EIS 797

AB019576

Mining, rehabilitation and environmental management plan for the Browns Creek Mine : annual report, 1988,volume 1

EIS 797

Vol 1

GRM9/Veen
Environmental Geology

Mining, Rehabilitation and Environmental Management Plan for the

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

Mining, Rehabilitation and Environmental Management Plan for the

Browns Creek Mine Annual Report, 1988 Volume 1

EIS 7A7

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October, 1988

Report No. 144/2

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EXECUTIVE SUMMARY

SCOPE

Condition 4(a) of the Schedule B Conditions pursuant to the transfer of mining leases to BHP Gold Mines Limited (dated 31st August, 1987) requires the preparation of a Mining, Rehabilitation and Environmental Management Plan, (herein to be called the Management Plan) for the Browns Creek Mine for the Minister for Mineral Resources' approval. The Schedule B Conditions are presented in Appendix 1 of this Annual Report.

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

(i) a management tool for the entire operation for the Company and its consultants;

(ii) a means of identifying and concentrating on the more significant rehabilitation and environmental aspects;

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

In order to obtain development approval for the long term development of its Browns Creek Mine, BHP Gold Mines Limited, herein to be called "the Company", prepared an Environmental Impact Statement in late 1987 which incorporated a Management Plan for existing and continued mining within the granted Leases. The one comprehensive document, incorporating both the Environmental Impact Statement and Management Plan, facilitated environmental assessment and approval requirements under both the Environmental Planning and Assessment Act and the Mining Act.

The Management Plan provides an advantageous means of reporting throughout the mine life by way of a comprehensive document on mining, rehabilitation and environmental management to regulatory and other government bodies. Such government bodies include:

Department of Mineral Resources
State Pollution Control Commission
Soil Conservation Service
Crown Lands Office
Blayney Shire Council

Development consent for the long term development of the Browns Creek Mine was granted on 22nd March, 1988 by Blayney Shire Council. Conditions of that Development Consent included the requirements that the Company:

(i) undertake and report on environmental monitoring;

(ii) incorporate rehabilitation proposals for activities outside the granted Mining Leases in the Management Plan (prepared for the Minister for Mineral Resources) and submit the Management Plan to Council annually for approval;

(iii) consult with relevant government authorities;

(iv) prepare and submit annually a report, in conjunction with the Management Plan, in respect of specified matters of performance of the development.

Pollution Control Approval for the long term development at Browns Creek was subsequently granted on the 11th August, 1988. Conditions of that approval required monitoring of noise levels of construction operations and normal running and treatment operations within a specified time of commissioning of the new treatment plant. This noise monitoring, and supplementary blast monitoring, has recently been completed.

This Annual Report to the Management Plan has therefore been prepared to facilitate:

(i) the annual reporting requirements of Blayney Shire Council pursuant to the conditions of Development Consent;

(ii) reporting of noise monitoring in satisfaction of conditions of the Pollution Control Approval;

(iii) reporting of supplementary information on the Management Plan and mining performance since the Environmental Impact Statement was submitted in December, 1987, and

(iv) the formal consideration of the Management Plan by the Minister for Mineral Resources in satisfaction of Condition 4(a) of the transfer of Mining Leases.

FORMAT OF THE MANAGEMENT PLAN, ANNUAL REPORT, 1988

The Management Plan is comprehensively incorporated in the document entitled "Environmental Impact Statement for the Long Term Development of the Browns Creek Mine, Blayney, New South Wales" dated December, 1987 - herein to be referred to as the EIS document.

This Annual Report supplements the components of the Management Plan as presented in the EIS document. Frequent reference is made to relevant sections of the EIS document. This Annual Report should therefore be read as an attachment to the EIS document.

The annual Report is presented in two volumes. Volume 1 comprises text in an A4 size document in the following format:

Section 1:	Statement of Mining Objectives
Section 2:	Mine Operations
Section 3:	Overburden Disposal
Section 4:	Process Residue Disposal
Section 5:	Treatment Plant and Infrastructure
Section 6:	Water Management
Section 7:	Soil Management and Revegetation Programme

Section 8:	Environmental Monitoring
Appendix 1:	Schedule 3 - Additional Conditions of Mining Leases at Browns Creek (pursuant to the Transfer of Leases)
Appendix 2:	Conditions of Development Consent
Appendix 3:	Pollution Control Approval
Appendix 4:	Cowriga Creek Rediversion Licence
Appendix 5:	Environmental Monitoring Data

Table A5-1: Water Monitoring Data
Table A5-2: Noise Monitoring Data
Table A5-3: Dust Monitoring Data
Table A5-4: Blast Monitoring Data

Volume 2 is an A3 size document and comprises plans, illustrations and photographs relevant to the Annual Report. Many of the plans presented in Volume 2 have been revised following amendments since preparation of the EIS document. Other plans relevant to the Management Plan which remain unchanged are referenced to the EIS document.

BACKGROUND

The Browns Creek Mine is 100 per cent owned by BHP Gold Mines Limited, a listed public company incorporated in the State of Western Australia on the 3rd March, 1987. Section 1.3 of the EIS document presents details of the Company's expertise and experience in mine operations.

Gold mining at Browns Creek was first recorded in 1876 and continued until increasing water management problems caused the cessation of operations. Mining involving a number of companies was sporadic up until 1980 when shaft sinking was undertaken and a treatment plant constructed by M.J. Hickey. Section 1.4 of the EIS document presents the history of mining at Browns Creek in further detail.

On the Ist September, 1986 BHP Minerals Limited acquired the mining tenements, mine plant and equipment, and in November, 1986 resumed mining and milling operations. Intensive mine planning and metallurgical and geological studies were undertaken to provide a basis for planning of future mine development. Also initiated was a mine rehabilitation programme. In 1987, BHP Minerals Limited transferred all its gold mining interests to BHP Gold Mines Limited.

The history of consents and approvals from Blayney Shire Council dates back to 1979 for various operations at Browns Creek Mine. These are presented in Table 1.1 of the EIS document.

All activities involved in the long term development of the Browns Creek Mine are now covered under one comprehensive development approval for the site granted by Blayney Shire Council on 22nd March, 1988. The conditions of Development Consent are presented in Appendix 2 of this Annual Report.

Since May, 1980 the mine had been operating with a licence from the State Pollution Control Commission under the provision of the State Pollution Control Commission Act, 1970. This licence (No. 01249) was transferred to BHP Minerals Limited on the 4th November, 1986.

The State Pollution Control Commission granted Pollution Control Approval for the long term development of the mine on 11th August, 1988. A copy of the Pollution Control Approval is presented in Appendix 3 of this Annual Report.

A Licence has been obtained from the Department of Water Resources for the Cowriga Creek rediversion. A copy of the licence is presented in Appendix 4 of this Annual Report.

MANAGEMENT AND IMPLEMENTATION

The Company's Mine Manager (Mr Richard Weston) is designated with direct supervision and responsibility for environmental management and rehabilitation at Browns Creek Mine.

R.W. Corkery & Co. Pty Ltd, who prepared the project's EIS document, have been retained by the Company to supervise the overall environmental component of the project. These include on site review of environmental monitoring procedures and results, rehabilitation and revegetation programmes, and compilation of the Management Plan and Annual Reports.

The following sub-consultants have provided specialised input to facets of this Annual Report of the Management Plan:

BHP Central Research Laboratories -	Blast Monitoring;
Coffey and Partners -	Stability analyses of the Cowriga Creek rediversion and pit dewatering studies.

The following Government Authorities are consulted throughout the implementation of the Management Plan:

Department of Mineral Resources
Blayney Shire Council
Soil Conservation Service
State Pollution Control Commission
Crown Lands Office

SECTION 1

STATEMENT OF MINING OBJECTIVES

1.1 MINING TENEMENTS

Details of the mining tenements held by the Company at Browns Creek are presented in Section 2.2 and Figure 2.4 of the EIS document. There has been no change to these tenements and it is anticipated that no further leases will be sought.

Table 1.1 summarises the mining and exploration tenements on and around the Browns Creek Mine. Security deposits held for these tenements by the Department of Mineral Resources total $158 000. Security deposits are held as a guarantee against non-compliance with conditions of the mining tenement.

Also, in satisfaction of a condition of Development Consent, the Company will lodge with Blayney Council a Bank Guarantee or equivalent for an amount of $600 000, for due performance of rehabilitation of activities associated with the mining operations outside the Mining Leases. This guarantee is reducible as progressive rehabilitation is completed.

1.2 LOCAL GEOLOGY AND ORE RESERVES STATUS

The understanding of the local geology and in particular the ore body at Browns Creek has not changed significantly and can be referred to in Sections 2.3 and 3.3.2 of the EIS document. Mineralogy of the principal rock types remain as in Table 2.2 of the EIS document.

The in situ reserve status has changed since December, 1987 due to proving of further reserves by exploratory percussion drilling and due to depletion by mining.

As at 30th September, 1988 the status of reserves was:

Proven and Probable Reserves

Hard skarn ore -	276 000 tonnes @ 6.0 g/t
Clay ore -	34 900 tonnes @ 3.8 g/t

Possible Reserves

Hard skarn ore -	28 800 tonnes @ 6.6 g/t
Clay ore -	2 000 tonnes @ 2.0 g/t

Approximately 70 per cent of the known skarn ore and 55 per cent of the remaining clay ore lies beneath the site of the old processing plant.

TABLE 1.1

Mining and Exploration Tenements on and around the Browns Creek Mine

Tenement	Holder	Security	Area (Ha)	Date Granted	Term (Yrs)	Minerals	Restrictions
GL 5895*	BHPGM		8.12	27/ 8/71	20	L, Au, Ag, Ni, Cu, Zn, Pb.	Nil
ML 1015**	BHPGM		3.55	20/10/82	21	L, Au, Cu, Ag, Zn, Pb, M.	20 m surface exemption
ML 910**	BHPGM	$151 000	22.4	14/ 1/81	21	L, M, Au, Cu, Ag, Zn, Pb, Ni, Co.	20 m surface exemption
ML 911**	BHPGM		44.9	14/ 1/81	21	L, M, Au, Cu, Ag, Zn, Pb, Ni, Co.	20 m surface exemption
ML 912**	BHPGM		0.15	14/ 1/81	21	L, M, Au, Cu, Ag, Zn, Pb, Ni, Co.	Nil
ML 1188**	BHP Minerals	$4 000	4.08	29/ 4/87	6.5	Au, Cu, Ag, Zn, Pb.	20 m depth restriction
PL 1073**	BHP Minerals	$3 000	216.70	13/10/87	1	L, M, Au, Cu, Ag, Zn, Pb, As, Co.	Nil

Source: BHP Gold Mines Limited
* Act 1906
** Act 1973
Ag = Silver As = Arsenic Au = Gold Co = Cobalt Cu = Copper L = Limestone M = Marble Ni = Nickel Pb = Lead Zn =Zinc

Exploratory drilling on the Mining Leases and Prospecting Licence (which has been renewed for a further 12 months) is ongoing using both percussion and diamond drilling rigs. It is anticipated that a further 2000 m of percussion drilling will be undertaken on the Leases before May, 1989 in order to better define known reserves and to explore for extensions to the known ore body. Most of this drilling will be confined to the pit or its immediate margins.

1.3 LONG TERM DEVELOPMENT

Plan 1, which is revised from Figure 2.1 of the EIS document, shows the local setting of the Browns Creek Mine, and the installation of facilities (power, road, telephone line) as at September, 1988.

The primary activities, which have been approved under Development Consent from Blayney Shire Council, involved in the long term mining development at Browns Creek are:

(i) the continued open cut mining with an extension of the open cut to the east and to approximately 90 m depth - The feasibility of underground mining after the completion of open cut mining is still being investigated, however the likelihood is considered to be low;

(ii) construction of a new efficient crushing and treatment plant in an area located 350 m southwest of the previously existing facilities. Plates 1 and 2 show that, as at September, 1988, construction of the new plant and removal of the old plant was mostly completed.

