Environmental impact statement proposed Clarence Colliery

ENVIRONMENTAL IMPACT STATEMENT

PROPOSED CLARENCE COLLIERY

for

COALEX PTY LTD

October 1975

DAMES & MOORE

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COALEX PTY. LIMITED

PREPARED BY

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1.0 INTRODUCTION

This report is being presented as a second report following on and including parts of the Environmental Impact Statement for the Wolgan Valley and Newnes Junction (now Clarence) Coal Mines which was presented in June 1974, on behalf of Coalex Pty. Limited, by Spencer Thomas Associates Pty. Limited, Sydney.

Since the time when the initial report was written in June 1974, additional information has been made available which now makes it possible to present the design criteria for the mine complex. As a result, the emphasis of this report is on the details of colliery development for the mine together with mitigating procedures for environmental protection and an assessment of environmental impact from the material presented in both reports.

2.0 SUMMARY

Coalex Pty. Limited intends to establish two new coal mines in the vicinity of Lithgow (Plates 1 & 2). The establishment of the two proposed mines will provide the protection of continuing employment for miners in the Lithgow district against the closing down of some existing mines within the next decade.

The first mine to be commissioned will be the Clarence Colliery which will be located in the vicinity of Newnes Junction, east of Lithgow on the Main Western Railway (see Plate 3). The second proposed mine will be the Wolgan Valley Colliery where it is hoped that operations will commence some time later and which will be the subject of a separate Environmental Impact Statement.

The proposed Clarence Colliery will have on site coal treatment plant facilities and refuse disposal and the coal product will be railed directly to ship loading facilities for export.

An extensive programme of pollution control from treatment plant facilities and refuse disposal areas will be carried out to minimise the possibility that harmful effects are suffered by the environment, particularly in the Blue Mountains National Park region to the east of the proposed colliery. In particular, this programme will include the careful construction and maintenance of refuse disposal areas which will ultimately be covered with topsoil and revegetated as part of land rehabilitation on completion of the project.

It is believed that the overall environmental impact will be small. The mitigating procedures to be adopted by the Company will protect the natural environment while the relatively small areas of development in relation to the surrounding bushland will cause only minor and temporary disturbance to fauna and flora.

3.0 ALTERNATIVE COURSES OF ACTION

3.1 No Action

The proposed Clarence Mine is the first major mining development in the Western Coalfield district since the post-war period. The district has been declining economically and the commissioning of the proposed mine will avert a serious socio-economic problem within Lithgow by providing security of employment for miners already in the district as well as career opportunities for their children. Over the last twenty years there has been a drift of young people away from the area and this has been a cause of concern by the civic authorities.

If the proposed mine is not opened then it will probably be necessary in the future for mining personnel and their families to leave the district and to seek employment elsewhere.

3.2 On-Site Treatment Facilities and Refuse Disposal

This alternative has been chosen by the Company as the most practical and economical means of establishing the colliery and with the least impact on the environment.

The coal treatment plant (washery) at the mine site will be positioned close to the raw coal exit portal in order to avoid excessive materials handling. Also, refuse disposal and subsequent rehabilitation will be carried out as close as possible to the treatment facilities to avoid excessive trucking of the material to distant sites. It is anticipated that a large percentage of refuse material from the Clarence mine may be disposed of in adjacent areas that are presently used for sand mining, and negotiations on this matter are under way with the sand mining companies. (see Plate 6). If this proves possible, it would tend to restore the existing topography.

Full details of the proposed facilities, environmental impact and mitigating procedures for the above mentioned operations are presented in Sections 4.0 and 5.0.

3.3 On-Site Treatment Facilities with Off-Site Refuse Disposal

On-site treatment facilities are favoured for this project as mentioned in the previous section (3.2). However, refuse disposal areas which are distant from the mine site usually present a major problem if the large number of motor trucks carrying refuse material must use public roads to gain access to disposal sites. Besides this, there do not appear to be refuse disposal areas elsewhere in the vicinity of Lithgow which have a distinct advantage over on-site disposal. It is also believed that far better control of the development of an on-site refuse disposal area is obtained since operations can proceed under the close scrutiny of mine management.

3.4 Off-Site Treatment Facilities and Refuse Disposal

The concept of off-site treatment facilities mainly implies that raw coal from the proposed collieries would be treated at the Company's existing washery facilities at the Wallerawang and Hermitage Collieries. This alternative requires that extensive modifications and expansion of the washeries and refuse disposal areas at these sites would have to be made to accommodate raw coal from the Clarence mine. However, this scheme would be impracticable since the land available for expansion at Wallerawang and Hermitage Collieries is limited and would not be sufficient for such large treatment plant and refuse disposal complexes.

As well as this, access to the existing washery sites from Newnes Junction would be by road or rail but neither alternative is attractive. If road transport were chosen it would be necessary for a regular stream of coal trucks to pass through the Lithgow city area enroute to the washeries but this alternative would probably be unacceptable to the local populace. The problem of air pollution from fine coal dust would also tend to be excessive along this route as a result of truck movements. The main objection to rail transportation is the excessive dust that is generated from raw coal being loaded into and unloaded from rail wagons. This is not a problem with washed coal since the moisture content after washing is high enough to prevent dust from rising.

?

The main objections to off-site refuse disposal have already been outlined in the previous section (3.3).

3.5 Selection of On-Site Treatment Plant and Refuse Disposal Areas

The mining purpose lease (MPL) area for the proposed Clarence Colliery is situated at the southern end of the Clarence mining lease area as shown in Plate 3. A considerable portion of this MPL area has also been set aside for sand mining interests (as shown in Plate 6) and for this reason, the proposed site is considered to be the best available since development will take place in an area already considered for industrial use.

The site is located at the headwaters of Wollangambe Creek which flows into the Blue Mountains National Park. For this reason, it is intended to carry out an extensive programme of pollution control and refuse disposal area revegetation (refer to following sections) so that in future years when the mine life is completed, the Company will leave the area in a rehabilitated state.

Other areas of possible development in the vicinity away from the Wollangambe Creek catchment have been investigated with little success. Within a short distance to the west of the proposed site is a separate catchment area that is used as Lithgow's water supply while a short distance to the south is the headwaters of the Lett River which flows into Cox's River and thence to Sydney's water supply at Lake Burragorang. Neither of these two possible areas offer advantages over the proposed site.

3.6 Coal Transportation Alternatives

The proposed Clarence Colliery will be developed in an area which has ready access to the Main Western Railway near Newnes Junction (see Plate 4). For this reason the only transportation alternative considered for this colliery is transportation of washed coal to port facilities via rail.

4.0 OPERATIONS STATEMENT

4.1 General

The proposed Clarence Colliery to be developed by Coalex Pty. Limited is located east of Lithgow, N.S.W. near Clarence and Newnes Junction railway stations (Plate 3). Newnes Junction on the Main Western Railway should not be confused with the township of Newnes some 33 kilometres to the north in the Wolgan Valley. The coal deposits to be mined contain steaming grades of black coal and are within the Western Coalfield District of N.S.W. The proposed mine is designed to produce up to 2.79 million tonnes of washed coal per annum of which 2.44 million tonnes is destined for shipment to overseas markets and approximately 350 thousand tonnes of steaming coal for local markets.

4.2 Proposed Mining Method

The proposed mining method for the extraction of coal will consist of underground workings at a depth of approximately 200 metres. The coal seam is almost horizontal and mining will be carried out mainly by the bord and pillar method with eventual collapse of the workings as the supporting coal pillars are removed. The extraction of coal could cause some subsidence at the surface but the actual amount will probably not exceed 0.5m. This figure is based on experience in the area when extracting pillars at Lithgow Valley Colliery where the seam thickness is similar.

4.3 Surface Facilities and Stockpile Areas

Surface facilities and stockpile areas at the proposed Clarence Colliery (Plates 4 and 5) will be located on a Mining Purpose Lease area near the Newnes Junction station on the Main Western Railway (Plate 3). These facilities are required to support the underground mining operations, wash the mined coal and to produce a saleable product by reducing the ash content, and to stockpile the washed coal before transportation to port facilities.

The following buildings will be required at the proposed colliery:

- Seam Access, Winder House and Conveyor
- Coal Treatment Plant (Washery) and Laboratory
- Bath House for 350 men
- First Aid Room
- Lamp Room
- Office for 25 staff
- Workshop and Store
- Water Treatment Plant
- Sewage Treatment Plant
- Ventilation Fans

In addition, the following associated and ancilliary facilities will be provided:

- Run-of-Mine Coal Storage Bin and an Emergency Surface Stockpile Area

- Conveyor System from the Run-of-Mine Coal Bins to the Washery and thence to the Product Coal Stockpile
- Reclaim Conveyor System from the Product Coal Stockpile to the Rail Loading Station
- Loop Railway Track and Overhead Waggon Loading Bins
- Electrical Transformer Substations (one main substation and one each low voltage substation for the mine and the washery)
- Bulk Stores Area
- Freshwater Supply Dam
- Washery Recirculation Water Dam
- Washery Waste Disposal Area
- Access Roads and Car Park

The layout of the surface facilities has been designed to form as compact an installation as possible. Roadways will be paved and guttered so that rainwater runoff can be collected and directed to the recirculation water dam for subsequent use in the washery. The whole area will be landscaped with gardens and trees to present a pleasing appearance and adequate labour engaged for continued maintenance.

Details of the surface facilities and stockpile areas to be established for the colliery are set out below:

4.3.1 Seam Access and Winder House

Two surface portal structures for the haulage and conveyor drifts will be positioned as shown in Plate 4. The drifts will lead to the underground coal seam, descending at an angle of approximately 10 degrees and will be concrete-lined and steel supported structures measuring approximately 6m by 4m. The haulage drift will be equipped with a winch which will be housed in a separate building approximately 50 metres from the entrance of the drift. Vertical shafts approximately 2.4m diameter will be constructed for ventilation and man-access to the coal working faces and several shafts of this nature will be sunk progressively during the life of the mine as the underground workings expand.

4.3.2 Coal Treatment Plant (Washery) and Laboratory

The washery will treat the run-of-mine coal to reduce ash content and provide a saleable product. It will be constructed in the latest modular design to permit expansion of plant capacity in stages by the addition of modules to the full production rate of 750 tonnes per hour. The ultimate anticipated rate of run-of-mine production will be 3.0 million tonnes per year (mty) which will produce 2.79 mty of washed coal including 2.44 mty for export and a smaller amount of steaming coal (about 350,000 tonnes per year). Each module will have a capacity of 250 tonnes per hour and will operate semi-independently of each other. The modules will be completely enclosed to prevent dust emissions and to reduce noise levels and provide satisfactory working conditions for employees.

The process water used within the plant will be contained in a closed recycle system and there will be no effluent discharge except for overflow during extremely heavy rainfall (see Section 4.3.10 Water Treatment). The lower floor of the

3 000 000 α 10% discard = 300,000 tons $\rightarrow$ 6,000000 m^3

slag pay 210,000 $\rightarrow$

for 20 years = 4,200000 $\rightarrow$

washery will be paved with drainage into sumps and all spillage and hosing down water will be returned to the circuit. Provision will also be made for a standby thickener which will have enough capacity to accommodate the largest item of plant that may require draining.

A small modern building housing a coal analysis laboratory and an environmental control room will be constructed adjacent to the washery. Hol

Refuse material from the washery will be transported to a surface disposal area as shown in Plate 5. The area will (if necessary) provide for the disposal of up to 3 million tonnes of refuse. This will be adequate for almost 20 years at the production rates shown in Table 1. However, it is also planned to dispose of refuse in the sand quarry adjacent to the proposed colliery. Negotiations are proceeding with the operators of the sand quarry to enable refuse to be used in restoring the quarried areas to their original contour levels. This course of action would be preferable since it would restore the mined out sand areas and at the same time would eliminate the need to establish any further refuse disposal areas of the type shown in Plate 5.

The exact capacity of the sand quarry cannot be stated since work is still proceeding. Production at the quarry has been continuing for more than 7 years and the daily production is in excess of 750 tonnes. Market for this type of sand as a speciality glass sand is up to 1000 tonnes per day. Two other operators are considering opening in a nearby area and

on 200 day/yr basis, the figure = 1000 tonnes/day

TABLE 1

CLARENCE COLLIERY

PRODUCTION & REFUSE QUANTITIES

YEAR	RUN-OF-MINE COAL TONNES	SALEABLE COAL TONNES	QUANTITY OF REFUSE MATERIAL	
			TONNES	VOLUME (M^3)
1	350000	325500	24500	22273
2	700000	651000	49000	44545
3	1000000	930000	70000	63636
4	1600000	1488000	112000	101818
5	2100000	1953000	147000	133636
6	2600000	2418000	182000	165455
7	3000000	2790000	210000	190909
8	3000000	2790000	210000	190909
9	3000000	2790000	210000	190909
10	3000000	2790000	210000	190909
TOTALS	20350000	18925500	1424500	1294999
		+10 years	2100000	
			= 3524500	

NOTE: Estimated Refuse for 20 years would be 3524500 tonnes

1.1 tonnes/m^3

2 x 50.000 comm + Stockpile
2 ~~3~~ weeks production!

it is considered that if satisfactory arrangements can be made with them also, then sand production areas could possibly provide sufficient storage for the total volume of refuse over the life of the mine. In that event the surface area set aside at the mine site for refuse disposal would be used as a surge area to guarantee continuity of coal production.

