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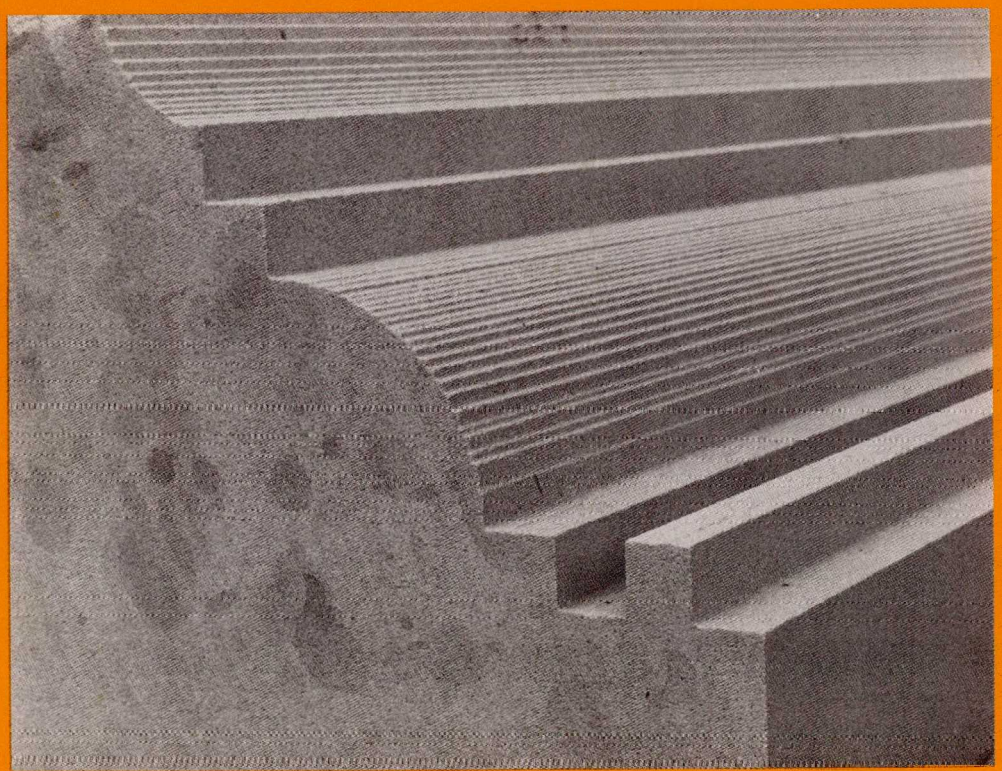
New South Wales Mining and Exploration Quarterly

No.30 issued JANUARY 1991



Department of Minerals and Energy

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New South Wales Mining and Exploration Quarterly No.30

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Cover photo: Sandstone stringer profile cut by a computer-guided profile saw. The saw ridges are smoothed off and the section cleaned during the finishing process
Photography by Department of Minerals and Energy unless acknowledged otherwise

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BASE METAL OVERVIEW— THE COBAR MINES*

This article continues the base metal series (refer *Minfo 26*, p. 16 and *29*, p. 1) and discusses the Elura and CSA mines at Cobar (figure 1). The Woodlawn mine near Goulburn, and the Cockle Creek and Port Kembla smelters will be discussed in a future issue of *Minfo*.

CSA MINE

The CSA mine, 11 km north of Cobar, employs 276 people and is the major copper producer in New South Wales. Enterprise Metals Pty Ltd (CRA Ltd's copper and gold business unit) manages the CSA mine, as well as the Southern Copper Ltd (formerly the Electrolytic Refining and Smelting Co. of Australia Ltd) smelter at Port Kembla, The Peak gold project (also at Cobar) and CRA's domestic sales of zinc products.

The deposit at the CSA mine has been worked intermittently since it was discovered in 1871. The mine's name is derived from the nationality of the three prospectors who discovered the deposit: a Cornishman, a Scotsman, and an Australian. In the period between 1871 and 1957, 120 781 tonnes of ore were mined, yielding:

Cu	-	4 640 t
Pb	-	4 047 t
Ag	-	2 972 kg

Since present operations began in 1965, 13 823 830 tonnes of ore have been mined, yielding:

Cu	-	223 746 t
Pb	-	53 947 t
Zn	-	234 529 t
Ag	-	190 509 kg

The sulphide orebodies are hosted by thin-bedded, rhythmically banded siltstones of the Early Devonian CSA Siltstone. Mineralisation occurs in a number of vein complexes or sub-massive to massive bodies (locally called lenses) which have been grouped under the following names: Western System, CZ, Eastern System, QTS North, QTS South and QTS Central (figures 2 and 3).

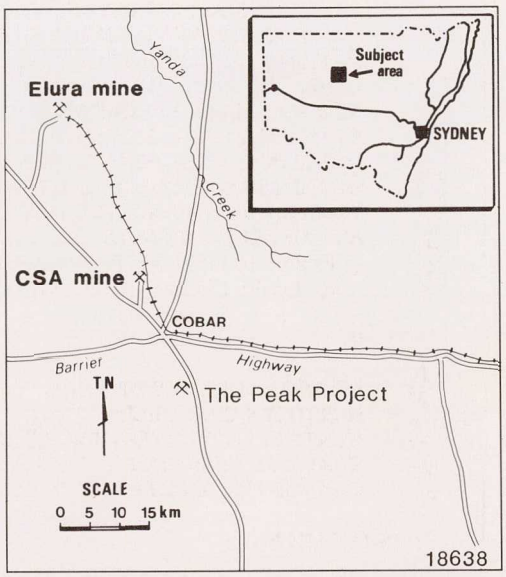


Figure 1. Location diagram, the Cobar mines

Western System

Mineralisation is in lenses averaging 45 m in length and 7 m in width. Most lenses contain copper at grades of 2.5% - 3.0%, the remainder are zinc rich with a variable but low copper content. Copper lenses consist of vein type pyrrhotite - chalcopyrite and sub-massive to massive pyrite - chalcopyrite, commonly banded.

* Article prepared from material provided by Enterprise Metals Pty Ltd and Pasminco Ltd

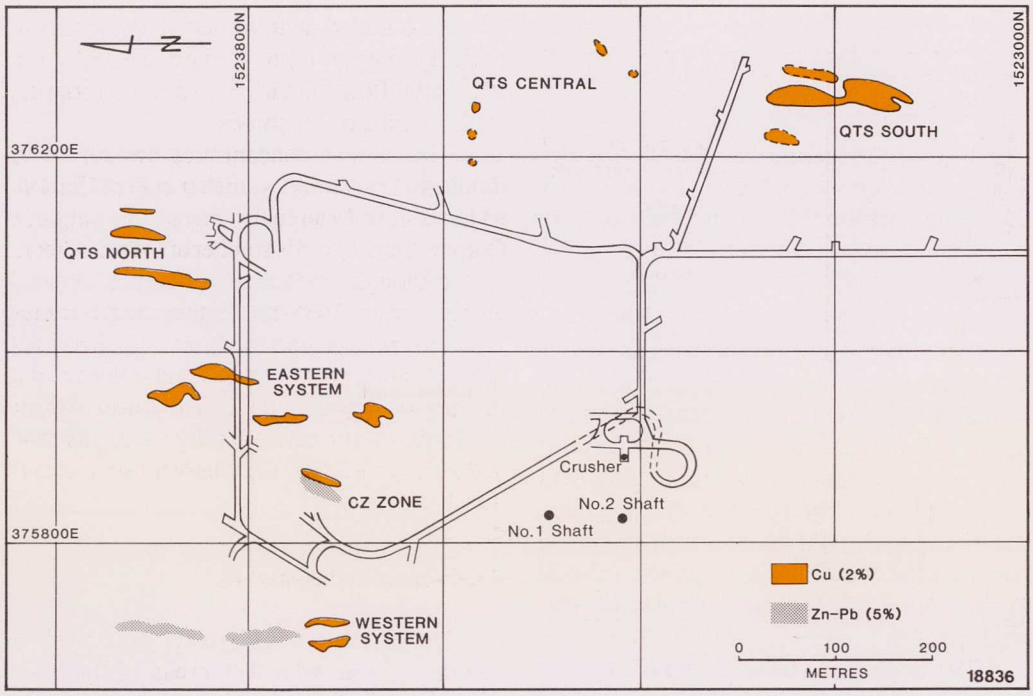


Figure 2. Plan of 830 m level ore lens outlines, main access and exploration development, CSA mine

CZ

Mineralisation occurs in podiform lenses. Average grade is about 10% Zn, 1% Pb and less than 1% Cu.

The largest lens is a banded sub-massive to massive body up to 40 m wide containing pyrite and sphalerite with smaller amounts of pyrrhotite and galena and minor chalcopyrite.

Eastern System

The Eastern System contains copper only and consists of at least three lenses 50-80 m in length and of variable width averaging 10 m, with each lens consisting of a number of vein sets. Run-of-mine grades are around 2.5% Cu. Mineralogy is chalcopyrite - pyrrhotite with minor pyrite.

QTS North

The QTS North also contains copper only and consists of four lenses below a depth of about 700 m. Chloritisation is intense but quartz veining is uncommon, silicification is patchy and sulphides other than chalcopyrite are rare.

QTS South and Central

Recent evaluation of QTS South indicated a Probable Resource of about 1.2 million tonnes grading 4.5% - 5.0% Cu in a similar geological setting to the Eastern System. Exploration of QTS Central is still in progress.

Structure

The ore lenses are hosted in north-striking quartz - chlorite shears. All ore zones dip to

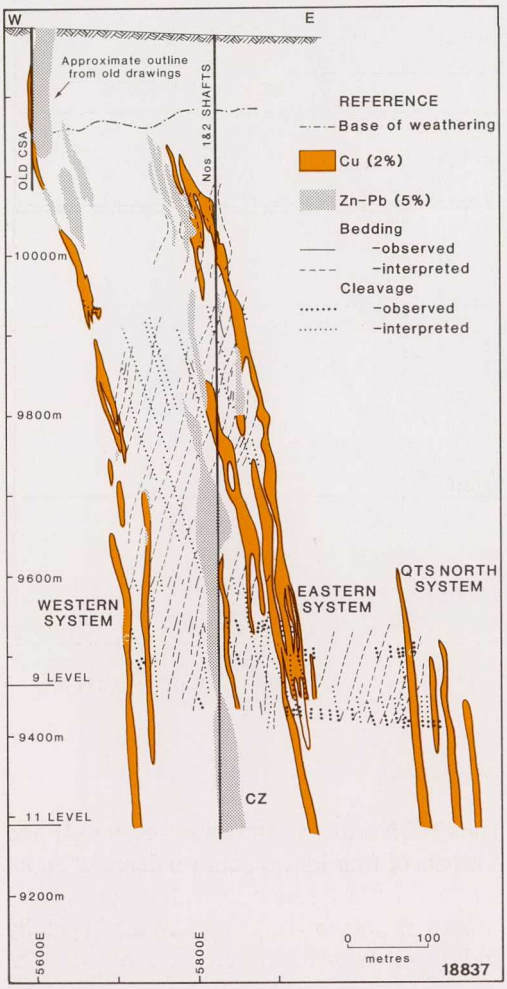


Figure 3. Schematic transverse projection, CSA mine

the east at between 70° and vertical, and they plunge north at about 80°. The Western and Eastern Systems extend over a strike length of 400 m and a width of about 250 m, but the inclusion of the QTS zones increases the overall strike length to about 1000 m and the width to 600 m (figure 2). Mineralisation extends for at least 1000 m down plunge.

Mining and Processing

The ore is mined underground using longhole open stoping methods, then treated in a sequential flotation circuit to produce copper, lead and zinc concentrates.

The copper concentrates are railed to Southern Copper Ltd's smelter at Port Kembla and the zinc and lead concentrates to the Sulphide Corporation Pty Ltd's smelter at Cockle Creek.

Although production was above planned levels during 1988-89, copper head-grades were lower than expected as a result of increased production from zinc stopes and dilution in a number of copper stopes. The lower copper production was partly offset by the higher lead and zinc grades, and the relatively strong base metal prices.

Production and Reserves

In 1988-89 mine development advanced a record 5567 m, with new areas of the main orebody (the QTS) being opened, commencing on levels 7 and 9. These developments should see the higher production levels maintained.

Recent exploration of the QTS orebody, and other CSA lenses between levels 9 and 11, has resulted in a reassessment of the mine's ore reserves to:

Proved Ore Reserves - 1.3 million tonnes
Probable Ore Reserves - 3.7 million tonnes
Inferred Resources - 1.6 million tonnes

ELURA MINE

The Elura mine (Pasminco Ltd), 47 km north of Cobar, employs 300 people and is one of the world's most modern underground metalliferous mines. Approximately 1.2 million tonnes of ore are mined and milled per year. The deposit was first indicated in 1972 by an aeromagnetic survey for EZ Industries Ltd carried out in an area to the north-west of the CSA mine. The

magnetic anomalies were followed up by ground magnetic surveys. The deposit was drilled in 1974, but a period of low metal prices delayed the decision to proceed with mining until July 1980. The mine was commissioned in 1982 and is now part of Pasminco Ltd, created on 1 July 1988 when CRA Ltd and North Broken Hill Peko Ltd merged their lead and zinc mining and smelting interests.

To the end of June 1989, 7.11 million tonnes of ore have been mined, yielding:

Zn	-	457 528 t
Pb	-	252 500 t
Ag	-	720 482 kg

minor Cu and Au

Structure

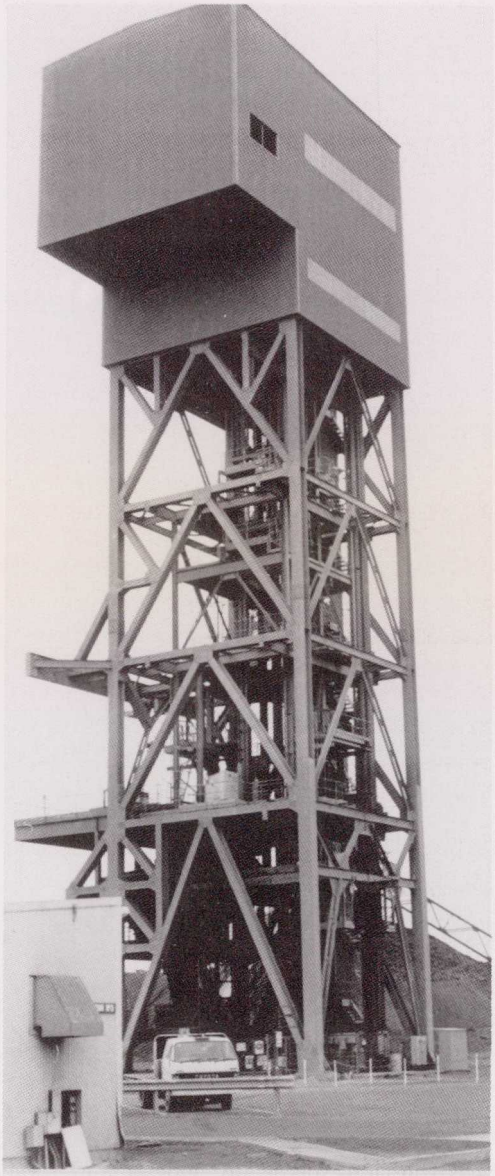
Mineralisation is hosted by a moderately deformed, turbiditic sequence of mudstones and siltstones with minor thin fine-grained sandstones of the Early Devonian CSA Siltstone.

The orebody comprises at least seven crudely elliptical, vertical pipe-like bodies (figures 4 and 5) with maximum diameters of 100 m and located in tight domes, formed by sharp plunge reversals, extending for 700 m along a north-north-easterly trending anticline. The mineralisation has been proven to a depth of at least 700 m in the southernmost lens. The two southern lenses (the main orebody) extend upwards into the weathered zone above 100 m depth but the five northern lenses terminate 300 to 400 m below the surface.

Ore Mineralogy

The orebody has three major ore types with relatively distinct mutual contacts (figure 5), namely:

* **Siliceous ore** - contains 20% to 50% of silica in various forms, associated with pyrite, iron-poor sphalerite, galena and minor arsenopyrite, chalcopyrite, tetrahedrite and siderite. Siliceous ore is typically very fine grained with complex textural relationships that cause metallurgical problems.



Headframe, Elura mine

* **Massive ore** - contains 70% to 95% sulphide; dominantly pyrite with iron-poor sphalerite, galena and minor arsenopyrite, chalcopyrite and tetrahedrite with a quartz and/or siderite gangue.
* **Pyrrhotite ore** - contains 70% to 80% sulphide with up to 40% pyrrhotite,

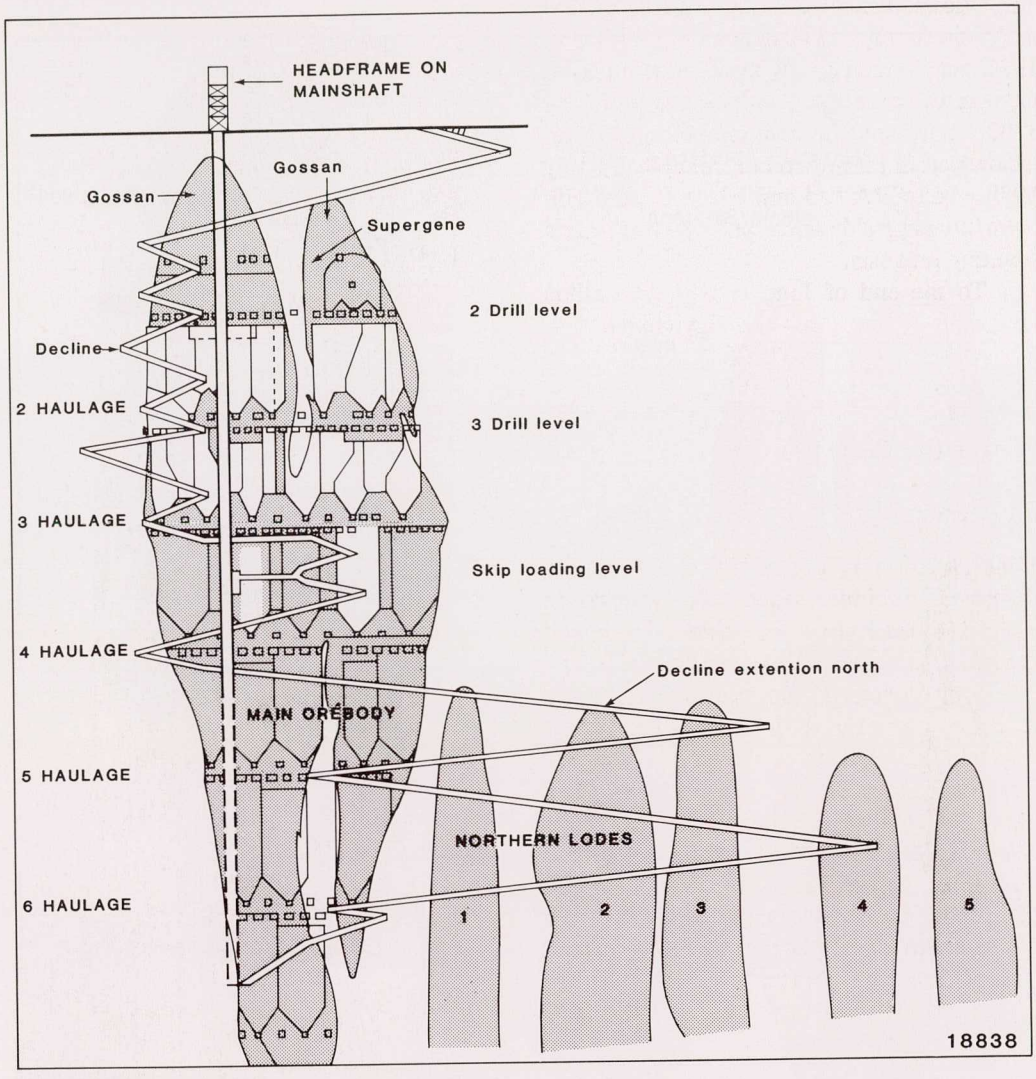


Figure 4. Orebodies and longitudinal mine section, Elura mine

iron-rich sphalerite, galena and minor chalcopyrite and arsenopyrite, in gangue dominated by siderite.

Since 1987 the mine has exploited a silver-rich supergene capping on the main orebody. This capping was exhausted in mid 1990.

Mining and Processing

The ore is mined by longhole open stoping methods and fed into a crushing, grinding and selective flotation treatment plant to produce lead and zinc concentrates, with silver accumulated mainly in the lead concentrates.

The zinc concentrates are railed to Newcastle for further shipment to Pasminco Ltd's smelter at Risdon in Tasmania and export. Pasminco Ltd's smelter at Port Pirie in South Australia takes 13% of the lead concentrates and the rest are railed to Newcastle for export.

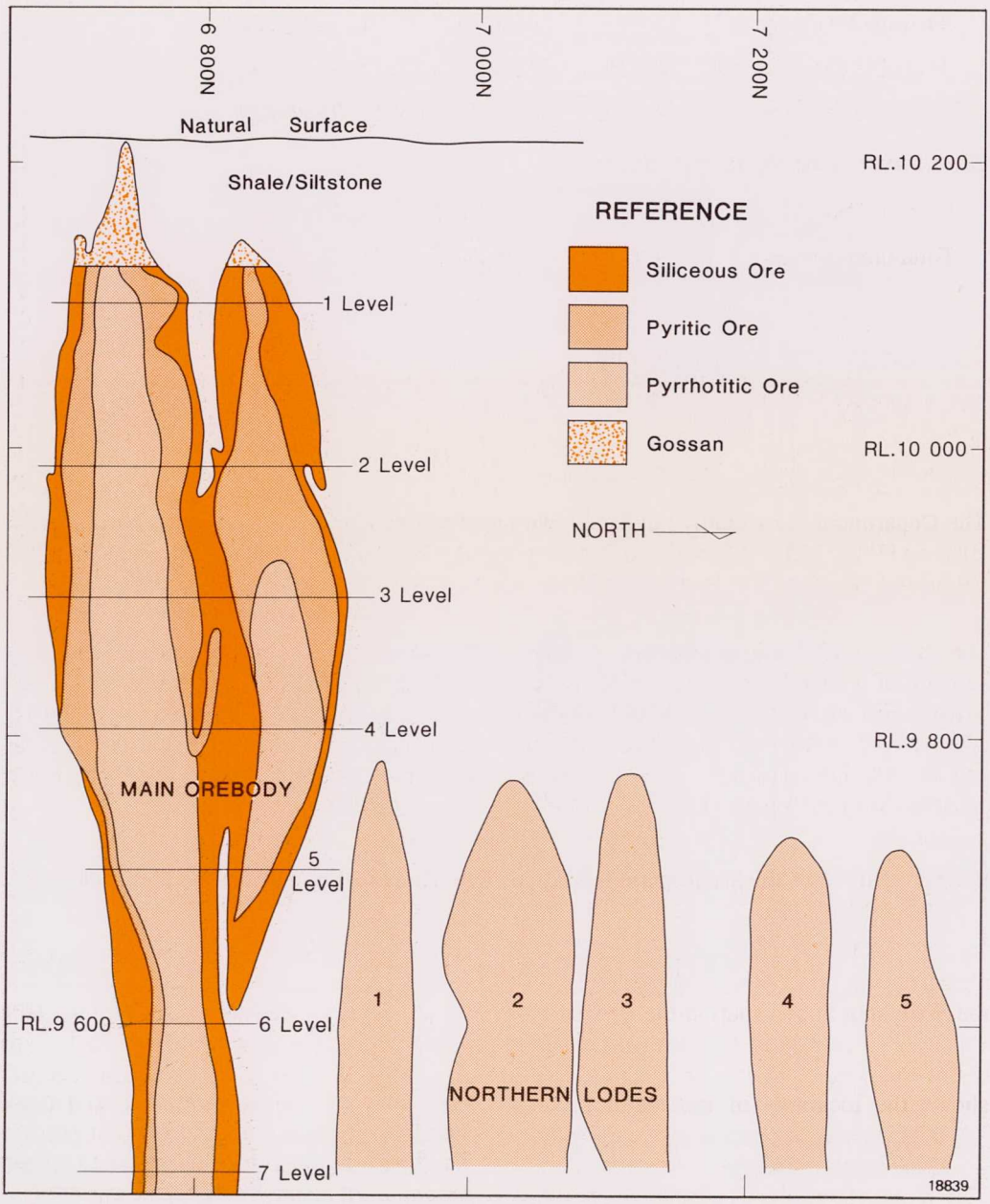


Figure 5. *Orebody mineralogy, Elura mine*

Production and Reserves

There was a slight decrease in production during 1988-89 mainly due to a change in the ore mixture as the mine deepened and harder primary sulphide ore was extracted. Additional crushing equipment has been installed and production levels and concentrator throughput should rise slightly.

Ore reserves in the **Main orebody** are:

*	Proved Ore Reserves	10.4 Mt	(9.0% Zn, 6.0% Pb, 119 g/t Ag)
*	Probable Ore Reserves	4.4 Mt	(8.3% Zn, 5.9% Pb, 38 g/t Ag)
*	Total ore reserves	14.8 Mt	(8.7% Zn, 6.0% Pb, 95 g/t Ag)

Ore reserves in the **Northern lodes** are:

*	Probable Ore Reserves	4.5 Mt	(8.5% Zn, 5.5% Pb, 60 g/t Ag)
*	Total ore reserves	4.5 Mt	(8.5% Zn, 5.5% Pb, 60 g/t Ag)

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IMPORTANT NEW MAPS OF THE BROKEN HILL AREA

The Department has recently published two important new maps of the Broken Hill area, the **Broken Hill 1:100 000 Stratigraphic Map** and the **Broken Hill Block Southwest 1:50 000 Metallogenic Map.** The locations of these maps are shown in figure 6.

The Broken Hill Block contains a large number of mineral deposits, including the Broken Hill main lode, one of the world's major silver - lead - zinc sulphide deposits, and has provided a major economic base in western New South Wales for over 100 years. The search for additional deposits is a major activity in the region. Since 1974, the Geological Survey of New South Wales has been undertaking lithological and metallogenic mapping studies in the region to assist the exploration effort.

Broken Hill 1:100 000 Stratigraphic Map, by R.G. Barnes, G.M. Bradley, R.E. Brown, B.P.J. Stevens, W.J. Stroud and I.L. Willis

The Broken Hill 1:100 000 Stratigraphic Map shows the latest stratigraphic interpretation of the Willyama Supergroup in the Broken Hill Block and most of the Euriowie Block (mapping of this Block is still in progress). The map also shows the locations of the major mineral deposits in the region.

The Willyama Supergroup hosts the Broken Hill main lode. The Supergroup is highly prospective and is the target for ongoing exploration by companies and prospectors searching for similar stratiform deposits, and therefore the stratigraphic map is an invaluable tool for explorers. It presents an overview of the most prospective stratigraphic intervals and illustrates their relationships to major structures and mineral deposits.