These principal activities necessitated:

(i) Rediversion of Cowriga Creek around the eastern extremity of the main ore body to enable extraction of proven ore and to reduce groundwater inflows from the creek into the pit. This has been completed.

(ii) Extension of the existing overburden storage area to an area on the southern side of the existing overburden storage area. Emplacement of limestone overburden is also underway in an area north of the open cut following discussions with the Department of Mineral Resources and Blayney Council subsequent to the EIS document.

The status of the abovementioned activities as at September, 1988 is shown on Plan 2, the existing site layout.

1.4 HOURS OF OPERATION

There are no changes to the working hours at Browns Creek Mine, as requested in the EIS document, and as approved in the Development Consent.

The new treatment plant was commissioned in late September, 1988 and construction of all related treatment plant facilities should be completed by the end of December, 1988.

Mining is currently carried out on a two-shift six-days per week basis with a reduced fleet on night shift. This will continue over the drier summer months with the nightshift terminating at the end of April, 1989.

Drilling is carried out on a two-shifts per day, six-days per week basis and will continue to be required for the period up to the end of April, 1989, after which the number of drills operating may be reduced.

No change is expected to operating hours for the other activities on site, such as crushing, operations of the rock breaker and blasting.

1.5 EMPLOYMENT

The mine fulltime workforce, as at September, 1988, was:

BHP Employed Personnel	31
Earthmoving Contractor's Personnel	44
Total:	75

The current permanent fulltime workforce (75) represents an increase of 3 positions since December, 1987, and is consistent with the prediction made in the EIS document of 5 per cent turnover after relocation of the treatment plant.

The current construction workforce involved in the construction of the plant is 16 persons. It is expected that the construction workforce will be approximately five personnel by the end of October, 1988 with all the construction workforce off the site by the end of December, 1988.

It is not expected that there will be any major change to either BHP personnel or the earthmoving contractor this year. There may be some reductions in workforce brought about by the improved operating efficiency of the new treatment facility and by reductions in mining equipment over the next 12 months.

SECTION 2

MINING OPERATIONS

2.1 OPEN CUT MINING

Details of the Company's open cut mine scheduling and procedures are presented in Section 2.4 of the EIS document, and includes a list of mining equipment used on site and the open cut design criteria. There has been no change apart from some modifications to the anticipated production rates. Figures 2.5, 2.6 and 2.7 respectively of the EIS document show a horizontal section and vertical sections through the ore body at Browns Creek.

Mining operations have been performed as expected during the past 12 months. Actual production data coincides closely with the production estimated in the EIS document, with the exception that relatively more clay ore encountered in the pit was mined. Production is shown in Table 2.1.

TABLE 2.1

Mine Production 1987 - 1988

Production Period	Skarn Ore Mined (Tonnes)	Clay Ore Mined (Tonnes)	Waste Mined (Tonnes)
July, 1987	14 950	3 200	127 300
August	9 150	3 100	56 500
September	10 150	1 700	84 500
October	12 300	4 000	121 000
November	9 500	4 700	116 000
December	8 100	9 300	105 000
January, 1988	7 400	11 700	97 000
February	9 400	28 300	146 500
March	4 600	25 900	158 100
April	7 400	17 400	201 200
May	1 900	7 700	128 200
June	7 900	21 400	116 000
Total:	102 700	138 400 (1)	1 346 800
EIS Estimate:	110 000	75 000	1 450 000

Note (1): The additional clay ores mined reflects an initial underestimate of clay ore within the pit.

The current production rate based on the existing mining fleet is 235 000 tonnes of total ore and waste moved per month. The Company will reduce the mining fleet in November, 1988 with a resultant reduction in production rate to 220 000 tonnes per month. This rate will

continue until the end of April, 1989, after which further reductions in the rate to 160 000 tonnes per month is proposed.

The current configuration of the pit, as at September, 1988, is shown in Plan 3. The island of ore, from which the old treatment plant is (to be) removed, is conspicuously yet to be mined out.

The proposed limit of the pit anticipated for the next 12 months period will see the Stage 2 pit configuration (shown on Plan 4) developed to approximately the 770 m level (AHD).

The proposed production schedule anticipated to the end of mine life is presented below in Table 2.2.

TABLE 2.2

Proposed Production Schedule (dry tonnes)

Production Period Year ending May	Ore Mined		Ore Treated		Total Treated
	Skarn	Clay	Skarn	Clay	
May, 1989	167 000	62 000	147 000	42 000(1)	189 000
May, 1990	150 000	16 000	150 000		150 000
May, 1991	74 300	-	94 300	36 900(2)	131 200

Notes:

(1) Clay ore treated up to decommissioning of the C.I.P. plant early in October, 1988

(2) Clay ore will be stockpiled on site until a decision is made to construct a C.I.P. plant to treat the ore. An alternative would be to truck all clay ores to the Company's London- Victoria plant at Parkes for treatment, however the economics of the alternatives will be investigated in the near future.

2.2 UNDERGROUND MINING

At this stage the probability of the mine life being extended by underground mining operations is considered low, however investigations on mining feasibility are continuing. The following factors apply to the feasibility of underground mining.

(i) the highly variable skarn ore body has relatively narrow mining sections which do not facilitate for efficient underground mine development;

(ii) the hydrogeological characteristics of the immediate area would necessitate an increase in pumping capacity to ensure the underground mine remains operational. The presence of major cavities in the limestone formation may lead to a flooding potential which is difficult to predict and manage.

SECTION 3

OVERBURDEN DISPOSAL

3.1 MATERIALS CHARACTERISATION

Section 2.8.1 of the EIS document describes the geochemical and physical characteristics of overburden materials. Overburden consists of hard rock (diorite, andesite and limestone) and clay.

The overburden, except for a limited occurrence within the andesite, is predominantly free of sulphide minerals. The high carbonate content provides a high neutralisation potential against leachate generation.

The overburden material is hard and sufficiently well graded to form a stable emplacement, when compacted. Compaction of the material by normal heavy vehicle movement and dumping along an advancing face will enable shedding of water off the emplacement, along drainage lines developed on the surface of the emplacement.

The clay overburden comprises weathered rock and fine clay and will be selectively used as a topdressing material in emplacement management.

3.2 STATUS OF OVERBURDEN DISPOSAL

Section 2.8.3 of the EIS document presents design proposals for disposal procedures of overburden. Scheduling of the emplacement area, southwest of the pit, is shown on Figures 2.16 and 2.17 of the EIS document.

Minor modifications to these disposal procedures consist of:

(i) stockpiling limestone overburden materials in a separate area north of the open cut. The procedure was adopted following discussions between the Company, Department of Mineral Resources and Blayney Shire Council subsequent to the EIS document.

(ii) the dumping of overburden materials within the western end of the open cut now being considered. Further exploration drilling is to be undertaken to ascertain the likelihood (or not) of ore blocks beneath this area, and hence its suitability for overburden disposal. Disposal within the pit has a number of operational advantages including shorter haul distance, and will reduce the area of overall disturbance requiring rehabilitation.

Since June, 1988 a total of 706 000 tonnes of overburden had been removed from the pit and emplaced up to October, 1988. The current extent of the main overburden emplacement area is shown on Plan 2. Plate 3 shows the view of the emplacement north from the Millthorpe-Carcoar Road.

The limestone stockpile area north of the pit is approximately 35 per cent full (see Plan 2) and emplacement of limestone in this area will continue until full design capacity is reached. Plate 4 shows a view of the current extent of the limestone stockpile and the area of topsoil prestripping.

The emplacement of overburden materials within the pit and of limestone on the stockpile area to the north will greatly reduce the areal extent initially proposed for the overburden emplacement area southwest of the pit. The concept of progressive rehabilitation will remain, and detailed scheduling of the main emplacement will be revised following the outcome of the feasibility of inpit dumping, anticipated in early 1989.

The design and rehabilitation of the limestone stockpile is presented later in Section 7.

SECTION 4

PROCESS RESIDUE DISPOSAL

4.1 MATERIALS CHARACTERISATION

The characteristics of process residues from the flotation and C.I.P. processes are presented in Section 2.7.1 of the EIS document. The chemical characteristics of the flotation and C.I.P. process residues are represented in this report in Table 4.1 and 4.2 respectively.

The assumed densities of residues, used for storage factors are:

Skarn ore - 1.4 tonnes/m^3;
Oxide ore - 0.6 tonnes/m^3.

4.2 DISPOSAL PROCEDURES

The handling and disposal procedures of process residues remain essentially unchanged from that presented in Sections 2.7.2 and 2.7.3 of the EIS document. Plan 5 shows the current management details of process residues (tailings) as at September, 1988. Plates 5 and 6 show views of the process residue dams No. 1, No. 2 and No. 3.

The use of existing process residue dams No. 1 and No. 2 has been extended and these are currently being surfaced with a layer of flotation residues to aid surface bearing capacity prior to rehabilitation.

The wall of No. 3 dam had been successfully raised to the 840 m AHD level by March, 1988.

It has been re-estimated that the existing storage capacity of the No. 3 dam is sufficient to contain all flotation process residues for the life of the mine. A decision to construct a new C.I.P. plant to treat clay ores, which are to be stockpiled until then, is likely to be made within the next 12 months. An alternative which is to be investigated may involve the transport by truck of clay ore to the Company's London-Victoria mine at Parkes for treatment. A decision to proceed with a new C.I.P. plant would therefore necessitate the construction of dam No. 4, as originally proposed in the EIS document, to serve as separate storage for C.I P. process water and residues. However the storage capacity may be reduced depending on life of mine treatment requirements.

The rehabilitation of the process residue dams is presented in Section 7.

SECTION 5

TREATMENT PLANT AND INFRASTRUCTURE

5.1 TREATMENT PLANT

Treatment of ore at the Browns Creek Mine involves:

(i) crushing and treatment of skarn (sulphide) ore in a flotation plant;

(ii) screening and treatment of clay (oxide) ore in a C.I.P. plant.

The processes are detailed in Section 2.5 and 2.6 of the EIS document. The crushing operations are illustrated in Figure 2.10 and 2.11. The treatment circuit flowsheet is shown in Figure 2.2 of the EIS document.

The new flotation treatment plant was commissioned by early in October, 1988 (see Plate 1) with the existing flotation plant being dismantled at the same time. The C.I.P. process facility which handles clay ore was dismantled early in October, 1988, after all clay ore stockpiles were depleted (see Plate 2). All materials from the dismantling operation have been stored on an area to the north of the open cut. These materials will be salvaged for scrap metal or auctioned.

The layout of the newly constructed treatment plant has been revised from Figure 2.18 of the EIS document and shown on Plan 6. Essentially the main modification at this stage is the absence of the C.I.P. plant.

The decommissioning of the old C.I.P. plant was delayed to allow additional time for the treatment of clay ore. As more clay ore was delineated in the open cut than was originally estimated, the mining of this clay ore was preferentially accelerated, in order to treat the bulk of this material prior to decommissioning of the old C.I.P. plant.

Now that the old C.I.P. plant has been decommissioned the Company's intent is to mine and stockpile the remaining clay ore. Depending on the success of regional exploration, a decision will be made within the next 12 months on alternatives, whether to construct a new C.I.P. plant facility (in the original location proposed in the EIS document) or to transport the clay ore (from stockpiles on site) to the Company's London-Victoria Mine at Parkes for treatment and recovery of gold. The Company proposes to initiate discussions with Blayney Shire Council concerning any modifications to development consent which may be necessary for the latter alternative, as soon as a decision is reached.

5.2 INFRASTRUCTURE

The provision of services (water supply, electricity, telephone, sewerage and transport) to the mine site are detailed in Sections 2.10 and 2.11 of the EIS document.

The installation of new facilities are shown on Plan 6. These comprise:

- construction of the contractor's workshops and contractor's office buildings as shown;
- mine entrance, gates, fencing and parking facilities;
- installation of a 66 kV switch yard. The power line to the mine site is shown on Plan 1.