In the unlikely event that the sand quarries were completely unavailable for refuse disposal, then after 20 years a further disposal area would be required near the mine site. An area just to the north of the sand quarry has been examined and would be suitable for this purpose.

When the potential capacity of all these areas in the vicinity of the proposed colliery is considered, disposal of refuse in a satisfactory manner can be guaranteed for a period in excess of 20 years.

Full details of the refuse disposal area including the retaining dam wall are provided in Section 4.5.

4.3.3 Run-of-Mine Coal Conveyor, Storage Bin and Emergency Stockpile Area

The run-of-mine coal conveyor will carry raw coal from the underground workings to the run of mine storage bin via the haulage drift. The conveyor belt will be 1.2 metres wide and will have a carrying capacity of 750 tonnes per hour. The surface section of the belt will be totally enclosed to prevent spillage and dust problems.

The storage bin will have a capacity of 3,000 tonnes and should an overflow occur due to a breakdown in the washery, the run-of-mine coal will bypass the bin to an adjacent emergency stockpile area. This stockpile area will be surrounded by a bund wall to collect drainage water from the area for reticulation to the washery recirculation system (Plate 5). capacity?

Raw coal for the run-of-mine storage bin will be fed to the washery by conveyor. The conveyor will be elevated and enclosed for protection against wind action and spillage, and will span the 30m. distance from the storage bin to the washery. On the occasions when the emergency stockpile area is used, a front end loader will be used to retrieve the coal and load it into a hopper below the storage bin to be fed by the conveyor to the washery. A sampling and automatic weighing station will be provided on the conveyor system with a remote readout in the washery main control room.

4.3.4 Product Coal Conveyor and Stockpile

bins or ground?

The washed coal product will be fed to the product stockpile area by means of a conveyor. This conveyor will be enclosed in a similar manner to others in the system, to prevent loss from wind action or spillage.

The stockpile conveyor will be an elevated, distributing conveyor equipped with a travelling, double-sided tripper which will form two parallel stockpiles, one each side of the conveyor. The capacity of each stockpile will be 50,000 tonnes. The stockpile conveyor will be provided with external water sprays to reduce dust emissions from the main stockpile. The stockpile area will be surrounded by bund walls to permit collection of drainage water for reticulation to the washery recirculation system. (Plates 4 and 5).

Beneath the centre line of each stockpile, the coal will be collected by reclaim conveyors which will transport the washed coal to the rail waggon loading bin on the rail loop (see Plate 5). The sections of reclaim conveyor above ground will be enclosed to avoid spillage and dust problems.

4.3.5 Rail Waggon Loader and Rail Loop

The rail waggon loading bin will have a capacity suitable for loading 2,000 tonne unit trains and the area below the bin will be paved with concrete, forming an apron flush with the top of the rails to facilitate clean-up of any spilled coal through mishap while loading. The loading doors on the bin will be the air operated - positive shut type, giving a clean shut-off of coal when closed. An enclosed control cabin for the loader operator will be provided with an uninterrupted view of the loading operation. The rail loading facility will have a weighing device to ensure correct loading of the waggons and prevent spillage from overloading.

A rail loop from the Main Western Railway line near Newnes Junction station will be provided to facilitate train loading (see Plate 4). The approximate length of the rail loop will be 2,000 m. and will require cut and fill to provide the correct railway line gradient.

4.3.6 Bath House, First Aid Room and Lamp Room

The bath house will be of modern design and will accommodate approximately 350 men. The design will comply in all respects with the requirements of the Coal Mining Regulation Act, the Mines Department and the Department of Health. Waste water from the showers, toilets, etc. will be treated in a sewage treatment plant, the effluent from which will be directed to the washery process water circuit as described in Section 4.3.11.

4.3.7 Workshops and Store

The workshops and store will be accommodated in a modern building which will contain office accommodation for electrical and mechanical engineers and storemen. Drainage from the area of the workshops and store building will be collected and passed through drainage pits, and oil and grease separators prior to flowing to the washery recirculation system. The workshops and store building will be located near the portal of the haulage drift as shown in Plate 4.

4.3.8 Bulk Stores Area

The bulk stores will be kept in an open paved storage area with a drainage system connected to the water recirculation system. The area will contain an "A" frame gantry and will be used to store timber, drums of oil, reels of cable and conveyor belting, steel etc. The area will be enclosed with a cyclone fence 1.8m. high with access gates for trucks and personnel.

4.3.9 Water Supply

In order to provide a source of potable water, it is proposed to repair the existing dam on the site which is located adjacent to the drift entry. A second collection dam will be constructed below the first so that any overflow from the first will be retained in the second (Plate 5). Water from the lower dam will be pumped to three existing 4.5 Megalitre concrete tanks which will act as a water reservoir for the colliery. The three concrete tanks were originally built to store shale oil from the Glen Davis project but have been abandoned for a number of years. Two of these tanks will be used as water supply for the surface operational needs and one exclusively as an underground supply. The tanks are situated on Commonwealth-owned property, and negotiations to lease the land are expected to be completed shortly.

4.3.10 Water Treatment

Treatment facilities will be established on-site to obtain both potable and process water. Natural runoff water contained in a small dam of 700 kilolitres capacity and located on the western boundary of the surface installations (Plate 5) will be purified in an adjacent treatment plant and used as potable and bathing water throughout the colliery.

All surface drainage and excess underground water will be collected in a large dam of 46,000 kilolitres capacity which will be located on the eastern boundary of the surface installations. (Plates 4 and 5). Water from this dam will be pumped to three concrete tanks (previously described in

Section 4.3.9) for distribution as process water to the various surface and underground recipient areas. Overflow water from the dam as well as sewage from the colliery will be fed to the adjacent water treatment plant as shown in Plates 4 and 5. This treatment plant will handle the overflow capacity in all but extreme rainfall conditions and will be capable of treating water to meet the effluent standards (as required by the Clean Waters Act) for discharge into nearby streams. However, under normal conditions, the water from this dam will be recirculated for industrial usage.

4.3.11 Sewage Treatment Plant

A modern package sewage treatment plant will be installed which will operate on the activated sludge principle with internal digestion. This plant will accommodate sewage and bathroom waste water and the effluent water quality is expected to be 20 ppm BOD and 20 ppm Suspended Solids. A polishing filter will be added as a final stage producing an effluent quality of 10 ppm BOD and 10 ppm Suspended Solids which will meet the requirements of the Clean Waters Act. The effluent will also be chlorinated as required by the Act. Under normal operation, the effluent from this plant will be returned to the main dam for recirculation as process water.

4.3.12 Electricity Supply

Electrical power will be supplied in bulk to the colliery from a 66 kV main transmission line. This line will originate from the Hartley County Council sub-station at Lithgow (Plate 3).

The route of the transmission line will follow an existing 11 kV power line northeast from Lithgow to the top of the plateau at the Newnes Junction to Wolgan Valley road. From this point, the line will extend southeast to the colliery site, terminating at a main 66/11 kV sub-station near the drift entrances (Plate 5). The total length of the line will be 15 kilometres and will be supported on wooden poles in a cleared corridor 40 metres wide.

At the colliery site, separate 11 kV/415 V sub-stations and switchyards will be provided for the mine and washery. All electrical equipment will be constructed to comply with regulations regarding lightning strikes, earth faulting and switching. The combined load on the electricity supply will not exceed 10 Megawatts - the design capacity of the sub-station transformers. The anticipated maximum power demand is 9 Megawatts. Electrical reticulation within the colliery site will be ducted or buried cable.

4.3.13 Roadways and Car Park

An access road, approximately 2 kilometres long, will be constructed (in conjunction with the Blaxland Shire Council) from the Bell's Line of Road near Newnes Junction to the colliery site. The proposed alignment of the access road is shown in Plate 4, and will be constructed to council specifications. All internal roads and car park will be paved and provided with kerbs and guttering.

4.4 Transport of Coal Product

Washed coal from the Clarence Colliery will be loaded directly onto unit trains near Newnes Junction as shown in Plates 4 and 5. A rail loop will be constructed from the Main Western Railway near Newnes Junction to service the nearby colliery and the coal product will be taken directly to ship loading facilities.

It is proposed to use 1,800 tonne gross unit trains made up of new 76 tonne waggons which the Public Transport Commission is planning to build. Investigations are proceeding to determine whether 2,400 tonne gross trains can be used to reduce the number of unit train trips. Traffic density on the main line will be the equivalent of that which now occurs when ships are being loaded. With the provision of adequate stockpiles at both the mine and the port, together with sufficient rolling stock and good unit train loading facilities, it will be possible to run an orderly and well regulated transport programme. This will contrast with the present difficulties being experienced in shipping coal from the Western Districts to overseas customers.

4.5 Refuse Disposal

4.5.1 General

Subsurface exploration with boreholes at the site of the proposed mining areas has shown that the refuse material will be composed mainly of shales and dark grey mudstones together with some fine-to-medium grained sandstones. Analysis for the

Katoomba Seam at the proposed Clarence mine indicate that refuse material is predominantly Kaolinite 55%, together with 26% carbonaceous matter and 15% quartz.

The run-of-mine coal will initially be conveyed to a 3,000 tonne surge bin and will then be crushed and wetted before passing to the washery separation process. Crushed material at minus 25 mm mesh size will be wet screened into two sizes, fine material at approximately minus 2 mm and a coarser fraction between 2 and 25 mm. The coarser material will be washed in dense medium cyclones and the finer material will be separated in water washing cyclones.

The cleaned coal products and refuse material will be mechanically dewatered after leaving the washery. The coal products will then be stockpiled and the refuse will be placed in disposal bins.

Refuse material will be dewatered and trucked to the disposal area. The minimum particle size of the refuse is expected to be 0.5 mm since the minus 0.5 mm size should be recoverable as a saleable middling product. The washability analyses of the Katoomba seam coal as undertaken by ACIRL, Joint Coal Board and CASCO indicate that the minus 0.5 mm product material has an ash content that will permit it to be added directly to the middling product. There is very little clay in this product as the seam is free of dirt bands and the floor is a splinty coal material.

how?, by filter?

why regrat them?

The nature of any particular coal seam has an effect on the overall size distribution of the run-of-mine coal and the expected quantities of refuse material for the Katoomba seam is shown in the adjoining Table 1.

4.5.2 Physical Properties of Refuse Material

In order to assistin the location and preliminary designs for the refuse dam in the disposal area, laboratory testing has been carried out to evaluate the physical properties of the refuse material from the proposed washery. For the Clarence Colliery refuse, a bulk sample was taken from a neighbouring colliery where the seam lithology is known to be very similar.

The results of the laboratory tests are detailed in Appendix 1 and, at this stage, it should be noted that these results can only be considered as preliminary and that additional design criteria will be needed.

4.5.3 Clarence Refuse Disposal

The refuse disposal area for the Clarence Colliery will be located as shown in Plates 4,5, and 6 and together with abandoned sand mining areas previously mentioned in 4.3.2 will provide sufficient capacity for the refuse produced during the life of the mine (about 20 years). The maximum height of the mine refuse area will be 35 metres above the present gound level. The natural vegetation will be removed prior to dumping and the area cleared as a fire prevention measure.

The proposed method of construction of the refuse dam wall is considered to be the most suitable for the Clarence Colliery and a cross-section is shown in Plate 7. Initially, a properly compacted starter dam will be constructed which will be composed of well-graded, free draining rockfill. This dam will serve as a drainage toe for the final wall and will be surrounded by an adequately designed sand filter zone to prevent leaching out of fines and possible piping failure of the outer wall.

The refuse material will be granular and relatively coarse ← Shale ? (?)
grained (25 mm to 0.5 mm) and will be dewatered at the washery before being trucked to the refuse disposal area. As shown in Plate 7, the outer zone of 50 metres (measured horizontally from the face) will be progressively compacted to increase the stability of the outer wall slope. The refuse will be compacted to a minumum of 100% standard compaction in 15 to 20 cm lifts by pneumatic tyred or other suitable compacting equipment. ← layering with the finest material ?
Refuse placed upstream of the above-mentioned 50 metre compacted zone will be end dumped and graded with only minimum compaction. Owing to the granular nature of the refuse, only minor subsidence will occur in this area after deposition.

The outer slope of the dam wall will be benched to limit erosion and to assist revegetation of the slope. Benching will result in an overall slope of 2:1 (horizontal to vertical). how about 8:1 ?

26.5° is fairly steep overall. I would not like to see heavy machinery on 15' wide benches with near vertical 10' high banks above & below them!

When disposal of refuse is completed, the surface will be graded as shown in Plate 8 and covered with a 15 cm thick layer of impervious soil material to seal the area. The impervious soil will be covered with 50 cm of suitable rock-fill to provide a drainage and armour layer to inhibit future erosion of the disposal area. The rockfill will be covered with 30 cm of topsoil to allow revegetation of the area.

Capstrum Flat ?

where is the impervious soil, rock fill & topsoil going to come from - in Hawkesbury S/S country!

5.0 ENVIRONMENTAL IMPACT

Interactions with the existing environment which are expected to result from implementation of the development proposals include effects on:

- Physical Environment - geomorphology, coal seams, soils, topography, climate, hydrology, water quality, air quality, background noise levels, allocations of construction materials and resources;

- Biological Environment - vegetation (flora), wildlife (fauna), aquatic life; and

- Socio-economic Environment - land use, aesthetics, employment, regional, state and national economic conditions, rail and road transportation, community health and social services.

