Sandy Hollow - Maryvale Railway: Economic Evaluation of Proposed Completion

Report

The uncompleted Sandy Hollow-Maryvale railway in New South Wales has a somewhat chequered history. It was finally begun in 1936 after inquiries stretching back to 1911. Construction was slowed to almost a standstill by World War 11, accelerated in the early post war years and then abandoned in 1951 due to a shortage of capital. Subsequent moves to complete the railway foundered in the face of unfavourable economic assessment. This report presents the results of an economic benefit-cost analysis of a recent proposal for the completion of the railway against the background of the discovery of massive proven coal reserves along the line.

BUREAU OF TRANSPORT ECONOMICS

SANDY HOLLOW-MARYVALE RAILWAY: ECONOMIC EVALUATION OF PROPOSED COMPLETION

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FOREWORD

The uncompleted Sandy Hollow-Maryvale railway in New South Wales has a somewhat chequered history. It was finally begun in 1936 after inquiries stretching back to 1911. Construction was slowed to almost a standstill by World War II, accelerated in the early post war years and then abandoned in 1951 due to a shortage of capital. Subsequent moves to complete the railway foundered in the face of unfavourable economic assessment.

This report presents the results of an economic benefit-cost analysis of a recent proposal for the completion of the railway against the background of the discovery of massive proven coal reserves along the line.

The research for this study was undertaken by Mr P.G. Gaetjens of the Economic Assessment Branch under the general supervision of Mr R. Filmer. Assistance in the study was provided by Messrs R. Moreland, R. Butterworth and R.C. Warn of the Economic Assessment Branch and also Dr K. Tronson of the Planning and Technology Branch of the BTE.

In addition the BTE wishes to thank the following organisations for their valuable assistance during the course of the study:

- White Industries Ltd
- Public Transport Commission of New South Wales
- The Joint Coal Board
- Maritime Services Board of NSW
- NSW Grain Elevators Board
- Cobar Mines Pty Ltd
- North Broken Hill Ltd
- Electrolytic Zinc Company of Australia Ltd
- Australian Mining and Smelting Ltd

The co-operation of these organisations is gratefully acknowledged.

Colin A. GANNON
Director

Bureau of Transport Economics
Canberra
July 1979

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SUMMARY

This report presents the results of a benefit-cost analysis of the completion of the Sandy Hollow-Maryvale railway in New South Wales.

Earlier investigations indicated that the expected level of traffic which would utilise the line was not sufficient to justify its completion. However, expansion of world markets for steaming coal has made large-scale coal extraction viable in areas which the railway could service. This new traffic was the main consideration in undertaking this appraisal.

The project was considered in two stages because of the separate freight markets involved over different sections of the line. Stage 1 covers construction of the railway from Sandy Hollow via Ulan to Gulgong for the transport of coal directly to Newcastle. Stage 2 is considered as a marginal subsequent extension to this section, and involves continuing construction from Gulgong to Maryvale.

The analysis is conducted using resource values of costs and benefits. All prices are expressed in terms of constant 1978-79 dollars.

The main benefits accruing to Stage 1 arise from the value of induced extraction and export of coal from Ulan. Stage 2 would service the western and north western New South Wales agricultural and mining activities. The main benefits associated with Stage 2 arise from reduced shipment distances (and thus cost savings) which accrue to freight being transported from these regions to the coast. These benefits together with the capital and operating costs of providing the railway, are discounted to a common base year to obtain the estimated benefit-cost ratio. The sensitivity of the results to changes in construction commencement dates, costs of the railway, and coal export prices is also examined.

Over the range of parameter values examined, benefits significantly exceed costs. Accordingly, the main conclusion of this report is that completion of both stages of the Sandy Hollow-Maryvale railway is warranted under a wide range of plausible conditions.

CHAPTER 1 - INTRODUCTION

HISTORICAL BACKGROUND[1]

This report contains the results of an economic assessment of completion of the Sandy Hollow-Maryvale railway. In order to plan the current proposals for completion of the railway in perspective, it is necessary to understand the historical background to the railway.

The proposal for the railway was first considered in 1911. A New South Wales Royal Commission on Decentralisation of Railway Transit[2] recommended that the line should be built to increase the decentralising effect of a proposed port that was under consideration at Port Stephens.

Construction of the railway began in July 1936. During World War II, construction activity was severely curtailed due to reduced loan allocations and resource shortages. Activity remained restricted until 1951, when construction ceased. By this time, the earthworks were almost complete, but no track had been laid.

Various proposals for completion of the railway were presented to both Commonwealth and State governments during the next sixteen years, until (in 1967) the New South Wales Government announced that an economic appraisal of the completion of the line would be made.

This appraisal was undertaken by the New South Wales Development Corporation, and was published in September 1970 as a 'Report on Sandy Hollow-Maryvale Railway Proposal'. On the basis of a cost-benefit analysis construction of the railway was not economically warranted.[3]

(1) A detailed history of events relating to the Sandy Hollow-Maryvale railway appears in Appendix I.
(2) Royal Commission as to Decentralisation in Railway Transit, Report, pxxi in NSW Legislative Assembly, Parliamentary Papers, 1911, Vol. 2, p.31.
(3) For a fuller explanation of the Development Corporation Study, see Appendix I.

In February 1973, following continued representations with regard to the completion of the line, the then Minister of Shipping and Transport and for Newcastle, the Honourable C.K. Jones, directed the Bureau of Transport Economics to undertake and report on an economic and financial evaluation of the construction of a railway line linking Sandy Hollow and Maryvale. The economic evaluation was intended to consider operating benefits to the railways and possible benefits to existing users (e.g. reduced freight delivery times or passenger journey times). The financial evaluation was intended to consider the effect which the proposed railway would have on NSW Railways operating costs, freight revenue and operating results.

The BTE's report was also intended to canvass possible benefits to national and regional development which could follow completion of the railway.

Initial investigations by the BTE indicated that the methodology used in the report of the Development Corporation of NSW could be improved. Furthermore, estimates of potential traffic and benefits appeared to be low. Subsequent recalculation of benefits indicated that the likely benefit-cost ratio was higher than that obtained by the Corporation. Nevertheless, the results of this preliminary review by the BTE did not favour implementation of the project.

ORIGIN OF THIS STUDY

In 1976, announcements were made of greatly increased proven reserves of steaming coal near Ulan, which lies along the rail route between Sandy Hollow and Gulgong. Furthermore, world markets for steaming coal were expected to become increasingly bouyant in the future. These developments led to the BTE undertaking this further study of the proposal with amended terms of reference(1).

(1) See Appendix 1.

This present study was conducted under terms of reference which involved an economic evaluation of the completion of the Sandy Hollow-Maryvale railway in two stages. The first stage was to cover Sandy Hollow via Ulan to Gulgong, which would service the potential coal export traffic. The second stage was an extension from Gulgong to Maryvale, which would mainly service other freight between western New South Wales and Newcastle.

The second part of the line (Gulgong to Maryvale) was to be considered as a marginal extension of the coal railway between Sandy Hollow and Gulgong. The analysis was to include gross benefits and costs derived from induced coal exports, and future rail cost savings because of reduced distance savings arising from diversion of traffic over the railway. The study also provided for coverage of any other factors which the BTE might regard as relevant.

OUTLINE OF THE STUDY

The Sandy Hollow-Maryvale route and current conditions of works already completed are described in Chapter 2.

Forecasts of coal, and general traffic are outlined in Chapters 3 and 4 respectively. Chapter 5 sets out the economic appraisal of the various options considered. In general, the procedure used in the study was to forecast potential levels of freight which could be carried over the railway. The benefits and costs of alternative options for constructing the railway were then identified, and benefit-cost ratios were calculated.

The appraisal was carried out over a period extending to the year 2000 on a monetary-based benefit-cost analysis. The evaluation considered the line in isolation, and no attempt was made to assess non-pecuniary social benefits or costs associated with completion of the line. Furthermore, the analysis of effects upon the whole New South Wales Government railway network was mainly confined to cost savings on freight which would be diverted over the line. Interactive effects such as impacts upon wagon utilisation in the network were not included in the analysis. Hence the results of the study are indicative rather than exhaustive in terms of identifying the overall economic feasibility of the proposals.

CHAPTER 2 - DESCRIPTION OF THE RAILWAY

THE SANDY HOLLOW-MARYVALE ROUTE

Since most of the tunnelling and earthworks associated with the Sandy Hollow-Maryvale line have been completed, the route for the new line is well-defined. A general map of the area is shown in Figure 2.1 on page 6. From Sandy Hollow the route proceeds westerly for 105 kilometres to Ulan, then south-westerly for 23 kilometres to Gulgong. From Gulgong, the route again takes a westerly direction for 72 kilometres to join the Great Western line near Maryvale.

The topography of the area is generally gentle and undulating, requiring no sharp curves and giving a ruling gradient of 1 in 80 for the route. This compares very favourably with the severe grades and curves on the Great Western line between Maryvale and Sydney.

WORK COMPLETED

Between 1936 and 1951 considerable work was undertaken on the line. The majority of the earthworks (95 per cent) were completed, and four of the five tunnels intended for the line were completed. In addition to this work, the piers and abutments of all three bridges over the Goulburn River were completed, and some steelwork was erected.

A summary of work completed on the line is given in the Gulgong, Sandy Hollow, Maryvale Railway Committee's submission to the Development Commission's Report on the line[(1)]. The work completed comprises:

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(1) Gulgong, Maryvale, Sandy Hollow Railway Committee, 'An Appraisal of the Uncompleted Sandy Hollow-Maryvale (near Dubbo) Railway Links', 30 September 1967. Newcastle, p.17.

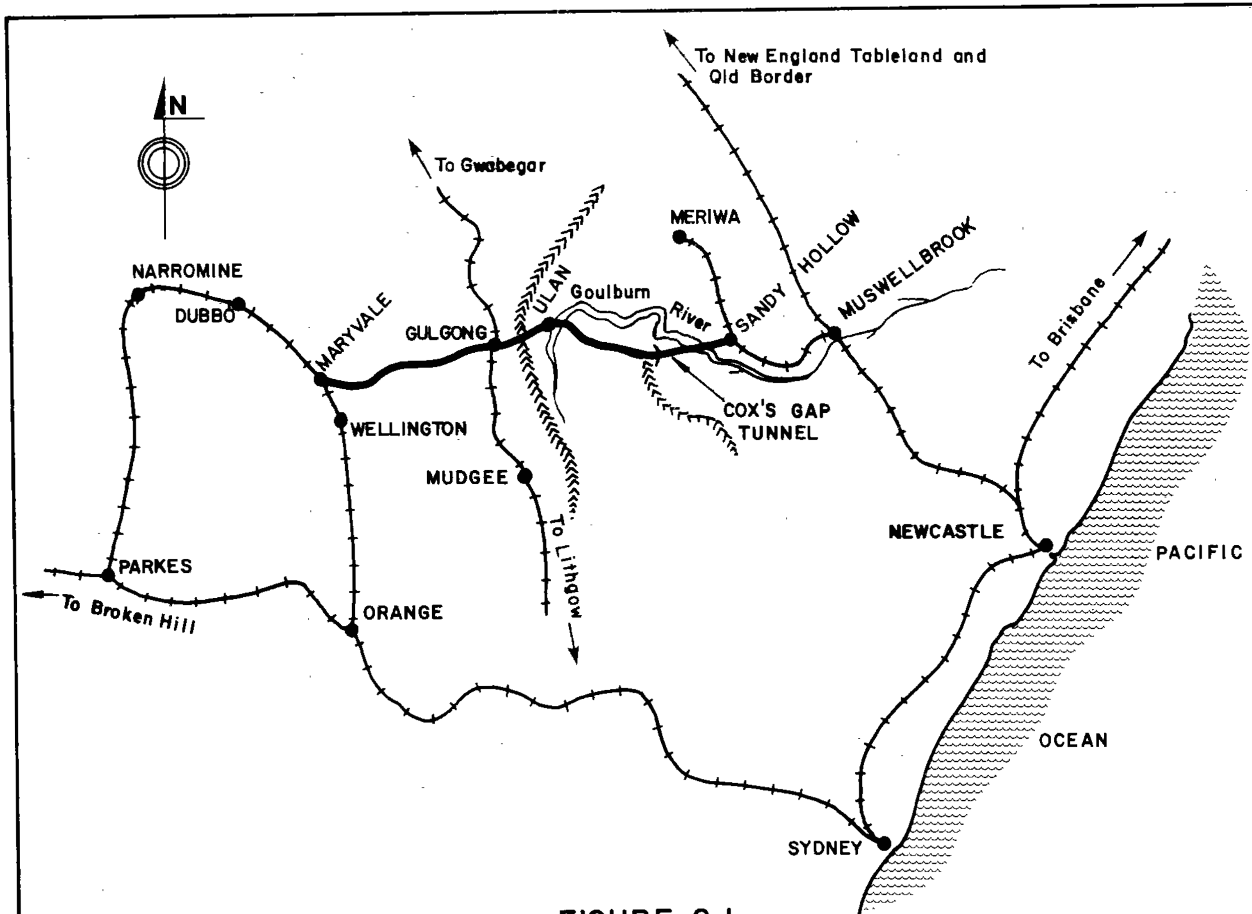

FIGURE 2·1

SANDY HOLLOW — MARYVALE ROUTE

- Four completed and lined tunnels 13, 19, 23 and 16 chains (261, 382, 462 and 322 metres, respectively) in length. Another tunnel (the Bylong tunnel) which is 97 chains (1.95 kilometres) long, has 48 chains (0.97 kilometres) complete (including lining) with the middle section of 49 chains (0.99 kilometres) to be cut and lined;

- Sixteen major bridges are complete, with concrete abutments and piers. Some of the 80 feet (24.4 metres) steel girders have been removed in recent years for use on the North Coast line, and other steelwork is either not yet fabricated or is awaiting placement;

- In the case of earthworks, 395 waterways and flood openings and 23 rabbit stops are complete. Forty-nine cattle stops are also complete. Drains are 95 per cent complete, and embankments are also 95 per cent complete;

- All gates and wing fences are complete for 100 km between Sandy Hollow and Gulgong.