The Company's site office facility, which were initially proposed to be relocated to a site northwest of the contractor's workshop, has been retained in its present location north of the open cut, shown on Plan 3 and Plan 4.

SECTION 6

WATER MANAGEMENT

6.1 INTRODUCTION

The water supply requirements of the mine are presented in Sections 2.10.1 of the EIS document. These requirements are adequately met by the supply of good quality clear water pumped from the old underground workings.

The objectives of water pollution controls and management procedures undertaken on site are presented in Section 4.4 of the EIS document. These management procedures are operative and remain essentially unchanged from that previously presented.

The current status of the water management of specific site activities is presented below.

6.2 MINE WATER PUMPING

The open cut is currently dewatered via pumps located at the base of the new main shaft. The pump is currently powered by a generator set located on the surface adjacent to the shift. Work has commenced on the old main shaft with the intention of relocating the pumps at a level below the proposed base of the open cut, for long term mine dewatering. In the interim the open cut will be dewatered by pumping from a sump located at the floor of the open cut. Groundwater from dewatering of the mine will be discharged into a sedimentation tank prior to discharge into Cowriga Creek. Analyses of groundwater and surface water in Cowriga Creek indicate these to be of similar water quality and that the discharge has no impact on Cowriga Creek.

6.3 PROCESS RESIDUE DAMS WATER MANAGEMENT

The spillage containment dam located below the process residue dams (shown as catchment dam A on Plan 5) has been operational for 18 months. Due to the decision to delay the construction of process residue dam No. 4, initially proposed in the EIS document, additional spillage containment dams have not been required.

A runoff diversion channel has been constructed around dam No. 3 (see Plate 5) so that only process water and rain falling directly on the dam surface is contained.

Process residue dams No. 1 and No. 2 are of "turkey nest" design and receive no surface runoff.

6.4 TREATMENT PLANT AREA CONTAINMENT DAMS

The water settlement dam positioned adjacent to the treatment plant workshop (located in Plan 6) will be constructed after the contractor's temporary workshop is removed and the site regraded. It is estimated that it will be operational by December, 1988. Any water collected in this dam will be used to suppress dust on haul roads during drier periods. In the interim, a smaller dam contains all runoff for settlements.

6.5 COWRIGA CREEK REDIVERSION

Cowriga Creek diversion channel was constructed and completed in June, 1988. A decision to install an impermeable membrane was delayed due to several weeks of bad weather and was finally installed during July, 1988.

Plan 7 presents details of the diversion plan profiles and cross sections, as constructed.

The impermeable lining consists of one layer of 100 micron high density and high tensile strength plastic film sandwiched between two layers of geotextile. The lining is covered with 300 mm of crushed rock. Under normal creek flows the lining has been highly successful.

Coffey and Partners Pty. Ltd. have carried out a stability analysis of the creek rediversion and the eastern pit wall which confirms the viability of mining operations.

The design of the Cowriga Creek rediversion has been submitted to the Department of Water Resources and was approved on 13th September, 1988. A copy of the licence is attached in Appendix 4.

6.6 OVERBURDEN EMPLACEMENT AREAS

The embankment of the sedimentation dam which is located in the drainage line upstream of the overburden emplacement has been formed. However, at this stage all runoff from the emplacement is directed toward the sedimentation barrier which is located along the toe of the overburden emplacement and parallel to Cowriga Creek.

Drainage lines will be superimposed on the surface of the emplacement as it more closely approaches final configuration.

Runoff from the limestone stockpile area is contained within the area of the old Cowriga Creek channel and eventually percolates into the pit.

SECTION 7

SOIL MANAGEMENT AND REHABILITATION

7.1 SOIL MANAGEMENT

The objectives and procedures for soil management and erosion controls at Browns Creek Mine are comprehensively presented in Section 4.5 of the EIS document.

Section 4.5 of the EIS document also details the soil types, nutrient status, and fertiliser applications used for soil treatment and sowing rates of grasses for stabilisation and revegetation.

All soils found in the area have value for rehabilitation, and are pre-stripped from areas of mine disturbance and stockpiled prior to use in site rehabilitation.

The status of soil management at the site since December, 1987 is summarised below.

- Topsoil from the initial area proposed for advancement of the overburden emplacement has been prestripped to a depth of approximately 0.2 m and stockpiled in areas south of the emplacement. These stockpiles have established stable grass cover.

- All topsoil and subsoil has been prestripped to a depth of 1 m from the area proposed for limestone stockpiling. The topsoil and subsoil in this area is fertile creek flat loam and is to be blended together for use in later rehabilitation. Approximately two thirds of this material has been removed and stockpiled in an area immediately north of the open cut. The remaining one third of this material remains windrowed on the area and will be removed progressively for the earliest respreading and rehabilitation of the advancing limestone stockpile.

  This soil material will be stabilised with grass during spring, 1988.

- The visual barrier bund which parallels Platform Road was formed and revegetated in autumn, 1988 in accordance with a report prepared by R.W. Corkery & Co. Pty. Ltd. entitled:

  > "Recommendations for soil conservation measures required for the stabilization of areas disturbed throughout the construction of the diversion around the Browns Creek Mine." September, 1987.

  Plates 7, 8 and 9 show the successful revegetation of the bund and earthworks.

  Some maintenance vegetation is to be undertaken on the table drains following weed defoliant spraying by Council's road crew.

- The wall of the process residue dam No. 3 was topsoiled and sown with grass in May, 1988. A good cover of grass has established - see Plate 10.
- The Company will, as part of a mass balance review early in 1989, undertake surveying of all existing soil stockpiles on site to establish volumes of materials available for rehabilitation.
- The Company proposes to undertake rabbit and blackberry infestation eradication programmes, early in 1989, on all Company owned land at Browns Creek, to ensure the success of revegetation programmes.

7.2 REHABILITATION

The Company's objectives and procedures for rehabilitation are detailed in Section 4.6 of the EIS document. The objectives are reaffirmed in this Annual Report.

The Company proposes to undertake progressive rehabilitation procedures where practical in all aspects of the mine development. The rate of successful rehabilitation is dependent on favourable seasonal conditions.

The short term objective is to stablise all earthworks, drainage lines and disturbed areas from erosion by means of a combination of grassing, treeplanting and rock armouring.

The Company's long term objective is to leave all land disturbed by mining and related activity within the lease area as a safe and stable landform commensurate with a future grazing land use capability and to minimise areas requiring long term maintenance.

Tree planting programmes will be undertaken for visual screening, aesthetic amenity and as tree shade commensurate with a grazing land use. Trees and shrubs native to the area will be selected for planting, although willows will be preferred for planting along the creek rediversion and any re-established drainage lines.

For those areas owned by the Company which are not directly affected by the mining and treatment operations, the pre-existing land use of grazing will remain. The Company has leased back much of this land for grazing. Soil conservation and farm management is observed in accordance with accepted guidelines of the Soil Conservation Service and Pastures Protection Board for those land areas.

The objectives and procedures for the rehabilitation of mine disturbed areas remains essentially as presented in Section 4.6 of the EIS document. The current status of rehabilitation is summarised below.

Mine Operations

The clay waste stockpile on the eastern side of the open cut has been removed and levelled back in and surrounding the old Cowriga Creek channel. Much of this area is now beneath the advancing limestone stockpile.

The final configuration of the open cut and associated rehabilitation works is shown on Plan 8. Rehabilitation works will be restricted to the perimeter of the open cut and the upper benches above the maximum water level to which the pit is likely to fill (810 m AHD).

Backfilling of overburden material within the western side of the open cut is being investigated. Backfilling of overburden would proceed, following the assessment of ore sterilization, sometime in early to mid 1989. The overburden would be emplaced to flatten the western face of the pit. The bulk of the overburden will infill levels below the mean water level (790 m AHD).

Rehabilitation of the rim areas, involving ripping, topsoiling, grassing, and selected tree and shrub planting will be undertaken following any backfilling operations.

Overburden Emplacement

The final landform for the overburden emplacement as proposed in the EIS document is shown on Plan 9.

This configuration may now be modified and subdued both in height and areal extent owing to the reduction in overburden required for emplacement:

(i) Significant storage of overburden may be possible within the western side of the open cut.

(ii) Limestone overburden will now be selectively emplaced north of the open cut.

The current emplacement height of 860 m AHD may not increase, depending on survey and waste mass balance currently being assessed. Clay waste and weathered diorite from the open cut is now selectively tipped and stockpiled on the top surface level of the emplacement prior to its later use in spreading as a topdressing material.

Tipping of overburden will proceed at the base of the existing southern face. Large sized boulders of waste will be selectively tipped into the existing drainage line to function as a rockdrain. The existing face will then be pushed and shaped over the drainage line to approximately a 1 in 3 slope prior to topsoiling and grassing.

Revegetation of emplacement slopes which have achieved final configuration is proposed by topsoiling and grassing in autumn, 1989. These specific areas include:

- the eastern slopes adjacent to Cowriga Creek;
- the batter faces along the haul road which accesses the emplacement.

Grass will be sown on these slopes and faces by a combination of broadcast seeding and hydromulch spraying.

Limestone Stockpile

Subsequent to the EIS document, and following discussions with the Department of Mineral Resources and Blayney Shire Council, limestone is selectively emplaced in an area north of the open cut and parallel to Platform Road, shown on Plan 10. Selective emplacement is to provide access to the limestone for possible future extraction for agricultural limestone use.

The final rehabilitated configuration of the limestone stockpile area is shown on Plan 11. Plan 12 shows a cross-section through the rehabilitated stockpile and indicates the zone of high grade limestone suitable for possible future use.

The outer bund, parallel to Platform Road, is to be constructed first and progressively rehabilitated as a visual barrier.

As previously mentioned, soil has been prestripped from the area of emplacement.

Process Residue Disposal Areas

Rehabilitation objectives and procedures for the process residue dams are presented in Section 4.6.4 of the EIS document.

Some modifications to the disposal procedures for CIP plant and flotation plant process residues, as previously presented in this Annual Report, has resulted in changes to the scheduling of rehabilitation. The use of existing dams No. 1 and No. 2 has been extended and these are currently being surfaced with a 2 m layer of flotation residues, to aid surface bearing capacity prior to rehabilitation. Completion of the discharge to No. 1 and No. 2 dams is anticipated in June, 1989, after which the surface will be dewatered and allowed to dry, prior to rehabilitation treatment which is anticipated to commence in late 1989.

Discharge of flotation process residues will proceed in dam No. 3 which has sufficient storage capacity for the remaining life of mine, however this depends on final settlement densities achieved in the dam.

Should a future decision be made to proceed to construct a new CIP plant, this will necessitate construction of dam No. 4 to receive CIP process water and residue.

Revegetation trials are currently being undertaken on an area of flotation process residues. Test plots (5 m x 5 m) were prepared in early October and sown with a fertilised grass mix under the following conditions:

(i) broadcast sowing on the undisturbed surface;
(ii) residue surface tyned and direct sowing;
(iii) residue surface tyned, topsoiled and sown.

A further test plot comprising a residue surface covered with a layer of waste rock, topsoiled and sown is to be prepared and is awaiting a supply of suitably sized waste rock.

The rate of growth will be monitored to access the effect of residue surface pretreatment on revegetation.

To date waste rock has not been stockpiled adjacent to the No. 1 and No. 2 dams, as proposed in the EIS document. A decision whether to emplace a rock blanket above the residue surface is to be delayed pending the success of the surface pretreatment trials, and the establishment of a final profile on the No. 1 and No. 2 dams.

Maintenance sowing of grass will be undertaken on the No. 1 and No. 2 dam emplacement walls in autumn, 1989. This will involve both broadcast seeding and hydromulch application.

Other Areas

Other areas programmed for rehabilitation works in the next 12 months include:

(i) completion of rehabilitation of exploration costeans, involving backfilling, topsoiling and sowing prior to summer, 1988;

(ii) maintenance sowing of diversion channels and the banks of the creek rediversion in autumn, 1989, and

(iii) planting of willow tree cuttings along the banks of the creek rediversion in autumn, 1989.