5.1 Physical Environment

Geomorphology

"The proposed coal mining and washing operations will take place in the southwest of the unit known as the Colo Highlands. The area involved is in the headwaters of the Wollangambe and Bungleboorie Creeks. These are tributaries of the Colo River and the area is characterised by upland valleys separated by high inter-valley plateaux. The valleys are steep sided with minor tributaries feeding in through canyons in the valley walls. The valleys narrow downstream to form long vertical sided gorges termed "bottleneck" valleys by Griffith Taylor (1) p. 27. (Plate 9).*

The highest point in the area is Bald Trig Station, near Newnes Junction, 1,140 m above sea level. Geologically, the area is part of the Sydney Basin, the major rocks exposed on the plateaux being the sandstone, shales and claystone of the Triassic Narrabeen Group. In the Wolgan and Capertee Valleys to the north, the Permian Illawarra Coal Measures outcrop on the valley walls. On the valley floor the underlying siltstones, shales and sandstones of Permian Shoalhaven Group occur. There are also small outcrops of basement rocks of Devonian conglomerate, limestone, quartzite and siltstone and of Carboniferous granite in the valley floor. In the broader parts of the valley the Shoalhaven group is covered by Quaternary sediments.

The Triassic and Permian formations are essentially horizontal and their erosion pattern gives rise to the characteristic appearance of the valley walls. From the base of the cliffs to the valley floor the ground falls away rapidly. The surface of this slope is a mixture of erosion products of the Illawarra coal measures and debris from the undermining of the Grose Sandstone. This slope is in a state of limiting equilibrium and is subject to frequent slips, particularly if slopes have been artificially increased and the access of water facilitated as in the case of road building.

* Reference refers to Spencer Thomas & Associates 1974 report

The capping of the valley walls consist of sheer vertical cliffs of Grose sandstone, part of the Triassic Narrabeen group of sediments. Immediately below the Grose sandstone are the shales, fine grained siltstones and sandstones of the Caley formation. These are quite soft and erode much more quickly than the overlying Grose sandstone which is consequently undermined and sheers off periodically. On the plateaux, soils are generally shallow sands with deeper sandy loams overlying clay horizons on flatter sites. Under favourable conditions sandy loams accumulate in the depressions on the plateau.

The proposed mine will be an underground operation extracting coal from the Illawarra Coal Measures. The extraction of the coal from the lease area will result in some subsidence (about 0.5 m) of the overlying formations of sandstone, claystone and shale of the Triassic Narrabeen Group, but the impact of subsidence in the remote area is expected to be negligible. Since none of these formations are rare or unusual, but are found in thousands of square kilometres in this region of New South Wales, the impact of disturbance to the geologic environment of the site and vicinity will be negligible.

Coal Seams

Immediately below the Grose sandstone and the Caley formation is the Katoomba coal seam, the top coal seam of the Illawarra Coal Measures. (Appendix 2) In descending order the other coal seams of the Measures are the Middle River, the Wolgan, the Capertee and the Lithgow seam. About 12 m above the

Wolgan Coal seam an oil shale seam occurs in the Newnes and Glen Davis area. The coal seams vary in thickness up to 4m and in places divide into splits or pinch out altogether. They are separated from one another by sandstone, shale and claystones and the overall thickness depth of the Illawarra Coal Measures varies from 100m to 200m. The Coal Measures slope gently to the north and east and are relatively free from faulting and igneous intrusions.

The Katoomba seam is a good quality low ash steaming coal with generally a good working thickness 1m to 4 m. The Middle River seam is unattractive because of its high ash and the presence of dirt bands in the coal seam. The oil shale seam is lenticular and had its maximum development in the Glen Davis area where it is 2 m thick and produced 80-120 gallons of oil per ton. It is thinner and generally higher in oil content at Newnes. The Wolgan seam consists of high quality coking coal but with a rather high ash content in the lower part. It is 2 m thick in the Newnes area where it is probably at its maximum thickness. The Capertee seam is also good coking coal and outcrops in the Capertee Valley at Glen Davis where the river has cut deeper into the Coal Measures than at Newnes. The lowest seam of the measures, the Lithgow seam, a steaming coal, does not outcrop in the Clarence area but does around Lithgow due to the general northeast dip of the Coal Measures.

At present there are no commercial operations on the coal and oil shale seams in the area, although Coalex Pty. Limited have operated an experimental mine some 3.0 km south of Newnes on the Wolgan seam. Outside the area the Lithgow seam is worked at collieries near Lithgow, and the Katoomba seam in Hartley Main near Bell." (Spencer Thomas & Associates,1974).

Soils

The soils which overly the sandstone and shale are generally thin and infertile. The construction of surface works for the mine such as roadways, structures, drift portal structures, water storage tailings disposal dams and stockpile systems will involve earthworks for site preparation, establishment of grade levels and drainage ways. These activities will unavoidably cause disturbance to the existing soils on the site and may lead to accelerated erosion and subsequent siltation of the drainage water to Wollangambe Creek until the exposed soils are stabilised. However, adequate safeguards in drainage control, capture and recycle of surface water runoff, and rapid stabilisation of exposed soils with vegetal cover as described in this report, will greatly mitigate any adverse impacts.

Topography

To a limited extent a modification of existing topography over the site will result from earthworks, placement of washery refuse material in the surface disposal area, and from subsidence following extraction of the coal. The most noticeable changes to topography will occur in the washery refuse disposal area and in the general mine site area (Plate 4). The topographic changes due to mine site grade levelling will be rather minor, but the washery refuse disposal areas may undergo contour elevation changes of up to 35 metres (Plate 5) during the life of the project. The rock excavations for the rail loop will also become a permanent landscape feature.

Land subsidence over mined out areas will not generally be noticeable to any observer due to the limited movement (about 0.5m) and the uniformity of any movement over wide areas. This subsidence or other topographic change will not adversely affect any existing man-made structures in the area or the amenity of the adjacent Blue Mountains National Park.

Climate

"The highest and lowest temperatures recorded at Newnes Prison Farm, 1,020m elevation, are 38°C and -12.2°C respectively. The average maximum (daily) temperature varies from 23.4°C in January to 9.2°C in July and the average minimum (night) temperature varies from 10.3°C in February to -1.0°C in July. Maximum temperatures in the valley floors could be expected to be 4°C higher than the above and those at more elevated points, such as Bald Trip, would be lower. Table 2 lists temperatures at Newnes Prison Farm at 1,020m (3).* Table 3 covers annual rainfall registrations at Newnes Prison Farm and Newnes Junction (4).* This indicates a reasonably well distributed rainfall throughout the year with highest falls in the summer. In winter snowfalls may occur 3 to 4 times a year on the higher areas.

The main wind direction is generally from the east in summer and from the west in winter with stronger and more frequent winds in winter. Tables 4 and 5 cover data at Newnes Prison Farm (5).* High points such as Bald Trip would experience winds of greater force and the valley would generally be protected from winds. Fogs and atmospheric inversions occur

* Reference refers to Spencer Thomas & Associates, 1974 Report

TABLE 2

TEMPERATURE DATA °C.[1]

NEWNES PRISON FARM - ELEVATION 1020 m

	Number of Years	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
1.	18	23.4	22.3	20.2	15.9	12.6	9.6	9.2	10.4	14.0	16.9	19.9	22.8	16.5
2.	18	9.8	10.3	8.7	5.3	2.2	0.4	-1.0	-0.3	1.4	3.9	6.3	8.3	4.6
3.		38.3	34.1	32.6	25.0	22.8	16.6	16.1	21.4	26.6	29.4	36.1	35.0	38.3
4.		-1.1	-1.7	-1.1	-5.6	-6.7	-8.3	-12.2	-10.8	-7.8	-6.7	-3.9	-2.2	-12.2

Line 1. Average Maximum Temperatures
Line 2. Average Minimum Temperatures
Line 3. Highest Maximum Temperature on Record
Line 4. Lowest Minimum Temperature on Record

1. Reference -Spencer Thomas & Associates, 1974

TABLE 3

RAINFALL DATA [1, 2]

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANN
NEWNES PRISON FARM 1938-1973													
Mean mm	118	120	88	74	74	94	63	81	65	89	85	93	1046
Median mm	136	93	76	62	62	55	35	75	61	82	73	66	1085
NEWNES JUNCTION 1959-1968													
Mean mm	89	86	80	94	73	103	66	83	61	110	93	134	1096
Median mm	74	78	68	76	38	81	68	78	57	112	66	164	1128

1. Reference - Spencer Thomas & Associates, 1974
2. - Number of values contributing to annual mean and median values is less than for monthly values.

TABLE 4

WIND DATA [1] [2]

PERCENTAGE OCCURRENCE BY SPEED VERSUS DIRECTION BASED ON 9 YEARS OF RECORDS

STATION: 063062 NEWNES PRISON FARM

PRODUCED BY M.I.S.S. 20th November 1973

JANUARY 0900 HOURS LST

Speed km/hr

CALM 2

DIRN	1 to 3.7	5.5 to 11.1	13.0 to 18.6	20.3 to 27.8	29.5 to 37.0	40.7 to 48.0	50.0 & UP	ALL
N	3	1	*		*			4
NE	15	6	1					21
E	5	3	*					8
SE	14	15	1					31
S	1	1						2
SW	7	3	1	1				11
W	5	3						8
NW	7	3	2		*			13
ALL	55	36	5	1	1			

NO. OF OBS. 172

APRIL 0900 HOURS LST

Speed km/hr

CALM 6

DIRN	1 to 3.7	5.5 to 11.1	13.0 to 18.6	20.3 to 27.8	29.5 to 37.0	40.7 to 48.0	50.0 to UP	ALL
N	1							1
NE	8	4	1					13
E	6							6
SE	15	6						21
S	3							3
SW	11	9	1	1		2		23
W	9	1		1				11
NW	9	4	1	2				17
ALL	61	24	5	3		2		

NO. OF OBS. 133

JULY 0900 HOURS LST

Speed km/hr

CALM 9

DIRN	1 to 3.7	5.5 to 11.1	13.0 to 18.6	20.3 to 27.8	29.5 to 37.0	40.7 to 48.0	50.0 & UP	ALL
N	2	1						3
NE	4	1				1		6
E	1	1						2
SE	6	3						9
S	2	1	1					4
SW	17	2	*	4				28
W	19	5	1	3				28
NW	6	3	1		1	1		12
ALL	56	24	3	6	1	1		

NO. OF OBS. 140

OCTOBER 0900 HOURS LST

Speed km/hr

CALM 14

DIRN	1 to 3.7	5.5 to 11.1	13.0 to 18.6	20.3 to 27.8	29.5 to 37.0	40.7 to 48.0	50.0 & UP	ALL
N	1	1	*		*			3
NE	12	2	1					16
E	4							4
SE	11	3	1		1	1		18
S	3							3
SW	6	3	3	1				14
W	8	1	*	1	1			13
NW	8	3	2	1	2	1		17
ALL	55	14	8	3	4	1		

NO. OF OBS. 148

* Less than 1%

1. Reference - Spencer Thomas & Associates, 1974
2. Reference - Beaufort Scale estimates only

TABLE 5

WIND DATA [1] [2]

PERCENTAGE OCCURRENCE BY SPEED VERSUS DIRECTION BASED ON 9 YEARS OF RECORDS

STATION: 063062 NEWNES PRISON FARM

PRODUCED BY M.I.S.S. 20th November 1973

JANUARY 1500 HOURS LST
Speed km/hr

CALM 2 DIRN	1 to 3.7	5.5 to 11.1	13.0 to 18.6	20.3 to 27.8	29.5 to 37.0	40.7 to 48.0	50.0 & UP	ALL
N	2	4	*					7
NE	9	7						16
E	8	8						15
SE	14	11	2	1				29
S	1							1
SW	5	3	*	1				10
W	2	2	*					4
NW	8	7	1					16
ALL	50	42	5	2				

NO. OF OBS 123

APRIL 1500 HOURS LST
Speed km/hr

CALM 3 DIRN	1 to 3.7	5.5 to 11.1	13.0 to 18.6	20.3 to 27.8	29.5 to 37.0	40.7 to 48.0	50.0 & UP	ALL
N	2							2
NE	16	3						19
E	3	1						4
SE	13	7						20
S	1							1
SW	10	11	1		2	1		25
W	1	3						4
NW	8	7	7					22
ALL	53	32	8		2	1		

NO. OF OBS 90

JULY 1500 HOURS LST
Speed km/hr

CALM 4 DIRN	1 to 3.7	5.5 to 11.1	13.0 to 18.6	20.3 to 27.8	29.5 to 37.0	40.7 to 48.0	50.0 & UP	ALL
N	3	1	1					5
NE	6	2				1		9
E	2	1						3
SE	8	2	1	1				12
S	2	1						3
SW	9	9	3	2	1	1		25
W	10	4	1	2		1		17
NW	7	8	3	1	2			20
ALL	46	28	9	6	3	3		

NO. OF OBS 93

OCTOBER 1500 HOURS LST
Speed km/hr

CALM 13 DIRN	1 to 3.7	5.5 to 11.1	13.0 to 18.6	20.3 to 27.8	29.5 to 37.0	40.7 to 48.0	50.0 & UP	ALL
N	1	1			1			4
NE	9	3	2					13
E	5							5
SE	15	2	3	1				22
S	1	1		*				2
SW	4	3	2	3				12
W	5	2	*	*	2	1		10
NW	9	4		3	2	1		18
ALL	50	16	7	7	5	2		

NO. OF OBS 123

* Less than 1%

1. Reference - Spencer Thomas & Associates, 1974
2. Reference - Beaufort Scale estimates only

in the valleys due to drainage of cold air from the neighbouring plateau." (Spencer Thomas & Associates 1974).