Detailed subdivision of the Broken Hill and Thackaringa Groups (of the Willyama Supergroup) has led to the recognition of the Parnell Formation, Hores Gneiss, and Cues Formation as the most prospective stratigraphic units for Broken Hill type mineralisation. These units are widespread throughout the Broken Hill Block and parts of the Euriowie Block, and include, in many areas, Broken Hill type lode rocks and some massive sulphide deposits. The Hores Gneiss, which hosts the major Broken Hill deposit, although widely developed throughout the Broken Hill Block, is notably

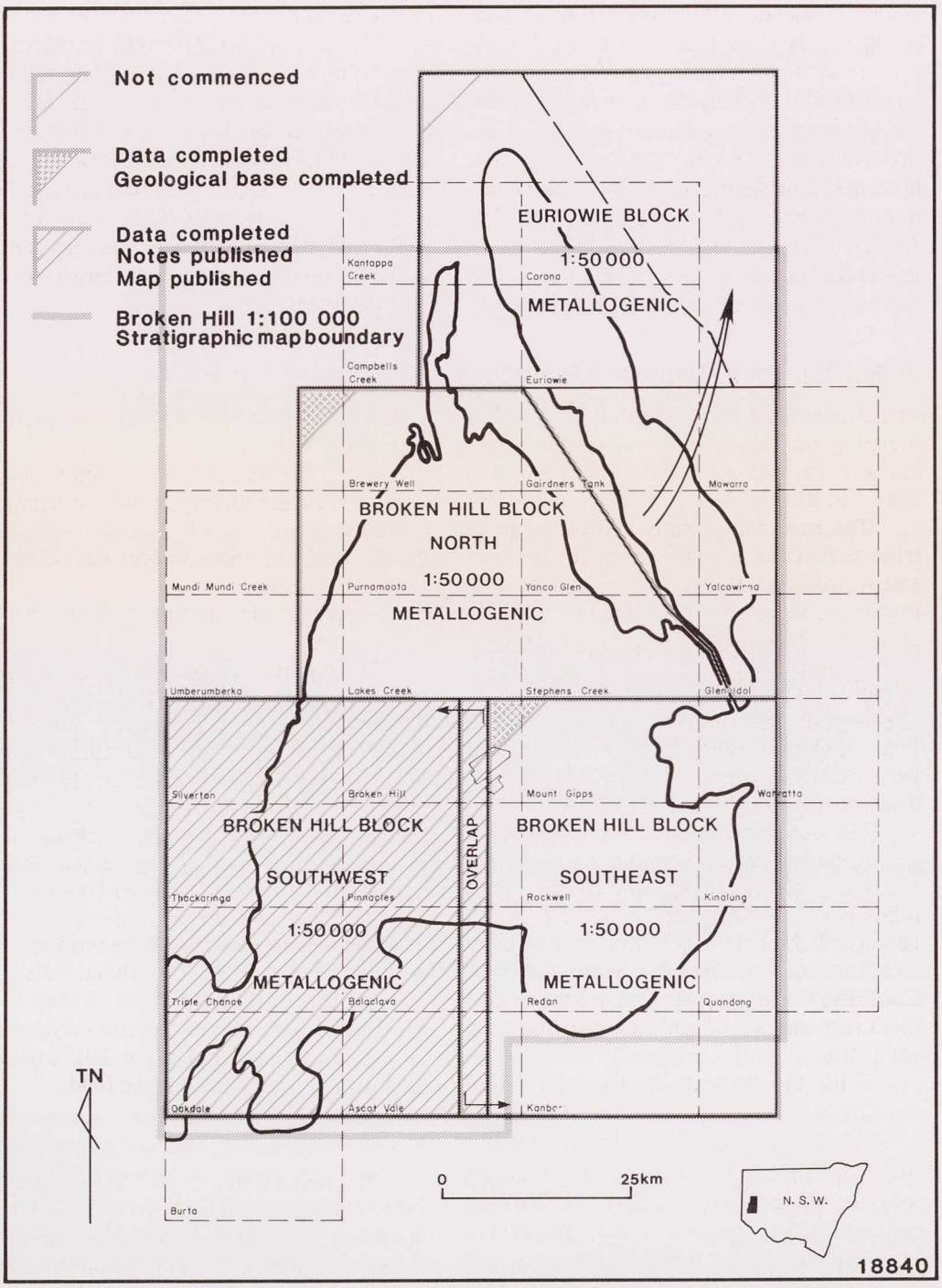

Figure 6. *Location diagram, Broken Hill 1:100 000 Stratigraphic Map and Broken Hill Block Southwest 1:50 000 Metallogenic Map*

absent in the Euriowie Block and western portions of the Broken Hill Block. The Parnell Formation is host to many small Broken Hill type deposits, such as the Allendale deposit, and is extensively developed throughout most of the Broken Hill Block. The Cues Formation hosts the Pinnacles orebody and is mineralised throughout both the Broken Hill and Euriowie Blocks. These stratigraphic units and their lateral equivalents are prospective targets and occur over a total surface area of many hundreds of square kilometres.

The Broken Hill 1:100 000 Stratigraphic Map is the culmination of the many years of regional mapping at 1:12 000 scale by the Geological Survey. Used in conjunction with the unpublished 1:12 000 geological sheets or published 1:25 000 geological sheets or 1:50 000 metallogenic maps (refer *Minfo 20*, p. 59, *28*, p. 6), the Broken Hill Stratigraphic Map gives a valuable overview and highlights targets for the exploration industry.

Broken Hill Block Southwest 1:50 000 Metallogenic Map, by R.G. Barnes.

The Broken Hill Block Southwest 1:50 000 Metallogenic Map is the first of a series of four maps which will cover the Broken Hill and Euriowie Blocks.

The new map depicts a wide range of mineral deposits which include the southern end of the Broken Hill main lode, the Pinnacles lead - zinc deposit, the major lead - silver vein groups at Thackaringa and Silverton, massive cobaltiferous pyrite deposits at Big Hill, as well as numerous smaller deposits of many types. The deposits are presented as symbols and follow major groupings of stratiform, vein and intrusive-related types. Major non-metallic deposits are also depicted.

The deposit symbols are displayed on a geological base which employs a concept not previously attempted at Broken Hill. The lithological base simplified from the 1:25 000 geological sheets has been combined with an overprint of stratigraphic interpretation. Considerable cartographic skill was required to produce the map which is at maximum printable paper size.

With the combined lithological and stratigraphic base, the map can be used to determine:

* the relationships between mineral deposits and various lithologies and stratigraphic units,
* the spatial distribution and nature of the mineral deposits, and
* the spatial relationships of deposits and structures.

Descriptions of specific deposits in the Southwest sheet area plus interpretations of metallogenic data are presented in *Geological Survey of New South Wales, Bulletin 32*(1,2) by R.G. Barnes, published 1988. Deposit numbers can be correlated with a summary of deposit data for much of the Broken Hill Block published in *Geological Survey of New South Wales, Records 22*(2) in 1986. Additional data on the deposits, on mineral deposit data sheets, along with numerous unpublished reports on specific areas, are available at the Department's Broken Hill and Sydney offices.

The Broken Hill metallogenic mapping program is continuing and over 3000 deposits have now been inspected in the field.

*

For further information, contact Barney Stevens, Senior Research Scientist, or Gary Burton, Geologist, at the Broken Hill Office, on (080) 88 0229, or Neil Raphael, Geologist, at Head Office, on (02) 901 8365.

*

The Broken Hill 1:100 000 Stratigraphic Map ($30), and the Broken Hill Block Southwest 1:50 000 Metallogenic Map plus reference sheet (together $40) are available from the Sydney and Broken Hill offices of the Department (see page 60).

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SHAPED EXPLOSIVE CHARGES TRIALS SUCCESSFUL*

Shaped explosive charges, in two different configurations, were recently designed in Sydney by Applied Explosives Technology Pty Ltd and trialled successfully at Pasminco Ltd's Elura mine, 40 km north of Cobar.

"Hung" drawpoints (i.e. jammed with oversized rocks) are a frequent problem in most underground ore mines. Oxidised ("cemented") ore, in combination with oversized rocks, presents a compounded problem in pyrrhotitic ore such as occurs at Elura. Various systems for bringing down hung drawpoints, including shaped explosive charges, have been trialled in a number of mines and have had varying degrees of success.

Two distinct problems at Elura, namely: oversized rocks, and "cemented ore, were addressed by the design and trial of specific configurations for each; namely Ballistic Disc and Hemispherical-shaped Charges.

BALLISTIC DISC

The Ballistic Disc consists of a concave metallic disc (either copper or steel) backed up by a quantity of high explosive cast into a spun aluminium container. The Ballistic Disc is supported on a telescoping leg stand that allows height adjustment and vertical and horizontal positioning, and is aimed with a reusable laser sight at the target boulder (figure 7A).

Once the device is detonated, the concave disc inverts, forming a metallic slug that has a velocity of approximately 3000 m/sec (approximately 3 times the muzzle velocity of a military SLR rifle bullet) and, upon impact with its target, delivers some 6000 kJ. The device has an accurate range of up to 60 m.

In the trials a 2 m impact mark with lateral and horizontal cracking was evident after firing the device. A small amount of the boulder was also fractured away from the main body (figure 7B).

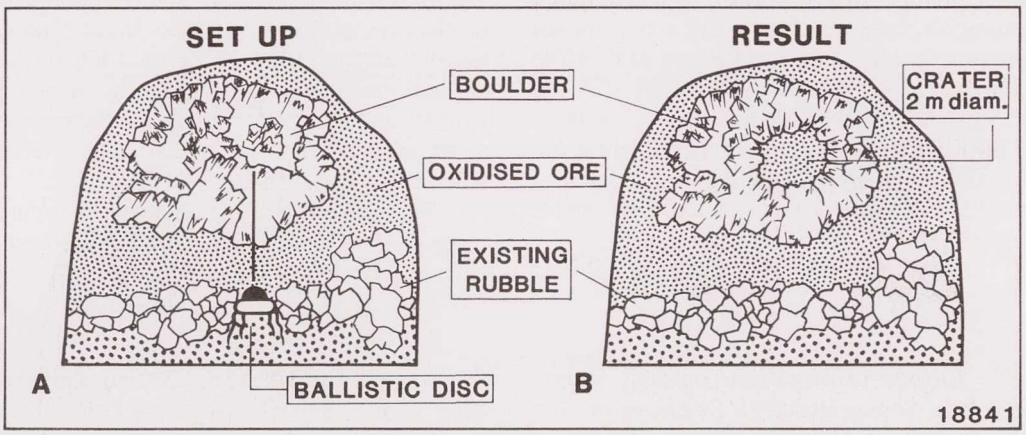

Figure 7. Schematic sketch of drive showing Ballistic Disc trial — shot 1

* Article prepared from material supplied by Applied Explosives Technology Pty Ltd

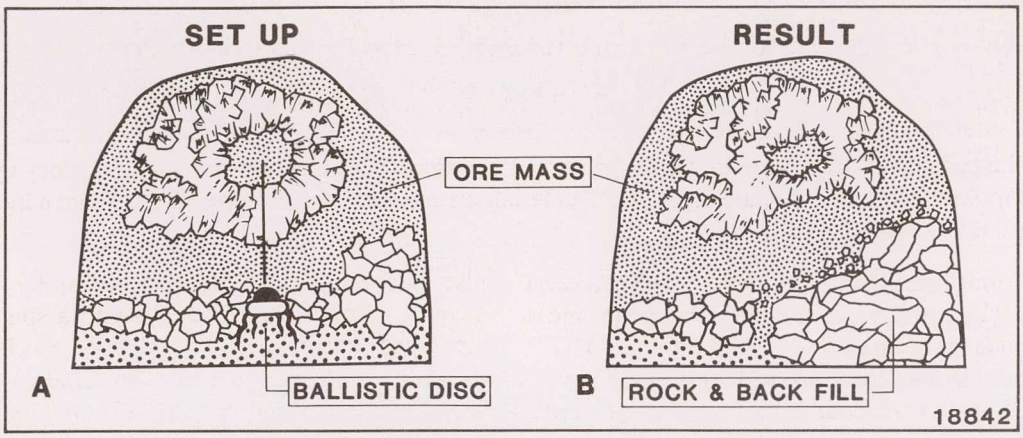

Figure 8. Schematic sketch of drive showing Ballistic Disc trial — shot 2

A second copper Ballistic Disc was aimed at the same point on the boulder (figure 8A) and detonated. The bottom section of rock was lost from the main boulder body below the impact point (figure 8B). Further cracks and fractures were evident within the boulder. Rock and backfill from the left side of the boulder were dislodged and collected on the drawpoint floor.

HEMISPHERICAL-SHAPED CHARGES

This charge was designed to bore holes remotely by explosive means into oxidised ore, thus enabling remote explosive filling and firing within the drawpoint. The device consists of a copper hemispherical liner backed up by a quantity of high explosive cast into a spun aluminium container.

The shaped charge is inserted into some oversize PVC tubing and, with the aid of eye bolts and ropes, poled and remotely placed within the drawpoint against the oxidised ore (figure 9A).

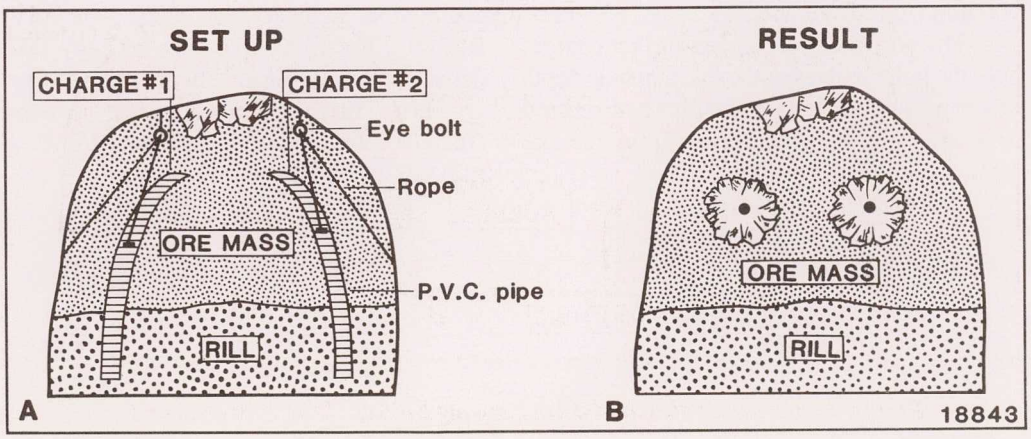

Figure 9. Schematic sketch of drive showing Hemispherical-shaped Charges trial

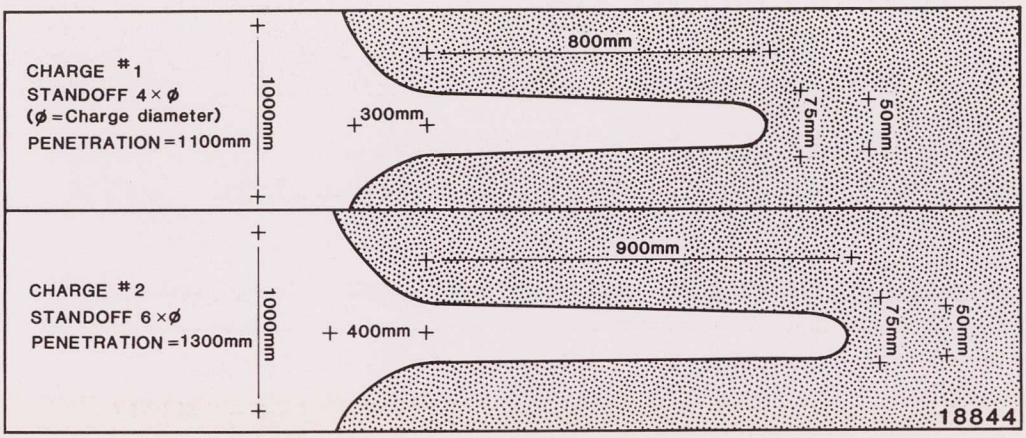

Figure 10. Hemispherical-shaped Charges — penetration dimensions

Upon detonation the hemispherical liner inverts to form a high velocity jet (as opposed to the slug of the Ballistic Disc) capable of penetrating its target and leaving a hole. The stand off distance of this charge to its target is between four and six charge diameters.

In the trials, detonation of the devices spalled out the surrounding orebody to a depth of approximately 350 mm and 1000 mm diameter. Charge No. 1 achieved a hole depth of approximately 800 mm and charge No. 2 achieved a hole depth of approximately 900 mm (figures 9B and 10).

The possibility of placing further charges over the holes and using the existing hole depth of 900 mm as the charge stand off was discussed as a means of boring further into the ore mass.

CONCLUSION

The results of these trials, using larger projectiles and charges, are probably the most successful yet achieved in this State and have re-kindled interest in these potentially effective and valuable techniques.

Although shaped explosive charges have had minimal success in the past, the successful trials at the Elura mine, where two difficult stopes are now back in production, and subsequent trials at the Holsworthy army firing range have resulted in the production of a commercial Ballistic Disc charge, the AET - BD260. The Elura mine has recently taken delivery of a working quantity of these charges.

For further information contact Graham Terrey, Chief Inspector of Mines, on (02) 901 8470.

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NEW GEOLOGICAL PUBLICATIONS ON THE TUMUT AREA

Tumut 1:100 000 Geological Sheet 8527, by Helena Basden

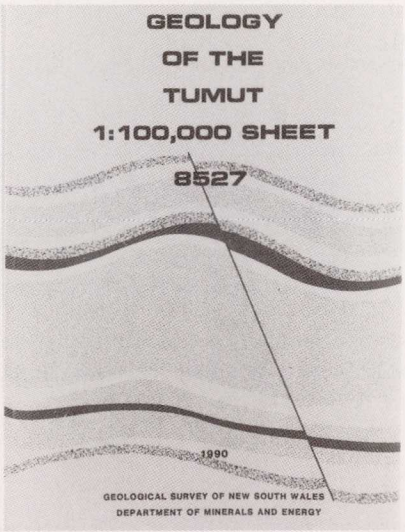
Geology of the Tumut 1:100 000 Sheet 8527, by Helena Basden (275 pp.)

The Tumut sheet is located in the southeastern part of New South Wales on the western slopes of the Great Dividing Range. From west to east the sheet includes part of the Wagga Anticlinorial Zone, the Tumut Synclinorial Zone and the Young Anticlinorial Zone of the Lachlan Fold Belt.

In the sheet area:

* The Wagga Anticlinorial Zone comprises Ordovician basic volcanics/intrusives and sediments, Ordovician and Silurian granitic bodies (Maragle Batholith), and minor Silurian basic intrusives.
* The Tumut Synclinorial Zone is dominated by the Silurian Tumut Trough sequence with ?Cambro-Ordovician basement and Early Devonian granites/volcanics also present. The Coolac ophiolite suite occurs along the eastern edge of the Tumut Synclinorial Zone, cropping out as a south-south-easterly trending belt up to 3 km wide extending for the full length of the sheet (55 km).
* The Young Anticlinorial Zone dominantly comprises Silurian granitic bodies (Young Batholith) and their coeval volcanic cap, with Silurian basic intrusives a minor but significant component.

Some 295 metallic mineral deposits and 84 industrial mineral and rock deposits are plotted on the map. Gold has been by far the most important metallic mineral mined; five proclaimed gold fields fall within the sheet



area, including the Adelong Creek Gold Field which has estimated reef production of 9066 kg Au and alluvial production of 13 485 kg Au. Other minerals mined on a less extensive basis are copper, chromium, tin, arsenic, molybdenum, barite, manganese, magnesite and iron. Deposits yielding unprocessed construction material, dimension stone, limestone, coarse and fine aggregate, asbestos, talc and clay also occur in the sheet area.

Copies of the Tumut 1:100 000 Geological Sheet 8527 and the Geology of the Tumut 1:100 000 Sheet 8527 are available for $30 each from the Wagga Wagga and Sydney Offices of the Department of Minerals and Energy (see page 60).

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CENTRAL COAST SANDSTONE — AN INDUSTRY OVERVIEW

The popularity and use of sandstone as a decorative dimension stone has increased markedly since the early 1980s, following the trend towards greater use of natural products in buildings and their surrounds. Sandstone is widely used as a dimension stone in the Sydney region because of its abundance and the relative ease with which it can be quarried and worked. Triassic sandstones of the upper Narrabeen Group and the overlying Hawkesbury Sandstone are the most suitable sources.

The New South Wales sandstone dimension stone industry is centred on the Central Coast between Somersby and Kariong, 6 km west of Gosford (figures 11 and 12) where four companies are quarrying: Gosford Quarries Pty Ltd, Central Coast Sawn Stone Quarries Pty Ltd, Melocco Pty Ltd, and Mooney River Sandstone Quarries Ltd. Further details of some of these operations will be included in a future issue of *Minfo*.

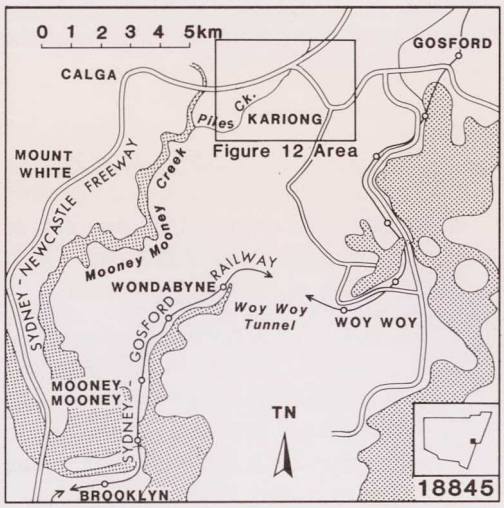


Figure 11. Location diagram, Central Coast area

HISTORY

European settlement of Australia was founded on Hawkesbury Sandstone, and the Nation's oldest existing dwelling, Cadman's Cottage at Sydney Cove, is constructed of it. The stone was widely quarried in the immediate Sydney city area and along the coast between Port Jackson and Botany Bay. However, the urban spread, the working out of existing quarries and the demand for high-quality stone made suitable quarry sites in this area rare by early this century.

Several early quarries, including those at Bondi (one of which operated until 1988), produced "yellow block" stone. This evenly coloured stone was widely used in many of Sydney's most beautiful and historic buildings. When quarried the stone is grey but on exposure to the atmosphere turns yellow (hence "yellow block") and then to a light tan. There are no longer working yellow block quarries in the immediate Sydney area.

In the 1920s, suitable quarry sites in a very attractive sandstone were found on the ridge 500 m east of Gosford on the Central Coast. A few years later, the construction of the Sydney - Gosford railway gave access to the Wondabyne deposit (figure 11). Further deposits were found and worked on a small scale between Somersby and south of the Woy Woy tunnel. The quarries at Gosford were overtaken by urban development by the late 1970s and attention concentrated on quarries near Somersby.

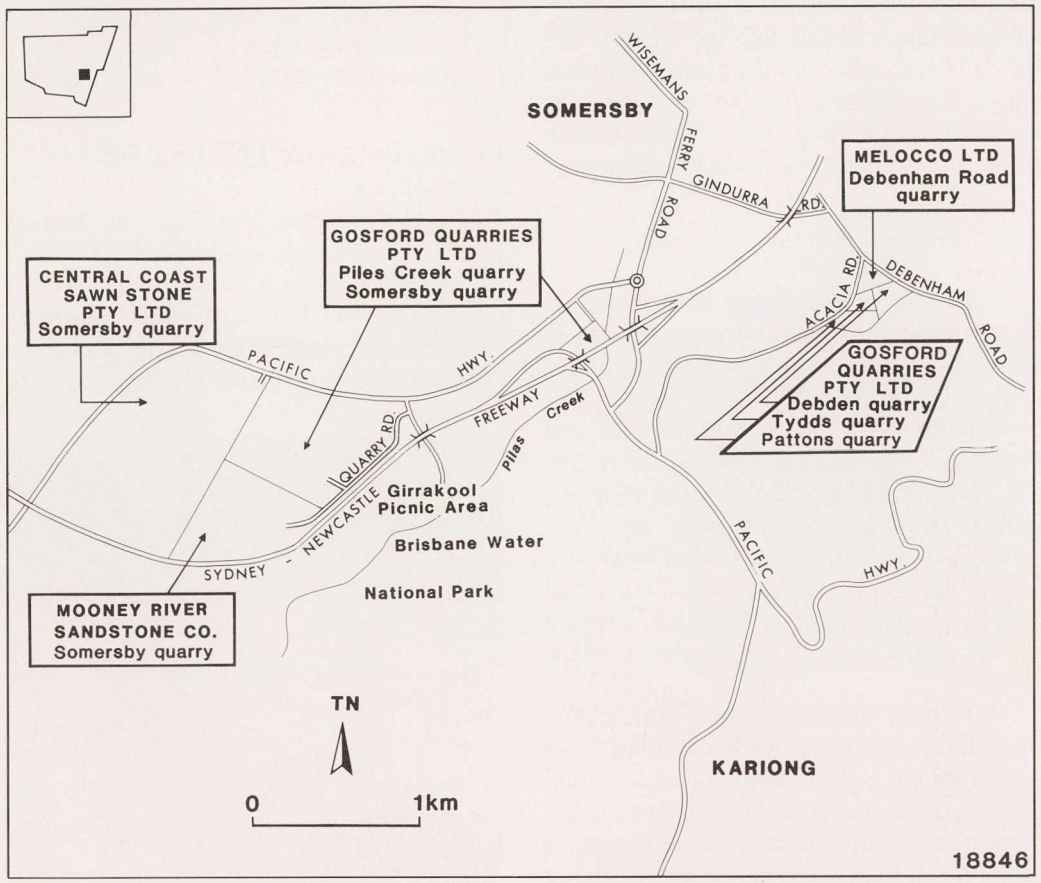


Figure 12. Location diagram, Somersby quarries

GEOLOGY

The quarries at Gosford (now abandoned) and Wondabyne are in the fluviatile Gosford Subgroup of the upper Narrabeen Group. This sandstone member is believed to represent distal interfingering of quartzose sandstones of the Hawkesbury Sandstone encroaching from the south-west. The Somersby quarries are in the Hawkesbury Sandstone which, apart from minor overbank shales, comprises two sand facies:

* a "sheet" facies of crossbedded sandstone, and
* a "massive" facies of sandstone typically internally homogeneous in grainsize and either perfectly massive or with crude to well-developed undulose lamination.

The "massive" bodies typically have undulose discordant lower surfaces and planar concordant upper surfaces and are thought to have been deposited during high-flow regime. These "massive" beds are suitable for the production of dimension stone.

The Hawkesbury Sandstone is believed to have been deposited in a river of massive proportions, comparable with the Brahamaputra River in India, with a strongly pronounced rise-and-fall flow regime. Existing bed deposits are eroded during rising flow and new deposits formed during falling flow. This situation produces a characteristic lack of bed continuity.

THE STONE

The Central Coast stone is characterised by its handsome, simple to intricate banding in a wide range of hues, from white through buff and tan, brown and purple. The colouring and banding can vary rapidly both laterally and vertically. The stone is distinctive, decorative and aesthetically appealing. Stone from the Sydney area is generally plain with less distinctive banding, but has greater durability.