- Earthworks for the platforms of 7 stations originally planned are 80 per cent complete.

WORK REQUIRED FOR COMPLETION

No maintenance of the earthworks has been undertaken since 1951, and considerable rehabilitation is required to complete the line. In addition to the earthworks, the work remaining includes installation and completion of steel bridges, and the provision and laying of ballast, rails and sleepers throughout. It also includes completion of culverts and positioning and completion of safety working equipment, sidings, terminal facilities and amenities. The seven originally proposed station platforms would not be completed, as no stations are currently planned for the line. Additionally, the line is planned to be unfenced. The existing Sandy Hollow-Muswellbrook line would also have to be upgraded to meet the main line standards which are proposed for the route from Maryvale.

In the 1970 New South Wales Development Corporation Report, the cost of completing the railway, together with other necessary upgrading on existing lines, was estimated at $24.17 million. Annual maintenance and staffing costs were estimated at $256 000 and capital recovery (including interest) charges at $1.91 million per annum.

AREA OF INFLUENCE AND POTENTIAL TRAFFIC

The area of New South Wales for which Newcastle would replace Sydney as the closest major port by rail if the Sandy Hollow-Maryvale railway was completed is shown in Figure 2.2. It comprises those local government areas(1) which would generate traffic to and from Newcastle and surrounding areas. The lines which serve the area influenced by the proposed railway are:

- The Great Western line which links Sydney to Broken Hill. Branch lines link Wallerawang to Gwabegar, Orange to Coonamble via Dubbo, Molong to Dubbo, Parkes to Bourke via Narromine (with spurs connecting Nyngan to Cobar and Byrock to Brewarrina);

- The Great Northern line which links Sydney to Brisbane over the Northern Tablelands. A branch line links Gwabegar to Werris Creek via Binnaway;

- Branch lines linking Muswellbrook to Merriwa and Craboon to Coolah.

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(1) Shires of Bogan, Bourke, Brewarrina, Cobar, Coolah, Coonamble, Gilgandra, Mudgee, Talbragar, Timbrebongie, Warren, Wellington, the City of Dubbo, and the Municipality of Narromine.

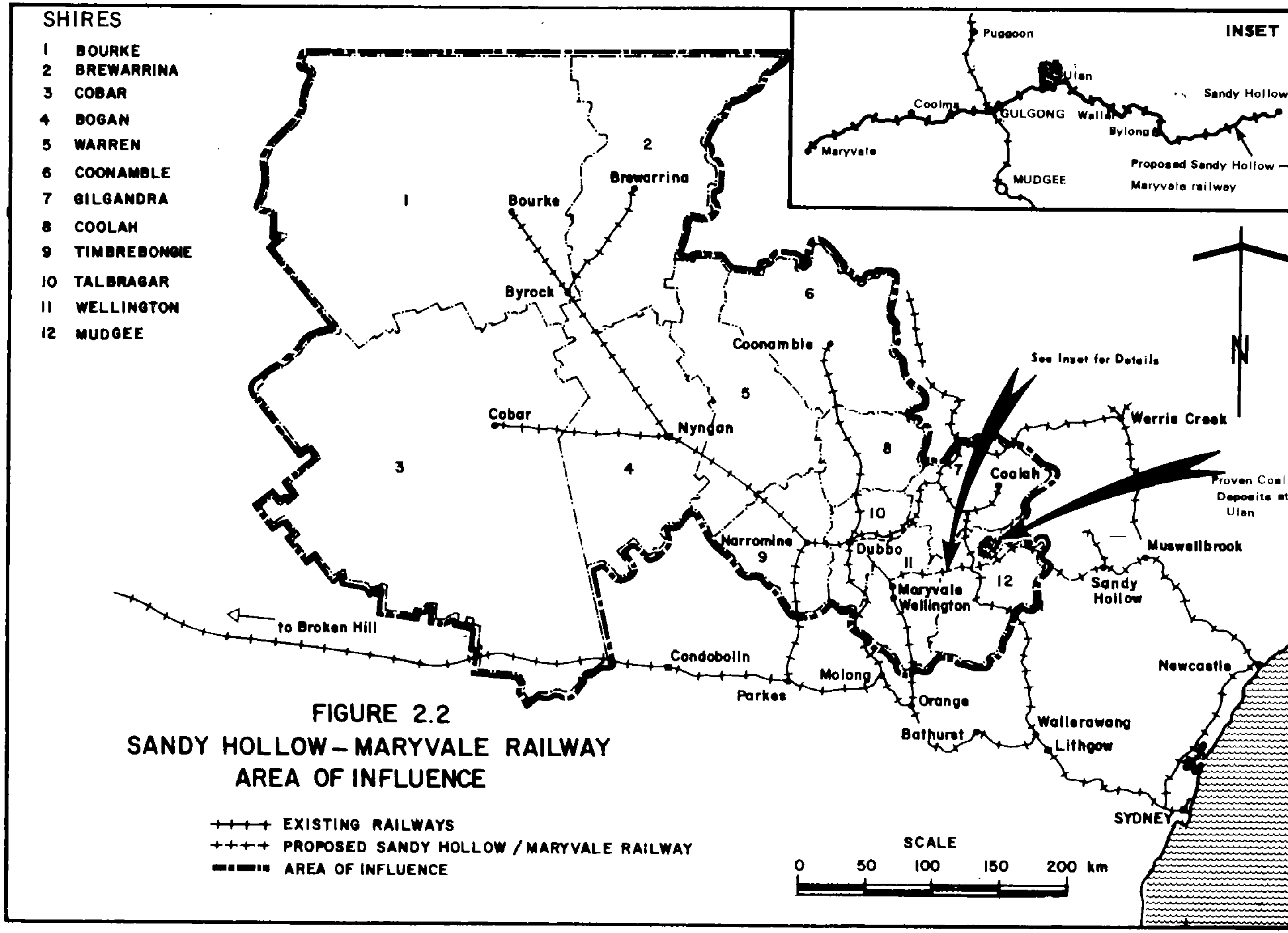

FIGURE 2.2
SANDY HOLLOW – MARYVALE RAILWAY
AREA OF INFLUENCE

This existing railway network provides the area of influence with a coverage of lines such that no part of the proposed Sandy Hollow to Maryvale route is more distant than 40 kilometres from an existing line.

The area occupies part of the wheat-sheep belt of New South Wales. Exports from the area consist of:

- Wheat to Sydney and Newcastle for domestic and export markets;
- Wool to Sydney for domestic and export markets;
- Sorghum to Newcastle;
- Cattle, consigned mainly to Aberdeen;
- Some mineral concentrates extracted from Cobar, which go to Port Kembla and Cockle Creek near Newcastle.

Imports to the area consist mainly of:

- Fuel from Sydney;
- Fertilisers from Newcastle and Port Kembla;
- Agricultural and consumer goods from Newcastle and Sydney.

Traffic which does not originate from the area of influence but nevertheless could be expected to travel over the Sandy Hollow to Maryvale link if it were completed should also be considered. This potential traffic consists mainly of agricultural produce and mineral concentrates coming from outside the area, which may be directed to Newcastle rather than Sydney to avoid rail and port congestion. Small tonnages of interstate traffic may also be redirected over the Sandy Hollow route.

Access from the area to overseas markets is gained through the ports of Sydney and Newcastle. At present, most traffic to Newcastle must pass through Sydney because of the existing pattern of rail routes. Although Sydney is currently the major port of New South Wales, recent and planned developments at Newcastle have increased and will significantly increase the capacity of the port for handling grain and coal - goods typically produced in the area of influence. A more direct rail link from the area of influence to Newcastle would therefore enable the greater utilisation of existing capacity at the port of Newcastle and relieve rail and port congestion at Sydney. Relevant distances to New South Wales ports, as they would apply to Ulan coal shipments for export, are as follows: Ulan to Sydney, 364 km; Ulan to Port Kembla, 454 km; Ulan to Newcastle via Sydney, 532 km; Ulan to Newcastle on the proposed Sandy Hollow-Maryvale railway, 269 km[1].

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(1) Summarised in Appendix III, Table III.2

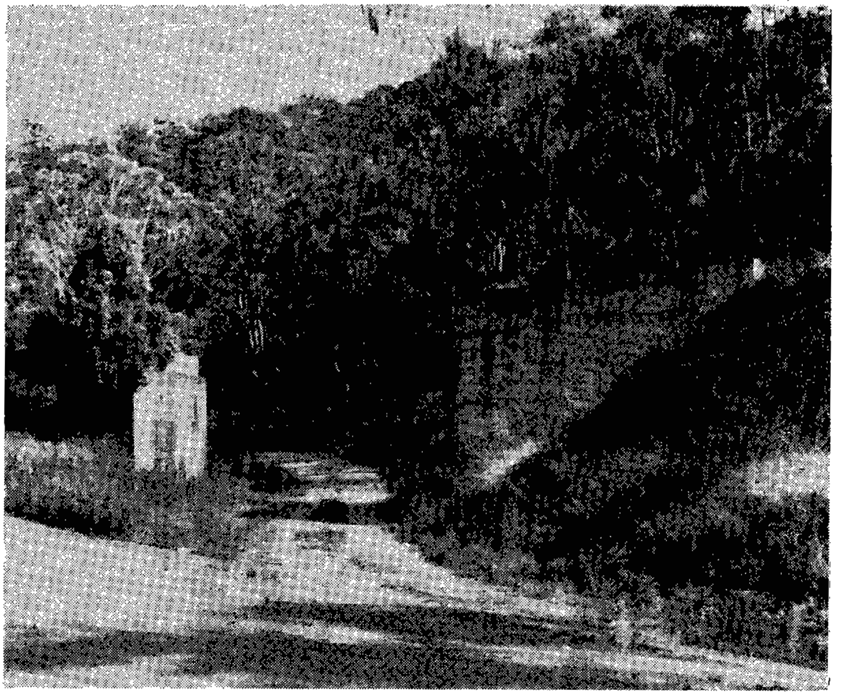

Plate 1 - Approach to Cox's Gap Tunnel showing abutments for road underpass

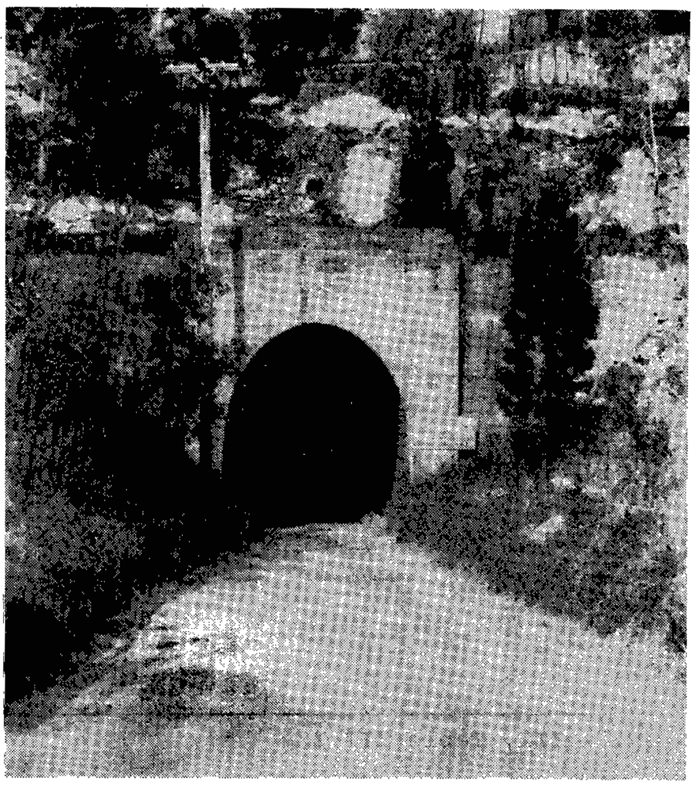

Plate 2 - Cox's Gap Tunnel

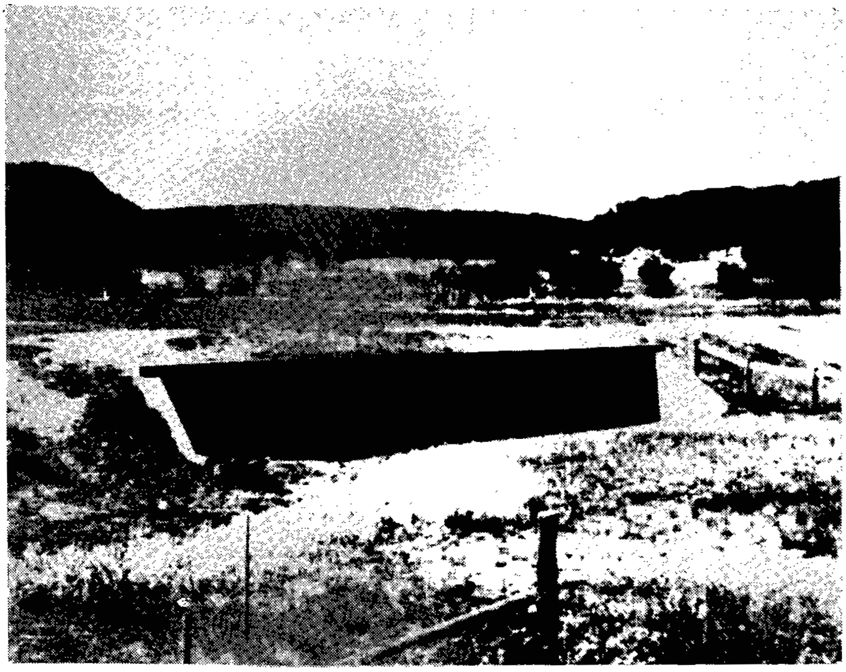

Plate 3 - Sample photograph of culvert, illustrating general condition

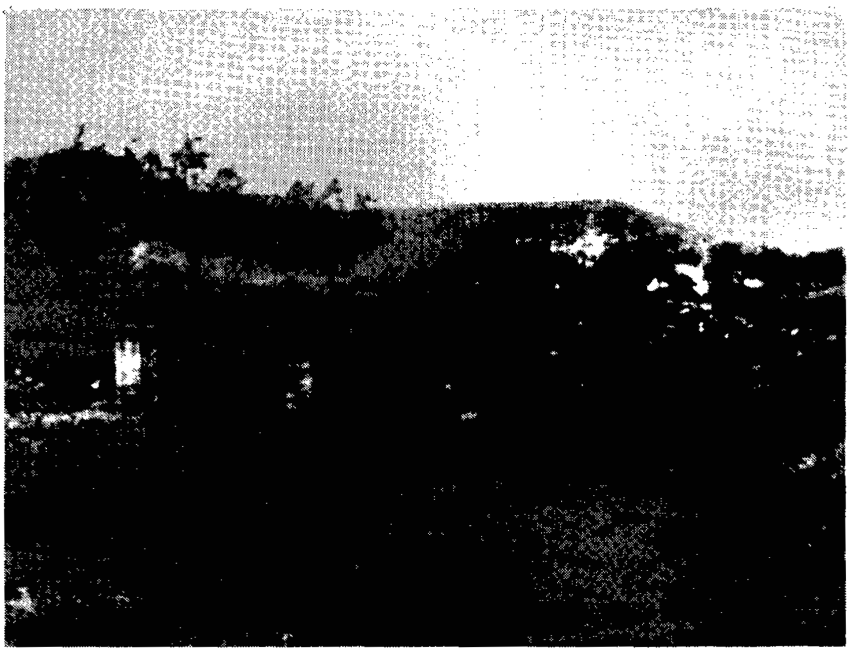

Plate 4 - Bridge with some steelwork in place (Sandy Hollow side of Cox's Gap Tunnel)