Hydrology

Surface water runoff from the general mine site area and washery reject disposal area will be affected and extensive control works to capture and store this water for subsequent re-use will be constructed. Since the site lies at the head of the Wollangambe Creek catchment area and involves only a very small portion of the total catchment area, the impact on the flow regime of the creek will be negligible. Other creeks and water supply catchments in the area will not be affected.

Water Quality

As with any industrial activity imposed on a relatively undeveloped area, and particularly those which use process water for product treatment, there is in most cases the potential for water pollution. The Clarence Colliery will use water, both underground and in the surface facilities site at the washery plant, and also for sanitation and employee amenity. However, the waste waters from these activities will be treated and returned to a storage dam for subsequent re-use as described in Sections 4.3.10 and 4.3.11, thus avoiding pollution of downstream surface waters. The design of the treatment works and recycling systems as described previously will be such that any overflow from the storage reservoir to Wollangambe Creek during periods of extremely heavy rainfall will be within discharge quality parameters set by

What is oxygen saturation?
Acceptable standards of effluents?

government regulations and the requirements of the Clean Waters Act of 1970. No domestic or municipal water supply will be significantly affected by the proposed action.

The Katoomba seam at Clarence has a very low sulphur content (0.28 - 0.48%S). The seam does not have any high sulphur bearing shale bands and the refuse will therefore be low in sulphur content. It is predicted that with the treatment previously described the acid levels in any runoff water will be at an acceptable level.

Process water used in the coal preparation plant is kept slightly alkaline to inhibit corrosion and aid flocculation of the fine coal. Since all drainage water is to be trapped and returned as process water, any acidity would be neutralised. It is proposed to keep frequent checks on water quality as part of the operation of the plant.

Water from underground workings will be pumped to underground settling dams before removal from the mine. This will remove any suspended matter and entrapped oils.

Air Quality

As with any human activity there is the propensity for adverse effects to air quality in the locality. In the case of the proposed Clarence Colliery, dust generation from coal handling and preparation will be greatly minimised by the incorporation of engineered safeguards into the design of all surface facilities. Specifically, these safeguards include the enclosure of conveyor systems and washery modules, use of raw coal storage bins and automatic water sprays over stockpiles, wind screen walls and tree barrier plantings around stockpiles, and rapid compaction, covering and revegetation of reject disposal banks. The distances between the site and any residences on public thoroughfares should further preclude any off-site nuisance caused by windborne dust.

Background Noise

It is unavoidable that human activity and the operation of industrial plant and equipment will generate noise which will add to existing background levels. Since the site is in a remote and relatively undeveloped area, any increase in background noise would be more easily noticed than in heavily developed industrial areas. Safeguards against excessive noise emissions from the colliery will be taken even though the population in the site area is sparse. Specific measures include enclosure of conveyors and the washery plant, and maintenance of noise suppression devices on vehicles and other equipment. The surrounding forest vegetation and natural attenuation of noise with distance from the source will further minimise significant adverse effects to background noise levels in surrounding areas off-site. The additional movements of railway trains and vehicles to and from the colliery will also involve an incremental rise in existing noise levels along these thoroughfares.

Allocation of Construction Materials and Other Resources

Development of the Clarence Colliery will involve allocation of coal resources from known reserves in the Sydney Basin.

The utilisation of the coal for the benefit of mankind may be seen as a positive impact, while other implications such as effects on Australia's mineral income earnings and overall balance of payments are often cited as beneficial as well. Attention should nevertheless be drawn to the fact that the mining of the coal will represent a net reduction to non-renewable coal resources.

Considerable quantities of construction materials such as concrete, steel, copper, stone and gravel will be required in development of the colliery. These materials must either be obtained in competition with other development projects from existing sources or new sources have to be developed. It is anticipated that existing sources for these materials will be adequate to meet the needs of this project for the most part. In terms of potential increases in demand for these materials on a regional basis, the overall percentage increase would be insignificant and not cause undue competition between proposed construction projects.

In terms of consumable resources, the Clarence Colliery is expected to require up to 25,000 Megawatt hours of power per annum and about 300,000 tonnes of water per annum. These resources are available for operation of the proposed colliery, the water being captured and stored on-site, and the electric power being supplied from Lithgow.

5.2 Biological Environment

Since the Clarence Colliery will be an underground mine, disturbance to existing vegetation should be limited to relatively small areas required for surface facilities. The mine site area, washery reject disposal area, rail loop and access roadways will be cleared of existing vegetation. The total area involved would only amount to four hectares.

The poor sandstone soils support dry sclerophyll forests of mainly peppermint associations plus mountain gum (Eucalyptus dalrympleana). Snow gums (Eucalyptus pauciflora) occur on some of the high points and low scrub often covers the more exposed and well-drained ridges. In the deeper valleys more luxuriant growth occurs. This is due in part to the better water supply and also in part to the better nutrients available.

Table 6 suggests that soils of the sandstone plateau are low in phosphorus and, the valleys, particularly where the Narrabeen shales are intersected, are much richer.

There does not appear to be any rare or unique plant species which will be affected by the proposed developments. Part of the area has been previously cleared for construction of the Glen Davis Tank farm and a small farm both of which are no longer in use.

As soon as practicable, following the construction of surface facilities, the site will be landscaped with native grasses, shrubs and trees to present a pleasing appearance. Adequate staff will be employed to maintain this landscaping.

The washery refuse disposal area will be covered with topsoil on completion and planted with trees, shrubs and grasses

Progressive and Information

TABLE 6 [1]

PHOSPHATE NUTRIENT CONTENT OF SOILS

	PARENT MATERIAL				
	HAWKESBURY SANDSTONE		WIANAMATTA SHALES	NARRABEEN SHALES AND SANDSTONES	
	Ridges	Valleys		Chocolate (Low P)	Chocolate (High P)
PLANT COMMUNITY	Woodland and Scrubs	Depauperate Rainforest	Wet Sclerophyll Forest	Wet Sclerophyll Forest	Rainforest
P CONTENT OF SURFACE SOIL (0-3 INS.) (MEAN AND RANGE) (PPM)	37 (23-53)	98 (65-163)	139 (74-266)	180 (102-211)	430 (230-720)
P CONTENT IN SOIL PROFILE AT ABOUT 9 INS. (PPM)	16	-	220	-	530-720
P CONTENT OF PARENT MATERIAL (MEAN AND RANGE) (PPM)	32 (12-55)		630 (107-1,950)	301 (96-590)	2,230 (1,200-3,100)

1. Reference - Spencer Thomas & Associates, 1974

progressively as final contours are reached. Overall, the impact on flora in terms of regional forest resources is judged to be slight. No adverse impact to the Newnes State Forest 10 kilometres to the north of the surface facilities, will result from implementation of the proposal and land rehabilitation programmes will greatly mitigate long-term effects.

Fauna

As with effects anticipated for flora discussed above, direct effects on wildlife within the region of the development site will probably be minor due to the relatively small area of habitat to be cleared. Some animals will be lost within those areas directly affected, but no significant impact in terms of regional populations of fauna species is expected. Following land rehabilitation and revegetation programmes, some recolonisation can be expected as human activities subside.

"It has been estimated (6)* that there are about 400 species of terrestrial vertebrates in the Hawkesbury River Valley System: birds 250 species, mammals 50 species, reptiles 50+ species and amphibians 50+ species. No figures are available for the portion involved in this study but apart from coastal species the variety would be quite large. Of the mammals the Eastern Grey kangaroo is frequently observed, particularly in grassed areas of the State Forest. The red necked wallaby is even more common and it seems probable that the numbers of Macropods have increased due to the

* Reference refers to Spencer Thomas & Associates, 1974 Report

clearing of natural forests for pine plantations to the north. Possums, dingoes and wombats appear to be common. The platypus seems to be relatively common in the Wollangambe river. The relative inaccessability of the area, has probably meant that man has had little effect on the native animal population. Introduced species, such as the rabbit are quite common but numbers have decreased since the 1950's."+ As for flora, the information gathered on fauna does not indicate any rare or unusual species or any valuable wildlife habitat in the area of the proposed development. +(Spencer Thomas & Associates 1974).

Aquatic Life

The site for the Clarence Colliery is located on the headwaters of the Wollangambe Creek and no significant water bodies exist on the site that would be directly affected by the proposed action. However, further downstream away from the site, there are significant pools and flowing water that would support aquatic life such as fish and amphibians, and possibly the platypus. Uncontrolled runoff from the site area would flow eastward to these areas and through areas of the Blue Mountains National Park, so extensive safeguards to avoid pollution of water courses off-site have been included in the design of the colliery. (See description of the proposed action and environmental impact discussion for water quality). Provided these safeguards are properly installed and maintained (as proposed in this report), no significant adverse effect on existing aquatic life should result.

5.3 Social Environment

Employment

The development of the proposed Clarence Colliery would provide employment for a construction labour force of up to 250 men and a mine operational force of up to 500 men. The source of this labour force is expected to be drawn primarily from an existing pool of miners in the Lithgow area with some contributions from other nearby population centres in the Blue Mountains such as Katoomba. The proposed colliery development will be of benefit in reducing unemployment levels in the Lithgow-Blue Mountains region.

Regional, State and National Economic Conditions

The development of the Clarence Colliery will benefit the economy in terms of providing employment for hundreds of workers, expanding the industrial base of the region, and injecting millions of dollars into the economy through purchase of plant and machinery. In a broader view, there will also be national benefits in terms of increased mineral export earnings and a favourable effect on Australia's balance of payments. Taxes, royalties and other payments to local and state governments can also be viewed as a community benefit.

Community Health and Social Services

Since a sudden large influx of population to the area is not anticipated due to the existing pool of miners, supporting staff and trainable unemployed persons, the impact on community health and social services should be minimal. The growth of the labour force is expected to occur over a three year period and would help change the declining trend of the last 20 years in the towns from the Katoomba to Bathurst areas.

Land Use

The site for the Clarence Colliery is located in an area used for mining and industrial use. Quarrying operations are currently being conducted near the site. Thus, a major change in land use for the site itself will not result from colliery development. However, nearby land uses or potential land uses could indirectly be affected by colliery development.

The Blue Mountains National Park, the boundary of which is adjacent to the colliery site to the east, could conceivably be indirectly affected by the proposed action. Although no recreational developments are located in the portion of the park near the colliery and current sand-mining sites and visitation of these areas is extremely infrequent due to the lack of roadways or walking tracks, future development plans or plans to extend park boundaries westward to further protect these wilderness areas would be thwarted for the time being.

Other nearby land uses, including single family residences to the southeast along the Bell's Line of Road may also be indirectly affected if the increase in industrial and transportation activity were to be viewed as a detriment to land values or desirability of any area for family dwellings.

However, due to the distances involved and intervening forest vegetation, this effect is expected to be minimal.

Aesthetics

To minimise any adverse impacts to aesthetic values, an extensive site landscaping and tree planting programme will be conducted and maintained at the colliery site which will beautify the grounds. The selection of building materials and exterior colour schemes will blend in with the surroundings and present a pleasing appearance.

Railway and Road Transportation

The transportation of the labour force to and from the colliery will increase traffic on the Bell's Line of Road (Sydney to Lithgow road), particularly at shift-change time. This could involve up to 1,000 additional vehicle movements per day concentrated in these descrete time periods, if each employee used his personal vehicle. It is anticipated however, that a bus service to and from residential centres such as Lithgow and/or Katoomba will be provided which will greatly ease this impact. It is also conceivable that, depending on negotiations with the Public Transport Commission, railway passenger trains to the Newnes Junction Railway Station could be re-instated thus further mitigating impact on road traffic.

The transport of coal to Sydney for export will involve additional train movements on the Great Western Railway Line, but the capacity of the line is adequate to handle the increased traffic. By utilising the railways to transport the product coal, overall efficiency would be maximised while at the same time minimising environmental impacts.

6.0 SOURCES OF INFORMATION

6.1 Primary Investigators

The primary investigators who were involved in the project are listed below together with a brief summary of their qualifications and experience.

Peter Campbell - is an Associate of Dames and Moore and before joining the firm in 1972, he held the position of lecturer in Earth Sciences at Macquarie University with a major interest in micrometeorology. He has had considerable experience in environmental matters and has acted in a management capacity on many environmental projects both in the U.S. and Australia.

James McNamara - is a water quality and pollution control specialist with Dames and Moore and holds degrees in chemical engineering and geology. He obtained ten years experience as an engineer in heavy industry, especially in water quality management, before branching into environmental sciences and has since participated in a number of studies.

John Herington - is a soils and rock engineering specialist with Dames and Moore and holds a Masters degree in soil mechanics from the University of Sydney. He has had considerable experience in site engineering and engineering analysis for foundation design as well as projects related specifically to slope stability.

James Weston - is a Masters graduate in park management and land use. He has participated in a number of environmental studies concerned with the socio-economic impact of proposed developments in partly built-up areas and has been responsible for several reports on possible land use management in rapidly developing sub-urban regions.