When freshly cut, the drying of interstitial fluids (the stone mason's "stone sap") on the surface produces a mild case hardening of the stone.

The most common cause of deterioration of sandstone in older buildings is through the crystallisation and expansion of salts, during wetting and drying cycles, causing weakening of the matrix. Failure to understand this process and take adequate precautions has been responsible for much of the decay experienced. However, careful construction and maintenance practices can minimise this problem.

APPLICATIONS

Sandstone has many applications in the large Sydney market where short-haul transport costs enable competitive pricing.

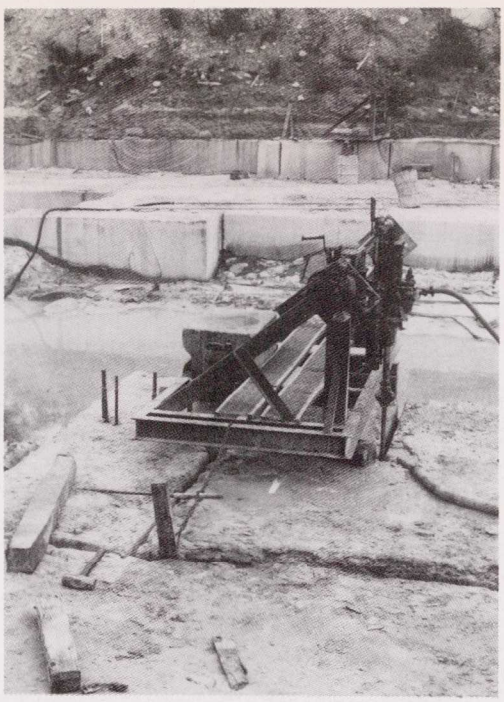
A breakdown of current applications shows:

* Landscape material/paving/pool and barbecue surrounds — 40%.
* Building construction and renovation (interior and exterior) — 35%.
* Restoration (replication and replacement) of existing stone work — 15%.
* Monumental (pedestals, monuments, headstones and vaults) — 10%.

These percentages vary for each company.

COMPANIES AND LOCATIONS

Gosford Quarries Pty Ltd, the largest producer by tonnage, commenced operations in the 1920s when it amalgamated several small quarries in the immediate Gosford area. The company operates five quarries: Somersby (where it has its processing plant), Debden,



"Massive" sandstone bed being quarried at Mooney River Sandstone Ltd 's Somersby quarry. Note the undulose lower surface and the planar upper surface overlain by crossbedded "sheet" sandstone, also the banding variation. Sullivan channelling machine in foreground and Cysco machine in background

Tydds, Pattons and Wondabyne, and is preparing to re-open its Piles Creek quarry.

The Somersby, Tydds and Pattons quarries produce "commercial" stone, the distinctive banded variety. Piles Creek quarry produces a plain white stone and a yellow block type stone both with specific applications for restoration work. The Wondabyne quarry also has a high-quality special purpose stone. The Debden quarry produces "Debden stone", a yellow block stone particularly suitable for restoration of buildings where the original Sydney yellow block stone was used.

Central Coast Sawn Stone Quarries Pty Ltd was incorporated in 1983, changed to its current name in 1987 and has rapidly increased production at its Somersby quarry through a major program of equipment modernisation and construction of an on-site processing plant incorporating the latest technology.

Melocco Ltd's Debenham Road quarry opened in 1966 and was bought by Melocco Ltd in the mid 1970s. The company was purchased by Boral (Aust.) Ltd in 1983. The quarry houses Melocco Ltd's stock and sawing plant for most of its local and imported granite and marble. This plant has the largest granite sawing capacity in Australia. The quarry adjoins the Debden quarry but is at a higher elevation. "Commercial" sandstone is quarried on the site.

Mooney River Sandstone Quarries Ltd commenced operations in 1988 on two adjacent quarry sites, with the plant on one and an active quarry on the other. The latter adjoins Gosford Quarries Pty Ltd's Somersby quarry.

Quarry block being lifted at Central Coast Sawn Stone Quarries' Somersby quarry. Note the channel configuration and the Korfmann saw on rails (right)

QUARRYING METHODS

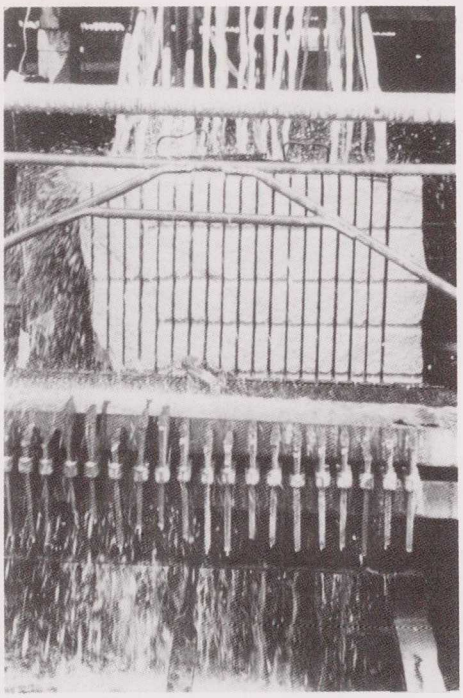
The "drill and broach" method of drilling lines of closely spaced holes then splitting with wedges is less frequently used, although some new equipment can increase the rate of this method.

Quarrying at both Gosford Quarries and Central Coast Sawn Stone Quarries' sites is by channel cuts from above made by a Korfmann saw which cuts with a toothed chain travelling around a flat bar, similar to a chain saw. Channels are cut at a spacing of 1.0 m and then crosscuts at 2.2 m spacing on a 1.4 m lift to produce 3.0 m^3 blocks weighing 7 tonnes. These dimensions for "commercial" stone vary slightly from quarry to quarry. The Korfmann saw produces a smooth face, low operating dust, and a 50 mm cut, and can operate against a flush face, thus eliminating the need to terrace the quarry face.

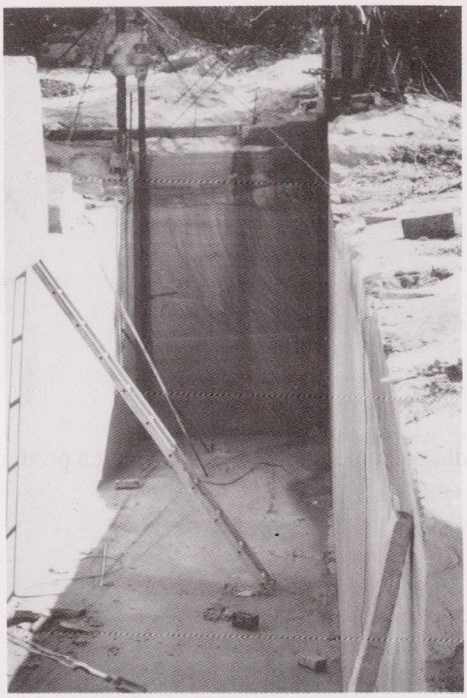
Gosford Quarries also uses pneumatic channelling machines, and Central Coast Sawn Stone Quarries Pty Ltd is also using a locally designed and manufactured excavator cutting wheel. This latter machine uses a water-irrigated 3.5 m diameter cutting wheel to produce a dust-free 95 mm rough-faced channel. The machine is fast-cutting, very mobile and can be relocated very quickly.

Prior to lifting, blocks are marked to show the sedimentary facing so that the stone can be cut to achieve maximum strength, i.e. parallel to bedding for horizontal applications such as paving, or perpendicular to bedding for vertical applications such as facade panels.

Melocco Pty Ltd uses a wire saw instead of the methods described above. The wire saw was invented in 1854 by a Belgian engineer and first used in marble quarries in Italy's Apuan Alps. The wire saw consists of approximately 1000 m of 4.55 mm three-stranded steel wire



Gang saw, Gosford Quarries Pty Ltd



Wire saw, Melocco Pty Ltd

with the strands so woven that the grooves in the wire change direction every 50 m to avoid the wave-like cutting motion of a conventionally stranded wire. The wire travells through aseries of pulleys at a constant 20 km/h and an abrasive mixture of sand and water is dripped on to the wire to enter the cut and wear the rock away. The method is quiet, dust-free and relatively fast, and cuts a smooth-faced channel less than 10 mm wide. Operating the wire saw is a delicate and exacting skill that takes several years of practice to perfect.

Mooney River Sandstone Co. uses pneumatic Sullivan or Cysco channelling machines to produce a 50 mm smooth-faced channel. Blocks are then spit using plugs and feathers (matching hemi-cylindrical rods inserted into a drill hole and forced apart by wedges), lifted out by fork lift and transported to the plant.

ENVIRONMENTAL PROTECTION

To avoid siltation of nearby watercourses, settling ponds and silt traps have been constructed. Melocco Pty Ltd is engaged in a site beautification project and Central Coast Sawn Stone Quarries Pty Ltd has constructed a 3 m high embankment around its quarry to form a visual screen.

Spoil and tailings are either removed as clean fill or stockpiled for rehabilitation work.

PROCESSING

All companies have gang saws which produce a coarser textured surface, diamond saws for cutting quarry blocks and slabs, and hydraulic splitters. However, the relative number and capacity of equipment for each company varies according to their product and market requirements.

Blocks are usually not sold unprocessed as producers prefer to gain the value-added benefits of maximising local processing.

PRODUCTION

Sandstone production has increased dramatically over the past 5 years (see table 1).

This increase is due to several factors, including:

* a general trend to wider use of dimension stone;
* landscaping becoming an integral part of new home construction; and
* a trend to upgrade existing dwellings with landscaping, pools and paved areas.

From in-ground resource to finished product there is an average wastage of approximately 40%; this figure includes rejected flawed stone.

The Central Coast sandstone industry is ideally located to supply the large market of the Newcastle - Sydney - Wollongong area. Expansion of this market will require efficient production and marketing to compete with alternative products, especially landscaping and paving materials.

The restoration market is very variable, being dependent on availability of funds for particular projects.

The export market for processed facade stone and for high-quality pavers is growing.

Gosford Quarries Pty Ltd has a significant export project in progress involving the supply of approximately 15 000 (4000 m^2, 840 tonnes) processed facade pieces to a building project in Japan (details in a future issue).

Central Coast Sawn Stone Pty Ltd is modernising its equipment to improve efficiency and is expanding its market, particularly in the export area.

Melocco Pty Ltd is planning to increase its share of the local market using its existing dimension stone infrastructure.

RESERVES

Reserves are difficult to assess by coring, due to the lack of bed continuity and the rapid variation in colour and pattern.

TABLE 1

NEW SOUTH WALES DIMENSION STONE PRODUCTION — SANDSTONE

Company (direct employment)	Quarry	1984-85 production Quantity (tonnes)	1984-85 production Value $	1988-89 production Quantity (tonnes)	1988-89 production Value $
Central Coast					
Gosford Quarries Pty Ltd (45)	Somersby	4699	373 938	6379	531 590
	Tydds	516	41 065	1058	87 854
	Debden	-	-	1174	144 481
	Wondabyne	312	38 660	468	66 733
Central Coast Sawn Stone Quarries Pty Ltd (21)	Somersby	2059	256 222	6862	1 909 491
Melocco Pty Ltd (18)	Debenham Rd	58	1 740	1000	190 000
Mooney River Sandstone Quarries Ltd (5)	Somersby	-	-	720	33 518
Other Areas					
Bundanoon Quarries	Bundanoon	600	30 238	2880	768 000
Others combined				1225	58

Combined reserves of "commercial" stone at the Somersby, Tydds and Pattons quarries should, at current extraction rates, service this decade. Gosford Quarries Pty Ltd has proven reserves at an old quarry at Mount White for at least the next two decades.

Reserves at the Wondabyne, Debden and Piles Creek quarries are used when demand for the specific characteristics of these special use and high-quality sandstones arises.

Central Coast Sawn Stone Quarries Pty Ltd has a further 18 years Permissive Occupancy (Permissive Occupancy to quarry sandstone dimenstone stone on Crown Land is granted by the New South Wales Department of Lands as title) at its Somersby quarry and, at current production rates, has more than adequate reserves for this period. The quarry is currently being developed by the removal of overburden from on-site reserves.

Melocco Pty Ltd has more than adequate on-site reserves for the next decade at currently planned extraction rates. Also stored on-site are 500-600 m^3 of yellow block stone from its Bondi quarry which ceased production in 1988.

Mooney River Sandstone Quarries Ltd has a further 3 years Permissive Occupancy at its active quarry and a 30 year Permissive Occupancy on its plant site where, at current extraction rates, reserves are adequate for well into this period.

As results from subsurface exploration for sandstone dimension stone are difficult to extrapolate and as land use competition (for industrial and residential development and for national parks) has sterilised large areas, exploration for future resources is confined to known areas of suitable stone, identified from surface outcrop, mainly in the nearby Mount White area.

For further information contact Helen Ray, Geologist, on (02) 901 8362.

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MARMOMACCHINE DIMENSION STONE EXHIBITION, VERONA, ITALY

To actively promote further development of the State's dimension stone industry, the Department participated, for the first time, in the world's premier dimension stone exhibition, ***Marmomacchine***, held in Verona, Italy on 23-30 September 1990. *Marmomacchine* this year played host to 800 exhibitors from 26 countries and attracted over 50 000 visitors.

All aspects of the dimension stone industry were on display at *Marmomacchine*, including stone blocks, slabs and tiles from around the world, cutting and polishing equipment, and finished stone products.

A team of four officers from the Department supported by representatives from several Australian dimension stone companies (including Australian Stone Products Pty Ltd, Clutha Ltd, Stonetile Pty Ltd, Sullivan Machinery Pty Ltd and Western Granites Ltd) mounted a prestigious display of a wide range of Australian stone, all processed in New South Wales. In addition, a range of promotional literature, including a glossy colour brochure on New South Wales dimension stone (with translations into six languages), was available at the stand.

A half-day seminar highlighting the opportunities for further trade and investment in the New South Wales dimension stone industry was also held during the exhibition. Mr Peter Arnold, Director of the New South Wales Government Office, London, visited the Department's stand and participated in the seminar.

Marmomacchine provided an excellent opportunity for the Department to bring the products and potential of the New South Wales dimension stone industry to the attention of the international industry.

Although modest in comparison with some of the larger, European industry displays, the Department's stand was one of the busiest at the exhibition with an estimated 5000 visitors during the 8 days of the Exhibition. There were over 300 genuine business enquiries (qualified by name and address of the inquirier) which will be followed up in co-operation with the local dimension stone industry. Industry representatives assisting on the Department's stand were most impressed at the level of business interest shown in all samples exhibited, particularly the wide range of granite samples and the local sandstone varieties.

Contact will be maintained with industry representatives to gain an accurate assessment of the value of business generated by the Department's first presence at *Marmomacchine*.

For further enquiries contact Garth Holmes, Principal Adviser Minerals Processing, on (02) 901 8480 or Helen Ray, Geologist, on (02) 901 8362.

Visitors talking to representatives at the Department's stand at ***Marmomacchine,*** *Verona, Italy*

NATIONAL ASSESSMENT OF GEMSTONE RESOURCES

A **"National Assessment of Gemstone Resources"** for Australia has been produced by a Gemstone Resources Study Group convened by the Australian Minerals and Energy Council (AMEC) Working Party on Gemstone Processing (see *Minfo 26*, p. 30). The assessment, the first to be undertaken, provides data necessary to encourage further investment in domestic processing of Australia's gemstones.

The Study Group comprised geologists from relevant State (New South Wales, Queensland and South Australia) government departments, together with geologists from the Bureau of Mineral Resources and companies representing gemstone exploration interests. The group operated under the constraint of "utilising the existing facilities of the Commonwealth and States" and hence a map-based approach was used in preparing a "status report" for the AMEC Working Party on Gemstone Processing.

The assessment indicates that there are resources of opal, sapphire and diamond within Australia capable of sustaining the gemstone industry for at least the next 10 years for sapphire, 25 years for diamond and in excess of 50 years for opal, based on current extraction rates and other assumptions. The likely "life" of various gem fields or gemstone mining regions should be extended by further exploration based on systematic geological studies.

Australia is the world's leading producer of **opal** (over 90%) and will remain so for the foreseeable future. The report notes that there is presently little systematic geological data available on opal outside established fields in New South Wales and South Australia. However, the involvement of larger companies in regional geological exploration for opal may change this position, and lead to their involvement in other parts of the opal industry, including mining and processing.

Australia's current share of the world rough **sapphire** market is estimated at 25%-30% (by volume).

The report states that much of the future sapphire production in Australia is likely to be derived from deeper, lower grade deposits, leading to decreasing total production rates within Australia. This trend, combined with new discoveries and reprocessing of selected areas, indicates that the sapphire mining industry in Australia should be sustainable for a period of 15-20 years.

Australia is currently the world's largest **diamond** producer (by volume). Commercial diamond production in Australia is presently restricted to the Kimberley region, Western Australia, and involves only two major mining operations.

The assessment indicates that the **jade** (nephrite) resources at Cowell, South Australia, have a conservative "life" in excess of 80 years, at current extraction rates. **Chrysoprase** resources at Marlborough, Queensland have a likely "life" of 20-40 years at current rates of production. There is insufficient information available to make meaningful resources/"life" estimates for other gemstones.

Major conclusions and recommendations of the report include:

* An on-going program of geological study and resource evaluation concerning opal and sapphire is essential to provide an appropriate basis for future investment and planning decisions concerning Australia's gemstone industry.
* All relevant mining regulations and legislation need to be analysed and amended, where necessary, to encourage and facilitate a systematic approach to gemstone exploration and resource evaluation.

* Greater efforts by Government should be directed to collecting more reliable statistics concerning gemstone production, particularly opal. Such information is essential to improve the data base on which investment and planning decisions are made.

Only limited numbers of the report (which contains 14 maps and 7 tables) were produced for the AMEC Working Party on Gemstone Processing. The newly formed Gemstone Industry Council will consider the report and possible commercial publication at the Council's inaugural meeting.

For further information contact Garth Holmes, Principal Adviser Minerals Processing, on (02) 901 8480.

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LIGHTNING RIDGE MINING BOARD

The Minister for Minerals and Energy, the Hon. Neil Pickard, M.P., established the **Lightning Ridge Mining Board** in July 1990. The main purpose of the Board is to encourage the resolution of issues at a local level, particularly those related to problems arising between miners and farmers, and to consider matters related to the Minister's portfolio and relevant to Lightning Ridge and the Narran - Warrambool Reserve (figure 13).

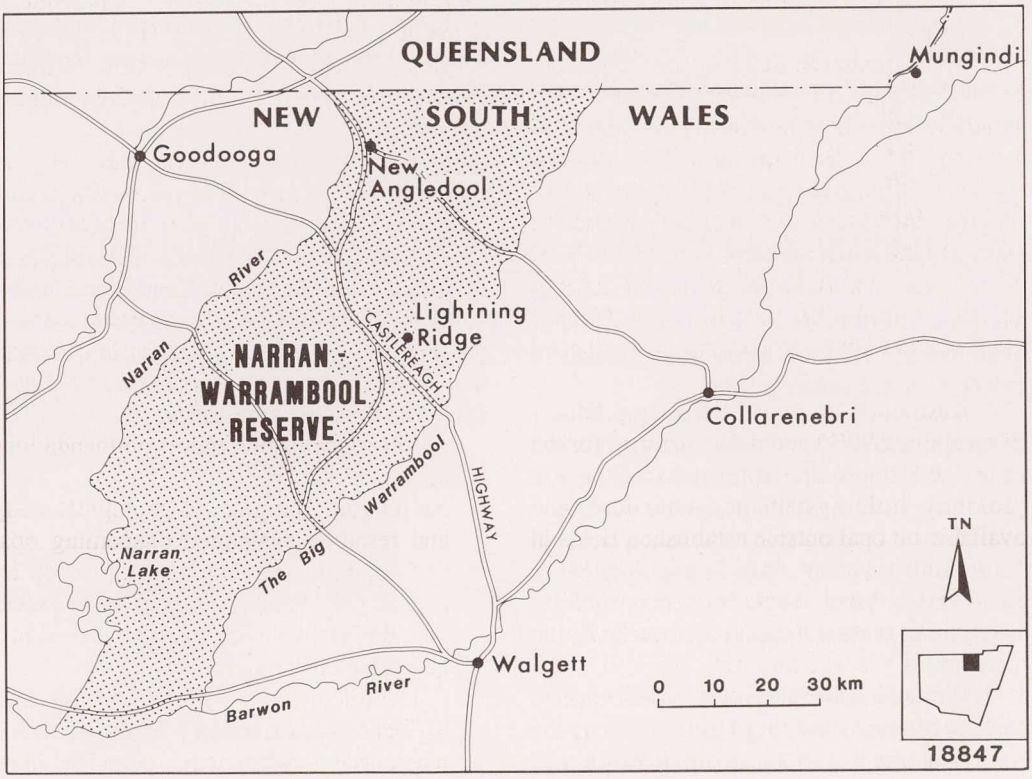

Figure 13. Location diagram, Lightning Ridge and Narran - Warrambool Reserve

The Board consists of:

* Director – Director Minerals Division, Department of Minerals and Energy
* Secretary – Mining Registrar Lightning Ridge
* The Commissioner for Western Lands

and representatives of:

* Lightning Ridge Miners Association (2)
* Grawin, Glengary, Sheepyards Miners Association (1)
* New South Wales Farmers District Council, County of Finch (2)
* Landholders Protection Association (1)
* Walgett Shire Council (1)

During its first year the Board will act in an advisory capacity and report to the Minister. Subsequently the Board may be granted certain statutory powers required for more direct involvement in matters including the:

* setting of fees and conditions,
* rehabilitation of derelict mined areas, and
* enhancement of the environment of the opal fields.

The Board's jurisdiction applies to the land within the Narran - Warrambool Reserve, an area bounded by the Queensland border; The Big Warrambool; the Barwon River; the Narran River; and the eastern boundaries of portions WL 3484, 4018, 4021 and 4023, Western Lands Leases 5834, 7954, 7955 and 8238.

An important objective is for the Board to become self-funding and, eventually, fund the maintenance of the Department's Lightning Ridge office and staff, and reimburse the Department of Minerals and Energy for any specialist services provided.

The Board will not become involved in issues not related to mining as has been the case in recent years with the Lightning Ridge Advisory Committee (a Committee with much wider representation than the Board). The future of the Lightning Ridge Advisory Committee is somewhat uncertain, although there is some support for its continued existence with the possibility of it reporting to some other agency.

For further information contact Don Pinkstone, Director Minerals Division, on (02) 901 8451.

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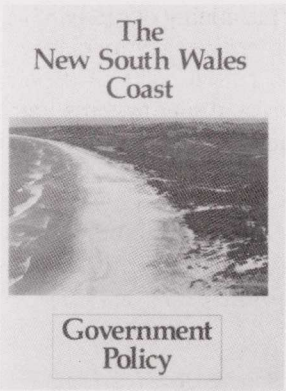
NEW SOUTH WALES COASTAL POLICY

The **New South Wales Coastal Policy,** covering a wide range of coastal management issues, was announced by the Premier on 10 September 1990. The policy incorporates guidelines for **coastal heavy mineral sands mining**.



Draft guidelines for coastal heavy mineral sands mining were released for public comments in early 1989, and these generated considerable reaction from the heavy mineral sands mining industry. The final guidelines in the Coastal Policy have been substantially amended in several areas to the benefit of the industry.

The area covered by the coastal policy consists of a landward strip 1 km wide along the coast, and offshore to 3 nautical miles (that is, the territorial sea). It applies to the full length

of the coast, some 1000 km, except for the more urbanised areas of Newcastle, Sydney and Wollongong.

Responsibility for monitoring implementation of the policy and further policy development will lie with the **New South Wales Coastal Committee**, which comprises an Independent Chairman and representatives from the:

* Local Government and Shires Association (3)
* Nature Conservation Council of New South Wales
* National Parks and Wildlife Service
* New South Wales Tourism Commission
* Departments of Planning, Public Works, Lands, Agriculture and Fisheries, Local Government, and Minerals and Energy.

The Coastal Policy acknowledges that heavy mineral sands mining makes a significant contribution to the economic development of New South Wales. In 1988-89 the value of heavy mineral sands production in this State was over $93 million. With strong prices, increased demand in traditional markets, and the development of new applications for heavy mineral products, the outlook for the industry is promising.

The industry has established a successful rehabilitation record, particularly over the past decade, but the mining of heavy mineral sands remains a sensitive environmental planning issue. Significant mineral sands deposits mainly occur in beach and dune systems, parallel to the coastline and adjacent to waterways, in places extending several kilometres inland.

The Coastal Policy reinforces the Government's long-standing position whereby heavy mineral sands mining on the coast **will not be permitted** in:

* National Parks,
* Nature Reserves, and
* designated littoral rainforests.

In **designated wetlands areas**, the strict environmental provisions will continue to apply.

Mining **will be permitted** on beaches and incipient dunes if it can be demonstrated that it is environmentally acceptable. Examples of environmental acceptability would be where a dune area requires stabilisation or revegetation to protect the coastal environment, or where a previously mined area would benefit from further rehabilitation. The New South Wales Coastal Committee will prepare guidelines to assist in determining environmental acceptability.

Development consent for heavy mineral sands mining on the coast can only be granted with the concurrence of the Director of the Department of Planning. Strict conditions governing site rehabilitation and prevention of adverse environmental effects will apply in cases where heavy mineral sands mining is approved.

A policy will be developed to ensure that appropriate planning processes also apply to sand extraction proposals in the coastal area.

In formulating the Coastal Policy, the Government acknowledges the need to balance the development of the economic potential of heavy mineral sands mining with environmental planning and management considerations. By identifying the environmental controls to which the heavy mineral sands mining industry will be subjected, the policy will assist the industry to adequately plan for its future growth.

Inquiries on the policy can be directed to Ian Clarke, Minerals Policy Officer, on (02) 901 8827. Copies of the New South Wales Coastal Policy are available from the Department of Planning, phone (02) 391 2222.

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DEPARTMENT EXHIBITION AT *MINERAMA 1990*

MINERAMA 1990, a mineral and gem show sponsored by the Glen Innes Municipal Council, was held in Glen Innes from 1 to 3 September 1990. This was the first such activity run in the area and the Glen Innes Municipal Council, being aware of the Department's activities in the region, invited the Department to participate.

MINERAMA 1990 was officially opened by the Hon. Neil Pickard, M.P., Minister for Minerals and Energy. During the course of *MINERAMA 1990,* Departmental officers from Armidale and Inverell assisted the several thousand visitors to the Department's display, and approximately 700 school children, in organised groups and of all ages, were treated to a series of brief informative lectures, videos and movies.

The Department's display comprised pictorial exhibits, mineral specimens (courtesy of The Earth Exchange), films and videos, and an abundance of pamphlets. The display focussed on the history of mining in the region and on the diversity of mineral deposits in the New England area. In addition, a range of products generated by the Department's regional offices featured prominently. The films and videos were shown in a small theatrette and reinforced the theme of the mining heritage of the region. Some exciting and educational presentations on modern underground mining and development of the Argyle diamond deposits of Western Australia were also presented.

