COUNTRY ROADS BOARD

VICTORIA

FIFTY-NINTH ANNUAL REPORT

FOR YEAR ENDED 30TH JUNE, 1972

PRESENTED TO BOTH HOUSES OF PARLIAMENT
PURSUANT TO ACT No. 6229

COUNTRY ROADS BOARD

Chairman	**R. E. V. Donaldson**
Deputy Chairman	**J. D. Thorpe**
Member	**T. H. Russell**

PRINCIPAL OFFICERS AS AT 30TH JUNE, 1972
HEAD OFFICE

Chief Engineer	**W. S. Brake**
Secretary	**N. L. Allanson**
Chief Accountant	**R. G. Cooper**
Deputy Chief Engineer	**Dr K. G. E. Moody**
Deputy Secretary	**C. C. Liddell**
Deputy Chief Accountant	**R. J. C. Bulman**

DIVISIONAL OFFICES

Division	*Divisional Engineer*
Bairnsdale	**W. H. Dolamore**
Ballarat	**E. T. Oppy**
Benalla	**R. R. Patterson**
Bendigo	**T. M. Glazebrook**
Dandenong	**F. W. Docking**
Geelong	**G. W. Marshallsea**
Horsham	**J. W. Heid**
Metropolitan	**L. M. Jones**
Traralgon	**A. Jacka**
Warrnambool	**F. G. Lodge**

60 Denmark Street
Kew

1st November, 1972

The Honorable A. J. Hunt, M.L.C.

Minister for Local Government

480 Collins Street

Melbourne 3000

Sir,

In accordance with the requirements of Section 128 of the Country Roads Act 1958, No. 6229, the Board has the honour to submit to you for presentation to Parliament the report of its proceedings for the year ended 30th June, 1972.

The Board thanks you, Sir, for your support and interest in its activities and wishes to place on record its appreciation of the continued co-operation and assistance of other State Ministers, Government Departments, State instrumentalities and municipal councils.

The Board also pays tribute to the continued loyal co-operation and work done by its staff and employees throughout the year.

We have the honour to be,

Sir,

your obedient servants

R. E. V. DONALDSON, A.A.S.A. (Senior),
A.I.M.A., F.C.I.T., J.P.,
Chairman.

J. D. THORPE, C.E., F.I.E. Aust.,
M.I.T.E. (U.S.), F.C.I.T.
Deputy Chairman

T. H. RUSSELL, M.Eng.Sc., B.C.E.,
Dip. C.E., C.E., F.I.E. Aust.,
Member.

N. L. ALLANSON, A.A.S.A. (Senior), J.P.,
Secretary

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During 1971/72 the Board:

- Expended $81,652,761 on new roads and bridges and the maintenance and improvement of existing roads and bridges.
- Expended $5,470,000 on the acquisition of land for road purposes.
- Constructed 43 miles of additional dual carriageways.
- Sealed or resealed with bitumen 3,274 miles of road.
- Commenced the construction of 153 new bridges.
- Planted 70,000 trees and shrubs on road reserves.
- Allocated $46,542,000 for expenditure by municipalities on main and unclassified roads.

ANNUAL REPORT 1971/72

REVIEW

SHORTAGE OF FUNDS FOR CONSTRUCTION AND MAINTENANCE OF STATE ROAD SYSTEM

The Board experienced increasing difficulty during the year in financing essential works on roods throughout the State. The primary causes of this situation were the general problems of inflation and the increasing demand for the improvement of roods to meet the needs of modern road transport and increasing traffic volumes. The situation in the immediate future is likely to be worse than in financial year 1971/72.

Labour costs which make up approximately one-third of the cost of roadworks have increased by approximately 60% since 1965. Steady increases in the prices of road-making materials and the costs of servicing roodmoking machinery have also taken place in recent years. In all, the costs of road construction and maintenance increased by approximately 35% over the period from 1965/66 to 1970/71. Furthermore, increases since 1970/71 in wages and prices are expected to increase road construction maintenance costs to more than 50% above the 1965/66 level by the end of the financial year 1972/73.

In the past the Board has been able to absorb a significant proportion of these cost increases through increased productivity, but the direct impact of recent wage and price increases cannot be completely overcome by improved efficiency. Consequently, the volume of work the Board is able to perform is less than it should be to cater for the needs of the motoring public. The backlog of work is causing grave concern.

The two main sources of funds available to the Board to enable it to carry out its statutory responsibilities are part of grants made to the State under the Commonwealth Aid Roads Act ($45.3M in financial year 1971/72) and money received from State sources ($47.7M in financial year 1971/72). Finance is also mode available to the Board by the Treasurer from the Roads (Special Projects) Fund and in 1971/72 the Board expended $6.7M from this fund.

The bulk of the funds available to the Board under existing legislation from Victorian sources consists of approximately two-thirds of the receipts from motor car registration fees and the full amount of the ton-mile tax paid by commercial vehicle operators.

Originally, the full amount of road user taxes levied under the Victorian Motor Car Act was specifically set aside for use on the construction and maintenance of roads, and, for this purpose, was paid into the Country Roads Board Fund.

At present, however, as shown in the following table only 66% of the net amount raised under the Motor Car Act in financial year 1971/72 was available to the Board for expenditure on roads and bridges; although the items marked with asterisks are in fact used for road and semi-road purposes.

REVENUE UNDER THE MOTOR CAR ACT IN 1971/72
(Estimates only)

	$	$
Fees (motor registration, drivers' licences, etc.) less cost of collection	57,351,000	
Fines	2,000,000	
		$59,351,000
Less paid to—		
Level Crossings Fund	1,130,000*	
Municipalities Assistance Fund	1,670,000	
Roads (Special Projects) Fund	16,106,000*	
Drivers' Licence Suspense Account	900,000*	
Transport Regulation Fund	10,000	
Consolidated Fund	5,240,000	
		$25,056,000
Amount paid to Country Roads Board Fund	Carried forward:	$34,295,000

REVENUE UNDER THE MOTOR CAR ACT IN 1971/72 (CONT.)
(Estimates only)

	$	$
Brought forward		$34,295,000
Less statutory payments to—-		
Tourist Fund	658,000	
Transport Regulation Fund	534,000	
Traffic Authority Fund	329,000*	
		$1,521,000
Net income available to CRB from fees and fines under the Motor Car Act		$32,774,000
Add—		
Grant to Country Roads Board in lieu of fines under Motor Car Act	679,000	
Allocation to C.R.B. from Roads (Special Projects) Fund	5,368,000	
		$6,047,000
Net amount available for use by Country Roads Board		$38,821,000

The number of motor vehicles registered in Victoria rose from approximately 1,068,000 as at 31st December, 1965 to approximately 1,417,000 as at 31st December, 1971, a rise of 32%. Even though this resulted in a rise in receipts from motor car registration fees, the increasing proportion of funds being diverted away from the Board, and the general problems of inflation, reduced the average amount of money available to the Board per registered vehicle in terms of 1965/66 money values from $60.60 per vehicle in 1965/66 to $51.50 per vehicle in 1970/71.

The Board's financial position caused:

(a) delays in implementing many urgent improvements to the existing road system;

(b) delays in commencing the construction of new freeways in the Melbourne metropolitan area;

(c) severe difficulties in maintaining the Board's rural workforce. During the year the Board was forced to reduce the number of its direct labour personnel by over 150;

(d) no further declarations of additional State highways, tourists' roads, forest roads and main roads. The Board has on hand a large number of applications from municipalities throughout the State for the declaration of additional roads under the Country Roads Act. Many of the applications on hand are worthy of declaration but the Board is not able to accept the additional financial commitment involved;

(e) only marginal increases being possible in providing financial assistance to municipal councils for works on main roads and unclassified roads. Municipal councils are facing similar financial problems and are looking to the Board for further assistance by the provision of increased grants year by year. Applications for funds submitted annually by municipal councils to the Board for works on main and unclassified roads always greatly exceed the amount of funds available. The Board received applications from municipal councils totalling almost $90M for allocations in 1971/72 for works on main and unclassified roads. The Board was only able to allocate $52M for this work, including the amounts required to be contributed by the councils;

(f) the deferment of the provision of additional office space urgently needed to house staff at the Head Office site. Accommodation for administrative and engineering staff at Head Office is so inadequate that some divisions and sections are located in leased premises in five buildings throughout Kew and Hawthorn. Preliminary planning is proceeding for a new building at the Head Office site, but the Board's finances do not permit a construction date to be set.

THE NEED TO IMPROVE MELBOURNE'S ARTERIAL ROAD SYSTEM

The Board is directly responsible for 174 miles of State highways, 14 miles of tourists' roads and 34 miles of freeways, and shares responsibility with municipal councils for 604 miles of main roads in the Melbourne Metropolitan Planning Area. There are many miles of other important undeclared arterial roads which are under the care

and management of municipal councils and which ideally should form part of the Board's declared road system. Unfortunately, the Board is not in a position to accept this additional financial responsibility, although it does assist councils with limited grants for works on unclassified roads.

At the present time, Melbourne has a population of approximately 2.3M people with about 33 motor vehicles per 100 of population. By the period 1985-1990 Melbourne's population is expected to rise to 3.6M and the number of motor vehicles per 100 of population is expected to rise to a minimum of 43.

The Metropolitan Transportation Study predicted that by 1985, 81.5% of the total person trips, including trips to and from the Central Business District in Melbourne, will be taking place in private motor cars, compared with 66% in 1964.

In metropolitan Melbourne the ratio of peak to off-peak traffic volumes during daylight hours varies from place to place but generally it is in the order of about $2\frac{1}{4}$ to 1. If the expected traffic growth occurs and nothing is done to provide extra road capacity, the conditions which exist at present during peak hours will exist in 1990 for most working hours with consequent congestion during the period when most commercial traffic operates. When a road is running at say 60% of capacity each 1% increase in volume of traffic will cause 0.6% of an increase in delays. When the capacity of a road approaches 95%, each 1% increase in volume increases delays by over 10%. When full capacity of a road is reached the increase in delays becomes much larger.

Extensive travel time runs carried out by the Royal Automobile Club of Victoria in 1971 on 247 miles of arterial roads show that average speeds on these roads were 18.2 m.p.h. during the morning peak hour and 18.6 m.p.h. during the evening peak hour. A similar survey carried out by the Board in 1972 indicated that 640 miles of the 1,200 miles of metropolitan arterial roads tested operated below acceptable standards during peak periods. These standards vary from through traffic speeds of 10 m.p.h. in the central business district to 30 m.p.h. in outer areas.

Delays will become intolerable unless a planned programme of major improvements and new roads is implemented. Morning and evening peaks will extend and traffic congestion will persist throughout most of the working day.

At present, special provision is made for peak flows by banning parking, banning turns at intersections, providing special traffic signal cycles at intersections, operating roads off-centre, and police control of many critical points. These provisions, which can provide only a temporary respite, cannot be enforced all day if the commercial transport needs of the city are to be met.

Solving the Problem

(a) Improving the Existing Street System.

The capacity of Melbourne's present street system is limited because of frequent intersections and inadequate widths of streets. These roads and streets are expected to provide direct access to residences and businesses fronting them and at the same time provide space for through traffic destined for other areas.

Traffic congestion in Bridge Road Richmond

Some work has been done in recent years to increase the capacity of intersections. Generally this has involved the purchase of corner properties to enable more traffic lanes to be constructed through the intersection. The purchase of land in built-up areas makes these improvements expensive to achieve.

Conditions for traffic on existing roads can be greatly improved by the construction of dual carriageways separated by a median. The risk of head-on collisions is greatly reduced because the traffic flow on each carriageway is in one direction only. The median can be used as a pedestrian refuge and, if sufficient width is available, designed to permit the planting of shrubs to form a screen against headlight glare at night.

Improvements to Melbourne's existing road and street system by the application of traffic engineering techniques, such as the flaring of intersections and the provision of dual carriageways, will continue to be carried out, but in general these can only provide limited additional traffic capacity.

(b) Providing New Arterial Routes.

The only development which can provide the capacity required to meet the demands of road traffic in the years ahead is the construction of new arterial roads and freeways. A typical urban freeway five miles in length and built at a cost of, say $6M per mile could be expected to save an average of $2.7M per year in time and vehicle operating expenses, and $370,000 per year in reduced accident costs. The total saving would thus average $3.07M per year over the life of the freeway, which should be well in excess of 50 years.

New arterial roads constructed in recent years, such as the Tullamarine Freeway and the Lower Yarra Freeway have conferred immense benefits by way of cheaper, safer, and more rapid transportation. The Tullamarine Freeway, for example, carries approximately 23,700 vehicles per day through the Bell Street interchange, providing superior operating conditions for through traffic and affording considerable relief to parallel arterial roads, residential areas and shopping centres, as well as having a significant effect in reducing traffic accidents.

New freeway routes are designed to incorporate access control and grade separation. These features provide for entry to and exit from the freeway to be restricted to points which are designed to allow streams of traffic to merge or separate with a high degree of safety. Cross streets are taken over or under the freeway by bridges. As there is no access provided to adjacent properties and no cross movements of traffic at the same level, impediment to the free flow of traffic is reduced to a minimum. These features reduce travel times and costs and result in accident rates which are only a fraction of those experienced on existing arterial roads. Detailed accident studies show that the fatal accident rates on freeways are only one quarter of those on the surface street system.

In general, freeways are a more economical and practical means of providing for increased road traffic than widening arterial roads because—

- ★ per lane, freeways have three times the capacity of an ordinary arterial road. Arterial roads other than freeways can satisfactorily carry about 650 vehicles per lane per hour through intersections. This compares with a freeway capacity of 2,000 vehicles per lane per hour;
- ★ freeways take through traffic away from streets serving abutting residential, shopping, commercial and industrial development;
- ★ freeways carry more traffic faster and more safely than surface streets;
- ★ the increased traffic capacity of freeways results in lower vehicle operating costs;
- ★ the operation of commercial traffic is economically tied to the time spent on the road between factories, stores, customers, etc.—new routes of high standard offer a means of reducing travelling time and attendant transport costs (increasing travel speeds from 16 m.p.h. to 30 m.p.h. halves vehicle operating costs);
- ★ smooth traffic flow on freeways greatly reduces the adverse effects of stop-start conditions on fuel consumption, vehicle wear and tear, and exhaust emission (raising vehicle travel speeds from 7½ m.p.h. to 15 m.p.h. reduces carbon monoxide emission by 80%);
- ★ the development of a new freeway route gives the opportunity to plan and implement a programme of visual improvement to the lanscape through such measures as tree and shrub planting, and the grassing of slopes. In many cases this will not only provide pleasant surroundings for motorists using the freeway, but will enhance the total landscape of the surrounding areas. To quote one example in recent years, many
been planted along the Lower Yarra Freeway, which is located in an area where few trees existed previously. These plants, when mature, will be a permanent asset to the community.

Unless the capacity of Melbourne's road system is increased very rapidly in the next decade, and is capable of further development into the future, economic and social activity will be severely impeded because of the increasing difficulty of moving goods and people when and where desired. In many instances the most satisfactory solution to the demand for increased road space will be the provision of freeways which are part of a planned road network.

FREEWAYS AND DUAL CARRIAGEWAY ROADS

During the year the Board completed the construction of 35.2 miles of dual carriageways on freeways and State highways. Approximately 7.7 miles of declared main roads were also converted to dual carriageway roads by municipal councils with financial assistance from the Board. This increased the total mileage of dual carriageways on freeways, State highways, and main roads to 306.9 miles. A comparison between the mileages of dual carriageways as at 30th June, 1972, and the mileages as at 30th June, 1967, is given in the following chart:

	30th June, 1967	30th June, 1972
Freeways and State Highways	144.0 miles	230.6 miles
Main Roads	45.6 miles	76.3 miles
TOTALS	189.6 miles	306.9 miles

Detailed planning for an additional 54 miles of new freeways proceeded during the year.
The more important dual carriageway projects completed, in progress, or in the planning stage during the year are briefly described below:

Calder Freeway (Keilor Section)

A new six-lane freeway connection between the existing freeway route to Tullamarine Airport at the south-west corner of Essendon Airport and the Calder Highway at Niddrie was completed during the year and officially opened to traffic by the Minister for Local Government, the Hon. A. J. Hunt, MLC, at a ceremony held on 21st April, 1972.

An essential part of the development of the freeway was the design and construction of an interchange at the south-west corner of Essendon Airport to permit traffic movements between Tullamarine Freeway, Lancefield Road and the Calder Freeway.

In addition, it was necessary to construct bridges over the freeway at Grange Road and Matthews Avenue, and a tramway bridge adjacent to Matthews Avenue. All of these structures were completed and opened for use by the end of 1970. A pedestrian overpass of the freeway near The Avenue was commenced in June, 1971, and completed in December of that year.

Each carriageway lane is 12 feet wide and sealed shoulders ten feet wide are available for emergency use. The two carriageways are separated by a median 16 feet wide.

Approximately 3,000 native trees and shrubs were planted, including some of which are now well advanced. The species mainly used are eucalypts, acacias, meloleucas, and grevilleas. Some 38,000 ground cover plants were used—mesembryanthemum in the crib-walls and gelenia on the steeper slopes. The flatter areas were sown with grass.

The total cost of constructing this first 1.2 miles of the Calder Freeway was $3,007,000.

The second section of the freeway westerly to Erebus Street is in progress generally following the line of the present Calder Highway. This additional 1.2 miles should be completed during financial year 1973/74.

A further extension of the freeway to by-pass the township of Keilor is planned for the future.

Hume Freeway (Wallan to Broadford Section)

The construction of a 21 mile freeway deviation of the Hume Highway between Wallan and Broadford commenced during the year.
Earthworks and drainage were well advanced on the southern section of the freeway between Beveridge and Wallan East.

The design of the adjoining section of approximately seven miles was completed and construction work will commence in 1972/73. The construction of the remaining length of the freeway is expected to commence during the second half of financial year 1972/73.

The full length of the four-lane freeway is expected to be opened to traffic in late 1975 at an estimated cost of $18.5M.

Hume Freeway (Craigieburn to Clifton Hill)

During the year planning proceeded for the development of some 16 miles of freeway from Craigieburn south along the valley of the Merri Creek to Clifton Hill and generally following the Melbourne Metropolitan Planning Scheme reservation and the freeway corridor for Route F2 in the Metropolitan Transportation Plan. The adopted alignment for the section from Craigieburn to Bell Street was included in exhibited amendments to the Melbourne Metropolitan Planning Scheme.

Detailed plans were under preparation for the section from Mahoneys Road to Bell Street with a view to commencing construction in 1973/74.

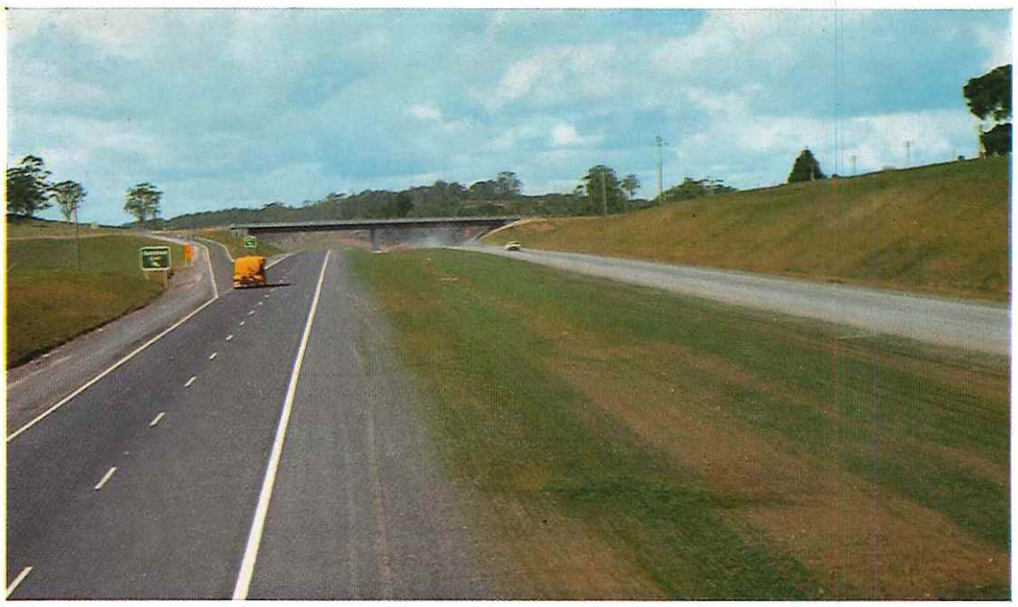
During March 1971 the Board forwarded to relevant municipal councils and planning authorities for comment plans showing four possible alignments being considered for the development of the freeway between Bell Street and St Georges Road.

Western Freeway (Gordon Section)

On 5th May, 1972, the Board's Chairman, Mr R. E. V. Donaldson, officially opened the Western Freeway (Gordon Section).

The Western Freeway (Gordon Section) is 5.74 miles long, by-passing the township of Gordon to the north. Connections to the existing Western Highway are provided at each end of the freeway. The new freeway which has dual carriageways each of two lanes reduces the route length for through traffic by almost a mile and saves considerable travelling time.

Local traffic wishing to cross the freeway is served by two bridges. One bridge, 250 feet long, provides an overpass of the freeway at Cartons Road, and the other, 272 feet long, forms part of the Moorabool West Road interchange.



The Western Freeway (Gordon Section) in the vicinity of the Moorabool West Road interchange.

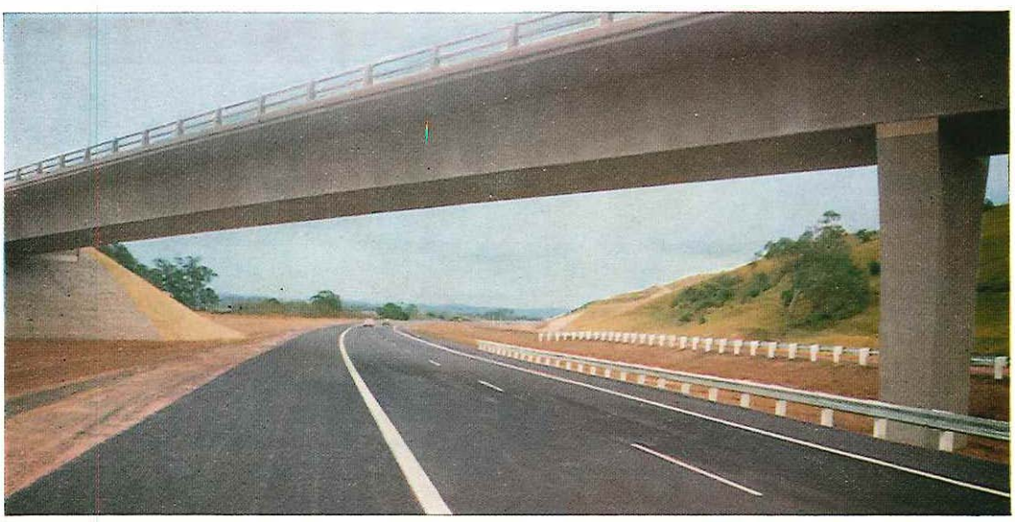
During construction of the freeway 900,000 cubic yards of earth were moved, 200,000 cubic yards of pavement material were placed, and 20,000 feet of pipes and drains were installed. A total of 90 acres of the freeway reserve was sown with grass, including 23 acres of batter slopes which were sprayed with a mixture of seed, fertilizer, and straw mulch using equipment from the Soil Conservation Authority. In the Spring of 1972 some 1,500 native trees will be planted in interchange areas and at other suitable locations along the length of the freeway.

The total cost of constructing the Western Freeway (Gordon Section) was $2.2M.

Cartons Road overpass of the Western Freeway (Gordon Section).

Western Freeway (Bacchus Marsh Section)

The Western Freeway (Bacchus Marsh Section), which was completed in June, 1972 is located generally north of Bacchus Marsh and extends from Coimadai Creek to just west of Korkuperrimul Creek, a distance of 5.88 miles.



The Western Freeway (Bacchus Marsh Section) at the eastern interchange.

The project involved the construction of dual carriageways by-passing the township of Bacchus Marsh to the north, together with interchanges with the existing Western Highway at each end of the freeway and an interchange at the Bacchus Marsh-Gisborne Road. The total cost of the project was approximately $4.3M.

The dual carriageways, each 24 feet wide, are separated by a median 70 feet wide. Each carriageway is flanked by sealed shoulders six feet wide on the right-hand side and ten feet wide on the left-hand side.

Seven bridge structures were constructed along the length of the freeway to carry the freeway carriageways over streams or to carry local traffic over the freeway.

At the eastern end of the project the alignment of the freeway is between the Lerderderg River and the high ground known as the escarpment. Construction work on the freeway required the removal of material from the south face of the escarpment for filling on low sections along the freeway. The face of the escarpment was sloped and benched to avoid slips and to ensure satisfactory drainage. Disturbed areas were treated with top soil and grassed. All batter areas along the length of the freeway were sown with grass. Work commenced on the planting of approximately 1,600 trees along the outer edges of the freeway reserve and 8,000 shrubs in the median. The varieties of trees chosen include eucalypts, acacias, melaleucas, hakeas, casuarinas and callistemons, and will be located to match or complement existing stands.

The Premier of Victoria, the Honorable Sir Henry Bolte, G.C.M.G., M.P., officially opened the Western Freeway (Bacchus Marsh Section) on 30th June, 1972.

Western Freeway (Pentland Hills and Myrniong Sections)

Construction of the Pentland Hills section of 4 miles commenced during the year and is expected to be completed in financial year 1974/75.

The design of the Myrniong section of 2.7 miles has been completed and construction is expected to commence early in 1973.

Work in progress on the Western Freeway (Pentland Hills Section) at the Lion Park interchange.

Frankston Freeway

The Frankston Freeway commences at its junction with the Mornington Peninsula Freeway near Armstrong's Road, Seaford, and extends to the Frankston-Cranbourne Road at Frankston, a distance of approximately four miles.

The 2.1 mile section between the Frankston-Cranbourne Road and Klauer Street has been completed, and earthworks are in progress on the 1.5 mile section northward along Wells Road to Armstrong's Road. The new work is expected to be completed to the stage of providing dual carriageway conditions by the end of 1972, and for full freeway conditions to apply in 1973/74.

The Frankston Freeway north of Dandenong-Frankston Road.

Mulgrave Freeway and Eumemmerring Freeway

Work continued on the construction of 3.9 miles of the Mulgrave Freeway and the Eumemmerring Freeway from the Princes Highway at Hallam to just west of Stud Road, Dandenong North. This section of four-lane freewoy is expected to be opened to traffic lote in 1972 at a cost of $6.5M.

Further progress was made on the construction of the adjoining four-lane section of the Mulgrave Freeway from just west of Stud Road to Springvale Road, a distance of 4½ miles. Earthworks were lorgely completed, pavement materials were being placed, and bridges were under construction. This section of the freeway is expected to be completed during 1974/75 at an estimated cost of $8.5M.

Some site clearance work was carried out in preparation for the construction of a third section of the Mulgrave Freeway which will extend from Springvale Road to Waverley Road, Chadstone. The relocation of some electricity supply lines commenced and the construction of bridges is expected to commence in 1972/73. When this third section of six-lanes is completed in 1978 at an estimated cost of $16M, 13½ miles of freewoy between the Princes Highwoy at Hallam and Waverley Rood, Chadstone, will be availoble for traffic.

Mornington Peninsula Freeway

When completed the Mornington Peninsula Freeway will extend from the junction with the Frankston Freeway north of Frankston to Canterbury Jetty Road south of Sorrento.

The construction of five miles of four-lane freewoy from the Nepeon Highwoy, Dromana, to Eastbourne Road, near Rosebud, continued during the year. The first 1½ miles section between the Nepean Highway and McCulloch Street was completed and opened to troffic in December 1971.

Earthworks were completed and pavement work is in progress on the one mile section between McCulloch Street and Burrell Road. Earthworks proceeded on the remaining section of 2½ miles to Eastbourne Road. The whole length of 5 miles is expected to be completed in 1974 at on estimoted cost of $6.2M.

Princes Freeway (Haunted Hills Section)

The construction of a second carriageway to provide dual carriageway conditions for 2.6 miles between Gunn's Gully and Hernes Oak was completed and opened to traffic.

Burwood Highway

The construction of 2.3 miles of dual carriageways, each 24 feet wide, from just east of Stud Road to Ferntree Gully Road was completed during the year at a cost of $670,000. Work commenced on one mile of dual carriageways from Austin Street to Acacia Road, Ferntree Gully. This section will be open for traffic during 1972/73 and is the finol stage in the progressive development of dual carriageways on the Burwood Highway over its full length of 12.75 miles.

Princes Highway West

The construction of a new six-lane bridge to replace the old four-lane road over rail bridge at West Footscray continued during the year. The project also includes improvements to several highway intersections on either side of the railway overpass. When completed in 1973 the project will materially improve the flow of through traffic and assist cross movements by local traffic.

Dual carriageways each 44 feet wide were completed from Bell Parade to Latrobe Terrace, Geelong, a distance of 1.1 miles.

The construction of 4.0 miles of dual carriageways between Allansford and Warrnambool commenced during the year and will be completed during the 1972/73 financial year.

Princes Highway East

The construction of 1.8 miles of the highway between Grange Road, Coulfield, and Pooth Road, Chadstone, to provide six-lanes for through traffic was completed.

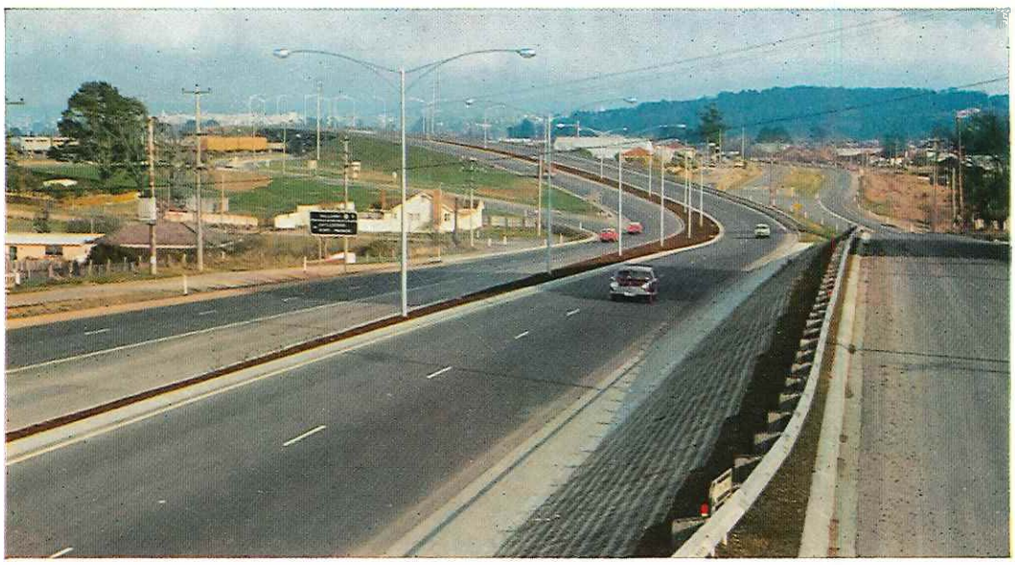
Nepean Highway

The construction of dual carriageways each of three lanes was completed between Lower Dandenong Road, Mentone, and White Street, Mordialloc, a distance of 1¼ miles.

New dual carriageways on the Nepean Highway north of White Street, Mordialloc.

Western Highway

The construction of 1.4 miles of dual carriageways to provide an improved eastern approach to Ballarat was completed.



New dual carriageways and railway overpass on the Western Highway at Ballarat East.

FREEWAY PLANNING

Economic analysis and forecasting, and an understanding of the social structure of urban communities ore valuable aids to freeway planners. The effect of freeways on the lives of people varies between communities, each of which has its own set of values and patterns of activity.

In the determination of freeway alignments the Boord has recognized the need for special consideration to be given to neighbourhood factors such as the economic effects on land values, local trading, municipal rating, and the sociological impact on community areas.

During the year the Boord appointed on Economist, a Sociologist, and a Town Planner to its stoff. These professionally qualified and skilled officers will work with engineers as a team in the Freeway Planning Division and will be engaged in defining and solving environmental and sociological problems associated with the proposed construction of freeways.

LIGHTING ON STATE HIGHWAYS

An amendment to the Country Roads Act in 1971 permits the Board to expend its funds on the lighting of State highways. The Act provides for the Board, the electricity supply authority, and the municipal council concerned to share the costs of street lighting on State highways where the lighting is of a standard not lower than the minimum standard determined by the Street Lighting Committee.

The Street Lighting Committee consists of a representative from each of the State Electricity Commission, the Municipal Association of Victoria and the Country Roads Board. The three members were appointed by the Governor in Council on 8th June, 1971. The Board's Representative, Mr H. W. P. Hobbs, Chief Road Design Engineer, is Chairman of the Committee.

During financial year 1971/72 municipal councils were invited to submit to the Board applications for a subsidy towards the costs of:

(a) the operation and maintenance of existing lighting installations requiring no improvement; and

(b) the installation, operation and maintenance of new lighting installations.

Nine existing installations involving 4.67 miles of State highway lighting were approved by the Board and the Street Lighting Committee for cost sharing purposes. The annual tariff for these installations is approximately $11,400. The financial savings to the municipal councils concerned will amount to approximately $7,600 per year.

Five new installations involving approximately 3.1 miles of State highway were also approved by the Board and the Street Lighting Committee. The estimated capital costs involved in these installations is $18,000 and the annual charge is approximately $11,700. These charges will be apportioned on the basis of one-third each to the Board, the State Electricity Commission, and the councils as the installations are completed.

CONSERVATION OF THE ENVIRONMENT AND ROADSIDE DEVELOPMENT

Within the State of Victoria the area occupied by the Board's road reserves is relatively small. However, in many localities these reserves have become the sole haven for indigenous vegetation and wild life.

Many of the Board's roads are in or near treeless countryside, and the establishment of plantations within the road reserve boundaries assists in re-establishing the balance of nature.

In the construction of roads and in the interests of safety some interference to roadside vegetation is unavoidable, but any disturbance is kept to a minimum. Restoration practices adopted by the Board aid natural regeneration on disturbed ground.

Trees planted on roadsides are carefully chosen to suit the particular soil and climatic conditions. Rainfall in Victoria ranges from 10 inches to more than 80 inches in various parts of the State. Most of the trees planted by the Board are Australian natives generally obtained in six inch tubes from the nurseries of the Forests Commission and the Natural Resources Conservation League of Victoria. The techniques of ground preparation, planting, and maintenance of trees are all aimed at providing trees capable of satisfactorily withstanding drought conditions without artificial watering.

During November, 1971, a booklet of 12 pages entitled "The C.R.B. and Roadside Conservation" was produced and forwarded to municipal councils, Government departments and authorities, libraries and service clubs. The publication explains the practices which the Board has developed over recent years to improve the appearance of roads throughout Victoria by preserving, replacing, and improving many of the features of the original landscape.

ROCK STABILIZATION ON GREAT OCEAN ROAD

In July, 1971, substantial movement was detected in the cliff face above the Great Ocean Road at Windy Point, three miles south-west of Lorne. To ensure the safety of the travelling public the Great Ocean Road was closed at Windy Point for approximately 4½ months from 23rd July, 1971.

After obtaining expert consultant opinion the Board adopted unique rock anchoring techniques never before employed in Victoria to arrest the movement of the cliff above the road. Forty-five, 3" diameter, high tensile cables were placed in drilled holes up to 140 feet deep and stressed to anchor the unstable surface rock to the underlying solid rock.

The rood was reopened to the public on 8th December, 1971. Measurements of the cliff face have indicated that no movement has token place since the completion of the work, which cost approximately $200,000.

A full technical description of the problem and the work carried out is given in Appendix 11.

LITTER ON ROAD RESERVES

In recent years it has become obvious that increasing amounts of litter are being left on rood reserves by the motoring public. A survey conducted by the Board during the year indicated that approximately $250,000 per annum is being absorbed in the collection and disposal of unwanted rubbish from roads under the Boord's control.

The magnitude of the roadside litter problem varies in different areas of the State, but is most marked on the more heavily trafficked arterial highways. Litter is removed by the Boord's maintenance patrol gangs. The work is unpleasant and diverts the patrolmen from their primary tosk of maintaining the road surface, signs, guide posts, and roadside trees. Approximately one-eighth of the working time of patrol gongs was devoted to the removal of on estimated 30,000 tons of litter in the past 12 months.

Although the Board has provided litter bins at locations where vehicles are likely to stop, these facilities are often ignored. Sometimes they are wrongly used to deposit household rubbish. This practice is more evident on the outskirts of cities and towns.

AUSTRALIAN ROADS SURVEY 1969-74

The Board's Annual Report for 1970/71 described the survey of roods being undertaken by the Notional Association of Australian State Rood Authorities in conjunction with the Commonwealth Bureau of Roods to provide information for consideration by the Commonwealth Government in framing legislation to replace the present Commonwealth Aid Roads Act, which expires on 30th June, 1974.

The five main phases of the survey are:

(i) the collection of inventory data on roods and bridges;
(ii) the identification of deficiencies;
(iii) the selection and estimated costs of improvement projects, and the preparation of maintenance estimates;
(iv) the economic evaluation of improvement projects;
(v) scheduling (listing of projects allowing for restrictions on finance and other resources).

The first three phases are being carried out mainly by the State Road Authorities and municipalities. and the latter two phases largely by the Commonwealth Bureau of Roods.

As a member of the National Association of Australian State Rood Authorities, the Board is undertaking the survey in Victoria with the assistance of local government bodies. During the year the collection of basic road and bridge inventory data was largely completed and processing of the information was commenced.

In addition to the design and co-ordination of the entire survey in Victoria, the Board is directly responsible for the collection of inventory data concerning roods declared or proclaimed under the Country Roads Act and urban arterial roods declared under the Commonwealth Aid Roads Act. Officers of 169 municipalities provided data concerning some 60,000 miles of trafficked unclassified roads.

During the year recording of information on road geometry, sealed surface condition, terrain, adjacent land use, road pavement riding quality, and traffic volumes and composition on approximately 11,000 miles of declared or proclaimed roods was carried out. In addition, travel time runs were made on approximately 2,000 miles of roads in urban Melbourne to ascertain delays due to road deficiencies. Computer programs required to edit the data and present it for further processing were written.

TRANSPORTATION STUDIES

Since 1969/70 transportation studies have been proceeding to determine the present and future public requirements for transportation facilities in the urban areas of Geelong, Ballarat and Bendigo. The studies have been carried out by consultants supervised by a committee acting on behalf of the Board. Seven-eighths of the cost of the studies is beng met by the Board with local bodies in each study area bearing the remaining one-eighth.

Geelong

During the year the study being undertaken in the Geelong area advanced to the stage of developing alternative road networks to meet the demands of traffic in 1991. The consultant's final report containing recommendations is expected to be released during financial year 1972/73.

Ballarat

The consultant's final report containing recommendations arising from the study carried out in the Ballarat Study Area was released in December 1971. The recommendations generally provide for improvements south of Sturt Street in the period to 1981 followed by the development of a by-pass through the northern suburbs in the period 1981-1986, and an expressway by-pass further north in the period 1986-1991 to cater for through traffic not destined for Ballarat.

The proposals were submitted to the Ballarat and District Joint Town Planning Committee for consideration.

Bendigo

The finol report on the recommended road plan in the Bendigo Study Area was released by the consultant in June 1972. The main features of the recommended future arterial road network are a circumferential route around the city centre, a direct route from the Calder Highway at Golden Square to Wills and Myers Streets, and a direct route from Strathfieldsaye Road to Myrtle Street. These works, together with many more of a lesser nature, have been suggested for implementation in order of priority over a series of five-year periods to 1991.

VICE-REGAL INSPECTION OF C.R.B. ROADWORKS IN EAST GIPPSLAND

His Excellency, Sir Rohan Delacombe, K.C.M.G., K.C.V.O., K.B.E., C.B., D.S.O., K.St.J., and Lady Delocombe, spent three days in May 1972, inspecting roadworks being carried out by the Board in Eost Gippsland.

Accompanied by the Board's Chairman, Mr R. E. V. Donaldson, the Vice-Regal party inspected the Board's Bairnsdale Depot and roadworks in progress on the Omeo Highway and Princes Highway East near Bairnsdale before travelling north on the Bairnsdale-Dargo Road and across the Dargo High Plains to Bright, Mt. Beauty and then Bogong.

Sir Rohan and Lady Delacombe with Patrolman H. Goudie (left), Mr. W. H. Dolamore, Divisional Engineer, and Mr. R. E. V. Donaldson, Chairman (right) at Tambo Crossing, Omeo Highway.

From Bogong the party returned to Bairnsdale via the Bogong High Plains Tourists' Road and the Omeo Highway.

During the inspection, Sir Rohan and Lady Delacombe showed great interest in the road improvement works being carried out by the Board in this part of the State and missed no opportunity to meet the Board's staff and employees encountered at the various work sites.

His Excellency meets members of a CRB construction gang at Peter Longs Corner, Bairnsdale-Dargo Road.

BOARD MEMBERS

Retirement of Mr I. J. O'Donnell

Mr I. J. O'Donnell, O.B.E., E.D., B.C.E., F.I.E.Aust., F.A.I.M., F.C.I.T., Chairman of the Board since July 1963, retired on 31st August, 1971, after 44 years of service. His service with the Board began in 1927 when he joined the staff as an Assistant Engineer. After distinguished military service during World War II, Mr O'Donnell was appointed Engineer for Bridges in 1946.

He was appointed Deputy Chief Engineer in 1956, Deputy Chairman on 1st July, 1962, and Chairman on 1st July, 1963. As Chairman, Mr. O'Donnell represented the Board on the National Association of Australian State Road Authorities, the Australian Road Research Board, the Metropolitan Transportation Committee and the State Planning Council.

Mr O'Donnell was also active in the 22nd Construction Regiment which comprises squadrons from the Country Roads Board, the Melbourne and Metropolitan Board of Works, and the State Rivers and Water Supply Commission.
His retirement brought to a close a long period of distinguished service with the Board and the State of Victoria as both an engineer and an administrator.

Appointments

Mr R. E. V. Donaldson, A.A.S.A. (Senior), A.I.M.A., F.C.I.T., JP., was appointed Chairman of the Board on 1st September, 1971.

Mr Donaldson joined the A.I.F. in 1940 in the 2/14th Australian Field Regiment, Eighth Division Field Artillery, and saw service in the South-West Pacific area. On discharge in September, 1945, he joined the Board's staff as a qualified accountant.

In 1949 he became Deputy Accountant, a position he held until 1956 when he was appointed the Board's Secretary. In 1962 he was appointed Member of the Board, and in 1963 became Deputy Chairman.

From February to May, 1961, he attended Advanced Session 10 of the Australian Administrative Staff College, Mt. Eliza.

During 1967 Mr Donaldson was sent on a 16 weeks' study tour of the United States of America, Canada, United Kingdom and Europe, observing the latest development in road design and construction, and making a special study of organization and administration including electronic data processing, financial planning and budgetary control.

Mr J. D. Thorpe, C.E., F.I.E.Aust., M.I.T.E. (U.S.), F.C.I.T., was appointed Deputy Chairman of the Board on 1st September, 1971, after serving as Member of the Board since 1st July, 1968.

Mr Thorpe joined the Board in 1926 as a junior clerk but transferred to the engineering staff as a junior engineering assistant the following year.

In 1941 Mr Thorpe was appointed as Officer Commanding the 2/1 Flash Spotting Battery. He returned to the Board and was seconded to the Traffic Commission in July 1956.

Mr Thorpe was Chairman of the Traffic Commission for 12 years and took a prominent part in the preparation of the Victorian Road Traffic Regulations, the setting up of the State Accident Record System, the Metropolitan Route Marking System and the Clear-way System as well as the preparation of standards for the design and use of traffic control signals and road signs in use in Victoria.

Mr T. H. Russell, M.Eng.Sc., B.C.E., Dip.C.E., C.E., F.I.E.Aust., formerly Chief Engineer, was appointed Member of the Board on 1st September, 1971.

Mr Russell joined the Board's staff in January, 1943, as a Diplomate Engineer. From 1952 to 1959 he held the position of Assistant Divisional Engineer, Traralgon. Early in 1959 Mr Russell was appointed Assistant Engineer for Plans and Survey and later that year Assistant Bridge Engineer.

During 1960 he attended Advance Session 7 of the Australian Administrative Staff College, Mt. Eliza. In 1968 Mr Russell was appointed Deputy Chief Engineer—Bridges.

Mr Russell became the Board's Deputy Chief Engineer in 1970, and later that year was appointed Chief Engineer.