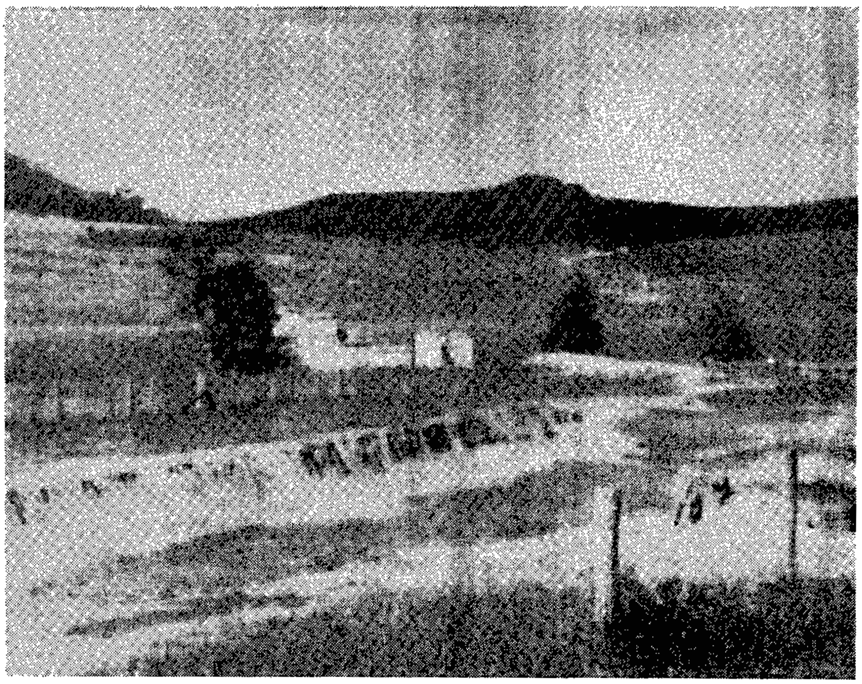

Plate 5 - Approach to bridge - steelwork removed (Gulgong side of Cox's Gap Tunnel)

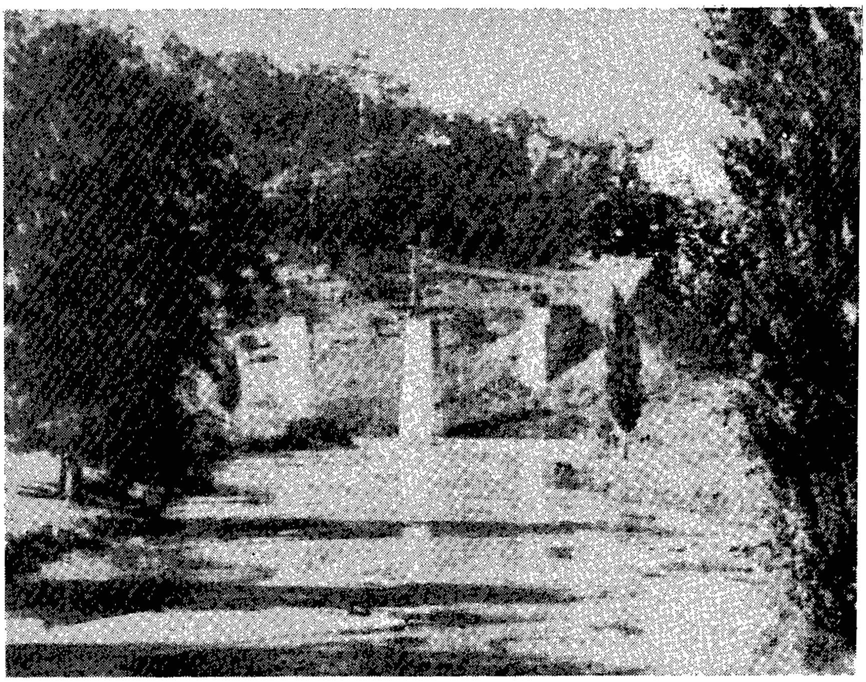

Plate 6 - Piers of major bridge over Goulburn River

CHAPTER 3 - COAL TRAFFIC FORECASTS

COAL RESERVES AT ULAN

As mentioned previously, the BTE examined the feasibility of completing the Sandy Hollow to Maryvale railway in 1973. At that time the indications were that there would be insufficient future traffic to justify further construction works. Since then there has been a marked change in both the known extent of coal reserves at Ulan and the market outlook for such coal. An overview discussion of the coal market follows, and further details are given in Appendix II.

Discussions with the Joint Coal Board have indicated that approximately 5 000 million tonnes of proven coal reserves exist around Ulan. Nearly 2 800 million tonnes of this total is expected to be suitable for marketing after recovery and washing. The quality of the coal is low rank bituminous and on present marketing patterns is suitable only as steaming coal, for which world demand is expected to expand strongly over the next decade. Coal deposits are also known to exist along the line between the Muswellbrook-Singleton fields and the Ulan seam, but have not yet been proven. Coal traffic on the Sandy Hollow to Gulgong (Stage 1) line would therefore open up extraction from the Ulan field to export markets through the port of Newcastle.

Although the process is currently uneconomic, steaming coal also has potential for future use in liquefaction projects for the production of oil refinery feedstock. Optimum production levels of such plants are generally considered to be 40 000 to 50 000 barrels a day. Each plant would require an input of several million tonnes of coal a year, with the exact requirement varying with quality(1). Further applications of steaming coal also exist. Newly available (but currently expensive) technology could also be used to reform it into particles suitable for coking purposes.

(1) Joint Coal Board, NSW Coal - Prospective Markets to the Year 2000, July 1977. p. 2.

THE OUTLOOK FOR NEW SOUTH WALES STEAMING COAL

The domestic market for steaming coal is currently saturated and any marked expansion of New South Wales production is dependent upon securing further export markets. Estimates of the extent of future overseas markets for steaming coal vary. In recent years sharply increased energy prices have brought about a review of existing fuel policies in most countries of the world. One of the outcomes of this has been a general tendency to change the power source of electricity generation plants from fuel oil to steaming coal, with a corresponding increase in world demand for such coal. The initial effects of this world-wide change in energy use are expected to be felt in the demand for steaming coal over the next few years.

Many countries appear to represent potentially large markets for NSW steaming coal. These include Japan, members of the European Economic Community (EEC), South Korea, Taiwan, Israel and South America. In 1975, the Japanese Electric Industry Council estimated that 4.7 million tonnes of steaming coal would be imported by Japan in 1980. The estimate for 1985 was 14.6 million tonnes[1]. The proportion which might be imported from Australia was not stated.

In a recent survey of market trends[2], the Joint Coal Board predicted that New South Wales steaming coal exports could lie between 26.0 and 61.0 million tonnes by the year 2000. Details of the estimates are given in Table 3.1. These figures probably underestimate projected steaming coal consumption to the extent that the proportion of high volatile coals (including coal to produce formed coke used in the Japanese steel industry) may increase from 20 per cent to 35 per cent. Coal from the Ulan seam is considered suitable for this latter purpose. It is described as high relative[3] quality for its type. It is free

(1) Bureau of Mineral Resources, Australian Mineral Industry Review, 1975 (preliminary) p.22.
(2) Joint Coal Board, op. cit., p.4.
(3) Joint Coal Board, 30th Annual Report 1976-77, p.158.

from high levels of impervities (in particular sulphur), which could constrain its potential for export to areas such as Japan.

TABLE 3.1 - PROSPECTIVE EXPORTS OF NEW SOUTH WALES STEAMING COAL TO THE YEAR 2000[(a)]

(million tonnes)

Destination	Actual	Prospective				
	1976	1980	1985	1990	1995	2000
High Level						
Japan	0.29	3.0	13.0	18.0	24.0	32.0
Other Asia	0.08	0.1	3.1	4.0	5.5	6.5
Europe	2.58	4.0	5.0	9.0	16.0	21.0
Elsewhere	0.01	0.4	0.6	1.0	1.0	1.5
Total	2.96	7.5	21.7	32.0	46.5	61.0
Low Level						
Japan	0.29	1.0	2.0	3.5	5.0	7.0
Other Asia	0.08	0.1	2.5	3.5	4.5	5.0
Europe	2.58	2.2	3.2	5.5	8.2	12.5
Elsewhere	0.01	0.3	0.5	0.9	1.0	1.5
Total	2.96	3.6	8.2	13.4	18.7	26.0

(a) The market levels which the New South Wales coal mining industry might reasonably obtain, subject to the necessary mining and infrastructure investments being made, the availability of manpower and the maintenance of productivity levels and market competitiveness.

Source: Joint Coal Board, New South Wales Coal - Prospective Markets to the Year 2000, July 1977, p.3.

The supply of New South Wales steaming coal necessary to meet such markets would largely come from the Western fields. However, the Singleton-North-West fields are capable of producing large quantities of low-quality coking and steaming coals in the future. Steaming coal production from this area, while expected to be used mainly at the nearby power stations for electricity generation within NSW is also suitable for export.

Within the Western field, the Ulan seam contains approximately 2800 million tonnes of exportable steaming coal. Recovery costs are relatively low, as this seam can be mined to a large extent by open cut methods, whereas other western mines are underground operations. Because of this cost advantage and the optimistic market outlook for New South Wales steaming coal, it is probable that the Ulan seam will undergo development in the future if the transport infrastructure is suitably expanded.

Possible markets for large quantities of Ulan coal already exist. The main constraint upon expansion of production at present is the lack of adequate transport facilities to New South Wales ports and limited coal loading facilities at those ports currently accessible to Ulan coal; in particular the port of Sydney and the Balmain coal loader.

A further factor which favours Western District steaming coal exports over those from other areas is that the Joint Coal Board (JCB) considers the Western Districts to be the traditional steaming coal area of New South Wales. This has been a relatively depressed area and past Board policy suggests that permits will be granted to western mines so that the districts will be a prime beneficiary from the expansion of steaming coal markets. Production from the Ulan fields could expand considerably as soon as a rationalised transport system can be established to shift coal from the area, as overseas countries are currently canvassing possible future contracts from the Western District including the Ulan field.

The outlook for coal in New South Wales, and in particular for steaming coal from the Western District, therefore appears bouyant. It can be expected that (providing suitable transport facilities are available) production from the Ulan field would expand markedly. At present, production from the field is constrained by lack of suitable transport facilities for export coal from the Ulan area. This factor is discussed in greater detail in Appendix III. However, the completion of at least the

Sandy Hollow-Gulgong part of the proposed railway would provide ready access to the port of Newcastle, which currently has capacity which could be utilised more intensively at its coal handling facilities.

FUTURE COAL TRAFFIC LEVELS

After an examination of prospective markets and discussions with the Joint Coal Board of NSW (JCB) and the owners of the mine at Ulan, the BTE estimated the quantity of coal which would be transported by the railway to Newcastle for export. These estimates are shown in Table 3.2. Although a comprehensive geological survey of the entire area through which the line runs has not been carried out, mining company officials have expressed the belief that similar large coal deposits exist along virtually the entire route of the line and the surrounding area. Thus in the longer term, the demand for rail transport of coal to export markets could be considerably in excess of the figures in Table 3.2. In addition the current lease at the Ulan field does not cover the entire proven reserves at this location. The JCB has placed a moratorium on further development of this deposit until such time that adequate transport infrastructure is provided.

TABLE 3.2 - ESTIMATES OF COAL EXPORTS USING SANDY HOLLOW-GULGONG LINE

Year	Coal Exports per annum (million tonnes)
1981-82	0.5
1982-83	1.5
1983-84	2.0
1984-85	2.5
1985-86 and thereafter until 1999-2000	3.0

Source: BTE estimates.

Should the Sandy Hollow-Gulgong section (Stage 1) be built, other coal from the western districts and cement from Kandos may also utilise the line, and hence might avoid the port and rail congestion at Sydney. However, no reliable estimate of the volume of this diversion of freight and the associated net economic benefit is available. Therefore, the evaluation of the economic merit of the Sandy Hollow-Gulgong section of the line was confined to the volume of Ulan coal expected to travel over the line and did not include these other possible benefits.