The Australian Mining Industry Council loaned a static display and pamphlets on rehabilitation and the importance of mining to Australian society.

For further information contact Bob Brown, Geologist, at the Armidale Office on (065) 73 7118.

Guests and staff at the inaugral MINERAMA gem festival. From left the Hon. Mr Ray Chappell, M.P., Member for Northern Tablelands, the Hon. Mr Neil Pickard M.P., Minister for Minerals and Energy, Jeffrey Kelly, Mr Ken McCusker, Regional Mining Officer (RMO) Inverell, Mr Bob Brown, Geologist, and Mr Noel Kelly, RMO Armidale.
Photo courtesy of the Glen Innes Examiner

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DEPARTMENT CO-SPONSORS IMPORTANT GEOLOGICAL CONFERENCE

The Department of Minerals and Energy is co-sponsoring a landmark conference on the **Tectonics and Metallogenesis of the Lachlan Fold Belt** (LFB), at the Australian Academy of Science, Canberra, on 4-6 February 1991. The Lachlan Fold Belt underlies the south-eastern part of eastern Australia and the southern half of New South Wales.

The other co-sponsors of the LFB 91 Conference are:

* the Geological Society of Australia (Inc.) through the Specialist Group in Tectonics and Structural Geology, and
* Project 267 (Paleozoic Terranes in the Circum-Pacific Orogens) of the International Geological Correlation Program.

Over the 3 days of the conference some 60 papers on structural, tectonic, granitic, economic and crustal structure aspects of the LFB will be presented and debated by government, academic and industry geologists. The stimulating papers and debate will undoubtedly produce a clearer understanding of the evolution of the LFB (most of which lies in New South Wales) based on recent advances in structural geology, stratigraphy, granite genesis and ore-search concepts. This understanding can be used as an updated framework for exploration and further investigation.

Several Departmental representatives are giving papers or presenting posters.

For further information contact Dick Glen (one of the conference convenors) on (02) 901 8346 or, preferably, contact the Conference Secretariat (ACTS, GPO Box 2200, Canberra ACT 2601).

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INTERNATIONAL CONFERENCE ON EXPLORATION

The Australian Society of Exploration Geophysicists and the Geological Society of Australia will co-host an international geoscientific conference at the Convention Centre at Darling Harbour between 17 and 21 February 1991.

The theme of the Conference is **Exploration in a Changing Environment.** In the context of the conference activities, the environment is considered to be everything that influences all phases of exploration, including the corporate, financial and technical influences on our world as well as its ecological aspects.

Each of the 4 days of the Conference will commence with a plenary session with three keynote speakers addressing different themes. The list of keynote speakers includes executives and managers from well-known petroleum and mineral companies and technical leaders in the geoscientific, computing and education fields.

More than 200 technical papers will be presented on topics covering petroleum, mineral and coal exploration, geotechnical and groundwater studies, regional and crustal studies, geoscience education, computer applications, and management and finance.

A major Exhibition will also be held in conjunction with the Conference. The Department of Minerals and Energy has taken exhibition booth space and will display the latest maps and publications alongside other State and Commonwealth Organisations and industry representatives.

For further information contact Adelmo Agostini, Senior Geophysicist, on (02) 901 8354.

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PROSPECTING LICENCES CONVERTED TO EXPLORATION LICENCES

On 1 August 1990, a number of amendments to the Mining Act 1973 came into force. The major amendments related to the conversion of all applications for Prospecting Licences to applications for Exploration Licences and all Prospecting Licences to Exploration Licences. The aim of these changes is to streamline the processing of applications thus enabling converted applications to be granted far more quickly than under the previous procedures.

For further information contact Manny Hatch, Manager Western Zone, Mineral Resources Administration Branch, on (02) 901 8481.

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EXPLORATION LICENCES

Exploration Licences in force September 1990

EL No.	Holder	Mining Div.*	Expiry*	Grp #
999	Cyprus Gold Australia Corp.	GO	24.07.81	1
1084	Cyprus Gold Australia Corp.	IN	02.04.82	1
1094	Triako Resources Ltd	BH	19.04.82	1
1096	Triako Resources Ltd	BH	19.04.82	1
1124	Endeavour Resources Ltd	IN	04.07.82	1
1127	Triako Resources Ltd	BH	09.07.82	1
1157	Cyprus Gold Australia Corp.	OR	16.11.82	1
1160	John Alexander McCarron, Betty Jane McCarron	OR	03.01.83	1
1161	Triako Resources Ltd	BH	03.01.83	1
1171	The Zinc Corp. Ltd	BH	30.01.83	1
1181	Roland Walton	AL	22.03.83	1
1224	Carpenteria Exploration Co. Pty Ltd	WA	01.08.83	1
1225	Endeavour Resources Ltd	IN	01.08.83	1
1307	Range Resources Ltd	WA	13.02.84	1
1319	BHP Gold Mines Ltd	OR	12.02.84	1
1324	Pacific Copper Ltd	CO	21.02.83	1
1376	Triako Resources Ltd	BH	30.06.90	1
1405	Eromanga Hydrocarbons N.L.	AR	31.07.84	1
1452	Cyprus Gold Australia Corp.	BH	21.09.82	1
1464	Alkane Exploration N.L.	DU	8.10.90	1
1466	Norgold Ltd	CO	15.10.89	1
1490	Torrington Minerals Pty Ltd	IN	06.11.84	1
1563	Base Resources Ltd, Paragon Gold Pty Ltd	OR	19. 2.91	1
1590	RGC Exploration Pty Ltd	OR	12.03.89	1
1629	North Broken Hill Ltd	GO	20.05.85	1
1684	Cluff Minerals (Aust.) Pty Ltd	DU	6.08.91	1
1821	Mount Carrington Mines Ltd	IN	17.03.88	1
1840	Renison Ltd	CM	7.04.90	1
1897	Commercial Minerals Ltd	DU	13.07.90	5
1905	Cyprus Gold Australia Corp.	IN	27.07.86	1
1914	Australian Diatomite Mining Pty Ltd	AR	27.01.89	2
1923	Little River (Resources) Pty Ltd	GO	06.09.88	1
1941	Cobar Mines Pty Ltd	CO	7.10.88	1
1975	Cobar Mines Pty Ltd	CO	15.12.88	1
1980	Tinga Holdings Pty Ltd	AR	05.01.87	1
1984	Challenger Mining Corp. N.L.	AR	10.01.87	1
1990	Triako Resources Ltd	BH	30.06.90	1
1994	Little River (Resources) Pty Ltd	WA	27.02.91	1
1999	Triako Resources Ltd	OR	3.03.89	1
2031	Cyprus Gold Aust. Corp.	CO	4.07.91	1
2032	Dowmill Pty Ltd	CO	4.07.91	1
2033	Cyprus Gold Aust. Corp.	OR	6.07.91	1
2036	Silver Orchid Pty Ltd	DU	19.07.89	1
2037	Silver Orchid Pty Ltd	OR	19.07.89	1
2044	Delta Gold N.L.	CM	31.12.88	1
2058	Dowmill Pty Ltd	CO	22.08.91	1
2059	Paragon Gold Pty Ltd	WA	22.08.91	1
2063	Canyon Resources Pty Ltd	GO	28.08.89	1
2064	Mumbil Mines N.L.	GO	28.08.87	1
2065	CRA Exploration Pty Ltd	CO	28.08.91	1
2071	Delta Gold N.L.	BH	30.08.91	1
2072	Triako Resources Ltd	BH	28.08.85	1
2075	Valley Exploration Pty Ltd	DU	8.09.91	1
2084	Freeport of Australia Inc.	AR	18.09.87	1
2088	Kinex Pty Ltd	AR	28.09.88	1
2089	Kinex Pty Ltd	AR	28.09.88	1
2100	John Alexander McCarron, Betty Jane McCarron	OR	12.10.85	1
2111	Range Resources Ltd, Nicron Nicron Resources Ltd, Petrocarb Exploration N.L.	GO	12.10.90	1
2121	Delta Gold N.L.	BH	18.10.91	1
2130	Jones Mining Ltd	OR	16.01.92	1
2150	Lachlan Resources N.L.	OR	16.01.92	1
2151	Lachlan Resources N.L.	OR	16.01.90	1
2159	Sunshine Gold Search Pty Ltd	DU	06.02.89	1
2161	Lachlan Resources N.L.	OR	6.02.90	1
2165	Mount Carrington Mines Ltd	LM	12.02.90	1
2186	Carpentaria Exploration Co. P/L	WA	12.03.90	1
2208	Denehurst Ltd	GO	02.04.90	1
2212	United Nickel Ltd	DU	23.04.88	1
2222	Golden Shamrock Mines Ltd, Mount Gipps Ltd	OR	13.05.90	1
2231	Renison Ltd	OR	22.05.90	1

EL No.	Holder	Mining Div.*	Expiry*	Grp #
2232	Renison Ltd	OR	22.05.90	1
2249	Australmin Holdings Ltd	NE	26.06.90	1
2261	Challenger Mining Corp. N.L.	DU	4.09.90	1
2265	M.J. Hickey	OR	10.09.90	1
2269	BHP Gold Mines Ltd	OR	26.09.90	1
2290	Metallic Resources Pty Ltd	OR	13.11.90	1
2291	Lachlan Resources N.L.	OR	13.11.90	1
2312	Alkane Exploration N.L.,	CM	22.11.88	1
2321	Peko-Wallsend Operations Ltd	WA	26.11.89	1
2322	Peko-Wallsend Operations Ltd	WA	26.11.89	1
2337	Renison Ltd	OR	7.01.91	1
2346	Pan Australian Mining Ltd	WA	7.01.91	1
2372	The Shell Co. of Australia Ltd	OR	14.02.89	1
2375	Central West Gold N.L.	GO	20.02.91	1
2376	Australian China Clays Ltd	DU	21.02.89	5
2377	Broken Hill Metals N.L.	OR	25.02.91	1
2378	CSR Ltd	OR	25.02.91	1
2386	Spargos Exploration N.L.	CO	14.03.91	1
2392	Young Mining Co. Pty Ltd	GO	18.04.91	2
2454	Baxter-Brown Exploration N.L.	IN	30.06.89	6
2473	Transit Mining Pty Ltd	DU	29.10.91	1
2513	Seltrust Mining Corp. Pty Ltd	BH	6.11.91	1
2521	Helix Resources N.L.	OR	9.12.89	1
2522	Helix Resources N.L.	OR	9.12.89	1
2526	Horizon Gold N.L.	CM	11.12.89	1
2528	Denehurst Ltd	GO	15.12.91	1
2534	Mount Isa Mines Ltd	BH	21.01.92	1
2535	Renison Ltd	OR	21.01.92	1
2537	Kinex Pty Ltd	AR	6.02.88	1
2543	Triako Resources Ltd	CO	27.02.90	1
2547	The Shell Co. of Aust. Ltd	OR	10.03.90	1
2548	Cobar Mines Pty Ltd	CO	10.03.92	1
2551	Helix Resources N.L.	CO	10.03.90	1
2583	CRA Exploration Pty Ltd	AL	17.09.90	1
2584	CRA Exploration Pty Ltd	AL	17.09.90	1
2590	Peko-Wallsend Operations Ltd	OR	26.03.90	1
2599	Rutile & Zircon Mines (Newcastle) Ltd	CH	15.05.90	1
2600	Aberfoyle Exploration Pty Ltd	BH	18.05.90	1
2605	Norgold Ltd	CO	18.05.90	1
2607	The Shell Co. of Aust. Ltd	WA	18.05.90	1
2615	Aberfoyle Exploration Pty Ltd	BH	10.06.90	1
2616	Aberfoyle Exploration Pty Ltd	BH	10.06.90	1
2619	Timbarra Mines N.L.	IN	18.06.92	1
2629	Tiwana Pty Ltd	OR	29.06.90	1
2631	Cluff Minerals (Aust.) Pty Ltd	DU	13.07.90	1
2642	Browns Creek Gold Ltd	OR	7.08.90	1
2652	Lachlan Resources N.L.	OR	7.09.90	1
2653	Lachlan Resources N.L.	OR	7.09.90	1
2654	Lachlan Resources N.L.	CO	7.09.90	1
2655	Lachlan Resources N.L.	CO	7.09.90	1
2658	Peter Penklis, Michael Penklis, Graziano Sirol & Danika Sirol	OR	14.09.90	1
2659	Peter Penklis, Michael Penklis, Graziano Sirol & Danika Sirol	OR	14.09.90	1
2662	Mount Carrington Mines Ltd	IN	15.09.90	1
2663	Noble Resources N.L.	OR	22.09.90	1
2664	Noble Resources N.L.	OR	22.09.90	1
2665	Horizon Gold N.L.	CM	22.09.90	1
2666	Poyngold Pty Ltd	CM	22.09.90	1
2669	Pasminco Australia Ltd	BH	24.09.91	1
2671	Helix Resources N.L.	DU	6.10.90	1
2672	Helix Resources N.L.	OR	6.10.90	1
2673	Helix Resources N.L.	OR	6.10.90	1
2676	Helix Resources N.L.	OR	6.10.90	1
2680	CRA Exploration Pty Ltd	CO	6.10.90	1
2681	CRA Exploration Pty Ltd	CO	6.10.90	1
2682	CRA Exploration Pty Ltd	OR	6.10.90	1
2683	Rutile & Zircon Mines (Newcastle) Ltd	NE	2.10.88	1
2684	Lachlan Valley Gold Mines Pty Ltd, Centralime Pty Ltd	OR	8.10.90	2
2689	CRA Exploration Pty Ltd	BH	17.09.90	1
2710	Quinton Charles Bland, and Dayle Scott Bland	OR	21.10.90	1
2711	The Shell Co. of Aust. Ltd	OR	26.10.90	1
2718	Peko Wallsend Operations Ltd	DU	10.11.90	1
2719	ZC Mines Pty Ltd	BH	12.11.90	1
2723	Alkane Exploration N.L.	CH	13.11.90	1
2724	Epoch Minerals Exploration N.L.	CO	18.11.90	1
2727	Mount Conqueror Minerals N.L.	OR	25.11.88	1
2728	Omega Mines Ltd	AR	25.11.90	1
2732	Western Granites Ltd	OR	2.12.90	4
2734	Western Granites Ltd	OR	2.12.89	4
2738	BHP Gold Mines Ltd	DU	9.12.90	1
2740	Aberfoyle Resources Ltd	BH	15.12.90	1
2741	Aberfoyle Resources Ltd	BH	15.12.90	1
2742	Phillip Edmond Cogar	CM	15.12.89	1
2743	Seltrust Mining Corp. Pty Ltd	BH	6.11.89	1
2746	Cluff Minerals (Aust.) Pty Ltd	DU	22.12.88	1
2747	Peko-Wallsend Operations Ltd	OR	23.12.90	1
2749	Renison Ltd	OR	22.05.90	1
2758	International Mining Corp. N.L.	DU	12.01.91	1
2761	Freeport Australian Minerals Ltd., Nicron Resources Ltd, Range Resources Ltd, Petrocarb Exploration N.L.	WA	14.01.91	1
2766	CRA Exploration Pty Ltd	CO	27.01.91	1
2767	Alkane Exploration N.L.	DU	3.02.91	1
2771	BHP Gold Mines Ltd	OR	15.02.91	1
2772	J.M. Stephen Pty Ltd	AR	18.02.91	2
2774	J.M. Stephen Pty Ltd	AR	18.02.91	2
2775	BHP Gold Mines Ltd	OR	1.03.91	1
2805	CRA Exploration Pty Ltd	BH	17.09.90	1
2808	CRA Exploration Pty Ltd	BH	17.09.90	1
2809	CRA Exploration Pty Ltd	BH	17.09.90	1
2824	Mumbil Mines N.L.	AR	08.03.89	1
2825	CRA Exploration Pty Ltd	CO	10.03.91	1
2835	Peko-Wallsend Operations Ltd	DU	22.03.91	1
2838	Ajax Joinery Pty Ltd	DU	31.3.91	1
2850	Mount Carrington Mines Ltd	CH	31.12.90	1
2851	Mount Carrington Mines Ltd	IN	31.12.90	1
2864	Aberfoyle Resources Ltd	BH	27.05.91	1
2865	Peko-Wallsend Operations Ltd	OR	1.06.91	1
2886	BHP Minerals Ltd	BH	28.06.91	1
2887	Valley Exploration Pty Ltd	CO	1.07.90	1
2889	BHP Minerals Ltd	DU	8.07.90	1
2890	Cluff Minerals (Aust.) Pty Ltd	DU	13.07.91	1
2893	International Mining Corp. N.L.	DU	15.07.91	1
2894	BHP Minerals Ltd	OR	16.07.91	1
2901	Compass Resources N.L.	OR	27.07.91	1
2902	Compass Resources N.L.	GO	27.07.89	1
2908	Norgold Ltd	OR	4.08.91	1
2911	Epoch Mining N.L.	CO	13.08.90	1
2912	Epoch Mining N.L.	CO	13.08.90	1
2916	Mount Carrington Mines Ltd	IN	31.12.90	1
2918	Consolidated Feldspar Ltd	BH	12.10.90	2
2919	Aberfoyle Resources Ltd	BH	12.10.91	1
2921	Clutha Minerals Ltd	BH	12.10.91	1
2922	Stockdale Prospecting Ltd	BH	12.10.91	1
2923	Stockdale Prospecting Ltd	BH	12.10.91	1
2931	James Barry McKinnon	AL	22.10.91	5

EL No.	Holder	Mining Div.*	Expiry+	Grp #
2934	Telberth N.L.	GO	22.10.89	1
2944	Border Resources N.L.	CM	2.11.91	1
2945	Australmin Pacific N.L.	LM	3.11.89	1
2947	Aberfoyle Resources Ltd	BH	16.11.89	1
2948	CRA Exploration Pty Ltd	CO	22.11.91	1
2949	CRA Exploration Pty Ltd	CO	22.11.89	1
2950	CRA Exploration Pty Ltd	CO	22.11.89	1
2951	CRA Exploration Pty Ltd	CO	22.11.91	1
2958	Epoch Mining N.L.	CO	2.12.89	1
2962	Western Granites Ltd	OR	2.12.90	4
2963	Metals Exploration Ltd	CO	8.12.89	1
2968	Lachlan Resources N.L. and Platinum Search N.L.	CO	13.12.91	1
2975	Broken Hill Metals N.L.	BH	22.12.91	1
2976	Young Mining Co. Pty Ltd	OR	3.01.92	2
2977	Mount Conqueror Minerals N.L.	OR	03.01.90	1
2982	Mount Carrington Mines Ltd	IN	6.01.90	1
2984	Cyprus Gold Australia Corp.	OR	10.01.90	1
2988	T.J. & P.V. Nunan Pty Ltd	IN	14.01.90	6
2989	T.J. & P.V. Nunan Pty Ltd	IN	14.01.90	6
2990	Little River Goldfields N.L.	IN	14.01.90	6
2991	G. & J. The Gem Merchants P/L	IN	14.01.92	6
2992	G. & J. The Gem Merchants P/L	IN	14.01.92	6
2993	G. & J. The Gem Merchants P/L	IN	14.01.92	6
2993	G. & J. The Gem Merchants P/L	IN	14.01.92	6
2994	G. & J. The Gem Merchants P/L	IN	14.01.92	6
2995	G. & J. The Gem Merchants P/L	IN	14.01.92	6
2996	G. & J. The Gem Merchants P/L	IN	14.01.92	6
2998	G. & J. The Gem Merchants P/L	IN	14.01.92	6
2999	G. & J. The Gem Merchants P/L	IN	14.01.92	6
3000	G. & J. The Gem Merchants P/L	IN	14.01.92	6
3001	G. & J. The Gem Merchants P/L	IN	14.01.92	6
3002	G. & J. The Gem Merchants P/L	IN	14.01.92	6
3003	G. & J. The Gem Merchants P/L	IN	14.01.92	6
3004	G. & J. The Gem Merchants P/L	IN	14.01.92	6
3005	G. & J. The Gem Merchants P/L	IN	14.01.92	6
3006	Lynch Mining Ltd	CO	17.01.90	1
3061	Anthony Kenneth Cox	NE	16.02.90	1
3062	Triad Minerals N.L.	OR	18.02.90	6
3066	Australmin Pacific N.L., R.Z. Mines (Newcastle) P/L	CH	23.02.90	1
3068	Brick & Stone Holdings Ltd	OR	24.02.90	4
3078	Valley Exploration Pty Ltd	DU	9.03.90	1
3083	BHP Minerals Ltd	BH	21.03.90	1
3085	Rutile & Zircon Mines (Newcastle) Ltd	NE	22.03.90	1
3086	Laporte Group Australia Ltd	LM	10.04.90	2
3087	The Stellar Minerals Pty Ltd	GO	10.04.90	6
3088	Alexander William Gordon, and Joseph James Clift	AR	28.04.90	1
3089	Alexander William Gordon	AR	28.04.90	1
3090	Alexander William Gordon	AR	28.04.90	1
3092	Renison Ltd	OR	31.05.90	1
3093	G. & J. The Gem Merchants P/L	IN	14.01.92	6
3094	Australmin Pacific N.L.	LM	1.06.90	1
3095	Australmin Pacific N.L.	LM	1.06.90	1
3096	Australmin Pacific N.L.	LM	1.06.90	1
3099	Australmin Pacific N.L. R.Z. Mines (Newcastle) P/L	CH	5.06.90	1
3100	Australmin Pacific N.L. R.Z. Mines (Newcastle) P/L	CH	5.06.90	1
3101	Australmin Pacific N.L. R.Z. Mines (Newcastle) Pty Ltd	CH	5.06.90	1
3102	Peko-Wallsend Operations Ltd	OR	5.06.90	1
3104	Aberfoyle Resources Ltd	BH	23.06.90	1
3105	Aberfoyle Resources Ltd	BH	23.06.90	1
3106	Aberfoyle Resources Ltd	BH	23.06.90	1
3108	Valley Exploration Pty Ltd	CO	29.06.90	1
3111	Aberfoyle Resources Ltd	AL	03.07.90	1
3113	Aberfoyle Resources Ltd	AL	03.07.90	1
3114	Aberfoyle Resources Ltd	AL	03.07.90	1
3117	CRA Exploration Pty Ltd	AR	05.07.90	1
3120	BHP Gold Mines Ltd	OR	06.07.90	1
3125	Pakrac Holdings Pty Ltd and Australian Gold Development N.L.	CO	07.07.90	1
3127	Cluff Minerals (Aust.) Pty Ltd	IN	07.07.90	6
3128	Metals Exploration Ltd	OR	10.07.90	1
3131	Norgold Ltd	CO	18.07.90	1
3136	Antony Ashworth MacNevin	IN	20.07.90	6
3137	BHP Gold Mines Ltd	GO	18.07.90	1
3138	Nord Australex Nominees P/L	CO	25.07.90	1
3142	Demite Pty Ltd	AR	25.07.90	1
3147	Etcorp Pty Ltd	LM	17.08.90	1
3148	R.Z. Mines (Newcastle) Pty Ltd	NE	16.08.90	1
3149	Cyprus Gold Australia Corp.	OR	17.08.90	1
3152	Aberfoyle Resources Ltd	BH	18.08.90	1
3155	BHP Gold Mines Ltd and Browns Creek Gold N.L.	OR	21.08.90	1
3156	BHP Minerals Ltd	OR	21.08.90	1
3159	Great Fingall Mining Co. N.L.	AR	21.08.90	1
3160	Laporte Group Australia Ltd	LM	21.08.90	2
3163	ZC Mines Pty Ltd	BH	28.08.90	1
3164	ZC Mines Pty Ltd	BH	28.08.90	1
3165	ZC Mines Pty Ltd	BH	28.08.90	1
3166	ZC Mines Pty Ltd	BH	28.08.90	1
3175	Aberfoyle Resources Ltd	AL	29.08.89	1
3176	Aberfoyle Resources Ltd	BH	29.08.89	1
3177	Aberfoyle Resources Ltd	BH	29.08.89	1
3178	Aberfoyle Resources Ltd	BH	29.08.89	1
3184	Peko-Wallsend Operations Ltd	OR	05.09.90	1
3188	Peregrine Mineral Sands N.L.	AL	12.09.90	1
3189	Peregrine Mineral Sands N.L.	AL	12.09.90	1
3190	Peregrine Mineral Sands N.L.	AL	12.09.90	1
3191	Peregrine Mineral Sands N.L.	AL	12.09.90	1
3193	Antrim Corporation Pty Ltd	DU	13.09.90	2
3195	Telberth N.L.	GO	13.09.90	1
3196	Quotidian No. 101 Pty Ltd and Cluff Minerals (Aust.) Pty Ltd	OR	14.09.90	1
3197	Major Mining Ltd	BH	19.09.90	1
3199	Etcorp Pty Ltd	LM	25.09.90	1
3200	Mineral Deposits Ltd	CH	22.09.90	1
3203	Aberfoyle Resources Ltd	BH	09.10.90	1
3204	Aberfoyle Resources Ltd	BH	09.10.89	1
3205	BP Australia Gold Pty Ltd	GO	09.10.90	1
3206	Telberth N.L.	GO	12.10.90	1
3207	Terry Fortescue Croft	WA	12.10.90	1
3209	Triako Resources Ltd	OR	17.10.90	1
3210	CRA Exploration Pty Ltd	CO	27.10.90	1
3213	Alkane Exploration N.L.	IN	18.10.90	1
3217	Pioneer Concrete (NSW) P/L	WO	14.11.90	4
3218	Ready Mixed Industries P/L	WO	14.11.90	4
3219	Ready Mixed Industries P/L	SY	14.11.90	4
3220	Ready Mixed Industries P/L	NE	14.11.90	4
3221	Archdall Investments Pty Ltd, and Unisearch Ltd	SY	14.11.90	4
3222	Archdall Investments Pty Ltd, and Unisearch Ltd	SY	14.11.90	4
3223	R.Z. Mines Pty Ltd	NE	14.11.90	1
3224	Picon Exploration Pty Ltd	NE	14.11.90	1
3225	Picon Exploration Pty Ltd	LM	14.11.90	1
3226	Picon Exploration Pty Ltd	CH	14.11.90	1
3229	TJ & PV Nunan Pty Ltd	IN	05.12.90	1
3230	Renison Ltd	OR	05.12.90	1