He is the author of a number of published technical papers on various aspects of road and bridge engineering. In 1965 he accompanied the Minister for Public Works, Victoria, on an overseas mission.

FINANCE

The total funds, less cost of collection of revenue, available for expenditure by the Board during the year, including the allocation from the Roads (Special Projects) Fund, was $99,816,672.

The funds available were derived from:

State sources	$54,438,672
Commonwealth Aid Roads Act	45,300,000
Balance brought forward from year 1970/71	78,000
Total	$99,816,672

RECEIPTS

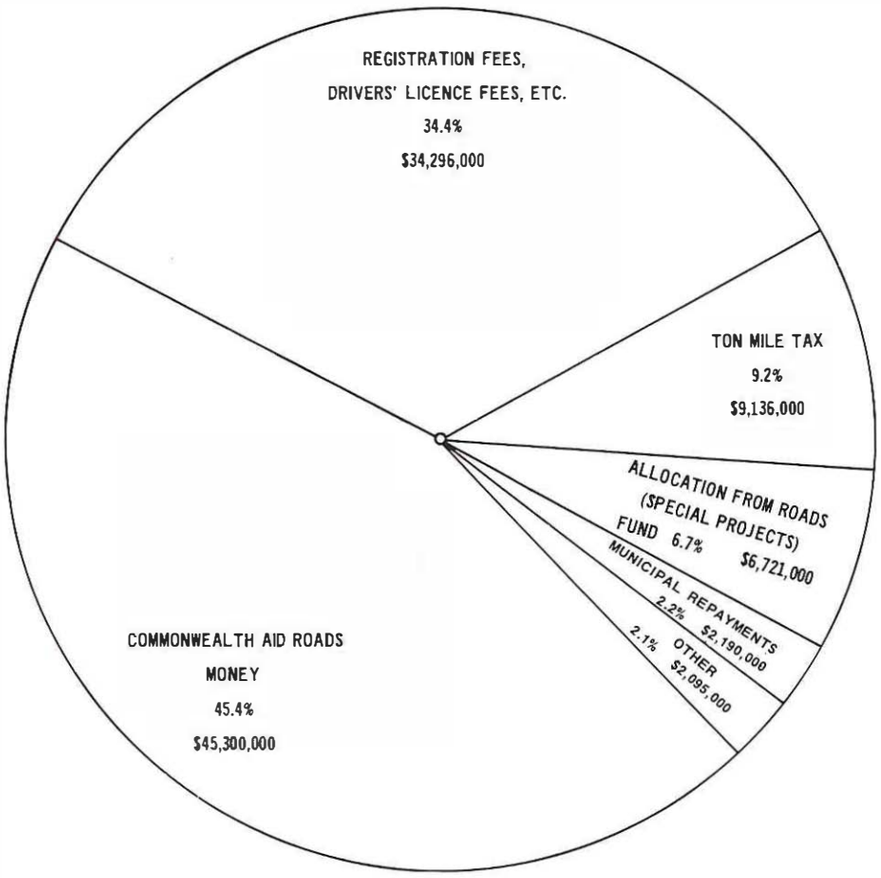
The Board's receipts were obtained from the following main sources:

1. Fees under the Motor Car Act:
   (a) Motor registration fees less cost of collection (metropolitan bus registration fees and the specified proportion of registration fees paid to the Roads (Special Projects) Fund are excluded).
   (b) Two-thirds of additional registration fees, less two-thirds cost of collection, levied on first registration and subsequent changes of ownership.
   (c) Trailer registration fees less cost of collection other than the amount paid to the Roads (Special Projects) Fund.
   (d) One-eighth drivers' licence fees less one-eighth cost of collection.
   (e) Seven-eighths drivers' licence testing fees less seven-eighths cost of collection.
   (f) One-quarter driving instructors' licence fees less one-quarter cost of collection.
   (g) Examiners' licence fees (motor car roadworthiness examination) less cost of collection.
   (h) Fees for the issue of authorized log books less cost of collection.

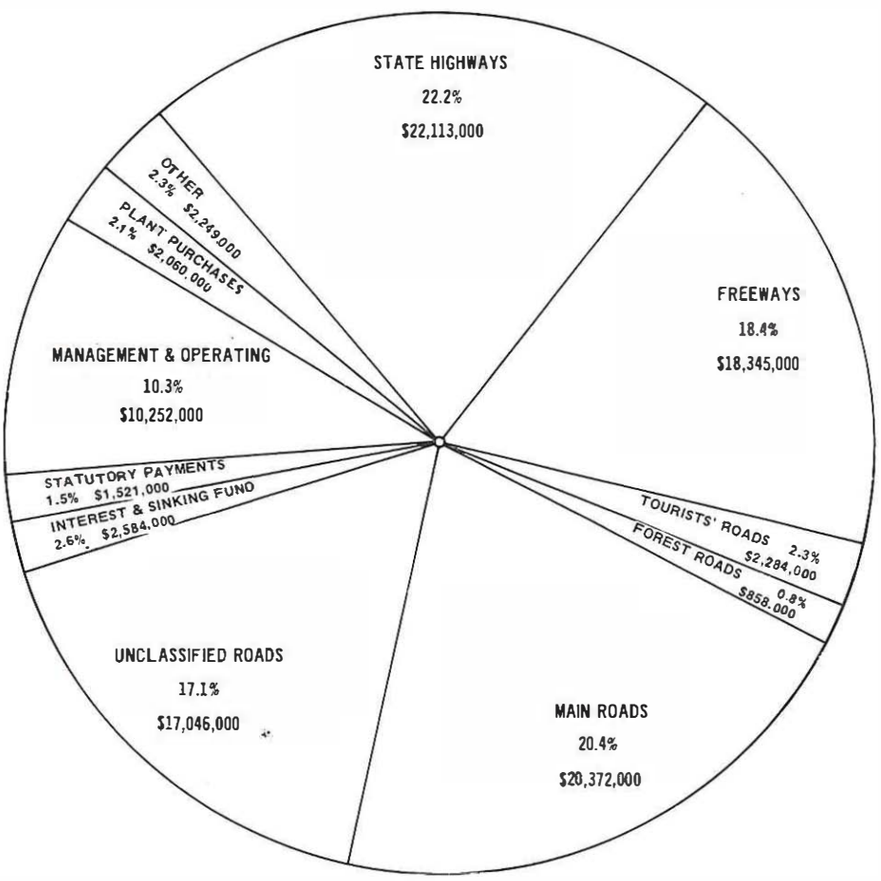
2. All moneys raised under Part II of the Commercial Goods Vehicles Act (ton mile tax).
3. Municipal contributions to expenditure on declared main roads as provided for in the Country Roads Act.
4. Special Government Grants.
5. Small amounts of loan money.
6. Allocations from the Roads (Special Projects) Fund.
7. Receipts under the Commonwealth Aid Roads Act.

The following table shows the funds available to the Board for the construction and maintenance of roads in 1971/72 compared with 1970/71.

STATE SOURCES	1970/71		1971/72	
	$	$	$	$
Fees under the Motor Car Act less cost of collection	32,894,538		34,295,617	
Less: Payments to				
(a) Interest and Sinking Fund	2,504,127		2,584,294	
(b) Traffic Authority Fund	308,682		328,946	
(c) Tourist Fund	617,363		657,891	
(d) Transport Regulation Fund	513,317		534,167	
		$28,951,049		$30,190,319
Commercial Goods Vehicles Act		8,902,789		9,136,206
Municipalities' Contributions		2,017,914		2,190,207
Loan Funds		388,000		400,000
Special Grant from State Treasury		782,550		982,500
General Receipts		543,336		712,970
Allocation from Roads (Special Projects) Fund		7,760,785		6,721,172
Totals		$49,346,423		$50,333,374
COMMONWEALTH AID ROADS ACT				
Urban Arterial Roads		23,295,000		25,780,000
Rural Arterial Roads		2,880,000		3,440,000
Rural Roads other than Arterial		14,600,000		15,330,000
Planning and Research		650,000		750,000
		$41,452,000		$45,300,000
Balance B/F at 1st July		1,201,238		78,000
Total Funds Available for Expenditure by the Board		$91,972,661		$95,711,374
Less: Expenditure on Planning and Research	940,823		1,282,643	
Capital Expenditure (Plant, Workshops, Offices, etc.)	2,555,432		2,391,416	
Salaries, Operating A/cs and Other Admin. Expend.	8,426,337	$11,992,592	10,252,427	$13,926,486
Funds available to Board for Construction and Maintenance of Roads and Bridges		$80,050,069		$81,784,888



RECEIPTS 1971 – 72.



EXPENDITURE 1971 – 72.

EXPENDITURE

Expenditure in the form of cash payments during the financial year amounted to $99,684,544 leaving a cash balance of $132,126 to be carried forward into the financial year 1972/73. The Board's share of the grants to the State under the Commonwealth Aid Roads Act were fully expended.

The following table compares expenditure made, including that from the Roads (Special Projects) Fund, in the year 1971/2 with 1970/71.

Item	1970/71	1971/72
	$	$
Construction and maintenance of roads and bridges	79,972,069	81,652,761
Capital expenditure (plant, workshops, offices, etc.)	2,555,432	2,391,416
Planning and Research	940,823	1,282,643
Salaries, operating accounts and other administrative expenditure	8,426,337	10,252,427
Statutory payments to Traffic Authority Fund, Tourist Fund and Transport Regulation Fund	1,439,362	1,521,004
Interest and Sinking Fund payments	2,504,127	2,584,294
Totals	$95,838,150	$99,684,545

SHARING THE COSTS OF ROADWORKS

The Country Roads Act provides that no more than one-half of the amount expended from loan funds and one-third of the amount expended from the Country Roads Board Fund on main roads during the preceding financial year shall be apportioned between the various municipalities benefited thereby. The Act also provides that the amount apportioned to a council in respect of expenditure charged to the Country Roads Board Fund may be reduced where the cost of maintenance is excessive due to motor traffic not of local origin or to timber traffic. The revenue, valuation, and rating of the municipality and its financial obligations for loan expenditure on permanent works are taken into account in deciding the level of contribution by a council.

In September 1971 expenditure on main roads in financial year 1970/71 was apportioned in accordance with the Country Roads Act, resulting in the following distribution of expenditure other than Loan Fund expenditure:

Expenditure from Country Roads Board Fund	$11,769,141
Expenditure from Commonwealth Aid Roads moneys	4,819,465
Expenditure from proceeds of ton/mile tax (Commercial Goods Vehicles Act)	2,780,243
Total	$19,368,849
Amount apportioned to councils	$2,044,981

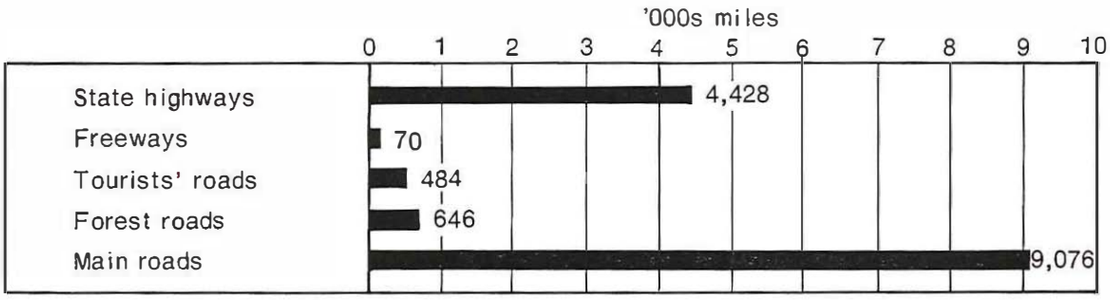
Within the limits of funds available, the Board made allocations to municipal councils for works on unclassified roads. The expenditure incurred from the allocations made by the Board in financial year 1971/72 compared with 1970/71 was as follows:

	1970/71		1971/72	
	CRB	Council Contribution	CRB	Council Contribution
	$	$	$	$
Construction and reconstruction	15,134,615	4,032,445	15,087,572	4,244,923
Patrol Maintenance	1,832,503	852,345	1,881,937	844,098
Totals	$16,967,118	$4,884,790	$16,969,509	$5,089,021

Municipal councils were not required to contribute towards the cost of works involving an expenditure during the year of $36,965,376 on State highways, freeways, tourists' roads and forest roads.

THE DECLARED ROAD SYSTEM

The total length of roads declared or proclaimed in Victoria under the Country Roads Act was 14,704 miles as at 30th June, 1972.



STATE HIGHWAYS

State highways are the principal road arteries forming interstate connections and links between the larger centres of population in the State. The Board bears the full cost of both construction and maintenance works required to meet the needs of through traffic.

The total expenditure of $22,106,000 on Victoria's 32 State highways during the year included an amount of $374,000 made available from the Roads (Special Projects) Fund. Details of the more significant works completed during the year on State highways are included in Appendix 2.

Included in Appendix 1 is a list of the State highways declared by the Board.

The Western Highway at Dobie, east of Ararat.

FREEWAYS

Freeways are roads with dual carriageways having no direct access from adjoining properties and side roads. All crossings of a freeway are by means of overpass or underpass bridges and traffic enters or leaves the freeway by means of carefully designed ramps. They provide safe, direct routes for heavy volumes of traffic, and allow through traffic to by-pass centres of population. Specially designed interchanges provide connections with other roads and streets.

The Board bears the full cost of all works on freeways. The major freeway projects completed during the year were the Calder Freeway (Keilor Section) from the Tullamarine Freeway to the Calder Highway at Niddrie, the Western Freeway (Gordon Section), and the Western Freeway (Bacchus Marsh Section). These projects are described on pages 5, 6 and 7 of this report.

The total expenditure of $18,351,000 on freeways during the year included an amount of $6,270,000 made available from the Roads (Special Projects) Fund.

Other significant freeway works completed during the year are included in Appendix 2.

The table in Appendix 1 lists the freeways constructed by the Board and opened to traffic. Approximately 22 miles of freeways are awaiting formal declaration.

TOURISTS' ROADS

Tourists' roads proclaimed under the provisions of the Country Roads Act provide access to places of special interest to tourists both in summer and winter. The Board bears the full cost of works required to cater for the needs of through traffic. In general the works are carried out under the direct supervision of the Board's staff. Details of the more significant works carried out on tourists' roads during the year are listed in Appendix 3.

The table in Appendix 1 lists the tourists' roads proclaimed under the provisions of the Country Roads Act.

FOREST ROADS

Forest roads proclaimed under the provisions of the Country Roads Act are situated within or adjacent to any State forest or in areas which are considered to be timbered, mountainous, or undeveloped. The Board bears the full cost of works required to cater for the needs of through traffic, with approximately half the work carried out on these roads being undertaken by municipal councils on behalf of the Board.

Appendix 3 lists the more important works completed during the year.

The table in Appendix 1 lists the forest roads proclaimed under the provisions of the Country Roads Act.

MAIN ROADS

Main roads are roads linking centres of population with other centres or with areas of industry, commerce, or settlement. Generally main roads are constructed and maintained by municipal councils to the satisfaction of and with financial assistance from the Board. In some cases at the request of the council works are carried out under the direct supervision of the Board's staff.

Doncaster Road east of Williamsons Road, Doncaster.

The following table shows the applications, allocations and expenditure on main roads for the financial years 1970/71 and 1971/72:

Item	1970/71	1971/72
	$	$
A Applications	31,121,000	39,572,000
B Allocations	25,481,000	25,059,000
C Expenditure	19,373,000	20,372,000
B as percentage of A	81.88%	63.33%
C as percentage of B	76.03%	81.30%

A summary of the more important works on main roads completed during the year is given in Appendix 4.

UNCLASSIFIED ROADS

Roads which are not included in the Board's declared and proclaimed road system are referred to as unclassified roads. These roads are the responsibility of municipal councils, but each year the Board provides financial assistance towards the cost of construction and maintenance works, generally in accordance with priorities allotted by municipal councils.

Municipal contributions are determined at the time the allocation is made and are based on many factors including the nature, extent, and location of the particular work and the financial position of the municipality concerned.

The following table shows the total amount of the applications received, allocations made, and expenditure incurred on unclassified roads in the 1970/71 and 1971/72 financial years:

Item	1970/71	1971/72
	$	$
Applications (gross)	55,748,000	53,175,000
Allocations (Board's funds only)	24,699,000	21,483,000
Expenditure (Board's funds only)	16,967,000	16,970,000

A list of the more significant works on unclassified roads carried out with financial assistance from the Board during the year appears in Appendix 5.

ROAD CONSTRUCTION AND MAINTENANCE

Appendices 2 to 5 list the more significant works completed during the year with funds provided wholly or partly by the Board.

The following table shows the miles of roads declared or proclaimed under the Country Roads Act and the expenditure incurred on such roads during the year:

Road	Declared or Proclaimed Miles	Road Expenditure (including Special Projects)		
		Patrol Maintenance	Other Maintenance	Construction & Reconstruction
		$	$	$
Freeways	70	416,000	55,000	17,880,000
State highways	4,428	4,136,000	1,178,000	16,792,000
Tourists' roads	484	585,000	132,000	1,566,000
Forest roads	646	368,000	112,000	379,000
Main roads	9,076	4,317,000	1,838,000	14,217,000
Totals	14,704	$9,822,000	$3,315,000	$50,834,000

SPECIAL PROJECTS

Works to be financed from the Roads (Special Projects) Fund must be approved by the Governor in Council on the recommendation of the Treasurer of Victoria. Each financial year the Board submits recommendations through the Minister for Local Government to the Treasurer for Special Projects to be carried out or commenced during the year.

Expenditure from the Roads (Special Projects) Fund by the Board on behalf of the State Government during the year was $6,721,000. Since the inception of the scheme in 1965/66 the Boord has expended a total of $28,686,000 on Special Projects.

Details of Special Projects on which work was carried out during the year are given in Appendix 6.

LAND PURCHASE

One of the pre-requisites to the construction of new roads and widening existing road reserves is the purchase of the necessary land. During the year the Board paid compensation and costs amounting to $5,139,000 to 977 owners of land. Under

the provisions of the Country Roads Act the Board is required to make full compensation for the value of land taken or used and for all damages sustained. The main principle adopted by the Board in the assessment of compensation is to ensure as far as possible that the owner is placed in the same financial position after the purchase of land as prior to the purchase.

The Board engages independent qualified valuers to assist in the assessment of compensation. The valuers are required to furnish a current market valuation of land, buildings and other improvements required for road purposes, and also where only part of a property is purchased, the amount of any compensation which should be paid for the reduction in value of the balance of the property due to the Board's works. In order to assist owners to submit claims for compensation, the Board permits owners to obtain a valuation from a valuer of their own choice at the Board's cost.

Other types of expenses incurred by the owner which are taken into account by the Board in assessing the amount of compensation to be paid include legal costs for the discharge of mortgages; legal costs incurred in the actual transfer to the Board of the land concerned and production of the relevant titles; removal costs; costs involved in the transfer of a telephone; other necessary incidental expenses relating to the owner's reinstatement in another home.

In order to prevent hardship accruing to owners of property affected by future roadworks, it is necessary for the Board in some cases to purchase properties well ahead of the time they are required for road construction purposes. These properties are then rented or leased until road construction is imminent.

The following table illustrates the number of land purchase transactions completed and the amount of compensation paid over the last five years.

Financial Year	1967/68	1968/69	1969/70	1970/71	1971/72
Number of Land Purchase cases settled	1,080	987	1,117	1,022	877
Compensation and associated costs paid by Board	$5.41M	$6.01M	$5.29M	$5.00M	$5.14M
Reimbursed to Councils for purchase of land for unclassified road works	$0.28M	$0.30M	$0.18M	$0.26M	$0.33M

During the year the Board received $526,000 from the rental of properties purchased ahead of the time they are required for road construction purposes. Twenty-nine houses owned by the Board and located on land required for road construction purposes were sold by auction for an amount of $62,500.

In some cases in rural areas owners prefer the Board to purchase the whole of their properties where the portion required for road purposes affects the owners' economic use of the land. When the exact area of land required for road purposes is known the surplus areas are advertised for sale. Seventeen such areas were sold during the year realizing $76,100.

TESTING OF MATERIALS

Materials used in the construction and maintenance of roads and bridges are required to meet minimum standards specified by the Board. Tests are carried out continuously in laboratories at Head Office and Divisional Offices, and at the sites of some larger projects where laboratories with the necessary testing facilities have been established.

The more common materials which are subject to regular testing include soils, rocks, gravels, concrete, steel, bitumen and bituminous concrete, paints, rubber and reflective materials.

The following table lists the number and types of material tests and investigations which were conducted during 1971:

	Head Office Laboratories	Regional Laboratories
Samples of materials tested	8,640	11,840
Pavement investigations	50	165
Pavement deflection investigations	95	25
Density tests on roads	6,470	3,950
Miscellaneous investigations	300	40

In recent years investigation and research into the skidding resistance and polishing of wet and dry road surfaces has been carried out. To assist in these investigations arrangements were made during the year for the purchase of a testing vehicle from the United Kingdom which is constructed generally to the design developed by the Transportation and Road Research Laboratories in Britain. The vehicle is basically a truck modified to carry a water supply to flood the road surface, and an inclined wheel to assess the skidding resistance of a wet road surface. The test vehicle is expected to be available during 1972/73.

CONTRACTS

Contracts under the Board's Direct Supervision

In Victoria there is a considerable number of contractors with the experience and capability to carry out road and bridge construction, making it generally possible for the Board to obtain competitive tenders for works. There are, however, certain projects which are more advantageously carried out by the Board's own direct labour force. These include:

(a) complex projects where flexibility of design, construction, and supervision is necessary;

(b) works in which there are special difficulties in making provision for the passage of traffic;

(c) urgent works for which no satisfactory tenders or no tenders at all have been received;

(d) bituminous surfacing.

The number of construction contracts let by the Board during 1971/72 was less than in the previous year, due to the Board entering into a number of large freeway constructional contracts which will commit the Board to substantial expenditure over a number of years.

Details of the types of contracts entered into and their respective values, together with a comparison with those of financial year 1970/71, are shown in the following table:

Type of Contract	1970/71		1971/72	
	Number of contracts	$ Value	Number of contracts	$ Value
Road Construction—Major Works (over $60,000)	15	4,647,949	10	6,396,948
Road Construction—Minor Works (under $60,000)	13	314,126	4	76,479
Combined Road and Bridge Construction	1	6,946,427	—	—
Supply of Roadmaking Materials	68	2,020,310	49	1,023,791
Bituminous Treatment and Materials	92	4,751,643	84	3,792,483
Bridge Construction	37	3,047,594	12	470,061
Manufacture of Bridge Components and Fabricated Steel	6	92,561	13	638,621
Supply of Reinforced Concrete Pipes and Box Culverts	19	1,040,000	1	96,190
Supply of Road and Bridge Construction Equipment	53	1,870,733	42	1,691,913
Divisional Facilities	9	213,472	6	207,027
Miscellaneous Services and Stores	31	1,828,596	32	1,941,943
Totals	344	$26,773,411	253	$16,335,456

The above details include contracts being financed from the Roads (Special Projects) Fund, which for the year 1970/71 amounted to 24 having a value of $2,177,504, and for 1971/72 amounted to 21 having a value of $6,329,000.

Contracts under Councils' Supervision

During the year the Board approved the acceptance by municipal councils of 331 tenders for a total amount of $6,523,281 for road and bridge works for which the Board allocated funds in whole or in part.

The Board also approved the use of 72 municipal contracts for the supply of materials for works partly financed from funds provided by the Board.

BITUMINOUS SURFACING

The total length of bituminous surfacing including both sprayed work and plant mix work completed during the year amounted to 3,274 miles at an approximate cost of $12,128,800.

The Board's 19 mobile bituminous surfacing units together with plant owned by municipal councils and contractors completed 3,164 miles of sprayed work at a cost of approximately $8,347,000.

Contractors operating from fixed asphalt plants completed 110 miles of plant mix work on densely trafficked roads at a cost of approximately $3,781,800, using 282,591 tons of bituminous concrete.

The types of work completed during the year were:

205 miles of sealing widened pavement,

26 miles of initial sealing on dual carriageways,

513 miles of restoration of sealed coats on reconstructed sections,

166 miles of final sealing on initial treatments,

1,564 miles of maintenance retreatments,

104 miles sealed on behalf of other State and municipal authorities,

696 miles of extensions to the bituminous sealed road system of the State including 116 miles of roads declared or proclaimed under the Country Roads Act.

The following quantities of materials were used by the Board or by contractors during the year on bituminous surfacing works:

MATERIAL	QUANTITY
Bitumen for sprayed work	30,088 tons
Bitumen for bituminous concrete	16,000 tons
Aggregate for sprayed work	353,190 cubic yards
Aggregate for bituminous concrete	210,000 cubic yards
Other bituminous materials for sprayed work and maintenance	14,000 tons

The total length of sealed roads in the Board's declared or proclaimed road network is 13,324 miles or 91 per cent of the total length of declared or proclaimed roads.

LINE-MARKING

During the year the Board maintained traffic lines and pavement markings on 8,127 miles of road. This represented an increase of 19% over the previous year as shown in the following table:

	1970/71	1971/72
State highways and freeways	4,045 miles	4,209 miles
Other declared or proclaimed roads under the Country Roads Act	2,073 miles	3,132 miles
Unclassified roads	690 miles	787 miles
Totals	6,808 miles	8,128 miles

The total length of line-marking carried out expressed as miles of "standard stripe", i.e. a 10 ft. 3 in. line with a 30 ft. gap was 28,642 miles, an increase of 39% over the previous year.

Three large line-marking machines were used for centre-line, lane-line and edge striping, and one medium sized machine was used for urgent striping work between scheduled visits of the larger units. Intersection and miscellaneous markings were painted by two small machines and two medium sized machines which were designed and constructed at the Board's Depot at Syndal during the year.

Costs and quantities of materials used in line-marking during 1970/71 and 1971/72 are shown below:

	1970/71	1971/72
Total expenditure	$412,776	$515,039
Roadmarking point used	55,930 gals.	80,921 gals.
Reflective glass beads used	185.7 tons	244.6 tons
Raised pavement markers used	14,300	7,430

For 1971/72 the cost of all striping by the three large line-marking units, converted to "standard stripe" was $13.69 per mile.

ROADS TO SNOW RESORTS

During the summer months the following improvements were carried out on tourists' roads which give access to winter snow fields:

Alpine Road

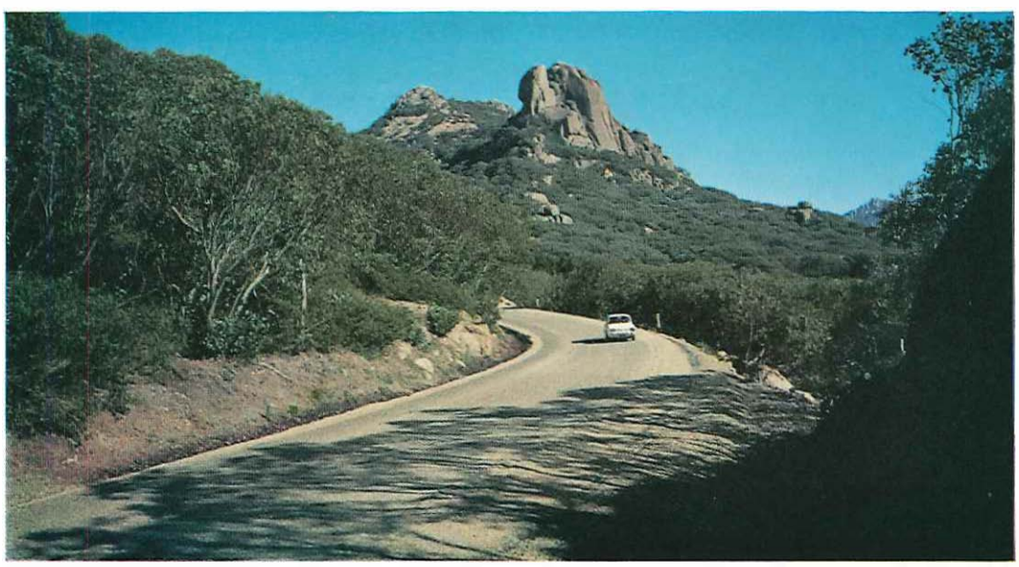
On the approach from Omeo to Mount Hotham a new high level bridge was constructed over the Victoria River at the foot of Cobungra Hill. A sharp bend was eliminated and the road was widened about three miles from Harrietville.

Bogong High Plains Road

An additional sealed parking area approximately 1,300 feet long by up to 54 feet was constructed above the main car pork at Falls Creek on behalf of the Falls Creek Tourist Area Committee of Management. A new plant shelter and operators' quarters were provided at Howmans Gap.

Mount Buffalo Road

A further 1.7 miles of the road was sealed between Dingo Dell and the Cathedral.



Reconstructed section of the Mount Buffalo Road between Dingo Dell and the Cathedral.

Mount Buller Road

A further 2 miles of the road was sealed during the year to complete the provision of a sealed pavement as far as the day car park at Tip Corner.

Vehicular access to the snow resorts was maintained during the 1972 winter. Six graders with suitably designed blades, two small snow blowers, and two large snow blowers were used. In addition, one large snow blower was stationed at Benalla as a standby unit in case of major breakdown in the regularly working snowblowers.

BRIDGES

CONSTRUCTION OF NEW BRIDGES

During the year the construction of 153 new bridges estimated to cost $8,590,000 commenced either under the direct supervision of the Board, or under municipal supervision with financial contribution from the Board. The table below gives a comparison between the number and estimated cost of bridge projects commenced in 1971/72 and those for the preceding financial year.

Description	1970/71		1971/72	
	No.	Estimated Cost	No.	Estimated Cost
Bridges commenced under the Board's supervision	69	$6,823,000	69	$7,150,000
Bridges commenced under municipal supervision with financial assistance from the Board	97	$1,510,000	84	$1,440,000
Total bridges commenced	166	$8,333,000	153	$8,590,000

LARGE BRIDGES COMPLETED IN RURAL AREAS

Some of the larger bridges completed in rural areas of Victoria during the year under the direct supervision of the Board's staff included:

(a) **Princes Freeway—Morwell River Bridges, Shire of Morwell:** Three bridges totalling 500 feet in length by 36 feet between kerbs, providing dual carriageways over the Morwell River.

(b) **Princes Highway West—Barwon River Bridge, Shire of Winchelsea:** A three-span prestressed and reinforced concrete bridge 219 feet long by 28 feet between kerbs over the Barwon River at Winchelsea.

(c) **Goulburn Valley Highway—Goulburn River Bridges, Shire of Yea:** Two prestressed and reinforced concrete bridges with a total length of 655 feet by 28 feet between kerbs, replacing two old timber bridges.

(d) **Princes Freeway—Lara Overpass, Shire of Corio:** A two-span post tensioned and reinforced concrete overpass structure 265 feet long and 28 feet between kerbs.

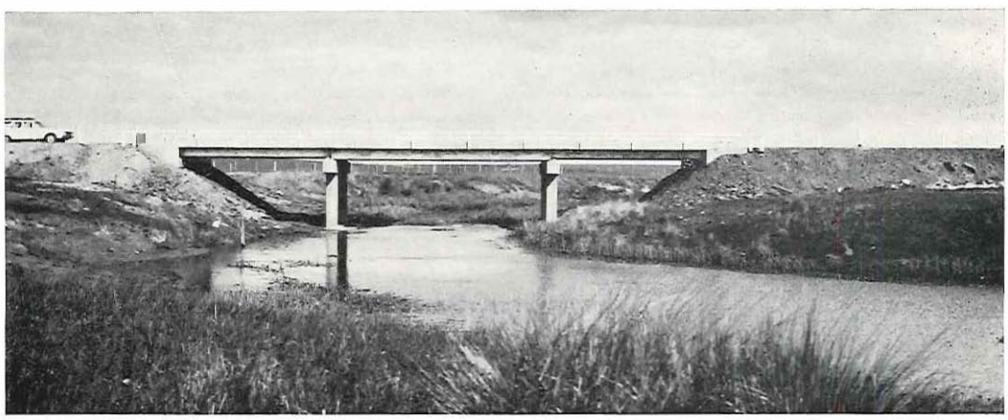
(e) **Hume Highway—Wodonga Creek Bridge, Shire of Wodonga:** A thirteen-span reinforced concrete bridge 576 feet long and 28 feet between kerbs.

Included amongst the larger bridges completed during the year under municipal supervision with financial assistance from the Board were:

(a) **House Creek Bridge—South Road, Shire of Wodonga:** A three-span reinforced concrete bridge 106 feet long by 28 feet between kerbs, plus a 5 feet wide footway.

(b) **Hopkins River Bridges, Shire of Ararat:**

(i) Calvert Road: A three-span composite steel girder and reinforced concrete bridge 98 feet long by 28 feet between kerbs over the Hopkins River; and



Bridge over the Hopkins River, Calvert Road, Shire of Ararat.

(ii) Langi Logan Road: A three-span composite steel girder and reinforced concrete bridge 98 feet long by 28 feet between kerbs over the Hopkins River.

(c) **Reedy Creek Bridge, Wangaratta—Eldarado Road, Shire of Wangaratta.** A five-span high strength precast U slab and reinforced concrete bridge 150 feet long and 24 feet between kerbs.

(d) **Moe River Bridge, Walhalla Road, Shire of Narracan:** A four-span reinforced concrete beam and reinforced concrete bridge 181 feet long by 28 feet between kerbs constructed on a curve.

(e) **Reedy Creek Bridge, Strath Creek Road, Shire of Broadford:** A three-span pre-cast high strength U slab and reinforced concrete bridge 91 feet long and 28 feet between kerbs.

METROPOLITAN BRIDGES AND OVERPASSES

Amongst the larger bridges in the metropolitan area on which construction proceeded or was completed under the direct supervision of the Board's staff, were:

(a) **Mulgrave Freeway (Stud Road to Princes Highway East):** Ten large bridges and overpass structures costing approximately $2,000,000 were completed.

(b) **Mulgrave Freeway (Stud Road to Springvale Road):** An overpass structure 345 feet long and 28 feet between kerbs carrying Brady Street over the freeway was constructed at a cost of approximately $265,000. Work proceeded on six other major bridge crossings on this section of the freeway.

(c) **Princes Highway West, Rail Overpass at West Footscray:** Work continued on the construction of bridges over the railway, Cross Street, and Gordon Street, a structure providing a connection to Gordon Street, and a pedestrian overpass over the railway from Buckley Street to Errol Street.

The whole project will cost approximately $3,400,000 and when completed will provide six lanes for highway traffic. Half the new width was completed and opened to traffic, providing four lanes for highway traffic.

(d) **Frankston Freeway, Overpass at Dandenong-Frankston Road:** An overpass structure 238 feet long by 90 feet wide was completed at a cost of approximately $556,000.

Pedestrian overpass of the Frankston Freeway serving Kananook Primary School.

GRADE-SEPARATED PEDESTRIAN CROSSINGS

Grade-separated pedestrian crossings eliminate the risk of conflict between motor vehicles and pedestrians as well as improving the safety of the road facility by allowing a smoother flow of traffic.

The Board participates in the provision of grade-separated pedestrian crossings in three ways, namely:

(1) construction of pedestrian overpasses across newly constructed freeways to restore pedestrian access to areas either side of the freeway;

(2) the replacement of at-grade school crossings on busy roads with pedestrian overpasses or underpasses under a scheme introduced by the State Government in 1965.

Under this scheme, applications for subsidies are received by the Board from municipal councils and priorities are allotted by the Road Safety and Traffic Authority in conjunction with the Board. The priorities are assessed on a formula which takes into account traffic volume, average speed of traffic, the number and age range of children crossing the road and the type of road to be crossed. Costs of these crossings are shared equally between the Government, the Board and the municipal council concerned;

(3) where a municipal council decides to provide a pedestrian overpass or underpass at its own expense, the Board is prepared to assist the council in the preparation of plans and specifications.

During 1971/72 the following progress towards the construction of grade separated pedestrian crossings was achieved:

(a) **Restoration of Pedestrian Access across Freeways**

(i) Calder Freeway, Niddrie—the Board completed the construction of a reinforced concrete pedestrian overpass 500 feet long by 6 feet wide to restore pedestrian access over the Calder Freeway near The Avenue, Niddrie.

(ii) Frankston Freeway, Frankston North—the Board constructed a reinforced concrete pedestrian overpass 637 feet long by 6 feet wide to restore pedestrian access over the Frankston Freeway, the Melbourne-Frankston railway and Wells Road in the vicinity of Jubilee Avenue and the Kananook Primary School.

(b) **State Government's Scheme for grade-separated crossings to serve schools**

Due to the limitations of funds available, no further pedestrian overpasses or underpasses to replace at-grade school crossings were approved in 1971/72. Three more pedestrian overpasses were completed during the year, viz:

Collingwood City—A pedestrian overpass in Johnston Street, near St. Euphrasia Roman Catholic School was completed in May, 1972.

Box Hill City—A pedestrian overpass in Canterbury Road in the vicinity of St. Leo's College was completed in May, 1972.

Doncaster and Templestowe City—A pedestrian underpass in Doncaster Road at Doncaster Primary School was completed in June, 1972.

In addition to the eleven grade-separated crossings already completed, fourteen other crossings to serve schools have already been approved by the Government.

BRIDGE AND CULVERT MATERIALS

The following materials either purchased directly by the Board or by municipal councils, were used during the year on works financed wholly or partly by the Board:

ITEM	AMOUNT
Reinforced concrete pipes	$528,000
Reinforced concrete box culverts	$372,000
Corrugated steel pipes and culverts	$483,000
Corrugated steel guardrail (75,500 feet)	$90,600
Precast concrete bridge units	$508,000
Fabricated reinforcing steel	3,130 tons
Welded steel girders	950 tons

Included in the value of precast concrete bridge units were approximately 11,600 tons of such units valued at $443,000 which were produced in the Board's precasting yards throughout the State.

ELIMINATION OF RAILWAY LEVEL CROSSINGS

The huge increase in road traffic over the last two decades has high-lighted the need for the elimination of railway level crossings both to reduce accidents and to reduce the substantial costs of traffic delays.

In 1954 the Government introduced special measures to accelerate the replacement of railway level crossings by the provision of overpasses or underpasses or by road deviations. The Level Crossings Fund was established with an initial appropriation of $500,000. This fund has been maintained subsequently from a fixed proportion of motor registration fees.

The purposes for which the Level Crossings Fund may be used are:

(a) the elimination of level crossings or the provision of alternative routes to enable road traffic to avoid level crossings;

(b) the provision of lights, signs and lighting at level crossings, and improved approaches to level crossings;

(c) any other works calculated to improve the flow of traffic across or to reduce the danger at level crossings.

The works undertaken are in accordance with the recommended priorities of the Abolition of Level Crossings Committee, which consists of the Chief Engineer of the Country Roads Board, the Chief Civil Engineer of the Victorian Railways, and the Assistant Chief Engineer (Civil) of the Public Works Department.

The following grade-separated overpasses or underpasses were opened to traffic during the year:

Elgar Road—Box Hill

A rail-over-road overpass on the Box Hill railway at Elgar Road was opened for use by road and rail traffic. The Victorian Railways was the bridge constructing authority and the Board carried out the road works. Between the hours of 7.00 a.m. and 7.00 p.m. the average weekday traffic in June 1972 on Elgar Road at this crossing was approximately 9,000 vehicles. The number of trains using the crossing during the same period was approximately 162. The cost of the project was approximately $1,100,000.

Kalkee Road and Urquhart Street—Horsham

A road-over-rail overpass between Kalkee Road and Urquhart Street, Horsham, was completed and two level crossings of the Melbourne-Adelaide railway at McPherson Street and Wawanna Street were closed. The Board was the constructing authority.

More than 5,000 vehicles per day use the new overpass, eliminating delays previously caused by up to 32 trains daily at certain times of the year. The cost of the project was $730,000.

North Road—Huntingdale

A road-over-rail overpass over the Dandenong railway at North Road, Huntingdale, was completed and opened to traffic. The Victorian Railways was the bridge constructing authority, and the Board and the Oakleigh City Council were responsible for the construction of the approaches and associated roadworks. The total cost of the project was $2,447,000.

Before the level crossing was closed, approximately 15,000 vehicles used the crossing between 7.00 a.m. and 7.00 p.m. daily. Approximately 175 trains use the railway during a full week day.

The following projects were commenced or continued during the year:

Millers Road—Paisley

Work continued on the construction of a rood-over-rail overpass of the Melbourne-Warrnambool railway at Paisley. The Board is the constructing authority.

More than 10,000 vehicles use this section of Millers Road between 7.00 a.m. and 7.00 p.m. daily, and approximately 56 trains use the level crossing in a whole day. The total estimated cost of the project is $1,000,000.

Princes Highway West—Allansford

Work commenced on the construction of a road-over-rail overpass of the Melbourne-Warrnambool railway on a new alignment of the Princes Highway West at Allansford. Approximately 1,300 vehicles use the existing level crossing daily between 7.00 a.m. and 7.00 p.m. The Board is the constructing authority.

The estimated cost of that portion of the highway deviation project which is regarded as a level crossing elimination project is $236,000.

Victoria Street—Geelong

Work commenced on the construction of a road overpass of both the Melbourne-Geelong railway and the Princes Highway West near Victoria Street, Geelong. The Board is the constructing authority.

The total estimated cost of the project is $513,000 of which $163,000 will be regarded as attributable to the elimination of the existing level crossing in Victoria Street.

Since the inception of the State Government scheme in 1954, the Board and the Victorian Railways have replaced 57 level crossings with overpasses or underpasses.

These works represent a total expenditure of approximately $29M.

NATIONAL PARKS SERVICE

Once again, the State Government provided $100,000 loan funds (repayable by the Board) for expenditure on roads and associated purposes in or near National Parks. Allocations were made by the Board after consultation with the National Parks Service for works in or near—

Bulga National Park in Alberton Shire
Ferntree Gully National Park in Sherbrooke Shire
Fraser National Park in Alexandra Shire
Glenaladale National Park in Bairnsdale Shire
Hattah Lakes National Park in Mildura Shire
Kinglake National Park in Eltham and Whittlesea Shires
Lind National Park in Orbost Shire
Mount Buffalo National Park in Bright Shire
Mount Eccles National Park in Minhamite Shire
Mount Richmond National Park in Portland Shire
Organ Pipes National Park in Keilor and Bulla Shires
Port Campbell National Park in Heytesbury Shire
Tarra Valley National Park in Alberton Shire
Wilson's Promontory National Park in South Gippsland Shire
Wyperfeld National Park in Karkarooc Shire

The work consisted of construction and sealing of access roads and roads within National Parks, parking areas and the maintenance of roads already constructed. The works were carried out either by the Board or the municipal council concerned.

The Government has made loan funds totalling $897,000 available for these purposes since 1st July, 1963.

MINISTRY OF TOURISM

Since 1st July, 1960, the State Government has provided loan funds (repayable by the Board) to a total amount of $2.394,000 for expenditure, after consultation with the Ministry of Tourism, on roads of a tourist nature other than roads proclaimed as tourists' roads under the provisions of the Country Roads Act.

The allocations made from the amount of $200,000 made available in financial year 1971/72 included amounts for work to be carried out on Truemans Road in Flinders Shire, the western access road to Mount Bow Bow in Narracan Shire, Point Addis Road in Barrabool Shire, the access road to Ebenezer Mission Station in Dimboola Shire, and the Cape Paterson-Inverloch Road in Woorayl Shire.

The applications for funds for work on roads of a tourist nature far exceed the amount of funds available, but the total expenditure of $2.335,000 to 30th June, 1972, has made significont progress in the provision of adequate access to many tourist attractions in Victoria.

The Board is required to make an annual payment into the Tourist Fund amounting to two per cent of the amount credited to the Country Roads Board Fund in the previous year from receipts under the Motor Car Act. An omount of $657,891 was paid during the year. The Tourist Fund is administered by the Ministry of Tourism.

MUNICIPALITIES FOREST ROADS IMPROVEMENT FUND

In 1955 the State Treasury established the Municipalities Forest Roads Improvement Fund to be used to assist municipalities in the improvement and protection of roads adjacent to State forest areas and to facilitate the extraction of forest produce.

Applications for grants from the Fund greatly exceed the funds available. Priorities for eligible works are established on a State-wide basis, following investigation by the Board's Divisional Engineers and the appropriate Forests Commission officers. Agreement is reached between the Board and the Forests Commission on the works for which allocations are made.

The authorized contributions to the Fund by the Government to 30th June, 1972, total $490,000.

Expenditure from the Fund during the financial year was $18,175, increasing the total expenditure to $436,133.