CHAPTER 4 - GENERAL TRAFFIC FORECASTS

In the previous Chapter estimates were made of likely future coal traffic levels for the line. In order to make an assessment of the total traffic it was necessary not only to estimate coal traffic but also to make estimates of the traffic other than coal which could be expected to utilise the line.

Non-coal traffic could be significant. If the entire Sandy Hollow-Maryvale route (Stages 1 and 2) were constructed, the west and north-western areas of New South Wales would then have direct rail access to the port of Newcastle, obviating the present need for traffic from these areas to travel through Sydney or via the Dubbo to Werris Creek line. Furthermore, Newcastle would become the closest port to Dubbo. As a result it could be expected that freight would be redirected over the proposed line from present routes and, in addition, Newcastle could attract traffic which currently either goes to, or originates from, Sydney.

Apart from coal (which relates to Stage 1 only), the major items which could be expected to use the Sandy Hollow-Maryvale line are grains, metalliferous concentrates and other freight. With the assistance of the Bureau of Agricultural Economics (BAE), the Grain Elevators Board of New South Wales and a number of mining companies which operate in the western part of the State, projections were developed for potential traffic in these commodities over the line. The projection for each commodity is discussed separately below.

GRAIN

The area of influence of the proposed railway, described above in Chapter 2, is a major part of the New South Wales grain-growing belt. Because of the nature of the present rail network, most of the grain produced in the area is railed to Sydney for export. However, minor amounts are also transported by train from Dubbo via Werris Creek to Newcastle.

Construction of the entire Sandy Hollow-Maryvale line (in particular, Stage 2) would bring all grain receival depots in the area of influence closer to Newcastle than they currently are to Sydney. In addition to consequent savings in rail transport costs to a port, there are also other factors which favour Newcastle over Sydney for the export of grain.

The north and north western areas of the state produce only one basic type of wheat, which is generally termed 'northern hard'. They are also the sorghum-producing areas of the state. At present, sorghum is loaded at both Sydney and Newcastle and two-port loadings are common. This adds an estimated $1 per tonne (on average) to shipping costs. Thus, although not included in the benefits for this evaluation, savings from concentrating all sorghum at Newcastle could amount to as much as $35 000 per vessel loading. This would also reduce the problem of handling many types of grain at the Sydney terminal.

The south and central west grain areas of the State produce both soft and hard grades of grain. The outcome of north western wheat being shipped out of Newcastle would be a more homogeneous distribution of grades at Sydney (mainly soft) and at Newcastle (hard).

The most efficient way of loading grain is to continuously feed the port terminals with scheduled unit trains. This is possible for the port of Newcastle, as excess capacity exists both at the port and on the rail links to it. However, as in the case of coal, the rail system from both Lithgow and Moss Vale into Sydney is congested.

The working storage capacity of the Sydney terminal is currently 210 000 tonnes. However, grain train schedules into Sydney are constantly interrupted. This means that large ships cannot be loaded continuously, since grain storage cannot be maintained at a sufficiently high level. Apart from the resulting inefficient use of the terminal, the waiting involved often includes demurrage charges of up to $10 000 per vessel per day.

In contrast, the terminal at Newcastle (with a nominal storage capacity of 75 000 tonnes) handles a third of the grain shipped out of New South Wales. Actual current storage capacity is only 35 000 to 40 000 tonnes, because of reconstruction works. Nevertheless, shipments can be worked as required because the rail system to the port has excess capacity.

Extensions under way at the Newcastle grain terminal will add an extra 80 000 tonnes capacity in 1978. A further stage of expansion is planned which will bring the total capacity of the terminal up to 200 000 tonnes within three years. When completed, the Newcastle terminal will be about the same size as that at Sydney. It will then be possible to reallocate loadings between the two ports in favour of Newcastle. Construction of the Sandy Hollow to Maryvale railway will considerably facilitate this action.

As in the case of coal, construction of the line will also provide a contingency route for export through Newcastle of grains which (with no congestion) would logically be exported through Sydney.

Trends in production of wheat and sorghum in the area of influence were provided by the BAE. The Grain Elevators Board of New South Wales estimated that over the past four seasons, averages of 500 000 tonnes of wheat and 100 000 tonnes of sorghum could have been diverted over the line. Currently, all barley and oats exported out of the State are shipped out of Sydney and this situation is unlikely to change. Therefore, further consideration of these products does not appear to be warranted.

Growth rates were estimated using regression analysis and applied to the base figures to forecast potential grain traffic over the line. The results of these calculations are given in Table 4.1.

TABLE 4.1 - POTENTIAL TRAFFIC - GRAINS[a]

('000 tonnes)

	Wheat	Sorghum
Base	500	100
1980-85	605	141
1985-90	693	176
1991-95	781	211
1996-2000	870	245

(a) Annual averages.

Source: BTE calculations on BAE base data.

The general consensus amongst grain experts in New South Wales is that future expansion of the industry in the State will tend to be concentrated in the north west. This is the only part of the State in which large areas of new land are available for adoption of irrigated or Canadian dry land production techniques and the grain varieties which are being developed for these purposes.

METALLIFEROUS CONCENTRATES

The line will provide ready access to the zinc and lead refinery at Cockle Creek (near Newcastle) as well as access to the port, thereby avoiding all rail congestion around Sydney. Copper concentrates are not expected to benefit from the construction of the line as they will continue to be sent (via Sydney) to the refinery at Port Kembla.

In order to assess the likely level of traffic carrying metalliferous concentrates over the line, relevant mining companies and the NSW Department of Mines were consulted. Only mining activities which are currently operating or being developed were taken into account, although there is considerable prospecting activity in the area of influence. Therefore, the estimates of potential traffic are conservative to the extent that new mines may be developed in the future. Details of potential flows are shown in Table 4.2.

TABLE 4.2 - POTENTIAL TRAFFIC - METALLIFEROUS CONCENTRATES

('000 tonnes)

Year	Traffic	Year	Traffic
1982-83	198	1991-92	388
1983-84	396	1992-93	388
1984-85	396	1993-94	388
1985-86	396	1984-85	388
1986-87	396	1995-96	388
1987-88	396	1996-97	388
1988-89	396	1997-98	388
1989-90	396	1998-99	388
1990-91	388	1999-2000	388

Source: Aggregated from data provided on confidential basis by mining companies in the 'area of influence' of the proposed railway.

OTHER FREIGHT

Preliminary figures for 1975-76 interregional freight flows[1] and final estimates for 1971-72 interregional freight flows[2] were used to obtain some indication of any other freight which may travel over the Sandy Hollow-Maryvale railway. Some slight over-estimation may have resulted, because the boundaries of the regions used were not identical to those of the area of influence[3].

Table 4.3 sets out the estimated total tonnage of general freight expected to use the railway, comprising the freight categories of bulk liquids, cement, fertiliser, iron and steel and other freight.

(1) Prepared in the Transport Costs and Information Branch, BTE.
(2) Bureau of Transport Economics, Estimates of Australian Interregional Freight Movements, 1971-72, AGPS, Canberra, 1976.
(3) The shire of Coonabarabran, which is not in the area of influence, is included for the purposes of estimating freight flows.

TABLE 4.3 - POTENTIAL TRAFFIC - GENERAL FREIGHT[a]

('000 tonnes)

Year	Traffic	Year	Traffic
1982-83	191	1991-92	457
1983-84	390	1992-93	467
1984-85	398	1993-94	476
1985-86	406	1994-95	485
1986-87	414	1995-96	495
1987-88	423	1996-97	505
1988-89	431	1997-98	516
1989-90	440	1998-99	525
1990-91	448	1999-2000	536

(a) Annual averages, based upon BTE estimate.

Source: A.B. Smith, The Outlook for Domestic Freight, paper presented at BTE Domestic Freight Workshop, Canberra, September, 1977.

PASSENGER TRAFFIC

No estimate of passenger traffic has been made in this report. It is considered that passenger services will be insignificant in comparison with the levels of freight services.

CHAPTER 5 - APPRAISAL OF OPTIONS

Transportation of coal from Ulan to Newcastle would require construction of only part of the Sandy Hollow-Maryvale railway. Therefore, the terms of reference for this study suggested that economic evaluation of the railway should be conducted in two stages. These are:

- Option 1: Construction of the line from Sandy Hollow (via Ulan) to Gulgong only;
- Option 2: Construction of the entire line from Sandy Hollow to Maryvale, with Option 1 above being constructed first at Stage 1, then continuing with the Gulgong to Maryvale section as Stage 2.

OPTION 1

Stage 1 would provide Ulan with a direct rail link to coal loaders at Newcastle, Balmain and Port Kembla as well as providing other Western District mines direct access to the Newcastle loader. By ending the line at Gulgong, traffic over the line would be virtually confined to coal, unless terminal and loading facilities for other bulk goods were established at Ulan or Gulgong.

The Gulgong to Ulan section of the line is not required to service coal export traffic from Ulan to Newcastle. However, this part of the line has been included in Option 1 because it could be used to distribute Ulan coal to its domestic markets. At present, the coal is mainly hauled by road from the mine to a coal siding at Gulgong and thence railed onward. Construction of the line would therefore eliminate the need and operating expense for these coal transfer facilities at Gulgong. Furthermore, it would give a contingency route for coal from other Western District mines, cement from Kandos and other products to reach the coast or avoid rail and port congestion at Sydney.

OPTION 2

(Construct Stage 1 and then continue with Stage 2)

Stage 2 is unlikely to carry significant amounts of coal. Potential traffic would mainly consist of mining, agricultural and general traffic, which was discussed in Chapter 4. This traffic would gain more direct access to Newcastle. Considered in conjunction with Stage 1, it provides a flexible situation for transportation of other goods as well as coal within New South Wales.

For the purpose of economic appraisal, it is assumed that the Gulgong-Maryvale railway would not be completed without prior construction of the Sandy Hollow-Gulgong section. Thus, the Sandy Hollow-Gulgong stage of the railway is considered as a project in itself, (Option 1) with the Gulgong-Maryvale section then considered as a marginal extension of this project (i.e. Option 2).

By taking this approach, each stage of the railway is evaluated solely on the traffic generated by its construction. Only the Sandy Hollow-Gulgong stage is required for transportation of Ulan coal. Therefore, this section is appraised solely on the level of coal traffic.(1) Construction of the Gulgong-Maryvale section would permit other freight from inland New South Wales to travel over the line. The amount of this other freight forms the basis for the appraisal of this section.(2)

The economic appraisal compares the discounted net benefits accruing to each option with the discounted capital costs and annual costs incurred. Since this is an economic appraisal, all benefits and costs are measured in resource terms and all prices are expressed in constant 1978-79 dollars.

(1) Stage 1 as a project is assumed to be completed before Stage 2 begins. No benefits from the Stage 2 project when it is completed, are attributed to Stage 1.

(2) Obviously, Stage 1 is necessary to obtain the benefits of constructing Stage 2. However, because the Stage 1 project is completed before Stage 2 begins, no costs associated with Stage 1 are included in the evaluation of Stage 2.

Two alternative discount rates (7 per cent and 10 per cent) are used to convert the future streams of benefits and costs are to present values. The appraisal period is set from 1978-79 to 1999-2000. Further benefits could be expected to accrue to the project after this time, but they are not considered in this study.

CAPITAL COSTS

Railway Construction

It is estimated that the most likely construction cost for the Sandy Hollow-Gulgong section is $34.4 million and that construction would take 24 months. In addition the case where the construction cost remains the same and the construction period is 18 months is also considered. The schedules for expenditure of these capital sums are given in Table 5.1.

TABLE 5.1 - CONSTRUCTION COSTS FOR STAGE 1 (SANDY HOLLOW-GULGONG)
($ million, 1978-79 prices)

Year	Construction Period (months)	
	18	24
1979-80	-	-
1980-81	17.7	11.4
1981-82	16.7	23.0
1982-83	-	-
TOTAL	34.4	34.4

The most likely construction cost of the Gulgong-Maryvale line was estimated at $8.2 million, and the construction period was estimated to be 12 months. For sensitivity testing, a higher construction cost of $11.5 million and a construction period of 24 months was considered.

It is envisaged that the construction of the Gulgong-Maryvale section of track would only occur after completion of the Sandy

Hollow-Gulgong section. Therefore, timing of construction of the former link depends upon completion of the Sandy Hollow-Gulgong section. A schedule of construction costs for the Gulgong-Maryvale link is set out in Table 5.2.

TABLE 5.2 - CONSTRUCTION COSTS FOR STAGE 2 (GULGONG-MARYVALE)[a]

Year		Construction Period (months)			
	Stage 1	18		24	
	Stage 2	12	24	12	24
1981-82		2.7	1.9	-	-
1982-83		5.5	5.8	8.2	3.8
1983-84		-	3.8	-	7.7
1984-85		-	-	-	-
TOTAL		8.2	11.5	8.2	11.5

(a) Stage 2 is assumed not to commence until Stage 1 is completed.

Locomotives and Wagons

It was assumed that additional locomotives and coal wagons would be purchased by the NSW PTC to form a fleet for the coal traffic. The capital cost of a locomotive is estimated at $800 000 and the cost of a coal wagon at $50 000. A schedule of locomotive and wagon acquisition for the Sandy Hollow-Gulgong railway (assuming a utilization rate of approximately 75 per cent)[1] is given in Table 5.3. For simplicity, it is assumed that locomotives and wagons are bought at the beginning of the year in which they are required.

For carriage of other traffic which is expected to emerge after construction of the Sandy Hollow-Gulgong link, it is assumed that locomotives and wagons can be reallocated from existing uses in the PTC fleet at negligible opportunity cost. Thus, it is assumed that no additional capital costs are incurred.

(1) Utilisation of capital on the basis of unit train operation.