EL No.	Holder	Mining Div.*	Expiry*	Grp #
3231	Browns Creek Gold N.L.	OR	05.12.90	1
3232	Norgold Ltd	CO	07.12.90	1
3233	Norgold Ltd	CO	07.12.90	1
3234	Norgold Ltd	CO	07.12.90	1
3235	Norgold Ltd	CO	07.12.90	1
3236	Norgold Ltd	CO	07.12.90	1
3237	BHP Gold Mines Ltd	OR	12.12.90	1
3238	ZC Mines Pty Ltd	BH	12.12.90	1
3239	Martin Gold Mines N.L.	CM	12.12.90	1
3240	ZC Mines Pty Ltd	BH	14.12.90	1
3241	Browns Creek Gold N.L.	OR	18.12.90	1
3242	International Pacific Holdings Ltd & Philip Anthony Wadley	CO	20.12.90	1
3243	Cluff Minerals (Aust.) Pty Ltd	DU	20.12.90	1
3244	CRA Exploration Pty Ltd	CO	04.01.91	1
3245	Regent Resources N.L.	DU	04.01.91	1
3248	CRA Exploration Pty Ltd	AL	08.01.91	5
3252	CRA Exploration Pty Ltd	DU	12.01.91	1
3253	Peko-Wallsend Operations Ltd	OR	16.01.91	1
3254	BHP Gold Mines Ltd	OR	16.01.91	1
3255	Norgold Ltd	CO	16.01.90	1
3256	Norgold Ltd	CO	16.01.90	1
3257	Norgold Ltd	CO	16.01.90	1
3258	Norgold Ltd	CO	16.01.90	1
3259	Norgold Ltd	CO	16.01.90	1
3260	Aberfoyle Resources Ltd	BH	16.01.90	1
3262	Aberfoyle Resources Ltd	AL	18.01.91	1
3265	Peko-Wallsend Operations Ltd	CO	05.02.91	1
3266	CRA Exploration Pty Ltd	BH	01.03.91	1
3267	BHP Minerals Ltd	DB	06.03.91	1
3268	Frank Franke	DB	06.03.91	1
3271	Baxter Brown Exploration N.L.	IN	21.02.91	6
3273	Dowmill Pty Ltd and Kia Pacific Gold Ltd	CO	30.03.91	1
3274	Dowmill Pty Ltd and Kia Pacific Gold Ltd	CO	30.03.91	1
3275	Peko-Wallsend Operations Ltd	DB	05.04.91	1
3276	Peko-Wallsend Operations Ltd	OR	05.04.91	1
3277	Peko-Wallsend Operations Ltd	OR	05.04.91	1
3278	Peko-Wallsend Operations Ltd	OR	05.04.91	1
3279	Peko-Wallsend Operations Ltd	OR	05.04.91	1
3280	Aberfoyle Resources Ltd	AL	05.04.91	1
3281	Aberfoyle Resources Ltd	AL	05.04.91	1
3282	Aberfoyle Resources Ltd	AL	05.04.91	1
3283	Aberfoyle Resources Ltd	AL	05.04.91	1
3284	Aberfoyle Resources Ltd	AL	05.04.91	1
3285	Norgold Ltd	IN	10.04.91	1
3287	Lachlan Valley Granite Supplies Pty Ltd	OR	12.04.91	1
3293	Plenty River Mining Co. N.L.	CO	12.04.91	1
3294	International Mining Corporlation N.L.	NE	11.04.91	1
3295	Pioneer Minerals Australia Ltd	DB	12.04.91	1
3296	CRA Exploration Pty Ltd	CO	12.04.91	1
3297	CRA Exploration Pty Ltd	CO	12.04.91	1
3298	CRA Exploration Pty Ltd	CO	12.04.91	1
3299	CRA Exploration Pty Ltd	CO	12.04.91	1
3301	BHP Minerals Ltd	AR	12.04.91	1
3303	Vamow Pty Ltd	OR	20.04.91	6
3304	Peko-wallsend Operations Ltd	GO	23.04.91	1
3305	Peko-Wallsend Operations Ltd	GO	23.04.91	1
3307	Red Anchor Investments Pty Ltd	OR	21.05.91	1
3308	Red Anchor Investments Pty Ltd	OR	21.05.91	1
3309	Australmin Pacific N.L.	CH	06.07.91	1
3310	Cluff Minerals (Aust.) Pty Ltd	IN	20.07.91	6
3311	CRA Exploration Pty Ltd	OR	25.07.91	1
3312	R.Z. Mines (Newcastle) Pty Ltd	CH	31.07.91	1
3313	Amatek Ltd	WO	01.08.91	1
3315	Clutha Minerals Ltd	AR	09.08.91	4
3317	Clutha Minerals Ltd	CM	09.08.91	4
3320	Clutha Minerals Ltd	OR	09.08.91	4
3321	Clutha Minerals Ltd	CH	09.08.91	1
3322	Moruya Gold Mines (1983) N.L.	GO	13.08.90	1
3324	Australmin Holdings Ltd	AR	22.08.91	1
3325	Cluff Minerals (Aust.) Pty Ltd	AR	22.08.91	6
3326	New England Antimony Mines N.L.	AR	22.08.91	1
3327	Mosaic Tile and Pottery Pty Ltd	CM	23.08.91	2
3328	Valley Exploration Pty Ltd	DU	23.08.91	1
3329	Costain Australia Ltd	GO	23.08.90	1
3332	Costain Australia Ltd	NE	23.08.90	1
3333	CRA Exploration Pty Ltd	BH	23.08.91	1
3334	Costain Australia Ltd	NE	23.08.90	1
3335	Aberfoyle Resources Ltd	BH	23.08.91	1
3338	R.Z. Mines (Newcastle) Pty Ltd	IN	22.08.91	1
3339	R.Z. Mines (Newcastle) Pty Ltd	IN	22.08.91	5
3340	Melocco Pty Ltd	IN	03.09.90	4
3341	Australmin Holdings Ltd	AR	22.08.91	1
3342	Gysbertus Barend Brink, Christopher Walker	AR	22.08.91	1
3343	CRA Exploration Pty Ltd	BH	10.09.91	1
3344	CRA Exploration Pty Ltd	BH	11.09.91	1
3345	CRA Exploration Pty Ltd	BH	10.09.91	1
3346	Renison Ltd	CO	19.09.91	1
3347	Renison Ltd	CO	19.09.91	1
3348	Clutha Minerals Ltd	NE	20.09.91	4
3349	Clutha Minerals Ltd	OR	20.09.91	4
3351	Clutha Minerals Ltd	DU	20.09.91	4
3352	Clutha Minerals Ltd	DU	20.09.91	4
3354	Clutha Minerals Ltd	IN	20.09.91	4
3356	Red Anchor Investments P/L	GO	24.09.91	1
3357	CRA Exploration Pty Ltd	CM	24.09.91	1
3358	Red Anchor Investments P/L	OR	25.09.91	1
3359	Red Anchor Investments P/L	OR	25.09.91	1
3360	Clutha Minerals Ltd	GO	25.09.91	4
3364	Climax Mining Ltd	DU	25.09.91	1
3365	Peter Turnbull, Ailsa Turnbull, Jeannette Agnes McGowan, Roy Andrew McGowan	AR	28.09.91	1
3366	ZC Mines Pty Ltd	BH	08.10.91	1
3367	CRA Exploration Pty Ltd	CO	08.10.91	1
3368	CRA Exploration Pty Ltd	CO	08.10.91	1
3369	CRA Exploration Pty Ltd	DU	11.10.91	1
3370	CRA Exploration Pty Ltd	BH	11.10.91	1
3371	CRA Exploration Pty Ltd	BH	11.10.91	1
3372	CRA Exploration Pty Ltd	BH	11.10.91	1
3373	Compass Resources N.L.	DU	11.10.91	1
3375	Southern Ventures N.L.	BH	11.10.90	1
3376	Southern Ventures N.L.	BH	11.10.90	1
3377	Southern Ventures N.L.	BH	11.10.90	1
3378	Peko-Wallsend Operations Ltd	OR	11.10.91	1
3379	Peko-Wallsend Operations Ltd	CO	11.10.91	1
3380	Platinum Search N.L.	CO	17.10.91	1
3381	Platinum Search N.L.	CO	17.10.91	1
3382	Platinum Search N.L.	CO	17.10.91	1
3383	Pancontinental Gold (Operations) Pty Ltd	OR	17.10.91	1
3384	Climax Mining Ltd	OR	18.10.91	1
3385	Climax Mining Ltd	OR	18.10.91	1
3386	Renison Ltd	OR	18.10.91	1
3387	BHP Minerals Ltd	DU	11.09.91	1
3388	CRA Exploration Pty Ltd	BH	22.11.91	1
3392	Peko-Wallsend Operations Ltd	DU	22.11.91	1
3393	Red Anchor Investments P/L	GO	22.11.91	1

EL No.	Holder	Mining Div.*	Expiry+	Grp #
3394	Melocco Pty Ltd	IN	05.12.90	4
3395	Lachlan Valley Granite Supplies Pty Ltd	WA	06.12.91	4
3396	Aberfoyle Resources Ltd	BH	07.12.90	1
3397	Aberfoyle Resources Ltd	BH	07.12.90	1
3398	Aberfoyle Resources Ltd	BH	07.12.90	1
3399	Aberfoyle Resources Ltd	BH	07.12.90	1
3400	Peko Exploration Ltd	CO	10.12.90	1
3401	Peko Exploration Ltd	CO	10.12.90	1
3402	Peko Exploration Ltd	CO	10.12.90	1
3403	Peko Exploration Ltd	CO	10.12.90	1
3404	Peko Exploration Ltd	CO	10.12.90	1
3405	Peko Exploration Ltd	CO	10.12.90	1
3408	Peko Exploration Ltd	CO	03.01.91	1
3409	Peko Exploration Ltd	CO	03.01.91	1
3410	Peko Exploration Ltd	CO	03.01.91	1
3411	Peko Exploration Ltd	CO	03.01.91	1
3412	Peko Exploration Ltd	CO	03.01.91	1
3413	Peko Exploratiion Ltd	CO	03.01.91	1
3414	Baxter-Brown Exploration N.L.	IN	16.01.92	6
3415	Baxter-Brown Exploration N.L.	IN	16.01.92	6
3416	Clutha Minerals Ltd	WO	16.01.92	4
3421	Goldrim Mining Australia Ltd	GO	23.01.92	1
3422	Peregrine Mineral Sands N.L.	BH	31.01.92	1
3423	Australmin Holdings Ltd	CH	13.02.92	1
3424	Saracen Minerals N.L.	IN	22.02.92	1
3425	BHP Gold Mines Ltd	OR	25.02.92	1
3426	Renison Ltd	OR	25.02.92	1
3427	Aberfoyle Resources Ltd	AL	26.02.91	1
3428	Aberfoyle Resources Ltd	AL	26.02.91	1
3429	Aberfoyle Resources Ltd	AL	26.02.91	1
3430	The Stellar Minerals Pty Ltd	GO	26.02.92	6
3432	The Stellar Minerals Pty Ltd	GO	01.03.92	6
3433	Magnum Gold N.L.	CO	01.03.92	1
3435	Clutha Minerals Ltd	DU	04.03.92	4
3436	Clutha Minerals Ltd	OR	04.03.92	4
3437	Clutha Minerals Ltd	OR	04.03.92	4
3438	Clutha Minerals Ltd	OR	04.03.92	4
3439	Clutha Minerals Ltd	OR	04.03.92	4
3440	Clutha Minerals Ltd	OR	04.03.92	4
3441	Aztec Mining Co. Ltd	WA	08.03.92	1
3442	BHP Gold Mines Ltd	GO	19.03.92	1
3443	Aberfoyle Resources Ltd	AL	19.03.91	1
3444	Aberfoyle Resources Ltd	AL	19.03.91	1
3447	Aberfoyle Resources Ltd	AL	19.03.91	1
3448	Aberfoyle Resources Ltd	AL	19.03.91	1
3449	Aberfoyle Resources Ltd	AL	19.03.91	1
3450	Aberfoyle Resources Ltd	AL	19.03.91	1
3451	Aberfoyle Resources Ltd	AL	19.03.91	1
3452	Aberfoyle Resources Ltd	AL	19.03.91	1
3453	Aberfoyle Resources Ltd	AL	19.03.91	1
3454	Aberfoyle Resources Ltd	AL	19.03.91	1
3455	Aberfoyle Resources Ltd	AL	19.03.91	1
3456	Aberfoyle Resources Ltd	AL	19.03.91	1
3457	Aberfoyle Resources Ltd	AL	19.03.91	1
3458	Aberfoyle Resources Ltd	AL	19.03.91	1
3459	Aberfoyle Resources Ltd	AL	19.03.91	1
3460	Aberfoyle Resources Ltd	AL	19.03.91	1
3461	Peko Exploration Ltd	CO	14.03.92	1
3462	Peko Exploration Ltd	CO	14.03.92	1
3463	Peko Exploration Ltd	CO	14.03.92	1
3464	CRA Exploration Pty Ltd	CO	21.03.92	1
3465	CRA Exploration Pty Ltd	CO	21.03.92	1
3466	CRA Exploration Pty Ltd	CO	21.03.92	1
3467	Minerals Mining and Metallurgy Ltd	BH	21.03.92	1
3468	Climax Mining Ltd	WA	22.03.92	1
3477	Magnum Gold N.L.	CO	01.04.92	1
3478	Magnum Gold N.L.	CO	01.04.92	1
3479	BHP Minerals Ltd	BH	04.04.92	1
3480	BHP Minerals Ltd	BH	04.04.92	1
3481	Aberfoyle Resources Ltd	BH	04.04.92	1
3482	Aberfoyle Resources Ltd	BH	04.04.91	1
3483	Aberfoyle Resources Ltd	BH	04.04.91	1
3484	Aberfoyle Resources Ltd	BH	04.04.91	1
3485	Aberfoyle Resources Ltd	BH	04.04.91	1
3486	Aberfoyle Resources Ltd	BH	04.04.91	1
3487	Aberfoyle Resources Ltd	BH	04.04.91	1
3488	Aberfoyle Resources Ltd	BH	04.04.91	1
3489	Aberfoyle Resources Ltd	BH	04.04.91	1
3490	Aberfoyle Resources Ltd	BH	04.04.91	1
3491	Helix Resources N.L.	CO	09.04.92	1
3492	Peko Exploration Ltd	CO	18.04.91	1
3493	Peko Exploration Ltd	CO	18.04.91	1
3494	Peko Exploration Ltd	CO	18.04.91	1
3495	Peko Exploration Ltd	CO	18.04.91	1
3496	Peko Exploration Ltd	CO	18.04.91	1
3497	Peko Exploration Ltd	CO	18.04.91	1
3498	Paragon Gold Pty ltd	WA	18.04.92	1
3499	Poseidon Exploration Ltd	WA	05.04.92	1
3500	Aberfoyle Resources Ltd	BH	19.04.92	1
3501	Aberfoyle Resources Ltd	BH	19.04.92	1
3502	Aberfoyle Resources Ltd	BH	19.04.91	1
3503	Aberfoyle Resources Ltd	BH	19.04.91	1
3504	Aberfoyle Resources Ltd	BH	19.04.91	1
3505	Aberfoyle Resources ltd	BH	19.04.91	1
3506	Aberfoyle Resources Ltd	BH	19.04.91	1
3507	Platinum Search N.L.	CO	19.04.92	1
3508	Placer Exploration Ltd	CO	22.04.92	1
3509	Placer Exploration Ltd	CO	22.04.92	1
3510	Placer Exploration Ltd	CO	22.04.92	1
3511	Placer Exploration Ltd	CO	22.04.92	1
3512	Placer Exploration Ltd	CO	22.04.92	1
3513	Placer Exploration Ltd	CO	22.04.92	1
3514	BHP Minerals Ltd	BH	23.04.92	1
3515	BHP Minerals Ltd	LM	29.04.92	1
3516	BHP Minerals Ltd	LM	29.04.92	1
3517	Cluff Resources Pacific Ltd	IN	29.04.92	6
3518	Cluff Resources Pacific Ltd	IN	29.04.92	6
3519	Cluff Minerals (Aust.) Pty Ltd	DU	06.05.92	1
3520	Delta Gold N.L.	AR	07.05.92	1
3522	Lynch Mining Ltd	AR	15.05.92	1
3523	Lynch Mining Ltd	AR	15.05.92	1
3524	Renison Ltd	OR	15.05.92	1
3525	Newmont Australia Ltd	WA	15.05.92	1
3526	Newmont Australia Ltd	WA	15.05.92	1
3527	Renison Ltd	CO	15.05.92	1
3528	CRA Exploration Pty Ltd	BH	20.05.92	6
3529	CRA Exploration Pty Ltd	BH	20.05.92	6
3530	CRA Exploration Pty Ltd	BH	20.05.92	6
3531	CRA Exploration Pty Ltd	BH	20.05.92	6
3532	CRA Exploration Pty Ltd	BH	20.05.92	6
3533	CRA Exploration Pty Ltd	BH	20.05.92	6
3534	Aberfoyle Resources Ltd	BH	21.05.91	1
3535	Aberfoyle Resources Ltd	BH	21.05.91	1
3536	Aberfoyle Resources Ltd	BH	21.05.91	1
3537	Aberfoyle Resources Ltd	BH	21.05.91	1
3538	Aberfoyle Resources Ltd	BH	21.05.91	1
3539	Lynch Mining Ltd	NE	17.05.92	1
3540	Talisman Mining & Exploration Pty Ltd	CM	23.05.92	1
3541	Delta Gold N.L.	GO	23.05.92	1
3542	BHP Gold Mines Ltd	OR	21.05.92	1
3543	Peko-Wallsend Operations Ltd	OR	29.05.92	1

EL No.	Holder	Mining Div.*	Expiry+	Grp #
3544	Peko-Wallsend Operations Ltd	OR	29.05.92	1
3545	Aberfoyle Resources Ltd	AL	30.05.91	1
3546	Aberfoyle Resources Ltd	AL	30.05.91	1
3547	Southern Ventures N.L.	AL	30.05.91	1
3548	Southern Ventures N.L.	AL	30.05.91	1
3550	Aberfoyle Resources Ltd	BH	03.06.92	1
3551	Magnum Gold N.L.	OR	03.06.92	1
3552	Magnum Gold N.L.	OR	03.06.92	1
3553	Magnum Gold N.L.	OR	03.06.92	1
3554	Perigrine Mineral Sands N.L.	OR	05.06.92	1
3555	Perigrine Mineral Sands N.L.	BH	05.06.92	1
3556	Perigrine Mineral Sands N.L.	BH	05.09.92	1
3557	Perigrine Mineral Sands N.L.	BH	05.06.92	1
3558	Perigrine Mineral Sands N.L.	BH	05.06.92	1
3559	Perigrine Mineral Sands N.L.	BH	05.06.92	1
3560	Perigrine Mineral Sands N.L.	BH	05.06.92	1
3561	Perigrine Mineral Sands N.L.	BH	05.06.92	1
3562	Perigrine Mineral Sands N.L.	BH	05.06.92	1
3563	CRA Exploration Pty Ltd	CO	02.07.92	1
3564	CRA Exploration Pty Ltd	CO	02.07.92	1
3565	CRA Exploration Pty Ltd	DU	02.07.92	1
3566	Dowmill Pty Ltd	CO	03.07.92	1
3567	BHP Gold Mines Ltd	DU	03.07.92	1
3568	Placer Exploration Ltd	CO	03.07.92	1
3569	Renison Ltd	CO	03.07.92	1
3570	Renison Ltd	CO	03.07.92	1
3571	Homestake Australia Ltd	OR	03.07.92	1
3572	Homestake Australia Ltd	DU	03.07.92	1
3573	Redfire Resources N.L.	LR	04.07.92	7
3574	Redfire Resources N.L.	LR	04.07.92	7
3575	Redfire Resources N.L.	CO	04.07.92	7
3576	Redfire Resources N.L.	CO	04.07.92	7
3577	Redfire Resources N.L.	BH	04.07.92	7
3578	Redfire Resources N.L.	BH	04.07.92	7
3579	CRA Exploration Pty Ltd	OR	03.07.92	1
3580	Cluff Minerals (Aust.) Ltd	DU	05.07.92	1
3581	Lachlan Resources N.L.	DU	08.07.92	1
3582	CRA Exploration Pty Ltd	DU	08.07.92	1
3583	CRA Exploration Pty Ltd	DU	08.07.92	1
3584	Aberfoyle Resources Ltd	AL	09.07.91	1
3585	Aberfoyle Resources Ltd	AL	09.07.91	1
3586	Aberfoyle Resources Ltd	AL	09.07.91	1
3587	Aberfoyle Resources Ltd	AL	09.07.91	1
3588	Aberfoyle Resources Ltd	AL	09.07.91	1
3589	Aberfoyle Resources Ltd	AL	09.07.91	1
3590	Aberfoyle Resources Ltd	AL	09.07.91	1
3591	BHP Gold Mines Ltd	OR	11.07.92	1
3592	BHP Gold Mines Ltd	GO	11.07.92	1
3593	Aberfoyle Resources Ltd	AL	10.07.91	1
3594	BHP Gold Mines Ltd	DU	11.07.92	1
3595	BHP Gold Mines Ltd	DU	11.07.92	1
3596	BHP Gold Mines Ltd	DU	11.07.92	1
3597	BHP Gold Mines Ltd	DU	11.07.92	1
3598	Helix Resources N.L.	OR	06.10.90	2
3599	Brick & Stone Holdings Ltd	OR	11.07.91	4
3600	Brick & Stone Holdings Ltd	OR	11.07.91	4
3601	BHP Gold Mines Ltd	WA	16.07.92	1
3602	Aberfoyle Resources Ltd	AL	16.07.91	1
3603	Aberfoyle Resources Ltd	AL	16.07.91	1
3604	Cluff Resources Pacific Ltd	IN	22.07.92	6
3605	Melocco Pty Ltd	AR	22.07.91	4
3606	CRA Exploration Pty Ltd	OR	22.07.92	1
3607	Clutha Minerals Ltd	CM	23.07.92	4
3608	Clutha Minerals Ltd	CM	23.07.92	4
3609	Clutha Minerals Ltd	NE	23.07.92	2
3610	Clutha Minerals Ltd	NE	23.07.92	2
3611	Clutha Minerals Ltd	NE	23.07.92	2
3612	Clutha Minerals Ltd	NE	23.07.92	2
3613	Clutha Minerals Ltd	NE	23.07.92	2
3614	Clutha Minerals Ltd	WA	23.07.92	4
3615	Clutha Minerals Ltd	WO	23.07.92	2
3616	Goldrim Mining Aust. Ltd	BH	22.07.92	2
3617	BHP Gold Mines Ltd	OR	24.07.92	2
3618	Peko-Wallsend Operations Ltd	OR	30.07.92	1
3619	Peko-Wallsend Operations Ltd	OR	30.07.92	1
3620	Peko-Wallsend Operations Ltd	OR	30.07.92	1
3621	Peko Exploration Ltd	BH	30.07.92	1
3622	Peko Explorlation Ltd	BH	30.07.92	1
3633	BHP Gold Mines Ltd	OR	30.07.92	1
3624	Renison Ltd	OR	30.07.92	1
3625	Renison Ltd	OR	30.07.92	1
3626	Newmont Australia Ltd	OR	30.07.92	1
3627	BHP Gold Mines Ltd	OR	30.07.92	1
3628	BHP Gold Mines Ltd	OR	30.07.92	1
3629	Diamondex N.L.	OR	30.07.92	6
3630	CRA Explorlation Pty Ltd	DU	13.08.92	1
3631	Newmont Australia Ltd	CO	19.08.92	1
3632	CRA Explorlation Pty Ltd	CO	19.08.92	1
3633	Zintoba Pty Ltd	OR	21.08.92	1
3634	CRA Explorlation Ltd	CH	29.08.92	1
3635	CRA Exploration Ltd	CH	29.08.92	1
3636	Australmin Holdings Ltd	CH	29.08.92	1
3637	Compass Resources N.L.	DU	04.09.92	1
3638	CRA Exploration Pty Ltd	AL	06.09.92	1
3639	Pioneer Minerals Aust. Ltd	CM	06.09.92	1
3640	Maymill Pty Ltd	WA	06.09.92	1
3641	Maymill Pty Ltd	WA	06.09.92	1
3642	Maymill Pty Ltd	WA	06.09.92	1
3643	Maymill Pty Ltd	GO	06.09.92	1
3644	Australmin Pacific N.L.	CH	19.09.92	1
3645	Arkland Pty Ltd	AR	24.09.92	2

* AL Albury; AR Armidale; BH Broken Hill; CO Cobar; CH Coffs Harbour; CM Cooma; DU Dubbo; GO Goulburn; IN Inverell; LR Lightning Ridge; LM Lismore; NE Newcastle; OR Orange; SY Sydney; WA Wagga Wagga; WO Wollongong

\# Group 1 - Elemental minerals (metallics); Group 2 - Non-metallics; Group 4 - Hard rock minerals; Group 5 - Clay minerals; Group 6 - Diamond, sapphire; Group 7 - Opal

\+ ELs with passed expiry dates may be either subject to renewal applications or continue by virtue of "flow on" applications

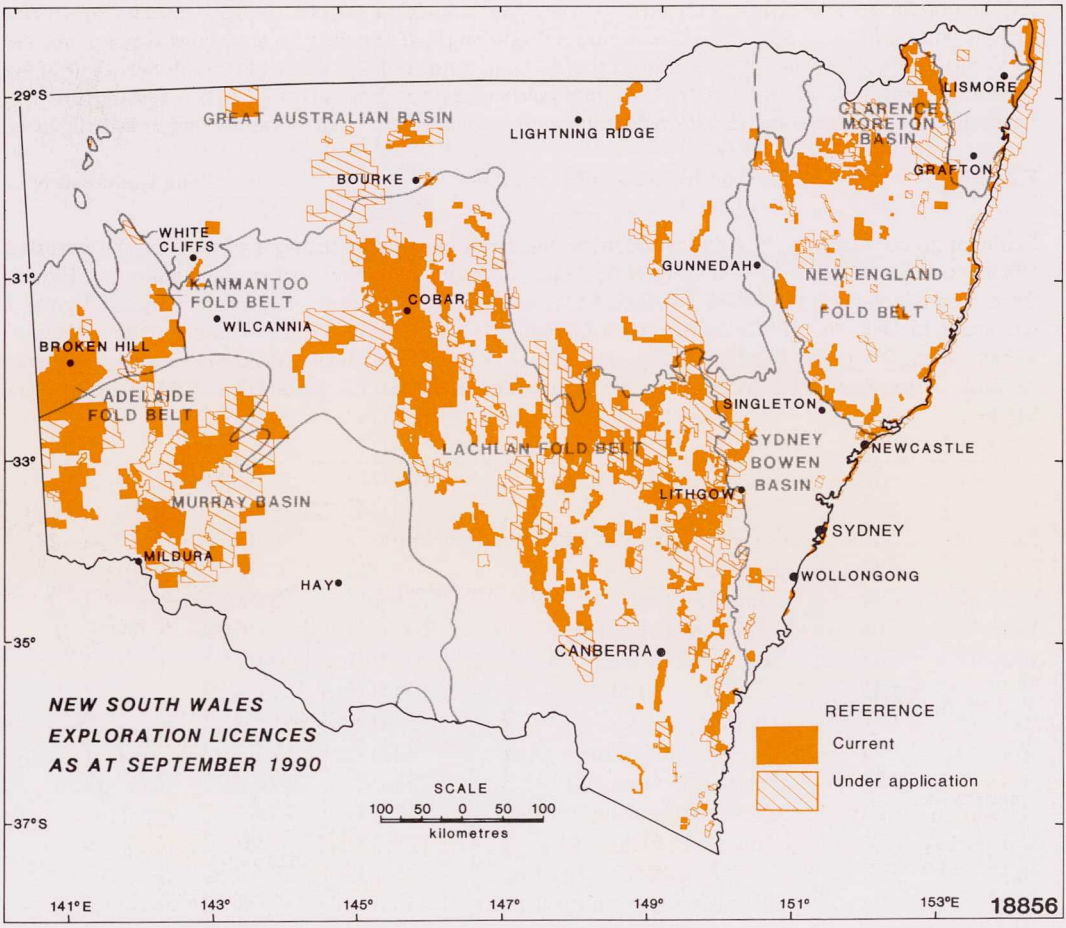
EXPLORATION LICENCES GRANTED JULY - SEPTEMBER 1990