CONTROL OF HEAVY TRAFFIC

Under the provisions of the Motor Car Act the Board is the authority charged with the responsibility of issuing permits for vehicles and loads exceeding the legal weight, height, length and width for travel on:

(a) State highways, freeways, main roads, tourists' roads, and forest roads declared or proclaimed under the provisions of the Country Roads Act; and

(b) a journey which includes unclassified roads in two or more greater metropolitan municipalities as defined in the Motor Car Act.

The following table sets out the number and type of permits issued during the year compared with those issued during financial year 1970/71:

	1970/71	1971/72	% Increase
Single trip permits issued	27,441	28,821	5
Annual permits issued	3,253	3,433	5
90-day permits issued	470	538	14
Total number of permits issued:	31,164	32,792	5

Three telex machines were installed in the Traffic Section's office at Church Street, Hawthorn, for the purpose of co-ordinating and controlling the issue of permits at Divisional Offices with those issued by the Traffic Section. The co-ordination and control is achieved by the transmission by telex of draft permits from divisions to the Traffic. Section for approval before issue as approved permits.

Permits may be issued at Divisional Offices without reference to the Traffic Section in cases where:

(a) the width of the vehicle and load is not in excess of 11 feet 5 inches;

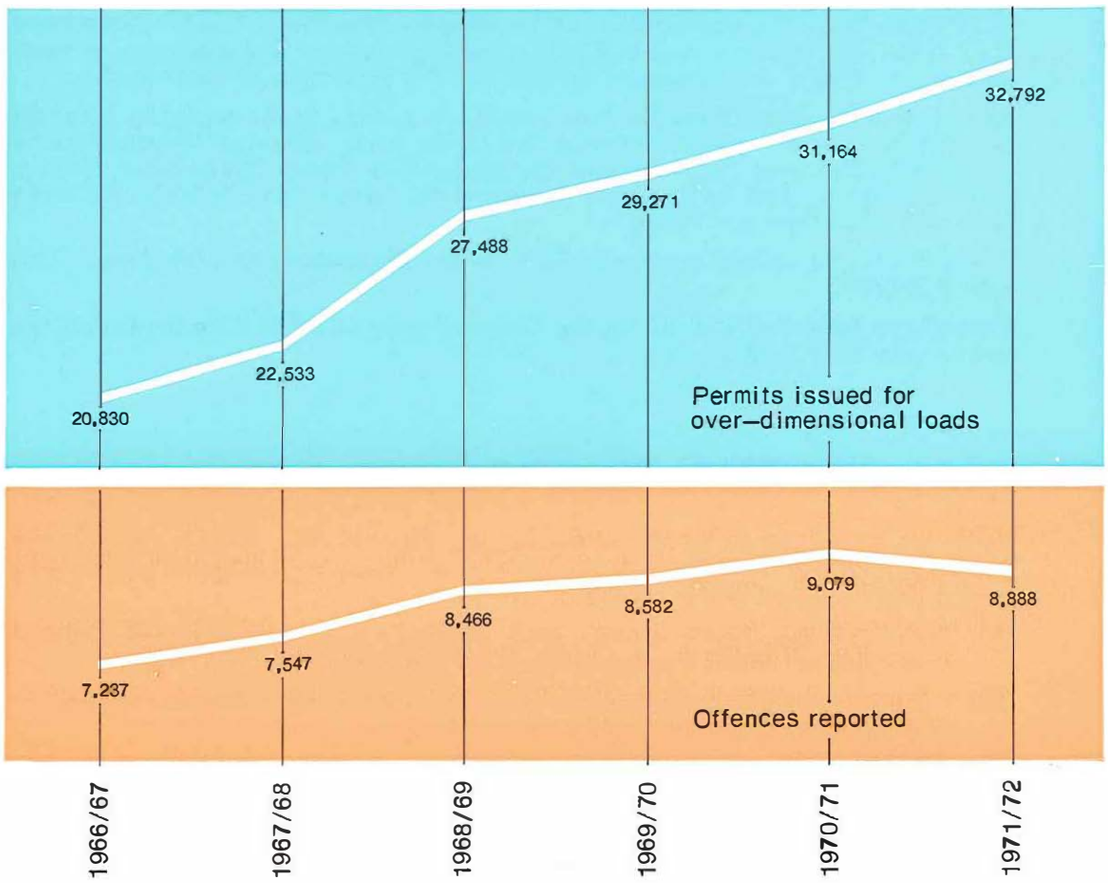
(b) the length of the vehicle and load is not in excess of 60 feet;

(c) the height of the vehicle and load is not in excess of 14 feet;

(d) a low loader has no more than 5 axles or 18 tyres, and the load and float do not exceed 41 tons overall weight.

The heaviest loads for which permits were issued during the year were for two trips from Port Melbourne to Yallourn each carrying turbine generator parts weighing 260 tons. Permits issued for loads of 70 tons or more numbered 780 and these included 27 permits for loads of 100 tons or more.

The following chart shows the number of permits issued for over-dimensional loads and the number of offences reported during the last five financial years.



Two Load Inspectors were appointed during the year to inspect vehicles and loads over 14 ft. high before the vehicles leave the loading premises and before a permit is issued.

The Board has on its staff 22 Traffic Officers and 7 Police Officers on attachment from the Victorian Police who patrol the State's principal road system to ensure as for as possible that commercial vehicles comply with the provisions of the Motor Car Act relating to weight, height, length, width and speed.

The Board's Traffic Officers and Police Officers reported 8,888 offences during the year, resulting in $405,689 in fines and costs payable into Consolidated Revenue. More than half of the reported offences related to excess weight on axles and axle groups, while the remainder related mainly to speeding or exceeding the legal length of the vehicle and load.

LEGISLATION AFFECTING THE BOARD

Legislation enacted during the year which affected the Boord included the following:

Dookie Agricultural College Land Act 1972, No. 8256

The purpose of this Act is to provide for the deviation of the Midland Highway at the Dookie Hills so far as the deviation affects Crown land permanently reserved for the purpose of the Dookie Agricultural College.

The Act provides for:

(a) the excision from the permanent Agricultural College reserve of the land required for the deviation, and

(b) transfer to the College reserve of the surplus land resulting from the reduction in width of the existing Midland Highway plus a portion of the old road which is to be closed.

Mount Hotham Alpine Resort Act 1972, No. 8260

This Act, amongst other things, constituted the Mount Hotham Alpine Resort Management Committee consisting of eleven persons one of whom shall be nominated by the Board.

Motor Car (Amendment) Act 1972, No. 8279

This Act provided, amongst other things, for:

(a) a speed limit for a motor car carrying passengers for hire with a trailer attached if the trailer is fitted entirely with pneumatic tyres, of:

(i) 45 miles an hour where the weight of the trailer together with the load does not exceed one ton, and

(ii) 40 miles an hour where the weight of the trailer together with the load exceeds one ton;

(b) a truck, suspected of being overloaded, to be diverted to any weighbridge or weighing machine within five miles of the place of interception or within five miles of any place along the route towards the place to which such truck is being taken. Previously any truck could be diverted to any weighbridge or weighing machine within two miles in any direction;

(c) a surcharge to be made on the registration or the renewal of registration of motor cars and motor cycles. The surcharge is 50 cents on private and primary producer registrations and $1.00 on the registration of commercial vehicles. The proceeds, less costs of collection, are paid into the Traffic Authority Fund kept in the Treasury pursuant to the Road Traffic Act 1958. This surcharge operated from the 1st August, 1972.

MUNICIPAL INSPECTIONS

During the year the Board Members travelled throughout the State in the course of making official visits to 29 municipalities. In company with councillors and council officers, roads and bridges were inspected in the following municipalities —the Shires of Ararat, Bannockburn, Bass, Bellarine, Benalla, Cohuna, Corio, Deakin, East Loddon, Grenville, Heytesbury, Korumburra, Lexton, Mildura, Omeo, Rosedale and Stawell; the Boroughs of Eaglehawk and Queenscliffe, Stawell Town and the Cities of Ararat, Benalla, Box Hill, Camberwell, Dandenong, Echuca, Mildura, Nunawading and Springvale.

These visits are part of a continuing programme, to keep the Board Members fully informed about road conditions and road needs and to maintain personal contact with the Councils.

The knowledge gained from these visits is of great value to the Board when the allocation of funds to municipal councils for expenditure on main roads and unclassified roads is being considered.

The Board is pleased to place on record its appreciation to the Councils visited for their ready co-operation in arranging the inspections and for the hospitality extended.

DEPUTATIONS

During the year the Board received 28 deputations, 25 from municipal councils and three from other organizations.

The principal submissions sought an increase in the general level of road grants, special allocation for specific projects, additional road declarations and details of road planning and design.

Owing to increasing costs and additional demands on the Board's revenues it was not generally possible to meet requests for additional funds or to effect any significant extension of the mileage of the declared road system.

Nevertheless, the exchange of information at these discussions is considered to be of value in arriving at a mutual understanding of problems.

TWENTY-EIGHTH CONFERENCE OF MUNICIPAL ENGINEERS

The Twenty-Eighth Annual Conference of Municipal Engineers, convened by the Board, was held under the chairmanship of Mr R. E. V. Donaldson on 29th February and 2nd-3rd March, 1972.

The Conference was officially opened by the Hon. A. J. Hunt, MLC, Minister for Local Government. Mr Hunt welcomed the large gathering of engineers, some 240 in number, representing municipalities throughout Victoria, with visitors from Tasmania and Western Australia, the Board's senior engineers, including the Divisional

Engineers of the Board's ten divisions, and engineers representing other Government Departments and Instrumentalities.

Mr Hunt paid tribute to the work carried out by municipal councils and their engineering staff, and commended the conference to all concerned as a means of widening their knowledge and improving their technical skills.

The papers presented at the conference were of a high standard, and covered a wide field including—

Overseas study tours	— Developments in residential subdivisions. — Solid waste disposal. — Planning parks and people.
Road design and construction	— Service roads contiguous with State highways and main roads. — Aqua-planing of vehicles on wet roads. — Erosion control of roadside cuts and fill batters. — Capacity of stormwater inlets. — Deep strength bituminous concrete pavement.
Roadmaking materials	— Extraction of roadmaking gravels by pumping. — Quarrying and small capacity crushing plants. — Extractive Industries Act.
Municipal amenities	— Construction of sports grounds. — Investigation, construction and operation of a multi-storey parking station.
General	— Anchoring of a moving rock slide. — Advertising on public highways. — Metric conversion. — Subdivision of lands—Titles Office practice.
Management	— Man management. — Management within a municipality.

The Conference closed with a field inspection of work on the Mulgrave Freeway.

The Board records its thanks to all who contributed to the twenty-eighth Conference, particularly to those who presented papers, and congratulates them on the high standard achieved.

NATIONAL ASSOCIATION OF AUSTRALIAN STATE ROAD AUTHORITIES

The National Association of Australian State Road Authorities (NAASRA) is an organization of the six State road authorities and the Commonwealth Department of Works.

The Association, initially known as the Conference of State Road Authorities was established in 1934 and has served as a centre for pooling technical and administrative experience. This co-operation has permitted the Association to inaugurate, co-ordinate, and rationalize road research projects and standards and to ascertain and publish the facts about Australia's principal roads and road furniture. As a result of these functions an increasingly broad national viewpoint on Australia's road problems has emerged.

Meetings of the Association are held at six-monthly intervals and are attended by the administrative heads of the seven member authorities. To assist them on wider aspects of national road needs and international co-operation, representatives from the Commonwealth Department of Shipping and Transport and the Commonwealth Bureau of Roads are regularly invited to NAASRA meetings.

The technical work of the Association is developed and approved by the Principal Technical Committee which consists of the Chief Engineers of the various authorities.

The Committee is assisted by specialist technical committees entitled: Advance Planning Committee, Bridge Engineering Committee, Computer Committee, Construction and Maintenance Practice Committee, Geometric Road Design Committee, Materials Research Committee, Plant and Equipment Committee, ond Traffic Engineering Committee.

The Secretarial and Accounts Committee consisting of the Secretaries and Chief Accountants of the various State Road Authorities is concerned with administrative procedures, uniform statistics and uniform accounting.

Co-ordination of road research within Australia is arranged by NAASRA in liaison with the Australian Road Research Board (ARRB).

The 1972 Annual Meeting (46th Meeting of NAASRA) was held in Adelaide, from 8th to 10th November, 1971, under the chairmanship of Mr A. K. Johinke, Commissioner of Highways, South Australia. The Board was represented by its Chairman, Mr R. E. V. Donaldson, the other members attending being Mr D. H. Aitken, Commissioner of Main Roads, Western Australia; Mr B. J. Donnelly, Director of Public Works, Tasmania; Mr H. A. Lowe, Commissioner of Main Roads, Queensland; Mr A. S. Reiher, Director-General, Commonwealth Department of Works; and Mr R. J. S. Thomas, Commissioner of Main Roads, New South Wales.

Major items on the agenda included reports of SAA Committees, NAASRA publications, NAASRA and ARRB research projects, code for location of pipelines an road reserves, standards for road signs, standards for vehicle dimensions and load limits, engagement of engineering consultants, national route numbering, the Australian Roads Survey 1969/74, and conversion to the metric system.

Representatives of the Commonwealth Department of Shipping and Transport and the Commonwealth Bureau of Roads attended part of the meeting.

The Intermediate (47th Meeting) of NAASRA was held in Brisbane on 16th June, 1972, again under the chairmanship of Mr A. J. Johinke.

Further developments on the items discussed at the 46th Meeting were considered together with items concerning maximum dimensions of vehicles, technical publications, and a national review of the road accident situation.

THIRD CONFERENCE OF MINISTERS RESPONSIBLE FOR THE ADMINISTRATION OF HIGHWAYS

The third meeting of Ministers responsible for the administration of highways was held in Adelaide on 12th November, 1971, in conjunction with the Annual Meetings of the Australian Road Research Board and the National Association of Australian State Road Authorities.

Victoria was represented by the Hon. A. J. Hunt, M.L.C., Minister for Local Government, who was accompanied by the Chairman of the Board, Mr R. E. V. Donaldson.

The other States of Australia were represented by their appropriate Minister with the head of the State Road Authority as adviser. The Commonwealth was represented by Senator the Hon. R. C. Wright, Minister of State for Works, with Mr A. S. Reiher, Director-General of Works as technical adviser.

The agenda for this Conference included the Commonwealth Aid Roads Acts, the Australian Roads Survey 1969/74, Outdoor Advertising, P.M.G. Services on Road Reserves, Metric Conversion, Special Problems of Urban Freeway Construction, Vehicle Load Limits, Control of Litter on Highways, Road Safety and Study Courses in Australia for African and Asian Engineers.

AUSTRALIAN ROAD RESEARCH BOARD

The Australian Road Research Board was established by the State Road Authorities in March 1960.

Membership of the Board consists of the following persons ex officio:

Commissioner for Main Roads, New South Wales
Chairman, Country Roads Board, Victoria
Commissioner of Main Roads, Queensland
Commissioner of Highways, South Australia
Commissioner of Main Roads, Western Australia
Director of Public Works, Tasmania
Director-General, Commonwealth Department of Works.

The objectives of the Board are to co-ordinate, encourage and arrange further research into such problems as road safety, cheaper and better road surfaces, traffic flows, planning to meet future needs, and the economics of road transport.

The Board holds biennial conferences for the presentation and discussion of papers on road research, and makes grants for carrying out road research to Road Authorities, Universities, the Commonwealth Scientific and Industrial Research Organization and similar bodies.

The Board's annual expenditure is shared by the six State Road Authorities on the percentage basis adopted by the Commonwealth Government in making grants to the States under the Commonwealth Aid Roads Act and the Commonwealth Department of Works contributes an amount of up to 10 per cent of the Board's estimated expenditure.

An advisory council, representative of road design and engineering, science, medicine, transport planning and extractive industry assists the Board in the organization of its research projects.

The Seventh Annual General Meeting of the Board (20th Meeting) was held in South Australia, at the Walkerville office of the Highways Department, South Australia on 11th November, 1971. At this meeting Mr R. E. V. Donaldson and Mr B. J. Donnelly, Director, Public Works Department, Tasmania, were elected Directors of the Board.

The 21st Meeting was held in Brisbane at the offices of the Main Roads Department, Queensland, on 14th and 15th June, 1972, when Mr R. E. V. Donaldson was elected Deputy Chairman of the Australian Road Research Board.

At these meetings, the Board's research programme was reviewed, progress on current projects considered. and new topics assessed. The current emphasis is on research with the possibility of immediate practical application, for example in the spheres of road safety, pavements and structures, and transport planning.

During the year the Board conducted two local symposia:

On 30th and 31st July, 1972, a Symposium on Flexible Pavements was held at Swan Hill, Victoria, attended by about 180 delegates. The Symposium was opened by the Board's Deputy Chairman, Mr J. D. Thorpe.

On 1st and 2nd October, 1971, a Symposium on Storm Water Drainage was held in Adelaide, attended by some 175 delegates.

Since its inception the Australian Road Research Board has occupied office space in the Head Office of the Country Roads Board. New premises for the Board being built at Vermont will be officially opened in November, 1972, and will be the national centre for road research in Australia.

CO-OPERATION WITH CITIZEN MILITARY FORCES

In conjunction with the State Rivers and Water Supply Commission and the Melbourne and Metropolitan Board of Works, the Board sponsors the 22 Construction Regiment, which is part of 6 Construction Group.

Officers and employees of the Board staff the Regimental Headquarters and also form two Squadrons, namely 104 Construction Squadron and 107 Plant Squadron.

The Regiment celebrated its 21st birthday at the 1971 camp at Puckapunyal. Approximately 150 of the Board's staff and employees attended the 1971 camp and received training in mine warfare, field defences, and basic military skills.

The Commanding Officer of the Regiment at the present time is the Board's Geelong Divisional Engineer Lt. Col. G. W. Marshallsea, E.D.

PERSONNEL

The Board's employment strength as at 30th June, 1972, was as follows:

Salaried Staff

Professional Engineers	454
Professional Scientists	21
Professional Surveyors	24
Technical Staff (Male)	461
Technical Staff (Female)	18
Administrative Staff (Male—qualified)	57
Adminstrative Staff (Male—non-qualified)	329
Administrative Staff (female)	225
Cadets	42
Total	1,631

General Staff and Employees

	Field	Depot
Supervisors	287	58
Road Construction and Maintenance personnel	1,594	—
Bridge Construction and Maintenance personnel	169	95
Workshops personnel	—	450
Transport personnel	252	32
Personnel of Miscellaneous classifications	—	156
Totals	2,302	791

Included in the figures are 116 persons employed in rural areas at 30th June, 1972, under the Government's scheme for providing unemployment relief work. These persons would otherwise not have been employed by the Board due to lack of funds.

Recruitment

During the year 182 new officers were recruited to the Board's salaried staff; 103 of these filled vacancies caused by resignations and retirements and 79 were engaged to satisfy necessary increases in the staff establishment.

New positions filled during the year included an Economist, a Sociologist and a Town Planner in the Freeway Planning Division, an Internal Auditor in the Chief Accountant's Branch and a second Legal Officer in the Secretary's Branch.

Due to the general economic situation there was a significant increase in applications received in response to the Board's advertisements for staff. As many as 220 applications were received for one Administrative Officer Class 1 position. The recruiting of Licensed Surveyors proved to be the only real difficulty experienced during the year.

The practice of attending Careers Nights and visiting Secondary Schools throughout the State continued during the year.

Cadetships

The Board's cadetship scheme, provides the payment of all fees, a book allowance and a living allowance for selected students.

Fourteen students were awarded cadetships during the year, eleven being in Civil Engineering, and one each in Mechanical Engineering, Surveying and Science. The following table shows the total number of cadets in training for the various courses during the 1972 academic year:

Course	Year of Training 1st	2nd	3rd	4th	Total
Civil Engineering	7	8	7	11	33
Mechanical Engineering	1	–	1	–	2
Surveying	2	1	–	–	3
Science	1	–	1	1	3
Economics	–	–	1	–	1
Totals	11	9	10	12	42

The Board also awarded four internal cadetships to enable the officers to complete their courses of study on a full-time basis. At the present time five officers are studying under this scheme, four in Civil Engineering and one in Law.

Apprentices

Twenty apprentices were indentured during the year for training in the trades of Motor Mechanics, Structural Steel, Painting and Decorating, Carpentry and Joinery, Lithographic Printing, and Plumbing and Gas Fitting.

As at 30th June the total number of apprentices in training was:

Trade	Apprentices
Carpentry and Joinery	3
Electrical Mechanics	1
Fitting and Turning	1
Lithographic Printing	1
Motor Mechanics	56
Painting and Decorating	2
Plumbing and Gas Fitting	1
Structural Steel	3
Total	68

National Service

The following table shows the numbers of Board's personnel undergoing National Service Training as at 30th June in the years 1970, 1971 and 1972:

	1970	1971	1972
Staff	18	19	9
Employees	4	2	2
Totals	22	21	11

Retirements

During the year the following personnel retired after substantial service with the Board:

	Classification on Retirement	Years of Service
Salaried Staff		
Chandler, S. C.	Purchasing Clerk	39
Lutze, F. A.	Survey Equipment Officer	32
Pulbrook, I. A.	Allocations Officer	23
Stephens, M. B. (Miss)	Telephonist	26
Stratford, T. R.	Senior Chauffeur	24
General Staff		
Bourke, J.	Foreman	35
Brennan, F. J.	Carpenter	26
Blake, P. R.	Overseer	21
Fowler, H. R.	Senior Assistant, Purchasing	35
Garthwaite, S. E.	Patrolman in Charge	32
Holland, T. F.	Overseer	32
Houghton, F. C.	Patrolman in Charge	37
Hayward, F. H.	Yard Maintenance Assistant	24
Lougoon, F. L.	Roadmaster	29
Nikkelson, G. H. M.	Patrolman in Charge	21
Peterson, R.	Clerk of Works	21
Pizzoni, A. R.	Leading Hand Welder	21
Rutherford, H.	Cost Clerk	23
Radosavljevic, V.	Machinist	21
Sainsbury, G. H.	Leading Hand Fitter	20
Smith, C. T.	Leading Hand Pipe Layer	24
Webber, J.	Patrolman in Charge	34
Employees		
Antonie, M. V.	Plant Operator	24
Blair, W. G.	Plant Operator	42
Bubb, S.	Clerk of Works	36
Campbell, T.	Truck Driver	23
Sapsed, H.	Camp Orderly	34
Sinclair, M. D.	Cost Clerk	21

The Board regrets that the following personnel with substantial service died during the year.

General Staff		
Garrett, F. W.	Leading Hand Welder	20
Hill, A. J. W.	Foreman	29
Johnson, D. F.	Leading Hand Fitter	20
Tohver, E.	Patrol Assistant	21

Industrial Relations

During the first half of the financial year there were substantial wage increases awarded to personnel engaged in road construction and maintenance, bridge construction and maintenance and in workshops and depots. These increases involved the Board in additional costs at the rate of approximately $800,000 per annum.

Salaried staff and general staff covered by the Municipal Officers' Association of Australia (Country Roads Board, Victoria) Agreement 1968, were granted salary increases of 9% from January 1972 involving the Board in additional costs at the rate of approximately $750,000 per annum.

The Association of Professional Engineers, Australia, made claims on the Board and other State employers for substantial salary increases and improvements in conditions. The outcome of the claims was not determined at the end of the financial year.

The National Wage Case increase of $2 per week for adult males and females, with proportionate increases for juniors, announced in May 1972 increased the Board's costs at the rate of $550,000 per year.

Training

In order to develop the skills and knowledge of the Board's staff a comprehensive training programme was pursued during the year. The programme was directed towards ensuring that staff, including engineers, scientists, surveyors, draftsmen, and administrative staff, are fitted to meet their work challenges. Many training courses dealt with technical subjects such as road design, computer programmes, bituminous surfacing, materials testing and traffic engineering. Other training courses provided for the development of personal skills of officers of all classifications.

Some of the most important external courses attended by officers of the Board during the year were:

The Australian Administrative Staff College:

Advanced Course (Mr W. Murray)
Intermediate Course (Mr L. G. Peterson)

The University of New South Wales:

Traffic Planning and Control Course (Mr D. J. Berry and Mr W. C. Dearnley)
Construction Management Course (Mr J. S. Waddell)
Government Administrative Staff Course (Mr S. K. Gavin)

The University of Melbourne:

Summer School of Business Administration (Mr P. M. Jeffreys).

More than 150 officers were given study leave of up to 5 hours per week to undertake courses of study at the Universities and Institutes of Technology. The courses undertaken were mainly in Civil and Mechanical Engineering, Drafting and Business Studies.

FILMS, PHOTOGRAPHY AND DISPLAYS

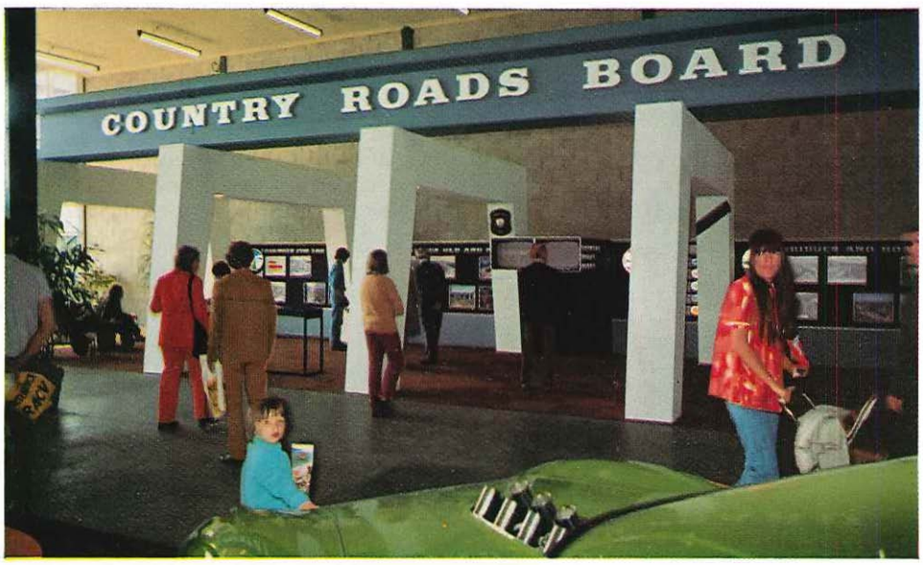
Over 12,000 photographic negatives were developed for the printing of approximately 50,000 photographs in colour or black and white. Apart from engineering record purposes, photographs were used in the preparation of technical and general interest publications, for exhibition at public displays, and for use by news organizations.

Photography was also used as an aid to studying engineering problems such as the simulation of a driver's vision on models of roads and bridges, and to illustrate the reflectivity, visibility, and outline of objects in both dry and wet conditions at night.

For public information purposes, technical conferences, and training courses there were 92 screenings of cine films, 48 slide screenings, and 62 screenings by overhead projectors or other visual aids.

The Board's display at the 1971 Royal Agricultural Show featured a unit consisting of three slide projectors controlled automatically by a tape recorder. A series of coloured slides depicting the early road history of Victoria and examples of the Board's current activities were shown and accompanied by a recorded voice commentary. The display also included a practical demonstration of soil testing, together with segments showing roadside development, major road building activities and the reflective properties of road signs and markings. A welcome visitor to the Board's display was His Excellency Sir Rohan Delacombe, K.C.M.G., K.C.V.O., K.B.E., C.B., D.S.O., K.St.J., Governor of Victoria.

At the 1972 International Motor Show the Board's stand featured bridge building. The main structure of the stand was formed by a series of simulated portal frame bridge piers supporting a beam. The display was awarded first prize in the Special Exhibits section of the show.



The Board's display at the 1972 International Motor Show.

APPENDIX 1

MILEAGES OF STATE HIGHWAYS, FREEWAYS, FOREST ROADS AND TOURISTS' ROADS

As at 30th June, 1972

STATE HIGHWAYS

NAME	ROUTE	LENGTH (MILES)
BASS	Lang Lang-Inverloch	38.0
BELLARINE	Geelong-Queenscliffe	19.8
BONANG	Orbost-N.S.W. border near Delegate	72.0
BORUNG	Dimboola-Charlton	76.7
BURWOOD	Burwood-Ferntree Gully	12.8
CALDER	Melbourne-Mildura	349.3
CANN VALLEY	Cann River-N.S.W. border	28.9
GLENELG	Ballarat-S.A. border near Mt. Gambier	175.9
GOULBURN VALLEY	Eildon-Strathmerton	139.4
HAMILTON	Geelong-Hamilton	144.3
HENTY	Portland-Ouyen	244.7
HUME	Melbourne-N.S.W. border near Albury	159.0
KIEWA VALLEY	Bandiana-Mt. Beauty	48.9
LODDON VALLEY	Bendigo-Kerang	76.8
MAROONDAH	Melbourne-Mansfield	108.0
McIVOR	Heothcote-Bendigo	27.5
MIDLAND	Geelong-Ballarat-Bendigo-Shepparton-Benolla-Mansfield	259.6
	Morwell-Port Welshpool	51.4
MURRAY VALLEY	Corryong-Hattah	462.5
NEPEAN	Melbourne-Portsea	55.4
NORTHERN	Kilmore-Echuca	88.5
NORTH WESTERN	Ballarat-Lascelles	176.9
OMEO	Bairnsdale-Tallangatta	177.8
OUYEN	Ouyen-S.A. border near Pinnoroo	80.9
OVENS	Wangaratta-Bright	47.4
PRINCES (EAST)	Melbourne-N.S.W. border near Genoa	306.5
PRINCES (WEST)	Melbourne-S.A. border near Mt. Gambier	262.4
PYRENEES	Elphinstone-Ararat	91.9
SOUTH GIPPSLAND	Dandenong-Yarram-Sale	157.9
STURT	Mildura-S.A. border near Renmark	71.1
WARBURTON	Lilydale-Warburton	22.9
WESTERN	Melbourne-Serviceton	254.0
WIMMERA	Apsley-St. Arnaud	138.6

FREEWAYS

NAME	SECTION	LENGTH (MILES)
CALDER	Keilor	1.2
	Elphinstone	1.7
FRANKSTON	Frankston-Cranbourne Road to Klauer Street	2.1
HUME	Craigieburn to Kalkallo	5.2
	Beveridge	2.0
	Broadford to Tallarook	3.6
	Chiltern	13.3
LOWER YARRA	Princes Freeway to west of Williamstown Road	3.4
PRINCES	Moe to Morwell	10.1
	Laverton	8.1
	Maltby (Werribee)	6.3
	Dartmoor	1.9
SOUTH GIPPSLAND	Whitelaw	2.4
TULLAMARINE	Bell Street to Melbourne Airport	7.0
WESTERN	Rockbank	8.7
	Bacchus Marsh	5.9
	Pykes Creek	3.6
	Gordon	5.7

TOURISTS' ROADS

NAME	MUNICIPALITIES	LENGTH (MILES)
ACHERON WAY	Healesville and Upper Yarra Shires	22.5
ALPINE	Bright and Omeo Shires	52.0
ARTHUR'S SEAT	Flinders Shire	5.4
BOGONG HIGH PLAINS	Bright and Omeo Shires	41.7
CAMERON DRIVE	Gisborne and Newham and Woodend Shires	2.7
DONNA BUANG	Healesville and Upper Yarra Shires	21.8
GIPSY POINT	Orbost Shire	1.5
GRAMPIANS	Arorat and Dundas Shires ond Stowell Town	43.2
GREAT OCEAN ROAD	Barrabool, Winchelsea, Otway and Heytesbury Shires	131.5
MALLACOOTA	Orbost Shire	15.0
MOUNT BUFFALO	Bright Shire	25.0
MOUNT BULLER	Mansfield Shire	15.7
MOUNT DANDENONG	Sherbrooke and Lillydale Shires	13.7
MOUNT VICTORY	Arapiles, Stowell and Wimmera Shires	19.1
MARYSVILLE-WOODS POINT	Healesville Shire	9.2
OTWAY LIGHTHOUSE	Otway Shire	8.0
PHILLIP ISLAND	Bass and Phillip Island Shires	15.1
SILVERBAND	Stawell Shire	5.7
SYDENHAM INLET	Orbost Shire	14.0
WARTOOK	Wimmera Shire	2.2
WILSONS PROMONTORY	South Gippsland Shire	19.3

FOREST ROADS

NAME	MUNICIPALITIES	LENGTH (MILES)
BAIRNSDALE-DARGO	Avon and Boirnsdale Shires	12.9
BEALIBA-MOLIAGUL	Bet Bet Shire	5.6
BEECH FOREST-MT. SABINE	Otway Shire	7.8
BENAMBRA-CORRYONG	Omeo, Towong, ond Upper Murray Shires	47.7
BENAMBRA-LIMESTONE	Omeo Shire	8.9
BENDOC-ORBOST	Orbost Shire	13.0
BROOKVILLE	Omeo Shire	9.9
BRUTHEN-BUCHAN	Tambo Shire	22.7
BUCHAN-ENSAY	Tombo Shire	12.3
BULLUMWAAL-TABBERABBERA	Bairnsdale Shire	18.8
CARRAJUNG-WOODSIDE	Alberton Shire	11.0
DARGO	Avon Shire	46.5
DEAN MARSH-LORNE	Winchelsea Shire	14.9
DRUMMOND-VAUGHAN	Daylesford and Glenlyon and Newstead Shires	13.0
EPSOM-FOSTERVILLE	Huntly Shire	13.2
FORREST-APOLLO BAY	Otway Shire	13.9
GREENDALE-TRENTHAM	Ballon and Kyneton Shires	14.8
HEYFIELD-JAMIESON	Mansfield and Maffra Shires	90.6
INGLEWOOD-RHEOLA	Korong Shire	10.8
KIMBOLTON	Strathfieldsoye Shire	8.4
LAVERS HILL-COBDEN	Heytesbury and Otway Shires	29.2
MEREDITH-STEIGLITZ-MAUDE	Bannockburn Shire	12.9
MURRUNGOWER	Orbost Shire	13.2
PORTLAND-NELSON	Portland Shire	24.0
RED KNOB	Tambo Shire	4.2
TATONG-TOLMIE	Benalla Shire	22.7
WALHALLA	Norracan, Mansfield and Upper Yarra Shires	68.8
WARBURTON-WOODS POINT	Healesville, Upper Yarra and Mansfield Shires	64.7
WARROWITUE	McIvor Shire	10.2

APPENDIX 2

STATE HIGHWAYS AND FREEWAYS

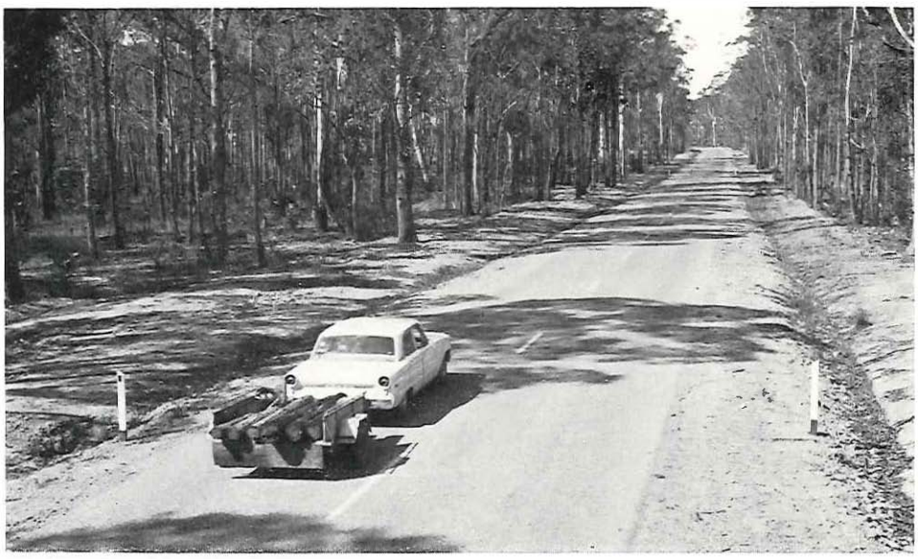
Significant Works Completed During Financial Year 1971/72

BASS HIGHWAY

BASS SHIRE	Widening 2.2 miles north of Bass to provide a sealed pavement 24 feet wide.
WOORAYL SHIRE	Reconstruction of 0.6 mile at Inverloch including improvements to the Kongwak-Inverloch Road and Inverloch-Leongatha Road intersections.

BONANG HIGHWAY

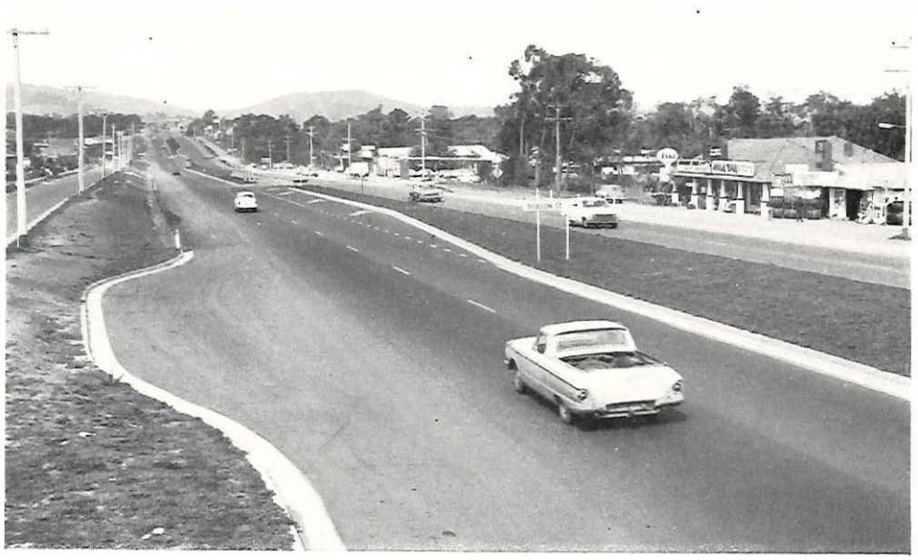
ORBOST SHIRE	Reconstruction of 1.3 miles at Orbost to provide a sealed pavement 24 feet wide.



Reconstructed section of the Bonang Highway at Orbost.

BURWOOD HIGHWAY

KNOX CITY	Construction of 2.3 miles between Tyner Road and Ferntree Gully Road, to provide dual carriageways each 24 feet wide.



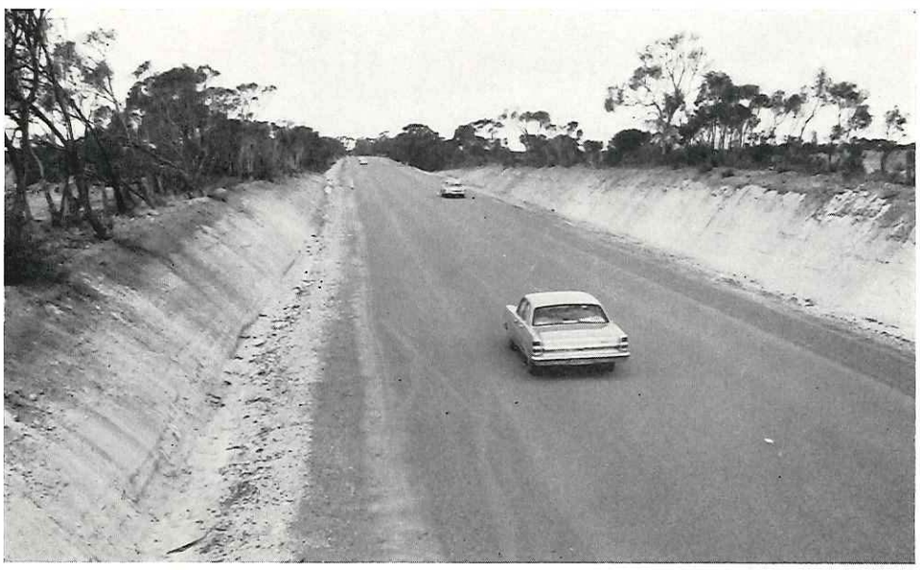
Dual carriageways constructed on the Burwood Highway, City of Knox.

CALDER FREEWAY

KEILOR CITY	Construction of 1.2 miles of dual carriageways between the existing freeway route to Tullamarine Airport at the south-west corner of Essendon Airport and the Calder Highway at Niddrie.

CALDER HIGHWAY

BENDIGO CITY	Removal of tram tracks over 0.8 mile and restoration of the pavement to provide a sealed carriageway 44 feet wide.
KORONG SHIRE	Reconstruction and realignment of 4.8 miles between Glenalbyn and Wedderburn to provide a sealed pavement 24 feet wide.



Reconstructed section of the Calder Highway north of Glenalbyn.

NEWNHAM AND WOODEND SHIRE	Redecking and strengthening the bridge over the railway line at Woodend providing a structure 118 feet long and 40 feet between kerbs with a 6 feet wide footway.

CANN VALLEY HIGHWAY

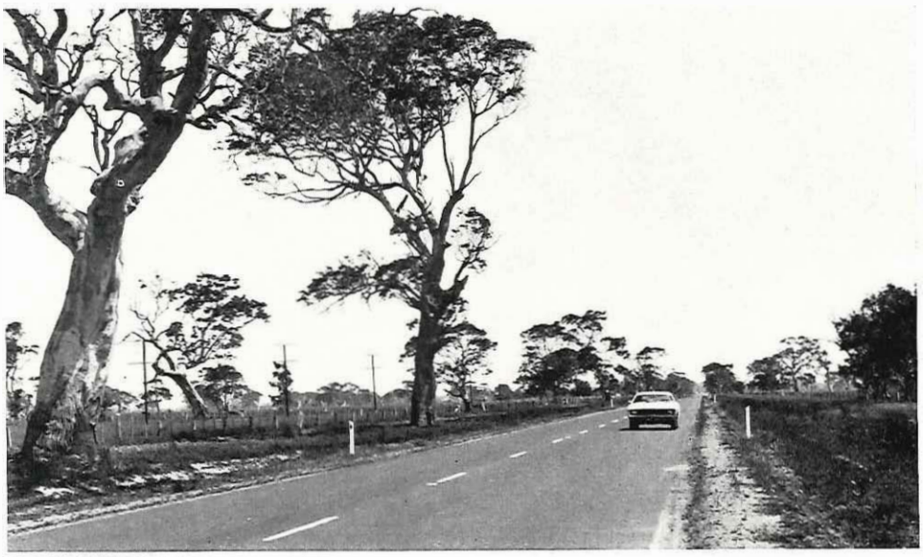
ORBOST SHIRE	Flood damage repairs involving replacement of the bridge over the Cann River and approaches. Flood damage repairs involving restoration of the road formation and repairs to bridges between Weeragua and the New South Wales border.

FRANKSTON FREEWAY

FRANKSTON CITY	Construction of 2.1 miles at Seaford to provide dual carriageways, each 24 feet wide.

GLENELG HIGHWAY

GLENELG SHIRE	Resheeting 3.1 miles east of Casterton to provide a sealed pavement 24 feet wide.
	Reconstruction and realignment of 6.0 miles west of Strathdownie to provide a sealed pavement 24 feet wide.



Reconstructed section of the Glenelg Highway west of Strathdownie.

WANNON SHIRE	Construction of a reinforced concrete bridge 35 feet long, 40 feet between kerbs over Bryans Creek and construction of 0.5 mile of approaches to provide a sealed pavement 24 feet wide.
	Construction of a reinforced concrete bridge 75 feet long, 40 feet between kerbs over Wennicott Creek and construction of 0.6 mile of approaches to provide a sealed pavement 24 feet wide.

GOULBURN VALLEY HIGHWAY

NUMURKAH SHIRE	Reconstruction of 1.7 miles between Shepparton and Numurkah to provide a sealed pavement 24 feet wide.
	Reconstruction of 1.5 miles between Numurkah and Katunga to provide a sealed pavement 24 feet wide.
SEYMOUR SHIRE	Reconstruction of 0.7 mile east of Seymour to provide a sealed pavement 24 feet wide.
SHEPPARTON CITY	Construction of 0.5 mile of dual carriageways, each 30 feet wide, in Shepparton.
YEA AND ALEXANDRA SHIRES	Construction of 2.4 miles on a new alignment at Molesworth, including the elimination of a rail level crossing.
	Construction of two reinforced concrete bridges at Molesworth; comprising two structures each 655 feet long, 28 feet between kerbs over the Goulburn River and over the Goulburn River backwater.

HAMILTON HIGHWAY

HAMPDEN SHIRE	Reconstruction of 2.1 miles east of Duverney to provide a sealed pavement 24 feet wide.

MORTLAKE SHIRE — Reconstruction of 6.1 miles east of Mortlake to provide a sealed pavement 24 feet wide.