6.2 Personal Contacts

Coalex Pty. Ltd.

Mines Department of N.S.W.

National Parks and Wildlife Service

Soil Conservation Service of N.S.W.

6.3 References

Australian Bureau of Census and Statistics. (1974). Handbook of Local Statistics - New South Wales

Australian Bureau of Census and Statistics. (1973). Census of Population and Housing, 1971. Characteristics of Population and Dwellings, Local Government Areas, New South Wales. Bulletin 7, Part 1.

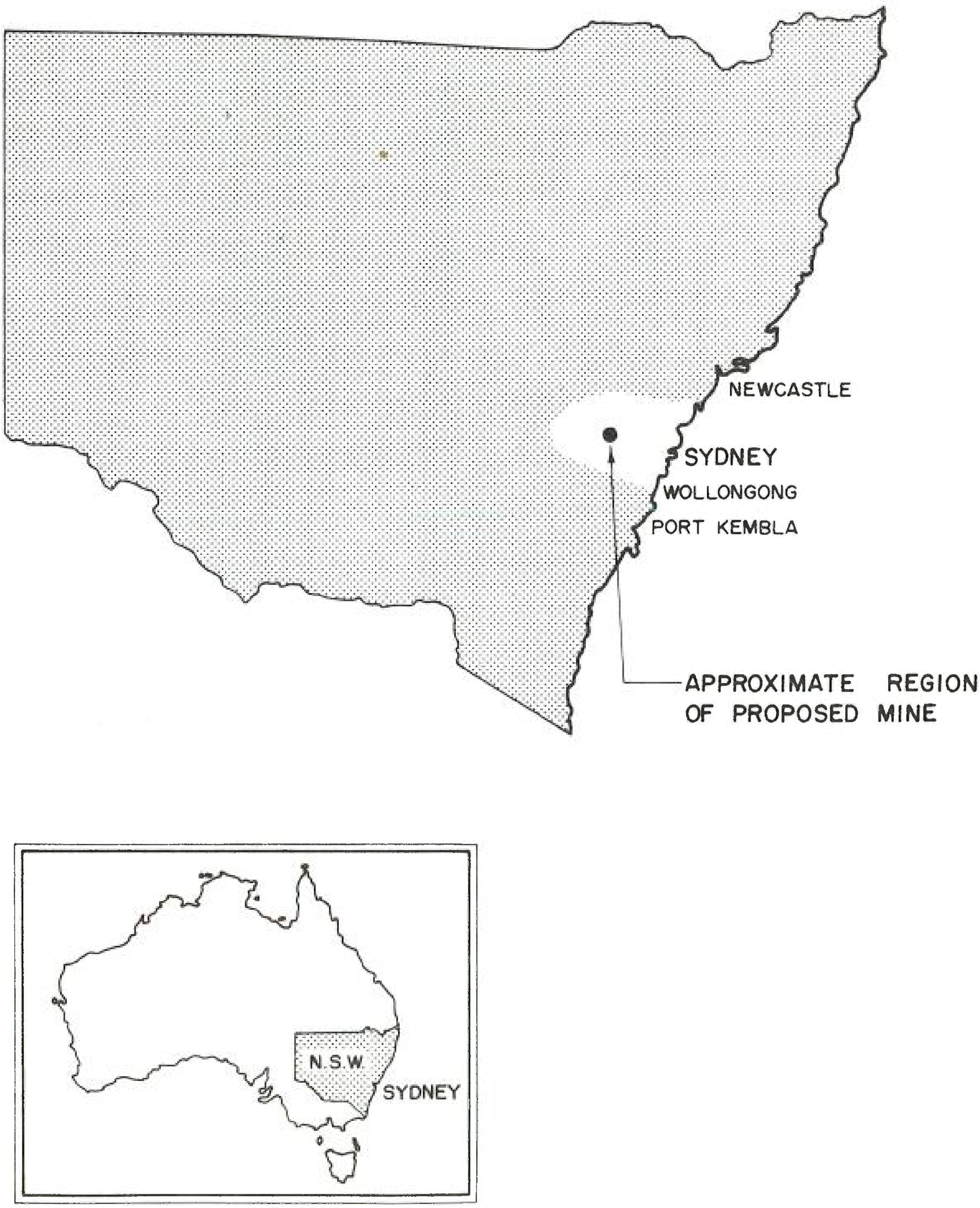
Ellis, J.P., P. Rowley and R. Wheway. (1973). An investigation of Water Pollution at Coal Washeries. Water Research Foundation of Australia.

Nasher, Beryl, (1967). Geology of the Sydney Basin. The Jacaranda Press.

Northcote, K.H. (1966). Atlas of Australian Soils. Explanatory data for Sheet 3, Sydney-Canberra-Bourke-Armidale area. C.S.I.R.O.

Setchell, G.H. (1968). Sydney 2000: Requirements for Conservation of Natural Areas, Scenic Preservation and Recreation. National Trust of Australia (N.S.W.)

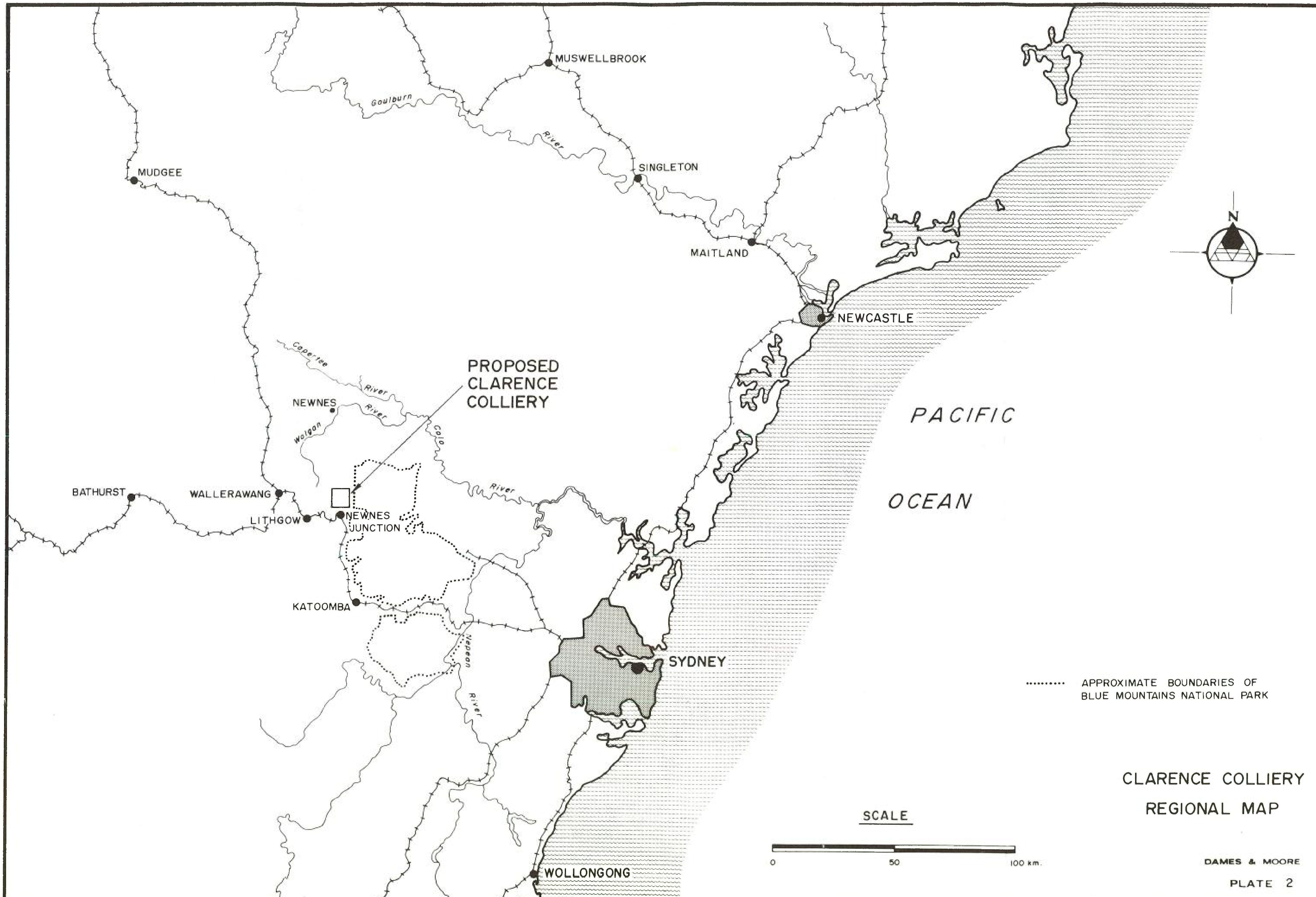
Spencer Thomas & Associates Pty. Ltd. (1974). Environmental Impact Statement - Proposed Wolgan Valley and Newnes Junction Coal Mines.