SECTION 8

ENVIRONMENTAL MONITORING

8.1 INTRODUCTION

Environmental monitoring is undertaken at the Browns Creek Mine to quantitatively determine the degree of impact the mining and treatment operations are having on the surrounding environment.

The results of environmental monitoring are presented in this and subsequent Annual Reports in accordance with the requirements of the conditions of development consent and the conditions of Pollution Control Approval.

The objectives of the environmental programmes, the location of monitoring sites and discussion of results to December, 1987 are comprehensively presented in Section 4.7 of the EIS.

Plan 13 of this Annual Report shows the location of environmental monitoring sites for easy reference.

8.2 WATER QUALITY MONITORING

Water sampling has been undertaken at five locations (designated BCW-1 to BCW-5) along surface water drainage lines within the lease on six occasions since January, 1987. Site BCW-1 is located upstream of all mine disturbed areas, and maybe considered of "background" water quality for the region.

A further internal monitoring site (designated BCI-1) is situated in the process residue dam No. 3, and is representative of "contaminated" water contained in storage on the mine site.

Water analyses of groundwater, sampled from the underground shaft (designated BCI-2) has been provided by Coffey and Partners Pty. Ltd., and is representative of water discharged during mine dewatering operations.

The results of water sampling undertaken at all sites are presented in Table A5-1 of Appendix 5 of this Annual Report.

Site BCW-5, a drainage line with a small catchment below process residue dams No. 1 and No. 2, was dry on both sampling occasions in 1988.

The results of water quality monitoring in 1988 at sites BCW-1 to BCW-4 are consistent with those presented and discussed in the EIS document with the exception of levels of copper at sites BCW-3 and BCW-4, sampled on 21st June, 1988 which were elevated relative to previous levels but were below the limits for restricted substances specified in Schedule 2 of the Clean Waters Act, 1970.

The concentration of total cyanide in waters at site BCW-4, downstream of areas of mine related activity, were 0.06 and 0.05 mg/l on the occasions of sampling in 1988. Although these results indicate a relative increase in cyanide concentration at this site to the limit specified in the Clean Waters Act, 1970 (0.05 mg/l) this level of concentration does not pose any threat to stream biota or downstream use.

It is proposed to undertake water sampling, specifically for cyanide levels, more regularly and at a further sampling site downstream of the Browns Creek Mine. It is to be noted that CIP processing will be discontinued for 12 months until a decision is made whether to construct a new CIP plant.

The results of water quality monitoring to date indicate that the mining and treatment operations at Browns Creek has no significant impact on water quality in Cowriga Creek.

Piezometer bores are to be installed in the wall of process residue dam No. 3 as indicated on Plan 13, in early 1989 and these will be monitored for seepage and water quality on a regular basis.

8.3 NOISE MONITORING

8.3.1 Introduction

Monitoring of noise levels from mine related activites has been undertaken prior to the preparation of the EIS document and subsequently to verify noise predictions.

Noise monitoring is specified as a requirement in both the conditions of development consent and conditions of the Pollution Control Approval.

The recommended limits for noise attributable to mine related activity at residences in the vicinity of the mine are summarised in Table 8.1.

The noise environment at the closest three residences to the mine site ("Bonnie Doon", "Springvale", and "Desmond Slopes") was monitored prior to preparation of the EIS document and prior to the subsequent relocation and commissioning of the new treatment plant. These previous levels reflected a significant contribution of the Browns Creek Mine to the local noise climate. Section 3.7 of the EIS document discussed the existing noise environment.

Appendix 7 (Section A.7.2) of the EIS document established design goal background noise levels (L_{90}) for the longterm development at the mine to be 38 dB(A), 35 dB(A) and 35 dB(A) respectively for daytime operations and 35 dB(A) for nighttime operations at residences "Bonnie Doon", "Springvale" and "Desmond Slopes". These design goals were established to satisfy the State Pollution Control Commission's overall objectives for noise control.

TABLE 8.1

Noise Limits Within 10 m of Residences

Activity	Time/Period (Any Day)	Noise Limit dB(A)	Noise Category
Operational Phase	7.00 am - 7.00 pm 7.00 pm - 10.00 pm 10.00 pm - 7.00 am	45 40 35	Continuous noise from any plant, equipment or process
Construction Phase	any time during approved hours	55	$L_{A10}T$ (sound level exceeded 10 per cent of the time - statistically determined)

8.3.2 Results of Noise Monitoring

The results of noise monitoring, undertaken in satisfaction of the conditions of Pollution Control Approval, at the following residences:

BCN-1 - "Bonnie Doon",
BCN-2 - "Springvale", and
BCN-3 - "Desmond Slopes"

are presented in Appendix 5 as:

Table A5-2.1 (construction phase on 27th September, 1988)
Table A5-2.2 (full operational phase on 18th and 19th October, 1988)

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 to 15 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.

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

The monitoring was carried out at various time throughout the day and night to establish the noise levels attributable to the full range of site activities. Table A5-2.2 indicates the site activities which were operating during the noise monitoring.

8.3.3 Discussion of Results

During the construction phase of the treatment plant (and dismantling of the old plant), L_{10} noise levels at the residences ranged from 35 to 49 dB(A) and therefore satisfied the specified L_{10} limit of 55 dB(A).

During the full operational phases of the mine development, the design goal noise levels (L_{90}) established by Richard Heggie Associates in the EIS document were met. The Commission's specified noise level requirements of 45 dB(A)(L_{10}) for daytime operations were satisfied. The Commission's specified noise level requirements of 35 dB(A) at nighttime were satisfied when the plant only was operating, however, with the underground pump operating an exceedance by up to 5 dB(A) was measured at "Bonne Doon" and "Desmond Slopes".

Night shift mining operations exceeded the L_{10} noise level requirements by 4 dB(A) at "Bonnie Doon" during the period 7 pm to 10 pm.

The results of noise monitoring undertaken in October, 1988 do, however, indicate a reduction in overall L_{10} noise levels during day and nighttime operations by up to 6 dB(A) from the results of monitoring in September, 1987.

It is to be noted, however, that the mining situation anticipated by autumn/winter of 1989 will have changed to achieve a likely further reduction in noise levels. These changes in mining situation are:

(i) the overburden emplacement will be further established as an acoustic barrier around the new treatment plant and thereby considerably restricting the line of sight from "Bonnie Doon" to the activities on site;

(ii) the underground pump generator, currently a significant source of nighttime noise, will not be operative (it is anticipated this will be discontinued by December, 1988);

(iii) mining activity will be contained at a lower level within the established open cut perimeter;

(iv) night shift mining will continue over summer until the end of April, 1989 and terminate temporarily over winter;

(v) the number of drills operating after April, 1989 may be reduced.

8.4 DUST MONITORING

8.4.1 Introduction

Monthly monitoring of dust deposition gauges has been undertaken at five sites in the vicinity of Browns Creek Mine over a 13 month period from 2nd February, 1987 to 1st March, 1988.

The installation of the dust deposit gauges, sampling, analyses and reporting are undertaken in accordance with Australian Standard 2724.1 - 1984.

Monitoring was undertaken to estalish the degree of dust generation by activities on the site and the level of impact on surrounding residences.

The five site locations are:

BCA-1 - "Long Hill" located 1.1 km northeast of the mine (Company owned residence);
BCA-2 - Located on a ridge 0.9 km east of the mine (Company owned property);
BCA-3 - Located 0.7 km south of the mine on the lease boundary;
BCA-4 - "Bonnie Doon" located 1 km south of the mine (residence of J.B. Baker);
BCA-5 - Located 0.2 km northwest of the mine (Company owned residence).

Monitoring was discontinued on the 1st March, 1988 at all but one site, BCA-4 at the "Bonnie Doon" residence. Monitoring will continue at BCA-4 for a further 12 months as this is the closest non-Company owned residence.

8.4.2 Discussion of Results

The results of all dust deposit gauge monitoring at the five sites are presented in Appendix 5, Table A5-3. The table indicates four results which are suspected to be anomalous (the high results are indicative of foreign organic matter). The anomalous results have been deleted from mean calculations.

Table 8.2 summarises the results and presents a comparision at each site of: seasonal averages, annual means, range and standard deviations. The following points are noteworthy:

(i) Dust deposition is seasonably variable and at all sites is highest in the dry spring and summer months.

(ii) Dust deposition at all sites, with the exception of sites BCA-1 and BCA-5 in spring and summer, are relatively low and are comparable to typical dust levels for a rural residential area.

(iii) The State Pollution Control Commission has no defined criteria to assess the impact of dust fallout, however, levels of 4 to 6 g/m^2/month generally attract complaints. Dust fallout at "Bonnie Doon", the closest non-Company owned

residence, is well below this level. It is notable that the predominant winds are southwesterly and hence blow from the direction of "Bonnie Doon" to the mine.

(iv) Relatively high dust deposition in spring at BCA-1 (Company owned residence) is exacerbated by the prevailing wind direction. The high spring mean dust fallout at BCA-1 may be attributable to a high result (20 g/m^2/month) in October, 1987 when earth works were underway on an exploration costean 300 m southwest of BCA-1.

(v) Relatively high dust deposition in spring and summer at BCA-5 is due to its close proximity (200 m) to the open cut mine and to Platform Road diversion earthworks which were undertaken in spring/summer, 1987.

(vi) The extent of Company land surrounding the Browns Creek Mine, upon which normal grazing use is undertaken, provides a buffer zone against the impacts of dust fallout to surrounding residences and properties.

TABLE 8.2

Dust Summary - Insoluble Solids (g/m^2/month)

Period	BCA-1	BCA-2	BCA-3	BCA-4	BCA-5
Summer	2.46	1.50	3.10	2.44	4.33
Autumn	2.28	0.93	2.53	1.50	2.24
Winter	1.36	0.64	1.45	0.94	0.93
Spring	7.53	1.00	1.79	2.16	7.31
Total Mean	3.41	1.02	2.22	1.76	3.70
Range	0.62- 20.09	0.20- 1.77	0.76- 3.75	0.25- 3.48	0.67- 13.73
Standard Deviation	2.79	0.36	0.74	0.67	2.78

- Summer, autumn, winter, spring dust levels are mean values
- Monitoring over 13 months.

8.5 BLAST MONITORING

8.5.1 Introduction

Blast monitoring, prediction and assessment of operations at Browns Creek Mine was conducted by Richard Heggie Associates in September, 1987 for the EIS document (Ref: Report No. 821-R1). Section A7.5 of Appendix 7 of the EIS document presents the discussion of this monitoring.

The Company has subsequently commissioned BHP Central Research Laboratories to monitor the impact of production blasting on two closest residences ("Bonnie Doon" and "Long Hill"). The monitoring was undertaken to verify the predictions made in the EIS document. During this monitoring period (26th to 30th September, 1988) production blasting was carried out at different sites within the pit using blasting techniques which had been developed over a period of time in a conscientious effort to reduce airblast and vibration. These practices, where possible, involve the use of Nonel surface and down hole delay systems and stemming depths of approximately 2.5 m. The monitoring also involved high speed photography and velocity of detonation measurements.

8.5.2 Discussion of Results

The results of the two series of blast monitoring (by Richard Heggie Associates in September, 1987 and by BHP Central Research Laboratories in September, 1988,) are presented in Tables A5-4.1 and A5-4.2 of Appendix 5 of this Annual Report.

The results of the recent monitoring in September, 1988 indicate that a reduction in the measured air blast overpressure at the residences has been achieved by the above mentioned blasting techniques. The air blast overpressure achieved better results than those predicted by Richard Heggie Associates in September, 1988.

The use of "noiseless" surface initiation systems will be continued, however there may be occasions when the airblast limits are exceeded due to either early ejection of stemming material or during pre-splitting operations when detenating cord and is required to be used. The covering of detenating cord is not always possible in those situations.