TABLE 5.3 - LOCOMOTIVE AND WAGON COSTS FOR STAGE 1 (SANDY HOLLOW-GULGONG)

($ million)

Year	Construction Period (months)	
	18	24
1980-81	-	-
1981-82	5.6	-
1982-83	5.6	11.2
1983-84	-	-
1984-85	5.6	5.6
1985-86	-	-

Capital Costs at the Mine

The quantities of coal which are assumed to be produced at the mine and which would require transportation over the Sandy Hollow-Gulgong railway were shown as Table 3.2 above.

However, at its present level of development, the mine cannot produce such quantities. For the purposes of this analysis, the capital costs necessary to obtain the production levels indicated are included in the costs of the project given above and the appraisal becomes that of an investment package for both the railway and the mining operation.

Alternatively, the benefits due to induced production could have been apportioned between the investment in the mine and that in the railway to conduct an appraisal of the railway alone. The course taken has been chosen on grounds of simplicity and in order to provide one measure of the total costs and benefits involved in a major project affecting the area of influence of the railway.

Confidentiality of mine construction costs precludes publication of details; nevertheless, they are included in aggregate in the cost flows.

ANNUAL COSTS

Implementation of the mining and railway projects would commit the operators of these projects to a set of annual costs required to produce, transport and market the coal output. These annual costs can be categorised as:

- Mining costs;
- Train operating costs;
- Track and train maintenance costs;
- Port loading costs.

For the purposes of the analysis, these costs have been estimated as a resource cost per tonne of coal to derive a unit cost which can be applied to production forecasts to estimate cash flows. Industry sources have estimated that mining costs will be approximately $5.00 per tonne of coal extracted. Train operating costs and track and train maintenance costs, taken as a group, are estimated as $2.10 per tonne of coal transported. The derivation of these costs is outlined in Appendix IV.

Based on Maritime Services Board of NSW estimates, the price of port loading at Newcastle was estimated to be $3.51 per tonne of coal loaded. In addition, a special levy of $1.00 per tonne will be applied until 1982-83 to finance harbour deepening. Thus, the port loading charges were taken as $4.51 per tonne until 1982-83 and $3.51 per tonne thereafter.

Total annual resource costs incurred to transport Ulan coal to a ship's hold can therefore be estimated as $12.31 per tonne of coal until 1982-83 and $11.31 per tonne thereafter.

BENEFITS

Two types of benefits are expected to accrue to the investment project: the value of induced production and the transport cost savings resulting from reduced distances travelled.

Value of induced production

The only good for which output is expected to expand as a result of the line is coal. Production forecasts made by the industry under the assumption that the railway is constructed (and which would otherwise not occur) are substantial. Their values are included as directly attributable benefits resulting from the railway investment.

The estimated export price for coal of similar quality to that found around Ulan was $28.50 per tonne. This price was used to estimate the value of output. The gross value of benefits from the mine and railway project is therefore expected to reach approximately $85.5 million per annum at full production.

Transport cost savings

The benefit from the export of coal can be attributed to the Sandy Hollow-Gulgong railway, because this line allows access to a port for Ulan coal. If this railway is not constructed, it is unlikely that exports of Ulan coal will occur.

If the marginal extension (Stage 2) between Gulgong and Maryvale is constructed after the Sandy Hollow-Gulgong link, potential freight available for movement over the line will realise savings because of the shorter distances involved.

The construction of the entire Sandy Hollow-Maryvale railway will result in considerable distance cost savings. Currently, Dubbo to Newcastle via Sydney involves a distance of 630 km, whereas Dubbo to Newcastle via Sandy Hollow is only 405 km (a shipment distance reduction of 225 km). Furthermore, Newcastle replaces Sydney as the closest directly-linked port, since Dubbo to Sydney is a distance of 462 km, whereas Dubbo to Newcastle via Sandy Hollow is 405 km.

It was shown in Chapter 3 that grain production from the railway's area of influence might be diverted from Sydney to Newcastle.upon completion of Stage 2. Therefore, grain transportation costs would be reduced because of the 57 km reduction in distance. Metalliferous concentrates and other freight will be able to travel directly to Newcastle via Sandy Hollow rather than via Sydney, thereby saving 225 km.

Coal production at Ulan for domestic consumption is currently transported by road to Gulgong, and then transferred to rail wagons for delivery. Construction of the Ulan-Gulgong section (part of Stage 1) of track would allow this production to obtain the lower costs of rail freight over the entire distance, and hence avoid the costs associated with modal transfer.

The total benefits obtained because of the transportation cost savings are set out in Table 5.4.

APPRAISAL RESULTS

The results obtained from the costs and benefit flows detailed above are summarised in Tables 5.5 and 5.6. The criteria used to present the appraisal results are net present value (NPV) and the gross benefit-cost ratio.

Stage 1 (Sandy Hollow-Gulgong)

Construction of this stage of the railway has been discussed under two sets of assumptions. From Table 5.5, it is seen that construction periods of 18 and 24 months have similar benefit-cost ratios while the net present value estimates for the 18-month period are marginally greater than those of the 24-month period.

TABLE 5.4 - BENEFITS FROM TRANSPORT COST SAVINGS

($ 000)

Year	Construction Period (months)			
	Stage 1 (Sandy Hollow-Gulgong)		Stage 2 (Gulgong-Maryvale)	
	18	24	12	24
1980-81	-	-	-	-
1981-82[a]	55	-	-	-
1982-83	110	110	621	-
1983-84	110	110	2514	1257
1984-85	110	110	2543	2543
1985-86	110	110	2572	2572
1986-87	110	110	2603	2603
1987-88	110	110	2633	2633
1988-89	110	110	2663	2663
1989-90	110	110	2694	2694
1990-91	110	110	2708	2708
1991-92	110	110	2739	2739
1992-93	110	110	2770	2770
1993-94	110	110	2801	2801
1994-95	110	110	2832	2832
1995-96	110	110	2864	2864
1996-97	110	110	2896	2896
1997-98	110	110	2929	2929
1998-99	110	110	2959	2959
1999-2000	110	110	2992	2992

(a) Half-year total. Assuming construction period of 18 months for Stage 1. No benefit would be available in 1981-82 if construction of Stage 1 took longer than 18 months.

TABLE 5.5 - COSTS AND BENEFITS: STAGE 1 (SANDY HOLLOW-GULGONG)

($ million)

Item	Construction Period (months)			
	18		24	
	Discount rate		Discount rate	
	7 per cent	10 per cent	7 per cent	10 per cent
Total costs	333.6	260.5	323.7	251.3
Total benefits	652.2	483.3	640.5	472.6
Benefit-Cost Ratios	1.95	1.85	1.98	1.88
Net Present Values (NPV)	318.6	222.8	316.8	221.3

TABLE 5.6 - COSTS AND BENEFITS: STAGE 2 (GULGONG-MARYVALE)

($ million)

Item		Construction Period (months)							
	Stage 1	18				24			
	Stage 2	12		24		12		24	
	Discount	7%	10%	7%	10%	7%	10%	7%	10%
Total costs		6.5	5.9	6.0	7.7	6.3	5.6	8.4	7.4
Total Benefits		21.1	15.5	19.2	13.9	20.1	14.7	18.3	13.1
Benefit-Cost Ratios		3.25	2.65	3.21	1.78	3.22	2.62	2.18	1.78
Net Present Value (NPV)		14.6	9.6	13.2	6.2	13.8	9.1	9.9	5.7

Stage 2 (Gulgong-Maryvale)

Since construction of this stage is taken as occurring after the Sandy Hollow-Gulgong stage, the results will depend on the construction period of Stage 1 as well as the assumptions used for this second stage of construction. Results of the evaluation are shown in Table 5.6. Again for each set of assumptions Stage

2 is favourable. Marginally more favourable results are obtained when construction time is minimised for both stages of the railway, allowing the flow of benefits to be enjoyed as early as possible.

SENSITIVITY ANALYSIS

The sensitivity of the benefit-cost ratios of the Sandy Hollow-Gulgong stage to a fall in the export price of coal was tested. Any increase in the price would increase the benefit-cost ratio, and Table 5.7 shows that the project can apparently withstand a significant (25 per cent) fall in real coal prices and still remain viable.

TABLE 5.7 - SENSITIVITY ANALYSIS : STAGE 1 (SANDY HOLLOW-GULGONG)

Item		Construction Period (months)			
		18		24	
	Discount Rate	7%	10%	7%	10%
Total costs ($m)		333.6	260.5	223.7	251.3
Most likely coal price					
Benefit-cost ratio[a]		1.95	1.85	1.98	1.88
Most likely coal price less 25 per cent					
Total benefits ($m)		489.1	362.5	480.4	354.4
Benefit-cost ratios		1.47	1.39	1.48	1.40

FINANCIAL CONSIDERATIONS

During the evaluation of the project, press announcements indicated that an Australian subsidiary of an overseas corporation had acquired a 40 per cent interest in the company which owns the coal mine currently operating at Ulan.[1] The Australian subsidiary is wholly owned by its foreign parent.

(1) Australian Financial Review, 15 September 1978, p.6. The owner of the lease is White Industries Ltd - the overseas corporation is Mitsubishi Development Pty Ltd.

Since this study is directed towards resource allocation, resource ownership matters have not been examined. The basic question that this report attempts to answer, is whether or not the completion of the railway is economically warranted. Detailed consideration of the source of funds is fundamentally peripheral to this question.[1]

One financial consideration which is considered to be an important aspect of the railway is its ability if constructed, to generate funds for the NSW PTC. Given that the NSW PTC would operate the proposed railway, it is considered that this project is likely to marginally improve the financial situation of the Public Transport Commission in New South Wales. It must be emphasised however, that this is an economic benefit-cost analysis and a detailed financial analysis of the rail operations of the PTC has not been undertaken. In addition, it should be noted in passing that no attention has been given to the distributive implications of the project; gross benefits and resource costs only have been considered.

(1) A suggested treatment for foreign ownership of firms associated with a project is given in the Ranger Uranium Environmental Enquiry Parliamentary Paper 117, Canberra 1977 p. 358ff.

CHAPTER 6 - CONCLUSIONS AND OTHER CONSIDERATIONS

Within the context of the benefit-cost methodology adopted in this evaluation it is clear that the construction of both segments of the Sandy Hollow to Maryvale railway is economically warranted.

The Sandy Hollow to Gulgong section of the line has been assessed solely on the basis of the coal traffic that would be generated by its construction. On this basis the analysis yielded benefit-cost ratios between 1.85 and 1.98 depending on the construction period and the discount rate that was applied. The two year construction option yielded slightly better results but the difference is minimal.

The Gulgong to Maryvale section was assessed on the basis of the potential distance savings that would accrue to freight diverted from the existing network. This section yielded benefit-cost ratios between 1.78 and 3.25 depending on the construction sequence and the discount rate. The shorter construction times yielded slightly higher benefit-cost ratios.

The analysis suggested that the optimum construction sequence would be a two year period for Stage 1 and a one year period for Stage 2. This sequence would not necessarily be the optimum for the entire nine-railway project however because the benefit-cost streams of mine development may outweigh the gains from the longer Stage 1 option.

Other benefits which have not been included in this evaluation also support the completion of the railway.

At the regional level, significant employment opportunities could be expected to become available in the short-term while the railway is being built and in the long-term as mine production is expanded.

OTHER CONSIDERATIONS

The Sandy Hollow-Gulgong line would provide the shortest link to a port, Newcastle, which currently has available coal loading capacity. Both the Balmain and Port Kembla loaders are more distant and Balmain currently suffers from access congestion and capacity problems. It would also provide a contingency export route, albeit longer, for other Western District coal. Such a contingency route for Lithgow coal of 482 km compared with 156 km to Sydney, 324 km to Newcastle via Sydney, and 246 km to Port Kembla would not normally be used. However delays due to severe congestion, for example along the usual route, can involve shipping demurrage of up to $10 000 per day or more and could make use of such an alternative route attractive.

The fact that Sydney is the centre of the transport network provides additional problems. In the metropolitan areas, a conflict with urban transport problems exists. For example, a small deviation from schedule can sometimes result in delays of hours or even days in freight consignments reaching their final destination.

The partly completed Sandy Hollow-Maryvale Railway is in relatively good condition and is easily accessible by road along most of its length. Thus construction could begin almost immediately and could be completed in time to take advantage of the current market expansion for coal.

Mining industry representatives have indicated that the Ulan coal deposits will not be developed unless the Sandy Hollow-Gulgong section of the proposed line is built.

The only real alternative to constructing at least part of the line appears to be to forego coal exports until pipelines became viable. This is a long-term solution and would involve an economic loss to the State of New South Wales. Further, by not participating in markets early in the expansion of demand for steaming coal, long-term outlets may be jeopardised.

APPENDIX I - TERMS OF REFERENCE

The Bureau of Transport Economics was directed in February, 1973 by the then Minister of Shipping and Transport, the Honourable C.K. Jones, to undertake and report on an economic and financial evaluation of the construction of a railway line linking Sandy Hollow and Maryvale. The terms of reference for this study were:

'The BTE

- undertake and report on an economic and financial evaluation of constructing a railway line linking Sandy Hollow and Maryvale.

'The economic evaluation should consider:

- operating benefits to the railways

- possible benefits to existing users
  : e.g. reduced freight delivery times or passenger journey times.

'The financial evaluation should consider:

- the effect which the proposed railway would have on N.S.W. Railways

: operating costs
: freight revenue
: and operating results.

'The Bureau's report should also canvass:

- possible benefits to national and regional development which could follow the completion of the railway.'

The Bureau prepared a report in response to these terms of reference. However, before this report was publicly released major proven resources of steaming coal were discovered near Ulan, on the route of the proposed railway.

As a result of the changed situation it was considered necessary to make a major reappraisal of the project. Terms of reference which more adequately reflected the changed circumstances were developed.

The new terms of reference were:

'To conduct an economic evaluation of the completion of the Sandy Hollow-Maryvale railway.

'The project is to be considered in two stages:

Stage 1: Sandy Hollow to Ulan to Gulgong, which will service the potential coal export traffic, and;

Stage 2: Gulgong to Maryvale which will mainly service other freight between western New South Wales and Newcastle.