No.	Mining Division*	Holder	Area $	Expiry date	Mineral group#
3563	CO	CRA Exploration Pty Ltd	15.0 U	02.07.92	1
3564	CO	CRA Exploration Pty Ltd	100.0 U	02.07.92	1
3565	DU	CRA Exploration Pty Ltd	56.0 U	02.07.92	1
3566	CO	Dowmill Pty Ltd	32.0 U	03.07.92	1
3567	DU	BHP Gold Mines Ltd	45.0 U	03.07.92	1
3568	CO	Placer Exploration Ltd	100.0 U	03.07.92	1
3569	CO	Renison Ltd	100.0 U	03.07.92	1
3570	CO	Renison Ltd	100.0 U	03.07.92	1
3571	OR	Homestake Australia Ltd	96.0 U	03.07.92	1
3572	DU	Homestake Australia Ltd	96.0 U	03.07.92	1
3573	LM	Redfire Resources N.L.	90.0 U	04.07.92	7
3574	LM	Redfire Resources N.L.	100.0 U	04.07.92	7
3575	CO	Redfire Resources N.L.	100.0 U	04.07.92	7
3576	CO	Redfire Resources N.L.	88.0 U	04.07.92	7
3577	BH	Redfire Resources N.L.	100.0 U	04.07.92	7
3578	BH	Redfire Resources N.L.	100.0 U	04.07.92	7
3579	OR	CRA Exploration Pty Ltd	86.0 U	03.07.92	1
3580	DU	Cluff Minerals (Aust.) Pty Ltd	27.0 U	05.07.92	1
3581	DU	Lachlan Resources N.L.	100.0 U	08.07.92	1
3582	DU	CRA Exploration Pty Ltd	100.0 U	08.07.92	1
3583	DU	CRA Exploration Pty Ltd	94.0 U	08.07.92	1
3584	AL	Aberfoyle Resources Ltd	60.0 U	09.07.91	1
3585	AL	Aberfoyle Resources Ltd	58.0 U	09.07.91	1
3586	AL	Aberfoyle Resources Ltd	72.0 U	09.07.91	1
3587	AL	Aberfoyle Resources Ltd	60.0 U	09.07.91	1
3588	AL	Aberfoyle Resources Ltd	98.0 U	09.07.91	1
3589	AL	Aberfoyle Resources Ltd	56.0 U	09.07.91	1
3590	AL	Aberfoyle Resources Ltd	54.0 U	09.07.91	1
3591	OR	BHP Gold Mines Ltd	100.0 U	11.07.92	1
3592	GO	BHP Gold Mines Ltd	95.0 U	10.07.92	1
3593	AL	Aberfoyle Resources Ltd	100.0 U	10.07.91	1
3594	DU	BHP Gold Mines Ltd	81.0 U	11.07.92	1
3595	DU	BHP Gold Mines Ltd	100.0 U	11.07.92	1
3596	DU	BHP Gold Mines Ltd	80.0 U	11.07.92	1
3597	DU	BHP Gold Mines Ltd	63.0 U	11.07.92	1
3598	OR	Helix Resources N.L.	43.0 U	06.10.90	2
3599	OR	Brick & Stone Holdings Ltd	9.0 U	11.01.91	4
3600	OR	Brick & Stone Holdings Ltd	36.0 U	11.01.91	4
3601	WA	BHP Gold Mines Ltd	68.0 U	16.07.92	1
3602	AL	Aberfoyle Resources Ltd	99.0 U	16.07.91	1
3603	AL	Aberfoyle Resources Ltd	99.0 U	16.07.91	1
3604	IN	Cluff Resources Pacific Ltd	100.0 U	22.07.92	6
3605	AR	Melocco Pty Ltd	7.0 U	22.07.91	4

No.	Mining Division*	Holder	Area $	Expiry date	Mineral group#
3606	OR	CRA Exploration Pty Ltd	91.0 U	22.07.92	1
3607	CM	Clutha Minerals Ltd	17.0 U	23.07.92	4
3608	CM	Clutha Minerals Ltd	31.0 U	23.07.92	4
3609	NE	Clutha Minerals Ltd	91.0 U	23.07.92	2
3610	NE	Clutha Minerals Ltd	90.0 U	23.07.92	2
3611	NE	Clutha Minerals Ltd	92.0 U	23.07.92	2
3612	NE	Clutha Minerals Ltd	100.0 U	23.07.92	2
3613	NE	Clutha Minerals Ltd	76.0 U	23.07.92	2
3614	WA	Clutha Minerals Ltd	72.0 U	23.07.92	4
3615	WO	Clutha Minerals Ltd	38.0 U	23.07.92	4
3616	BH	Goldrim Mining Aust. Ltd	25.0 U	24.07.92	1
3617	OR	BHP Gold Mines Ltd	45.0 U	24.07.92	1
3618	OR	Peko-Wallsend Operations Ltd	100.0 U	30.07.92	1
3619	OR	Peko-Wallsend Operations Ltd	100.0 U	30.07.92	1
3620	OR	Peko-Wallsend Operations Ltd	100.0 U	30.07.92	1
3621	BH	Peko Exploration Ltd	100.0 U	30.07.92	1
3622	BH	Peko Exploration Ltd	100.0 U	30.07.92	1
3623	OR	BHP Gold Mines Ltd	100.0 U	30.07.92	1
3624	OR	Renison Ltd	13.0 U	30.07.92	1
3625	OR	Renison Ltd	11.0 U	30.07.92	1
3626	OR	Newmont Aust. Ltd	100.0 U	30.07.92	1
3627	OR	BHP Gold Mines Ltd	100.0 U	30.07.92	1
3628	OR	BHP Gold Mines Ltd	6.0 U	30.07.92	1
3629	OR	Diamondex N.L.	36.0 U	01.08.92	6
3630	DU	CRA Exploration Pty Ltd	72.0 U	13.08.92	1
3631	CO	Newmont Aust. Ltd	98.0 U	19.08.92	1
3632	CO	CRA Exploration Pty Ltd	50.0 U	19.08.92	1
3633	OR	Zintoba Pty Ltd	20.0 U	21.08.92	1
3634	CH	CRA Exploration Pty Ltd	100.0 U	29.08.92	1
3635	CH	CRA Exploration Pty Ltd	50.0 U	29.08.92	1
3636	CH	Australmin Holdings Ltd	9.0 U	29.08.92	1
3637	DU	Compass Resources N.L.	100.0 U	05.09.92	1
3638	AL	CRA Exploration Pty Ltd	8.0 U	06.09.92	1
3639	CM	Pioneer Minerals Aust. Ltd	71.0 U	06.09.92	1
3640	WA	Maymill Pty Ltd	86.0 U	06.09.92	1
3641	WA	Maymill Pty Ltd	97.0 U	06.09.92	1
3642	WA	Maymill Pty Ltd	30.0 U	06.09.92	1
3643	GO	Maymill Pty Ltd	100.0 U	06.09.92	1
3644	CH	Australmin Pacific N.L.	17.0 U	19.09.92	1
3645	AR	Arkland Pty Ltd	15.0 U	24.09.92	2

* AL Albury
AR Armidale
BH Broken Hill
CO Cobar
CH Coffs Harbour
CM Cooma
GO Goulburn
DU Dubbo
IN Inverell
LM Lismore
NE Newcastle
OR Orange
WO Wollongong
WA Wagga Wagga

#Group 1 - Elemental minerals (metallics)
Group 2 - Non-metallics
Group 4 - Hard rock minerals
Group 6 - Diamond, sapphire, ruby
Group 7 - Opal
$U = Graticular system units



Exploration Licences cancelled/expired July - September 1990

Reports on ELs that have terminated during the quarter and have been placed on open file include the following:

EL 2288 North of Broken Hill BP Australia Gold Pty Ltd

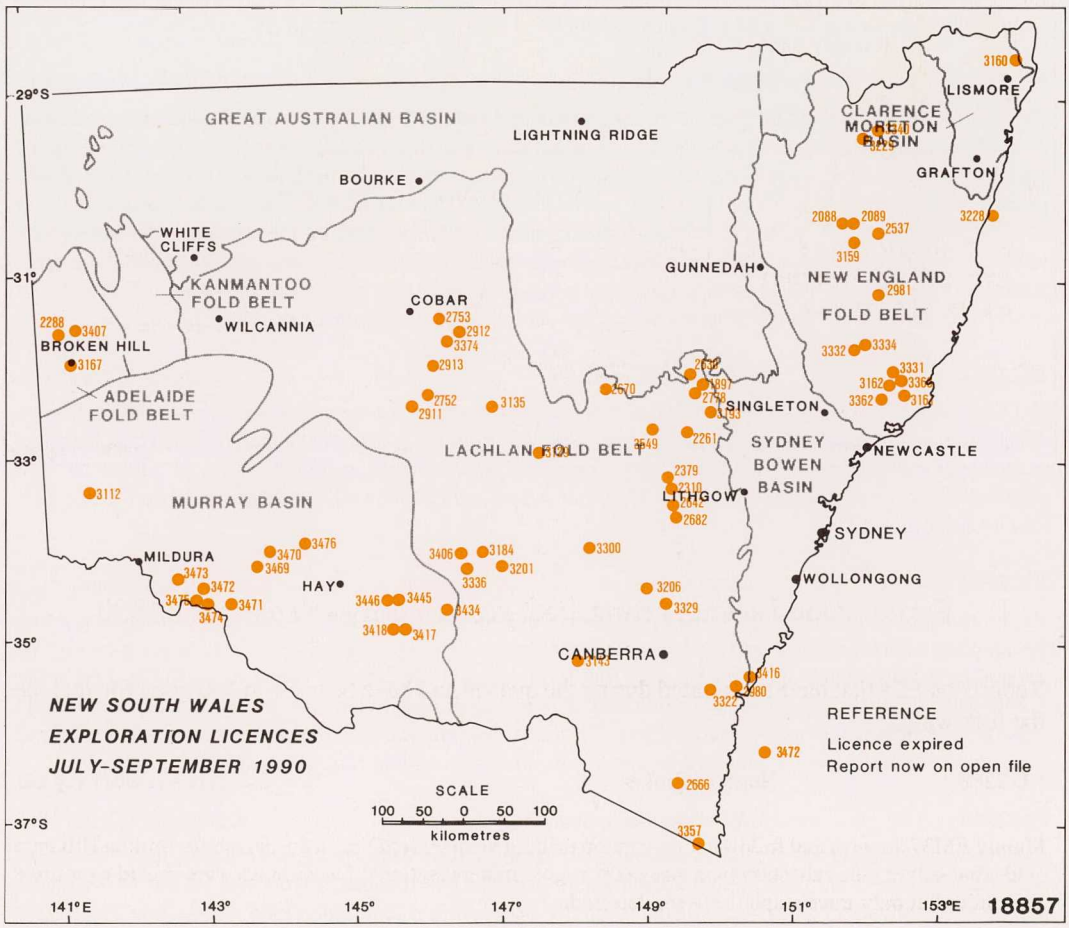
Mainly EM37 surveys and follow-up percussion drilling were undertaken in the search for Broken Hill type lead–zinc–silver mineralisation (and also copper–gold mineralisation). Seven holes were drilled over three anomalies but only trace sulphides were detected.

EL 2642 South of Blayney Browns Creek Gold N.L.

Exploration for gold deposits was undertaken where the Ordovician Angullong Tuff is intruded by several granitic bodies. Small copper deposits occur in the Angullong Tuff near the granite margins. Stream, soil and rock chip geochemical sampling and aeromagnetics were carried out. Drilling under the old workings of the Bluebird copper–gold mine intersected low-grade gold with the best interval being 5 m of 1.4 g/t Au. No new mineralisation was found and all known deposits were considered too small to warrant further investigation.

EL 2670 18 km south-east of Narromine Helix Resources N.L.

Platinum group elements (PGE) were sought within small ultramafic intrusions of the Tantitha Intrusive Complex. These intrusions are petrologically similar to the platiniferous Alaskan type bodies near Fifield. Exploration including geological mapping, rock, stream sediment and soil geochemistry, and ground magnetics located weak PGE anomalies associated with the ultramafic rocks, with maximum values of 77 ppb Pd and 21 ppb Pt. Minor erratic, patchy gold anomalies were located, but no significant targets were defined. The source of the gold in one stream sediment sample containing over 100 gold grains was not located.



EL 2682 South of Blayney CRA Exploration Pty Ltd

This licence was acquired to test for strike extensions of gold mineralisation in jaspers and cherts located in the adjacent EL 2148. Aeromagnetics, mapping and sampling results, mainly in the northern part of the licence, identified three areas of interest but follow-up work did not give encouraging results. The holders cancelled most of the licence, retaining a small area incorporating three prospecting licence applications over the old Trunkey Creek vein-gold workings.

EL 2753 West of Canbelego Epoch Mining N.L.

Gold mineralisation of the Mount Boppy gold mine type was sought, particularly in the Devonian rocks (Cobar Supergroup) of the Meryula [Formation]. Results from rock chip, soil and maghemite pisolite concentrate sampling were generally disappointing. Mineralisation at sites yielding anomalous rock chip results was concluded in all cases to be non-extensive since no associated soil anomalies were detected.

EL 2778 Gulgong Carrington Holdings Pty Ltd

Geochemical sampling on several prospects in part of the Gulgong Gold Field revealed a number of anomalous gold and silver values. However, in the present economic climate they do not warrant further investigation. Anomalies of interest include a 52 ppb Au anomaly from stream sediment sampling around the Gulgong reef workings and a 62 ppb Au anomaly from the Lewis prospect.

EL 2911 South of Cobar Epoch Mining N.L.

Exploration was conducted for gold and base metals in rocks of the Cobar Supergroup. Drilling for extensions of the Mayday gold mineralisation (located on an adjacent EL) into this EL gave intersections in excess of 1 g/t Au, but these do not appear to be associated with any potentially economic lenses. Rotary air blast (RAB) drilling at the Four Mile gold field gave low results and mineralisation here is restricted to quartz veins with no bulk potential. RAB drilling at Seigals shaft intersected a 50 m wide zone of anomalous gold with results to 0.8 g/t, and a more extensive gold and lead anomaly was identified by soil sampling. The potential for this anomaly representing a halo to nearby significant mineralisation has not been adequately tested. Further work is also warranted at the Tango prospect where soil sampling gave anomalous gold to 0.32 g/t.

EL 2912 South-east of Cobar Epoch Mining N.L.

Exploration for Canbelego type gold deposits was focussed near the contact between the Devonian Kopyje Group and the Ordovician Girilambone Group. Drainage bulk leach extractable gold (BLEG) geochemistry to the north and south of the Pipeline Ridge polymetallic prospect (held under other title) gave three samples >250 ppt Au that could deserve follow up. Reconnaissance and soil and rock geochemistry in the licence gave no encouraging results.

EL 2913 South of Cobar Epoch Mining N.L.

Exploration for near-surface gold was undertaken along the Shuttleton line of lode and surrounding areas. Resampling of diamond drill core, soil sampling, rock chip sampling and pisolite stream sampling confirmed anomalies in base metals but detected only low levels of gold. Maximum values of 6.2% Cu, 1.64% Pb, 1.20% Zn and 2 m of 1.02 g/t Au were obtained. Percussion drilling found no significant base metal or gold supergene enrichment in near-surface targets. The only area remaining with potential near-surface gold and base metal mineralisation is the Lyell prospect, with limited sampling returning gold values up to 4 g/t.

EL 2980 North-west of Batemans Bay Greenvale Mining N.L.

Exploration was undertaken for gold and and other metals in the vicinity of known old workings. Results of reconnaissence rock chip sampling focussed attention on the Brimberamalla workings. A ground magnetic survey gave encouraging but inconclusive results. Further work is required to fully test the potential of this area.

EL 2981 South-east of Walcha Derbury Pty Ltd

This licence was acquired to explore for gold deposits, but no work was done because the area of main interest comprises agricultural land and the licence holders were denied access.

ELs 3111(part), 3112 North-north-west of Wentworth Aberfoyle Resources Ltd

These licences are part of a group being explored for heavy mineral sand accumulations in probable strandlines in the Pliocene Parilla Sand of the Murray Basin. Some 192 RAB and one reverse circulation (RC) drill holes were drilled to a target depth of 18 m. Heavy minerals were noted mainly in trace amounts with an estimated maximum content of 0.2%. The area was considered to have little potential for significant deposits of heavy mineral sands.

EL 3129 West of Parkes Lachlan Resources N.L.and Platinum Search N.L.

Exploration for platinum in alluvials emanating from Alaskan type intrusive complexes (predominantly comprising pyroxenite and dunite) that contain hard-rock platinum mineralisation and are located to the north of the licence was undertaken. Access was hampered by wet conditions, and work on alluvials in the adjacent EL 2653, between the source and this licence, detected only narrow zones containing weak mineralisation, thus downgrading the potential within EL 3129.

EL 3135 North-west of Condobolin Cyprus Gold Aust. Corp.

Cyprus explored for Group 1 minerals associated with the Erimeran Granite/Girilambone [Group] contact. Despite low-grade mineralisation shown by trenching and soil sampling, the Rosedale area has potential for improved grades of mineralisation at depth and the granite/Girilambone [Group] contact has potential for further occurrences. The EL was relinquished as a consequence of corporate restructuring.

EL 3143 Adelong area Cyprus Gold Aust. Corporation

The potential for Mount Adrah type gold mineralisation within Ordovician metasediments intruded by multiphase granites was examined. Mapping and stream sediment sampling delineated two anomalous gold zones at Mount Pleasant and Hillview which have not been fully evaluated. However the remainder of the area showed little promise and the licence was surrendered.

EL 3167 Broken Hill CRA Exploration Pty Ltd

The Burke Street lode zone was tested by rock chip sampling which confirmed its prospectivity whilst an EM survey on a nearby drill hole was abandoned due to a stuck probe. Subsequently the zone was determined to be within Mining Leases and further exploration will be conducted under the authority of those leases.

EL 3184 North-north-west of Ardlethan Peko-Wallsend Operations Ltd

Exploration comprised a (BLEG) survey of colluvial deposits. Follow-up rock chip and BLEG sampling of the weak gold anomalies detected failed to confirm their presence. One BLEG sample contained 650 ppt Au but no other sample exceeded 200 ppt. All base metal results were low.

EL 3201 East of Ardlethan CRA Exploration Pty Ltd

Aeromagnetic anomalies and their potential for large-scale precious or base metal deposits were examined. Minor small-scale mineralisation at Kildarey mines was found to be associated with shear systems. A major anomaly in the southern part of the EL was associated with outcropping rhyolite. No significant targets were identified and the EL was relinquished.

EL 3300 Young Norgold Ltd

Burrangong Creek (north of the Young Gold Field) was explored for alluvial gold. Previous exploration by Valley Gold Exploration Pty Ltd (EL1655) was very discouraging and difficulties with landholders led Norgold to relinquish the licence without having done any work.

EL 3322 North-west of Batemans Bay Moruya Gold Mines N.L.

Planned drill testing of old dredged areas and unworked areas of alluvium in the Araluen gold alluvials was not conducted when the holders discovered that mining would not be permitted under the zoning provisions of an Interim Development Order for the Araluen Village.

ELs 3331, 3362, 3363 North of Bulahdelah CRA Exploration Pty Ltd

Reconnaissance stream sediment and bulk cyanide leach sampling were carried out to explore for precious metal mineralisation associated with epithermal alteration in the Alum Mountain Volcanics. Numerous low-order zinc and arsenic anomalies were not considered significant and the program did not identify any areas prospective for gold–silver mineralisation.

EL 3357 South-west of Eden CRA Exploration Pty Ltd

Ordovician metasediments and Devonian sediments and granite and were explored for gold mineralisation. A stream sediment sampling program that included BLEG analyses identified anomalous results (up to 5.9 ppb Au) in the Stony Creek area. Follow-up rock float sampling gave weakly anomalous results and the source of the gold remains unknown.

EL 3407 North of Broken Hill BHP Minerals Ltd

A literature survey was used to assess this area for zinc–lead–silver mineralisation. The area covers Willyama Supergroup unconformably overlain by Adelaidean metasediments. Analysis of previous geophysical surveys of the area indicated that the area has low prospectivity. The title was relinquished after 6 months and without new surveys or field work.

EL 3416 South-east of Ulladulla Clutha Minerals Ltd

The Termeil Essexite was explored for potential black dimension stone quarry sites. The unsuitable patterns of jointing present, including sets of tectonic origin plus a possible giant polygonal cooling joint set, precluded possible sites.

ELs 3469 - 3476 Hay Ausmindex N.L.

These EL's were taken out to follow up single-line aeromagnetic anomalies for possible Elura type base metal mineralisation. Ground magnetic and gravity surveys were undertaken and, although verifying the magnetic anomalies, no massive sulphide mineralisation was detected so the titles were relinquished.

EL 3549 South of Wellington Homestake Aust. Ltd

A literature review downgraded the percieved potential for porphyry and/or skarn gold–copper deposits in this area of intermediate and basaltic volcanics of Ordovician age. The licence was terminated soon after grant.

Other cancelled or expired Exploration Licences

At the time of compilation final reports had not been received for the following licences:

1897, 2088, 2089, 2261, 2310, 2379, 2537, 2630, 2666, 2752, 3159, 3160, 3161, 3162, 3193, 3206, 3228, 3229, 3329, 3332, 3334, 3336, 3340, 3374, 3406, 3417, 3418, 3434, 3445, 3446.

EXPLORATION LICENCES TERMINATED PRIOR TO JULY 1990

Reports on Els that terminated prior to this quarter and have been placed on open file include the following:

EL 2030 South-west of Orange Renison Ltd

A comprehensive exploration program for hydrothermal replacement deposits of gold and base metals (such as those at Cadia and Sheahan–Grants), consisting of mapping, geochemical sampling, aeromagnetics and drilling, found no evidence for major mineralised bodies. However, some exploration potential remains for moderate tonnages of marginal-grade gold mineralisation.

EL 2098 South-east of Bathurst Macapa Pty Ltd

This licence covered several historical gold mines hosted by Silurian sediments and volcanics. Mapping, geochemical sampling and drilling were carried out to explore for a large-tonnage low-grade gold resource amenable to open cut mining. Despite a number of economic-grade intersections on several prospects, drilling failed to locate a significant tonnage of mineable mineralisation.

EL 2162 North-east of Blayney Macapa Pty Ltd

This licence covers Silurian volcanics and sediments on the western margin of the "Hill End Trough" and includes several old mines in the Kings Plains and Newbridge gold fields. Exploration defined several zones of anomalous gold centered predominantly around the Last Chance prospect but these were not fully tested.

EL 2367 North of Cobar Jones Mining Ltd

Preussag Aust Pty Ltd, in joint venture with the holders, drill tested beneath the old workings of the Mount Drysdale gold field and intersected good gold grades (e.g. 9.08 g/t Au over 2 m) in shoots associated with cherty silicification, but found little potential for an open cut resource. CRA Exploration Pty Ltd, also in joint venture, conducted a regional airborne magnetics and radiometrics survey which identified anomalies that may be related to prospective structural features.

EL 2456 South of Bega Union Reefs Gold N.L.

This licence covered the Wolumla Gold Field which produced 669 kg Au and 102 kg Ag and is located at the contact of the Bega Batholith and the Devonian Lochiel Formation. The principal prospect, the Mount Momsen breccia zone, is elliptical in plan and is interpreted as an epithermal system. A tonnage potential of 40 000 t/vm is estimated but the indicated near-surface grades are sub-economic. Other encouraging results from within the area include an alteration zone grading 16.6 g/t Au over 4.8 m at the Pacific mine.

EL 2520 Mittagong Calmin Gold Pty Ltd

Exploration for diamonds and sapphires was undertaken around the historic Mittagong (Southeys) and Kangaloon diamond mines near Mittagong. An airborne magnetic and radiometric survey, bulk stream sediment sampling, and follow-up ground magnetic, radiometric and geochemical surveys in the vicinity of Belmore Crossing and other locations identified a number of areas of volcaniclastic outcrop and subcrop. Although sapphire and accessory minerals were recovered, it is unlikely that a potentially economic deposit is located within the licence area.

EL 2536 Tumut Helix Resources N.L.

Stream sediment and rock chip sampling were carried out to explore for gold and platinum group mineralisation in the Coolac Serpentinite. The exploration produced encouraging gold results but the platinum group potential was downgraded. The best rock chip gold assays were from the area of the Tumut gold/base metals mine where assays up to 13 g/t in a sample of gossan were returned.

EL 2626 Albury BHP Minerals Ltd

Exploration for large gold deposits suitable for open cut mining was focused on old quartz-vein/stockwork/ breccia workings in metasediments. Initial surface sampling gave encouraging results (e.g. 6.93 ppm Au over 5.7 m from a channel sample at the Soudan workings). Alkane Exploration N.L., in joint venture with the holders, drill tested these and the Bungowannah workings but the results were disappointing with the best intersection being an isolated 6 m at 1.97 ppm Au. The close spacial association with pegmatites and the characteristics of the veins suggest that the mineralisation is related to the intrusion of granites.

ELs 2636, 2907 South of Wellington Electrolytic Zinc Co.of Aust. Ltd/Norgold Ltd

These licences were two of ten licences taken out in the area between Orange and Wellington to search for gold in Ordovician volcanics of the Molong Arc. A drainage geochemistry program identified a number of anomalies, five of which were assessed and downgraded. Several anomalous areas, however, remain to be investigated.

EL 2657 North of Nyngan Lachlan Resources N.L.

Ground magnetic surveys were carried out over three aeromagnetic anomalies similar to those associated with ultrabasic rocks containing platinum group metals in the Fifield–Nyngan area further to the south. The surveys indicated the depth to bedrock to be in excess of 110 m and, in view of these likely depths and the limited understanding of the nature of platinum occurrences in this setting, no further work was warranted.

EL 2725 East of Parkes BHP Gold Mines Ltd

Exploration for epithermal style gold mineralization concentrated on north-north-west-trending zone of stream sediment anomalies between Red Hill and Mount Aubrey. Stream sediment sampling, rock chip sampling, soil sampling and mapping detected sporadic gold anomalies but these are unrelated to any areas of significant alteration or mineralisation. Although further work may be warranted at Red Hill and an area further to the south, this "Dulladerry Volcanics Project" area is unlikely to contain a significant gold deposit.

EL 2754 Forbes Epoch Mining N.L.

Extensions or repetitions of the Lachlan line of lode gold mineralisation were sought along the contacts of the Daroobalgie [Volcanics]. Orientation soil geochemistry identified anomalous gold and arsenic in the vicinity of the Forbes abbatoir, confirming potential along this contact, but the licence was relinquished without further work being done.