The levels of ground vibration measured both in September, 1987 and September, 1988 were less than 1 mm/s in all cases.

On the basis of these results the Company has demonstrated that the impacts of blasting at surrounding residences satisfy the recommended limits specified by the State Pollution Control Commission of:

Air blast overpressure	- 105 dB LIN
Ground vibration	- 2 mm/s

The Company is confident that its blasting techniques now adopted will maintain impacts of blasting within these specified limits throughout the mine life.

APPENDICES

APPENDIX 1

SCHEDULE B

ADDITIONAL CONDITIONS OF MINING LEASES AT BROWNS CREEK

(Pursuant to the Transfer of Leases to BHP Gold Mines Limited as Approved by the Minister for Mineral Resources)

SCHEDULE 'B'
ADDITIONAL CONDITIONS OF MINING LEASES AT BROWNS CREEK

1. (a) Any topsoil which may be disturbed shall be removed separately for replacement as far as may be practicable.

   (b) The registered holder shall plant or sow such grasses, shrubs or trees in the replaced topsoil as may be considered necessary by the Minister to control erosion.

2. (i) The registered holder shall not open up any "new mine" in any part of the subject area, without the prior approval of the Minister first had and obtained and subject to such conditions as he may stipulate.

   (ii) The registered holder shall supply such information as is required to be lodged in respect of any such approval and shall comply with the conditions in any approval by the Minister, including any conditions requiring the lodgement of an additional security.

   For the purpose of this clause, "new mine" shall mean:

   (a) An open cut or underground operation that is not an extension to the currently operating mine;

   (b) Any variation to the mining operation that will significantly increase the production rate of the existing open cut or underground mine;

   (c) Any change to the mining method employed in the subject area.

3. The registered holder shall provide, within a period of 28 days after the 30th June of each year or at such other date as the Secretary may stipulate, a progress report(s) to the satisfaction of the Secretary containing the following:

   (i) Full pariculars, including results, interpretation and conclusions, of all exploration conducted during the twelve months period;

   (ii) Details of expenditure incurred in conducting that exploration;

(iii) A summary of all geological finding acquired through mining or development evaluation activities;

(iv) Particulars of exploration proposed to be conducted in the next twelve month period;

(v) All plans, maps, sections and other data necessary to satisfactorily interpret the report(s);

(vi) The Minister may, by notice in writing served on the registered holder, direct the registered holder to do any one or more of the following things:

(a) To preserve for the period specified in the notice any drilling core or sample recovered as a result of prospecting operations;

(b) To label or otherwise identify those cores or samples in the manner specified in the notice and to keep such other records in relation to those cores or samples as may be so specified;

(c) To make those cores or samples available for inspection by officers of the Department of Mineral Resources at the times and in the manner specified in the notice;

(d) To deliver up to the Secretary any such core or sample specified in the notice.

4. (a) The registered holder shall within 28 days of each anniversary of the transfer of this lease or within such other times as the Minister may allow or direct in writing, submit for the Minister's approval a mining, rehabilitation and environmental management plan (hereinafter referred to as "the plan") which shall describe the methods to be used to protect the environment by controlling disposal of mine wastes, by minimising by best practicable means air, noise and water pollution, by minimising by best practicable means erosion and by rehabilitating the land surface which is disturbed by mining operations.

Plans and appropriate written documents where necessary, prepared to the satisfaction of the Secretary, shall show:

(i) The approximate depth and nature of the topsoil in the subject area.

(ii) The type of vegetation on the subject area.

(iii) The contours of the premined area indicating drainage lines and any water empoundments.

(iv) Plans and sections illustrating mineralisation in the subject area.

(v) An overall site plan showing the surface location of the mine processing plant, mine workings and ancilliary facilities.

(vi) The methods and order in which the land is to be mined and rehabilitated.

(vii) Plans and sections showing the extent to which the mineral resource is utilised and the nature of the remaining mineralisation that is not included in the plan. Mine development and slope layout or pit plans shall be included.

(viii) The methods proposed to be adopted, to prevent effluent or contaminated waters discharging from works or operations in the subject area onto surrounding areas or into creeks, streams or watercourses; toxic waste must be identified and provision for its control both before and after mining be addresed in the plan.

(ix) The methods to be employed to dispose of mine wastes, refuse, tailings, effluent or like substances.

(x) Steps to be taken to minimise adverse impacts caused by dust and the vibration and noise effects of blasting.

(xi) The approximate contours to which the surface shall be rehabilitated indicating drainage lines and any water empoundments.

(xii) A description of the method of minimising erosion.

(xiii) The manner in which it is proposed to remove, store and replace the topsoil, and

(xiv) The grasses, plants, shrubs and/or trees and the planting techniques proposed for the subject area following the mining operations to obtain a self sustaining vegetative cover or such other methods of rehabilitation that shall make the landform stable.

(b) The Minister may in respect to a plan or an amendment to a plan submitted to him under this condition direct the registered holder to amend or vary the plan (or amendment thereto) as may be specified in a notice served on the registered holder and to resubmit the plan or amendment to him for approval within a period specified in the notice.

(c) The registered holder shall on or before each anniversary of the grant of this lease or as directed by the Regional Mining Engineer review the plan to ensure that the plan adequately deals with the matters referred to in paragraph (a). Where the registered holder is of the opinion that the plan should be amended he shall submit the amendment or new plan to the Minister for approval.

(d) The Minister when approving any plan or amendment thereto submitted to him pursuant to this condition may approve the plan or amendment subject to conditions.

(e) Where the Minister is of the view that the plan should be amended he may by notice served on the registered holder direct that the plan be varied in the manner set forth in the notice.

(f) The Minister or his nominee shall consult with the registered holder before:

(i) Any condition is included under paragraph (d) which would have the effect of amending the plan or any amendment thereto submitted pursuant to this condition; or

(ii) Makes a direction under paragraph (e).

(g) The registered holder shall comply with and conduct all operations within the mining area in accordance with the provisions of any plan or amendment thereto approved by the Minister or any variation made pursuant to paragraph (e) or any conditions imposed pursuant to paragraph (d).

(h) On each anniversary of the transfer of the lease, the registered holder shall submit a report to the Minister which describes the environmental management measures used to protect the environment; a summary of the results of the environmental monitoring together with a description of the environmental management measures to be carried out in the succeeding twelve months. The report shall include a plan showing the progress made towards rehabilitation in the preceding twelve months and the rehabilitation proposed for the succeeding twelve months.

(i) Notwithstanding the provisions of paragraph (g) the registered holder may bring to the attention of the Minister at any time, circumstances which have arisen which make partial compliance with the plan untenable.

(j) The registered holder shall when required by the Regional Mining Engineer to do so furnish such information relating to the responsible utilisation of the mineral resources of the mining area as the Regional Mining Engineer may specify.

(k) Where the Minister is satisfied on a report of the Regional Mining Engineer that the method or system or working or processing employed in the development of or in any subsequent operations in any mine is such as to result in failure to recover minerals that would otherwise be economically recoverable at the time he may give notice in writing to the registered holder:

(i) Stating the particulars in which it is considered the method or system of working or processing tends to such failure to recover minerals; and

(ii) Requiring that such methods or system of working or processing be abandoned or so modified as to remedy such failure to recover minerals; provided that:

(a) No such report shall be submitted to the Minister until it has been thoroughly discussed with and has incorporated the views of the registered holder; and

(b) The notice shall not specify the modification of the mining or processing method to be adopted by the registered holder.

(l) The registered holder may object to any notice issued under this condition and on receipt of such an objection the Minister shall refer the objection to a Warden for inquiry and report under Section 178 of the Mining Act, 1973.

(m) On receipt of the Warden's report the Minister shall determine the objection in accordance with findings of such report and the registered holder shall comply with the determination so made.

5. Upon cancellation (in part or in total) or upon expiry, full details of the following shall be lodged with the Secretary:

(i) Plans and sections showing the extent of working on the area cancelled or subject to expiry.

(ii) Records of tonnage and grades mined and treated.

(iii) Records of concentrate and/or finished products produced.

(iv) Geological information including details of any remaining mineralisation.

6. The registered holder shall ensure that the ground vibration peak particle velocity generated by any blasting within the subject area does not exceed 10 mm per second and does not exceed 5 mm per second in more than 5% of the blasts at any dwelling or occupied premises outside the subject area, unless approval has been granted by the Regional Mining Engineer to exceed the said particle velocity or as otherwise determined under the provisions of the State Pollution Control Commission Act, 1970.

7. The registered holder shall ensure that the blast overpressure noise level generated by any blasting within the subject area does not exceed 120 dB (linear) and does not exceed 115 dB (linear) in more than 5 per cent of blasts, outside the said area, at any dwelling or occupied premises, as the case may be unless approval has been granted to exceed such levels by the Regional Mining Engineer or as otherwise determined under the provisions of the State Pollution Control Commission Act, 1970.

8. Only the minimum number of access tracks will be constructed to permit satisfactory operations. Temporary access tracks shall be ripped, topsoiled and revegetated as soon as possible after they cease to be required for mining operations. The design and construction of access tracks shall be in accordance with specifications fixed by the Soil Conservation Service of New South Wales.

9. All precautions will be taken to divert runoff from the surrounding catchment area away from excavations, spoil dumps, access tracks and tailings ponds. All such diversions shall lead runoff to safe disposal areas and be constructed in accordance with designs and specifications provided by the Soil Conservation Service of New South Wales.

10. (a) The registered holder shall prior to the cessation of open-cut operations, submit for the Minister's approval, a plan, describing the ultimate post mining use of the remaining void and the methods to be adopted to render it safe and stabilise the sides of the excavation.

    (b) Upon the Minister's approval and upon cessation of such operations the registered holder shall carry out the works so approved.

11. Unless otherwise directed by the Minister the registered holder shall batter the sides of all waste disposal dumps and stockpiles to an angle no greater than 1:3.

12. (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 provisions 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 the Engineer issues any direction to the registered holder pursuant to paragraph (a) of this condition the registered holder shall compy with the direction.

APPENDIX 2

CONDITIONS OF DEVELOPMENT CONSENT

SHIRE OF BLAYNEY

CONDITIONS OF DEVELOPMENT CONSENT RELATING TO DEVELOPMENT APPLICATION NO. 44/87 - BROWNS CREEK GOLD PROJECT

1. Environmental Monitoring and Control

The applicant shall:

1.1 Undertake and implement environmental monitoring in respect of air, noise and water quality.

1.2 Designate a Company employee to be responsible for ensuring that all environmental safeguards and monitoring proposed for the development are met or are not exceeded.

2. Statutory Authorities

The Applicant shall:

2.1 Submit an application to the Council for installation of a septic tank.

2.2 Make arrangements acceptable to Council for the disposal of rubbish and putrescrible rubbish.

2.3 Obtain Pollution Control approval for the project under the provisions of Clean Air, Clean Waters and Noise Control Acts.

2.4 Obtain approval from the Dam Safety Committee for design of the tailings dam including adequate freeboard.

2.5 Obtain a licence to divert Cowriga Creek from the Department of Water Resources.

2.6 Obtain a licence to construct a waste rock sedimentation dam and spillway channel from the Department of Water Resources.

2.7 Construct bund walls, suitable to contain spillage of reagents, around both the Carbon-in-Pulp and Froth Flotation Treatment Plants.

2.8 Submit building plans to Council in accordance with Ordinance 70.

2.9 The hydrogeological study currently being undertaken by the Applicant on the effect of mine dewatering is to be extended in boundary to Matthews Lane and submitted to the Department of Water Resources for assessment.

2.10 Submit the hydrogeological report to the Department of Water Resources and obtain the approval of the Department of Water Resources to the proposed hydrogeological works associated with dewatering the mine.

2.11 Limestone shall not be removed from the mine site by road transport on Council's public road system without the prior consent of Council.

2.12 The limestone stockpile shown on the supplementary sketch (Plan No. BCP 1200, 1201 and 1201.1) shall be rehabilitated in a similar manner to that of the waste rock dump, details of which are included in the Environmental Impact Statement.