Hamilton Highway—reconstruction east of Mortlake.

HENTY HIGHWAY

HAMILTON CITY — Reconstruction of 0.6 mile between Grange Burn and Thompson Street to provide a sealed pavement 24 feet wide.

Construction of dual carriageways, each 30 feet wide, between Market Place and Mount Bainbridge Road.

Dual carriageways constructed on the Henty Highway in the City of Hamilton.

HUME HIGHWAY

WODONGA SHIRE — Construction of a 13 span reinforced concrete bridge 576 feet long, 28 feet between kerbs to provide dual bridges over Wodonga Creek.

Construction of 0.7 mile of dual carriageway approaches to the above bridge, providing two carriageways each 24 feet wide.

HUME FREEWAY

Reconstruction of 0.7 mile of the western carriageway north of Broadford, to provide a sealed pavement 24 feet wide.

LODDON VALLEY HIGHWAY

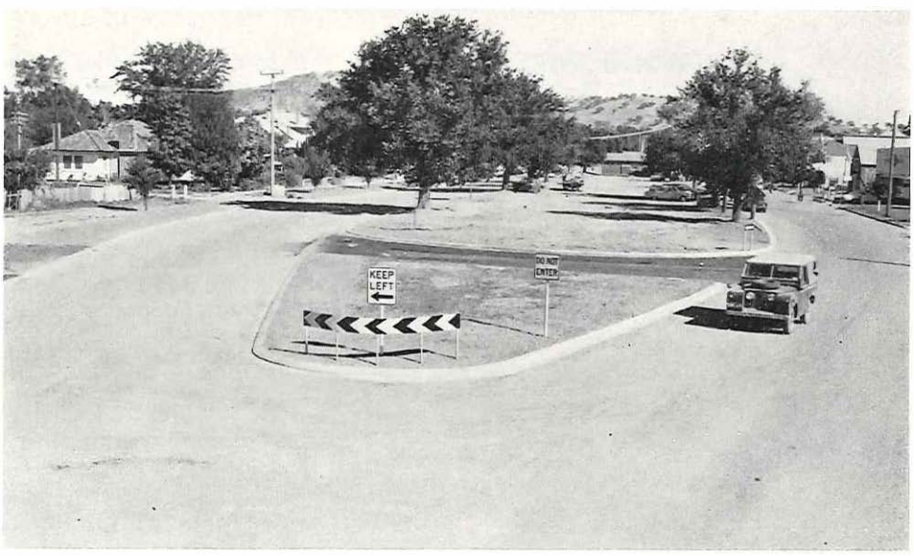
EAGLEHAWK BOROUGH	Reconstruction of 0.4 mile at Eaglehawk to provide a sealed pavement 30 feet wide.
GORDON AND KERANG SHIRES	Reconstruction of 1.2 miles and elimination of sub-standard curves between Durham Ox and Kerang, to provide a sealed pavement 24 feet wide.

MAROONDAH HIGHWAY

ALEXANDRA SHIRE	Reconstruction and realignment of 1.7 miles north of Cerebus Creek to provide a sealed pavement 24 feet wide.
	Construction of a new reinforced concrete road over rail overpass at Yarck, replacing a narrow timber bridge over the Mansfield-Tallarook railway line.
	Construction of 1.1 miles of dual carriageway approaches to the new Yarck overpass including treatment of the Cathkin-Mansfield Road intersection.
MANSFIELD SHIRE	Replacement of the timber deck on the bridge over Fords Creek with a wider, reinforced concrete deck 28 feet between kerbs.
	Reconstruction of 0.5 mile to provide a sealed pavement 26 feet wide plus the construction of 0.1 mile of dual carriageways, each 24 feet wide, in Mansfield.

MIDLAND HIGHWAY

CASTLEMAINE CITY	Construction of 0.5 mile to provide dual carriageways, each 30 feet wide.
MANSFIELD SHIRE	Reconstruction of 1.2 miles at Mansfield Township to provide dual carriageways, each 24 feet wide.



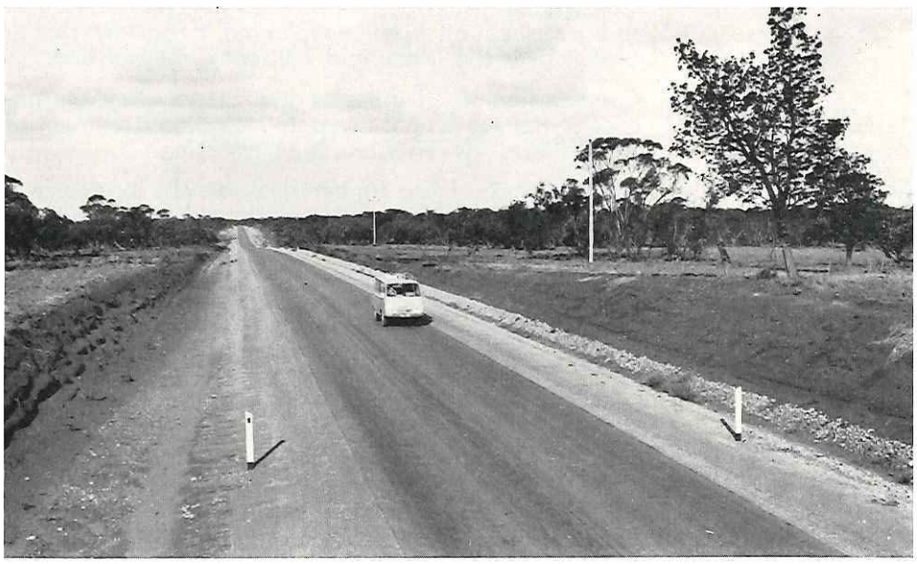
Dual carriageways constructed on the Midland Highway in Mansfield.

MORNINGTON PENINSULA FREEWAY

FLINDERS SHIRE	Construction of 1.5 miles between the Nepean Highway and McCulloch Street, Dromana, to provide dual carriageways, each 24 feet wide.

MURRAY VALLEY HIGHWAY

KERANG SHIRE	Widening, resheeting and realignment of 2.0 miles between Cohuna and Kerang to provide a sealed pavement 24 feet wide.
	Widening the five-span reinforced concrete bridge at Lake Charm from 22 feet to 40 feet between kerbs.
SWAN HILL SHIRE	Reconstruction and sealing of 5.2 miles between Wemen and Hattah to provide a sealed pavement 18 feet wide.



Reconstructed section of the Murray Valley Highway between Wemen and Hattah.

TOWONG SHIRE	Widening and sealing 5.1 miles between Colvan and Strathmerton to provide a sealed pavement 24 feet wide.
WODONGA SHIRE	Construction of a steel and reinforced concrete bridge 60 feet long, 28 feet between kerbs to replace a timber bridge over the Kiewa River flats.
	Reconstruction of the Kiewa Valley Highway intersection as the first stage in the construction of dual carriageways between Wodonga and Bandiana.

NEPEAN HIGHWAY

FRANKSTON CITY	Widening 1.6 miles at Seaford to provide a sealed pavement 50 feet wide.
MORDIALLOC CITY	Reconstruction of 1.3 miles between Lower Dandenong Road ond White Street to provide dual carriageways, each 36 feet wide.
MORNINGTON SHIRE	Construction of 3.5 miles between Tower Road, Mt. Eliza and Dava Drive, Mornington, to provide dual carriageways, each 24 feet wide.
	Reconstruction and widening of 1 mile to provide a sealed pavement 24 feet wide between the Balcombe Army Camp and Mt. Martha Hill.

NORTH WESTERN HIGHWAY

AVOCA SHIRE — Reconstruction of 1.9 miles between Lamplough and Avoca to provide a sealed pavement 24 feet wide.

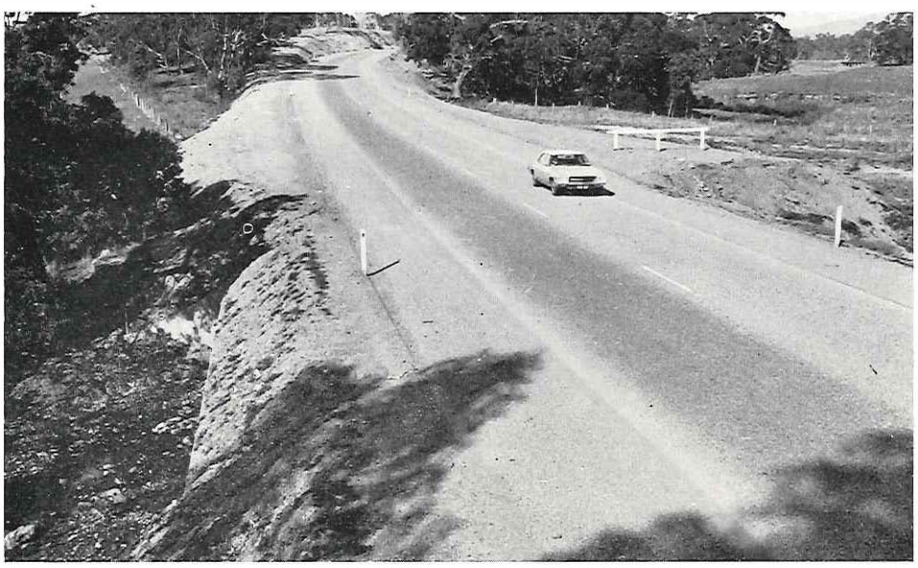
Reconstructed section of the North-Western Highway between Lamplough and Avoca.

DONALD SHIRE — Construction of 1.8 miles in Donald including realignment of a railway level crossing.

NORTHERN HIGHWAY

PYALONG SHIRE — Widening and reconstruction of 0.8 mile on the approaches to the bridge over Percivals Creek, to provide a sealed pavement 24 feet wide.

Construction of a concrete box culvert 40 feet between kerbs to replace an old timber bridge over Percivals Creek between High Camp and Pyalong.

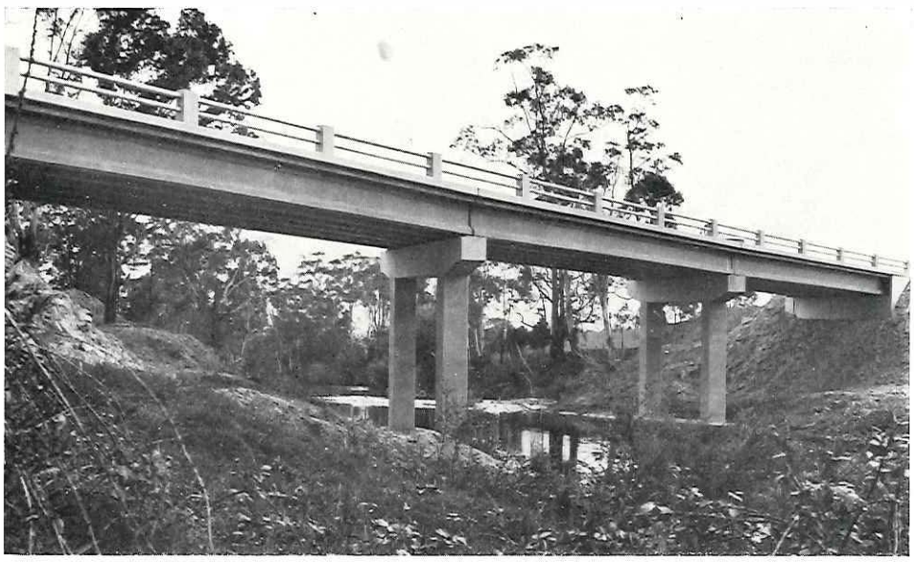


Northern Highway—reconstruction and realignment at Percivals Creek.

OMEO HIGHWAY

BAIRNSDALE TOWN — Intersection treatment at the Omeo Highway/Princes Highway intersection in Bairnsdale.

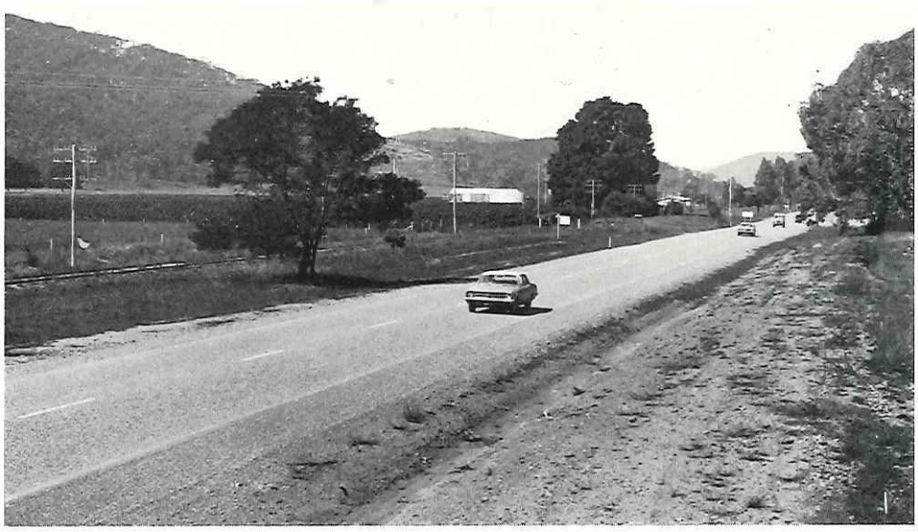
BAIRNSDALE SHIRE — Construction of a new reinforced concrete bridge 210 feet long, 28 feet between kerbs over the Nicholson River.



Omeo Highway bridge over the Nicholson River.

OVENS HIGHWAY

BRIGHT SHIRE — Widening and resheeting 1.7 miles near Eurobin to provide a sealed pavement 24 feet wide.



Reconstructed section of the Ovens Highway near Eurobin.

PRINCES FREEWAY

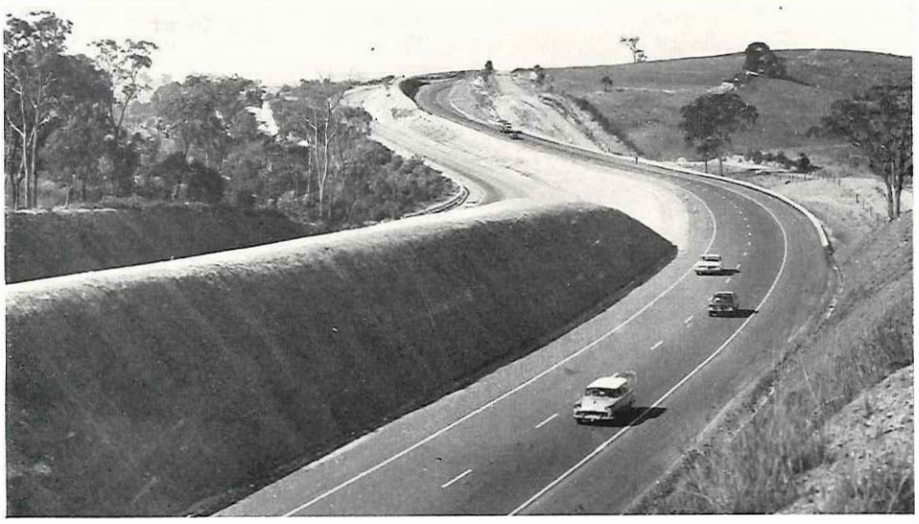
CORIO SHIRE — Construction of a reinforced concrete bridge 265 feet long, 28 feet between kerbs at the Lara Interchange.

Construction of 1.0 mile of approaches to the above bridge.

Widening of 10.3 miles of Melbourne-bound carriageway to provide a sealed carriageway 24 feet wide between Little River and the Corio Overpass.

MOE CITY AND MORWELL SHIRE

Construction of 2.6 miles between Gunns Gully and Hernes Oak, to provide dual carriageways, each 24 feet wide.



Dual carriageways constructed on the Princes Freeway between Gunns Gully and Hernes Oak.

MORWELL SHIRE

Construction of 1.2 miles of new carriageway across the Morwell River Flats between the Morwell River and the Morwell-Thorpdale Road to provide a sealed pavement 24 feet wide.

Construction of three reinforced concrete bridges to take the freeway over the Morwell River and Morwell River Flats, the bridges being 241 feet, 181 feet and 81 feet in length, and each 36 feet between kerbs.

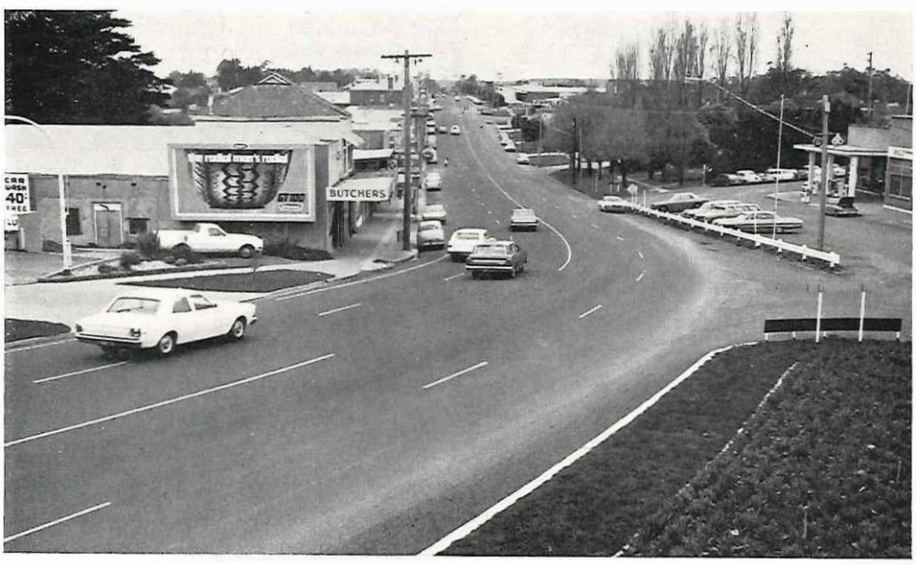
PRINCES HIGHWAY EAST

BAIRNSDALE SHIRE

Reconstruction and widening of 2.9 miles between Lindenow South and Bairnsdale to provide a sealed pavement 24 feet wide.

BULN BULN SHIRE

Reconstruction of 0.5 mile between Sinclair Street and Buln Buln Road in Drouin, to provide a sealed pavement 60 feet wide including a 12 feet wide parking lane.



Reconstructed section of the Princes Highway East in Drouin.

ORBOST SHIRE	Flood damage repairs to the bridge over the Snowy River at Orbost and its approaches.
SPRINGVALE AND DANDENONG CITIES	Resurfacing 2.8 miles bituminous concrete between Police Road and Terry Street.
TAMBO SHIRE	Reconstruction and widening of 1.5 miles east of the Nicholson River to provide a sealed pavement 24 feet wide.
WARRAGUL SHIRE	Construction of 0.5 mile of dual carriageways in Warragul Township, providing pavements each 30 feet wide. Structural strengthening and replacement of the deck on the road-over-rail bridge at Warragul.

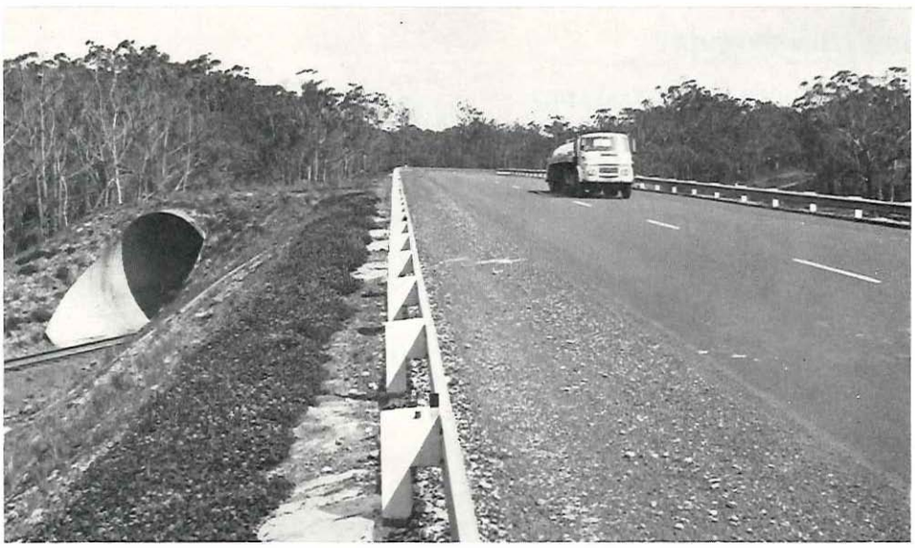
Dual carriageways constructed on the Princes Highway East in Warragul.

CAULFIELD AND MALVERN CITIES	Reconstruction of 1.8 miles between Grange Road and Poath Road, to provide dual carriageways, each 36 feet wide.

PRINCES HIGHWAY WEST

CAMPERDOWN TOWN	Reconstruction of 1.5 miles through Camperdown to provide a sealed pavement 24 feet wide.
GEELONG WEST CITY	Construction of a reinforced concrete bridge 260 feet long, 48 feet between kerbs to replace the old Telegraph Bridge at the Midland Highway intersection. Construction of 1.1 miles of dual carriageways, each 36 feet wide, between Latrobe Terrace and Bell Parade.

PORTLAND SHIRE	Construction of a 1.2 miles deviation eliminating a rail level crossing at Lyons.



Princes Highway West—railway level crossing eliminated at Lyons.

SOUTH BARWON SHIRE	Channelization of the Anglesea Road intersection involving the construction of a reinforced concrete bridge 75 feet long, 50 feet between kerbs over Waurn Ponds Creek.
WARRNAMBOOL SHIRE	Reconstruction of 0.3 mile of the southern carriageway west of Allansford to provide a sealed pavement 24 feet wide.
WINCHELSEA SHIRE	Construction of a reinforced concrete bridge 204 feet long, 28 feet between kerbs, to provide dual bridges over the Barwon River at Winchelsea.

PYRENEES HIGHWAY

CASTLEMAINE CITY	Construction of 0.3 mile to provide dual carriageways, each 30 feet wide.
MARYBOROUGH CITY	Reconstruction of 0.2 mile in Tuaggra Street, Maryborough, to provide a sealed pavement 40 feet wide.
TULLAROOP SHIRE	Reconstruction of 1.3 miles west of Carisbrook to provide a sealed pavement 24 feet wide.

SOUTH GIPPSLAND HIGHWAY

ALBERTON SHIRE	Reconstruction and raising of 1.9 miles subject to flooding at Gelliondale, providing a sealed pavement 24 feet wide.
	Widening and strengthening 1.1 miles between Woodside and Giffard West to provide a sealed pavement 24 feet wide.
CRANBOURNE SHIRE	Reconstruction and realignment of 0.8 mile between Tooradin and Caldermeade including the approaches to new bridges over Alsop's and Lyall's Inlets.
	Construction of two reinforced concrete bridges; 80 feet long, 28 feet between kerbs over Alsop's Inlet and 100 feet long, 28 feet between kerbs over Lyall's Inlet.
	Widening 1.5 miles between Monomeith and Caldermeade to provide a sealed pavement 24 feet wide.
	Widening 1.3 miles south of Caldermeade to provide a 24 feet wide sealed pavement, including treatment of the Westernport Road intersection.
	Widening and realignment of 3.5 miles south of Caldermeade to provide a sealed pavement 24 feet wide.

ROSEDALE SHIRE	Reconstruction of 2.3 miles south of Longford to provide a sealed pavement 24 feet wide.

WESTERN FREEWAY

BACCHUS MARSH SHIRE	Construction of 5.9 miles of duol corriogewoys, eoch 24 feet wide, and three associated interchanges to provide a northern by-pass of Bacchus Marsh Township.
	Construction of eight reinforced concrete bridges and overpass structures on the above section of freeway.
BALLAN AND BUNINYONG SHIRES	Construction of 5.7 miles of dual carriageways, each 24 feet wide, by-possing Gordon Township to north.
	Construction of two reinforced concrete bridges over the obove section of freeway.

WESTERN HIGHWAY

ARARAT SHIRE	Resheeting and widening 1.0 mile between Langi Ghiron and Dobie to provide a sealed pavement 24 feet wide.
BALLAARAT CITY	Construction of a reinforced concrete road-over-rail overposs 251 feet long, 74 feet between kerbs on an improved alignment of the highway at Ballarat East.
	Construction of 1.3 miles of dual carriageway approaches to the above overpass, providing sealed pavements each 30 feet wide.
DIMBOOLA SHIRE	Construction of two reinforced concrete bridges at Lochiel; one bridge 245 feet long, 28 feet between kerbs over the Wimmera River and one bridge 105 feet long, 28 feet between kerbs over the odjacent floodway.
	Construction of 1.0 mile of approaches to above bridges.
SUNSHINE CITY	Reconstruction and widening of 1.7 miles of the southern carriageway between the Albion overpass and Kororoit Creek.

WIMMERA HIGHWAY

ARAPILES SHIRE	Widening and resheeting 2.0 miles at Jilpanger to provide a seoled povement 24 feet wide.
DUNMUNKLE SHIRE	Widening, resheeting and regrading 2.0 miles west of Murtoa to provide a sealed pavement 24 feet wide.

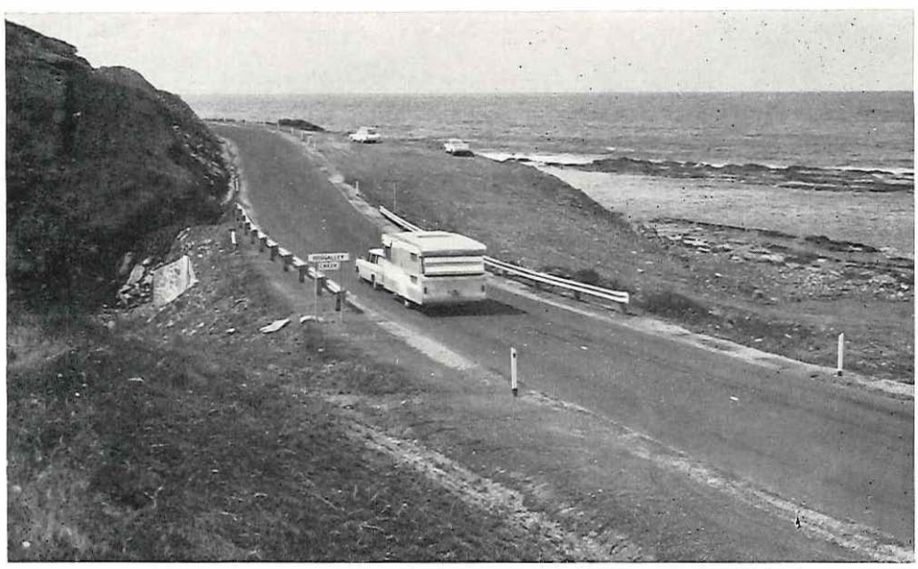
APPENDIX 3

TOURISTS' ROADS AND FOREST ROADS

Significant Works Completed During Financial Year 1971/72

TOURISTS' ROADS

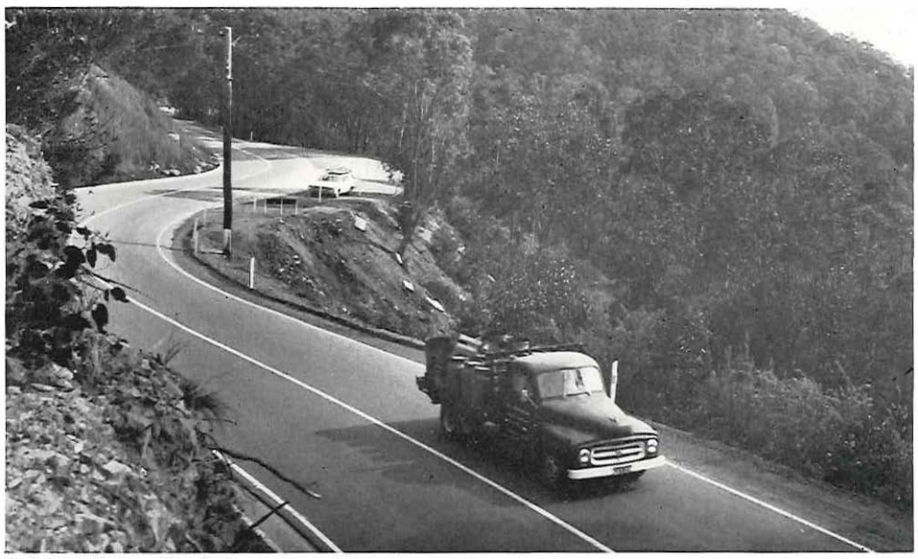
ALPINE ROAD	Construction of a new reinforced concrete bridge 90 feet long, 24 feet between kerbs and 0.6 mile of approaches to replace an old timber bridge over the Victoria River.
BOGONG HIGH PLAINS ROAD	Widening of 1.1 miles and construction and sealing of 0.3 mile to provide a pavement 25 feet wide between Howmans Gap and Falls Creek. In addition, a further sealed parking area approximately 1,300 feet long by up to 54 feet wide was constructed above the main car park at Falls Creek at the cost of the Falls Creek Tourist Area Committee of Management.
DONNA BUANG ROAD	Reconstruction of 0.9 miles between Myrtle Reserve and the Summit turn-off, to provide a sealed pavement 20 feet wide.
GREAT OCEAN ROAD	Construction of a reinforced concrete bridge 123 feet long, 28 feet between kerbs over Painkalac Creek, Aireys Inlet. Construction of a reinforced concrete bridge 30 feet long, 34 feet between kerbs over Boggaley Creek, including construction of 0.4 mile of new approaches. Rock anchoring to stabilize approximately 200,000 tons of moving rock above the road at Windy Point, approximately three miles north-west of Lorne. Reconstruction and realignment of 0.7 mile west of Port Campbell to provide a sealed pavement 20 feet wide.



New bridge on the Great Ocean Road at Boggaley Creek.

MARYSVILLE-WOODS POINT ROAD	Widening and reconstruction of 2.3 miles between Robley's Saddle and Tommy's Bend, to provide a sealed pavement 20 feet wide.
MOUNT BUFFALO ROAD	Construction of pavement and sealing 1.7 miles from Dingo Dell to the Cathedral to provide a sealed pavement 24 feet wide.
MOUNT BULLER ROAD	Construction of top course pavement and sealing 2.0 miles east of Mirrimbah completed the sealing of the entire length of this road.

MOUNT DANDENONG ROAD	Widening and resheeting 1.6 miles between Kaloramo and Montrose to provide a sealed pavement 24 feet wide.



Widened section of Mount Dandenong Road between Kalorama and Montrose.

PHILLIP ISLAND ROAD	Widening 4.2 miles between Newhaven and the Rhyll turn-off, to provide a sealed pavement 24 feet wide.
WILSON'S PROMONTORY ROAD	Reconstruction and sealing of 0.9 mile south of Darby River to provide a sealed pavement 20 feet wide and completing the seal on the entire length of this road.

FOREST ROADS

CARRAJUNG-WOODSIDE ROAD	Construction of 1.0 mile east of Woodside, to provide for a sealed pavement 19 feet wide.
WARBURTON-WOODS POINT ROAD	Resheeting 8 miles terminating at Monty's Hut, to provide a gravelled pavement 20 feet wide.

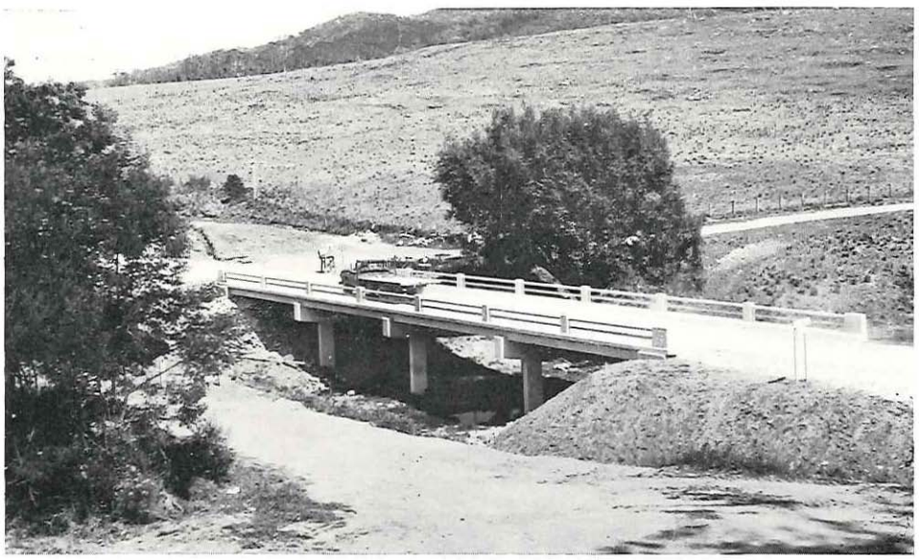
APPENDIX 4

MAIN ROADS

Significant Works Completed During Financial Year 1971/72

BAIRNSDALE DIVISION

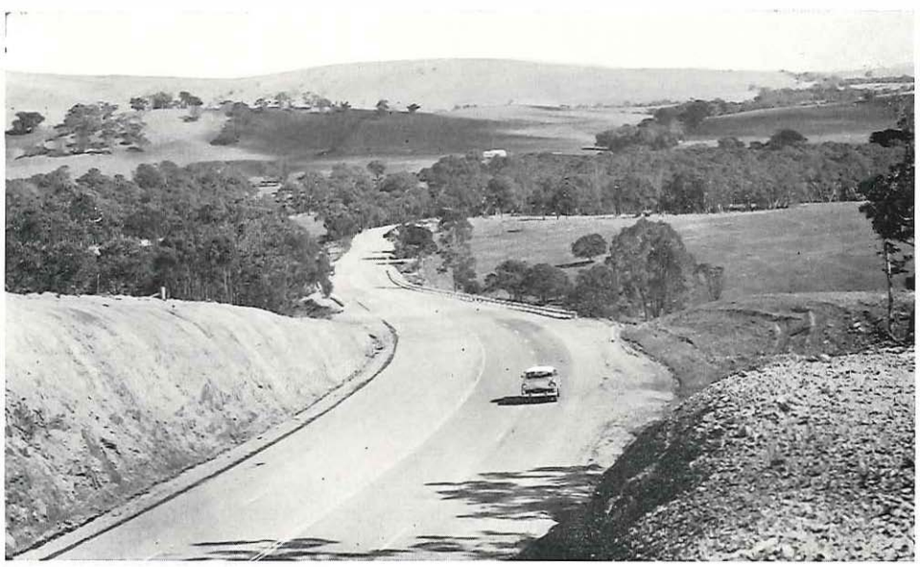
BAIRNSDALE SHIRE	Bairnsdale-Dargo Road—Reconstruction and regrading 1.7 miles at Pleasant Creek to provide a sealed pavement 20 feet wide.
ORBOST SHIRE	Combienbar Road—Widening and sealing 2.8 miles between Club Terrace and Combienbar, to provide a sealed pavement 18 feet wide.
TAMBO SHIRE	Gelantipy Road—Construction of a reinforced concrete bridge 120 feet long, 24 feet between kerbs over Murrindal River and construction of 0.4 mile of approaches.



New bridge on Gelantipy Road at Murrindal River, Shire of Tambo.

BALLARAT DIVISION

ARARAT SHIRE	Ararat-Halls Gap Road—Reconstruction and realignment to provide climbing lanes and a sealed pavement 22 feet wide at Copes Hill.

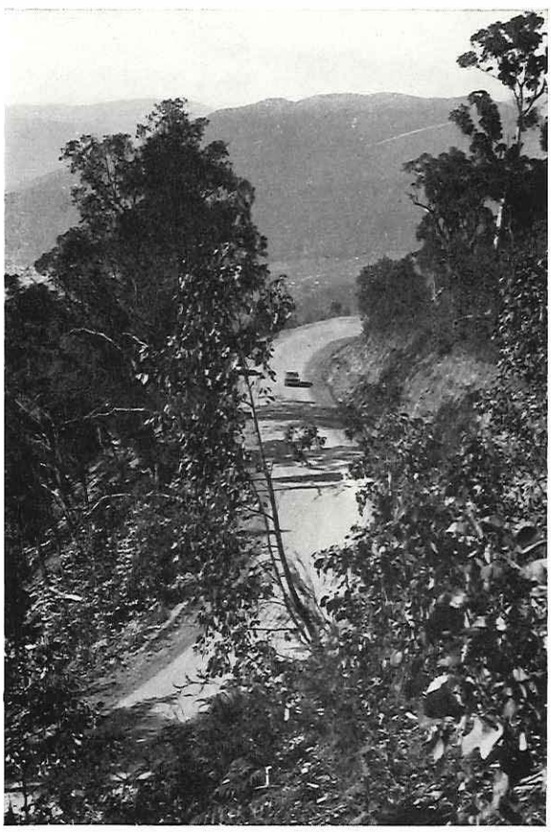


Reconstruction to provide climbing lanes on the Ararat-Halls Gap Road at Copes Hill, Shire of Ararat.

BALLAN SHIRE	Daylesford Road—Reconstruction of 1.9 miles at Korweinguboora and reconstruction and realignment of 1.0 mile near Korweinguboora to provide sealed pavements 22 feet wide.
	Geelong-Ballan Road—Resheeting 1.2 miles south of Ballan to provide a sealed pavement 20 feet wide.
BUNINYONG SHIRE	Colac-Ballarat Road—Reconstruction and realignment of 1.1 miles south of Cambrian Hill to provide a sealed pavement 22 feet wide.
GRENVILLE SHIRE	Pitfield Road—Reconstruction and realignment of 0.8 mile at Brownsvale to provide a sealed pavement 22 feet wide.

BENALLA DIVISION

ALEXANDRA SHIRE	Buxton-Marysville Road—Reconstruction of 1.0 mile to provide a sealed pavement 22 feet wide.
BEECHWORTH SHIRE	Bright Road—Construction of a reinforced concrete bridge 130 feet long and 28 feet between kerbs, to replace a timber bridge over a lagoon of the Ovens River.
BRIGHT SHIRE	Bright-Tawonga Road—Reconstruction of 2.2 miles to provide a sealed pavement 20 feet wide.



Reconstructed section of the Bright-Tawonga Road, Shire of Bright.

CHILTERN SHIRE	Chiltern-Beechworth Road—Construction of a reinforced concrete bridge 80 feet long and 24 feet between kerbs, over Black Dog Creek.
COBRAM SHIRE	Benalla-Tocumwal Road—Reconstruction of 1.1 miles and 1.3 miles to provide a sealed pavement 24 feet wide.
GOULBURN SHIRE	Heathcote-Nagambie Road—Reconstruction of 1.7 miles to provide a sealed pavement 18 feet wide.
OXLEY SHIRE	Mansfield-Whitfield Road—Reconstruction and realignment of 3.1 miles to provide a sealed pavement 18 feet wide.

SEYMOUR SHIRE	Seymour-Tooboorac Road—Reconstruction of 0.7 mile to provide a sealed pavement 24 feet wide.
TOWONG SHIRE	Murray Valley Road—Reconstruction and realignment of 1.3 miles to provide a sealed pavement 22 feet wide.
UPPER MURRAY SHIRE	Cudgewa-Tintaldra Road—Reconstruction and realignment of 1.4 miles to provide a sealed pavement 18 feet wide.
YACKANDANDAH SHIRE	Dederang Road—Reconstruction and realignment of 0.5 mile to provide a sealed pavement 20 feet wide.
YEA SHIRE	Whittlesea-Yea Road—Reconstruction and realignment of 1.8 miles to provide a sealed pavement 20 feet wide.

BENDIGO DIVISION

BENDIGO CITY	Mandurang Road—Removal of tram tracks and reconstruction to provide 0.5 mile of sealed pavement 48 feet wide.
BROADFORD SHIRE	Strath Creek Road—Construction of a reinforced concrete bridge 90 feet long and 28 feet between kerbs, to replace a timber bridge over Strath Creek.
CHARLTON SHIRE	Boort-Wycheproof Road—Reconstruction of 4.7 miles to provide a sealed pavement 22 feet wide.
EAST LODDON SHIRE	Bendigo-Pyramid Road—Widening 2.5 miles to provide a sealed pavement 22 feet wide.
GORDON SHIRE	Boort-Kerang Road—Reconstruction of 2.3 miles to provide a sealed pavement 22 feet wide.
	Charlton-Durham Ox Road—Reconstruction of 1.6 miles to provide a sealed pavement 22 feet wide.
KERANG SHIRE	Koroop Road—Construction of a reinforced concrete bridge 70 feet long, 28 feet between kerbs, over Barr Creek and the construction of 0.5 mile of approaches.
KORONG SHIRE	Serpentine Road—Reconstruction of 1.5 miles to provide a sealed pavement 24 feet wide.
MALDON SHIRE	Maldon-Lockwood Road—Widening of 1.4 miles to provide a sealed pavement 22 feet wide.

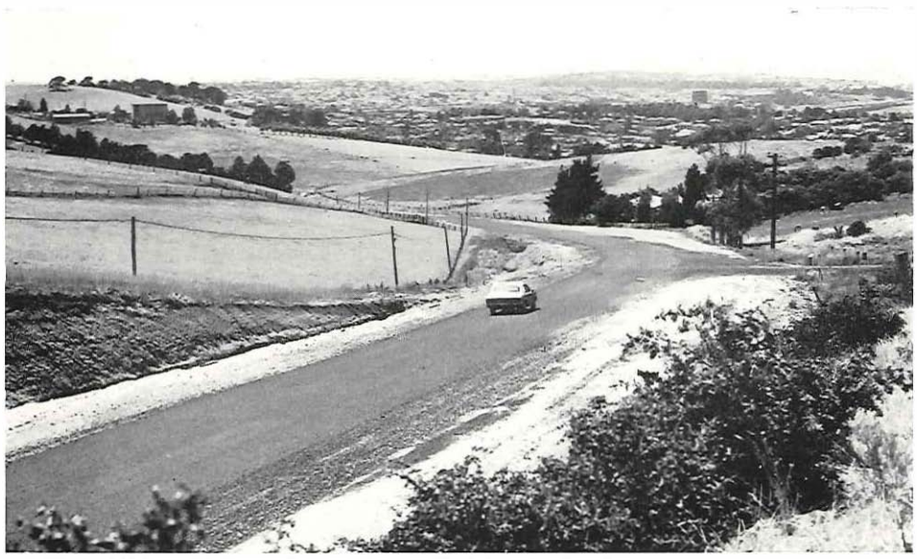
DANDENONG DIVISION

BERWICK SHIRE	Beaconsfield-Emerald Road—Reconstruction of 1.4 miles to provide a sealed pavement 24 feet wide.
CROYDON CITY	Canterbury Road—Construction of 0.8 mile between Ramsay Street and Dorset Road, to provide a sealed pavement 34 feet wide.
DONCASTER AND TEMPLESTOWE CITY	Doncaster Road—Construction of 0.7 mile to provide dual carriageways, each 30 feet wide, between Davey Street and Short Street.
ELTHAM SHIRE	Eltham-Yarra Glen Road—Construction of 0.2 mile to provide dual carriageways, each 30 feet wide, between Bridge Street and Brougham Street.
	Whittlesea-Kinglake Rood—Reconstruction and realignment of 1.1 miles east of Pheasant Creek to provide a sealed pavement 20 feet wide.
FLINDERS SHIRE	Mornington-Flinders Road—Reconstruction of 1.9 miles to provide a sealed pavement 24 feet wide.
FRANKSTON CITY	Moorooduc Road—Construction of 0.9 mile of dual carriageways, each 24 feet wide, south from the Frankston-Flinders Road.
HASTINGS SHIRE	Frankston-Flinders Road—Reconstruction and sealing of 0.4 mile in Hastings.
HEALESVILLE SHIRE	Eltham-Yarra Glen Road—Reconstruction of 1.3 miles to provide a sealed pavement 20 feet wide.
SHERBROOKE SHIRE	Wellington Road—Construction of 1.2 miles to provide a sealed pavement 24 feet wide.

SPRINGVALE CITY	Springvale Road—Reconstruction of the intersection with Cheltenham Road and Lower Dandenong Road.
WAVERLEY CITY	Springvale Road—Construction of 0.7 mile to provide dual carriageways, each 33 feet wide, between Harris Street and Highbury Road.
YEA SHIRE	Healesville-Kinglake Road—Reconstruction of 2.3 miles between the Yarra Glen-Yea Road and Mt. Slide, to provide a sealed pavement 20 feet wide.

GEELONG DIVISION

BARRABOOL SHIRE	Barrabool Road—Reconstruction of 1.1 miles to provide a sealed pavement 24 feet wide.



Reconstructed section of Barrabool Road, Shire of Barrabool.