EL 2821 West of Newcastle Antrim Corporation Pty Ltd

The Permian Singleton [Supergroup] at Doyles Creek contain bentonite, which occurs as calcium montmorillonite seams. Deposits are likely to have formed by subaqueous alteration of ignimbrite tuff in a shallow freshwater coal swamp. Samples from outcrop and three costeans were submitted for various characterisation tests. Clays were found to be suitable for various purposes including civil engineering, foundry sand bonding, animal feed additives and OCMA specification drilling muds. They are unlikely to be suitable for API grade drilling muds. Difficulties in obtaining landholder access to some sites hampered further exploration.

EL 2836 East of Parkes BHP Gold Mines Ltd

As part of the "Dulladerry Volcanics Project", this area was explored for epithermal style gold mineralisation. Follow-up of encouraging stream and soil sample results failed to extend the anomalous area, or to detect an obvious source for it. The possible explanation, that gold from quartz stringers or along lithological contacts has been slightly concentrated within stream sediments, discouraged further exploration.

EL 2848 North of Bathurst Brittania Exploration Pty Ltd

Reconnaissance work to locate and explore the Pliocene and Pleistocene alluvial gravels along the Turon River was undertaken. Fine gold was panned in Culmarah Creek but the rugged terrain deterred further exploration.

EL 2849 Sofala Brittania Exploration Pty Ltd

Exploration for gold in Pliocene and Pleistocene alluvial gravels along tributaries of the Turon River and assessment of old hard-rock gold workings was planned. However, only minor reconnaissance to locate old workings was carried out.

EL 2857 South-west of Orange BHP Minerals Ltd

Exploration for gold focussed on a major north - south structural zone, a splay of which hosts the Bowan Park gold workings. Bulk cyanide leach (BCL) stream geochemistry identified gold anomalies centred on the Bowan Park area. RC drilling at the northern Bowan Park gold workings encountered anomalous gold, the best intersections being 5 m at 0.54 g/t and 4 m at 0.69 g/t. The gold appears to be related to various zones of quartz veining with little potential for a bulk mineable target.

Els 2883, 2884 West of Coffs Harbour Talisman Mining and Exploration Pty Ltd

Landsat image analysis, an airborne geophysical survey, and soil and rock chip geochemistry were used to explore for epithermal and mesothermal gold deposits. The results of the exploration indicated that the mineralisation was confined to small narrow tension and joint-controlled veins.

EL 2910 North of Newcastle Status Minerals N.L.

A limited sampling program was conducted to explore for zeolites in Carboniferous volcanics and tuffaceous sediments. A recorded occurrence at the Eagleton quarry was investigated and reconnaissence sampling was conducted over the rest of the licence. Ten samples were tested for ammonium ion exchange capacity with disappointing results.

EL 2924 South of Tibooburra CRA Exploration Pty Ltd

Aeromagnetic and ground magnetic surveys, geochemical sampling and drilling were undertaken in the search for Tennant Creek type pipe-like aurifeorus quartz–magnetite/haematite bodies (as well as magnetically detectable massive sulphides and mafic/ultramafic intrusions).

Two drill holes on one magnetic anomaly intersected a mafic intrusive breccia with an indicated age of Late Permian/Early Triassic. The rock is of lamprophyric or alkali basaltic affinity and does not show any enrichment in base or precious metals.

EL 2961 South-east of Orange Renison Ltd

Exploration was undertaken for hydrothermal replacement style gold mineralisation (similar to the nearby Cadia and Sheahan - Grants deposits) in Ordovician/Silurian calcareous sediments. BCL drainage sampling was unsuccessful in locating significant gold mineralisation.

ELs 2969 - 2972 North of West Wyalong The Shell Co. of Aust. Ltd

Exploration targets, including Gidginbung type epithermal gold deposits and Cobar type deposits, were sought on a possible northern extension of the Gilmore Suture which appears to have been an important structural influence on a number of gold mineralised systems.

Literature reviews, image processing and reinterpretation of aeromagnetic data of previous explorers indicated that prospectivity was insufficient to justify further exploration in this area of thick alluvial cover.

EL 2985 South of Orange Cyprus Gold Aust. Co.

This area was considered prospective for a variety of styles of structurally controlled gold mineralisation. BCL stream sediment sampling was carried out and results greater than 1 ppb Au were followed up. Geological mapping and further sampling failed to locate any significant mineralisation and elevated BCL values were attributed to accumulations in gravels and clays in the pre-Tertiary surface.

EL 2986 East of Parkes BHP Gold Mines Ltd

Exploration of the [Dulladerry Rhyolite] as part of the "Dulladerry Volcanics Project" was undertaken to locate epithermal style gold mineralisation. Follow-up investigation of stream anomalies involved mapping and stream sediment, rock chip and soil sampling. The highest rock chip gold value was 0.05 ppm. The presence of a significant gold deposit is considered unlikely.

ELs 3074, 3075 Young area Norgold Ltd

Exploration for non-vein gold mineralisation in the Young Granodiorite involved stream sediment geochemistry and BLEG sampling, with follow-up on eight sites. The best results were 460 ppb Au in vein quartz and 14 ppb Au in weathered granite at Blackguard Gully.

EL 3107 East of Bathurst L. McClatchie

Note: this licence replaced the previously granted EL 2623 which was voided.

A drilling and costeaning program over the Mount Conqueror deposit indicated a resource of about 200 000 t of 0.8 g/t Au. The Last Chance mine also has potential to host bulk-style gold mineralisation and warrants further testing, but most of the other known gold deposits appear to have little prospectivity.

A flow-on title application has been lodged over the Mount Conqueror deposit.

EL 3110 Jerangle Resolute Resources Ltd

The rocks of this area comprise Ordovician sediments unconformably overlain by a Silurian sedimentary/acid volcanic sequence and intruded by Devonian/Carboniferous granites. A major northerly trending fault (the Narongo Fault) was postulated as a mineralising channel for ore deposition in the area.

Work was directed towards locating and sampling any gold mineralisation associated with aeromagnetic anomalies reinterpretated from previously flown airborne magnetic data. Disappointing results for gold were obtained and the area was considered to have more potential for base metals.

EL 3141 North-east of Tumut Australmin Holdings Ltd

Exploration for gold and other metallic minerals in Silurian volcanics, intrusives and derived alluvial sediments in the Billapaloola and Wee Jasper areas involved airphoto and Landsat interpretation, and stream sediment and rock chip sampling. Although anomalous gold values were detected (maximum 1.22 ppm), the holder concluded that they were indicative of localised mineralisation and not worthy of further investigation.

EL 3144 East of Tamworth Clutha Minerals Ltd

Geological mapping, stream sediment and rock chip geochemistry, and percussion drilling were carried out to explore for vein style gold and syngenetic stratabound gold–base metal mineralisation in the Ordovician to Devonian Woolomin [Group]. The results of the geochemistry and drilling were disappointing and indicated that the area has little potential for economic precious metal deposits.

ELs 3145, 3146 South-east of Tamworth Clutha Minerals Ltd

Investigation of the Niangala Gold Field for vein-type or stratiform precious metal deposits involved geological mapping and detailed drainage sampling over a number of old occurrences. Percussion drilling at the Starlight and Baalganum prospects was also carried out. Results however were disappointing and the licences were cancelled at the company's request.

EL 3150 20 km south-east of Forbes Brick and Stone Holdings Ltd

This title, located around the "Grandee Black" quarries at Mulyandry, was taken out to explore for dark-grey to black granite dimension stone. Exploration consisted of air photo interpretation and limited field mapping within the Eugowra Granite. The area was relinquished because the areas of greatest interest were already under title or agreement.

EL 3157 West of Cowra BHP Gold Mines Ltd

This licence was one of three taken out to explore the Illunie [Rhyolite] for epithermal style gold mineralisation. The results from a stream and soil sampling program gave little encouragement for the discovery of gold mineralisation.

ELs 3169, 3171, 3179, 3180, 3182, 3183 North of Wentworth Aberfoyle Resources Ltd

These licences belong to a series taken out to investigate the potential of Pliocene sands in the Murray Basin for heavy minerals. A total of 4903 m of RAB drilling to a maximum depth of 18 m investigated a series of arcuate ridges interpreted as palaeoshorelines. Many of the holes intersected sands and clays of the younger Woorinen Formation and Blanchetown Clay but failed to intersect the target Loxton–Parilla Sand. Where the Loxton–Parilla Sand was intersected, mainly trace amounts of heavy minerals were detected, the maximum being 0.6%.

EL 3208 North-west of Yass Renison Ltd

Exploration for structurally controlled gold mineralisation within Silurian–Devonian volcanics involved regional geological mapping and rock chip sampling, auger drilling, BCL stream sediment sampling and detailed geological mapping. The Spion Kop and Victory mines were sampled and mapped. Follow-up sampling did not give improved grades so futher work was not warranted.

EL 3211 South-west of Forbes BHP Gold Mines Ltd

Exploration was for epithermal style gold deposits, possibly associated with the hydrothermal alteration evident at West Currowong Hill and Porters Mountain. Drainage sampling for gold was carried out, as well as detailed mapping of the Currowong Hills area. No gold anomalies were detected.

EL 3227 Offshore of Bermagui Archdall Investments Pty Ltd

Exploration was planned for offshore gold deposits. Gold occurs in the hinderland and along the beaches. The probable source of this beach gold is Tertiary river gravels overlying Ordovician basement. No exploration was conducted due to a fall in the gold price and various technical problems.

EL 3431 West of Gundagai CRA Exploration Pty Ltd

Geological mapping was conducted to explore for strike extensions of gold mineralisation at the Long Tunnel mine in the Silurian Frampton Volcanics, the Long Tunnel Metabasic Igneous Complex and ultramafic rocks. Geological mapping demonstrated that the serpentinite bodies in EL 3431 were smaller than expected and therefore the potential of the EL has been downgraded.

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COAL

MINING UNDER GAS PIPELINES IN NEW SOUTH WALES

Underground coal mining, including longwall mining, has been successfully undertaken in New South Wales under long-distance pipelines carrying natural gas under pressures up to 6 MPa. The locations of examples discussed are shown in figure 14.

PIPELINE SPECIFICATIONS

The pipelines are of welded steel construction with yield strength of 450 MPa and of diameters up to 860 mm. The pipe wall thickness varies between 5.3 mm and 13.3 mm. The pipes have a thick bitumen wrapping on the outside to reduce the interface friction with the soil.

Long-distance pipelines have higher axial strength, due to the larger diameter, and lower friction, resulting from the bitumen covering, than the smaller diameter pipes used in urban reticulation systems. It appears that long-distance pipes are less vulnerable to damage than the pipes in urban systems.

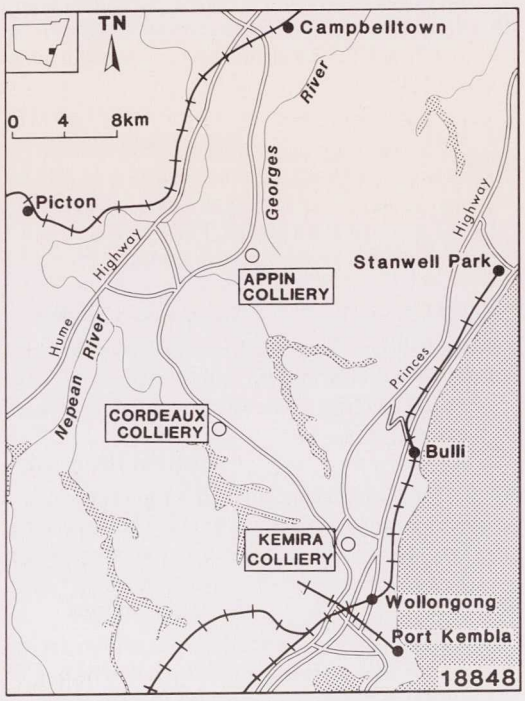

Figure 14. Location diagram, examples of mining under gas pipelines

PROCEDURE FOR MINING

Over the years, good rapport between the Department of Minerals and Energy and the Australian Gas Light Co. (AGL), the pipeline operators, has lead to the formulation of procedure guidelines for mining under natural gas pipelines. The following steps are generally involved:

* For a proposal to mine under a pipeline, subsidence predictions are provided to AGL which undertakes a theoretical investigation into pipe safety. Appropriate precautionary measures are taken in cases where the calculated stresses are above the allowable design limit. In addition, if stresses are excessive, consideration is given to designing a mining layout to limit the ground disturbance.
* During mining, surveying for levels and ground strains is undertaken along the pipeline and data provided to AGL for reviewing their analysis.
* AGL may also undertake certain field measurements of pipe strains to verify their design assumptions.

SOME CASE HISTORIES

Examples of past mining under gas pipelines are shown in table 2.

TABLE 2

LONGWALL MINING UNDER GAS PIPELINES

	Appin Colliery	Cordeaux Colliery	Kemira Colliery
Pipe diameter	864 mm	508 mm	508 mm
Wall thickness	9.2 - 13.3 mm	5.3 mm	5.9 mm
Depth of mining	500 m	440 m	120 m
Maximum subsidence	700 mm	750 mm	950 mm

In the above cases, at Appin and Cordeaux Collieries, AGL monitored pipe strains and undertook computer analysis of pipe stresses, but did not consider it necessary to expose the pipeline to relieve pipe stresses. At Kemira Colliery, however, AGL considered that the level of ground disturbance was very high and decided to build and operate a by-pass line approximately 1.5 km in length, and also to expose the existing pipeline during mining to prevent it being damaged. These precautionary measures were considered necessary because the pipeline supplied gas to The Broken Hill Proprietary Company Ltd's steel works at Port Kembla and to the residents of the South Coast, including Wollongong. Any disruption to supply was considered unacceptable economically, socially and politically.

The by-pass was built by the side of the main pipeline and was put into operation as the mining face approached the main pipeline. In addition, the main pipeline was exposed because AGL thought that the monitored pipe strains were approaching the design strains. Surface subsidence monitoring along the pipeline was disrupted and could not be continued as many monitoring pegs were disturbed while exposing the pipeline.

The cost of building the by-pass, exposing the pipeline, monitoring the pipe strain by strain gauges and all related costs were borne by the Mine Subsidence Board. The survey work was carried out by the Kemira Colliery surveyors.

No damage was reported either to the main pipeline or to the by-pass, and the gas supply was not interrupted during mining. The main pipeline is expected to be pressure-tested before it is recommissioned.

LESSONS FOR THE FUTURE

The experience of mining under gas pipelines indicates that mining under deeper covers does not pose any significant problem to the serviceability of the pipeline. When cover depths are shallow and the level of ground disturbance is high, precautionary measures may be required to ensure the continued supply of gas. In such cases, and before a decision on mining is made, the cost of precautionary measures may need to be related to the value of coal which would otherwise have been sterilised. Both AGL and the Department have gained valuable experience in yet another area of potential land use conflict.

For further information please contact Dr Lax Holla, Principal Subsidence Engineer, on (02) 9018593.

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NORTHERN COALFIELDS STRATEGIC STUDY

The **Northern Coalfields Strategic Study Working Party** was commissioned in late 1989 by the Coal Resources Development Committee to prepare an integrated coal development strategy for the Newcastle, Hunter, Gunnedah and Ulan Coalfields.

The Working Party comprises representatives from the

* Department of Minerals and Energy
* Association of Coal Related Councils
* Combined Mining Unions
* Electricity Commission of New South Wales
* Joint Coal Board
* Newcastle Coal Export Review Committee
* New South Wales Coal Association
* Maritime Services Board
* Department of Planning
* Roads and Traffic Authority
* State Rail Authority
* Department of Transport

The Working Party has addressed coal production and markets (both current and future), mining technology and employment, transport, ports, land use planning, community impacts, and environment issues. An assessment of the future needs of the industry has been undertaken in light of the forecasts and deliberations so that a planned approach, including a coal transport strategy, can be made to mining developments in the region.

The Working Party identified the concerns of local communities and will make recommendations to Government, Local Councils and industry that will enable all the bodies involved to plan well ahead for coal developments. A draft report was considered by the CRDC at a meeting on 20 September. The final version of the report will be available in December 1990.

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HUNTER REGION OVERVIEW— YEAR ENDED JUNE 1990

The New South Wales "Hunter Region" embraces the Hunter and much of the Newcastle Coalfields.

COAL PRODUCTION AND EXPORTS

Production and export figures for the region are shown on table 3. The 1989-90 figures are preliminary.

Raw coal production climbed 15% to record levels in New South Wales overall last year. Hunter Coalfield open cut and Newcastle Coalfield underground production rose 27% and 14% respectively. Productivity also significantly improved. The production level increases were a response to improved profitability in the industry.

Exports through Newcastle Port were however only slightly up (3.6%) on last year at 30.2 million tonnes.

Demand for thermal coal eased slightly in Korea and Taiwan compared with the previous year and stockpiles accumulated to about 8 million tonnes by year's end. A disappointing feature was the slight decline in thermal coal exports.

The ratio of coking to thermal coal exports again increased slightly to 1:1.54.

NEW COAL LEASES

During the year the following major coal leases were granted: Coal Lease 352 (Bloomfield Collieries Pty Ltd, Rixs Creek Colliery), Coal Lease 357 (Camberwell Coal Pty Ltd, Camberwell Colliery), Coal Lease 358 (Glendell Coal Ltd, Glendell Project) and

Coal Lease 340 (Electricity Commission of New South Wales, Mount Arthur Project).

The following minor coal leases were granted: 359 and 360 (Hunter Valley No. 1), 353 (Bloomfield), 355 and 356 (FAI Mining, Westside) and 346-351 (FAI Mining, West Wallsend).

NEW DEVELOPMENTS

During the year development commenced at three new mines: Rixs Creek, Camberwell and Hunter Valley No. 2 (to be combined with Hunter Valley No. 1 and called Hunter Valley mine). The Howick Southern Extension proposal obtained development consent.

COAL MINING PROPOSALS

Development applications were submitted in the latter part of the year for the Mitchells Flat (Barix Pty Ltd) and Bulga (Newcastle Wallsend Coal Co. Pty Ltd) Projects.

During the 1990-1991 year it is anticipated that development applications will be submitted for the Dartbrook, Narama, Glennies Creek, Mount Owen and Wambo West Projects.

TABLE 3
COAL PRODUCTION AND EXPORT STATISTICS, HUNTER REGION
1987-88 - 1989-90*

RAW COAL PRODUCTION ('000 tonnes)

	All mines	Open cut	Underground	Longwall
		New South Wales		
1987-88	76 336	32 012	44 324	17 552
1988-89	81 101	35 520	45 581	19 295
1989-90(p)	93 814	42 776	51 038	22 365
Variation 88-89 to 89-90	+15.6%	+20.4%	+10.7%	+15.9%
		Hunter Coalfield		
1987-88	29 921	25 821	4 100	1 307
1988-89	31 634	28 235	3 399	625
1989-90(p)	39 755	36 009	3 746	388
Variation	+25.6%	+27.5%	+10.2%	-37.9%
		Newcastle Coalfield		
1987-88	17 373	1 301	16 072	5 326
1988-89	17 662	1 373	16 289	5 787
1989-90(p)	20 199	1 634	18 565	7 017
Variation	+14.3%	+19%	+14%	+21.2%

EXPORTS - NEWCASTLE PORT ('000 tonnes)

	Total	Coking	Thermal
1987-88	30 097	10 071	20 026
1988-89	29 156	10 673	18 483
1989-90(p)	30 196	11 875	18 321
Variation	+3.6%	+11.2%	-0.1%

EMPLOYMENT

	Hunter and Gunnedah Coalfields	Newcastle Coalfield	New South Wales
June 1989	5 566	5 022	17 129
June 1990(p)	5 917	4 954	17 309
Variation	+6.3%	-0.1%	+1.0%

*Figures supplied by the Joint Coal Board. Figures for 1989-90 are preliminary.

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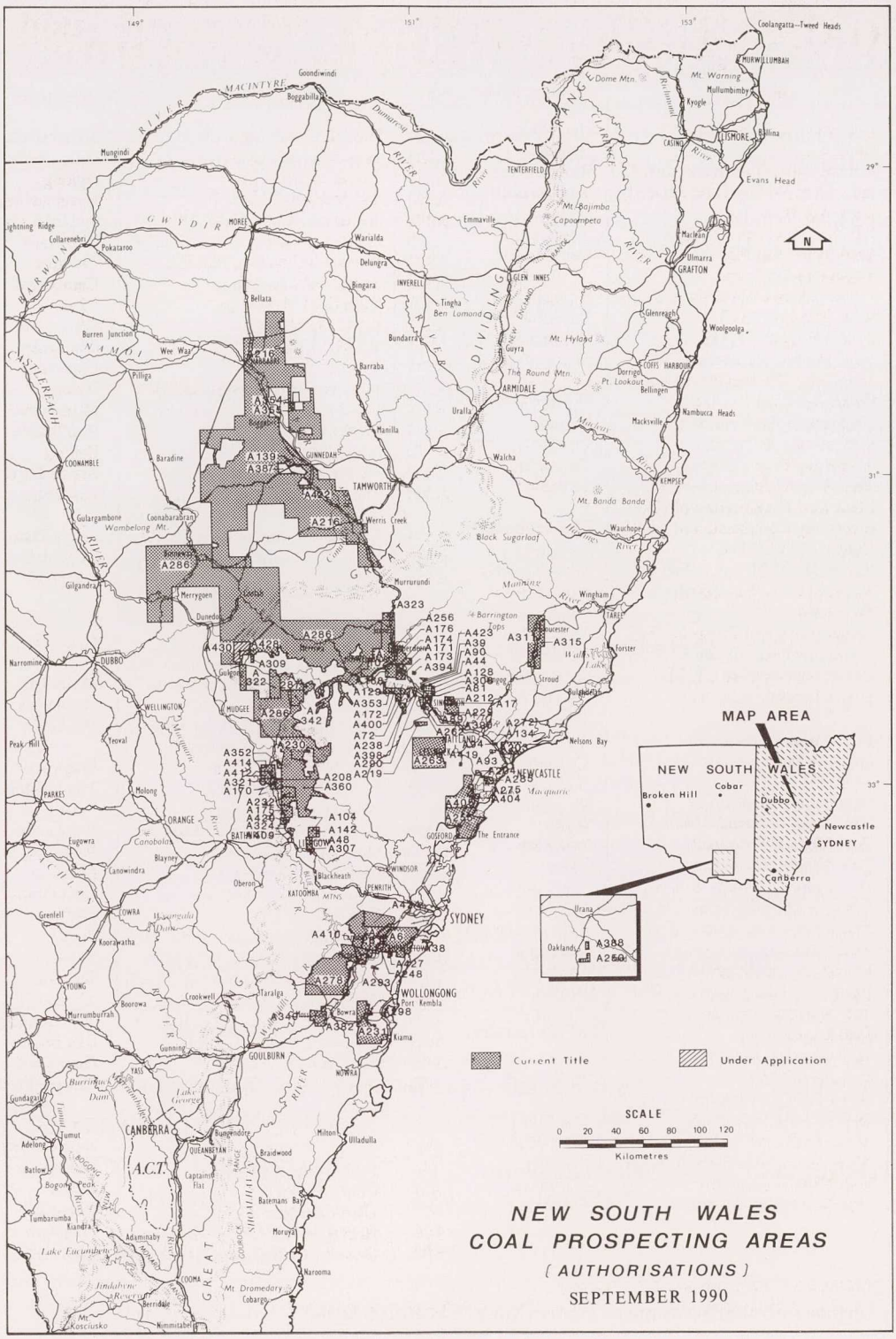
COAL AUTHORISATIONS SEPTEMBER 1990

No.	Holders	Nearest town
A6	Dep. Mineral Resources	Campbelltown
A17	Barix P/L	Singleton
A39	Consolidated Goldfields Aust. Ltd	Ravensworth
A44	Australian Mining Investments Ltd	Camberwell
A48	Austen & Butta Ltd	Lithgow
A72	BP Coal Development Aust.	Jerrys Plains
A81	Southland Coal P/L Toyota Tsyho Corp.	Camberwell
A90	Consolidated Goldfields Aust. Ltd	Ravensworth
A93	R.W. Miller & Co. P/L	Beresfield
A94	R.W. Miller & Co. P/L	Beresfield
A102	Dep. Mineral Resources	Muswellbrook
A104	Electricity Commission of NSW	Lithgow
A128	Gunnedah Coal Co. Ltd	Camberwell
A129	Carpentaria Exploration Co. P/L	Denman
A134	R.W. Miller & Co. P/L	Beresfield
A139	Gunnedah Coal Co. Ltd	Gunnedah
A142	Electricity Commission of NSW	Lithgow
A149	Electricity Commission of NSW	*
A168	Electricity Commission of NSW	Muswellbrook
A170	Genders Mining P/L	Capertee
A171	Bayswater Colliery Co. P/L	Muswellbrook
A172	Bayswater Colliery Co. P/L	Jerrys Plains
A173	Thiess Bros. P/L	Muswellbrook
A174	Mount Sugarloaf Collieries P/L	Muswellbrook
A175	Electricity Commission of NSW	Ben Bullen
A176	Muswellbrook Coal Co. Ltd	Muswellbrook
A203	Dep. Mineral Resources	Raymond Terrace
A204	Dep. Mineral Resources	Toronto
A208	Genders Mining P/L	Capertee
A212	Barix P/L	Singleton
A216	Dep. Mineral Resources	Gunnedah
A219	Newcastle Wallsend Coal Co.	Bulga
A229	Dep. Mineral Resources	Singleton
A230	Dep. Mineral Resources	Rylstone
A231	Electricity Commission of NSW	Robertson
A232	Western Main Collieries P/L	Capertee
A238	Electricity Commission of NSW	Ravensworth
A248	Australian Iron & Steel P/L	Menangle
A250	Mitsubishi Development P/L	Oaklands
A255	Electricity Commission of NSW	Wyong
A256	The Bellambi Coal Co. Ltd	Aberdeen
A261	Esso Exploration & Production Aust. Inc.	*
A262	Esso Exploration & Production Aust. Inc.	Warkworth
A263	Dep. Mineral Resources	Wollombi
A272	R.W. Miller & Co. N.L.	Beresfield
A275	Electricity Commission of NSW	Toronto
A278	Dep. Mineral Resources	Mittagong
A281	Dep. Mineral Resources	Camden
A285	Dep. Mineral Resources	Toronto
A286	Dep. Mineral Resources	Gulgong
A287	Austen & Butta Ltd	Bylong
A290	The Nardell Colliery P/L	Ravensworth
A293	Australian Iron & Steel P/L	Appin
A298	Electricity Commission of NSW	Robertson
A307	Hartley Valley Coal Co. P/L	Lithgow
A308	Southland Coal P/L	Camberwell
A309	Ulan Coal Mines Ltd	Ulan
A311	B.M.I. Mining P/L	Gloucester
A315	B.M.I. Mining P/L	Gloucester
A321	Genders Mining P/L	Capertee
A322	Electricity Commission of NSW	Bylong
A323	Electricity Commission of NSW	Murrurundi
A324	Clutha Coal P/L	Ben Bullen
A342	Austen & Butta Ltd	Bylong
A349	Austen & Butta Ltd	Sutton Forest
A352	The Kandos Coomber Mining Co. P/L	Clandulla
A353	Carpentaria Exploration Co. P/L	Jerrys Plains
A354	Coal Cliff Collieries P/L	Boggabri
A355	BHP Minerals Ltd Agip Coal Australia P/L Idemitsu Boggabri Coal P/L	Boggabri
A360	Dep. Mineral Resources	Rylstone
A373	Wambo Mining Corporation P/L	*
A382	Southern Portland Cement P/L	Moss Vale
A387	Gunnedah Coal Co. Ltd	Gunnedah
A388	The Coal Cliff Collieries P/L Mitsubishi Development P/L	Oaklands
A390	Dep. Mineral Resources	Singleton
A394	BP Coal Development Australia P/L	Muswellbrook
A398	Wambo Mining Corporation P/L	Warkworth
A400	Dep. Mineral Resources	Jerrys Plains
A404	Newcom Collieries P/L	Morisset
A405	Dep. Mineral Resources	Cooranbong
A409	Clutha Coal P/L	Wallerawang
A410	B.P. Coal Development Pty Ltd	Picton
A412	Genders Mining P/L	Ilford
A414	Kandos Coomber Mining Co. P/L	Kandos
A419	Newcastle Wallsend Coal Co. P/L	Cessnock
A423	Hunter Valley Coal Corporation	Ravensworth
A420	Clutha Coal P/L	Ben Bullen
A422	Preston Coal Co. P/L	Gunnedah
A424	Department of Minerals & Energy	Campbelltown

AUTHORISATION APPLICATIONS

No.	Applicant	Nearest town
38	Bulli Main Colliery P/L	Heathcote
427	Coalcliff Collieries P/L	Appin
428	Ulan Coal Mines Ltd	Gulgong
429	Hunter Valley Coal Corp.	Singleton
430	Department of Minerals & Energy	Ulan

Note: Section 21A Authorisations are not listed.
* Section 20 Authorisations over colliery holdings (not shown in diagram)



Minfo 30, 1991

CHANGES TO COAL MINE OWNERSHIP

The ownership of New South Wales coal mines continues to undergo change as part of the rationalisation brought about by a period of financial losses, although the rate of change has slowed. Table 4 lists the more important changes to ownership of coal mines since 30 June 1990. Table 5 lists some of the corporate restructing which has occured in the same period. Both tables are correct as at 30 September 1990.