2.13 No vehicle associated with the mine construction or mine operation will be permitted to cross the timber bridge over Cowriga Creek adjacent to the mine site where the gross weight of the vehicle exceeds the maximum loaded weight set out in ordinance 30D Cl. 7 1(A) - being 38 tonnes.

2.14 The Applicant is to consult with the Soil Conservation Service prior to the construction of soil erosion control measures and in respect of implementation or rehabilitation.

2.15 The Applicant is to restore Crown Road access to Portions 54 and 55, Parish of Beaufort, on completion of the mining operation.

2.16 The downstream faces of the tailings and sedimentation dams are to be topsoiled and grassed following completion of construction to the satisfaction of the Soil Conservation Service.

2.17 The Applicant shall contribute the sum of $16,500 towards the improvement of the entrance of the mine site with Brown's Creek Road by widening of the pavement in accordance with Department of Main Roads drawing 4.20A.

2.18 The Applicant is to consult with the Lands Office, Orange, prior to the final determination of the method of securing the void from the aspect of public safety.

2.19 The standard of works for rehabilitation of activity associated with the mining operation outside Mining Lease Nos. ML 5895, ML 1015, ML 910, ML 911, ML 912, ML 1188, (or any subsequent amalgamation of those Mining Leases) shall be to the standard of works for rehabilitation required by the conditions of approval of the Department of Mineral Resources as advised by the Soil Conservation Service and attached to those Mining Lease numbers above and any subsequent variations to the Mining, Rehabilitation and Environmental Management Plan (MREMP) directed by the Department of Mineral Resources for restoration within those Mining Leases.

2.20 The Applicant is to incorporate rehabilitation proposals for activity outside Mining Leases referred to in 2.19 above in the Mining, Rehabilitation and Environmental Plan and submit the Plan to Council annually for approval.

2.21 The Applicant shall lodge with Council, a Bank Guarantee for an amount of $600,000 for due performance of rehabilitation of activity associated with the mining operation outside the Mining Leases referred to in 2.19 above in accordance with the MREMP approved by Council.

3. Annual Reporting

Prepare and submit to Council, annually, in conjunction with the annual MREMP, a report in respect of the performance of the Development. The annual report shall include information concerning:

a. The performance of the development.

b. The implementation and effectiveness of the environmental controls and conditions relating to the development.

c. A review of results of environmental monitoring in respect of air, water and noise and vibration.

d. A review of mining operations undertaken during the preceeding twelve (12) months.

e. An overview of workforce characteristics of the development.

4. Community Infra Structure

The Applicant shall:

4.1 Initiate discussions with the Council concerning additional demand for social and/or community facilties in the Council's area resulting from an increase in population and pay to the Council an agreed financial contribution for provision of such additional facilities.

4.2 Fund all infrastructure that it exclusively uses.

4.3 Contribute towards the cost of installation, upgrading and maintaining publicly provided infrastructure items used for industrial purposes by the development in respect of which the applicant does not have exclusive use.

5. General

This approval shall be regarded as being in accordance with the particulars and information set out and described in the Development Application registered in Council records as 44/87 of 16th December, 1987, except where varied by any or all of the attached conditions, and any alteration, variation or extension of the development for which approval is hereby given shall require the further consent of Council.

6. The hours of operation are to be:

Activity	Time	Days	Status
Construction	7.00am - 10.00pm	Mon - Sat	Temporary
Crushing	7.00am - 7.00pm	Mon - Sat	Normal
	7.00am - 10.00pm	Mon - Sat	Contingency
	8.00am - 5.30pm	Sunday	Contingency
Treatment Plants	24 hours per day	7 days	Normal
Rock Breaker	7.00am - 5.30pm	Mon - Sat	Normal
Mining	7.00am - 5.30pm	Mon - Sat	Normal
	5.30pm - 7.00am	Mon - Sat	Contingency
Blasting	3.00pm - 6.00pm	Mon - Fri	Normal
	Other daylight hrs		Contingency

7. The Company is to make a contribution of $10,000 to Council towards the cost of heavy patching maintenance to be undertaken during the advised construction period.

R B HORNERY
Shire Engineer/Planner
22nd March 1988

APPENDIX 3

POLLUTION CONTROL APPROVAL

STATE POLLUTION CONTROL COMMISSION

STATE POLLUTION CONTROL COMMISSION ACT,1970

Pollution Control Approval

Number: 260 464 CS

Date of issue: 11 August 1988

Approval is hereby given to B.H.P. Gold Mines Limited

of P.O. Box 57
BLAYNEY NSW 2799

under the provisions of Section 17K of the State Pollution Control Act, 1970, to carry out work to: extend, modify and relocate gold mining and processing facilities

at Browns Creek Gold Mine
Platform Road
Browns Creek
via Blayney

on the basis of the information supplied in the application dated 3 June 1988

and in any subsequent correspondence between the applicant and the Commission, subject to the following conditions:

CATEGORY I

1. Air pollution control equipment shall be fitted to blast hole drilling rigs to prevent fines generated during drilling from being discharged to the atmosphere. Facilities shall be installed to prevent re-entrainment of fine dust into the air either during or after discharge from the filter hoppers.

2. The dump hopper shall have windshields. Windshields shall have full walls with a height of two metres above the surface of the dump grate, and extending two metres beyond the ends of dump hopper opening.

3. All loading and unloading points, feeders, conveyor loading, transfer and discharge points shall be effectively enclosed to prevent wind access or material spillage. All these points shall incorporate effective spray suppression systems using water and a suitable dust control agent automatically mixed with the water, or an effective exhaust system and fabric filter, dust collector or similar equipment. The control systems shall operate automatically whenever the conveyor system is activated.

4. The fine ore bin and all transfer points shall be fully enclosed, the ore screen shall be enclosed on the top and all sides and all conveyors shall be enclosed on at least the top and one side or both sides to prevent material blow-off.

5. Effective cleaning devices shall be fitted to the return side of all conveyor belts.

6. Suitable dust collectors shall be installed on the fine ore bin. All dust collected shall be contained for dust free disposal or reuse. It shall not be permitted to discharge to the ground.

7. The silo containing lime shall be enclosed, and all air discharging to atmosphere shall pass through a bag filter. The bag filter shall be automatically cleaned.

8. The outlet air from bag filter shall be ducted to within one metre of ground level to safeguard against dust emissions at elevated height in the event of filter failure.

9. A level indicator shall be fitted to the lime silo and it shall be interlocked with the filling line such that, in the event of the silo approaching an overfull condition, an audible alarm will operate, and the pneumatic line to the filling tanker will close before an overflow occurs.

10. The silo high level indicator shall incorporate a test circuit, which will enable the operator to simulate a high level condition prior to each delivery. Should the level indicator test circuit show a malfunction of the level indicator, then an inspection of the lime level within the silo shall be made to ensure that it is capable of holding the volume of material which is to be discharged from a tanker.

11. All inspection ports and hatches on the lime silo shall be effectively sealed at all times when not in use and shall not be used for routine inspection of material levels.

12. Guide posts or other suitable barriers shall be placed along the edges of unsealed roads to prevent traffic movement onto other unsealed areas.

13. A mobile tanker equipped with a pump and sprays capable of spraying water at the rate of not less than 3 litres per second and not less than 700 kPa pressure, shall be provided. This equipment shall be used to suppress dust from all loading and unloading operations and from roadways.

14. Surface stormwater run-off shall be diverted away from the tailings dam and in a manner which prevents scouring or erosion.

15. A catch dam shall be constructed downstream of the tailings dam and a recycle pump shall be installed which shall be capable of returning all seepage from the tailings dam. There shall be no discharge from the catch dam. This dam shall be constructed prior to operations commencing.

16. Roof water and stormwater from uncontaminated areas shall be drained direct to the stormwater drainage system. Areas subject to contamination shall be segregated from clean areas by the use of appropriate grades, drains, speed humps or equivalent.

17. Stormwater diversion drains shall be completed prior to construction of the tailings dam wall.

18. Sedimentation basins shall have a minimum capacity of 500 cubic metres per hectare of disturbed area draining to the structure.

19. The outlet from the sedimentation basin shall be provided with a suitable baffle to ensure that effluent is withdrawn at least 300 mm below the liquid surface so as to control the carryover of scum and floating matter.

20. All practical measures shall be taken to prevent short-circuiting in the sedimentation basins.

21. Sediment control facilities shall be installed before any other construction takes place.

22. Impervious bunds shall be constructed around all fuel or oil storage areas large enough to contain 120% of the volume held in the largest tank.

23. Dewatering of construction areas and open cut areas subject to infiltration shall be controlled such that the suspended solids concentration in the wastewaters does not exceed 50 mg/L. In addition, equipment shall be provided to ensure there is no visible oil and grease and, in any case, less than 10 mg/L oil and grease in the wastewaters.

24. The processing plant, including the flotation plant and all tanks containing cyanide solutions, cyanide mixing facilities, carbon stripping and chemical store and mixing facilities, shall be bunded and be capable of holding at least 120% of the volume of the largest containment within the area.

25 The bunded area shall be drained to a pumping sump. The sump shall have a suitable pump installed which shall be automatically operated. A high level visual and audible alarm shall be installed and operated at the sump.

26. The Commission shall be notified in writing of the proposed date of commissioning of the works, not less than 14 days before commissioning.

CATEGORY II

27. The applicant shall certify by means of the attached form (Certificate of Compliance with Pollution Control Approval), as to the manner of compliance with the information supplied in the application and in any subsequent correspondence between the applicant and the Commission and with any condition under Category I, such compliance having been achieved before the plant, equipment or construction is put into regular operation. The applicant shall forward the completed form to the Commission within fourteen days of the commencement of such regular operation.

28. Fines collected from blast hole drilling shall not be used for stemming unless moist.

29. Detonating cord lines shall not be covered with drilling materials unless wetted.

30. The pneumatic line and lime silo shall be blown through into the silo and the end capped after each delivery.

31. Material removed during belt cleaning operations shall be contained for dust free disposal or reuse. It shall not be discharged to the ground.

32. Water spray nozzles shall be operated to suppress any dust emissions that occur during truck unloading operations.

33. Material shall not be allowed to bank-up against the windshields.

34. The undisturbed surface layer of a stockpile shall be thoroughly wet before road truck loading operations from the stockpile are commenced.

35. The air flow from radiator fans and exhaust gases from the motors of all plant and equipment, including trucks, shall be so directed that they do not impinge on the ground from a height of less than two metres.

36. All unsealed roads, including temporary roads on stockpiles, shall be kept sufficiently damp to prevent wind blown or traffic generated dust. Plant shall be provided to enable watering at least hourly at a rate of 1.5 litres per square metre.

37. All dust control equipment shall be kept in good operating condition. The equipment shall be operable at all times with the exception of shutdowns required for maintenance. Planned maintenance shutdowns of control equipment shall not be scheduled to commence during periods when wind speeds in excess of 10 metres per second are being experienced or are forecast to occur within the period of shutdown.

38. There shall be no discharges, other than uncontaminated stormwater, from the premises.

39. Wastewaters from workshops shall be collected and treated prior to reuse on site.

40. All contaminated waters, including stormwater run-off, seepages and leachates, shall be collected and treated prior to reuse on site.

41. All wastes collected in the bund collection sump shall be pumped to the tailings dam or recycled.

42. Any spillage of cyanide or liquors containing cyanide shall be immediately neutralized, pumped to the tailings dam or recycled.

43. All drums and other containers holding any pollutant matter shall be stored in such a manner that any leakage or spillage shall be collected and retained for subsequent disposal by means which do not pollute waters. Effective measures shall be taken to exclude rain and surface stormwater runoff from container storage areas.

44. A minimum of 1,000 millimetres freeboard shall be maintained in both the tailings dam and process water dam.

45. The applicant shall provide to the Commission a certificate as to the stability of all dam walls from a suitably qualified civil engineer prior to processing operations commencing.