'The second part of the line will be considered to be a marginal extension of the coal railway described in Stage 1.

'The analysis will include:

(a) gross benefits and costs to the State of New South Wales arising from induced coal exports,

(b) future rail cost savings because of the distance savings arising from diversion of traffic over the railway, and

(c) any other factors which the Bureau may deem to be relevant.'

This report is a response to these amended terms of reference.

APPENDIX II - HISTORY OF THE RAILWAY

STATE GOVERNMENT PROPOSALS

The proposal to construct a railway between Sandy Hollow and Maryvale originated in 1911, in the report of a New South Wales Royal Commission on Decentralisation of Railway Transit. It was understood by the Commissioners that the scope of that inquiry was '... to be limited to decentralisation by means of the establishment of ports on the coast of the State and their connection by rail with inland centres.'[(1)]

The Commissioners recommended that a port should be established at Port Stephens. Furthermore, '... in order to make the proposed port fully effective as a decentralising factor...', the Royal Commission concluded that the following railway lines (arranged in the order of their importance as seen by the Commission) should be constructed:

- Maryvale, via Gulgong, Wollar and Denman to Muswellbrook (through Sandy Hollow);
- Morpeth to Salamander Bay, Port Stephens;
- Walcha Road, via Walcha, Nowendoc, Woodside and the North Coast Railway, to Salamander Bay, Port Stephens;
- Inverell to Guyra;
- Warialda to Boggabilla.

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(1) Royal Commission as to Decentralisation in Railway Transit Report p. xxi in NSW Legislative Assembly, Parliamentary Papers, 1911, Vol. 2, pp. 31-484.

The Maryvale to Muswellbrook rail link was to service the primary producing regions surrounding Bourke, Brewarrina, Cobar, Coonamble, Dubbo and Maryvale. Although the development of Port Stephens did not eventuate, the proposed route would shorten the distance between Dubbo and Newcastle from 630 kilometres (via Sydney and the Great Western line) to 405 kilometres via Sandy Hollow.

It was estimated in 1911 that the cost of the Sandy Hollow-Maryvale link would be $2.36 million in then current prices. This included strengthening of 60 kilometres of existing track between Sandy Hollow and Muswellbrook.

In 1915, in response to the enquiries of local residents, a proposal for a railway from Maryvale to Gulgong was referred to the New South Wales Parliamentary Standing Committee on Public Works.(1) However, Parliament dissolved before the investigation was completed.(2)

In 1918, the Bylong and Goulburn River Railway League sent a deputation to the Minister of Public Works to seek construction of a railway between Sandy Hollow and Bylong. The Minister approved a survey of the route, and while this was in progress, the Wollar and Gulgong Railway Leagues asked for the survey to continue through to Wollar and Gulgong. The Railways Commissioners agreed.

Further representations to the Standing Committee on Public Works were made by local bodies in November 1921, but they were too late to be referred to the then current session of the Committee.

In 1922, a meeting between the Minister for Public Works and delegates representing areas from the whole length of the proposed Sandy Hollow-Maryvale route resulted in a request to the Commissioner for Railways for a report on the route. The report

(1) New South Wales, Parliament Debates, Second Series, Vol. 62, p.4813.

(2) Parliamentary Standing Committee of Public Works, Report, p. 66, in NSW Lesislative Assembly. Parliamentary Papers, 1925, Vol. 1, p. 66-745.

was not received in time to enable a reference to the Standing Committee on Public Works during the Parliamentary session ending in December 1922. However, when the reference was made in December 1923, the Commissioner briefly described the country traversed by the route and estimated the cost of the line at $2.346 million. No traffic projections were made because of lack of time to prepare the report[1].

Following the Commissioner's Report, the Standing Committee on Public Works held an inquiry into the whole Sandy Hollow-Maryvale route. The line was recommended for construction in the Committee's report of January 1925, which said:

> 'Generally, the Committee favour the construction of the proposed line for the reasons that it will form an additional cross country connection between the southern, western, northern and north-western districts; develop a large area of agricultural and pastoral country; afford facilities for the quicker removal of stock during drought periods; open up market for general produce, coal and manufacturers; and bring about decentralisation in railway transit by enabling direct communication to be effected between the west, north-west and Newcastle.'[2]

In March, 1927, Act No. 28 the 'Sandy Hollow, via Gulgong, to Maryvale Railway Act' authorised the railway's construction.[3] However, it was not until July 1936 that construction actually commenced.

In 1928, there was an investigation into junctioning points of the railway. In the intervening years there was correspondence between the Railways Commissioner and the Minister for Public Works detailing increases in construction costs since 1922. The latter stated that construction of the line was not justified and would result in a substantial loss to the State.

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(1) Ibid, p.676.
(2) Ibid, p.674.
(3) <u>The Statutes of New South Wales</u>, 1927 p.265.

Notwithstanding this opposition to the railway, the 1936 Report of the Commissioner for Railways[1] said:

> 'Advice was received that the Government had decided to proceed with ... the Sandy Hollow to Maryvale railway ... Funds to the extent of $50 000 were provided for the permanent survey and other preliminary work on the Sandy Hollow to Maryvale railway. This work has progressed satisfactorily.'

In 1937, the New South Wales Secretary of Railways stated that the cost of the project was to be shared equally between the Government and the Decentralisation Commission.

Work began in three places: at Sandy Hollow working west, at Maryvale working east and at Gulgong working to both the west and the east. By 1938, 131 kilometres of earthworks had been completed and two of the tunnels were being driven.

COMMONWEALTH GOVERNMENT INVOLVEMENT

Following exchanges between the Commonwealth and New South Wales governments regarding the Sandy Hollow-Maryvale railway, the Commonwealth agreed in July 1941 that construction on the line should continue. A contribution of $162 000 was offered by the Commonwealth to expedite the railway's progress, subject to the State obtaining a loan. The contribution was to be provided when needed. However, reduced loan allocations and shortages of labour and materials severely curtailed construction during the war years and only minor works were undertaken between 1941 and 1946. None of the available evidence suggests that the Commonwealth contribution was spent on the line, or in fact received by NSW.

Construction was still restricted after 1946 by resource shortages, especially of steel, until 1951 when construction ceased. However, the works have never been officially abandoned. It was

(1) Report of the Commissioner for Railways, p. 875 in New South Wales Parliamentary Papers, 1936, Joint Volume 1, p.861-924.

estimated that $4.9 million had been expended on the line by 1951.

COMPLETION PROPOSALS

In July 1954, the Sandy Hollow-Maryvale Railway League sent a telegram to the Prime Minister suggesting that '... consideration be carefully given to the urgent completion of the Sandy Hollow-Maryvale railway ...' for defence reasons. In October 1954, the Newcastle Chamber of Commerce asked for financial assistance from the Commonwealth to complete the railway. This request was a result of ' ... press intimation ... of the Commonwealth Government's intention to improve amenities that would be most likely a defence asset.'[1] In November 1954, a conference at Muswellbrook of local government bodies, chambers of commerce and trade unions from the area of the proposed railway called upon the Commonwealth Government to provide financial assistance for its completion. The Newcastle waterfront group of unions also wrote to the Prime Minister supporting the resolution of the Conference.

In all cases, the Commonwealth replied stating that its priority for funds to be expended on trackwork was to standardise the Australian railway gauges and that the Sandy Hollow-Maryvale railway was the responsibility of the New South Wales Government.

Further action concerning the railway was taken in the New South Wales Legislative Assembly in 1957, when the Member for Waratah, Mr F.J. Purdue, argued for the completion of the line. His reasons briefly, were:

- To improve the safety and practical working of the NSW railway system;,

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(1) From a letter sent by Newcastle Chamber of Commerce to Mr D.O. Watkins, Federal MHR.

- The proposed railway had easier gradients and curves than the main western line and could therefore be worked more economically;

- The railway would promote decentralisation and relieve port congestion at Sydney;

- The railway would remove the need to spend money on additional outlets in Sydney and upgrading of the main Western line;

- The railway was necessary in the interest of national defence;

- The railway would develop and open up food-producing areas and areas rich in minerals;

- The completion of the railway would provide revenue, thereby offsetting some of the capital funds already expended[1].

When the debate resumed in March 1958, the Assembly carried the resolution that:

- Steps should be taken to complete the Sandy Hollow-Maryvale railway;

- Having regard to the huge interest bill of the railways and the resultant necessity to ensure immediate substantial savings in operating expenses, a recommencement of the work of construction must necessarily be deferred for the present;

- With a view to giving an earlier priority to this work, the Federal Government should be approached, regarding its attitude to this railway from a defence aspect, as to whether it would provide for a standard gauge line to Adelaide via Broken Hill by making the necessary finance available.[2]

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(1) New South Wales Parliament Debates, 1957-58 Third Series, Vol. 21, p.524 ff.
(2) New South Wales Legislative Assembly, Votes and Proceedings, 1957-58, Vol. 1, p.186.

This resolution was conveyed to the Prime Minister, whose reply indicated that, given the strategic circumstances of the day, transport projects should be judged on economic and civil grounds, rather than pure defence requirements.

A further conference of organisations in the proposed railway's area, held at Muswellbrook in 1959, also called for Commonwealth financial assistance. In 1964 the Newcastle City Council wrote to its Federal Member, Mr C.K. Jones, advising that it intended to make representations to the Federal Ministers for Shipping and Transport and Defence requesting financial assistance for the Sandy Hollow-Maryvale railway. Again, the Commonwealth replied that, as the railway would be an integral part of the New South Wales railway system, the construction of the railway was for the consideration of the New South Wales Government.

Finally, in 1967, the then Premier of New South Wales, Mr Askin, announced that the New South Wales Development Corporation would investigate the cost and economic advantages of the proposed railway. It was felt that '... the outcome of earlier investigations ... had suggested that insufficient attention had been paid to long term development potential ...'(1).

THE NEW SOUTH WALES DEVELOPMENT CORPORATION REPORT

The Development Corporation investigation was required to report on:

- The estimated cost of completion of the Sandy Hollow-Maryvale railway and the estimated annual operating and interest charges;
- Advantages to the State generally which would be likely to accrue from its construction;

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(1) <u>Sydney Morning Herald</u> 13/7/67.

- Transport benefits likely to accrue to primary producers within its area of influence;
- Consequential development and population growth likely to result within its area of influence;
- The likely diversion from Sydney to Newcastle of raw or beneficiated mineral products for processing;
- The likely impact upon the industrial and commercial development of Newcastle and upon its population growth rate;
- The likely extent and consequences of freight diversion to the port of Newcastle and, conversely, the likely extent and consequences of freight diversion from the port of Sydney.[1]

The Corporation used benefit-cost techniques in its investigation of the line. An area of influence was defined and used to estimate potential generated traffic over the railway.[2] The estimated volume of traffic then became the basis for calculating the benefits accruing to the line.

The costs of constructing, operating and maintaining the railway were estimated, using two sets of cost assumptions. Both resulting benefit-cost ratios were less than 0.5.

On the basis of these ratios, the Corporation stated that '... the present case against completing the Railway is conclusive.' It was stressed however, '... that the conclusions could be very materially altered by the development of mineral resources, particularly coal, within the area of influence.'[3]

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(1) Development Corporation of NSW: Report on the Sandy Hollow-Maryvale Railway Proposal, Sydney, 1970, p.1.
(2) Further discussion concerning the area of influence is given in Chapter 2 of this Report.
(3) Ibid p.4.

Subsequent developments concerning completion of the line and the origin of this study have been discussed in the introductory sections of this report.

APPENDIX III - THE MARKET SITUATION FOR COAL

Prior to the recent increases in world prices for fossilised fuels coal industry in general suffered from weak export markets. During 1973-74, the outlook of the industry changed dramatically and production increased but could not meet demand and both export and domestic prices rose. Despite a minor set back in 1975-76, principally because of the world recession which resulted in falls in Australian and world steel production, prices for New South Wales coals have tended to remain at relatively high levels.

The production of raw coal by fields in New South Wales over recent years is shown in Table III.1.

TABLE III.1 - NEW SOUTH WALES RAW COAL PRODUCTION

('000 tonne)

Field	1973-74	1974-75	1975-76	1976-77	1977-78
South Maitland	1 868	1 802	1 188	1 294	1 662
Singleton-North West	8 427	11 467	10 713	12 410	14 061
Newcastle	11 876	12 361	11 358	12 893	13 324
West	1 987	2 658	3 487	4 023	4 128
Burragorang Valley	3 806	4 518	5 202	5 318	5 004
South Coast	8 668	9 500	8 605	10 847	11 085
NSW	36 632	42 306	40 554	46 785	49 264
Underground	30 155	32 957	32 177	37 014	37 889
Open Cut	6 477	9 349	8 377	9 771	11 375

Source: Joint Coal Board, 29th Annual Report 1975-76, Table 4, p.29; Joint Coal Board, 30th Annual Report 1976-77, Table 9, p.69; Joint Coal Board, 31st Annual Report 1977-78, p.3.

UTILISATION OF COAL PRODUCTION

Details of the destinations of the production of each field over the period 1973-74 to 1976-77 are shown in Table III.2. The South Coast field is currently the major supplier to the NSW iron and steel industry. The Newcastle field is the second largest supplier to the industry. Consignments from other fields to the industry were comparatively minor.

In contrast, coal for electricity generation was concentrated in the two northern fields. Over the four-year period, production of the Singleton-Maitland field exceeded that of the Newcastle field for this purpose, mainly due to the decline in the level of use of Newcastle field coal by the New South Wales Electricity Commission power stations.

Export levels from all fields are relatively high and have been fairly consistently so since 1972-73, with the exception of that from the Western field. Exports of Western coal have grown from insignificant amounts in 1973-74 to over two million tonnes in 1976-77, as a result of the development of markets for steaming coal. No metallurgical coal is produced in this field.