TABLE 4
RECENT CHANGES TO
COAL MINE OWNERSHIP IN NEW SOUTH WALES

Colliery/ Project name	Previous interest		New interest	
Denman Project	MIM Holdings Ltd	100%	MIM Holdings Ltd	50%
			Agipcoal Australia P/L	50%
United Collieries	Agipcoal Australia P/L	30%	Agipcoal Australia P/L	50%
	United Mineworkers Federation	50%	United Mineworkers Federation	50%
	Exxon Coal Australia Ltd	20%		
Wambo Mine	Sumitomo Coal Mining Co. Ltd	60%	Sumitomo Coal Mining Co. Ltd	75%
	GIO of NSW	13.3%	GIO of NSW	12.5%
	Total Australia Ltd	13.3%	Total Australia Ltd	12.5%
	Charbonnage de France Internationl	13.3%		

TABLE 5
RECENT CHANGES TO COAL COMPANY OWNERSHIP
IN NEW SOUTH WALES

Company	Old ownership		New ownership	
Coal & Allied Industries Ltd	Howard Smith Ltd	42.5%	Ube Industries Ltd	10%,
			Nissho Iwai Corp.	7.3%
Oakbridge Ltd	Elders Resources NZFP Ltd	73%	McIlwraith McEachern Ltd, Tomen Corp., Nippon Oil (Aust.) Ltd	97%

For further information contact Denis Casey, Executive Officer (Coal), on (02) 901 8511

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PETROLEUM

CSIRO RESEARCH INTO COALBED METHANE*

Methane locked in the black coal seams of Australia's coal basins is a potentially enormous resource, conservatively estimated at several times greater than the current reserves for conventional natural gas. The commercial advantages offered by coalbed methane as an energy resource include relatively low "finding cost" and convenient location close to major markets (compared with most major conventional gas reserves in Australia) .

Apart from commercial issues, the significant environmental advantages of burning gas (particularly methane) instead of other fossil fuels such as coal and oil are sufficient in their own right to warrant research into coalbed methane. The relatively lower yield of carbon dioxide per unit of energy produced when burning methane compared with oil and coal would help reduce the impact of the greenhouse effect if substantial fuel substitution can be achieved. Coalbed methane could be a long-term replacement for Australia's dwindling reserves of oil, particularly for transport fuels.

The Commonwealth Scientific and Industrial Research Organisation (CSIRO) has expanded its research program into coalbed methane. The objective of this research is to foster the development of coalbed methane as an environmentally sensitive and economically viable alternative energy source.

An integrated series of projects has been set up to investigate major technical issues facing the coalbed methane industry in Australia.

The objectives of the **Coalbed Methane Geology** project are to:

* identify the geological conditions characterising regions of better than average methane production potential; and
* identify the geological conditions likely to be most conducive to methane production stimulation techniques.

The aim of the **Multi-phase Flow** project is to improve understanding of the mechanics governing the dual flow of water and gas in coal. Reservoir modelling for predicting coalbed methane production and evaluating potential will be refined and the best dewatering strategies will be determined.

The aim of the **Well Testing** project is to develop and demonstrate well testing techniques for evaluating coalbed methane prospects. Two techniques are being investigated:

* a wireline handling system, designed to work in exploration drilling and to make rapid and cost effective deployment of down-hole well testing tools possible; and
* a group of well testing tools that will allow down-hole measurement of the absolute and relative permeability (water versus gas) of coal under reservoir conditions.

The aim of the **Hydraulic Fracture Stimulation** project is to refine the application of hydraulic fracture stimulation to overcome the problems inherent with hydraulic fracturing in Australia's coal basins.

Finally, there is a **Case Studies** project which aims to demonstrate the commercial viability of coalbed methane technology in Australia, including new developments pioneered in the other projects under the coalbed methane research program.

For further information contact Jim Enever, Program Manager, or Lincoln Paterson, Principal Research Scientist, CSIRO, PO Box 54, Mount Waverley, Victoria, 3149, phone (03) 881 1355.

*Article supplied by the Commonwealth Scientific and Industrial Research Organisation

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PETROLEUM EXPLORATION LICENCES SEPTEMBER 1990

PETROLEUM EXPLORATION LICENCES

No.	Holder	Area (km²)*	Expiry date
PEL 182	Gel Oil P/L, Oil Co. of Australia N.L., Ampol Exploration Ltd, Tennscourt Oil P/L, Winton Oil N.L., Poseidon Oil P/L	9 700	14. 3.1991
PEL 238	Consolidated Peroleum (Aust.) N.L., The Australian Gas Light Co.	9 900	31.8.1991
PEL 239	"	3 072	31.8.1991
PEL 246	Comserv (No. 779) P/L	9 550	14.11.1990
PEL 247	"	9 550	14.11.1990
PEL 250	"	9 660	14.11.1990
PEL 251	"	10 000	14.11.1990
PEL 253	"	9 450	14.11.1990
PEL 254	"	10 000	14.11.1990
PEL 255	The Australian Gas Light Co. Sydney Ltd	3 710	8. 3. 1991
PEL 258	Endeavour Resources Ltd, Claremont Petroleum N.L., Basco Energy Inc., Charterhall Oil Aust. P/L	2 950	6. 1. 1991
PEL 259	The Australian Gas Light Co. Consolidated Petroleum (Aust.) N.L.	8 297	6. 1. 1991
PEL 260	The Australian Gas Light Co. Sydney Ltd	7 660	8. 3. 1991
PEL 267	Sydney Oil Co. (N.S.W.) P/L, Manvane P/L, Base Resources Ltd, Seahawk Oil Aust. N.L., Reading and Bates Petroleum Co.	7 000	19. 1. 1991
PEL 276	Petroleum Resources Pty Ltd	1 350	16. 4. 1991
PEL 277	Western Gulf Oil & Mining Ltd	10 000	14.11.1991
PEL 278	The Electricity Commission of NSW	9 900	17. 4.1991
PEL 279	The Electricity Commission of NSW	2 300	17. 4.1991
PEL 280	Tasman Gas Pty Ltd	9975	16. 6.1992

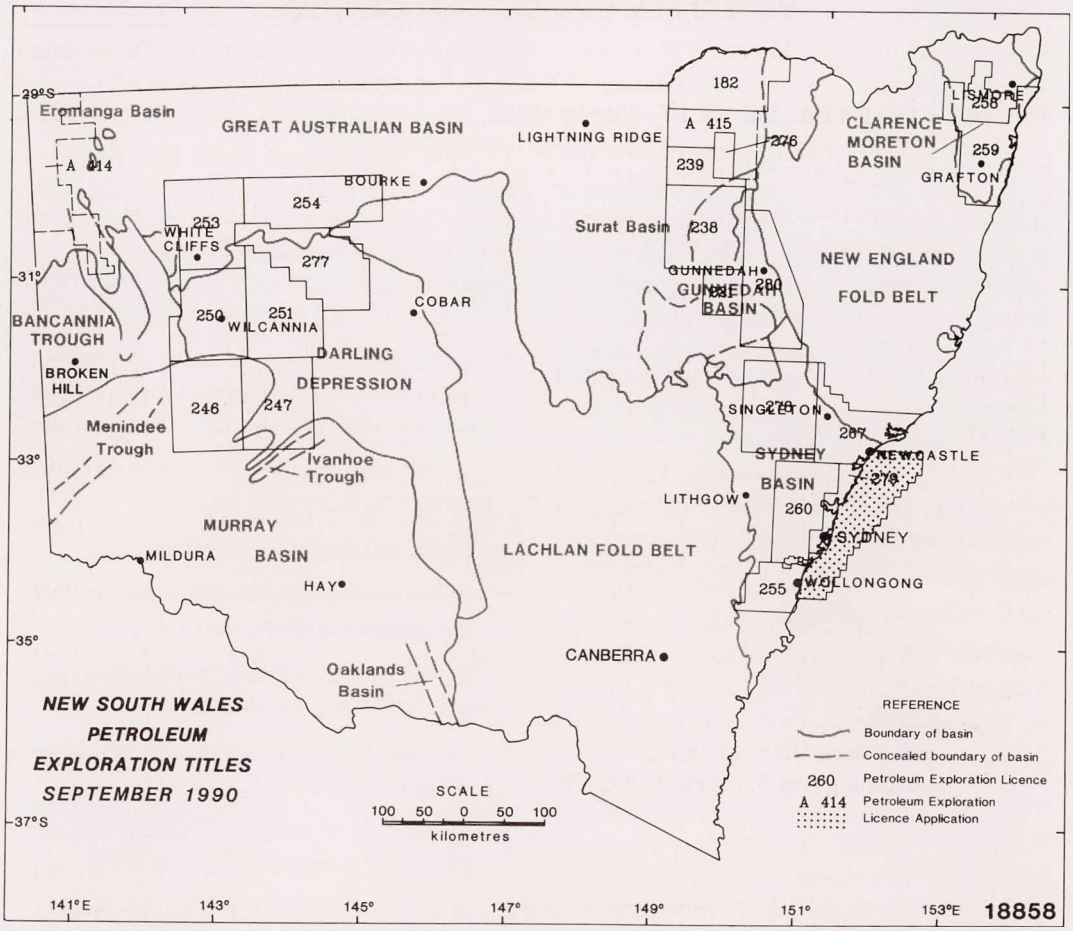
PETROLEUM EXPLORATION LICENCE APPLICATIONS

No.	Applicant	Area (km²)*	Application date
PELA 414	Cluff Resources Pacific Ltd	10 000	6. 8.1987
PELA 415	Beach Petroleum N.L.	7 012	26. 8.1987

* Total area, i.e. area available plus exclusions where relevant

PETROLEUM EXPLORATION PERMITS

No.	Holder	Area	Expiry date
P10	Santos Ltd, Ampol Exploration Ltd	148 graticular blocks	25.1.1995



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PETROLEUM EXPLORATION UPDATE

AGL Petroleum recorded the Bringelly seismic survey in PELs 255 and 260. The survey consists of 90 km of 60-fold vibroseis data which were recorded between 16 July and 6 August, and 32 km of 12-fold dynamite data which were recorded between the 23 August and 3 September 1990.

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GENERAL

MINERALS PROCESSING TASK FORCE REPORT RELEASED

The report of the **Task Force on Minerals Processing Development Strategies** was finalised in July 1990 and presented to a meeting of Heads of Departments and a meeting of relevant Government Ministers, prior to its public release in September 1990.

The Task Force was established by the Minister for Minerals and Energy to develop a strategic plan to increase the level of minerals processing in New South Wales (see *Minfo* 27, p. 29). Industry-based task forces are being convened to prepare appropriate development strategies for 14 other industry sectors, which, together with minerals processing, have been identified as having the greatest potential for increasing the State's economic growth.

The report identifies what the Task Force consider to be commodities with the best opportunities for developing further minerals processing in New South Wales. These are:

(a) **Existing Industries**

* steel
* aluminium
* refractories
* zinc
* lead
* copper
* coke
* dimension stone
* gemstones

(b) **New Opportunities**

* titanium metal
* titanium dioxide pigment
* rare earths
* silicon metal
* fused silica
* advanced ceramic materials
* mullite (and other high grade refractories)
* magnesium

The Task Force's report recommends a number of strategies to improve New South Wales' competitive position. These strategies will encourage expansion of existing minerals processing and attract major new developments. The recommended strategies involve:

* a competitive and constant government environment which will encourage, promote and defend responsible minerals processing;
* an efficient administrative process to rapidly process development approvals;
* access to competitively priced energy;
* government taxes and charges that encourage, not deter, minerals processing;
* access to cost-efficient transport systems, port facilities and other infrastructure;
* achievable environmental standards and pollution controls;
* availability of sufficient mineral resources to sustain industry in the long term;
* availability of suitable industrial land;
* availability of suitable skilled labour and appropriate training courses;
* appropriate financial incentives and concessions;
* encouragement of research and development;
* effective promotion of investment opportunities for minerals processing in New South Wales; and
* greater consultation with industry by Government.

Public comment on the report (by 14 December 1990) was invited by the Department of State Development which is co-ordinating action on the various industry sector strategies. Copies of the Task Force report are now available from the Department of State Development, contact Bob Coughlin, Project Manager, on (02) 228 4263.

For further information contact Garth Holmes, Principal Adviser Minerals Processing, on (02) 901 8464.

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THE INFOMINE — LATEST TOUCH-SCREEN SYSTEM FOR MUSEUM VISITORS

When **The Earth Exchange** opens to the public in March 1991, visitors will be able to use ***The Infomine***, a modern computerised touch-screen museum orientation and information system developed by the museum's staff.

Visitor-operated touch-screen information systems (interactives) are common in many of Australia's museums. However, *The Infomine* takes the application of the latest technology and the concept of interactives in new directions. *The Infomine* units are very "user friendly", are fun to use and will be strategically placed throughout the museum.

As *The Infomine* combines the separate information and orientation systems as used in older systems into a single multi-functional unit, visitors will have considerably more choice and access to a much greater depth and variation of orientation, information, entertainment and educational programs to meet their individual requirements.

Not only will *The Infomine* direct visitors to individual or a series of related exhibits, it will provide further material such as educational games, quizzes or mini-documentary clips according to the visitors' requirements. Through *The Infomine*, visitors will also be able to find out about topics from other exhibits or galleries within The Earth Exchange. For example, visitors to the **Transformation** gallery will be able to trace the story of energy production and consumption, and explore associated economic and social issues. Texts in the exhibits will add support by referring the visitor to *The Infomine* for further details.

Some of the information on *The Infomine* will be updatable. Details on the latest theories and current issues in the fields of geology and mining can be added as required, and news about major events such as earthquakes can be incorporated within hours.

Other important functions *The Infomine* will perform include:

* providing The Earth Exchange and its sponsers with valuable data on public attitudes and perceptions,
* canvassing users' opinions on a wide range of issues relevant to the mining and energy industries, and
* evaluating visitor reaction to The Earth Exchange and of *The Infomine* itself.

Visitors will have in *The Infomine*, as the name suggests, a mine of information and a two-way communication with The Earth Exchange.

For further information contact Tina Broad, Public Relations Manager at The Earth Exchange, on (02) 251 2422.

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INDUSTRY COMMISSION INQUIRY INTO MINING AND MINERALS PROCESSING

Copies of two submissions by the New South Wales Government to an Inquiry by the Commonwealth Industry Commission into mining and minerals processing are now available.

The **Industry Commission,** formed in February 1990, is the Commonwealth Government's major review and inquiry body in industry matters. The Industry Commission has absorbed functions previously performed by the:

* Industries Assistance Commission — industry assistance and related issues,
* the Inter-State Commission — interstate transport, and
* Business Regulation Review Unit — regulation review.

The Inquiry into mining and minerals processing was initiated by the Federal Treasurer in October 1989 through the then Industries Assistance Commission. In its report due at the end of February 1991, the Inquiry will:

* report on institutional, regulatory or other arrangements which are impediments to the minerals sector and are subject to influence by governments in Australia;
* advise on action to reduce or remove such impediments; and
* consider allocation of mineral rights, operating costs such as energy, transport and labour, the level of research and development, and resource taxation and royalty.

The Inquiry is being conducted in a climate of micro-economic reform by government bodies throughout Australia. This reform aims to improve the performance of the Australian economy by removing unnecessary regulation and improving the rationality of decision-making. The major areas of micro-economic reform affecting the minerals sector in New South Wales concern the Maritime Services Board (privatisation of coal loading) and the State Rail Authority (pricing of coal rail freight).

The success of such an inquiry depends on interested parties identifying ways of improving the performance of industries Therefore the initial submission, compiled by the Department of Minerals and Energy in consultation with other relevant Government agencies, covers:

* a summary of the mining and minerals processing industries in New South Wales;
* the State Economic Strategy for minerals-related industries;
* technology, safety and training;
* allocation of mineral rights;
* land management;
* environmental regulation of exploration, mining and minerals processing; and
* aboriginal land; energy; transport; royalty, taxes and other charges; and Commonwealth control of exports and foreign investment.

Reforms underway in many of these areas were outlined in the submission.

Following presentation of the submission, officers of the Department of Minerals and Energy appeared on behalf of the New South Wales Government at the Sydney hearings for the Inquiry. A supplementary submission was then compiled containing further information requested by the Commissioners and an update on some recent developments. Coal lease

allocation, approvals for mine development and mining operations, electricity pricing, local government rates, reforms in rail and ports, and Commonwealth taxation were the main issues elucidated in the supplementary submission.

Both submissions by the New South Wales Government contain valuable current information on the major issues affecting the minerals sector in this State. Copies are available from the Department of Minerals and Energy, at a cost of $24 for the initial submission and $19 for the supplementary submission (see page 60).

The New South Wales Government has also contributed to related inquiries by the Industry Commission into energy generation and distribution, and into rail transport.

For further information contact Ian Clarke, Minerals Policy Officer, on (02) 901 8827.

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ENVIRONMENT POLICY SUCCESS BENEFITS THE MINING INDUSTRY

The Commonwealth Government announced taxation changes for the mining industry in the 1990 Budget. Environmentally related expenditures are to be more appropriately treated than in the past. The costs of rehabilitation of mine sites will be regarded as deductable expenses. In addition, the Treasury is to review the taxation treatment of other environmental related capital expenditures incurred by business.

The minerals industry must meet a range of costs associated with environmental protection often resulting from requirements imposed by the State Government but which were not recognised in the Commonwealth taxation legislation.

The Minister for Minerals and Energy, the Hon. Neil Pickard, M.P., through contact with the Commonwealth Government, supported efforts by the mineral industry for a more appropriate allocation of environmentally related costs.

For further information contact Rod Cook, Policy Officer Economics, on (02) 901 8825.

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EARTHQUAKE MONITORING AT NEWCASTLE IMPROVED

Earthquake monitoring in the Newcastle area has been significantly improved since the disastrous earthquake of 28 December 1989 (refer *Minfo 28*, p. 68). Four state-of-the-art digital seismographs, able to locate local earthquakes down to magnitude 1, have been funded and installed by the Bureau of Mineral Resources.

The seismographs are located at Merewether, the Newcastle Central Business District, Quorrobolong and Boolaroo, thus giving Newcastle the best earthquake monitoring system of any city in Australia. Data from one of these seismographs will be telemetred directly to the Australian Seismological Centre in Canberra.

Prior to the December 1989 earthquake, the nearest seismograph was at the Riverview station in Sydney, more than 100 km away.

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PUBLICATIONS ISSUED JULY - SEPTEMBER 1990

1:50 000 METALLOGENIC MAP

Broken Hill Block Southwest $40.00

Mineral deposit data lists and descriptions of the deposits are available separately in Records 22(2) and Bulletin 32(1,2) respectively POA

1:100 000 GEOLOGICAL SHEET

Tumut $30.00

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QUARTERLY NOTES Annual subscription $10.00 (from 1.1.91)

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Interpretation of regional and detailed aeromagnetic data over the Owendale Igneous Complex, Fifield, New South Wales, by R. Spencer

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EL 2981 South-east of Walcha Derbury Pty Ltd

This licence was acquired to explore for gold deposits, but no work was done because the area of main interest comprises agricultural land and the licence holders were denied access.

ELs 3111(part), 3112 North-north-west of Wentworth Aberfoyle Resources Ltd

These licences are part of a group being explored for heavy mineral sand accumulations in probable strandlines in the Pliocene Parilla Sand of the Murray Basin. Some 192 RAB and one reverse circulation (RC) drill holes were drilled to a target depth of 18 m. Heavy minerals were noted mainly in trace amounts with an estimated maximum content of 0.2%. The area was considered to have little potential for significant deposits of heavy mineral sands.

EL 3129 West of Parkes Lachlan Resources N.L.and Platinum Search N.L.

Exploration for platinum in alluvials emanating from Alaskan type intrusive complexes (predominantly comprising pyroxenite and dunite) that contain hard-rock platinum mineralisation and are located to the north of the licence was undertaken. Access was hampered by wet conditions, and work on alluvials in the adjacent EL 2653, between the source and this licence, detected only narrow zones containing weak mineralisation, thus downgrading the potential within EL 3129.

EL 3135 North-west of Condobolin Cyprus Gold Aust. Corp.

Cyprus explored for Group 1 minerals associated with the Erimeran Granite/Girilambone [Group] contact. Despite low-grade mineralisation shown by trenching and soil sampling, the Rosedale area has potential for improved grades of mineralisation at depth and the granite/Girilambone [Group] contact has potential for further occurrences. The EL was relinquished as a consequence of corporate restructuring.

EL 3143 Adelong area Cyprus Gold Aust. Corporation

The potential for Mount Adrah type gold mineralisation within Ordovician metasediments intruded by multiphase granites was examined. Mapping and stream sediment sampling delineated two anomalous gold zones at Mount Pleasant and Hillview which have not been fully evaluated. However the remainder of the area showed little promise and the licence was surrendered.

EL 3167 Broken Hill CRA Exploration Pty Ltd

The Burke Street lode zone was tested by rock chip sampling which confirmed its prospectivity whilst an EM survey on a nearby drill hole was abandoned due to a stuck probe. Subsequently the zone was determined to be within Mining Leases and further exploration will be conducted under the authority of those leases.

EL 3184 North-north-west of Ardlethan Peko-Wallsend Operations Ltd

Exploration comprised a (BLEG) survey of colluvial deposits. Follow-up rock chip and BLEG sampling of the weak gold anomalies detected failed to confirm their presence. One BLEG sample contained 650 ppt Au but no other sample exceeded 200 ppt. All base metal results were low.

EL 3201 East of Ardlethan CRA Exploration Pty Ltd

Aeromagnetic anomalies and their potential for large-scale precious or base metal deposits were examined. Minor small-scale mineralisation at Kildarey mines was found to be associated with shear systems. A major anomaly in the southern part of the EL was associated with outcropping rhyolite. No significant targets were identified and the EL was relinquished.

EL 3300 Young Norgold Ltd

Burrangong Creek (north of the Young Gold Field) was explored for alluvial gold. Previous exploration by Valley Gold Exploration Pty Ltd (EL1655) was very discouraging and difficulties with landholders led Norgold to relinquish the licence without having done any work.

EL 3322 North-west of Batemans Bay Moruya Gold Mines N.L.

Planned drill testing of old dredged areas and unworked areas of alluvium in the Araluen gold alluvials was not conducted when the holders discovered that mining would not be permitted under the zoning provisions of an Interim Development Order for the Araluen Village.

ELs 3331, 3362, 3363 North of Bulahdelah CRA Exploration Pty Ltd

Reconnaissance stream sediment and bulk cyanide leach sampling were carried out to explore for precious metal mineralisation associated with epithermal alteration in the Alum Mountain Volcanics. Numerous low-order zinc and arsenic anomalies were not considered significant and the program did not identify any areas prospective for gold–silver mineralisation.

EL 3357 South-west of Eden CRA Exploration Pty Ltd

Ordovician metasediments and Devonian sediments and granite and were explored for gold mineralisation. A stream sediment sampling program that included BLEG analyses identified anomalous results (up to 5.9 ppb Au) in the Stony Creek area. Follow-up rock float sampling gave weakly anomalous results and the source of the gold remains unknown.

EL 3407 North of Broken Hill BHP Minerals Ltd

A literature survey was used to assess this area for zinc–lead–silver mineralisation. The area covers Willyama Supergroup unconformably overlain by Adelaidean metasediments. Analysis of previous geophysical surveys of the area indicated that the area has low prospectivity. The title was relinquished after 6 months and without new surveys or field work.

EL 3416 South-east of Ulladulla Clutha Minerals Ltd

The Termeil Essexite was explored for potential black dimension stone quarry sites. The unsuitable patterns of jointing present, including sets of tectonic origin plus a possible giant polygonal cooling joint set, precluded possible sites.

ELs 3469 - 3476 Hay Ausmindex N.L.

These EL's were taken out to follow up single-line aeromagnetic anomalies for possible Elura type base metal mineralisation. Ground magnetic and gravity surveys were undertaken and, although verifying the magnetic anomalies, no massive sulphide mineralisation was detected so the titles were relinquished.

EL 3549 South of Wellington Homestake Aust. Ltd

A literature review downgraded the percieved potential for porphyry and/or skarn gold–copper deposits in this area of intermediate and basaltic volcanics of Ordovician age. The licence was terminated soon after grant.

Other cancelled or expired Exploration Licences

At the time of compilation final reports had not been received for the following licences:

1897, 2088, 2089, 2261, 2310, 2379, 2537, 2630, 2666, 2752, 3159, 3160, 3161, 3162, 3193, 3206, 3228, 3229, 3329, 3332, 3334, 3336, 3340, 3374, 3406, 3417, 3418, 3434, 3445, 3446.