LOCATION MAP

DAMES & MOORE

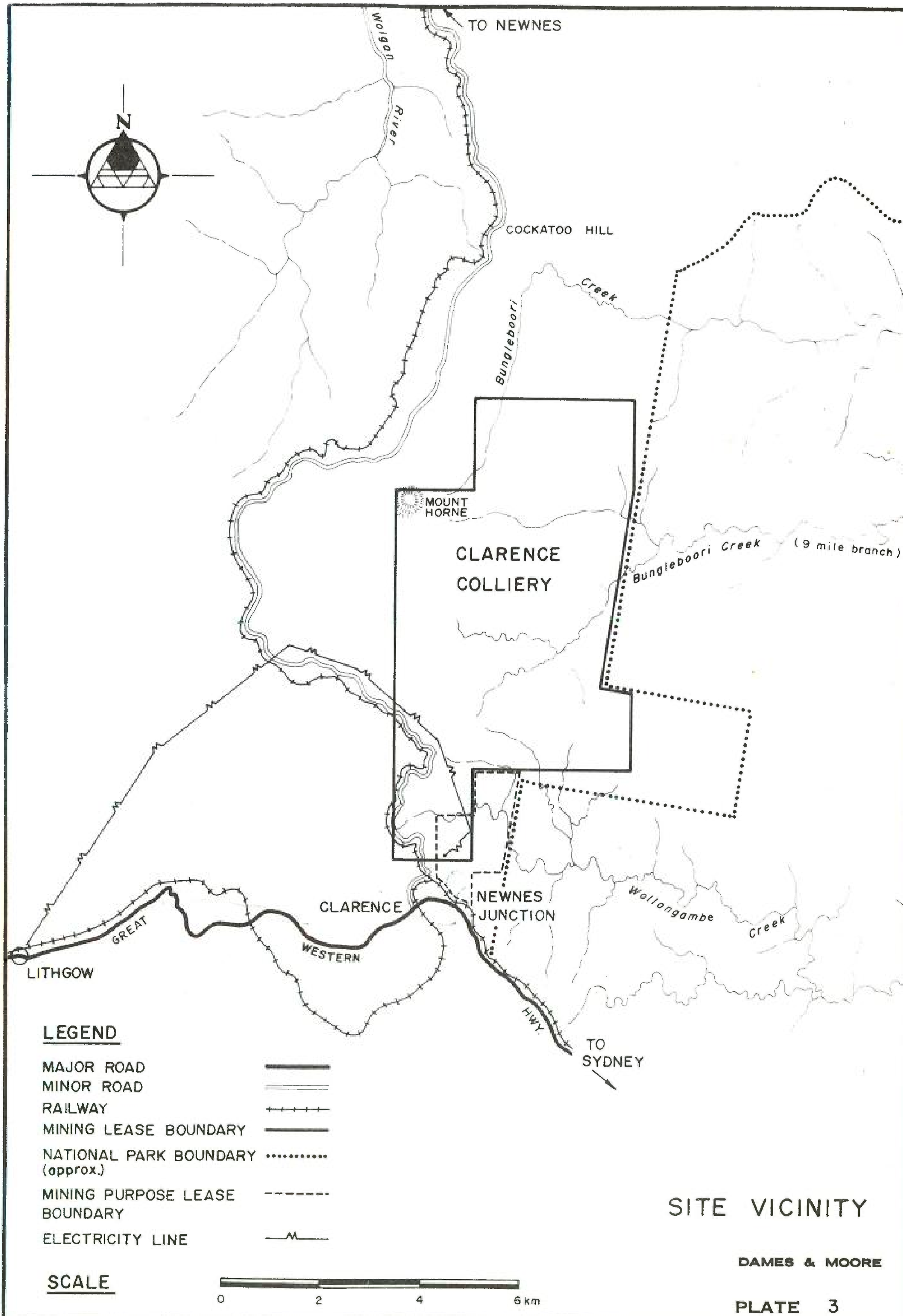
PLATE I



CLARENCE COLLIERY
REGIONAL MAP

DAMES & MOORE

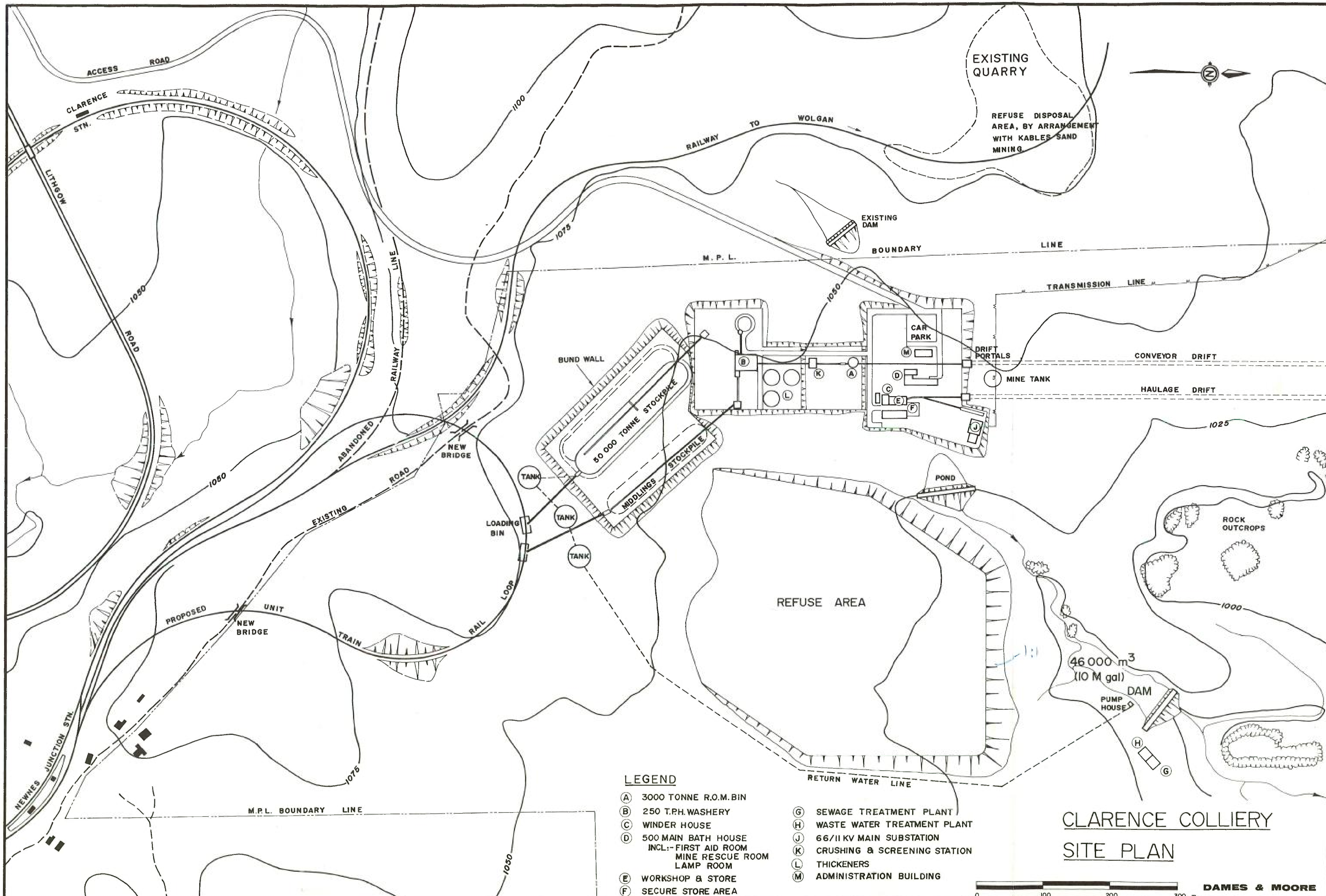
PLATE 2



SITE VICINITY

DAMES & MOORE

PLATE 3



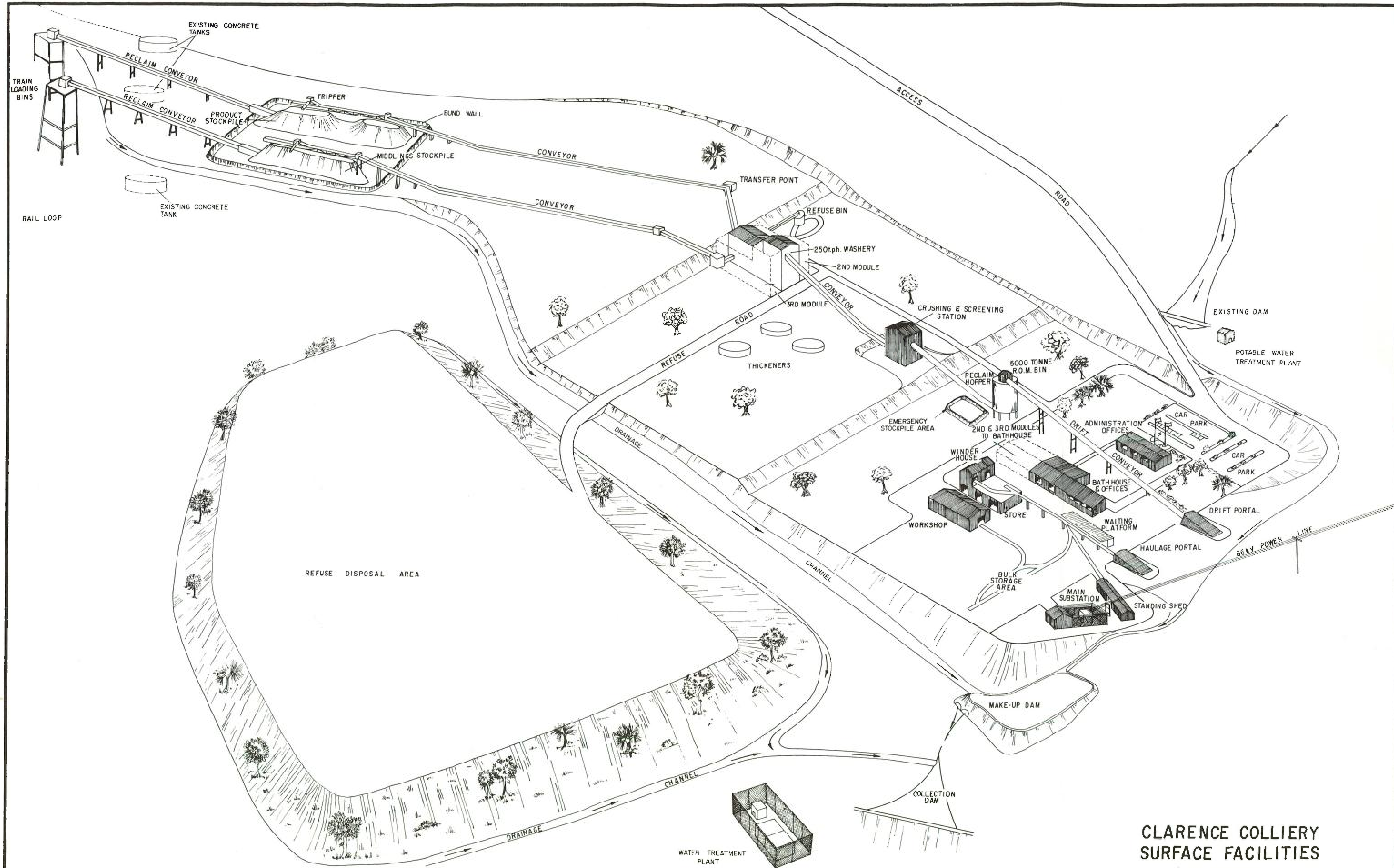
LEGEND

- (A) 3000 TONNE R.O.M. BIN
- (B) 250 T.P.H. WASHERY
- (C) WINDER HOUSE
- (D) 500 MAIN BATH HOUSE
  INCL:- FIRST AID ROOM
  MINE RESCUE ROOM
  LAMP ROOM
- (E) WORKSHOP & STORE
- (F) SECURE STORE AREA
- (G) SEWAGE TREATMENT PLANT
- (H) WASTE WATER TREATMENT PLANT
- (J) 66/11 KV MAIN SUBSTATION
- (K) CRUSHING & SCREENING STATION
- (L) THICKENERS
- (M) ADMINISTRATION BUILDING

CLARENCE COLLIERY SITE PLAN

DAMES & MOORE

PLATE 4



CLARENCE COLLIERY SURFACE FACILITIES
(DIAGRAMMATIC)

DAMES & MOORE

PLATE 5

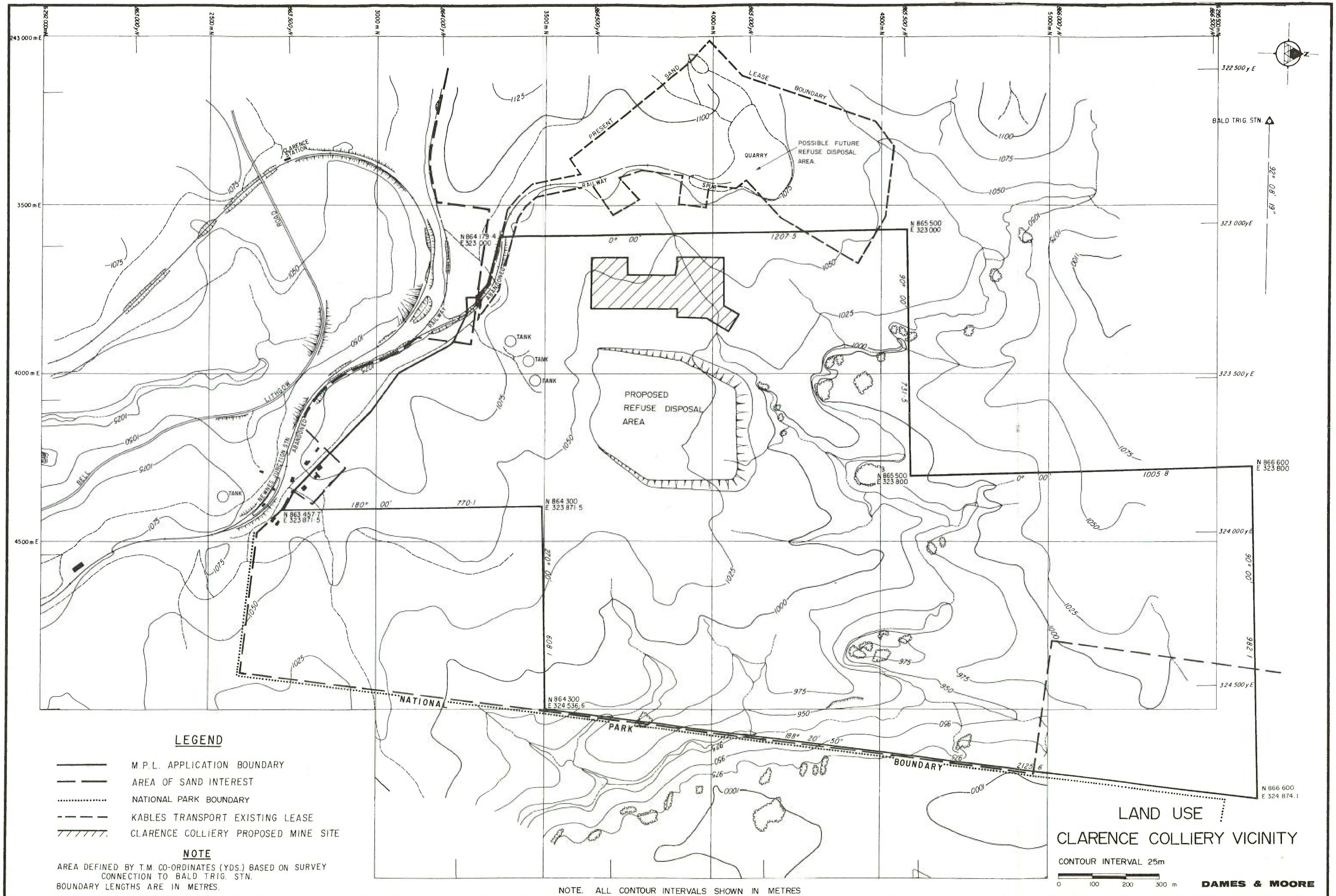
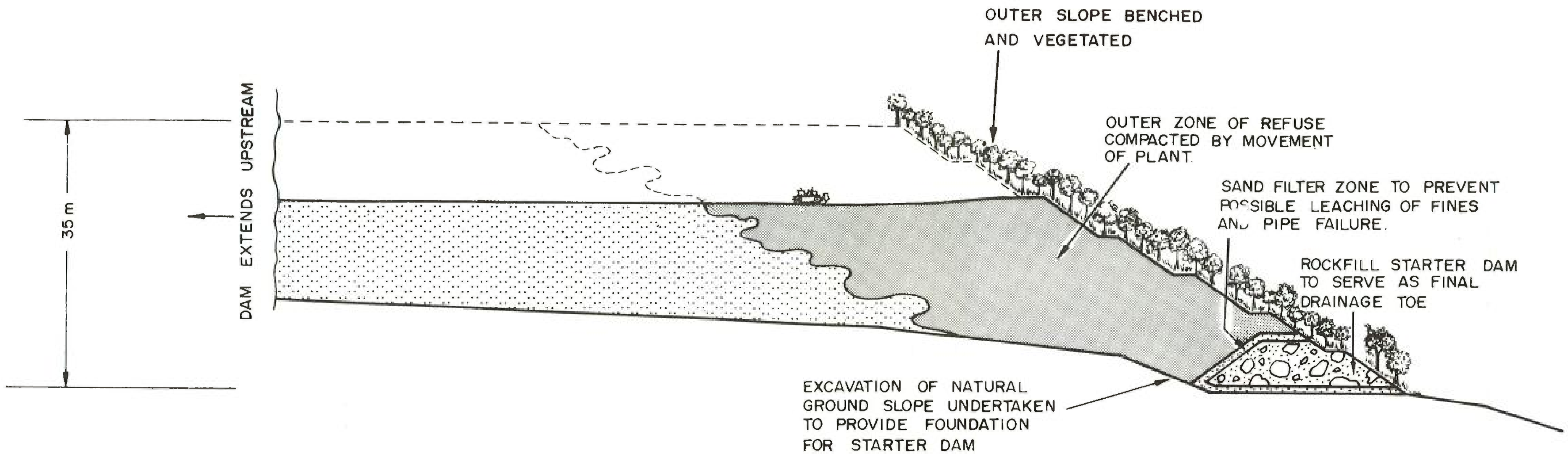
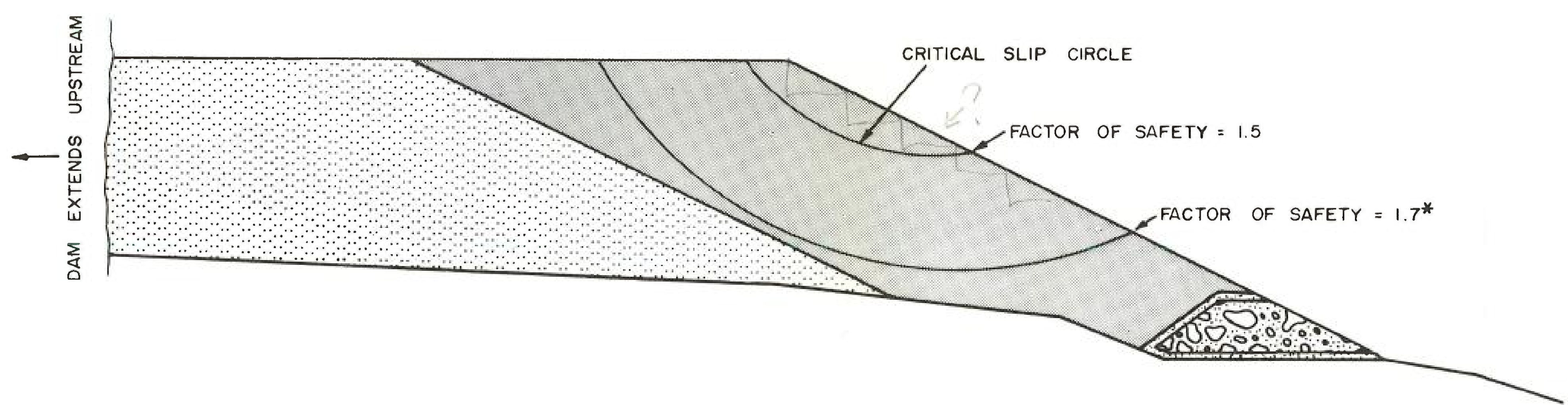