BELLARINE SHIRE	Geelong-Portarlington Road—Construction of 1.2 miles to provide dual carriageways, each 24 feet wide.
COLAC SHIRE	Colac-Beech Forest Road—Reconstruction of 0.7 mile at Elliminyt to provide a sealed pavement 40 feet between kerbs.
OTWAY SHIRE	Birregurra-Forrest Road—Construction of a single-span steel and concrete bridge 50 feet long and 24 feet between kerbs, over the Barwon River.
SOUTH BARWON SHIRE	Torquay Road—Construction of 0.4 mile to provide dual carriageways, each 24 feet wide.

Dual carriageways constructed on the Torquay Road, Shire of South Barwon.

HORSHAM DIVISION

DUNMUNKLE SHIRE AND WIMMERA SHIRE

Horshom-Lubeck Rood—Construction of two reinforced concrete bridges eoch 140 feet long and 24 feet between kerbs, over the Wimmera River and Mount William Creek.

New bridges over the Wimmera River and Mount William Creek on Horsham-Lubeck Road, Shires of Dunmunkle and Wimmera.

KARA KARA SHIRE

Bendigo-St. Arnoud Rood—Reconstruction and realignment of 1.6 miles to provide a sealed povement 24 feet wide.

WYCHEPROOF SHIRE

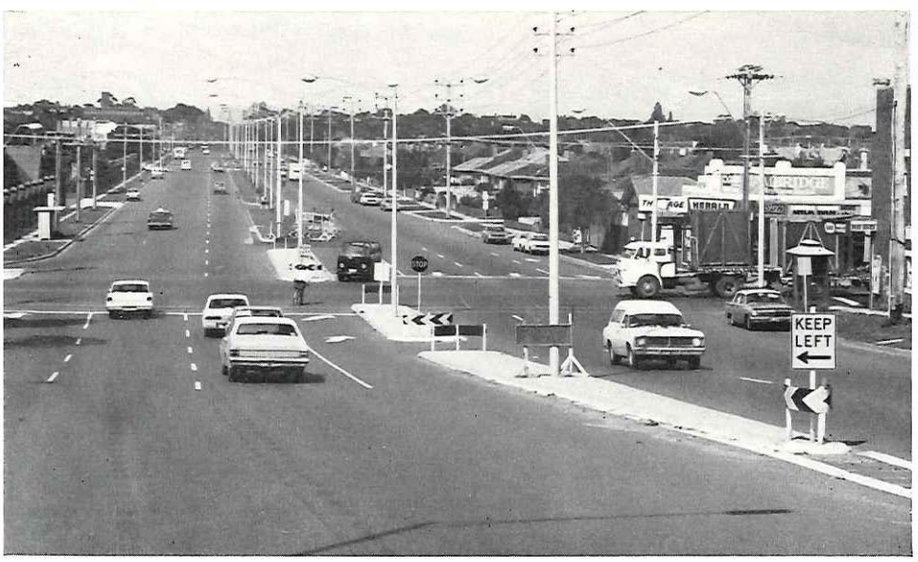
Berriwillock-Birchip Road—Widening of 5.3 miles to provide a seoled povement 12 feet wide.

METROPOLITAN DIVISION

BRIGHTON CITY

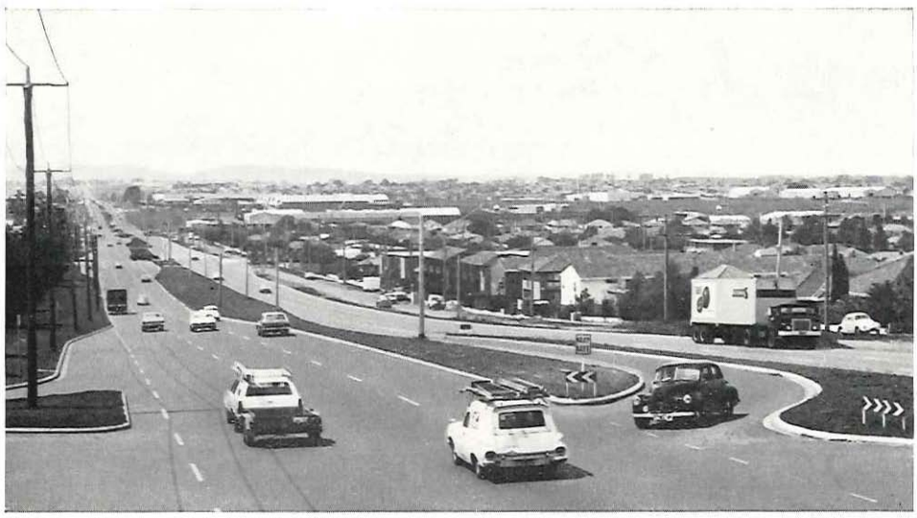
North Rood—Construction of 0.5 mile between Howthorn Rood and Thomas Street to provide duol carriageways, each 34 feet wide.

South Road—Construction of 0.3 mile between Beach Road and New Street to provide dual carriageways, each 34 feet wide.



Dual carriageways constructed on North Road, east of Hawthorn Road, Cities of Brighton and Caulfield.

DIAMOND VALLEY SHIRE	Heidelberg-Kinglake Road—Reconstruction of 0.5 mile between Greensborough Road and Henry Street to provide a sealed pavement 42 feet between kerbs.
	Heidelberg-Kinglake Road—Construction of 0.3 mile between Collins Street and Diamond Creek to provide dual carriageways, each 32 feet wide.
	Whittlesea Road—Construction of 0.5 mile between Grimshaw Street and McLean's Lane to provide dual carriageways, each 32 feet wide.
ESSENDON CITY	Pascoe Vale Road—Reconstruction of 0.7 mile between Fletcher Street and Cameron Street to provide a sealed pavement 41 feet between kerbs.
OAKLEIGH CITY	North Road—Reconstruction of the intersection with Golf Road and Golf Links Road.
	Wellington Road—Construction of 1.2 miles between the Princes Highway East and Nantilla Road to provide dual carriageways, each 32 feet wide.



Dual carriageways constructed on Wellington Road east of the Princes Highway, City of Oakleigh.

PORT MELBOURNE CITY	Beach Road—Construction of 0.4 mile between Pickles Street and Bay Street to provide dual carriageways, each 32 feet wide.
PRESTON CITY	Epping Road—Reconstruction of the intersection with Mahoneys Road and Keon Parade together with the installation of automatic boom barriers at the Keon Parade rail level crossing.
ST. KILDA CITY	Beach Road—Construction of 1.1 miles between Shakespeare Grove and Normandy Road to provide dual carriageways, each 32 feet wide.

Dual carriageways constructed on Beach Road, north of Normandy Road, City of St. Kilda.

TRARALGON DIVISION

ALBERTON SHIRE	Balloong Road—Reconstruction and realignment of 1.1 miles south-east of Woodside to provide a sealed pavement 18 feet wide. between kerbs,
KORUMBURRA SHIRE	Bena-Kongwak Road—Construction of a reinforced concrete bridge 75 feet long and 24 feet wide between kerbs, over a tributary of Foster Creek north of Kongwak.
MIRBOO SHIRE	Grand Ridge Road—Reconstruction and realignment of 0.4 mile to provide a sealed pavement 58 feet wide in Mirboo North Township.
TRARALGON CITY	Yarram-Traralgon Road—Reconstruction and realignment of 0.6 mile to provide a sealed pavement 30 feet wide.
WARRAGUL SHIRE	Warragul-Lardner Road—Reconstruction and realignment of 0.7 mile in Warragul, to provide a sealed pavement with widths varying from 24 feet to 60 feet.
WOORAYL SHIRE	Inverloch-Leongatha—Reconstruction of 1.2 miles south of Leongatha to provide a sealed pavement 24 feet wide.

WARRNAMBOOL DIVISION

DUNDAS SHIRE	Hamilton-Port Fairy Road—Reconstruction and realignment of 2.4 miles to provide a sealed pavement 20 feet wide.
HAMPDEN SHIRE	Camperdown-Ballarat Road—Reconstruction of 1.2 miles to provide a sealed pavement 20 feet wide.
MORTLAKE SHIRE	Warrnambool-Mortlake Road—Reconstruction and widening of 5.1 miles to provide a sealed pavement 22 feet wide.

APPENDIX 5

UNCLASSIFIED ROADS

Significant Works Completed During Financial Year 1971/72

BAIRNSDALE DIVISION

ORBOST SHIRE	Lake Tyers Access Road—Construction of 3.2 miles of gravelled road 24 feet wide, to provide a new access road to the Lake Tyers Aboriginal Community.
TAMBO SHIRE	Snowy River Road—Reconstruction of 1.1 miles at Black Mountain to provide a gravelled pavement 24 feet wide.

BALLARAT DIVISION

ARARAT SHIRE	Langi Logan Road—Construction of a reinforced concrete and steel bridge 98 feet long, 24 feet between kerbs, over the Hopkins River.
	Rossbridge-Calvert Road—Construction of a reinforced concrete and steel bridge, 98 feet long, 24 feet between kerbs, over the Hopkins River.
CRESWICK SHIRE	Myer's Road—Reconstruction of 1.8 miles south of Mt. Prospect to provide a sealed pavement 12 feet wide.

BENALLA DIVISION

ALEXANDRA SHIRE	Whanregarwen Road—Reconstruction and realignment of 0.9 mile to provide a gravelled pavement 16 feet wide.

GOULBURN SHIRE	Nagambie-Locksley Road—Construction of a reinforced concrete bridge 75 feet long, 22 feet between kerbs, over Wormangal Creek.
	Two Chain Road—Construction of a multi-cell culvert and reconstruction of 1.5 miles to provide a gravelled pavement 14 feet wide.
MANSFIELD SHIRE	Old Tolmie Road—Reconstruction and sealing of 1.4 miles to provide a sealed pavement 12 feet wide.
SHEPPARTON CITY	Tom Collin's Drive—Construction of 0.5 mile to provide a sealed pavement 24 feet wide.
SHEPPARTON SHIRE	Central Avenue—Reconstruction and sealing of 1.2 miles to provide a sealed pavement 22 feet wide.
TOWONG SHIRE	Jarvis Creek Road—Reconstruction and sealing of 0.5 mile to provide a sealed pavement 18 feet wide.
TUNGAMAH SHIRE	Boweya Road—Reconstruction of 2.1 miles and 2.7 miles to provide a sealed pavement 12 feet wide.
UPPER MURRAY SHIRE	Benambra-Corryong Road—Reconstruction and realignment of 2.7 miles to provide a sealed pavement 18 feet wide.
WANGARATTA CITY	Mason Street—Construction and sealing of 1.1 miles to provide a sealed pavement 22 feet wide.
WANGARATTA SHIRE	Eldorado-Tarrawingee Road—Reconstruction and realignment of 1.5 miles to provide a sealed pavement 18 feet wide.
	Three Chain Road—Reconstruction and sealing of 1.5 miles to provide a sealed pavement 18 feet wide.
	Wangaratta-Eldorado Road—Construction of a reinforced concrete bridge 150 feet long, 24 feet between kerbs, over Reedy Creek, and 0.5 mile of approaches to provide a sealed pavement 18 feet wide.
WODONGA SHIRE	South Street——Construction of a reinforced concrete bridge 105 feet long, 28 feet between kerbs plus one footway, over House Creek, and construction and sealing of approaches.
YACKANDANDAH SHIRE	Bryants Gap Road—Construction of a reinforced concrete bridge 91 feet long, 24 feet between kerbs, over Sandy Creek.
YEA SHIRE	Whanregarwen Road—Reconstruction and realignment of 0.9 mile to provide a sealed pavement 12 feet wide.

BENDIGO DIVISION

BENDIGO CITY	Williamson Street—Construction and sealing of 0.5 mile to provide a sealed pavement 31 feet wide.
DEAKIN SHIRE	Scobie Road—Construction of 2.0 miles to provide a sealed pavement 18 feet wide.
KERANG BOROUGH	Shadforth Street—Widening and sealing 0.6 mile to provide a sealed pavement 40 feet wide.
KERANG SHIRE	Murrabit West Road—Resheeting 1.0 mile to provide a sealed pavement 20 feet wide.
	Mystic Park East Road—Resheeting 0.8 mile to provide a sealed pavement 20 feet wide.
PYALONG SHIRE	Glenaroua-Broadford Road—Construction of 3.5 miles south from the Pyalong-Seymour Road, to provide a sealed pavement 12 feet wide.
	Pyalong-Lancefield Road—Construction and sealing of 1.3 miles west from the Northern Highway, to provide a sealed pavement 20 feet wide.
ROCHESTER SHIRE	Gunbower Island Road—Reconstruction and sealing of 1.3 miles north from Gunbower, to provide a sealed pavement 18 feet wide.

RODNEY SHIRE	Byrneside-Gillieston Road—Construction of 1.8 miles north of Byrneside to provide a sealed pavement 20 feet wide.
	Cravens Road—Construction and sealing of 1.3 miles east of Tatura to provide a sealed pavement 20 feet wide.
SWAN HILL SHIRE	Robinvale Settlement Road—Providing a 12 feet wide seol on 9.5 miles of various roads within the Robinvale Settlement.

DANDENONG DIVISION

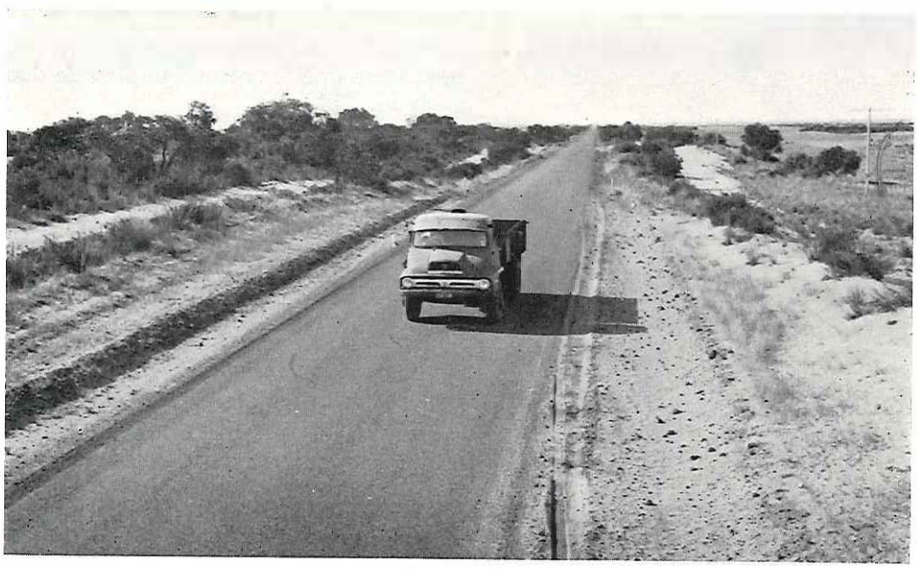
ALEXANDRA SHIRE	Lake Mountain Road—Construction of 1.3 miles to provide a gravelled pavement 20 feet wide between "The Ployground" and Ski Run 21.
CROYDON CITY	Norton Road—Reconstruction of 0.3 mile south from Mt Dondenong Road to provide a gravelled povement 29 feet wide.
LILLYDALE SHIRE	Hunter Road—Reconstruction of 0.8 mile to provide a sealed povement 20 feet wide.
MORNINGTON SHIRE	Hearn Road—Reconstruction of 1.1 miles to provide o sealed pavement 25 feet wide.
RINGWOOD CITY	Wonga Road—Reconstruction of 0.2 mile to provide a sealed povement 24 feet wide.
SPRINGVALE CITY	Heatherton Road—Reconstruction of 0.7 mile to provide a sealed pavement 38 feet wide.
WAVERLEY CITY	Gallaghers Road—Reconstruction of 0.2 mile to provide a sealed pavement 38 feet wide.
	Lum Road—Reconstruction of 0.7 mile to provide a sealed pavement 24 feet wide.

GEELONG DIVISION

CORIO SHIRE	Cox Road—Construction of 0.7 mile of duol carriageways, each 32 feet wide, from Bacchus Marsh Road to Princess Road.
	Thompson Road—Reconstruction of 1.0 mile between Separation Creek and Cowies Creek to provide a sealed pavement 42 feet wide.

HORSHAM DIVISION

KANIVA SHIRE	Edgerley Rood—Construction of 4.0 miles between Kaniva and the Big Desert area, to provide a sealed pavement 20 feet wide.

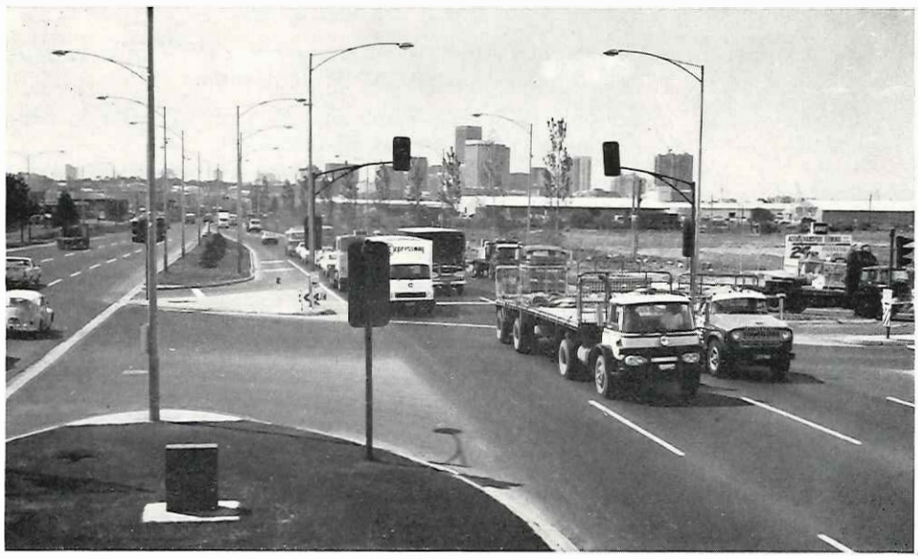


Construction of Edgerley Road between Kaniva and the Big Desert, Shire of Kaniva.

KARKAROOC SHIRE	Wyperfeld National Park Road—Construction of 7.0 miles to complete the pavement from Hopetoun and Yaapeet to Wyperfeld National Park.
LOWAN SHIRE	Propodollah Road—Reconstruction and realignment of 3.7 miles to provide a sealed pavement 12 feet wide.
MILDURA SHIRE	Red Cliffs-Colignan Road—Widening and sealing 2.5 miles to provide a sealed pavement 20 feet wide.
STAWELL SHIRE	Stawell-Joel South Road—Construction and regrading of 2.0 miles to provide a gravelled pavement 12 feet wide.

METROPOLITAN DIVISION

BRUNSWICK CITY	Moreland Road West—Reconstruction of 1.0 mile between Melville Road and Moonee Ponds Creek to provide a sealed pavement 44 feet between kerbs.
HEIDELBERG CITY	Burke Road North—Reconstruction of 0.5 mile between Heidelberg-Eltham Road and McArthur Road to provide a sealed pavement 33 feet between kerbs.
MELBOURNE CITY	Footscray Road—Construction of 1.4 miles of a new southern carriageway 48 feet between kerbs, from Cool Canal to the Maribyrnong River Bridge.



Dual carriageways provided on Footscray Road, City of Melbourne.

SANDRINGHAM CITY	Ludstone Street—Reconstruction of 1.1 miles between Hampton Street and Bluff Road to provide a sealed carriageway 42 feet between kerbs.
SOUTH MELBOURNE CITY	Ferrars Street—Construction of 0.8 mile between Kerford Road and City Road to provide dual carriageways, each 32 feet wide.

TRARALGON DIVISION

KORUMBURRA SHIRE	Yannathan Road—Reconstruction and realignment of 1.0 mile north of Nyora to provide a sealed pavement 20 feet wide.
NARRACAN SHIRE	Dingley Dell Road—Reconstruction and realignment of 1.9 miles south of Thorpdale, to provide a gravelled pavement 15 feet wide.
ROSEDALE SHIRE	Loch Sport Causeway—Construction of 1.3 miles to provide a gravelled pavement 14 feet wide and a reinforced concrete bridge 50 feet long, 20 feet between kerbs over the main channel of Lake Reeves.
SOUTH GIPPSLAND SHIRE	Buffalo-Stony Creek Road—Construction of a reinforced concrete bridge 60 feet long, 24 feet between kerbs.

WARRNAMBOOL DIVISION

MOUNT ROUSE SHIRE	Glenthompson-Coramut Road—Construction of 1.5 miles to provide a gravelled pavement 12 feet wide.
PORTLAND SHIRE	Drik Drik-Nelson Road—Reconstruction of 4.1 miles to provide a gravelled pavement 20 feet wide.
	Nelson Beach Road—Construction of 2.5 miles to provide a gravelled pavement 22 feet wide.
WARRNAMBOOL CITY	Skene Street and Eddington Street—Reconstruction and sealing of 0.9 mile to provide a sealed pavement 32 feet wide.

APPENDIX 6

SPECIAL PROJECTS

Details of Special Projects on which Work was Carried out During the Year

Project No.	Project	Length (miles)	Progress of Work
5	**Western Highway**—Extension of the four-lane divided high- from Deer Park to west of Bacchus Marsh.	22.3	18.4 miles of dual carriageways have already been constructed, including the Bacchus Marsh section of the Western Freeway which was completed during the year.
16	**Western Highway**—Construction of a four-lane divided highway from east of Ballarat, including the by-pass of the townships of Gordon, Wallace and Bungaree.	11.0	Construction of the Gordon section of the Western Freeway (5.74 miles) was completed during the year.
17	**Hume Highway**—Construction of a four-lone divided highway from south of Wallan to north of Broadford.	21.3	Work commenced on southern section of approximately 7 miles, south of Wandong.
27	**Mulgrave Freeway**—Construction of a four-lane freeway from west of Stud Road to and including the interchange with Eumemmerring Freeway.	2.7	Construction of 3.7 miles continued.
28	**Eumemmerring Freeway**—Construction of a four-lane freeway from the interchange with the Mulgrave Freeway to south of the Princes Highway East interchange.	1.0	
29	**Mornington Peninsula Freeway**—Construction of a four-lane freeway for a length of 5 miles from the Nepean Highway near Palmerston Avenue, Dromano, to Eastbourne Rood.	5.0	1½ miles completed. Construction continued on the remaining length of 3½ miles.
30	**Western Freeway**—Pentland Hills section, including a by-pass of Myrniong.	7.0	Work commenced on the construction of 4 miles through the Pentland Hills.
31	**Calder Highway**—Realignment of the highway at Porcupine Hill.	1.3	Work commenced.

APPENDIX 7

MOTOR REGISTRATIONS

Registrations under the Motor Car Act during the year 1971/72 totalled 1,723,708, an increase of 4.8% over the total for the previous year.

Vehicle	Financial Year 1970/71		Financial Year 1971/72		Increase	Decrease
Private						
New	111,153		110,211			
Secondhand:						
Re-registered	38,708		40,305			
Renewed	1,060,056		1,111,764			
		1,209,917		1,262,280	52,363	
Commercial and Hire						
New	15,696		14,855			
Secondhand:						
Re-registered	4,481		5,082			
Renewed	117,207		117,115			
		137,384		137,052		332
Primary Producers' Trucks						
New	3,213		3,265			
Secondhand:						
Re-registered	3,324		3,919			
Renewed	82,047		81,642			
		88,584*		88,826†	242	
Licences under the Motor Omnibus Act		644		683	39	
Trailers		181,618		199,646	18,028	
Motor Cycles		26,275		35,221	8,946	
Total		1,644,422		1,723,708	79,618	332

* Includes 46,090 no-fee tractors
† Includes 45,979 no-fee tractors

APPENDIX 8

COUNTRY ROADS BOARD

Statement of Receipts and Payments (to Nearest Dollar) for the Year Ended 30th June, 1972

	Country Roads Board Fund		Loan Funds	Commonwealth Aid Roads Act 1969						Total
	Act 6229	Act 6222 Rd. Mtce. A/c		Sec. 4(1)	Sec. 4(2)	Sec. 4(3)	Sec. 4(4)			
RECEIPTS	$	$	$	$	$	$	$	$	$	$
Balance as at 1st July 1971	78,000	..	..	..	..	..	..	..	..	78,000
Motor Car Act 1958 No. 6325										
Motor Car Registration Fees	33,964,751									
Additional Registration Fees	2,397,127									
Drivers' Licence Fees	915,737									
Drivers' Licence Testing Fees	447,920									
Trailer Registration Fees	806,236									
Examiners' Licence Fees	8,195									
Sale of Log Books	9,839									
	38,549,805									
Less Cost of Collection	4,254,188									
	34,295,617	..	..	..	..	..	..	..	34,295,617	
Municipalities Contributions—										
Permanent Works—Main Roads	128,453									
Maintenance Works—Main Roads	2,061,754									
	2,190,207	..	..	..	..	..	..	..	2,190,207	
Commercial Goods Vehicles Act No. 6222	..	9,136,206	..	..	..	..	..	..	9,136,206	
Public Works and Services Act No. 8212	982,500	..	..	..	..	..	..	..	982,500	
Fines—*Country Roads Act* No. 6229	5,002	..	..	..	..	..	..	..	5,002	
General Receipts	707,968	..	..	..	..	..	..	..	707,968	
State Loan Funds Act No. 6229	..	..	400,000	..	..	..	..	..	400,000	47,717,500
Commonwealth Aid Roads Act 1969	..	..	..	25,780,000	3,440,000	15,330,000	750,000			45,300,000
	38,259,294	9,136,206	400,000	25,780,000	3,440,000	15,330,000	750,000			93,095,500
PAYMENTS										
Road Expenditure										
Main Roads—										
Construction and Reconstruction	8,758,324	..	12,695	3,066,421	26,151	2,353,411	..	14,217,002	..	
Maintenance	3,052,283	3,102,569	..	..	..	..	..	6,154,852	..	
									20,371,854	
State Highways—										
Construction and Reconstruction	5,967,478	..	387,305	5,993,406	2,852,717	..	..	15,200,906	..	
Maintenance	725,342	5,805,988	..	..	..	..	..	6,531,330	..	
									21,732,236	
Freeways—										
Construction and Reconstruction	1,062,070	..	..	10,548,805	..	..	..	11,610,875	..	
Maintenance	242,869	227,649	..	..	..	..	..	470,518	..	
									12,081,393	
Tourists' Roads—										
Construction and Reconstruction	1,320,909	..	..	245,372	..	..	..	1,566,281	..	
Maintenance	717,316	..	..	..	..	..	..	717,316	..	
									2,283,597	
Forest Roads—										
Construction and Reconstruction	172,964	..	..	..	..	206,744	..	379,708	..	
Maintenance	478,442	..	..	..	..	..	..	478,442	..	
									85	
Unclassified Roads—										
Construction and Reconstruction	2,033,271	..	..	2,798,580	24,453	8,803,665	..	13,659,969	..	
Maintenance	338,596	..	..	..	..	2,770,944	..	3,109,540	..	
Contribution to Melbourne & Metropolitan Tramways Board										
Tram Tracks Reconstruction	200,000	..	..	..	..	..	..	200,000	..	
									16,969,509	
Murray River Bridges and Punts	119,811	..	..	..	..	..	..	..	119,811	
Traffic Line-Marking	515,039	..	..	..	..	..	..	..	515,039	
Statutory Payments										74,931,589
Interest and Sinking Fund	2,584,294									
Traffic Authority Fund	328,946									
Tourist Fund	657,891									
Transport Regulation Fund	534,167									
	4,105,298	..	..	..	..	..	..	..	..	4,105,298
Planning and Research	532,643	..	..	..	..	..	750,000	..	..	1,282,643
Capital Expenditure										
Plant Replacement and Additions	2,060,117									
Buildings, Workshops, etc.	331,299									
	2,391,416	..	..	..	..	..	..	..	..	2,391,416
Management and Operating Expenditure	5,393,096	..	..	3,127,416	536,679	1,195,236	..	..	..	10,252,427
	38,127,167	9,136,206	400,000	25,780,000	3,440,000	15,330,000	750,000	..	..	92,963,373
Balance as at 30th June 1972	132,127	..	..	..	..	..	..	..	..	132,127

NOTE: Relief to Municipalities granted under Act 6229 Section 32 amounted in 1971/72 to $24,440.39.

R. G. COOPER,
Chief Accountant,
17th November, 1972.

AUDITOR-GENERAL'S CERTIFICATE

The accounts of the Country Roads Board for the year ended 30th June, 1972, have been audited. In my opinion the above Statement of Receipts and Payments fairly presents in summary form the transactions during that period.

B. HAMILTON,
Auditor-General,
21st November, 1972.

APPENDIX 9

COUNTRY ROADS BOARD

Loan Liability as at 30th June, 1972

	Main Roads, etc.	Developmental Roads	Total
	$	$	$
Permanent Works			
Main Roads	16,723,976.47		16,723,976.47
State Highways	17,310,649.89		17,310,649.89
Freeways	3,000,000.00		3,000,000.00
Tourists' Roads	227,316.44		227,316.44
Forest Roads	2,167.89		2,167.89
Developmental Roads		12,851,515.09	12,851,515.09
Discount and Expenses	724,909.23	580,021.08	1,304,930.31
Total Amount Borrowed	$37,989,019.92	13,431,536.17	51,420,556.09
Less Redemption of Loans			
Redemption Funds	170,438.11	1,292,772.73	1,463,210.84
Main Roads Sinking Fund	571,376.76		571,376.76
Developmental Roads Sinking Fund		110,166.02	110,166.02
State Loans Repayment Fund	3,183,945.36		3,183,945.36
National Debt Sinking Fund	6,441,340.58	6,435,146.01	12,876,486.59
Consolidated Fund	2,597.22		2,597.22
	$10,369,698.03	7,838,084.76	18,207,782.79
Loon Liability at 30th June, 1972	$27,619,321.89	5,593,451.41	33,212,773.30

APPENDIX 10

Works Executed on Behalf of Commonwealth and State Government Authorities, etc., for the Year Ended 30th June, 1972

(Adjusted to the nearest Dollar)

Departments	Description of Works	Expenditure	
		$	$
Commonwealth—			
Department of Works	Access roads to various Commonwealth establishments	2,482	2,482
Victoria—			
Lands and Survey	Roadworks in Glenelg and Kowree Shires	10,273	
Melbourne City Council	Construction of bridge in Dynon Road	9,853	
Melbourne and Metropolitan Board of Works	Roadworks in Healesville Shire, Sherbrooke Shire and Berwick Shire	129,471	
Ministry of Tourism	Development of toilet facilities in Rest Areas on State Highways at selected locations throughout the State	8,372	
Public Works Department	Bituminous sealing at Ararat Gool, Dookie Agricultural College and Won Wron Reforestation Camp	7,436	
Rural Finance and Settlement Commission	Roads in Commission land settlement projects throughout the State	48,277	213,682
State Treasury	Kings Bridge—land compensation and other sundry expenditure less proceeds of rental of properties acquired in connection with the construction of Kings Bridge	11,882 Cr.	
" "	Grade-separation Projects, etc., charged to Level Crossings Fund ($241,531) and Railways Department ($573,293)	814,824	
" "	Pedestrian Overpasses and Underpasses charged to State Treasury ($35,429) and Municipalities ($35,404)	70,833	
" "	Improvements to various roads adjacent to State Forests to facilitate the extraction of timber and charged to the Municipalities Forest Roads Improvement Fund	18,175	
" "	Construction of roads and bridges charged to the Roads (Special Projects) Fund	6,721,172	
" "	Unemployment relief in rural areas—roadworks	138,110	7,751,232
			$7,967,396

APPENDIX 11

CHIEF ENGINEER'S REPORT

Country Roads Board
Melbourne

THE CHAIRMAN,

I have the honour to submit the Chief Engineer's Report for 1971/72. The report covers those activities within the Chief Engineer's Branch which are considered to be of special technical and general interest.

W. S. BRAKE,
Chief Engineer

HUME FREEWAY

WALLAN-BROADFORD SECTION

Introduction

Detailed investigation, location and design of the Wallan-Broadford Section of the Hume Freeway commenced in June 1970 and was nearly completed by June 1972. The project involves a 21¼ mile deviation of the Hume Highway to link two existing sections of the Hume Freeway, i.e. the Beveridge Section and the Broadford-Tallarook Section. The Wallan-Broadford Section is the longest section of freeway planned by the Board.

The route location was undertaken jointly by the Bridge Sub-branch and the Freeway Planning, Major Projects, Materials Research, Plans and Surveys, and Right of Way Divisions. As with other major projects, this team approach contributed a wide range of specialist experience from which lower costs and a typically high standard freeway resulted. Examples of the advantages of this approach to route selection are instanced by sections at Wallan East and north of Wandong, where cuttings are located so as to win selected materials for use in the upper levels of embankments, thus reducing the need for importation of pavement materials.

The consideration of many more alternative route locations than would otherwise have been possible in the limited time available was facilitated by the availability of computer-aided design systems for use with the Board's computer and external computer services.

The location of this new section of the Hume Freeway is shown in Figure 1. Over the greater part of its length the adopted route is generally close to the alignment of the existing Broadford-Wallan Main Road. At the southern end the route is across volcanic plains for about five miles. It then traverses hilly Silurian country followed by a length through an area of steep hills near Wandong, with another hilly Silurian length at the Broadford end.

Road Design

The freeway is of two two-lane carriageways, each 24 ft. wide with 10 ft. left and 4 ft. right sealed shoulders, separated by a residual median 74 ft. wide. Provision has been made for future widening to two three-lane carriageways by construction of two additional lanes within the median.

The curvilinear design concept is used, with large radius curves linked by relatively long plan transitions of the clothoid form. This type of design results in a flowing and aesthetically pleasing alignment that can readily be fitted to the terrain.

The design of suitable alignments for critical sections was aided by model studies using the Abbot system. Arrisses on the downhill side of cuttings are removed, and slopes generously rounded and transitioned, to bring about a natural appearance which blends with the surrounding countryside.

In general, horizontal curves with radii larger than 4,000 ft. are used. However, 3,000 ft. radius curves are adopted for the steep country on the approach to the main saddle north of Wandong. Grades flatter than 3% are generally utilized, except in the Wandong Section, where there are short lengths of 3½% up grade and 4% down grade.

Where economically feasible, the freeway roadside and its appurtenances are designed to afford a safe recovery width of at least 30 ft. for vehicles which accidentally leave the carriageways. This is achieved by flattening fill slopes on medium height embankments, by extending all culverts by 30 ft. or more clear of traffic lanes and by eliminating culvert end walls within the median. Breakaway sign supports will be used on all minor and medium sized signs. Plantings in medians and within 30 ft. of the outer edge of the carriageways will be restricted to shrubs.

Headlight glare is minimized by the adoption of different gradelines for the two carriageways along approximately 26,000 lin. ft. of the freeway and by the proposed planting of shrubs in the median over the rest of the length, except in those areas where picturesque views will be available to motorists.

Interchanges are to be constructed as follows:

- a 'Y' interchange with the existing Hume Freeway, south of Wallan,
- a half-diamond interchange, with provision for a future full-diamond, with the Wallan-Whittlesea Road at Wallan East,
- a full-diamond interchange with the Kilmore-Wandong Road at Wandong,
- a full-diamond interchange with Saunders Road,
- a half-diamond interchange with the Strath Creek Road at Broadford, and
- a half-diamond interchange with the Hume Freeway north of Broadford.

Grade separations of the freeway from Arkells Road, the Kilmore East-Wandong Road, an access road near Sunday Creek and an extension of the Mia Mia Road south of Broadford are included in the design. Farm access and stock movement structures are provided at five locations.

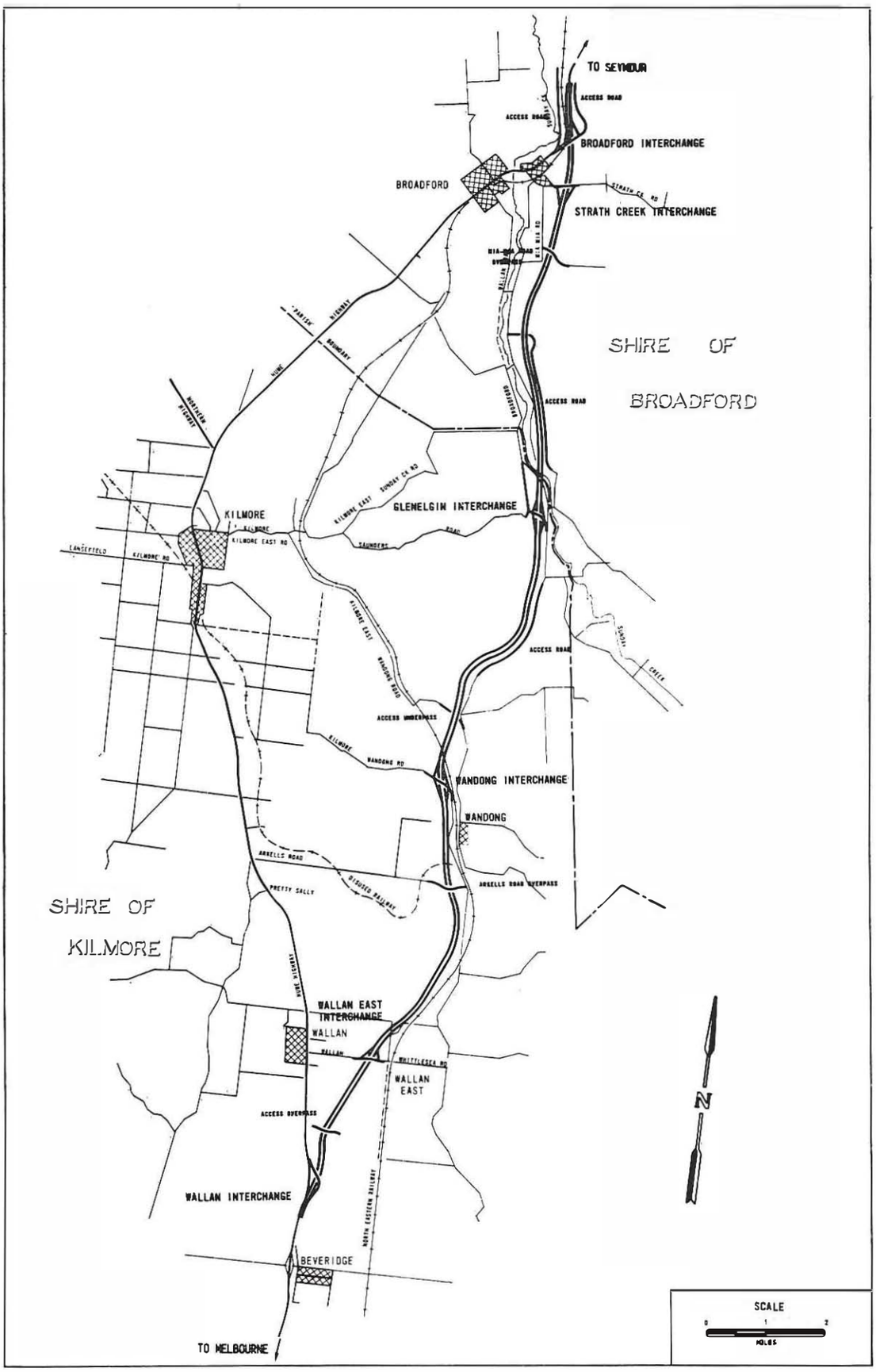


Figure 1—Hume Freeway, Wallan-Broadford Section.

Twin rest areas are designed north of Wallan East. Each will be accessible only from one carriageway. They will have separate parking areas for cars and trucks, toilet facilities, picnic tables and plantation areas. Twin areas remove the temptation for drivers to stop on one carriageway to walk across the median to a rest area adjacent to the other carriageway.

Deviations of the Broadford-Wallan Main Road, reconstruction of some other roads and the construction of roads for the restoration of access have required the design of an additional 78,500 lin. ft. of roading.

Bridges and Culverts

Bridges on the freeway carriageways are designed full formation width, i.e. 38 ft. wide, and are to be provided with concrete barriers similar to the California Division of Highways Type 20 barrier. Guard fencing on the approaches to the bridges is to be positively anchored to the ends of the bridge barriers. Transition from the flexible guard fencing to the rigid bridge barriers is to be accomplished by increasing the size of posts and reducing the post spacing.

Bridges over the freeway are designed as two-span structures, each with a single column pier located on the centreline of the median. All abutments or walls will be located at least 30 ft. clear of the outer edge of the traffic lanes to reduce traffic hazards and obviate the need for guard fencing. As guard fencing is also unnecessary around the centre piers in the two-lane stage, this form of construction leads to an attractive, open appearance. In order to further ensure a pleasing appearance for the bridges and the landscaping of the adjacent earthworks, models were made by officers of the Bridge Sub-branch before the final adoption of the designs.

Tests of ground water along the corridor indicate a high corrosiveness and, consequently, corrugated metal pipe structures are to be used only for culverts exceeding 72 in. diameter, as in these cases the additional cost of special protective treatment can be offset by a saving in pipe costs. However, as fills greater than 30 ft. high are fairly common on the project and several embankments exceed 60 ft. in height, the policy on corrugated metal pipe necessitates the use of large numbers of "over-strength" reinforced concrete pipes in diameters less than 72 in. and pipe classes were therefore introduced in multiples of "0.25Z" cracking loads up to twice the "**Z**" class cracking load.

Environmental Aspects

The final plans include provision for planting of the roadsides and slopes in an informal manner with indigenous shrubs and trees. The combination of these plantings with the grassing of cut and fill slopes is aimed at furthering the natural appearance of the earthworks.

As mentioned above, the route traverses Silurian areas, which consist of deposits of decomposed siltstone and mudstones. The surface horizons of these materials have weathered into fine grained silty clay soils that are readily eroded. These soil types, in combination with the hilly nature of the areas and the resultant high stream velocities, make the areas highly susceptible to erosion. Special attention is paid in the design to minimization of erosion within and adjacent to the road serve.

Major culverts and associated diversions and straightenings of streams are designed at grades nominally of 1 in 200. Drop structures are included to accommodate the differences in elevation which result from the reduced lengths of streams brought about by the diversions and straightenings and the generally flatter grades of these as compared with the natural streams. The treatment of major culverts was planned in liaison with officers of the State Rivers and Water Supply Commission.

Smaller culverts are generally laid on the floors of existing gullies and special protection measures are specified. Usually, these measures involve either the temporary thatching of inlets and outlets, the paving of outlet areas, or the construction of drop outlets or energy dissipator outlets. The selection of the type of protection is related to the nature of the culvert site, the magnitude of flows, hydraulic conditions at the inlet and the flow velocities at the outlet.

Open earth drains are designed as flat-bottomed channels with an 8 ft. bed width. When either the depth of flow in these channels exceeds 6 in. or the velocity exceeds about 5 or 6 ft./sec., they will be initially protected by thatching until natural cover is established.

For control of the flow of water from through carriageways and to minimize table drain scour and maintenance, all major cuttings are kerbed and channelled. This treatment results in a reduction of initial costs and will reduce maintenance costs on the completed road.

The treatment of culvert inlets and outlets and catch drains was evolved in conjunction with officers of the Soil Conservation Authority.

Surveys and Preparation of Final Plans

The southern 28,000 lin. ft. of the alignment across the flat volcanic plains near Wallan and Wallan East was designed on an engineering survey basis, alternative lines being set out and levelled in the field and analysed in the office to achieve the optimum solution. The remainder of the project, in hilly country, was designed on photogrammetric mapping, at a plan scale of 100 ft. to 1 in. with a vertical contour interval of 2 ft. Subsidiary engineering surveys were made on local roads, at stream crossings, at materials investigation sites and for construction referencing.

The final plans produced for the contract represent an extension of methods developed for the Western Freeway (Gordon Section). Extensive use is made of computer aids in both design and production of final plans. Cross-sections are generally computed and plotted on external computers and plotting facilities. Computer listings are used directly on final plans, thus avoiding transcription errors and reducing drafting costs.

As previously indicated, computers were used extensively in the design. Programmes monly used in the project were:

Survey Traverse Analysis,
Curvilinear Alignment and Centreline Geometry,
Horizontal Alignments and Offsets,
Digital Terrain Modelling (including formating and plotting programmes),
Earthwork Computation and Plotting of Interchange Cross-Sections, and
various listing programmes.

A special programme was developed for pit scheduling. This programme checks the pit size against the depth and the pipe sizes, and specifies the need to include step irons or step ladders with the pit. The output is in the form of a final pit schedule and pit quantities summarized for the contract schedule.

A programme was also developed for recovery of all design effort in terms of man days and for recalling the design effort used on any part of the project. This type of programme was conceived in order to improve historical records and to provide a means of storing and retrieving historical data which will be used in estimating design times and staff requirements for future projects.