The average value per tonne of saleable output at the New South Wales mines over the period 1969-70 to 1975-76 is shown in Table III.3. Prices for Western coal have remained consistently below those of other areas because such production is virtually all steaming as opposed to coking coals. The extent of price differences is illustrated by the fact that there was a differential of more than $18 between Western and Southern coal prices in 1975-76. The latter fields produce mainly coking coals which are of the highest quality available in NSW. A further factor is the greater distance of the Western field from markets and hence higher transport costs.

TABLE III.2 - DESTINATIONS OF NEW SOUTH WALES COAL

('000 tonne)[a]

Field and Destination	1973-74	1974-75	1975-76	1976-77
South Maitland				
Iron and Steel Australia[b]	24	9	0	0
Electricity Generation NSW	20	3	..	..
Other - Australia[c]	180	156	144	139
Direct Shipments Overseas	1773	1326	902	978
Interdistrict transfers, stock variations and losses	-78	+10	-21	+14
Total deliveries	1919	1513	1025	1131
Singleton-North West				
Iron and Steel - Australia[b]	32	170	160	15
Electricity Generation NSW	3816	4018	4168	5463
Other - Australia[c]	122	89	79	82
Direct Shipments Overseas	3346	4530	4679	5219
Interdistrict transfers, stock variations and losses	-39	+128	+25	+60
Total deliveries	7277	8835	9112	10839
Newcastle				
Iron and Steel - Australia[b]	3227	3223	3054	2867
Electricity Generation NSW	4664	3743	3849	5524
Other - Australia[c]	627	612	555	470
Direct Shipments Overseas	2482	2779	2186	2507
Interdistrict transfers, stock variations and losses	-130	+132	-153	+124
Total deliveries	10870	10488	9501	11492
Western				
Iron and Steel - Australia[b]	294	117	147	121
Electricity Generation NSW	754	158	516	806
Other - Australia[c]	636	687	614	645
Direct Shipments Overseas	109	1432	1222	2048
Interdistrict transfers, stock variations and losses	+5	+16	+38	+15
Total deliveries	1788	2411	3129	3635

TABLE III.2 (CONT) - DESTINATIONS OF NEW SOUTH WALES COAL

Field and Destination	1973-74	1974-75	1975-76	1976-77
Burragorang Valley				
Iron and Steel - Australia[b]	372	450	589	418
Electricity Generation NSW	72	..	28	..
Other - Australia[c]	104	81	92	72
Direct Shipments Overseas	3227	3638	2716	3101
Interdistrict transfers, stock variations and losses	+26	+35	-9	+52
Total deliveries	3253	3215	3416	3643
South Coast				
Iron and Steel - Australia[b]	4764	5370	4778	5170
Electricity Generation NSW	331	315	259	333
Other - Australia[c]	613	708	589	530
Direct Shipments Overseas	2342	2106	1738	2594
Interdistrict transfers, stock variations and losses	-125	-6	+87	+263
Total deliveries	7825	8493	7452	8890
All NSW Mines				
Iron and Steel - Australia[b]	7945	8552	8045	8591
Electricity Generation NSW	8667	8138	8821	12126
Other - Australia[c]	3028	3120	2756	1938
Direct Shipments Overseas	12731	14812	14054	16447
Interdistrict transfers, stock variations and losses	-341	+324	-41	+528
Total Deliveries	33032	35055	33635	39630

(a) Total initial deliveries from mines or industry washeries.
(b) Some coal consigned to the steel industry was subsequently forwarded to other destinations.
(c) Includes Railways and town gas - NSW, Cement - NSW, Other consumers within NSW and shipments interstate.
(d) Includes 46 000 tonnes from the Burragorang Valley.

Source: Joint Coal Board, 29th Annual Report 1975-76, Tables 39 and 67 to 72. Joint Coal Board, 30th Annual Report 1976-77, Tables 72 to 77.

TABLE III.3 - VALUE OF COAL AT THE MINE - SALEABLE OUTPUT - NEW SOUTH WALES

($ per tonne)

	North	West	South	NSW
1969-70	5.00	3.49	7.02	5.66
70-71	5.49	3.64	8.11	6.32
71-72	5.83	4.00	8.57	6.72
72-73	5.70	4.39	9.38	6.95
73-74	6.28	5.06	10.62	7.65
74-75	9.89	7.69	17.96	12.39
75-76[a]	14.42	11.33	29.15	18.97

(a) Includes duty payable on coal exports.

Source: Joint Coal Board, 29th Annual Report 1975-76, Table 28, p.63.

The differential between prices for steaming coal and coking coals is further demonstrated by the contents of Table III.4. All New South Wales exports to the United Kingdom and most shipments to Northern Europe consist of steaming coal. The average fob value of such coal to the United Kingdom increased in the latter half of 1976-77 to $20.21 per tonne compared to $16.32 per tonne in 1975-76[1].

FUTURE MARKETS

The industry currently anticipates an increasing export demand for both coking and steaming coal. Many Australian industries operated below full capacity in 1975-76 and 1976-77. Australian iron and steel production is expected to increase as the state of the economy improves, as will coal consumption for electricity generation in New South Wales. The Joint Coal Board anticipates that total usage of New South Wales coal will rise from 22m tonnes in 1977-78 to 27m tonnes by 1981-82.

(1) An increase of 24 per cent - representing a real price increase of up to 15 per cent. (The CPI rose by 13.6 per cent between March 1976 and March 1977 and by 13.4 per cent between June 1976 and June 1977).

TABLE III.4 - AVERAGE fob VALUE OF NEW SOUTH WALES COAL EXPORTS

($A per tonne)

Destination	1973-74	1974-75	1975-76[a]	July-Dec 1976	Jan-June 1977
Japan	12.50	21.74	35.62	35.28	37.15
United Kingdom	11.88	13.66	16.32	18.97	20.21
Northern Europe	13.63	14.31	16.82	19.68	20.80
Southern Europe	11.28	24.67	23.21	15.75	18.50
South Korea	12.01	22.63	33.72	35.75	36.76
Others	11.07	18.66	24.04	26.52	35.37
Average all Areas	12.43	20.26	31.43	33.04	33.86

(a) Includes duty payable on coal exports.

Source: Joint Coal Board, 29th Annual Report 1975-76, Table 61, p. 106; Joint Coal Board, 30th Annual Report 1976-77, Table 66, p.142.

Export markets are also expected to expand. The use of coal by steel mills is anticipated to rise by 100 per cent in developing countries and by 20 per cent in developed countries by 1985. Australia can therefore look forward to supplying a considerably expanded world market.

Overseas demand for steaming coal is expected to increase in a more stable fashion than it has in the past. It is anticipated that an increased proportion of new power stations constructed throughout the world will be coal-fed rather than oil-fed or nuclear-fed. Nuclear stations have high costs, low operating time ratios and pose difficult environmental problems. Current forecasts indicate marked shortages of oil and therefore higher real prices in the near future. In addition to these factors, which are already encouraging the use of coal, there are good prospects of higher efficiencies and lower capital costs for several new techniques of power generation from coal.

APPENDIX IV - COAL TRANSPORTATION AND LOADING FACILITIES IN NEW SOUTH WALES

In 1975-76 the New South Wales Public Transport Commission hauled 14.56 million tonnes (approximately 43 per cent of the total from coal mines in New South Wales) over the Government railway system. The remainder was moved by conveyor (approximately 21 per cent), road haulage (28 per cent) and private railway line (8 per cent)[(1)].

Current State Government policy aims to ensure that rail haulage will become increasingly important in the future. After approving the Port Waratah coal loader project at Newcastle, '... the New South Wales Government ... imposed the condition that all coal currently transported by rail to the port is to continue to be transported that way and coal from any new mines is to be transported by rail. The Government also announced that coal transported by road is to be the subject of environmental protection control'.[(2)].

It is the policy of the JCB that coal should be transported by rail rather than road[(3)]. The Board has wide regulatory powers and road transportation of coal is seen to be acceptable only during the initial development of a mine.

The ability of the PTC to cope with future rail traffic will therefore be a major factor in whether NSW coal fields obtain export sales. An examination of the current utilisation of capacity on the major coal-carrying railway lines and their overall ability to cope with the expected increase in coal production in the State, is therefore included below. These discussions, coupled with the market outlook for steaming coal, suggest that any excess capacity which exists in the current system will be fully utilised in the near future by mines outside the Ulan area.

(1) Derived from JCB 29th Annual Report 1975-76 p.112-113.
(2) JCB, 29th Annual Report 1975-76, para 4.9 p.113.
(3) Ibid, para 4.7.

COAL LOADING FACILITIES IN NEW SOUTH WALES

There are three principal coal loading facilities at ports in New South Wales. Their current utilisation and estimated capacities are shown in Table IV.1.

Newcastle

The Basin - Port Waratah complex at Newcastle is a joint facility with common stockpiles of coal mined in the Northern and North Western fields. The facility operates with excess capacity and hence the capital component of current and tonne costs is high. However, charges have lately fallen as throughput has increased. Nevertheless, there are barriers to any increases in capacity.

Trains to the loader operate on a regular schedule, but shipping does not. As total demurrage costs are as high as $10 000 a day, it is important to co-ordinate shipping, stockpiles and land transport. Moreover, most ships load several types of coal and hence a large number of separate coals must be held in the stockpile, which further reduces potential throughput.

Forward planning may lead to improvements in the situation, but the need to load from railway wagons still arises. The coal loading charge is $4.51 a tonne, inclusive of a $1.00 per tonne harbour deepening levy which will eventually permit ships up to 70 000 DWT (58 000 DWT now) to be handled at the Basin loader(1).

Sydney

The Balmain loader in Sydney is operating close to its practical (as opposed to rated) capacity, and stockpiles are so small that ships often have to be loaded directly from trains. Already, delays of up to five hours are experienced in loading because trains are held up by congestion on suburban lines.

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(1) JCB, 29th Annual Report 1975-76, para 4.25, p.117.

TABLE IV.1 - PRINCIPAL COAL LOADING FACILITIES - NEW SOUTH WALES

	Nominal hourly rate (tonnes)	Estimated annual capacity (million tonnes)	Coal loaded 1976-77 (million tonnes)	Maximum size vessel (DWT)
Newcastle				
- Basin	2 000	9.5	7.60	58 000
- Port Waratah[a]	4 000	20.0	.80	120 000
Sydney				
- Balmain[b]	1 000	3.0	2.43	44 000
Pt Kembla				
- Inner Harbour	2 000	6.0	5.37	58 000

(a) Estimated prior to completion.
(b) Up to 10 000 tonnes per day is achieved in loading direct from trains (PTC estimate).

Source: JCB, *29th Annual Report 1975-76*, Table 65, p.116.
JCB, *30th Annual Report 1976-77*, Table 70, p.150.

Balmain's capacity is apparently to be expanded. The Premier of New South Wales, Mr Wran, when announcing rejection of the proposed coal loader at Botany Bay, said that, '... the western coal fields would be given priority on the use of an expanded Balmain facility for the export of their coal ... When coal from these important fields exceeds the capacity of the Balmain facility, rationalised freight rates would be provided to enable this coal to be exported through Port Kembla.'(1) Charges at Balmain are currently $1.87 (including a $0.40 'diversion' charge)(2) per tonne.

Port Kembla

Coal loading facilities at Port Kembla are almost fully utilised. Industrial concern over dust and other matters has prevented loadings reaching capacity, although recent reports indicate that throughput has been increased by improved maintenance of equipment. The loader ships out both Western and Southern coals. Stockpiles at mines in the southern district generally are small because of the hilly nature of the country. Hence stockpiling capacity at Port Kembla is at a premium. The railway system at the loader also requires that wagons must be shunted up and down for unloading, whereas a loop system would be much more efficient.

A new onshore coal loader is being constructed at Port Kembla as an alternative to the rejected Botany Bay proposal, but this will take three years to become operational. Loading charges at Port Kembla are presently $1.68 (including $0.40 'diversion' charge) per tonne(3).

Hence, Newcastle would seem to be the only coal loading facility with sufficient excess capacity to accommodate the expected level of expansion for New South Wales coal exports in the immediate future. In the particular case of this study, Newcastle has the added advantage of being the closest port to the Ulan fields.

(1) Australian Financial Review, 15 June 1977, p.8.
(2) Maritime Services Board.
(3) Ibid.

Nevertheless there are several means, in addition to the Sandy Hollow to Maryvale railway, of moving Ulan coal to ports with coal loading facilities. The capacity of each of these strategies to transport at least two million tonnes per annum by 1980 is the main constraint on their viability. The current situation concerning existing facilities is discussed below, followed by brief descriptions of other methods of transportation (which strictly lie outside the terms of reference laid down for this study).

ALTERNATIVE OPTIONS FOR TRANSPORTING ULAN COAL

Current transportation

The present method of distributing coal from the Ulan mine either involves direct road transport to consumers or road transportation from Ulan to Gulgong, whence supplies are either railed to domestic users or to either of the coal loaders at Balmain or Port Kembla for export.

However, the transport system for coal for export is not satisfactory because of constraints imposed by both the Gulgong to Sydney railway line and the limited available capacity at the Balmain and Port Kembla coal loaders.

The Gulgong to Mudgee section of the line is capable of taking only 1200 tonne net trains, although bridge strengthening would permit trains of up to 1800 tonnes net. In addition, every train through Lithgow has to be grade tested because of the 1 in 30 gradient between Katoomba and Valley Heights, a test which results in a delay of 90 minutes. These constraints, while substantial, are not however the major problems encountered.

At present, 10 or 12 coal trains run daily on the line to or through Sydney. This could be increased, but any increases beyond 15 per day would be prohibited by congestion on the track from Westmead to the goods lines at Lidcombe. Suburban passenger traffic is already so heavy that there are no additional paths through the morning and afternoon peaks, while industrial issues limit the use of excess capacity at nights and weekends. The size of marshalling yards, sidings and crossing loops on the Gulgong-Sydney line also restricts train size and frequency of service.