LAND USE
CLARENCE COLLIERY VICINITY
CONTOUR INTERVAL 25m
0 100 200 300 m
DAMES & MOORE
LEGEND
M.P.L. APPLICATION BOUNDARY
AREA OF SAND INTEREST
NATIONAL PARK BOUNDARY
KABLES TRANSPORT EXISTING LEASE
CLARENCE COLLIERY PROPOSED MINE SITE
NOTE
AREA DEFINED BY T.M. CO-ORDINATES (YDS.) BASED ON SURVEY CONNECTION TO BALD TRIG. STN.
BOUNDARY LENGTHS ARE IN METRES.
NOTE. ALL CONTOUR INTERVALS SHOWN IN METRES
PROPOSED REFUSE DISPOSAL AREA
POSSIBLE FUTURE REFUSE DISPOSAL AREA
QUARRY
PRESENT SAND LEASE BOUNDARY
RAILWAY SPUR
ABANDONED RAILWAY
CLARENCE STATION
NEWNES JUNCTION STN
LITHGOW BELL ROAD
NATIONAL PARK BOUNDARY
BALD TRIG. STN.
92° 08' 19"
TANK
N 864 179.4
E 323 000
N 865 500
E 323 000
N 866 600
E 323 800
N 865 500
E 323 800
N 864 300
E 323 871.5
N 863 457.7
E 323 871.5
N 864 300
E 324 536.6
N 866 600
E 324 874.1
0° 00'
1207.5
90° 00'
731.5
1005.8
180° 00'
770.1
270° 00'
809.1
188° 20' 50"
2125.6
982.1

PLATE 6





SLOPE STABILITY -
FACTOR OF SAFETY
DIAGRAM

LEGEND

- UNCOMPACTED REFUSE
- WELL COMPACTED REFUSE
- ROCKFILL
- * ASSUMES THAT COMPETENT BEDROCK IS CLOSE TO THE NATURAL GROUND SURFACE.

SCALE

0 5 10 20 30 40 m

SEE ATTACHED NOTES

CLARENCE COLLIERY
PROPOSED REFUSE
DISPOSAL SCHEME

DAMES & MOORE

PLATE 7

CLARENCE COLLIERY PROPOSED REFUSE DISPOSAL SCHEME

NOTES:

1. THE OUTER SLOPE OF THE REFUSE DISPOSAL DAMS WILL BE BENCHED TO LIMIT EROSION AND ASSIST IN REVEGETATION. BENCHING WILL RESULT IN OVERALL SLOPE NOT EXCEEDING 2:1 (HORIZONTAL : VERTICAL). DURING STAGED CONSTRUCTION A LIFT HEIGHT OF 5 METRES WILL BE USED.

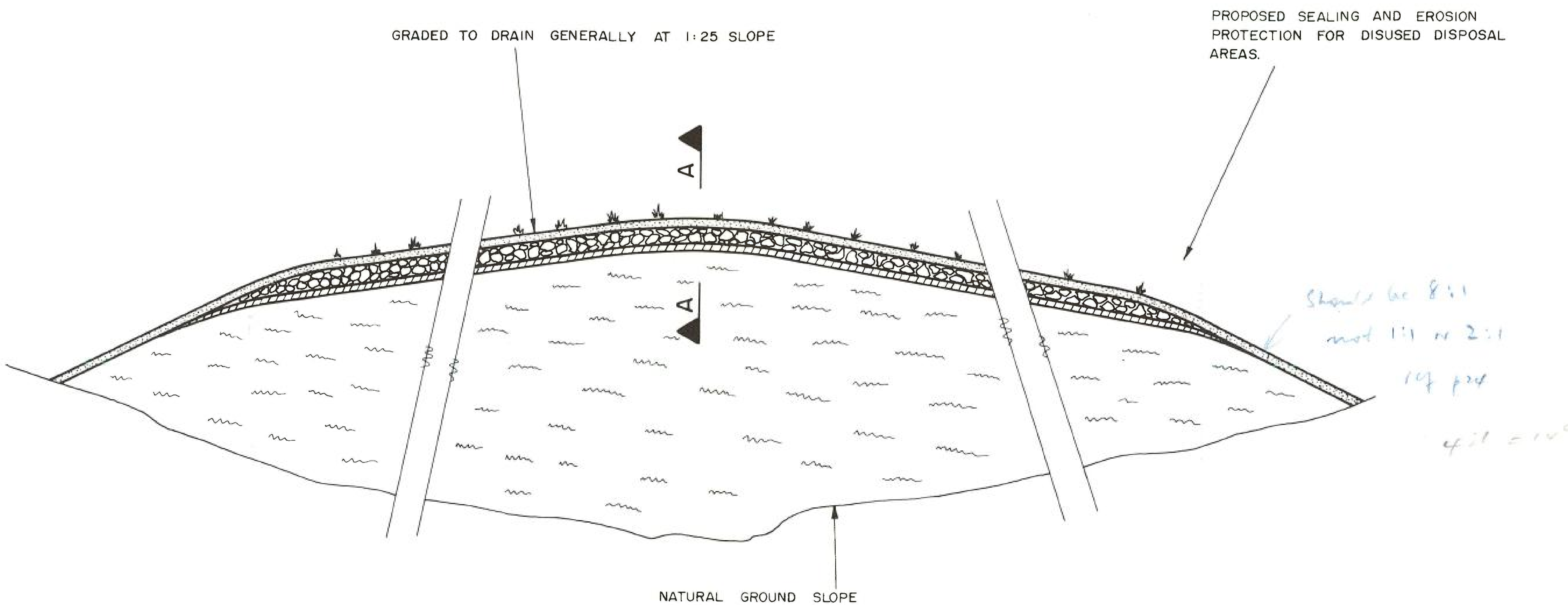
2. THE SEEPAGE FROM THE REFUSE PILE WILL BE COLLECTED IN THE ACROSS-STREAM COLLECTION DAM FROM WHENCE IT WILL BE PUMPED TO THE TREATMENT PLANT FOR REUSE IN THE WASHERY.

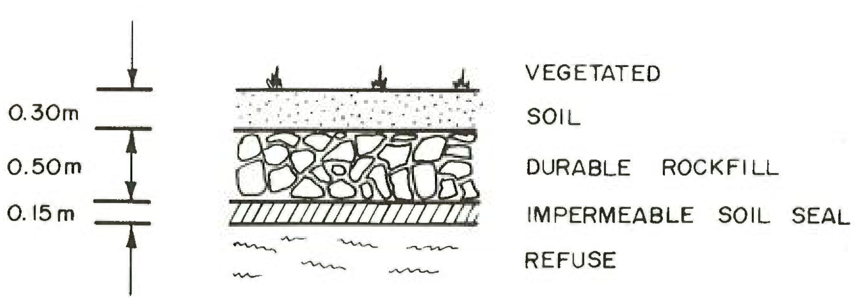
3. SURFACE DRAINAGE AND STORM RUN OFF FROM THE CATCHMENT SURROUNDING THE REFUSE DISPOSAL AREA WILL BE DIVERTED BY DRAINAGE CHANNELS AND COLLECTED TO DISCHARGE DOWNSTREAM OF THE DOWNSTREAM SEEPAGE DAM.

4. PRIOR TO FINAL DESIGN AND CONSTRUCTION THE AREA BENEATH THE PROPOSED REFUSE DAM WALL WILL BE ADEQUATELY INVESTIGATED BY A COMPETENT GEOTECHNICAL ENGINEER TO EVALUATE THE PRESENCE OF ANY WEAK AND/OR PERMEABLE SUBSOILS. THESE, IF FOUND SHOULD BE REMOVED AND A FOUNDATION OF ADEQUATE STRENGTH PLACED.

5. THE DOWNSTREAM SEEPAGE COLLECTION DAM MAY BE A CONVENTIONAL EARTH-FILL CENTRE CORE DAM WITH THE UPSTREAM ZONE CONSTRUCTED OF COMPACTED COARSE REFUSE. HOWEVER, THE DOWNSTREAM ZONE WILL NOT BE CONSTRUCTED FROM REFUSE OWING TO THE POSSIBILITY OF ACID SEEPAGE WATER.

6. DURING THE CONSTRUCTION OF THE REFUSE DAM WALL PERIODIC INSPECTION AND TESTING OF THE COMPACTED REFUSE WILL BE UNDERTAKEN TO ENSURE THAT CONSTRUCTION TECHNIQUES ARE ADEQUATE.





SECTION A - A
OF REFUSE DAM, PLATE 4

DIAGRAMMATIC SECTION THROUGH REFUSE DISPOSAL AREA. (General)

DAMES & MOORE

PLATE 8

TOPOGRAPHIC MAP OF
CLARENCE COLLIERY

Showing 12sq. miles Lease Application

CONTOUR INTERVAL 20 METRES

DAMES & MOORE

0 0.5 1.0 km

PLATE 9

APPENDIX 1

LABORATORY TESTING

APPENDIX I

Laboratory Testing

Mechanical properties

As discussed in section 4.5.2 of the main report, a bulk sample of refuse representative of the refuse to be produced at Clarence colliery was tested in the laboratory. This sample was obtained from a neighbouring colliery where the seam lithology is known to be very similar. Such testing was carried out to provide data on material properties for use in preliminary design calculations.

