follows:

- a That the applicant shall meet the requirements of all public authorities having statutory responsibilities in respect of the proposed development;
- b That the applicant shall obtain from the State Pollution Control Commission all statutory approvals required under the Clean Air Act 1961, the Clean Waters Act 1970 and Noise Control Act of 1973;
- c That the applicant shall carry out all operating and monitoring measures as described and specified in the Statement of Environment Effects to prevent, minimise or ameliorate adverse environmental impact.

~~The reasons for the imposition of the conditions/the refusal are set out as follows:~~

In this regard within six months of commissioning of the plant, noise and dust levels are to be re-assessed and a report submitted to Council of the results. If deemed necessary, Council will require cladding of the crusher building and shielding of existing company houses. The effect of dust on flora and fauna is also to be monitored

- NOTES:
- 1) To ascertain the date upon which the consent becomes effective refer to section 93 of the Act.
  - 2) To ascertain the extent to which the consent is liable to lapse refer to section 99 of the Act.
  - 3) Section 97 of the Act confers on an applicant who is dissatisfied with the determination of a consent authority a right of appeal to the Land and Environment Court exercisable within 12 months after receipt of this notice.

.....  
Shire Clerk

23.12.87  
.....  
Date

\*Delete whichever is unapplicable.

- c both within company land and at the site of the nearest outside residence;
- d The applicant shall furnish to Council copies of all required approvals from Government Departments and statutory bodies;
- e The applicant shall consult with the Water Resources Commission re armouring of the creek bed and also the Soil Conservation Service of NSW in respect of sediment control, erosion control, stability of stockpile batters etc and take such corrective measures as are required to ensure no pollution of Carwell Creek occurs. If deemed necessary, a filter trap shall be constructed on Carwell Creek to ensure pollution does not occur;
- f Council is to be notified of production of production in excess of 600 000 tonnes per annum;
- g The requirements of the Department of Industrial Relations re safety and health of employees shall be complied with.



EIS 690

KABLE'S TRANSPORT PTY LTD

EIS  
690

Response to Lithgow City Council re  
additional information in support of  
an application for the extension of