All contract drawings are produced at the DIN A4 size in multi-colour format, and include all contract details and provision of traffic signing, pavement marking and roadside development.

A brief summary of some data on the project is as follows—

Estimated cost of project (1972 costs)	$18,500,000
Length of freeway	21¼ miles
Length of associated roads (not including interchanges and overpasses)	15 miles
Total length of alternative alignments or gradings studied (est.)	400 miles
Major structures	18
Major culverts and stock underpasses (more than 80 sq.ft. in area)	20
Minor drainage (not including access roads)	112,000 lin.ft.
Volume of earthworks	7,900,000 cu.yd.
Maximum depth of cutting (approx.)	100 ft.
Maximum height of embankment (approx.)	60 ft.
Photo-control surveys	18.5 route miles
Total length of engineering survey traversing	89 miles
Total number of finished road plans	2,280 sheets*
Total number of computer hours used (in terms of IBM 1620 time)	1,100 hours

* Including 1,470 computer-drawn sheets.

1. DESIGN

Use of Computers in Bridge Design

(i) Use of the C.R.B. IBM 1620 Computer.
The Board's computer was used for 536 hours of running time during 1971/72 in the design of 137 projects.

(ii) Development of new computer programmes.
The development of new programmes for the Bridge Substructure Analysis System, which was described in the 1970/71 Report, was completed. The three-column abutment programmes are now in use and the single-column pier programmes will be available for use when documentation has been completed. Development work is also proceeding on the Bridge Superstructure Analysis System, also described in the 1970/71 Report.

(iii) Programmable desk calculator.
Use of the Hewlett-Packard 9100B programmable desk calculator has continued to increase and sixty programmes are now in use.

Mornington Peninsula Freeway—Dromana Section

Burrell Road Overpass of the Freeway

The Dromana Section of the Mornington Peninsula Freeway extends for five miles from the Nepean Highway, north-east of Dromana, to Jetty Road, south-east of Rosebud. The construction of four structures over or under the freeway is completed or is well in hand.

Construction of the Burrell Road bridge (Figure 2) over the freeway is planned to commence in August 1972. This structure will restore access from a residential area south-east of the freeway to the Nepean Highway and the Port Phillip Bay foreshore. It will be located at a point where the freeway formation is depressed some forty feet below natural surface level, and is adjacent to a summit curve on the freeway.

The initial design proposal, a statically indeterminate frame structure with rigid connections between the piers and superstructure, was analysed using the commercially available computer system ICES—STRUDL II. The system offered solutions to both frame structures and continuum mechanics, using the stiffness approach, the stiffness matrices being generated from beam theory for frames, and from energy considerations for finite element analysis.

Self weight, live loads and the effects of axial and transverse temperature differential gradients, and of shortening of the superstructure, were examined. Secondary effects resulting from post-tensioning of the indeterminate frame were computed manually and an iterative design procedure was devised to determine the location of the stress relieved tendons.

However, it was concluded that economies which could be achieved by the use of the foregoing structural arrangement would be more than offset by the costs of the complex construction procedures which would be required to minimize the secondary effects of post-tensioning. Accordingly, precast post-tensioned concrete bearing sections were incorporated at the extremities of columns to overcome this problem. The final design assumptions now provide for rotation at the supports and for superstructure movements by considering the structure as a four-element chain mechanism restrained by pinning of the propped cantilever span at the Dromana abutment.

The slab superstructure is designed to be cast in five stages, each of 200 cu. yd. of concrete. An initial force of 7,700 tons will be provided over the piers by stressing fifteen tendons which will extend the full length of the bridge, and eight shorter tendons which will have single stressing anchorages. Each of the continuous tendons will be jacked simultaneously from anchorages at either end, to a load of 330 tons, and will then be released to 270 tons. The design allows for some degree of flexibility in both tendon profile and magnitude of tendon force.

Provision for pedestrian traffic has been made by the inclusion of cantilevered footways. Aluminium hand-railing will be similar to that used in the Phillip Island bridge and will incorporate a stress-relieved tendon in an extruded aluminium top rail. The tendon will be anchored to end blocks separate from the structure.

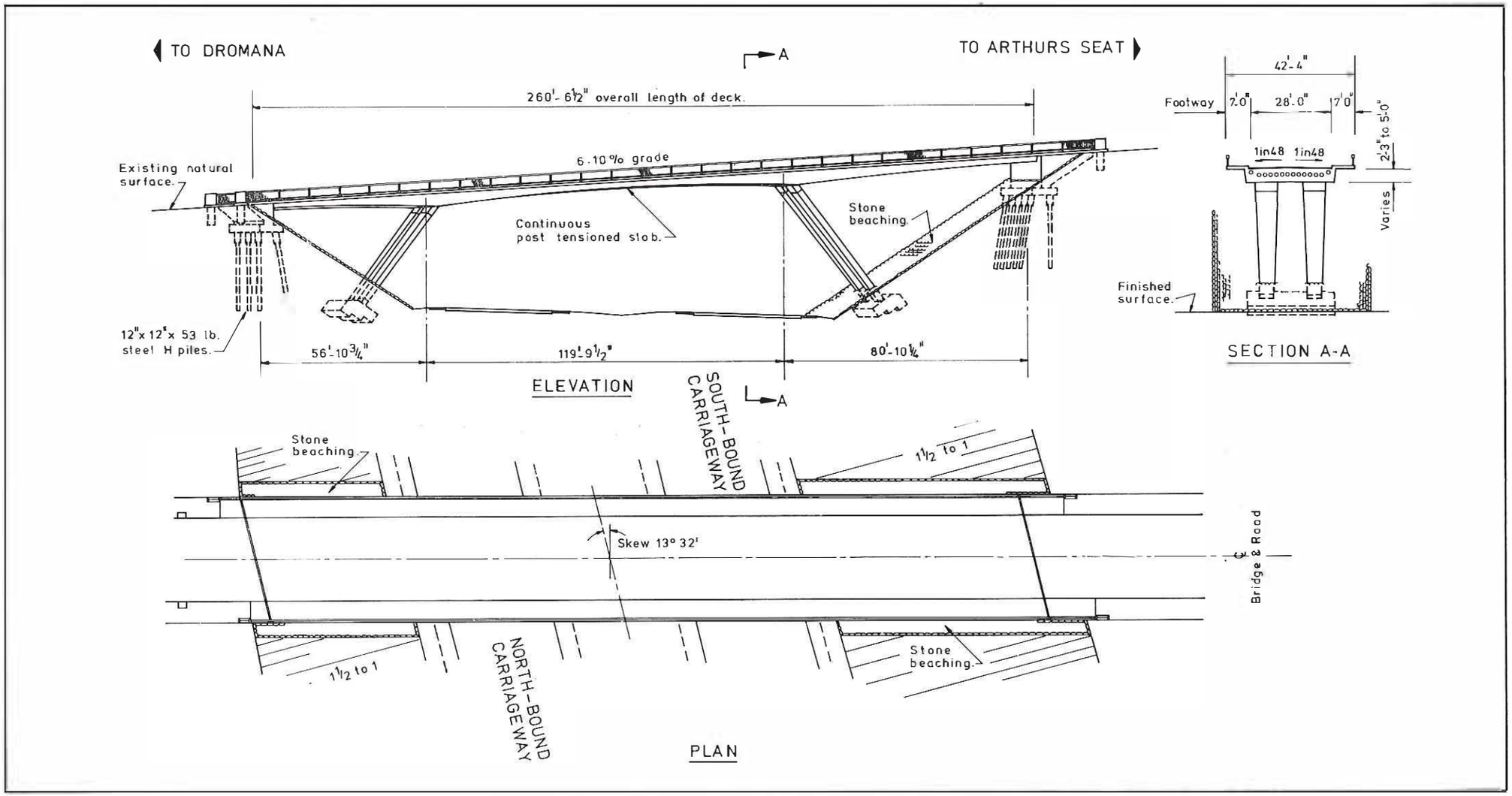


Figure 2—Burrell Road Bridge over the Mornington Peninsula Freeway.

Study of Deck Expansion Joints

A study of the types of deck expansion joint in current use by the Board has been completed. A full report on the findings of the study and recommendations for improving joint selection, design and installation is in preparation, and some findings can now be reported.

The joints investigated were:

rubberized bitumen,
tubular neoprene,
cellular neoprene,
butyl impregnated polyurethane foam,
self-expanding cork,
bituminous felt,
Serviseal,
P.S.C. heavy duty joint,
cantilevered comb,
Transflex and
the sliding plate type.

Expansion joints were inspected on some eighty bridges to assess their in-service performance. The investigation revealed that sliding plate joints frequently break loose at the deck anchorage and that butyl impregnated polyurethane foam deteriorates rapidly.

The increasing use of long span and skew bridges has created a need for more elaborate expansion jointing. Of the more recent developments, pre-formed cellular neoprene compression seals are the most promising for movements in the range of $\frac{1}{2}$ in. to $1\frac{3}{4}$ in.

2. CONSTRUCTION

Pedestrian Overpass over the Calder Freeway at Niddrie

During 1971/72 the Board constructed a pre-stressed reinforced concrete pedestrian bridge over the Calder Freeway at Niddrie. The main span, 149 ft. in length, is the longest yet built by the Board for a pedestrian bridge (Figure 3).

The bridge enables school children attending the Niddrie State School and the Niddrie High School to cross the freeway safely. The children are afforded maximum safety by the bridge being constructed over both the freeway carriageways and the service roads. The safety of motorists on the freeway was the consideration which led to the adoption of the 149 ft. main span, in that it was decided not to build a central pier in the narrow median of the freeway. The overall length of the bridge, including approaches, is approximately 530 ft. There are eight spans, i.e. the main span, two secondary spans and five spans in the spiral ramps. The overall width of the beams is 7 ft., giving a clear distance between handrails of 6 ft. 1 in. The minimum vertical clearance for vehicular traffic on the service roads is 15 ft. The approach ramps (for which no property acquisition was required, as they are situated within the right of way) have a maximum grade of 1 in 8.

The main span consists of a suspended beam of 75 tons weight and 105 ft. length supported on anchor beams, both of 67 tons weight, which each cantilever 22 ft. from the main columns. The depth of the suspended beam is 3 ft. 3 in. throughout, but the depth of the cantilevers varies from 3 ft. 3 in. at the ends of the cantilevers to a maximum of 5 ft. 4 in. over the main columns.

The beams for the main and secondary spans were cast at the site and post-tensioned before being lifted into place. The suspended beam was stressed using four cables each containing fourteen $\frac{1}{2}$ in. diameter Supa-7 strands (working capacity of 349,000 lb. per cable at 60% U.T.S.). Of the four cables in the anchor beams, the upper two are similar to those in the suspended beam and the lower two consist of thirteen $\frac{1}{2}$ in. diameter Supa-7 strands each (working capacity of 324,000 lb. per cable at 60% U.T.S.). The design concrete cylinder strengths of these beams are 5,000 lb./in.^{2} minimum at stressing and 6,000 lb./in.^{2} at 28 days.

The spiral ramp approaches consist of cast *in situ* continuous reinforced beams, 3 ft. in depth.

Precast Concrete Traffic Barriers for Bridges

Increasing emphasis is being placed on the provision of effective traffic barriers on bridges. The most important requirements to be satisfied by such barriers are as follows:

(i) no penetration, or vaulting, of barriers by vehicles should occur;
(ii) injury to occupants and damage to vehicles should be minimal;
(iii) the initial cost and the maintenance cost of the barriers should be moderate; and
(iv) their appearance should be pleasing.

Shaped concrete barriers, e.g. of the New Jersey, General Motors, or California Division of Highways types, appear to meet these requirements better than do most forms of rigid barrier; and they have the advantage that accident severity is significantly reduced at low angles of impact.

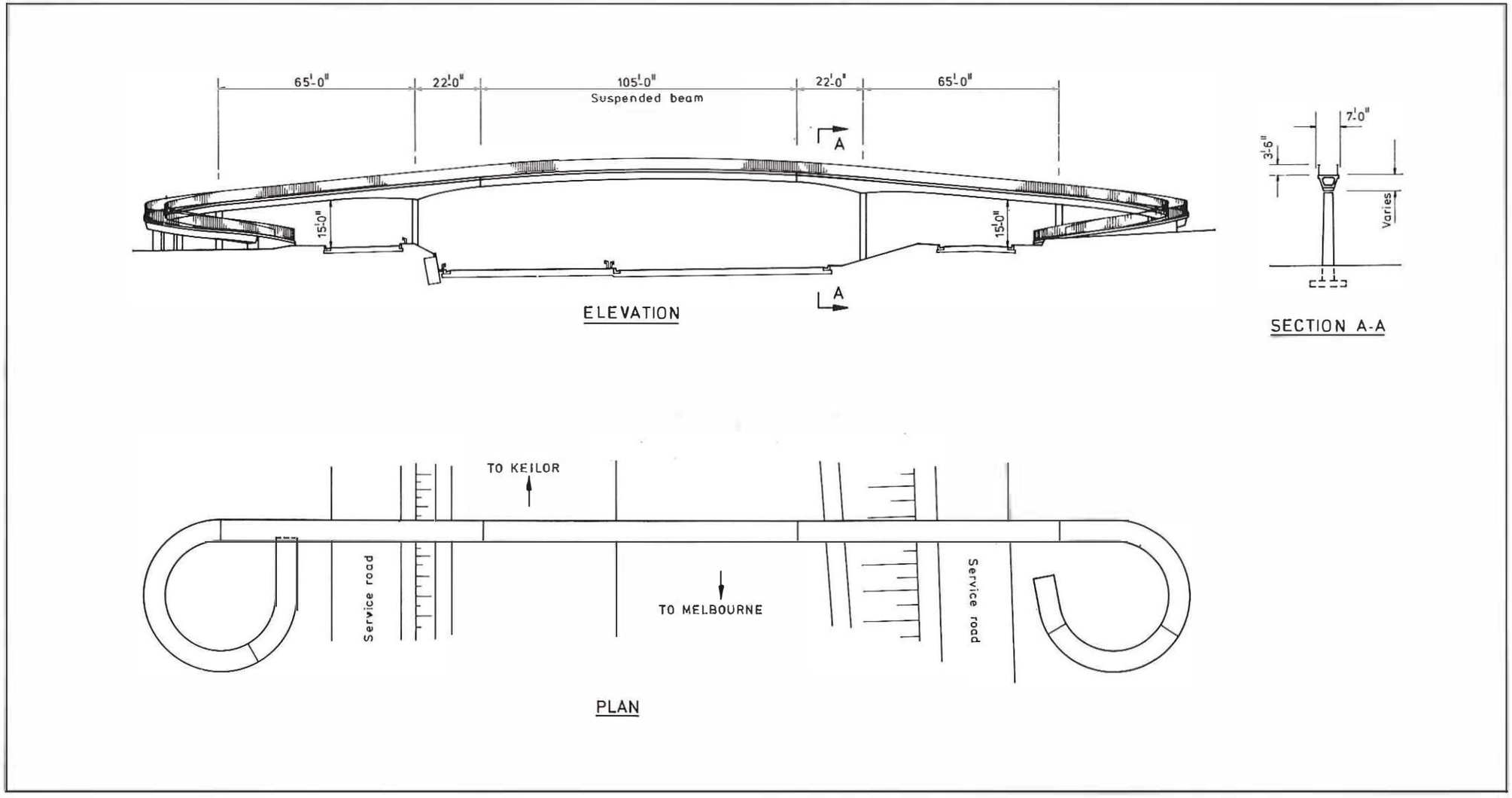
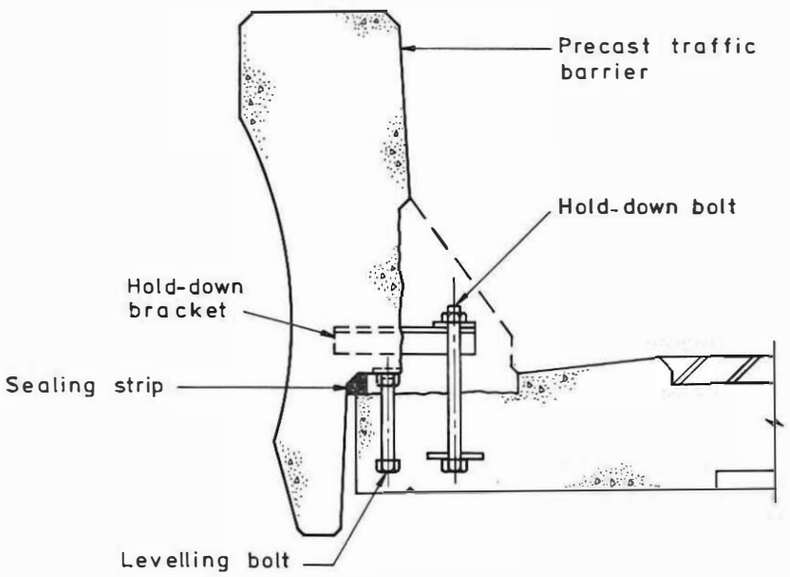


Figure 3—Pedestrian Overpass structure, Calder Freeway, Niddrie.

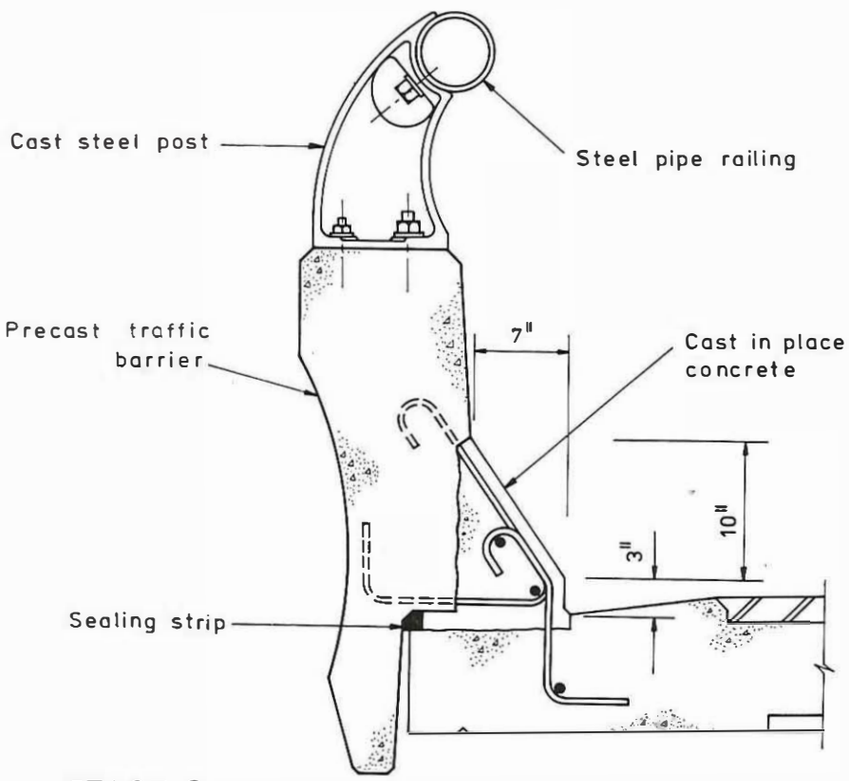
On the Princes Highway West bridge over the railway at West Footscray, a concrete traffic barrier similar to the California Division of Highways Type 20 is incorporated. Unlike the concrete barriers of the General Motors type used by the Board on the bridges on the Lower Yarra Freeway and the modified California Division of Highways Type 20 used on the Mulgrave Freeway, the West Footscray barrier uses a precast section. This barrier was chosen in order to reduce site erection time and to allow the greater freedom, in the selection of of shape and surface finish of the barrier, which can be achieved with factory production.

Approximately 5,000 lin. ft. of barrier is to be constructed on the West Footscray project. The barrier is to be continuous over approach embankments and structures. A steel-pipe railing supported by cast-steel posts is to be mounted on top of the concrete barrier (Figure 4). The design loading of the barrier is in accordance with N.A.A.S.R.A. Highway Bridge Design Specification 1970 for "Traffic Railing—Special Type".



STAGE 1

Precast barrier set on bridge.



STAGE 2

Cast in place concrete connection and steel pipe railing erected.

Figure 4—Precast concrete traffic barrier used on the West Footscray Bridge, Princes Highway West.

The standard precast unit is 5 ft. long and weighs 1,100 lb., allowing easy handling and installation on curved alignments (at West Footscray, units are used around a 90 ft. radius curve). Special units of various lengths or with provision for mounting lighting poles are also precast. The units are provided with hold-down brackets and levelling bolts. They are levelled prior to casting, *in situ* on the lower traffic-face, the concrete section which furnishes a connection with the bridge deck. Units are butted together with a nominal gap of ½ in. and the connection is cast in continuous lengths between expansion joints. Where barriers are erected on approach embankments, the precast units are secured to a ground beam on piles at approximately 25 ft. centres in order to prevent possible misalignment of the barrier in the event of any subsequent settlement.

The precasting was carried out at the Board's Bendigo Depot, where the forms were also designed and fabricated. The forms are used with the curved outer face downward, because reinforcement projects from the roadside face for incorporation into the cast-in-place connecting section. Three forms were constructed in steel, in 10 ft. modules. Adjustable endboards and hinged panels with ½ in. steel fillets, to expedite the forming and stripping of the faces which are placed against the deck, are incorporated. Some precast units are flared out at the centre to provide greater width on top of the barrier to accommodate lighting poles, and this shape was fabricated from steel plate and welded to the centre of one of the 10ft. modules.

The units are heavily reinforced with mild steel connected by spot welding. This is quicker than wire tying, allows a more precise location of bars and produces a cage which may be handled without difficulty and in which the bars cannot slip out of position.

For casting, the forms, set up with two external vibrators, are oiled and the reinforcement and other fixtures are placed. A stiff mix of 6½ bag, ¾ in. maximum aggregate concrete is placed and is heavily vibrated externally and internally to ensure compaction. The units are then water cured and can be stripped daily during the warmer months and on alternate days during winter. The off-form finish is generally very good, and the finish of the erected barriers looks excellent after bagging up with the cast *in situ* connecting section (Plate 1).

By June 15th 1972, all of the 263 units required for the first stage of the West Footscray bridge had been delivered to the site, and 750 units for later stages remained to be manufactured. The same type of units will be used on several bridges on the Wallan-Broadford Section of the Hume Freeway.

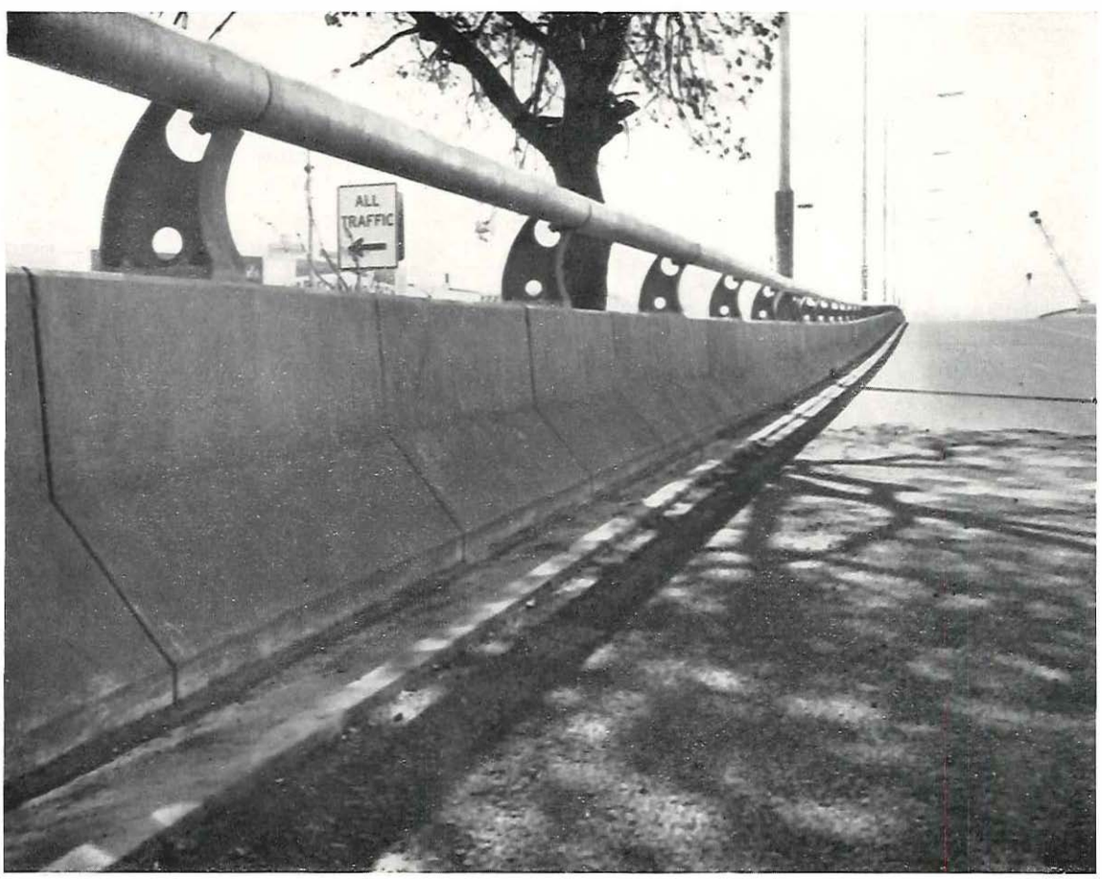


Plate 1—Precast concrete traffic barrier, West Footscray Bridge, Princes Highway West.

MECHANICAL SUB-BRANCH

Design and Development

The following design, development and construction work is either complete or is in progress:

(i) Improvements to patrol grader attachments.

Windrow eliminators supplied by the makers of patrol graders have two deficiencies, viz. they can only be used on left-side shoulders, and they are unable to remove stones from bitumen surfaces adjacent to the shoulders.

A new design has been completed which will enable both left-hand and right-hand operation of the windrow eliminator, i.e. on left shoulders and also on right shoulders adjacent to medians. A power-driven rotary broom will also be fitted to remove stones from carriageways. Due to improved design, the windrow eliminator/broom assembly should require less maintenance, and will be easier to remove and refit, than the eliminator/broom assemblies now in use.

(ii) Water sprayer nozzles.

The small drilled holes in the sprayers of the present gravity water sprayers used by the Board cause concentrated water jets which gouge the soil. A new spraybar design obviates this erosion by the use of spoon nozzles which produce water fans 30 in. wide. Fifteen of the spoon nozzles spray over a width of 8 ft. The nozzles are supplied from $\frac{3}{4}$ in. orifices in the spraybars. This large diameter was adopted to avoid blockages from debris from water holes.

The design has been tested and it is expected that field evaluation will be completed during the 1972/73 summer.

(iii) Vehicle weight sensing condenser.

The development, in association with the Australian Road Research Board, of a vehicle weight sensing condenser to weigh vehicles in motion continued during 1971/72. An initial programme of developing and testing seven designs of small sample condensers has been completed. Work is now proceeding on the development of one of the more satisfactory designs into a full sized condenser.

A cyclical loading machine which has been constructed for testing the sample condensers is being enlarged to test full sized condensers. The machine is also being provided with heating and cooling facilities to permit ready assessment of the effects of temperature variation on the condensers, such as will occur when they are attached to road surfaces.

(iv) Liquefied petroleum gas heating of bitumen.

The system for heating bitumen on the Board's existing mobile plant uses atomized oil as the fuel. This system has the disadvantanges of high capital and maintenance costs and of being bulky. Attempts have been made in the past by the Mechanical Sub-branch to devise a system using liquefied petroleum gas (LPG), as such a system would be simple, relatively cheap, and would require little maintenance. The attempts were unsuccessful, because the necessary high gas consumption rates produced excessive cooling of the gas storage cylinders, resulting in the gas pressure, and consequently its discharge rate, falling below the levels that were required to sustain satisfactory heating.

Excessive cylinder cooling could be avoided by using a liquid withdrawal system instead of the unsuccessful vapour withdrawal system. A mock-up liquid withdrawal system was designed, constructed and demonstrated to the Chief Gas Examiner who has now notified the Board that the L.P.G. Regulations, which now specifically prohibit the use of a liquid withdrawal system for mobile applications other than those using L.P.G. as an engine fuel, will be amended. This liquid withdrawal system will be used on the Board's 1,000 gallon capacity bitumen sprayers which are nearing completion.

Heating with L.P.G. will give the following advantages:

(a) savings up to $1,500 in capital cost per installation;
(b) large reductions in maintenance costs; and
(c) simplification of the heating operation.

New Types of Plant

The following items of major plant and machinery not previously owned by the Board were acquired:

(a) Crawler tractor.

Caterpillar model D7F, powered by a Caterpillar model D333, 6 cylinder, 180 h.p. turbo-charged engine driving through a torque converter power-shift transmission. The unit is equipped with a hydraulically operated bulldozer blade complete with a hydraulic tilt cylinder. A hydraulically operated fixed tyne ripper is also fitted.

(b) Tractors—pneumatic tyred.

(i) Chamberlain Mark 3, industrial towing tractors powered by a Perkins model 4/236, 4 cylinder, 64 h.p. diesel engine driving through a 6 speed conventional transmission. These units are mainly used for towing multi-wheel pneumatic tyred rollers on bituminous sealing work.

(ii) Fiat model 500 tractors powered by a 3 cylinder, 50 h.p. diesel engine driving through an 8 speed conventional transmission and fitted with a 10 cu. ft. bucket capacity Superlift front-end loader.

These units are used for patrol maintenance work.

(iii) Massey-Ferguson model 3303 tractor powered by a Perkins model 4/212, 4 cylinder, 56 h.p. diesel engine driving through a 6 speed conventional transmission. The machine is fitted with a Conquip model BH150-2 side-shift type back hoe with a 24 in. wide bucket, and a Conquip model FEL 20M front-end loader with a 1 cu. yd. capacity bucket.

This machine is used for trench digging, channel clearing and general construction work.

(c) Power graders.

Aveling Austin model 99-H/400, four wheel, all wheel drive, all wheel steering, power graders powered by a Leyland model AU600, 6 cylinder, 163 h.p. diesel engine.

These graders are used for construction work in mountain areas. In winter they are fitted with front mounted, hydraulically operated blades and used for snow clearing.

(d) Four-wheel-drive loaders.

International model AH 308, pneumatic tyred, rigid frame loaders powered by an International model D239, 4 cylinder 66 h.p. diesel engine driving through a torque converter power-shift transmission. The bucket has a capacity of 1.25 cu. yd. and each unit is fitted with a hydraulically operated swivel tyne ripper.

(e) Crane.

P & H model 325-TC, 26 ton capacity truck-mounted mobile crane with a 60 ft. boom. The crane is powered by a Bedford model 330, 6 cylinder, 75 h.p. diesel engine and the truck by a Cummins model 190, 6 cylinder, 190 h.p. diesel engine.

This crane is used on bridge work and in conjunction with a diesel pile hammer for pile driving.

(f) Diesel pile hammer.

B.S.P. model DE 50B, diesel pile driving hammer. The net weight of the hammer is 10,330 lb., the weight of the ram is 5,000 lb. and the maximum energy per blow is 45,000 ft. lb.

(g) Drawn vibrating rollers.

(i) Vibroll model 72T Mark 5, smooth drum type, in which the vibrator is powered by a Petters model PJ3, 3 cylinder, air cooled, 37 h.p. diesel engine. The roll is 72 in. wide. The static weight of the roller is 5 tons.

(ii) Vibroll model 72T Mark 5, sheepsfoot type with either 96 truncated pyramid shaped feet or 104 diamond shaped feet. The vibrator is powered similarly to the smooth drum roller. The roll is 72 in. wide. The static weight of the roller is 5 tons 9 cwt.

(h) Trucks.

(i) International model ACCO 1820, chassis and cabs, powered by an 8 cylinder, 177 h.p. petrol engine, and fitted with an Evans 7 cu. yd. tipping body.

These units are used as tender trucks with bituminous spraying units.

(ii) Bedford model KHM, chassis and cabs, powered by a General Motors model 6V53 diesel engine of 195 h.p. through a 10 speed Fuller transmission.

These units will be used as prime movers for the new 1,000 gallon bitumen sprayers.

(i) Mobile drill rig.

Gemco model 210B, two wheel trailer-mounted drill rig, powered by a Volkswagen Industrial, 4 cylinder, 34 h.p. petrol engine.

(j) Fuel tanks.

(i) Desma, single compartment, 1,000 gallon capacity tanker on a four wheel trailer, for the transport of diesel fuel oil.

(ii) Desma, two compartment, 1,000 gallon capacity trailer on a four wheel trailer. The unit complies with the Inflammable Liquids Regulations and will carry 650 gallons of power kerosine and 350 gallons of diesel fuel oil.

(k) Sand spreader.

This unit is an adaptation by Kelly and Lewis Pty. Ltd. with the co-operation of the Board, of a Kelly and Lewis agricultural spreader. The unit, with a hopper holding 20 cu. ft. of sand, is fastened to the tray of a Land Rover and, when not required, can be detached and lifted off the vehicle tray. A rotary spinner, driven by a small, single cylinder Briggs and Stratton engine, spreads the sand.

(l) Mobile laboratory.

A 20 ft. by 8 ft. Franklin caravan with tandem axles and four wheels has been fitted as a mobile laboratory for field testing of materials.

(m) Water sprayers.

Delarue skid-mounted water tank/sprayers of 1,200 gallon capacity. The units are transported on the trays of trucks and each tank is fitted with a spraybar to which water is admitted by a valve controlled from the cab by the truck driver. The tanks are also fitted with taps for filling knapsack fire extinguishers.

Plant Maintenance

Again in 1971/72 the trend of the previous years continued, and there were substantial increases in the costs of parts, materials and the labour employed in maintaining plant.

The shortage of suitably skilled labour continued but there was a reduction in labour turnover. Notwithstanding the skilled labour shortage, the plant requirements for construction and maintenance work were met.

PLANNING SUB-BRANCH

FREEWAY PLANNING AND TRANSPORTATION STUDIES

Provincial Urban Transportation Studies

The 1969/70 and 1970/71 Reports outlined progress on transportation studies for the provincial cities of Ballarat, Bendigo and Geelong. The situation on the studies as at 30th June, 1972, is set out below.

(a) In February 1972 the Ballaarat and District Joint Town Planning Committee, which co-sponsored the Ballarat Study with the Board, released the report, "Ballarat Transportation Study, December 1971", by Harris, Lange-Vorhees, Transportation and Planning Consultants, Melbourne. The report documents the existing conditions, the procedures used in the Study, forecasts of population, employment and land use, the recommended street and highway plans (illustrated), and the central area traffic and parking strategy.

Three interim reports were also released by the consultant:

Interim Report No. 1—Community Goals and Objectives
Interim Report No. 2—Population and Employment Forecasts
Interim Report No. 3—Parking Study.

For wider public distribution of the Study findings, a five-page report, "Summary of Principal Conclusions and Recommendations, February 1972", was prepared and circulated.

The total estimated cost for implementation of the recommended street and highway plan is $18,888,000, spread over four five-year periods from 1972 to 1991. The cost is only for operational improvements to provide the required capacity increases in the chosen arterial road system and does not include costs for maintenance, replacement of unsound road surfaces or functional improvements.

The final cost of the Ballarat Study, excluding staff salaries, was $140,562, to which the Ballaarat and District Joint Town Planning Committee contributed $17,476.

(b) On 31st May, 1972, the Committee supervising the Bendigo Study made available to representatives of the Bendigo municipalities the report, "Bendigo Transportation Study, The Recommended Road Plan, June 1972", by Rankine and Hill, Consulting Engineers, Melbourne. The report outlined the illustrated road improvement proposals and listed the works in four five-year periods from 1972 to 1991.

The full list of reports released for the Bendigo Study is:

Report No. 1—Basic Data, May 1971 (Rankine and Hill)

Report No. 2—Economic Projections, July 1971 (Philip Shrapnel and Co.)

Report No. 3—Urban and Traffic Growth, November 1971 (Rankine and Hill)

Report No. 4—The Recommended Road Plan, June 1972 (Rankine and Hill).

The total estimated cost for implementation of the recommended arterial road plan for Bendigo is $18,608,000. Of the total, $9,736,000 is for "functional" road improvements, i.e. improvements suggested to develop arterial and sub-arterial roads in the area to predetermined standards of width, line and grade; and the balance, $8,872,000, is for operational improvements and committed works. In the report, the functional road improvements are so proposed as to even out the annual rates of total expenditure through to 1991.

The final accounting of costs for the Bendigo Study had not been determined as at 30th June, 1972, but the total expenditure to that date was $107,099, of which the local municipalities contributed $13,331.

(c) For the Geelong Study, the results of travel studies and road inventories carried out during 1970/71 were published in the Volume 1 report, "Geelong Transportation Surveys and Travel Characteristics", by Wilbur Smith and Associates, Consulting Engineers, Melbourne.

Supporting the main consultant, Philip Shrapnel and Co. Pty. Ltd. published the employment survey and economic base study in the report, "Projections of Employment and Population in Geelong, 1971-1991, July 1971" and, in consultation with the Geelong Regional Planning Authority, established more detailed land use forecasts.

After development of extensive mathematical travel models, 1991 travel forecasts were developed for identifying likely deficiencies in the existing road network under 1991 demands. The extent of the capacity deficiencies indicate the need for major road improvements by 1991, and to date three test networks have been examined to help develop a plan for recommendation.

The cost of the Geelong Study to 30th June, 1972, was $172,561, of which $21,508 had been met by the Geelong Regional Planning Authority which, with the Board, is the co-sponsor of the Study.

Inter-Disciplinary Design Team

The Board is strongly aware of the need for a wider approach to freeway design and construction than would be obtained simply by applying the most satisfactory traffic engineering solution to a congestion problem. Accordingly, during 1971/72, there were appointed to the Freeway Planning Division an economist, a sociologist and a town planner. These officers will assist in developing an integrated concept of freeway planning by:

evaluating the economic effects of alternative proposals,

investigating the aesthetic and town planning effects of these proposals, and

assessing the socio-economic impact of freeway construction on urban and rural communities.

Together with freeway design engineers, the economist, the sociologist and the town planner form an inter-disciplinary design team. In conjunction with freeway planning consideration this team will report on ways of developing communities which will be affected by the construction of freeways.

Freeway Route Planning

During 1971/72 the following freeway routes were approved:

(a) Hume Freeway, Bell Street, Coburg, to St. Georges Road, Fitzroy

At an early stage into investigations for the Bell Street-St. Georges Road Section of the Hume Freeway, a "favoured route" was adopted by the Board (Figure 5). During 1971/72 information concerning the favoured route was submitted to municipal councils and planning authorities in order to obtain their views on it. These views will be fully considered during further design investigations, which will lead to recommendations for approval of programming and construction of the section. The section, 2.8 miles in length, will be the next stage after the Mahoneys Road-Bell Street Section, and will be a second stage towards this north-south freeway, which is an important element in the Metropolitan Transportation Committee Transportation Plan for 1985.

(b) Hume Freeway, Wodonga Section

A short length of the Hume Freeway by-passing the commercial area of Wodonga has been adopted by the Board and is being included in the Planning Scheme of the Shire of Wodonga. Investigations are in progress regarding extension of the freeway conditions from each end of this Wodonga Section, i.e. both westerly along the existing Hume Highway and northerly across the Murray River to Albury. This latter investigation is being made in collaboration with the Department of Main Roads, New South Wales.

(c) Calder Freeway, By-pass of Keilor

During 1971/72 the Board approved a route that will extend the Calder Freeway westerly from Fosters Road, Keilor East to the Keilor-Melton Road (Figure 6). The section is 3.2 miles long and will be located to the north of the town of Keilor, which will be served by a fully directional interchange at Milburn Road-Kennedy Street.

(d) Mornington Peninsula Freeway

The Frankston-Cranbourne Road—Eramosa Road Section was approved in 1971/72 and will ultimately form part of the Mornington Peninsula Freeway, which will link the Peninsula to the metropolitan area. The length of the section is five miles. Access to the freeway is proposed through interchanges at the Frankston-Cranbourne Road, Golf Links Road, the deviated Baxter-Tooradin Road and Eramosa Road. Substantial improvements to the road network in the Baxter area are proposed in conjunction with the freeway works to enable the road system to be developed as traffic demand increases.

(e) South Gippsland Highway, Hampton Park—Cranbourne Section

Preliminary layouts have now been approved for the development of the South Gippsland Highway to a four-lane divided highway between Dandenong and Cranbourne. In the Hampton Park area, the highway is deviated to allow the Eumemmerring Freeway to be extended southerly as a possible future connection between the Dandenong-Berwick urban corridor and the proposed Hastings industrial development.

(f) Mulgrave Freeway

Extension from Warrigal Road to Waverley Road
During 1971/72, a western terminal of Mulgrave Freeway in the vicinity of Warrigal Road was the subject of extensive investigation. The conclusions reached were that the freeway should be extended from the previously adopted terminal at Warrigal Road, to Waverley Road. This extension would enable direct connections to both Warrigal and Waverley Roads and would thus allow sufficient freeway entry and exit capacity to minimize traffic congestion on the arterial roads in the area.

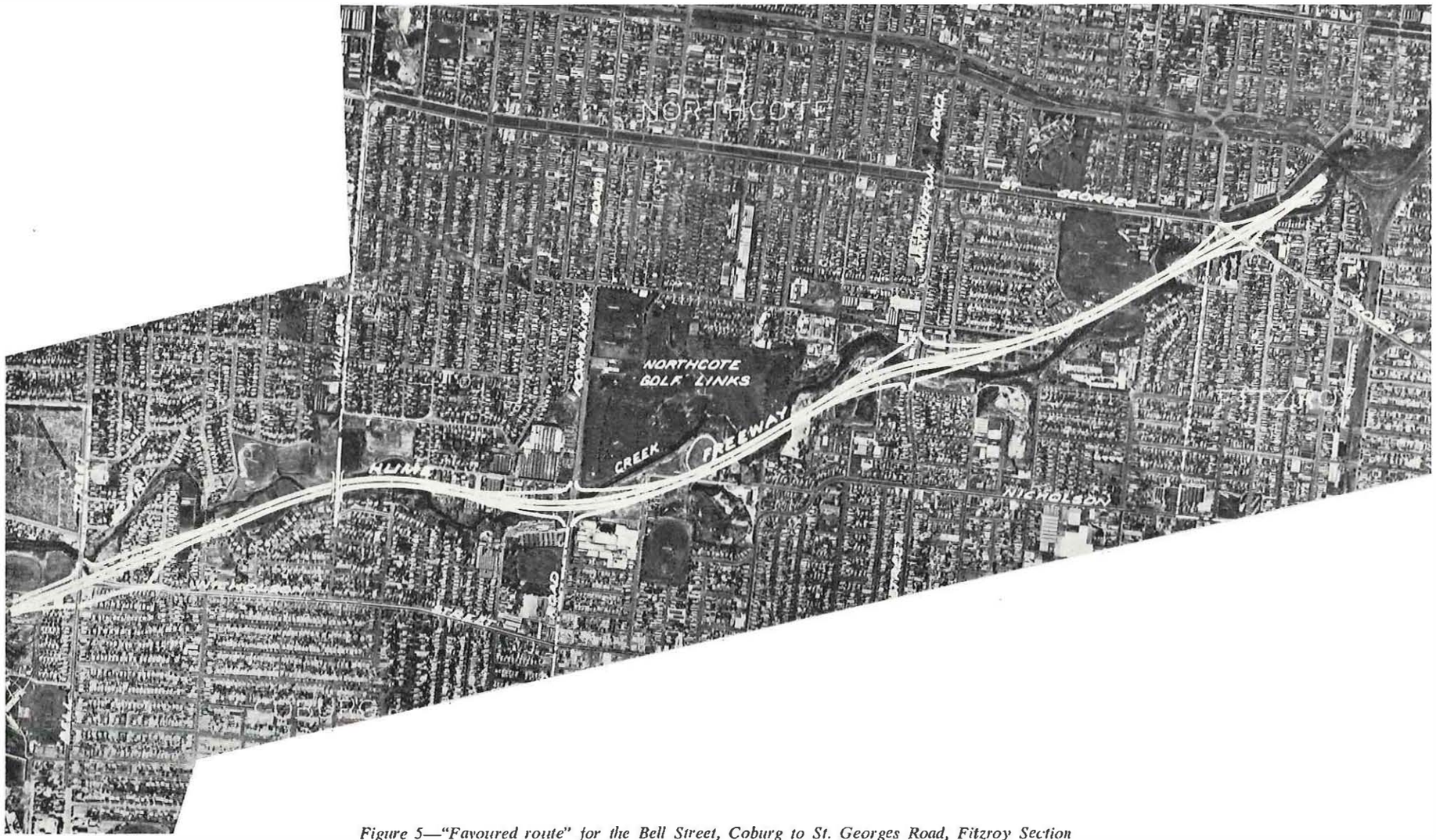


Figure 5—"Favoured route" for the Bell Street, Coburg to St. Georges Road, Fitzroy Section of the Hume Freeway.