46. All units of the water pollution control system shall be inspected at least once per working shift. The condition of all units shall be noted in a ledger kept for the purpose. The ledger shall be maintained in a legible condition at all times and retained for a period of not less than three (3) years. The ledger shall be made available to any authorised officer of the Commission on demand.

47. The applicant shall be responsible for the operation and maintenance of the water pollution control system and shall ensure that it is operated by a competent operator in accordance with the conditions of approval.

48. No alteration to the works or method of disposal shall be made without the approval in writing of the Commission.

49. A copy of the report of the water quality monitoring shall be sent to the Commission within thirty (30) days of its release or at least annually.

50. The following operations shall only be carried out during the following hours:-

    a) The construction phase - between the hours of 7.00 a.m. and 10.00 p.m. Monday to Saturday inclusive and at no time Sundays or Public Holidays.

    b) Drilling - between the hours of 7.00 a.m. and 5.30 p.m. Monday to Saturday inclusive and at no time Sundays and Public Holidays.

    c) Blasting operations - between the hours of 3.00 p.m. and 6.00 p.m. Monday to Friday inclusive and at no time Saturdays, Sundays or Public Holidays except for contingencies when blasting shall only be carried out during daylight hours.

    d) Mining - between the hours of 7.00 a.m. and 5.30 p.m. Monday to Saturday inclusive and at no time Sundays or Public Holidays except for contingencies when mining shall only be carried out during during the hours of 24 hours per day Monday to Saturday inclusive and at no time Sundays or Public Holidays.

    e) Rock Breaking - between the hours of 7.00 a.m. and 5.30 p.m. Monday to Saturday inclusive and at no time Sundays or Public Holidays.

    f) Crushing - between the hours of 7.00 a.m. and 7.00 p.m. Monday to Saturday inclusive and at no time Sundays or Public Holidays except for contingencies when mining shall only be carried out during during the hours of 7.00 a.m. and 10.00 p.m. Monday to Saturday inclusive and between the hours of 8.00 a.m. and 5.30 p.m. Sunday and at no time Public Holidays.

    g) Treatment Plant - at any time on any day.

51. The applicant shall notify, at least monthly, the Bathurst Office of the Commission in writing the full details of any contingency necessitating operations in excess of normal hours of operation including the nature, period and reason for exceedence.

52. The $L^{A10}T$ sound pressure level of the construction phase when measured over a period of not less than 15 minutes within ten (10) metres of any residence shall not exceed a sound pressure level of 55 dB(A).

53. The blast overpressure shall not exceed 105 dB(Linear Peak) and the Peak Particle Velocity shall not exceed 2mm/sec at any point in or on any residential premises.

54. The continuous noise from any plant, equipment or process in or on the premises when measured at any point within ten (10) metres of any residence shall not exceed a sound pressure level of 45 dB(A) between the hours of 7.00a.m. and 7.00p.m. and shall not exceed a sound pressure level of 40 dB(A) between the hours of 7.00pm and 10.00p.m. and shall not exceed a sound pressure level of 35 dB(A) between the hours of 10.00p.m. and 7.00a.m.

55. All vehicles, including plant and equipment, shall be fitted with suitable exhaust muffling equipment.

56. The applicant or his agent shall test the noise emissions from the premises during both the constructional and operational phases under full working conditions, demonstrate compliance with the conditions of approval and send a copy of the report to the Commission with sixty (60) days of the date of this approval in respect of the constructional noise and within thirty (30) days of the commissioning of the plant.

PETER STANDEN
DIRECTOR

Per.....
..
Deputy Regional Manager-
Inland
(by Authorisation)

APPENDIX 4

COWRIGA CREEK REDIVERSION LICENCE

Water Resources

B.H.P. Gold Mine Limited
P.O. Box 57

BLAYNEY. NSW 2799

Telex: 121188
Facsimile: (02) 895 7281
Telephone: (02) 895 6211
Ext: 895 7761
Contact Name: J.R. Hurst
Our Reference: 800795

15 AUG 1988

Dear Sir,

Your application under Part VIII of the Water Act, 1912, has been granted. The Approval Certificate is enclosed. You will note it is effective for a period of five years commencing from 13/9/88.

I also draw your attention to conditions attached to this Approval Certificate. If you object to any of these conditions you may lodge a protest in writing to the Department specifying the grounds for protest. It must be lodged within 21 days of the date of this letter.

If you lodge a protest the effective date of the Approval will be nullified, as the provisions of the Water Act require applications subject to protests to be referred to the Local Land Board for Inquiry and Report. The Local Lands Office would then advise you of the date, time and place of the Inquiry so that you may attend. If the Board's Inquiry confirms the Department's determination, or varies the conditions of Approval, the effective date of the Approval then commences from the date the Board announces its decision. An appeal may be made to the Land and Environment Court against any such decision by the Land Board.

The holders of this Approval shall bear full responsibility for and take all reasonable and proper precautions and care with the construction, maintenance and repair of the controlled work covered by said Approval No. 800795.

Yours faithfully,

J.R. Hurst

for A/Senior Licensing Officer.

CONDITION STATEMENT

~~RENEWED~~/APPROVAL NO. 800795

UNDER PART VIII OF THE WATER ACT

Effective to 11/9/93

1. The location and nature of the approved controlled work, as shown on a plan retained in the office of the Department of Water Resources, shall not be altered.

CONDITION STATEMENT REFERRED TO ON 88/3049

ISSUED UNDER PART II OF THE WATER ACT, 1912

1. The level of the bed of the cutting at its offtake shall be fixed at not lower than 813.1 metres A.H.D. particulars of which are retained in the office of the Department of Water Resources.

2. The location of the bloc. dam as shown on a plan retained in the office of the Department of Water Resources shall not be altered.

3. The work shall be constructed and maintainted in such manner as will ensure its safety and as will preclude the possibility of damage being occasioned by it, or resulting from it, to any public or private interest.

4. The bed of the cutting shall be constructed to grade and suitable batters.

5. The licensee shall construct and maintain such protective works in the cutting as may be deemed necessary for the prevention of erosion.

APPENDIX 5

ENVIRONMENTAL MONITORING DATA

G.R. McIlveen

MINING, REHABILITATION AND ENVIRONMENTAL MANAGEMENT PLAN

FOR THE BROWNS CREEK MINE ANNUAL REPORT 1988

AGENDA
SITE INSPECTION AND MEETING

Date: 25th November, 1988

Attendance:

David Bedford	-	Dept. Mineral Resources
Kerry Brooks	-	Dept. Mineral Resources
Graeme McIlveen	-	Dept. Mineral Resources
Terry Knowles	-	State Pollution Control Commission
Ian Lynch	-	Soil Conservation Service
Lloyd Gerdes	-	Dept. Water Resources
Ken Harris	-	Dept. Water Resources
Wayne McDonald	-	Crown Lands Board
	-	Crown Lands Board
Ray Hornery	-	Blayney Shire Council
	-	Blayney Shire Council
Richard Weston	-	BHP Gold Mines Ltd (Chairperson)
John England	-	BHP Gold Mines Ltd
Robert Corkery	-	R.W. Corkery & Co. Pty Limited
Greg Summerhayes	-	R.W. Corkery & Co. Pty Limited

Proceedings Start 9.00 am

9.00-9.15: **Welcome and Introduction**
- Richard Weston

9.15-10.45: **Site Inspection**

10.45-12.00: **Site Meeting**
- Richard Weston (Chairperson)

- Preliminary Commentary - David Bedford
- Review of Annual Report 1988
- Greg Summerhayes will provide a resume of each Section
- Questions and discussion on each Section
- The next 12 months - Richard Weston
- Open discussion and concluding remarks

TABLE A5-1 WATER MONITORING DATA - BROWNS CREEK GOLD MINE

Date Sampled	Discharge	pH	E.C.	HCO_3	Cl	SO_4	Ca	Mg	K	Na	S.S.	Cyanide	Unfiltered As	Cu	Pb	Zn	Mn	Cd	Fe	Filtered As	Cu	Pb	Zn	Mn	Cd	Fe
Units	Megalitres per day		u mhos /cm	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	mg/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	mg/l
BCW-1																										
23.01.87		7.1	565	340	24	1.7	44	40	2.3	22	8	<0.01	3.0	10	9.5	10	300	0.50	0.24	1.5	5	6	4	5	0.25	0.02
10.03.87		7.2	425	140	67	12	25	22	2.4	28	22	0.02	<0.05	10	8	15	72	0.50	0.45	<0.05	6	5.5	12	2.5	0.30	<0.01
02.06.87		7.6	450	255	32	7	31	27	2.1	22	3	-	<0.05	7.5	5	6.5	3	0.45	0.10	<0.05	10	13	12	39	0.80	0.34
03.08.87		6.6	265	110	15	15	12	16	2.6	14	145	-	1.0	11	9	16	335	0.45	1.96	<0.50	7.5	6.5	9.5	10	0.25	0.26
05.01.88		7.2	480	250	-	5	-	-	-	-	7	<0.01	-	22	-	-	-	-	0.61	-	7.5	-	-	-	-	0.02
21.06.88		10.1	410	590	30	5	28	24	2.4	21	60	0.02	<0.50	36	12	11	63	0.65	0.93	<0.50	12	8.5	7.5	18	0.55	0.53
BCW-2																										
23.01.87		Dry											Dry							Dry						
10.03.87		7.8	950	370	64	125	80	46	1.5	60	5	<0.01	5.0	38	27	36	750	1.20	0.50	1.5	7.5	18	12	4.5	0.30	0.02
02.06.87		7.3	740	405	39	25	55	39	0.7	46	4	-	<0.5	7.5	3.5	7	230	0.75	0.13	<0.50	10	19	14	610	1.30	0.70
03.08.87		7.1	440	175	20	35	24	19	1.3	27	100	-	5.5	32	18	13	320	0.50	1.32	3.0	10	8.0	5.0	10	0.30	0.16
05.01.88		Dry											Dry							Dry						
21.06.88		7.7	680	355	40	30	57	36	1.1	42	70	0.01	<0.5	12	14	14	710	0.85	1.29	<0.50	8.5	10	8.0	20	0.70	0.23
BCW-3																										
23.01.87		7.5	610	375	21	2.7	73	29	1.2	15	7	<0.01	14	27	14	16	155	1.4	0.20	13	15	7.5	6.0	6.5	0.40	0.01
10.03.87		7.6	420	210	32	9	29	23	2.3	28	30	0.02	<0.50	20	14	16	110	0.35	0.67	<0.5	10	8.0	10	2.5	0.15	0.02
02.06.87		7.3	550	320	25	10	51	27	1.6	19	12	-	2.0	27	6.0	7.5	45	0.7	0.18	5.0	75	12	12	240	1.0	0.49
03.08.87		6.8	290	120	20	20	15	16	2.7	15	565	-	6.5	88	14	26	740	0.90	3.30	5.5	23	12	10	12	0.45	0.22
05.01.88		7.5	580	320	-	4	-	-	-	-	7	<0.01	-	37	-	-	-	-	0.53	-	14	-	-	-	-	0.01
21.06.88		7.8	540	280	20	15	41	25	2.2	20	155	0.02	8.0	310	12	34	380	1.0	1.36	5.5	130	7.0	15	32	0.70	0.37
BCW-4																										
23.01.87		7.5	610	375	24	2.9	72	29	1.2	15	6	<0.01	17	18	14	11	119	8.0	0.31	12	10	6.0	4.5	7.0	0.45	0.03
10.03.87		7.5	420	210	35	49	51	23	2.3	27	20	0.01	<0.5	21	12	19	115	0.75	0.64	<0.5	13	8.0	13	5.0	0.40	0.03
02.06.87		7.4	545	310	28	11	50	27	1.6	19	22	-	5.0	21	7.0	7.5	55	0.65	0.17	7.0	80	12	11	360	0.95	0.68
03.08.87		6.8	295	125	15	15	16	15	2.8	15	640	-	5.5	110	23	34	860	1.0	2.37	4.0	26	17	18	15	0.55	0.14
05.01.88		7.5	580	245	-	7	-	-	-	-	40	0.06	-	46	-	-	-	-	0.60	-	17	-	-	-	-	0.01
21.06.88		7.9	530	280	20	20	40	25	2.0	20	175	0.05	5.0	240	9.0	14	410	0.80	1.27	4.5	125	6.5	10	64	0.55	0.30
BCW-5																										
23.01.87		Dry											Dry							Dry						
10.03.87		6.4	180	50	35	14	8	11	4.3	18	240		<0.5	15	8.5	18	156	0.25	2.80	<0.5	8.5	6.0	14	10	0.20	0.12
02.06.87		Dry											Dry							Dry						
03.08.87		6.2	140	45	7	30	6.4	8	4.8	8.4	220		5.0	75	14	26	145	0.50	2.41	3.5	22	9.0	11	26	0.35	0.17
05.01.88		Dry											Dry							Dry						
21.06.88		Dry											Dry							Dry						
BCI-1																										
05.01.88		9.1	4200	785	-	160	-	-	-	-	15	378	-	660000	-	-	-	-	18.6	-	620000	-	-	-	-	17.5
21.06.88		9.3	1950	415	460	60	41	15	3.2	310	25	255	60	65000	18	1490	160	22	0.33	55	47000	13	1010	14	0.20	0.07
BCI-2																										
16.11.87 *	AV.2.5	7.1	-	370	20	5	87	24	1.3	12.4	2	-	5.0	<10	<5	24	<10	<1.0	0.24							