Extra traffic which could move over the line to Sydney is therefore limited to 330 000 tonnes of coal a year. This quantity is insufficient to cope with the planned scale of operations at Ulan, let alone further increases in production from elsewhere in the Western District. The Katoomba seam, which will also use this railway, will have an expected minimim annual output of 3.7 million tonnes by 1980, taking existing contracts into account.

A contingency plan exists for a four fold expansion of the line from Mount Victoria to Sydney. This would be an extremely expensive undertaking, however, and thus can be currently viewed as being hypothetical. Construction of additional goods lines from Parramatta into Lidcombe could be an option which would enable increased goods traffic on the route, but this would also require a massive investment.

Given that improvements on the Western Line might be achieved, albeit at high cost, barriers to increasing capacity on the Sydney to Port Kembla line still exist. There is a high level of passenger traffic and restrictions are imposed by a single track section through a tunnel between Clifton and Scarborough. Additional paths for freight or coal trains during peak periods are prohibited by congestion, while the single track tunnel is a constant bottleneck to efficient train scheduling. Finally, because of the limited stockpile at the Port Kembla loader, trains require extensive shunting to unload wagons; this would tend to further restrict the usefulness of this option.

In addition to rail link difficulties, the Balmain and Port Kembla coal loaders have limited excess capacity. Although expansion of these facilities has been foreshadowed, the State Government does not appear to have any definite plans as yet. It therefore seems doubtful that the Port Kembla facility will be constructed and operational before the expected start of market expansion in the early 1980s.

The proposed Douglas Park rail link is associated with the proposed new loader at Port Kembla. If constructed, this line will be approximately 45 kilometres long and will probably be constructed between Maldon in the Southern Tablelands and Port Kembla, to service mines that are being developed in the South and South Western districts. This line would have extensive grades despite the construction of a 12 km long tunnel, and the possibility of electrification of the line is being closely examined. A further possible development is extension of the line to join the Great Western Line in the vicinity of Penrith. This would provide Western District mines with access to Port Kembla, avoiding the congestion of the Sydney suburban system.

These developments, if carried out, would increase the coal carrying capacity of the railway network. However, it can be envisaged that the increased capacity would largely be utilised by increased production from the Western and Southern fields. Hence, the capacity of the system to transport Ulan coal may still be limited.

Finally, the costs encountered in the extra handling involved in the transfer from road to rail at Gulgong and the higher costs of road over rail transport would make this option less attractive than a pure rail transport strategy.

Railing coal from Gulgong to the Newcastle loader via Sydney has not been considered viable because of the distances involved (together with the handling costs at Gulgong and congestion in Sydney discussed above). Gulgong to Port Kembla is 431 km and Gulgong to Sydney is 341 km, while Gulgong to Newcastle via Sydney is 509 km.

However, the Sydney to Newcastle railway currently carries coal for export. Its excess capacity is currently limited to four to five extra trains a day or about 330 000 tonnes of cargo a year. These additional trains could not be programmed and would have to be adapted to the traffic whenever possible. Loading off these trains would therefore not be feasible and the strategy would increase the demand for stockpile facilities.

If the Sydney to Newcastle rail link were to become a heavy coal traffic route, a connection should preferably be provided in Sydney from the urban freight lines to the Main Northern line. This would avoid the main passenger lines between Flemington and Strathfield. As in the case of the other lines which are discussed in this chapter, train size here is currently limited by the size of yards for forming and reforming trains and the length of refuge and crossing loops. Upgrading of this line is not considered a viable option for the export of Ulan coal.

Construction of a spur line from Gulgong to Ulan and Rail to Sydney or Port Kembla

This option is similar to the existing situation but it eliminates the extra costs of road haulage over rail for the 23 kilometres from the Ulan mine to Gulgong and the costs of modal transfer, which are approximately $1 a tonne. The same problems associated with rail transport from Gulgong to Sydney and Sydney to Port Kembla are encountered, as are the capacity limitations of the two southern coal ports. For these reasons, this option is not considered viable.

Road transport of Coal from Ulan to Merriwa and then Rail to Newcastle

Coal could be road-hauled to a railway siding at Wappinguy Hill, just south east of Merriwa. The road distance is approximately 95 kilometres, while the subsequent rail haul to Newcastle would be about 200 kilometres.

Quantities of up to one million tonnes of coal per annum could be transported by this method. However, it is probable that capacity would be limited to no more than 0.5 million tonnes for environmental reasons associated with road haulage of large quantities of coal. A fleet of 25 tonne trucks would need to cart 200 loads a day to shift one million tonnes a year. Assuming an eight-hour day and 200 working days a year, this operation would involve a truck travelling in either direction, passing any point along the route about every three minutes. The current route also requires trucks to travel through the main thoroughfare of Merriwa. Thus a diversion route for heavy vehicles around Merriwa would have to be built for this option to become practical.

As noted above it is the policy of the Joint Coal Board to restrict road haulage of coal to the initial developmental stages of a mine. It is unlikely that the JCB would vary this policy to permit road transportation of coal over the long-term.

Extension of the Mount Thorley Spur Line

Early in 1976, the NSW Government let a contract for the construction of the first stage of a spur line from the Main Northern Line at Whittington, South of Singleton, to Mount Thorley where a terminal, now nearing completion, has been established. It provides 'a common use coal handling and loading facility including bins and reclaiming and elevating conveyors ...'[1]. The line to the terminal is about 10 km long, and will carry coal traffic from the developing coal fields in the Warkworth and Broke areas.

Early discussions with the PTC indicated that this link was planned to be gradually extended through the coal leases of the Singleton-North-west District. The general direction of this extension would have been towards Sandy Hollow. However, the extension of the line is not considered to be a realistic alternative to the Sandy Hollow-Maryvale line, as it will be years before it even approaches Sandy Hollow (let alone Ulan).

(1) JCB, 29th Annual Report, p.114.

Potential Slurry Pipelines

Coal slurries which are capable of being transported by pipeline are 60 to 70 per cent water. Solids are restricted to particles less than three millimetres in size which are in the 'fines' category. They cannot be larger because the piston and plunger type pumps which are used incorporate valves which cannot seal against discharge pressure when slurry particles are larger. The high water component of such slurries and the fine size of the particles cause dewatering and drying costs to be high at end use.

Coal and slurry pipelines are not in general use. In 1975 only one commercial coal slurry pipeline was in operation in the world. This was the Black Mesa pipeline in Arizona USA. It delivers 4.8 million tonnes of steaming coal annually over a distance of 445 kilometres to an electricity generation plant(1).

Pipelines have not yet been considered for the transportation of coal in New South Wales, because most coal fired power stations are close enough to mines for road haulage or conveyors to be economic means of transportation to them.

As indicated above, present slurry technology involves massive water requirements. Following separation from the fine coal, the water is discoloured and presents a pollution problem. Recycling the water increases pipeline costs by approximately 40 per cent. Furthermore, if a power failure or line break occurs, all of the slurry must be dumped somewhere to avoid the particles settling and clogging the pipe(2). The environmental problems associated with present slurry pipelines are therefore considerable.

The tendency for slurry mixtures to settle when stationary also applies to fines. Fines in fact set rock hard in a relatively short time. The shipment of fines for export and therefore the

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(1) M. Rieber et al, The Coal Future: Economic and Technological Analysis of Initiatives and Innovations to Secure Fuel Supply Independence, NTIS, Springfield Va., 1975.

(2) Ibid.

use of a slurry pipeline for the transport of coal intended for export is not possible. Because fines 'bulk' in transit, export buyers specify a maximum proportion of fines in coal to be transported by ship, even though steaming coal usually has to be ground fine before it can be fed to furnaces. Fines also clog machinery and absorb much more moisture than larger coal particles.

A new 'rotary ram' pump is being developed by an Australian engineering firm which overcomes the valve problems of slurry pumps currently in use. It is designed to be able to pump coal up to 5 cm in diameter or larger[(1)]. This pumping principle provides solutions to key pump problems. These are the need to seal against large particles and to pump a very high coal concentration with low pipe friction and without the problems associated with pipeline blockage. The pump could be used to transport lump coal almost directly from washeries to the holds of ships with minimal water removal requirements. Thus, although this pump is in the earliest stages of prototype operation and it is expected that another three to five years will be necessary before production models could become available, pipelines might become feasible for most future coal transport situations.

When developed, such slurry facilities will be most competitive where other infrastructure does not yet exist or where large movements of coal are proposed and existing road and rail networks have limited capacities.

There are two pipeline options for transporting Ulan coal which might become possible in the long-term, but which are not possible in the foreseeable future. A pipe could be used between Ulan and Sandy Hollow, with subsequent transportation by rail to Newcastle. Alternatively the pipeline could transport the coal over the entire distance to Newcastle. Assuming that pipes would be laid

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(1) B.A. Boyle and Associates, 'The Hydraulic Transportation and Storage of Coking Coal' - Paper presented at Technical Conference of Institution of Engineers, Australia. p.87 n.d.

along existing railway easements in order to minimise disruption of the environment, the lengths of such pipes would be approximately 105 kilometres for the first alternative and approximately 269 kilometres for the latter.

COMPARISON OF OPTIONS

A summary of the distances which would be travelled in each mode under each of the optional strategies described above, as well as the two stages of construction of the Sandy Hollow-Maryvale railway, is presented in Table IV.2.

TABLE IV.2 - DISTANCE TRAVELLED TO COAL LOADERS FOR EACH OPTION TO TRANSPORT ULAN COAL

(distances in kilometres)

Option	Coal Loader		
	Newcastle	Balmain	Pt Kembla
Current method	532 [a]	364	454 [a]
Spur railway from Ulan to Gulgong	532 [a]	364	454 [a]
Road transport via Merriwa	295	463 [b]	533 [b]
Extension of Mt Thorley Spur	270 [c]	438 [b]	528 [b]
Slurry pipeline	269 [d]	-	-
Construction of Sandy Hollow-Gulgong railway	269	364	454

(a) Via Sydney.
(b) Via Newcastle.
(c) Approximate - the exact route has not been determined.
(d) Assumed to follow existing rail rights of way.

The Sandy Hollow-Gulgong line would provide the shortest links to all three coal loaders, as well as permitting supply of current domestic markets for Ulan coal to continue on a more efficient basis. It would also provide a contingency route to Newcastle for other Western District coal, with the distance from Lithgow to Newcastle via Gulgong being 482 kilometres.

Present rail distances for Lithgow coal are 324 km to Newcastle via Sydney, 156 km to Sydney and 246 km to Port Kembla.

These distances indicate that, given sufficient capacity on the Western line and expanded loading facilities at Sydney or Port Kembla, coal would not normally be railed from Lithgow to Newcastle. However, such an option could have some merit if congestion on current routes, or at the two southern points, could be avoided by such action. For instance, ships often currently incur demurrage costs of up to $10 000 a day at those ports. Nevertheless, considerable resource savings would arise if Ulan coal was railed over the Sandy Hollow to Maryvale route to Newcastle.

The descriptions of the other strategies indicate that they are unlikely to prove viable, especially in the short-run. The current system and the possible spur line from Gulgong to Ulan cannot immediately provide sufficient rail freight capacity to meet the available demand for Ulan coal. Road transport to Merriwa is not feasible, because of the serious environmental problems that it poses and the high level of transport costs. Extension of the Mount Thorley spur line is not considered realistic by the PTC.

The pipeline solutions are not yet sufficiently developed to be considered feasible. Hence, they can only be considered as probable long-term options, and are not relevant to this study which concerns immediate transport needs.

Construction of all or part of the Sandy Hollow to Maryvale railway, as discussed more fully in Chapter 5 of this Report, could commence almost immediately and could be completed by the time expansion of production could occur. Either of the options available could provide a solution to both the short- and long-term requirements of transporting Ulan coal. The only real alternative to constructing at least part of the line appears to be to postpone capturing markets for Ulan coal until pipelines become viable. This would involve a considerable economic loss to the State as it is a long-term solution. By missing out on markets early in the expansion of demand for steaming coal, long-term outlets may be prolonged.

APPENDIX V - DERIVATION OF ANNUAL COSTS

Train Operating and Maintenance Costs

After discussions with the NSW PTC regarding the most likely level of operation of coal trains between Ulan and Newcastle, the operating and maintenance costs of each unit train were estimated. The basic data used are discussed below.

The round trip distance between Ulan and Newcastle is 558 km. Coal carried by each unit train per trip is 2700 tonnes. A 24-hour day and 350 working days per year were assumed after consultation with the NSW PTC. The cycle time for each round trip was assumed to be 18.5 hours. These figures imply that each train can make 454 round trips per year. Assuming an average load of 2700 tonnes of coal, each train could carry 1 226 000 tonnes of coal per year.

Export contract requirements which are expected in the future for Ulan coal indicate that one train making 196 trips per year would be required in 1981-82. This would rise to two trains in 1982-83 and 1983-84 (with each train making 278 trips in 1982-83 and 371 trips in 1983-84). Three trains would be required in 1984-85 and 1985-86 (with each train making 309 trips in 1984-85 and 371 trips in 1985-86). The 1985-86 situation would prevail in later years.

The components of train operating and maintenance costs were identified as:

- Locomotive maintenance;
- Locomotive share of fuel;
- Train crew cost;
- Guards van maintenance;
- Guards van share of fuel;
- Wagon maintenance;
- Wagon share of fuel.

These components were then expressed as functions of historical costs and distances travelled by each train per year to obtain total costs of operation.

Track Maintenance Costs

Two components of track maintenance were identified:

- Wagon weight component;
- Freight weight component.

These were expressed as functions of distance travelled by each wagon per year, the weight of the wagon, the weight of the freight load and historical cost data.

LIST OF ABBREVIATIONS

BTE	Bureau of Transport Economics
PTC	Public Transport Commission of New South Wales
DWT	Dead Weight Tonnes
MSB	Maritime Services Board of NSW
JCB	Joint Coal Board
GEB	Grain Elevators Board of NSW
NSW	New South Wales
AGPS	Australian Government Publishing Service
BAE	Bureau of Agricultural Economics
fob	Free on board
km	kilometre(s)
m	million