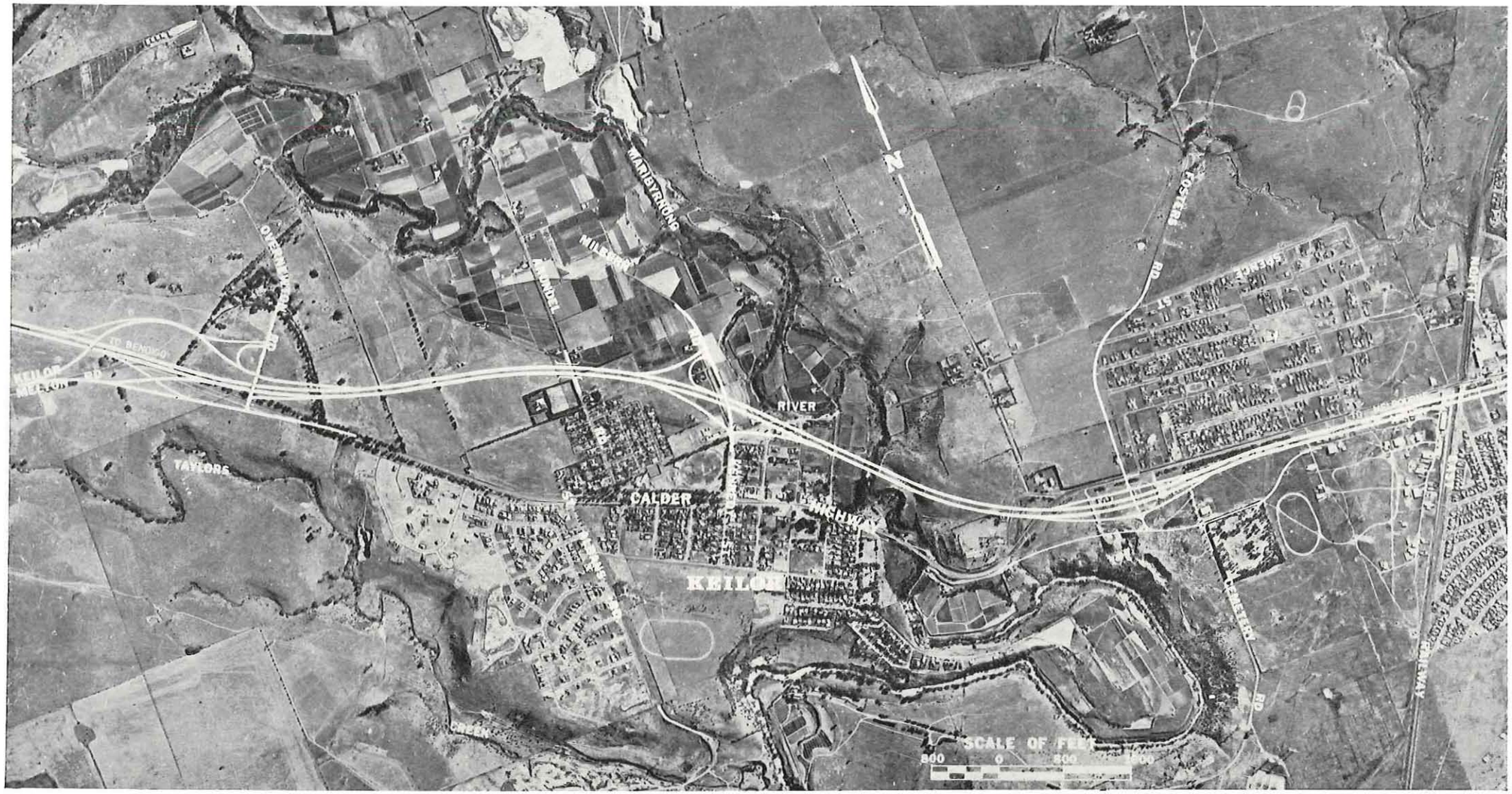


Figure 6—Approved route for the Calder Freeway by-pass of Keilor.

ROAD DESIGN SUB-BRANCH

1. ENGINEERING PLANS AND SURVEYS

Engineering Surveys

Head Office engineering survey parties carried out the following surveys during 1971/72:

	Traverse or Centreline Miles	Route Miles
Freeways	133	25
State highways—general	39	25
—reconstruction	9	6
Other roads —general	10	7
—reconstruction	6	4
Ground control for photogrammetry	287	52
	484	119

Consultants completed 19 traverse miles of freeway surveys, comprising 15 miles of photo-control surveys and 4 miles of detail traverse.

Two additional survey parties were established during the year, making a total of twelve parties.

The Department of Crown Lands and Survey is now supplying final values of reduced levels related to the nationally adjusted Australian Height Datum, for bench marks which have been established throughout the Board's road system. These new values are in metric units.

Plans for Road Construction

The extent of final construction plans completed in, or under the direction of, the Plans and Surveys Division during 1971/72 was as follows:

(a) Route miles

Freeways	26 miles
Other divided roads	9 miles
Undivided	21 miles
	56 miles

(b) Estimated cost of roadworks for which plans were completed:

Freeways	$12,941,000
Other divided roads	1,545,000
Undivided roads	1,235,000
Grade separations } Other projects }	1,473,000
	$17,194,000

Included in the above figures are designs completed by consultants for the following projects:

Latrobe Valley Freeway: 1.1 miles between the Mulgrave Freeway and Hallam-Emerald Road, estimated cost $600,000,

Scoresby Freeway: 1.0 miles between Mulgrave Freeway Interchange and Police Road, estimated cost $2,200,000,

Western Freeway: Ballan Section of 5.4 miles, estimated cost $2,200,000,
Myrniong Section of 3.5 miles, estimated cost $1,000,000,
Pentland Hills Section of 4.0 miles, estimated cost $1,600,000,

Princes Highway West: 0.9 miles between McDonald's Road and Kororoit Creek, conversion to six lanes, estimated cost $300,000,

Nepean Highway: 1.4 miles between Centre Dandenong Road and Warrigal Road, conversion to six lanes, estimated cost $600,000.

Contract Specifications

Specifications advertised during 1971/72 were as follows:

	Number	Value
Contracts for materials and incidental construction works	97	$5,570,000
Contracts for road construction projects	13	$6,530,000

Photogrammetry

During the year the Board's two Wild A8 stereoplotters were engaged continuously on compilation of locational photogrammetry. The Department of Crown Lands and Survey co-ordinated and controlled the flying and the production of aerial photography.

Photogrammetry, to enable detail design on various projects to commence, was prepared by four mapping consultants. Project control surveys and photo-control surveys, for the accurate establishment of the photogrammetric models and the preparation of the final mapping, were carried out by Board surveyors. The preparation of large and small-scale uncontrolled photo-mosaics has been initiated to facilitate the establishment of control points and to illustrate reports. The recording of project photography and photogrammetric mapping coverage is being systematically presented on a set of base maps covering the whole State.

Experimental work is continuing in the field of mapping accuracy. Also, investigation is proceeding into the photogrammetric acquisition of terrain data for highway engineering purposes. Constant liaison is being maintained with other Government departments and with teaching institutions to interchange ideas in these fields.

Developments in Computer Usage

A programme controlled by the Monash University Computer Contracts Group was used during the year to contour field-surveyed terrain and as-built design. The use of these automatic contouring facilities has proved very useful to road designers.

A package of programmes has been developed by the Plans and Surveys Division, and is in use, to produce Digital Terrain Model data and natural surface cross-sections for design. The raw input data is obtained from either stadia observations, a stereoplotter or a digitizing table.

A new and expanded Fortran version of Digital Terrain Modelling, including horizontal alignment, has been written and is under test. Other new programmes produced are as follows:

(i) Pit Schedule Analysis;
(ii) Setting-out Booklets;
(iii) Minimum Length Vertical Curves (Metric);
(iv) Transition Tables (Metric);
(v) Various Jobbing and Listing programmes.

The conversion of existing programmes to metric units is proceeding.

To expedite design computations, two Hewlett Packard 9100B programmable desk calculators have been installed in the Road Design Sub-branch. These calculators are an invaluable aid to Road Design staff and are working at near-maximum capacity. Full documentation and user instructions for available programmes were revised during the year.

2. RIGHT OF WAY

Plans

(a) Right of Way Plans

Right of way plans showing in pictorial form such information as land tenure, access details, abutting development, and leased and surplus land, were compiled for the Mornington Peninsula Freeway at Dromana and the Laverton Section of the Princes Freeway.

In addition, existing right of way plans were revised as required.

(b) Access Authorization Plans

Plans were prepared to enable the Board to authorize access to the Hume Freeway (Tallarook-Seymour Section) and to assist in publicising, by advertisement, regulations controlling the use of the freeway.

(c) Tenure Plans

Tenure plans showing existing land ownership were compiled to assist in determination of new road reserve boundaries on the following projects:

(i) Freeway F6 (Wells Road)

(ii) Princes Highway East—deviation at Orbost

(iii) Mulgrave Freeway—Scoresby Freeway interchange.

(d) Alignment Plans

Plans were compiled showing the alignments of Dandenong-Hastings Main Road and Dorset Main Road with subdivisional development abutting thereon, for assistance in formulating widening proposals for these declared main roads.

(e) Tentative Subdivisions

Tentative subdivisional layouts were prepared for properties on the route of the Mulgrave Freeway and on the site of the Hume Freeway-Mahoney's Road interchange. The preparation of these plans enabled the most advantageous methods of treating with property owners regarding acquisition of land.

(f) Highway Record Survey Plans

Highway record survey plans were completed for:

the Princes Highway East, Sections 5 and 6	84 miles
the Calder Highway, Sections 3, 4, 5 and 6	282 miles

Strip aerial mosaics were prepared for:

the Phillip Island Tourists' Road	14 miles
the Foster-Promontory Road (unclassified) and the Wilson's Promontory Tourists' Road	37 miles

Odometer Surveys

Odometer surveys were carried out on:

the Ocean Road Tourists' Road (Apollo Bay-Peterborough Section)	66 miles	
* the Phillip Island Tourists' Road	14 miles	(23 km.)
* the Foster-Promontory Road (unclassified) and * the Wilson's Promontory Tourists' Road	37 miles	(59 km.)
* the Midland Highway, Sections 4 and 5	76 miles	(122 km.)

* These odometer surveys were carried out in both miles and kilometers.

Land Acquisition

The Right-of-Way Division assisted other Divisions in matters relating to land acquisition, subdivision, deviations, and planning schemes. The number of enquiries which were received from persons purchasing properties continued to increase, to approximately two hundred per week.

Town Planning

Two sets of coloured plans were prepared for each of the principal statutory planning schemes that were on public exhibition during the year. These new schemes, and amendments to existing schemes including the major Amendments 3 and 21 to the Metropolitan Planning Scheme, were examined to ensure that the interests of the Board were not adversely affected.

3. TITLE SURVEY AND PRINTING

Drafting

A total of 329 survey plans, drawn from control surveys, acquisition surveys, subdivision surveys and other survey sources, were completed during the year.

A total of 1,073 Gazette plans were prepared for Approving Orders in Council, Fixing New Alignments and Declarations.

Approximately 2,000 document diagrams were drawn for 1,071 cases of land acquisition or sale of old roads or surplus areas.

Seventy Road Inventory Maps at 1: 100,000 and nine Australian Road Needs Survey maps were completed, and twenty-nine Australian Road Needs Survey maps were in the process of compilation, for the Advance Planning Division. Six Divisional Direct Works maps were completed and four were in preparation, for the Works Sub-branch. Six bridge clearance maps and a feature map for the Board room were being compiled, and twelve other miscellaneous maps were completed.

The volume of title searches continued to increase. During 1971/72 nearly 19,000 individual searches were made at the Titles Office and sixty-one search charts were prepared for engineering design and other investigations.

Printing

The machine runs on offset printing machines totalled nearly 4,600,000 and some 16,800 photo-direct plates were made. The volume of plan reproduction was consistent with the 1970/71 volume, but Statfile production increased by 25%.

The installation of a Vari-typer increased the capacity for copy preparation.

An improved and more economical presentation of contract specifications, plans, drawings and computer listings has been evolved in conjunction with the Plans and Surveys Division. Original plans and drawings are reduced to a true scale which will fit A4 sized pages, and plates are then prepared for offset printing in the required colours. Cross-sections and computer listings are reproduced from photo-direct plates. All the information is then bound as one set. The Hume Freeway (Wallan-Broadford Section) specifications were the first to be dealt with in this way.

Surveys

Project Control Surveys

Recognition of the benefits ensuing from integration of photo-control, engineering and title surveys, particularly on major projects, has led to a wide acceptance of the need for project control surveys and to a considerable increase in this type of work. Accordingly, project control surveys were completed on twelve major projects, in the course of which the Geodimeter was used to measure a total of 511 miles of traverse over 119 route miles and also 178 miles of traverse and connections on cadastral work.

Cadastral Surveys

The Division completed a total of 167 cadastral surveys in 1971/72, of which 24 were carried out by consultant surveyors. During the year a large part of the survey strength of the Cadastral Sub-section was committed to the Wallan-Broadford Section of the Hume Freeway. The survey for acquisition purposes on this project also provided an accurate system of specially placed permanent survey marks, which are co-ordinated on the Australian Map Grid, to facilitate construction and further survey during construction.

Survey computations were carried out mainly on the Board's IBM 1620 computer, which processed nearly 400,000 lines.

4. TRAFFIC ENGINEERING

Traffic Design

More than one hundred projects concerned with the investigation and functional design of urban and rural intersections, road widenings and railway level crossing abolition schemes were dealt with during 1971/72.

Traffic Operations

Investigation, the preparation of schemes for the layout of signs and pavement markings, the preparation of manufacturing drawings, and the production of signpost schedules, were undertaken for ten freeway and eight major highway improvement projects, and many other individual intersection projects or projects requiring special signs. The preparation of some 450 sign plans was required.

In 1970 the Country Roads Act was amended to permit the Board to install traffic control signals in certain circumstances. The Traffic Engineering Division has been increasingly involved, in liaison with the Road Safety and Traffic Authority, in the design, the preparation of specifications and the supervision of installation of traffic signal works. During 1971/72 the installation of vehicle actuated traffic control signals at one intersection was completed and the design and administrative procedures for a further six installations were in progress.

Linemarking

During the year the Board maintained traffic lines and other pavement markings on a total of 8,128 route miles of road, consisting of 4,209 miles of freeways and State highways, 3,132 miles of other declared roads and 787 miles of unclassified roads. The work output expressed in length of equivalent standard stripe was 28,642 miles, an increase of 39.3% over the 1970/71 level.

Single line, double barrier line and edge line striping was painted by three large machines and one medium machine which was also used for striping urgent work that could not wait for scheduled visits by a larger machine. Pavement markings other than traffic lines were maintained by two small machines until April 1972, when two new medium machines were commissioned to assist with this work.

The expenditure on marking totalled $515,039 during 1971/72, including $93,129 expended by the Board's regional Divisions. The material used was 80,921 gallons of paint, 245 tons of glass beads and 7,430 raised pavement markers. The average cost of linemarking with the large machines was $13.69 per mile of standard stripe.

Four new machines, all designed and built at the Central Workshops, Syndal, commenced work in 1971/72. One large and two medium machines were placed under the control of the Traffic Engineer and the other, a medium machine, was placed under the administrative control of the Divisional Engineer, Geelong. A fifth machine, of medium size, became available late in the financial year and will be placed under the control of the Divisional Engineer, Bendigo, early in the 1972/73 year. All the machines are under the technical supervision of the Traffic Engineer. The medium machines allocated to the regional Divisions will be used for maintaining markings other than traffic lines and for restoring traffic lines on some new seals in the nominated Divisions and adjacent Divisions. The performance of the two machines in the regional Divisions and the extent to which additional linemarking capacity is required from time to time, will determine whether additional machines of this size will be constructed for use in other Divisions.

Street Lighting

An increasing demand developed during 1971/72 for technical advice on and investigations into street lighting proposals on State highways, prior to their submission at the appropriate time to the Street Lighting Committee.

Traffic Data Collection

There was also an increasing demand during 1971/72 for traffic data for planning and design purposes.

The automatic continuous counting programme was continued. In conjunction, a coverage counting programme was carried out to obtain data for the 1971/72 Australian Roads Survey. This work consisted of short period counts of approximately two days' duration, using Fisher-Porter machines at specific locations on State highways in order to record the change in traffic volumes along the length of each highway. Data obtained from the continuous programme was used to expand these short period counts to give a basis for estimating A.A.D.T.s (annual average daily traffic volumes). Volume profiles indicating the A.A.D.T. throughout the length of each highway were thus prepared. A continuing programme of coverage counting is to be implemented in order to maintain an up-to-date record of volume profiles.

Work continued on the conversion of urban and rural permanent continuous counting stations from the use of rubber-tube detectors and Fisher-Porter machines to the use of induction loops and Sangamo counters, as mentioned in the 1970/71 report. Plates 2 and 3 illustrate the types of counter installations being made at urban and rural locations respectively.

Approximately 180 manual traffic surveys were undertaken during 1971/72. These included intersection turning movement counts, pedestrian movement counts, speed studies, advisory speed determinations and railway level crossing delay studies. Major surveys included origin and destination studies at Lilydale, Seymour and the V.F.L. Park at Waverley.

The annual traffic census was conducted on March 22nd, 1972. Twelve-hour (7 a.m.-7 p.m.) classification counts were taken manually at 1,425 stations, approximately 640 fewer stations than in 1971. The automatic continuous and coverage counting programme has allowed this reduction in the extent of the census, and may eventually obviate the need for it. The basis for the Rural Highway Traffic Index was changed this year from a base year of 1933 to a more recent base year of 1957/58. There has also been some revision of the actual stations included in the calculation of the Index, which now is computed from 72 rural counting stations.

The following tabulation indicates the trend of the new Index and a comparison with the old Index from 1957/58 to 1972:

Years	Average of years 1957 and 1958	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972
Old Index	524·5	583	634	680	701	729	768	840	881	919	927	1035	1062	1093	Not available
New Index	100	109	—	125	—	139	149	167	168	176	182	193	201	218	240

Plate 2—Typical urban counter installation.

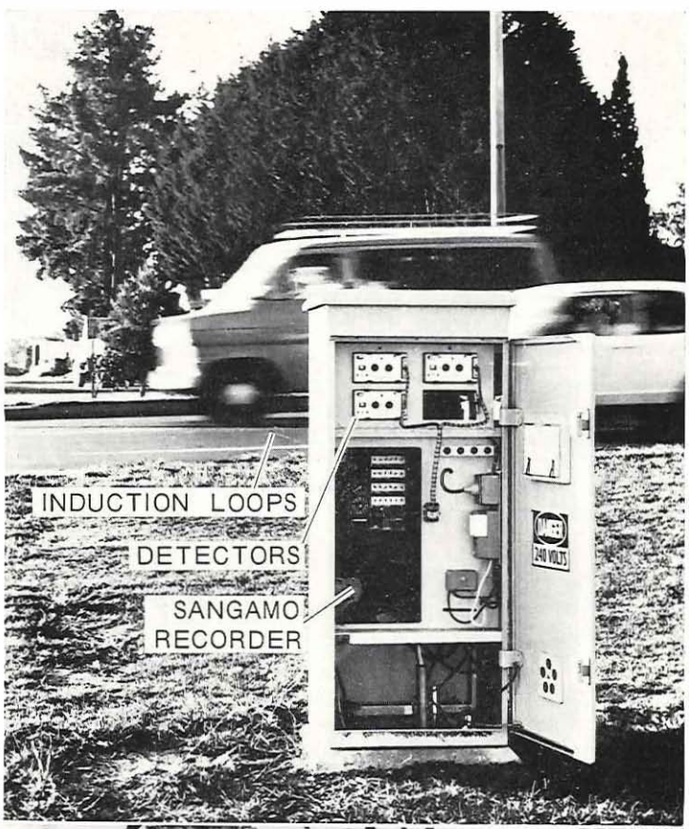
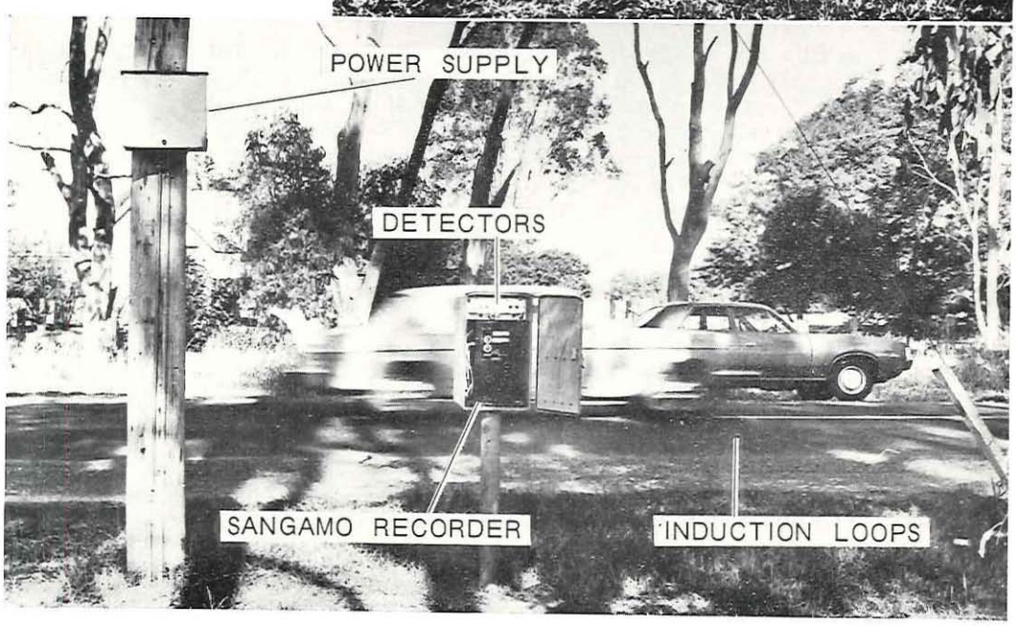


Plate 3—Typical rural counter installation.



1. ROAD CONSTRUCTION AND MAINTENANCE

Bitumen Emulsion Stabilization of Base Course Material

In the north-central region of Victoria there is a lack of road-making materials of the usual type, and in the last fifteen or so years mixtures of coarse sand and loam, both of which materials occur in the area, have been used as substitutes.

On reconstruction of the Goulburn Valley Highway north of Numurkah during September-November 1971, bitumen emulsion was used to stabilize the sand/loam base course pavement material. This job, over a length of 8,100 lin. ft., required approximately 4,800 cu. yd. of base course material and was the largest yet undertaken by the Board in which bitumen had been used in the emulsified form for stabilization purposes.

Residual bitumen percentages as follows were employed:

1.0%	6,000 lin. ft.
1.2%	600 lin. ft. } trial sections
1.5%	400 lin. ft. } trial sections
2.0%	1,100 lin. ft. } trial sections

The stabilization of the sand/loam mix was carried out in a contractor's mixing plant. The plant consisted of six 8 cu. yd. hoppers, three of which were used on this occasion to hold the raw sand/loam mixture; a pugmill; two 3,000 gallon tanks for the bitumen emulsion, and one 3,000 gallon tank for water; and an overhead hopper from which the stabilized material was loaded into trucks. Conveyor belts transferred the sand/loam from the three hoppers to the pugmill, where the bitumen emulsion and water were added, and another conveyor belt transferred the stabilized material to the overhead hopper. Problems regarding the feeding of the sand and loam from the hoppers and from the pugmill to the belts, were overcome during the course of the job and the rate of production was improved from 400-500 cu. yd. per day at the outset, to over 800 cu. yd.

The sand and loam, which occur at different horizons at the pit at which the plant was located, were roughly mixed by a bulldozer and loaded into the hoppers by a front end loader. The sand/loam was conveyed to the pugmill at the same rate from each of the three hoppers, in order to reduce the possibility of sudden variations in grading or plasticity. The pugmill then further mixed the material and broke up the larger lumps of loam before the emulsion and water were added.

Slow breaking anionic R200 emulsion was used as the stabilizer. The emulsion was broken and uniformly dispersed through the sand/loam by the action of the pugmill. The water from the broken emulsion was absorbd by the solid material and, where necessary, additional water was added to bring the total fluids content to the optimum. It was observed that the fluids were dispersed very uniformly throughout the mixture.

At the construction site, the sub-base (unstabilized sand/loam mix) was boxed out and the stabilized base course pavement material was placed to a solid depth of 4 in. in one pass. The width of the base course pavement was 28 ft., which was 4 ft. wider than the seal.

It was observed that the use of the stabilized material gave the following advantages over the use of the unstabilized material:

(a) generally the stabilized material was easier to handle. This was due in part to the uniformity achieved through mixing the sand and loam in the pugmill and in part to the fact that the material was available at the roadbed with the correct amount of moisture uniformly dispersed through it. The waterproofing effect of the bitumen prevented loss of moisture from the stockpiled material, except from the outer 2 in. layer, even in the generally fine and warm conditions which prevailed. The presence of the correct moisture meant that only minimal watering was required during compaction.

(b) the stabilized material was much stronger and more cohesive than its untreated counterpart. It was found that a single grader and a half-ballasted multi-wheel roller were sufficient to place and compact the material to an adequate density to allow final levels to be taken on the finished surface. Any required corrections to the pavement levels were then made before a heavier roller, a Duopactor, was used to compact the pavement to its maximum density. After compaction, the pavement was lightly planed each day to maintain a tight, knitted surface prior to primersealing. At no time was any section of the base course ripped during the preparation stage.

(c) the stabilized material withstood heavy rainfall and traffic better than unstabilized material. During the course of the job 280 points of rain fell over one week-end, at which stage 1,400 lin. ft. of base course stabilized with 1% residual bitumen had been placed. The surface water ran freely off the treated material, which remained reasonably sound, became only slightly potholed, and was trafficable at moderately high speeds. This was in contrast to the untreated boxed-out section, which was very

severely potholed and was trafficable only at low speeds (due in part to the fact that water was retained in the boxed-out section).

It has also been possible to compare the bitumen stabilized section with a section in which the sand/loam mix was stabilized with fine crushed rock (F.C.R.), as an adjoining length of the highway had previously been reconstructed by this latter method. The F.C.R. was mixed in equal proportions with a similar sand/loam mix, using a Rotamobile and two graders to provide a 4 in. base course pavement. It was found in this case that thorough mixing was a slower operation, with the machines handling only 400 cu. yds. per day.

The final surface of the F.C.R. stabilized pavement was not so good as that of the bitumen stabilized pavement, since large stones from the F.C.R. tended to tear away and scar the surface during grading or under heavy traffic. A further advantage of the bitumen stabilized pavement, noticeable after the sealing of both lengths, is the absence of large loose stones in the exposed 2 ft. width of base course pavement on both sides of the seal.

The use of sand/loam mix stabilized with 2% residual bitumen has also proved effective for the maintenance repair of potholes.

The project gave some useful insights as to the optimum percentage of residual bitumen required for the type of sand/loam pavement material found in the area. With material containing 2% residual bitumen, congealed bitumen particles became visible, soft patches occurred in the pavement (although no additional water was used with this mixture), and the material was more difficult to place. The soft patches had to be ripped up and exposed to the air to dry out. Despite the problems during construction with the 2% residual bitumen material, the possibility of its use in the future has not been completely dismissed, as it may provide a better pavement in the long term.

The following is a comparison of costs of the stabilizing methods discussed above:

	$/cu. yd.
(i) * supply and delivery of unstabilized sand/loam sub-base material	0.63
(ii) * supply and delivery of stabilized sand/loam base course material—	
stabilized with 1.0% residual bitumen	2.44**
stabilized with 1.2% residual bitumen	2.66
stabilized with 1.5% residual bitumen	3.01
stabilized with 2.0% residual bitumen	3.58

* from the same pit

** details of cost per cu. yd. per stabilized material:

(a) supply of sand and loam to mixing plant and delivery of stabilized material to roadbed	0.80
(b) mixing at plant, including supply of water	0.50
(c) supply of emulsion	1.14***
	$2.44

*** each further increase of 0.5% residual bitumen raised the cost per cu. yd. by $0.57

(iii) cost in place of alternative pavement materials:

	Sand/loam, bitumen emulsion stabilized (November 1971)		Sand/loam, F.C.R. stabilized (March 1971)
	1% $/cu. yd.	2% $/cu. yd.	$/cu. yd.
Supply	2.44	3.58	3.25
Spread and compact	0.61	0.61	0.40
Mixing	—	—	0.75
	$3.05	$4.19	$4.40

A more detailed account of this work can be found in Technical Report No. 57.

Construction of Drop Structures to Reduce Stream Erosion

Approximately six miles north of Benalla, Joyces Creek flows under the Hume Highway through a multi-cell box culvert. Between 1966 and 1972 deep erosion undercut the outlet of the culvert and also jeopardised the Sydney-Melbourne coaxial cable where it lies beneath the bed of the creek, approximately 250 ft. downstream from the culvert.

In conjunction with the State Rivers and Water Supply Commission, the Soil Conservation Authority and the Australian Post Office, a proposal was formulated to arrest the erosion and to restore the creek bed. The proposal required the construction of separate drop structures at the culvert outlet and the cable crossing. The State Rivers and Water Supply Commission produced designs for the drop structures, of a type that had been successful in reducing head in irrigation channels. These drop structures consisted mainly of precast concrete dissipator blocks designed by the Commission. The dissipator blocks, weighing approximately 150 lb. each, interlock with each other when placed and have a 9 in. rock projecting from the top surface (Plates 5 and 6). They introduce turbulence into stream flow, thus reducing kinetic energy and consequently controlling erosion.

The construction was done during the summer, when there was virtually no stream flow.

The construction of the structure at the culvert outlet commenced with the removal from the stream bed of rock beaching which had been used as a temporary measure to halt erosion. Two steel sheet-piling cut-off walls were then driven, one parallel to and 1 ft. from the culvert outlet and the second also parallel to the culvert outlet and 24 ft. downstream (Plate 4). A concrete cap was then cast on each cut-off wall, with the downstream cap 4 ft. lower than the upstream cap, giving the structure a grade of 1 in 6.

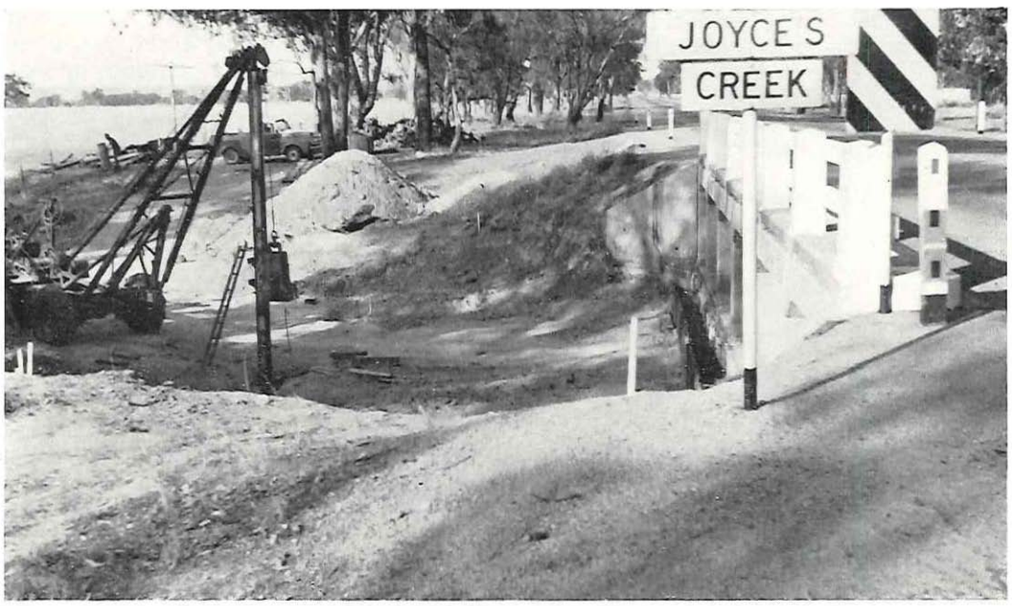


Plate 4—Hume Highway—Joyce's Creek. Driving steel sheet-piling for a cut-off wall.

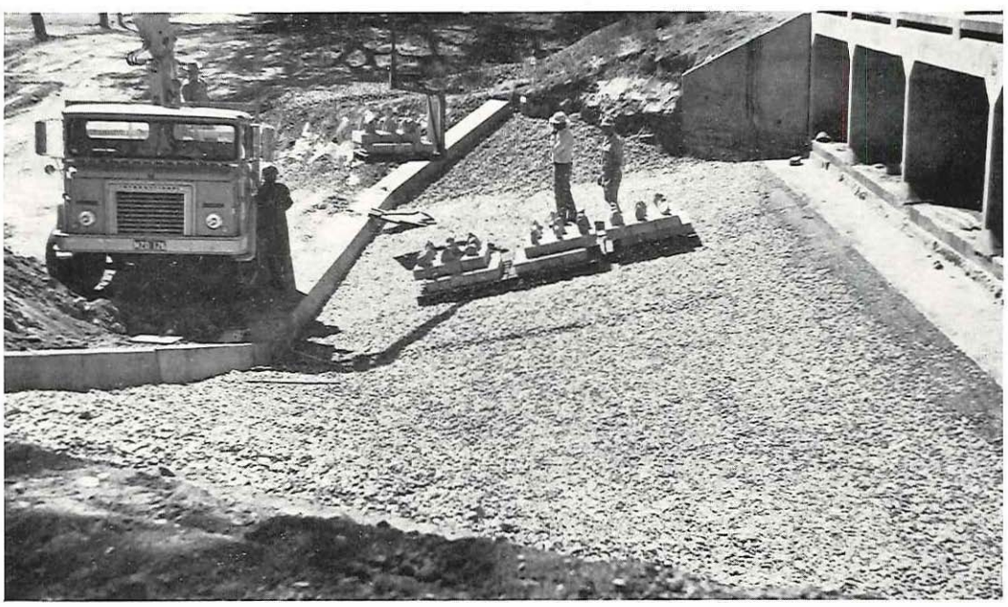


Plate 5—Filter layer spread level with top of upstream cap. The design of the precast concrete dissipator blocks to facilitate interlocking may be seen.

A 6 in. filter layer of river gravel was next spread over compacted back fill in the drop structure, with the top of the filter layer level with the top of the upstream cap (Plate 5). Precast concrete dissipator blocks were then placed manually. The first row of blocks was placed against the downstream cap, subsequent rows being set behind the first with all blocks interlocking with each other. After the last row was placed, the gap between it and the culvert outlet was filled with cast *in situ* concrete.

Plate 6—Placing the dissipator blocks.

The construction of the structure at the co-axial cable was basically similar to that of the structure near the highway. However, as the inlet to this second structure was only 3 ft. downstream from the coaxial cable, a concrete cut-off wall was constructed in lieu of the use of sheet-piling. The outlet was located a further 12 ft. downstream and 2 ft. lower than the inlet, giving the structure a grade of 1 in 6.

Additional protection was provided for the coaxial cable by placing concrete box culvert lids on the creek bed approximately 2 ft. above it, with rock beaching on the lids.

The stream banks at both structures were beached as a further anti-erosion measure. The two completed drop structures are shown in Plates 7 and 8.

The use of the precast concrete dissipator blocks helped keep the construction time to a minimum, thereby reducing the risk of interruption by stream flow.

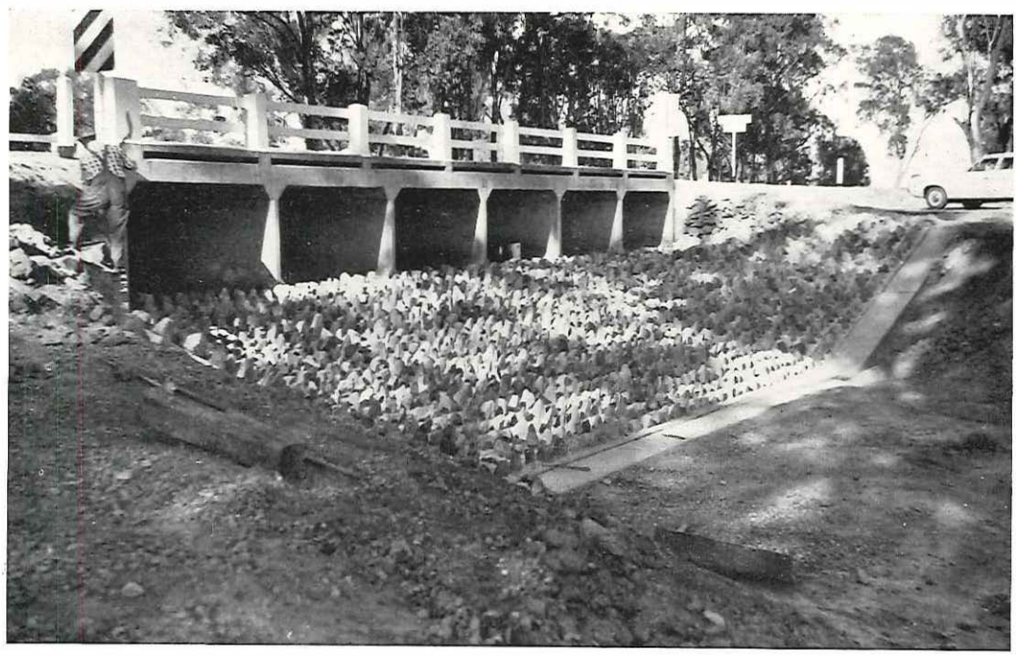


Plate 7—Completed drop structure at the Hume Highway culvert.

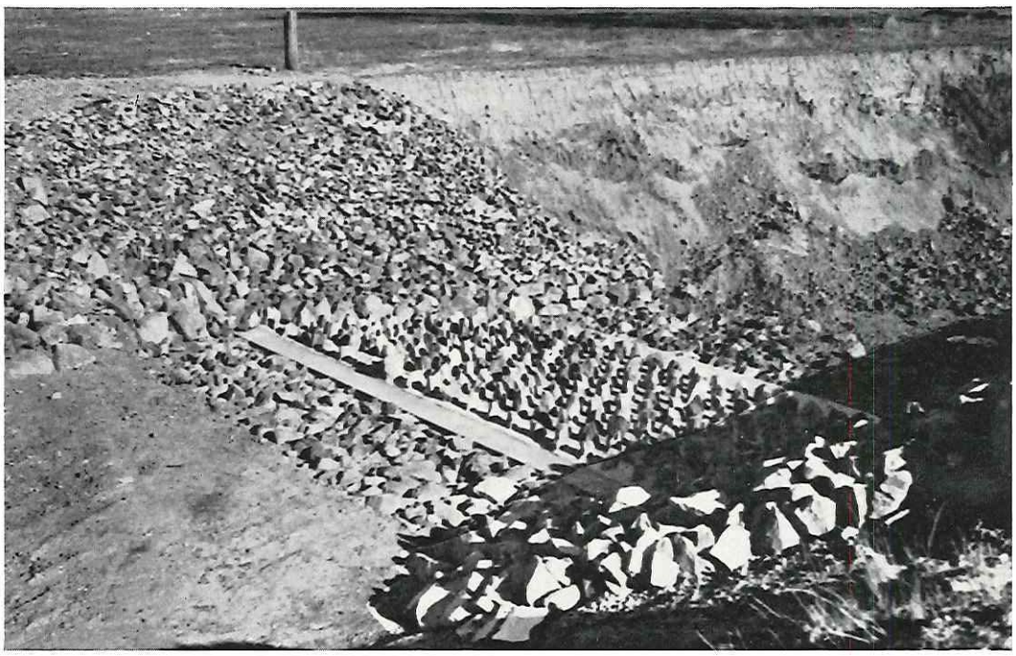


Plate 8—Completed drop structure near the co-axial cable.

DIRECT LABOUR ROAD CONSTRUCTION COSTS

Tables 1 to 4 set out analyses of the costs of 107 construction and reconstruction jobs completed by direct labour by the Board during 1971/72 at a total cost of $9.3 million. Within the limitations imposed by variations in the number of cost statements submitted, regional differences and factors relating to the types of jobs costed from year to year, the 1971/72 costs indicate no sharp change from the cost trends for previous years.

TABLE 1—

DISTRIBUTION OF EXPENDITURE

	1971/72	Five-year Average 1967/68 to 1971/72
	%	%
Plant	31.5	34.1
Labour	34.3	33.0
Materials	23.0	23.5
Stores	11.2	9.4
	100.0	100.0

TABLE 2—

WORKS OVERHEAD EXPENDITURE

(Percentage of productive costs)

	1971/72	Five-year Average 1967/68 to 1971/72
	%	%
Construction overhead expenses	15.6	13.1
Camp expenses	10.0	10.7
	25.6%	23.8%

TABLE 3—FORMATION COSTS

(Including distributed overhead expenditure)

	ROCK		EARTH UNCLASSIFED		Total	
	Quantity	Unit Cost	Quantity	Unit Cost	Quantity	Unit Cost
	cu. yd.	$	cu. yd.	$	cu. yd.	$
1971/72	Nil	Nil	1,725,660	1.22	1,725,660	1.22
Five-year average 1967/68 to 1971/72	166,195	1.52	1,595,019	1.15	1,727,975	1.19

TABLE 4—PAVEMENT COSTS

(Consolidated in place, including distributed overheads)

	FINE CRUSHED ROCK		COARSE CRUSHED ROCK		GRAVEL, ETC.		Total	
	Quantity	Unit Cost	Quantity	Unit Cost	Quantity	Unit Cost	Quantity	Unit Cost
	cu. yd.	$	cu. yd.	$	cu. yd.	$	cu. yd.	$
1971/72	183,036	5.84	63,925	5.90	1,415,943	2.57	1,662,904	3.12
Five-year average 1967/68 to 1971/72	121,871	5.07	60,208	4.86	1,059,564	2.29	1,240,643	2.70

2. TESTING OF MATERIALS AND RESEARCH

Friction Welding of Stud Shear Connectors

The construction and the installation of a production friction welding machine was completed during 1971/72. The purpose of the machine is to semi-automatically attach 1 in. diameter stud shear connectors to bridge beams. The machine is the first in Australia to use friction welding as a production process for attaching stud shear connectors.

The machine (Plate 9) can be mechanically elevated to accommodate beams up to 5ft. deep. It runs on a track which will accommodate beams up to 100 ft. long and 5 ft. wide. The studs are automatically fed to the machine chuck and are welded to the steel beams at a rate of about three per minute. Welds of consistently high quality are obtained.

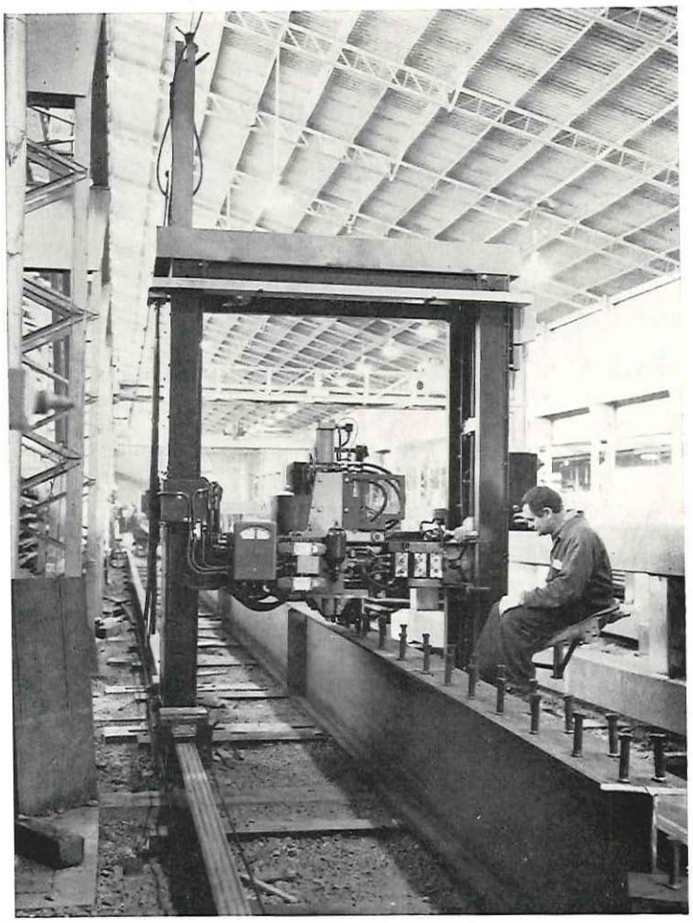


Plate 9—Production friction welding machine

Zinc-in-Silicate Paints

Zinc-in-silicate paints provide a film of zinc particles bound together with silica. The coating is used to protect steel by providing an electrically conducting sacrificial anode which behaves in much the same way as does hot-dip galvanizing. The Board uses zinc-in-silicate paints only as the applied coatings, and is often placed in the position of having to approve or reject a contractor's proposed use of a particular product. As no reliable criteria exist on which such a decision can be made on theoretical grounds, an experiment was carried out to evaluate all the locally available materials of this type.