- = Levels not determined

TABLE A5-2.1

Noise Monitoring Data - 27th September, 1988 - Construction Phase

Time & Date	Site No.	L_{90}	L_{eq}	L_{10}	Temp °C	Cloud Cover %	Mean Wind Speed m/s	Wind Direction	Noise Sources
27.9.88 11.00 am to 12.30 pm	BCN-1	43	48	49	16	30	4.5	NW	Wind in trees, trucks, constructions, very gusty
	BCN-2	39	44	45	17	20	4.7	NW	Wind in trees, brids, sheep, no mine noise discernible
	BCN-3	29	36	38	16	50	1.25	NW	Birds, sheep, distant traffic, wind in trees, farm tractor
27.9.88 4.30 pm to 5.30 pm	BCN-1	42	46	47	15	20	2.52	NW	Mill, frogs, sheep, trucks
	BCN-2	30	34	35	14	50	2.1	NW	Wind in trees, birds, distant traffic, sheep, no mine noise discernible
	BCN-3	32	38	39	16	50	1.4	NW	Distant traffic, birds, sheep, wind in trees

TABLE A5-2.2

Noise Monitoring Data - 18th and 19th October, 1988

Time & Date	Site No.	L_{90}	L_{eq}	L_{10}	Temp °C	Cloud Cover %	Mean Wind Speed (m/s)	Wind Direction	Noise Sources *	Site activities operating (See Key below)
18-10-88	BN-1	37	42	43	20	60	1-6	SW	Sheep, (shearing in progress), trucks, mining, distant traffic, crusher.	
3.00 pm - 4.30 pm	BN-2	31	37	38	20	70	1.15	SW	Birds, wind in trees, sheep; no mining noise audible.	Notes:
	BN-3	36	41	42	20	70	1.5	SW	Wind in trees, mining/mill, birds, reverse alarms.	
18-10-88	BN-1	36	42	44	9	clear	still	-	Mill, pump generator, trucks, sheep, drill.	
9.00 pm - 10.00 pm	BN-2	31	37	37	9	clear	still	-	Frogs, mining, mill.	Notes:
	BN-3	34	39	40	9	clear	still	-	Pump generator, mining, sheep, frogs.	
18-10-88	BN-1	31	35	36	9	clear	still	-	Frogs, mill (33-35 dB(A)), sheep (to 40 dB(A)).	
10.00 pm - 11.00 pm	BN-2	26	31	32	9	clear	still	-	Sheep, frogs; mill just audible.	Notes:
	BN-3	30	34	35	9	clear	still	-	Sheep, mill, frogs.	
19-10-88	BN-1	34	39	40	12	clear	2.3	W	Sheep, pump, generator, birds, mill.	
	BN-2	34	40	41	11	clear	2.4	W	Sheep, birds, wind in trees; mill just audible.	
6.00 am - 7.00 am	BN-3	33	38	40	11	clear	0.5	NW	Birds, distant traffic, sheep; mill just audible.	Notes:
19-10-88	BN-1	37	42	43	12	clear	3.8	SW	Sheep, pump generator, rock breaker, trucks, dozer tramming.	
7.00 am - 8.00 am	BN-2	31	37	39	12	clear	3.8	W	Birds, sheep, wind in trees; mine not audible.	Notes:
	BN-3	38	42	45	12	clear	2.4	W	Birds, rock breaker, trucks, wind in trees, dozer, sheep, mill.	

* Listed in order of audibility.

Site Activities Key

- Treatment Plant
- Underground Pump Generator
- Mining
- Crusher

TABLE A5-3

Deposit Gauge Analyses - Browns Creek Gold Mine

SITE NO.	BCA-1			BCA-2			BCA-3			BCA-4			BCA-5		
	Insoluble Solids	*Loss on Combustion*	*Rainfall (mm)*	*Insoluble Solids*	*Loss on Combustion*	*Rainfall (mm)*	*Insoluble Solids*	*Loss on Combustion*	*Rainfall (mm)*	*Insoluble Solids*	*Loss on Combustion*	*Rainfall (mm)*	*Insoluble Solids*	*Loss on Combustion*	*Rainfall (mm)*
PERIOD															
02.02.87 - 05.03.87	2.11	0.49	117	1.28	0.40	116	2.27	0.44	114	1.91	0.59	114	1.69	0.41	120
05.03.87 - 03.04.87	3.61	1.50	67	1.08	0.34	75	2.43	0.38	78	1.68	0.46	53	2.21	0.47	80
03.04.87 - 01.05.87	1.60	0.39	23	0.59	0.16	18	2.43	1.20	19	1.39	0.27	16	2.26	0.37	22
01.05.87 - 02.06.87	1.64	0.83	108	1.12	0.55	80	2.74	0.81	99	1.88	0.57	97	33.78 *	16.98	98
02.06.87 - 02.07.87	2.12	1.04	98	1.38	0.70	59	2.68	0.65	101	1.68	0.49	105	1.30	0.41	86
02.07.87 - 03.08.87	0.62	0.13	83	0.34	0.16	66	0.76	0.10	59	0.90	0.21	92	0.81	0.06	72
03.08.87 - 01.09.87	0.02 *	0.01	93	0.20	0.10	79	0.92	0.07	87	0.25	0.10	91	0.67	0.11	83
01.09.87 - 02.10.87	20.09	4.34	43	0.69	0.22	36	1.33	0.24	45	1.31	0.47	51	2.81	0.79	38
02.10.87 - 04.11.87	1.52	0.35	111	1.44	0.64	78	2.16	0.40	91	2.80	1.67	108	5.41	1.14	88
04.11.87 - 02.12.87	0.99	0.56	87	0.86	0.40	74	1.88	0.58	118	2.36	1.61	100	13.73	7.68	80
02.12.87 - 05.01.88	3.32	2.16	92	1.53	0.58	62	3.34	1.19	70	16.85 *	15.31	72	4.46	0.93	74
05.01.88 - 01.02.88	2.65	1.64	70	1.77	1.75	61	3.75	1.05	61	3.48	1.37	63	5.23	1.07	68
01.02.88 - 01.03.88	1.75	0.76	41	1.41	0.29	44	2.86	0.58	37	1.94	0.72	33	5.94	0.85	45
03.03.88 - 02.04.88	Discontinued			Discontinued			Discontinued			1.04 *	0.06	26	Discontinued		
02.04.88 - 05.10.88										0.36	0.17	115			

Units $g/m^2/month$

* Anomalous results - deleted from mean calculations.

TABLE A5-4.1

Predicted and Measured Air Blast Overpressure and Ground Vibration - 23rd September, 1987

Residence	Air Blast Overpressure		Ground Vibration	
	Predicted	Measured	Predicted	Measured
BCN-1 "Bonnie Doon"	109 dB LIN	112 dB LIN	1.0 mm/s	0.2 mm/s
BCN-2 "Springvale"	105 dB LIN	107 dB LIN	0.5 mm/s	0.3 mm/s
BCN-3 "Desmond Slopes"	106 dB LIN	113 dB LIN	0.6 mm/s	0.1 mm/s

Monitoring and Prediction by Richard Heggie Associates (Ref: Report No. 821- R1)

For location of residences see Plan 13

TABLE A5-4.2

Measured Air Blast Overpressure and Ground Vibration - 26th to 30th September, 1988

Residence	Date	Air Blast Overpressure	Ground Vibration
BCN-1 "Bonnie Doon"	26.9.88	<100 dB LIN	<1 mm/s
	27.9.88 *	97-98 dB LIN	0.5 mm/s
	28.9.88 *	96-98 dB LIN	0.5 mm/s
	29.9.88 *	<85 dB LIN	0.5 mm/s
	30.9.88 *	98 dB LIN	0.5 mm/s
"Long Hill"**	26.9.88	<110 dB LIN	<1 mm/s
	27.9.88	<110 dB LIN	<1 mm/s
	28.9.88	<100 dB LIN	<1 mm/s
	29.9.88 *	<100 dB LIN	<1 mm/s
	30.9.88 *	<100 dB LIN	<1 mm/s

Monitoring undertaken by BHP Control Research Laboratories
For location of residences see Plan 13

* Monitoring Equipment Triggered Manually

** "Long Hill" residence is onwed by the Company and occupied by Company personnel

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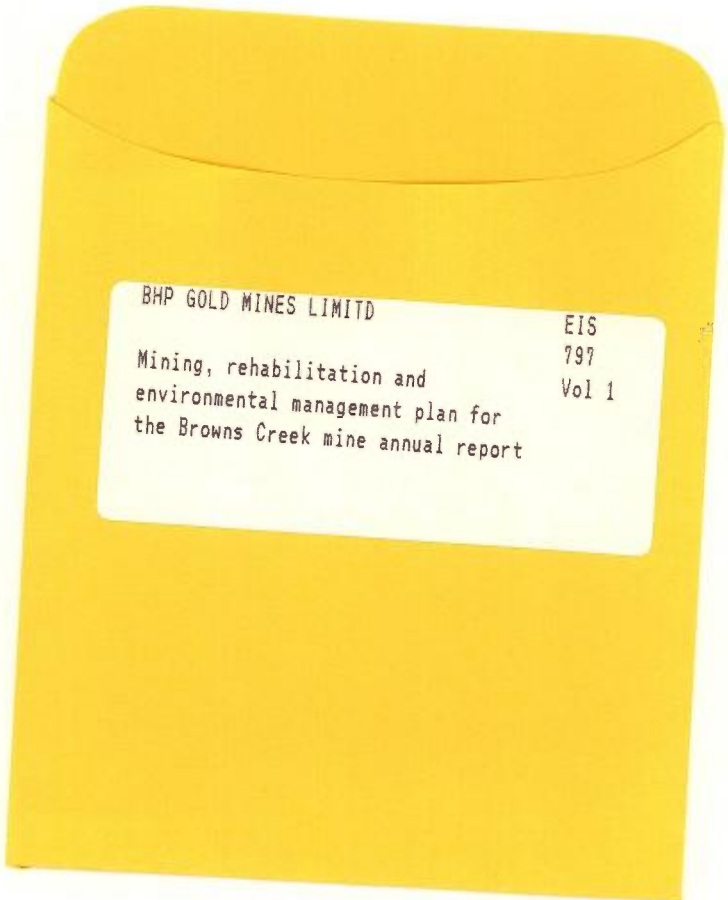
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