The following laboratory testing was carried out:-

(1) The sample was mechanically broken down to 40mm maximum particle size,

(2) the sample was then sieved and the 25mm to 0.5mm size was retained for further testing,

(3) the retained fraction (coarse refuse size) was compacted in a mould to near standard compaction (ASA 89 1966 Test 11A) to evaluate the compacted density,

(4) the sample was tested in a falling head permeameter to evaluate the permeability of the material to assist in seepage calculations,

(5) the sample was then placed in a triaxial shear testing machine - back pressure saturated, and a staged consolidated undrained triaxial test - with pore pressure measurements carried out to evaluate the effective shear strength parameters,

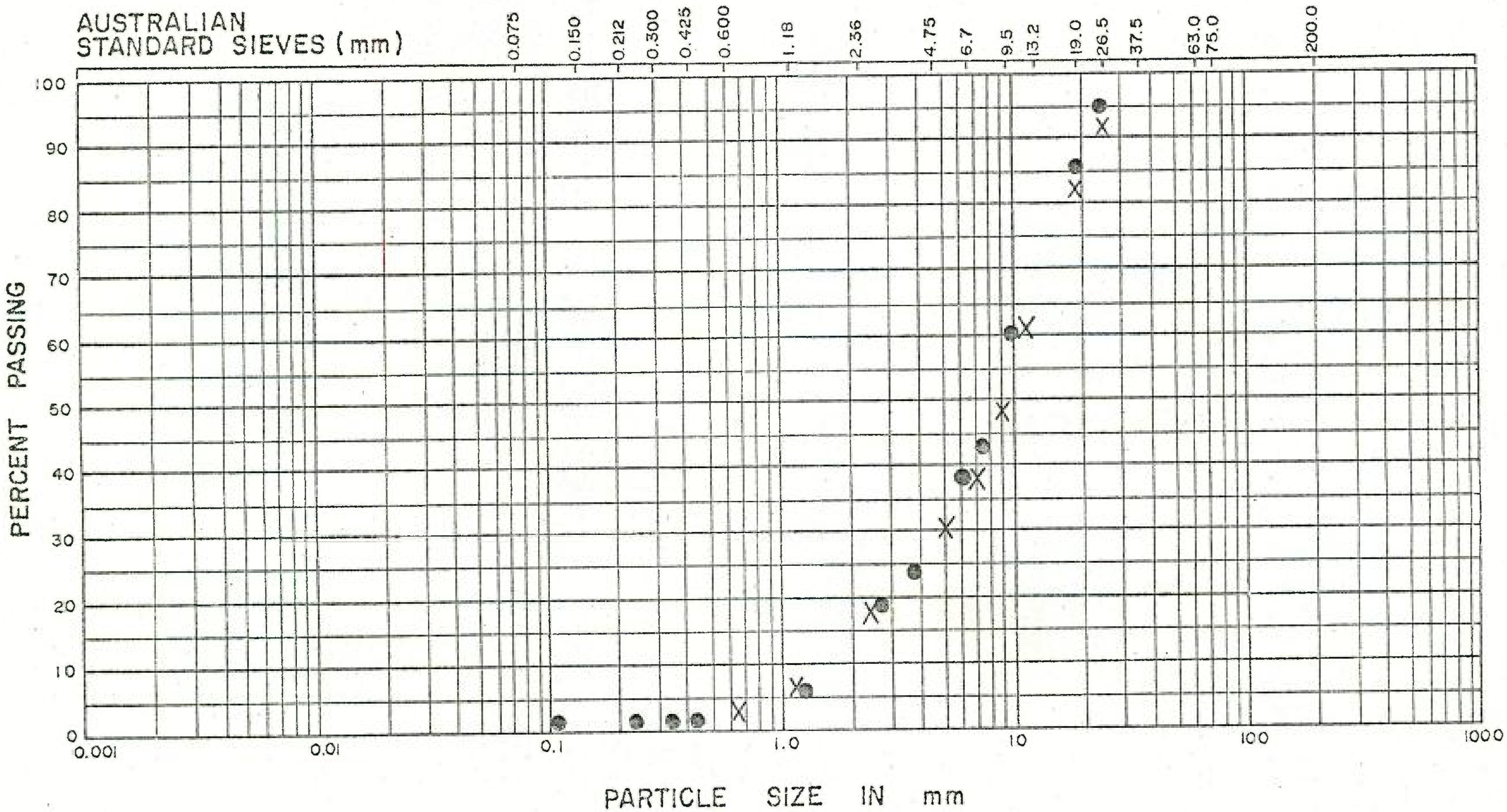
(6) finally a sieve analyses of the sample following testing was carried out to enable an assessment of particle breakdown during saturation and compaction to be evaluated.

The results of the above tests are calculated below and the results of the sieve analyses of the sample prior and after testing are shown on Plate A-1.

TEST TYPE	COMPACTED DRY DENSITY	MEASURED PERMEABILITY	
Permeability	1.44 tonnes/m^3	2.6 cms/sec	
Triaxial Testing Consolidated Un-drained with pore pressure measurements	1.48 tonnes/m^3	EFFECTIVE SHEAR STRENGTH PARAMETERS	
		Cohesion C' kPa	Internal Fraction Angle ϕ'
		0	35^{o}

[redacted]

CHECKED BY.................... FILE.................... BY.............DATE.............



CLAY	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	COBBLES
	SILT			SAND			GRAVEL			

TEST TYPE.........DRY SIEVE.................... MATERIAL.........COAL REFUSE....................

CLASSIFICATION......MEDIUM GRAVEL.........

● BEFORE TESTING
X AFTER TESTING

GRADATION CURVE

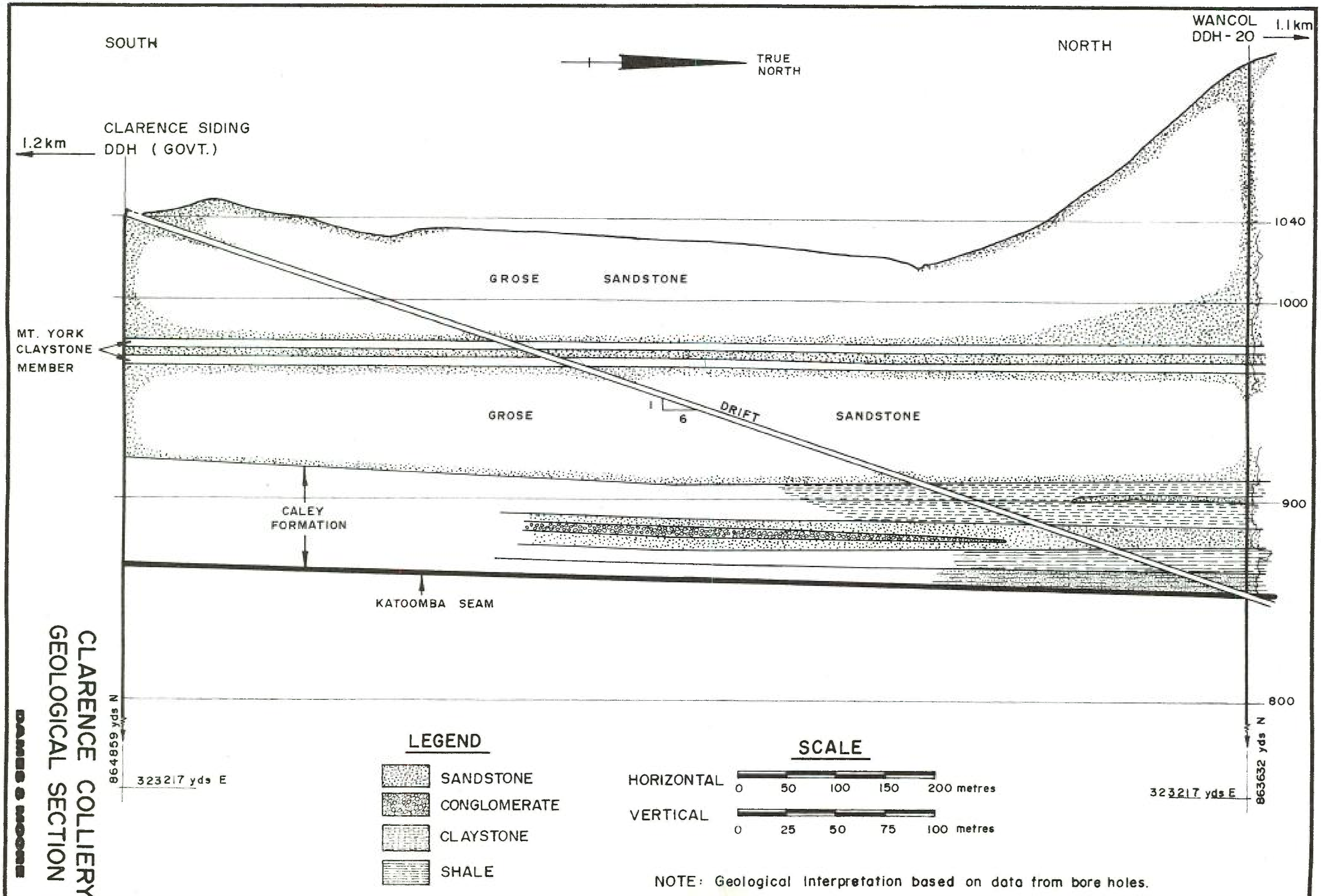
DAMES & MOORE

FIGURE 1

APPENDIX 2

DIAGRAM - CLARENCE COLLIERY GEOLOGICAL SECTION

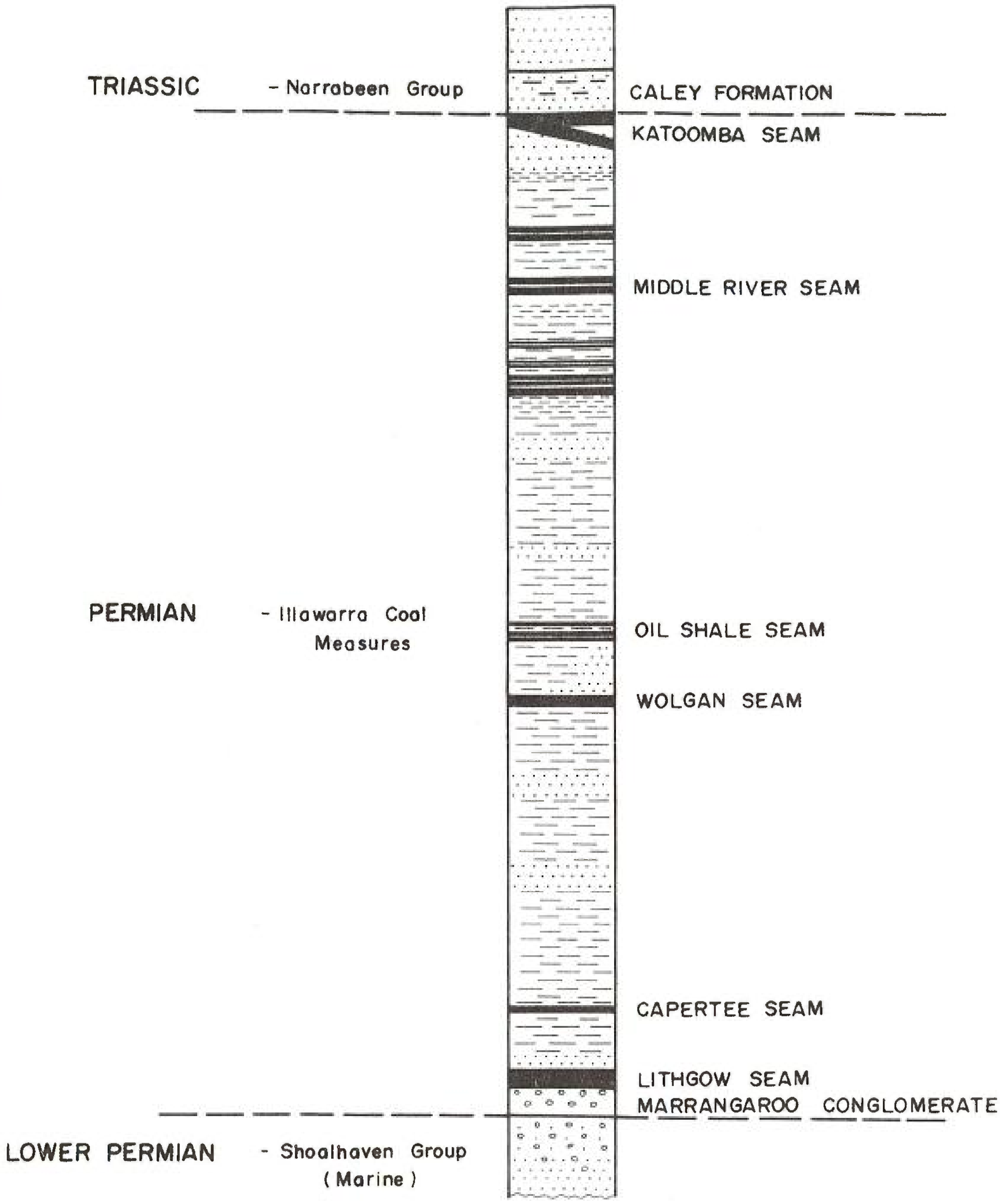
ILLAWARRA COAL MEASURES

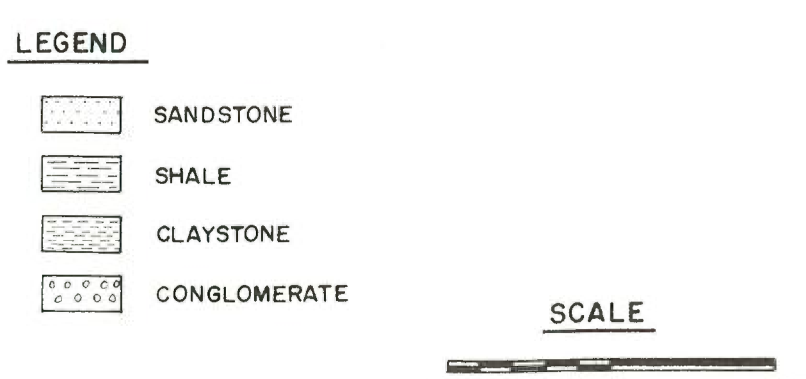


CLARENCE COLLIERY
GEOLOGICAL SECTION

DAMES & MOORE

FIGURE 1





GENERALISED STRATIGRAPHIC COLUMN OF THE

ILLAWARRA COAL MEASURES

WESTERN COALFIELD

DAMES & MOORE

FIGURE 2

COALEX PTY LTD EIS 335A

Proposed Clarence colliery a

Borrower's name	Date	Ext