Zinc-in-silicate paints usually consist of two packs whose contents are blended just before application. One pack is fluid and might be either a complex alkali-metal silicate, an ethyl silicate solution or colloidal silica. The other part is solid and, in first-quality products, consists essentially of finely divided pure zinc. However, cheap adulterated products, in which Portland cement replaces some of the zinc, are reputed to be on the market.

Some types of the zinc-in-silicate coatings cure when exposed to the air as a thin film, some must be chemically cured, and others only reach a hard scrubbable state after heat curing treatment.

In the experiment, 28 products were procured and applied to grit-blasted steel panels (grit- or sand-blasting of the steel to a clean metal surface is necessary for good adhesion) under closely controlled conditions. The panels have been on an exposure rack at Syndal for almost a year and are regularly inspected. One panel failed within a month but the majority should last for up to 15 years.

Painting of Guide Posts

Sets of differently painted guide posts have been placed in four regions, viz., of high, medium, and low rainfall and just above the surf-line at Barwon Heads. The object is to test the feasibility of eliminating the priming coat and to measure the effective life of the top coat, with the aim of reducing maintenance costs.

Corrosion of Steel Culverts

A Krautkramer ultra-sonic thickness meter was obtained during 1971/72 so that the rates of thinning of steel culvert walls due to corrosion might be measured. It is hoped thereby to test the California Division of Highways' method for the prediction of the time required for perforation to occur.

Design and Testing of Reflective Materials, Signs and Road Furniture

The 1970/71 Report referred to the establishment of the Signing and Delineation Materials Section within the Materials Research Division. The work of the Section includes:

(a) the evaluation and development of materials and techniques for signing, delineating and raised-surface pavement-marking of traffic ways;

(b) control testing of such materials supplied by tender;

(c) the development of specifications and test methods of new materials to be used for the above purposes;

(d) the testing of guard rail and frangible roadside furniture.

Projects in progress or completed during 1971/72 include:

(a) the provision of outdoor weathering stations at Mt. St. Bernard, Warracknabeal and Warrnambool, for testing reflective and non-reflective facing materials,

(b) the installation of the first batch of high intensity corner-cube reflective delineators on the Calder Highway between Gisborne and Woodend. The complete installation will consist of some 1,600 delineators of two types throughout an eleven mile section of the highway. The performance of these delineators will be compared with that of the present standard reflective sheeting delineator.

(c) photometric tests, totalling more than 500, conducted on various types of reflective sheeting, reflective pavement markers and roadside delineators. Specifications and test methods for all types of reflective sheeting and devices have been finalized. The reflective sheeting specifications are now in use on current contracts.

(d) several experimental in-service installations of anti-skid intersection marking materials. Feasibility studies are under way for evaluating the effectiveness of ultra-violet-excited fluorescent materials in combination with abrasive-type aggregates with good skid resistance properties.

(e) the development, design and destructive testing (in both the laboratory and the field) of frangible and slip-base posts for mounting signs and other roadside furniture, and posts for supporting guard-rail. This project is in the literature research stage at present.

(f) miscellaneous small projects, such as:

  (i) investigation of textile and plastic materials for use in traffic controlmen's jackets;

  (ii) evaluation of the retro-reflective performance of traffic hazard warning lamps;

  (iii) assistance with the development of an anti-glare screen for use at problem locations on freeway ramps and surface street connections.

Experimental Bituminous Concrete for Improved Skid Resistance

During March 1972 the Board, using City of Camberwell asphalt plant, machinery and personnel, laid test sections of $\frac{3}{8}$ in. bituminous concrete surfacing on the Maroondah Highway at Blackburn. The object of the experiment was to produce surfaces with increased skid resistance.

Four test sections, each measuring 150 ft. x 24 ft. x 1 in. depth were laid, together with 100 tons of control material. The same constituent aggregates were used for all the test sections and the control material, the principal constituent being a vesicular newer basalt having a

high resistance to polishing (polished stone value = 50). The control material was designed to have a typical $\frac{3}{8}$ in. dense bituminous concrete grading and bitumen content which would render an air voids value of approximately 4%.

The aims in the formulation of the experimental mixes were:

(a) to provide a rough surface texture by the use of mixes containing a less than usual quantity of fine material;

(b) to provide drainage through the bituminous concrete;

(c) to resist traffic polishing by the use of an aggregate with a high polished stone value;

(d) to prolong the life of the bituminous concrete by the use of a softer bitumen (R200 in place of the usual R90).

Of the two basic experimental mixes that were adopted, one was only slightly coarser than normal $\frac{3}{8}$ in. densely graded bituminous concrete, and was designated "$\frac{3}{8}$ in. C". The other mix was so coarse as to be porous and was designated "$\frac{3}{8}$ in. P". Separate batches of each of the experimental mixes were tried with R200 and R90 bitumen. The following tabulation shows the design and test properties of the materials laid:

Mix Type		$\frac{3}{8}$ in. C (Coarse)		$\frac{3}{8}$ in. P (Porous)		$\frac{3}{8}$ in. Control
Bitumen Grade		R200	R90	R200	R90	R90
Bitumen Content		5.7%		4.5%		6.3%
B.S. Sieve Sizes		Gradng—% Passing B.S. Sieves				
1/2 in.		100		100		100
3/8 in.		95		97		98
3/16 in.		61		61		61
No. 14		33		30		36
No. 52		17		16		16
No. 200		5.7		5.0		6.5
Test properties	Stability (lb.)	1550	2320	1200	1840	2310
	Flow (in.)	7.0×10^{-2}	9.1×10^{-2}	8.0×10^{-2}	7.4×10^{-2}	11.0×10^{-2}
	Air voids	6.8%	5.5%	12.4%	11.2%	4.2%
	Voids mineral aggregate	17%	17%	20%	19%	16%
	Film thickness (microns)	7.05	7.65	5.70	6.22	7.55
	Density (lb./cu.ft.)	146	148	139	142	149

Some two weeks after laying, initial measurements of skid resistance, surface texture and permeability to water were made. The results were as shown in the following tabulation:

Mix Type	$\frac{3}{8}$ in. C (Coarse)		3/8 in. P (Porous)		$\frac{3}{8}$ in. Control
Bitumen grade	R200	R90	R200	R90	R90
Skid resistance (@ 30 mph)	49	49	51	53	49
Texture (0.01 in.)	$2\frac{1}{4}$	$2\frac{1}{2}$	2	2	2
Permeability (ml/minute)	1090	1320	1290	1610	1010

The test results, and the appearance of the sections laid, indicate that the experimental mixes have tended towards producing the desired properties of increased skid resistance and higher permeability.

Testing will be repeated at six-monthly intervals to study the effect of traffic on the various properties measured.

Quality Control at Metropolitan Quarries

The quantities of quarry products supervised by Board Clerks of Works between 1/7/71 and 30/6/72 were as follows:

	Board Direct Control Works	Municipal Control		Total
		Subsidized Works	Sundry Debtor Works	
Bituminous concrete	Tons 104,162	Tons 119,606	Tons 260,561	Tons 484,329
Cement treated crushed rock and plant mixed wet mix crushed rock	187,738	74,325	68,874	330,937
Crushed rock	74,643	—	—	74,643
Total	366,543	193,931	329,435	889,909
Cement concrete	Cu. yd. 20,357	Cu. yd. —	Cu. yd. —	Cu. yd. 20,357

Measurement of Strain in a Continuously Reinforced Concrete Pavement

The 1970/71 report described the construction of 3,500 lin. ft. of continuously reinforced concrete pavement in Boundary and Montague Streets, South Melbourne, and also indicated that the opportunity had been taken to investigate the strains in the concrete and the steel, and the temperature gradients through the concrete. This report provides futher information regarding the investigation.

The concrete pavement is 8 in. thick and consists of longitudinal slabs which are continuously reinforced with 8 in. x 3 in. steel wire fabric at half depth. The diameter of the longitudinal wire is 0.432 in. and that of the transverse wire is 0.300 in. Two 20 ft. long sections of one slab in Boundary Street were instrumented for the investigation.

In one section the longitudinal strain and the temperature in the reinforcement beneath a transverse saw cut were recorded. The saw cut, 1 in. deep, was placed in the concrete one day after casting. The purpose of the saw cut was to ensure that the slab cracked adjacent to strain gauges. The strain gauges, of the electrical resistance type, and thermocouples were bonded to the reinforcement.

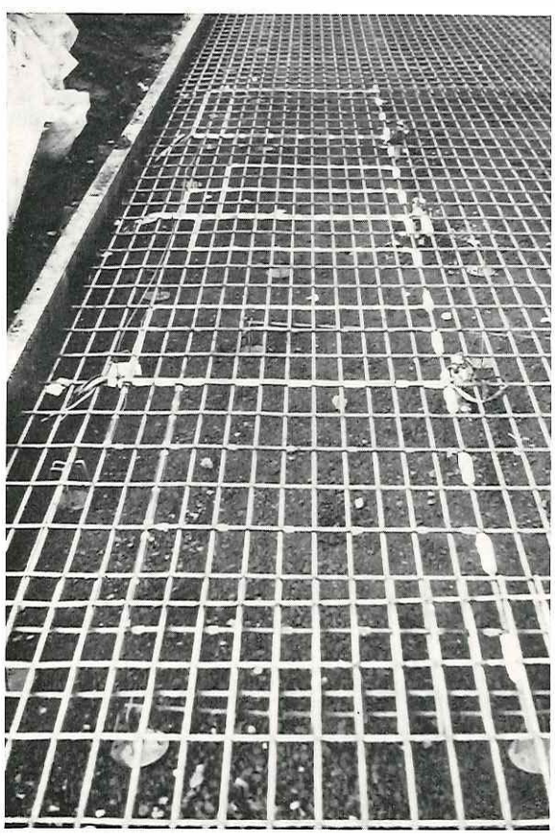


Plate 10—Continuously reinforced concrete pavement, Boundary Street, South Melbourne. Strain gauges and thermocouples attached to reinforcing fabric.

In the other section, the longitudinal strain and the temperature developed in the reinforcement near and parallel to the slab centre line were measured, also by the use of electrical resistance strain gauges and thermocouples bonded to the reinforcement (Plate 10). In the concrete adjacent to this reinforcement, strain and temperatures were also measured using vibrating wire strain gauges and thermocouples attached to wooden pegs driven into the pavement sub-base, the strain gauges being located in positions either 2 in. or 6 in. above the sub-base. Most of the gauges in this section were rendered inoperative about two weeks after the concrete was cast, due to damage to the leads during excavation work adjacent to the slab.

The connecting leads from the gauges were terminated at sockets installed in two boxes mounted on steel pipe sections located near the building line, thus permitting ready connection to the associated electrical measuring equipment.

After the completion of instrumentation, the concrete was cast. The datum level for strain measurements was set as one day after the casting.

Records subsequently obtained indicate that large strains occurred in longitudinal reinforcement when stress in the concrete was relieved by cracking.

Geological Investigations

The Geology Section is involved with an increasing volume of field investigations for freeways and other roads for both the Board and municipalities. These investigations include the location and exploration of sources of pavement materials, landslip stabilization and slope stability problems (further discussed in the next item in this report), and a variety of minor matters, such as the relocation of large sewers, water mains and water bores.

Wherever possible during road alignment investigations, the Section endeavours to determine whether materials from cuts will be acceptable for pavement construction, select fill or other purposes.

The various single- and multi-channel seismographs, resistivity meters and mobile drill rigs owned by the Board have proved invaluable for all types of sub-surface investigations. A new seismograph which was purchased during 1971/72 is exceedingly effective in noisy locations, such as metropolitan freeway alignments.

Horizontal Sub-Surface Drains

Horizontal sub-surface drains have been used successfully in connection with certain Board projects, as set out in Table 5. The function of these drains is to provide outlets from potentially unstable hillsides and cut slopes for sub-surface water during periods of large hydrostatic pressure, usually times of high water-table level. Landslips are prevented or stabilized because the high water pressure in the mass of unstable soil or rock is relieved by drainage and the frictional shear strength is thereby increased.

TABLE 5—HORIZONTAL SUB-SURFACE DRAINAGE INSTALLATIONS

Location	Purpose	Degree of Success	Average cost/ft. inc. casing
Mt. Dandenong—Tourists' Road, 22M (Devil's Elbow)	Stabilization of slip in sandy clay cut-batter.	Highly successful: slip movement has ceased since installation of horizontal drains.	$2.15
Mt. Dandenong—Tourists' Road, 32.5M (Kalorama)	Stabilization of slip in clay cut-batter.	Unsuccessful, due to impermeable nature of clay soil and difficulty of drilling caused by presence of boulders.	$1.60
Mulgrave Freeway—(Heatherton Road to Power Road)	Stabilization of minor slips due to seepage through the cut-batter face.	Highly successful: batter face shows cessation of seepage after treatment and no further slips have occurred.	$1.60
Ocean Road—(Windy Point)	Stabilization of massive rock slide.	Indeterminate: used in an attempt to de-water the unstable area but fissured ground may have intercepted water flow along the hole. Three holes from a total of 13 showed water seepage at collar. Total footage 1,347 ft.	$5.30*
Hume Freeway—Wallan-Broadford Section (Wandong Saddle)	Experimental, to develop procedures for installation and to test effectiveness in this area.	Indeterminate: holes dry on completion but showed seepage after rain.	$3.00

* No casing used.

Installation of the drains involves drilling 2 in. or 3 in. diameter holes, slightly inclined above the horizontal, to the required depth. A row of holes is placed along the toe of the batter to be drained, though more holes at higher levels up the slope may be needed on high batters. Where blocking of drains is likely, slotted P.V.C. pipe may be installed and, if required, flushed with water to clear the slots. Plate 11 illustrates drilling of such drains in progress.

It has been found that the installation of horizontal sub-surface drains provides, under suitable conditions, a simple, effective and low cost means of treatment of certain potential landslips.

Plate 11—Drilling horizontal sub-surface drains at Mulgrave Freeway. PVC pipe is shown leading from completed drains.

Subsoil Drainage Pipe

The introduction of plastic subsoil-drainage pipe, which is supplied in either a corrugated flexible form or a plain rigid form, both with longitudinal slots about 0.1 in. wide in the walls, indicated the need for tests to establish the efficiency of this type of pipe when compared with terracotta pipe (Plate 12). Hydraulic flow tests were performed on pipes bedded in prepared filter material and the efficiency of the various types of pipe was assessed on the results.

The results indicated that:

(a) 4 in. diameter corrugated plastic pipe is 35% more efficient than terracotta pipe of the same diameter;

(b) corrugated plastic pipe, being flexible, is easier to install than other types;

(c) there is less tendency for silt to accumulate in corrugated plastic pipe than in other types;

(d) plain plastic pipe performs similarly to terracotta pipe of the same diameter.

The load-bearing capacity of the plastic pipes has not been assessed at this stage.

The Windy Point Landslide

A very large landslip on the Ocean Road at Windy Point, approximately two miles south-west of Lorne, was investigated by the Geology Section. The slip was stabilized by a contractor under the direction of the Divisional Engineer, Geelong, with technical and supervisory assistance from the Materials Research Division.

The Windy Point landslide is one of the most significant on record in Australia, because of the threat it offered to an important road and because it is the largest one stabilized by cable-anchoring so far.

At Windy Point, which overlooks Bass Strait, the rugged natural surface rises to R.L. 700 ft. and the Ocean Road is at R.L. 60 ft. to 70 ft. Massive sandstone beds, with several thin clay beds at critical locations, dip steeply towards the sea. Two persistent sets of vertical

joints are present, intersecting at approximately 90°. This structure, which enables most of the rainwater to reach the clay beds, is predisposed to sliding. In fact, prior to movement in the last four years, the mass had been at a fairly delicate level of stability following movement in the remote past.

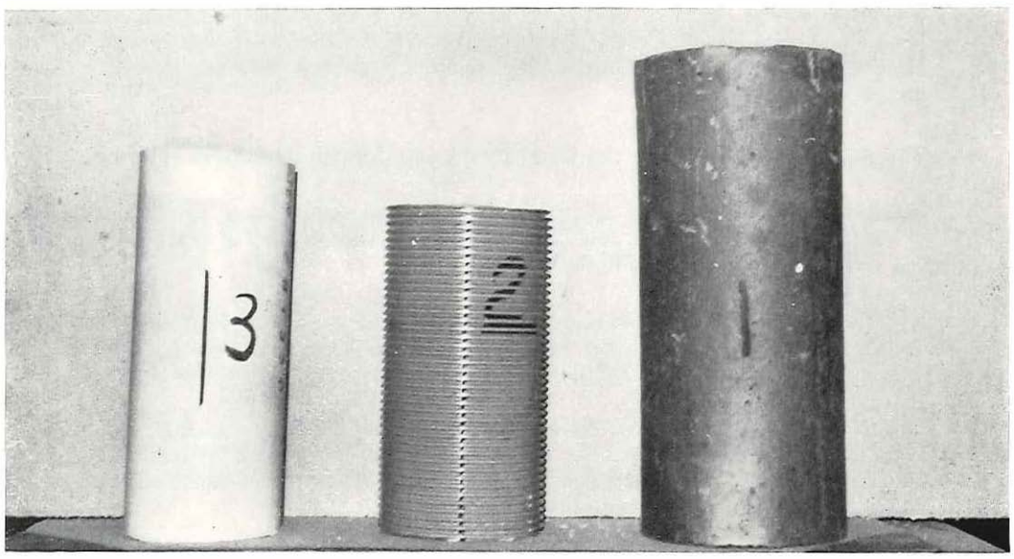


Plate 12—Samples of drainage pipe tested,

1. Terracotta,
2. Slotted corrugated plastic,
3. Slotted plain plastic.

Plate 13 shows the bedding planes that dip at a steep angle (27°) towards the lower left, and the positions of the deep major vertical fissures **Y — Y′** and **Z — Z′** which form the boundaries of the large triangular slide area. Measured along the road the length of the slide exceeded 400 ft. and the maximum elevation was about R.L. 300 ft. at the intersection of the two major fissures. The quantity of moving rock exceeded 200,000 tons.

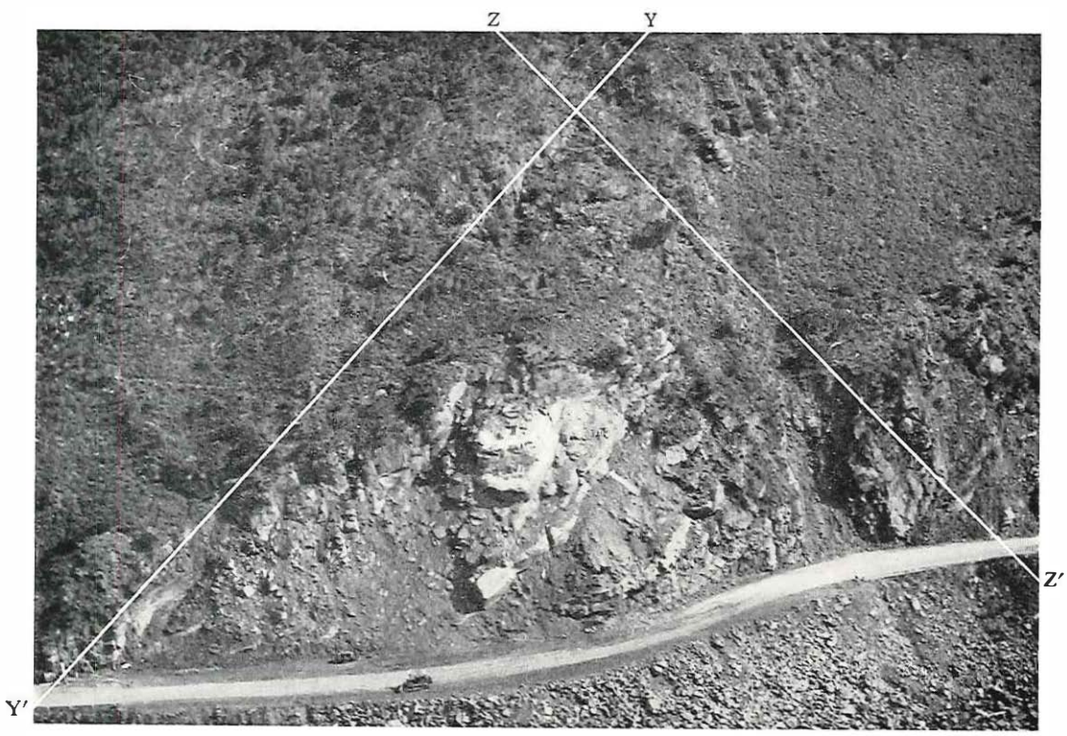


Plate 13—The Windy Point landslide. Y — Y′ and Z — Z′ indicate the major fissures which form the boundaries of the slide area.

For many years, numerous slides and falls of rock, up to 4,000 tons at a time, were a problem. Considerable expense, including the cost of blasting down unstable rock from time to time, was incurred in maintaining an acceptable degree of safety. The situation deteriorated and massive movement commenced after October 1968, when relatively minor quantities of rock were removed from the toe of the slip area in connection with widening work on the Ocean Road. The movement ceased during the drier summer period, but resumed for several weeks in the spring of 1969. Movement again resumed in October 1970, accelerated after heavy rains in April 1971, and continued until the first group of seven cable-anchors was tensioned in October 1971. Due to concern for the safety of the travelling public, the Board had closed the Ocean Road in July 1971. The road was re-opened to traffic in December 1971, when sufficient cable anchors had been placed to arrest the movement of the slip.

Three proposals to remove the hazard were considered. Two were rejected:

(a) relocation of the road inland. This new road, constructed to a similar design standard to the existing road, would have added 13 miles to the distance to Apollo Bay, and would have cost $1,000,000.

(b) massive irrigation of the slope, causing the slide to fail, followed by reconstruction of the road on an alignment further to seaward, using rock fill from the slide. The defect of this proposal was that the condition of the slope after failure could not be predicted.

The third proposal, that of cable-anchoring, was adopted by the Board. This method was initially proposed by Mr. L. A. Endersbee of the Tasmanian Hydro-Electric Commission, who provided consultant advice to the Board on the treatment of the slip and who also provided advice during the stabilizing work.

The contractor commenced work in September 1971, when the landslide was moving at a maximum rate of 1 in. per day. Movement ceased after the first seven cable-anchors were tensioned to approximately 200 tons each and three horizontal drains were drilled. As the anchor, drainage and exploratory boring progressed, the structural information thus obtained was plotted on the plan (Figure 7), and on the vertical cross-sections prepared at the outset from surface mapping. Section VII, shown as Figure 8, is an example.

The anchor bores were drilled on a bearing directly counter to the direction of movement and were depressed at an angle calculated to permit the maximum anchoring effect. The woven steel anchor cables were placed in the bores, the lowest 20 ft. grouted to the solid rock below the slip plane and tensioned in groups against concrete anchor blocks at the surface. The work was completed in April 1972, with 43 anchor cables tensioned and grouted up to the surface. Thirteen drainage bores were also drilled. The total cost of the work was $212,000.

A full account of the theoretical and practical aspects of the cable-anchoring is given in the paper by A. F. Williams and A. G. Muir, "The Stabilisation of a Large Moving Rockslide with Cable-Anchors", to be presented at the Third South-East Asian Conference in Soil Engineering, Hong Kong, November 1972.

3. ROADSIDE DEVELOPMENT

With the increase in disturbed areas of ground on new roadworks, greater attention is being given to providing satisfactory protection against erosive forces. This involves the use of mechanically applied mulch materials as well as traditional manual methods of straw or brush held in place with wire. Also, research is continuing into new forms of vegetative cover including low maintenance grass mixes and low growing plants.

During the year median plantations of shrubs and small trees were established on the Princes Highway East in the cities of Oakleigh, Malvern and Caulfield, as part of the construction of a dual carriageway over the length of the highway.

In continuation of the approved programme for rest areas a toilet block was established at Providence Ponds on the Princes Highway East, within Bairnsdale Division.

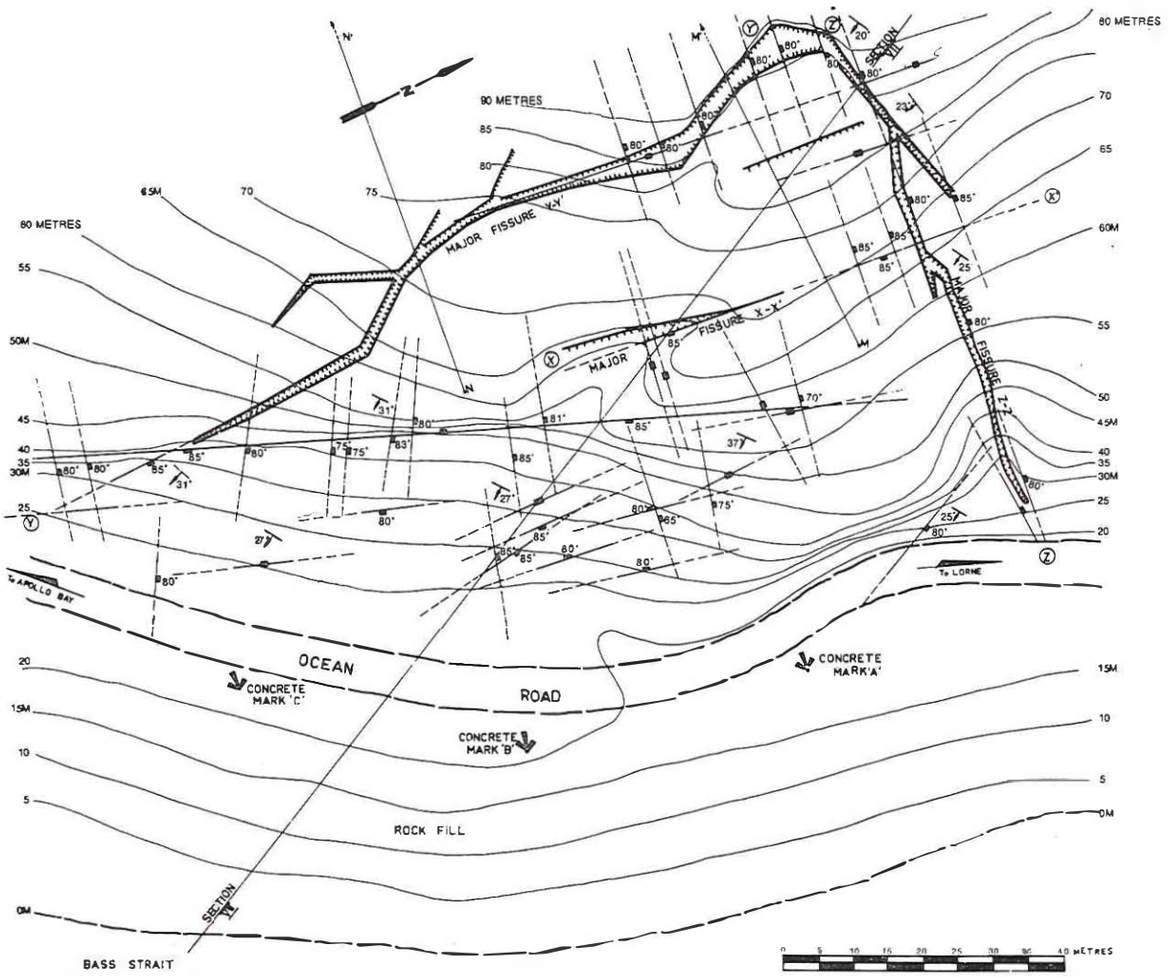


Figure 7—Plan of Windy Point landslide area, showing the major fissures, north-south and east-west vertical joints, and the location of Section VII (see Figure 8)

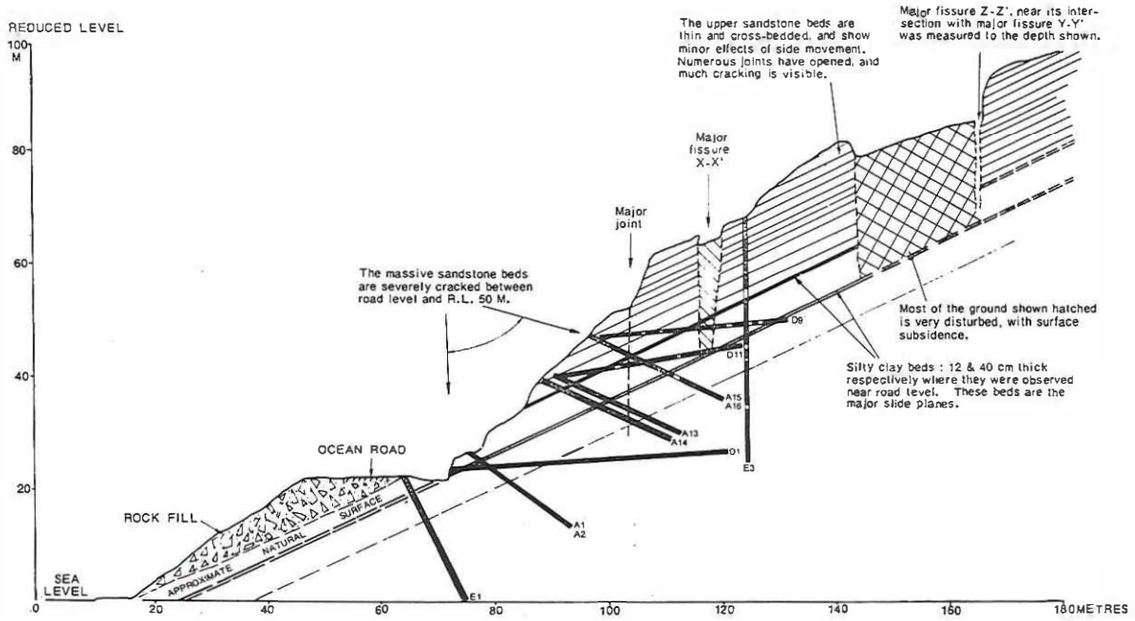


Figure 8—Section VII of Windy Point landslide area showing the sliding rock mass, the inclined bedding planes and the several types of bores drilled. As indicated, the bores showed the location of the crush zones, cavities and the more solid rock under the slide planes.

4. BITUMINOUS WORK

Extent of Work

The mileages of all types of bituminous surfacing completed during 1970/71 and 1971/72 are compared in Table 6. This shows that 3,274 miles were completed in 1971/72 compared with 3,250 miles in 1970/71.

In 1971/72 the length of sealed pavement on the Board's declared road system was increased by 116 miles, and the length on unclassified roads by 580 miles, as shown in Table 7.

Reconstruction of existing sealed pavements and restoration of the seal coat amounted to 379 miles of the declared road system, 2.8% of the sealed length, compared with 2.9% in 1970/71 and 3.3% in 1969/70. Retreatments amounted to 1,066 miles or 8.1% of the sealed sections, compared with 8.7% in 1970/71.

TABLE 6—BITUMINOUS SURFACING WORK COMPLETED

Category of Road and Plant Used	1970/71		1971/72	
	Miles		Miles	
Work on roads to which the Board contributed funds:				
(a) C.R.B. declared roads:				
(i) Board's plant	1.627		1,593	
(ii) Municipal plant	68		55	
(iii) Contractors' plant	167		195	
		1,862		1,843
(b) Unclassified roads:				
(i) Board's plant	1,126		1,108	
(ii) Municipal plant	75		117	
(iii) Contractors' plant	66		102	
		1,267		1,327
Sub-totals		3,129		3,170
Work done for other Authorities by the Board's plant (no Board contributions for these works)—				
(i) Municipalities	110		99	
(ii) State instrumentalities	10		4	
(iii) Commonwealth works	1		1	
		121		104
Totals		3,250		3,274

TABLE 7—BITUMINOUS SURFACING WORK ON VARIOUS ROAD CATEGORIES

(On roads to which the Board contributed funds during 1971/72)

Type of Work	State Highways	Freeways	Tourists' and Forest Roads	Main Roads	Total Board's Declared System	Unclassified Roads	Totals
Initial Treatments:	Miles	Miles	Miles	Miles	Miles	Miles	Miles
Extensions to sealed system—							
(a) Sprayed work	9.50	19.33	10.18	71.03	110.04	575.53	685.57
(b) Plant mix work	—	5.45	—	0.31	5.76	4.49	10.25
Reconstruction of lengths of previously sealed pavements—							
(a) Sprayed work	117.17	5.90	5.00	229.17	357.24	118.25	475.49
(b) Plant mix work	10.53	—	1.58	9.43	21.54	15.83	37.37
Widening of existing sealed pavements—							
(a) Sprayed work	21.73	1.60	3.13	110.48	136.94	58.64	195.58
(b) Plant mix work	1.96	—	—	1.37	3.33	6.17	9.50
Duplication of existing sealed pavements—							
(a) Sprayed work	8.67	—	—	2.50	11.17	0.80	11.97
(b) Plant mix work	6.51	—	0.12	4.99	11.62	2.25	13.87
Final seal—							
(a) Sprayed work	79.30	4.20	7.30	19.50	110.30	44.60	154.90
(b) Plant mix work	5.22	0.28	—	2.44	7.94	4.15	12.09
Retreatments:							
(a) Sprayed work	376.61	9.20	47.10	614.41	1,047.32	489.44	1,536.76
(b) Plant mix work	7.44	0.21	0.94	10.48	19.07	7.81	26.88
Totals	644.64	46.17	72.71	1,076.11	1.842.27	1,327.96	3,170.23

Types of Work

Sprayed work (initial treatments and retreatments) was again the principal type of work, amounting to 96.5% of the total length of work completed.

The plant mix work completed during 1971/72 was 110 miles, that is, 3.5% of the total mileage and 7.2% of the total area of the bituminous surfacing programme, compared with 118 miles in 1970/71. The 1971/72 plant mix work was equivalent to 31% of the year's total expenditure on bituminous surfacing. For the plant mix work during 1971/72, a total of 282,591 tons of bituminous concrete was supplied and spread by contractors operating from fixed plants near Melbourne, Geelong, Ballarat, Portland, Shepparton and Morwell.

Costs of Work

The average unit costs of sprayed work completed by the Board's nineteen bituminous surfacing units are shown in Table 8. The average overall cost of all types of sprayed work was 25 cents per sq. yd. compared with 23.5 cents for 1970/71, an increase of 6.4%.

The average cost per ton of bituminous concrete supplied and spread was $13.38 compared with $11.69 in 1970/71.

Materials

(a) Aggregate

The total quantities of covering aggregate used were approximately 302,000 cu. yd. on sprayed work done by Board plant and 51,000 cu. yd. on sprayed work done by municipalities and contractors. Table 9 sets out the average cost of aggregate per cubic yard over the past five years and shows that the 1971/72 average price was $0.07 higher than the 1970/71 average price.

TABLE 8—AVERAGE COSTS OF SPRAYING BITUMINOUS SURFACING DONE BY C.R.B. PLANT

(On roads to which the Board contributed funds during 1971/72)
(Costs in cents per square yard)

	NATURE OF WORK																			
ITEM	I.T.P. & S. ⅜" & Over		I.T.P. & S. ½"		I.T.P. & S. ⅝"		I.T.P. & S. ¼" & Sand		Primerseals		I.T. Two-Application Seal		I.T.S.O. and Reseals ⅜" & Over		I.T.S.O. and Reseals ½"		I.T.S.O. and Reseals ⅝"		I.T.S.O. and Reseals ¼" & Sand	
Square Yards Costed	36,985		2,251,434		1,620,738		177,853		1,388,731		124,752		41,850		4,656,791		7,953,783		9,625,797	
	cents	%	cents	%	cents	%	cents	%	cents	%	cents	%	cents	%	cents	%	cents	%	cents	%
Material	20.1	53.8	20.1	50.9	19.7	56.0	15.2	53.1	12.0	49.5	30.8	58.5	17.8	50.7	15.8	52.1	12.6	53.4	10.2	56.4
Stores	1.0	2.7	1.9	4.8	1.3	3.7	1.6	5.6	1.3	5.4	1.8	3.4	2.4	6.8	1.2	4.0	1.1	4.7	0.8	4.4
Plant hire	5.7	15.2	6.7	17.0	5.6	15.9	4.8	16.8	4.2	17.4	8.0	15.3	5.4	15.4	4.9	16.2	3.6	15.3	2.7	14.9
Labour	10.6	28.3	10.8	27.3	8.6	24.4	7.0	24.5	6.7	27.7	12.0	22.8	9.5	27.1	8.4	27.7	6.3	26.6	4.4	24.3
Totals	37.4	100.0	39.5	100.0	35.2	100.0	28.6	100.0	24.2	100.0	52.6	100.0	35.1	100.0	30.3	100.0	23.6	100.0	18.1	100.0

I.T.P. & S. Indicates "Initial treatment prime & seal"
I.T.S.O. Indicates "Initial treatment seal only"

TABLE 9—AVERAGE PRICE OF AGGREGATE FOR BITUMINOUS SURFACING

(In roadside stacks)

Material	Prices per cubic yard				
	1967/68	1968/69	1969/70	1970/71	1971/2
	$	$	$	$	$
Screenings	5.19	5.01	5.12	5.08	5.15
Gravel	4.57	4.30	4.61	4.86	4.97
Sand	2.32	2.13	2.82	2.32	1.57
Scoria	2.80	2.93	2.90	3.30	3.41
Average price all aggregates	4.89	4.79	4.93	4.93	5.00

(b) Bitumen

The Board purchased 30,088 tons of bitumen, which was distributed by road and rail by four marketing companies. All the bitumen used was produced from Kuwait crude petroleum.

Two 8,000 gallon electrically heated bitumen tanks, similar to those at Benalla, Hamilton and Horsham, were installed and commenced operation at Ballarat.

(c) Experimental Work

The 1969/70 Report referred to experimental work to determine the efficiency of an anti-oxidant in bitumen. Each year the work has been inspected and samples of the binder have been taken from each section for laboratory examination.

The inspections have indicated no apparent difference in the appearance of the binder in the seal coat of each section.

Laboratory test results on the most recent samples indicated that practically all the diethyl dithiocarbamate in the binder layer has been decomposed and that even the zinc residue has largely been dissipated. The test results also indicated no differences in the amount of hardening that had occurred in the binder in each section.

Further samples will be taken at yearly intervals, although on the present evidence there appears little possibility of favourable results.

Bitumen Sprayer Test Pit

The new test pit at Syndal became available to the Asphalt Division during 1971/72 for the testing and calibration of the Board's bitumen sprayers.

ENGINEERING COMPUTER SECTION

Use of the Board's IBM 1620 Computer During 1971/72

A summary of the use of the computer is set out in Table 10. Details of the work processed and the programming work undertaken are set out elsewhere in this Report.

TABLE 10—IBM 1620 USE, 1971/72

User	Productive Hours	Developmental Hours	Total Hours
Advance Planning Division	120	—	120
Asphalt Division	3	—	3
Bridge Sub-branch	439	98	537
Chief Accountant's Branch	14	—	14
Computer Section	221*	101	322
Freeway Planning Division	22	3	25
Major Projects Division	31	12	43
Materials Research Division	137	—	137
Mechanical Sub-branch	207	—	207
Outside Users	11	—	11
Plans and Surveys Division	578	85	663
Secretary's Branch	271	—	271
Title Survey Division	189	11	200
Traffic Engineering Division	339	102	441
Totals for 1971/72	2,582	412	2,994

* Includes computer maintenance.

Use of External Computer Facilities

Several external computers were used during the year to utilize special facilities not available on the Board's computer. The computers used included those belonging to:

C.S.I.R.O.—automatic plotting and magnetic tape facilities;

S.E.C.V.—automatic plotting and magnetic tape facilities;

I.B.M. and C.D.C. Service Bureaux—road design and structural analyses;

University of Melbourne—traffic assignment work;

Monash University—contour mapping;

Honeywell Timesharing Service—urgent road design and surveying computations.

Trends in Computer Use

Overall use of computers was 19% higher in 1971/72 than in 1970/71. Use of the IBM 1620 decreased by 11% and use of external facilities increased by 140%.

A specification has been prepared for new computer equipment to replace the IBM 1620.

SAFETY

There was a slight increase in the number of lost time injuries in 1971/72 compared with 1970/71, as shown in Table 11.

TABLE 11—INJURIES TO BOARD'S EMPLOYEES

Type of Injury	1971/1972	1970/1971	Changes from 1970/71	
			Decrease	Increase
Back strains	46	57	11	—
Burns and scalds	26	14	—	12
Burns to eyes	10	8	—	2
Fatal injuries	0	1	1	—
Foreign bodies in eyes	28	29	1	—
Fractures	15	22	7	—
Head injuries	21	12	—	9
Lacerations and wounds	47	48	1	—
Miscellaneous	49	45	—	4
Multiple injuries	0	0	—	—
Occupational diseases	28	18	—	10
Sprains and strains	44	40	—	4
Totals	314	294	21	41

There has been a general trend towards reduction of lost time accidents in the five-year period 1967/68 to 1971/72, as shown in the tabulation below. The "days lost" information (based on Australian Standard CZ6-1966, "Recording and Measuring Work Injury Experience") also indicates a generally downward trend (after excluding the effects of fatal accidents, each of which, in accordance with A.S. CZ-6, is assessed as being equivalent to 6,000 days lost).

	1971/72	1970/71	1969/70	1968/69	1967/68
Total manhours worked	9,077,000	8,965,900	8,757,080	8,423,000	8,420,000
Lost time accidents	314	294	369	375	385
Accident frequency rate per million manhours	34.6	32.7	42.1	44.5	46.0
Days lost	2,113	7,794*	2,058	22,113*	14,328*
Days lost per million manhours	233	869	235	2,563	1,714

* Include one or more fatal accidents.

TRAINING

Internal Training

During 1971/72 the comprehensive in-service training programme in the Chief Engineer's Branch was continued and extended. Perhaps the most important courses held were on job management for road construction engineers. These courses gave the younger engineers involved in road construction an appreciation of all aspects of job management.

Courses were also given in subjects such as road design, materials test methods, bituminous plant mix work, freeway planning procedures. contract administration, T.W.I. job instruction and report writing.

The Board continued to provide training for Asian engineers, mostly from Indonesia. These engineers worked in various Divisions of the Board for periods ranging between three and six months.

A study was conducted in the Bridge Sub-branch to obtain the opinions of a group of young engineers regarding the job satisfaction received by them from their jobs. These engineers recommended a number of ways in which their work satisfaction and work output could be improved, and as a result a number of the recommendations have already been implemented and others are under consideration.

External Training

Selected engineers attended external courses on administration, construction management and traffic engineering.

TECHNICAL LIBRARY

A total of 1,360 new books, reports and standards were received. Loans totalling 6,200 were made to Board's officers, an increase of 29% over the previous year. Through inter-library loans, some 300 items were borrowed and 540 items were lent.

Periodicals under 370 titles were received. This total was similar to that of 1970/71, but there were various changes in the titles obtained. The periodicals were circulated to 338 officers.

The Library has continued to maintain a profile of the subject interests of each library user. New material in these subjects is circulated to the officers concerned.

PUBLICATIONS

The following papers by Board's officers were presented during 1971/72 in connection with the Board's engineering work:

Paper	Author
The Use of Hydrostatic Transmission on a Linemarking Machine Presented to the Fluid Power Society, Syndal, July 1971.	J. B. Armitage, Dip.Mech. Eng., Dip.Elec.Eng.
Skidding, Skid-resistance and its Measurement Presented to a Symposium on Stormwater Drainage, Adelaide, October 1971.	J. D. Bethune, Dip.C.E., C.E., M.I.E.Aust.
Case Studies in Roadway Failures Presented to the Transportation and Highways Branch, Victoria Division, The Institution of Engineers, Australia, August 1971.	J. D. Bethune, Dip.C.E., C.E., M.I.E.Aust.
Quality of Stone—Some New Tests Published in Highway Engineering in Australia, July 1971.	D. T. Currie, Ph.D., B.C.E., C.E., M.I.E.Aust.
The Use of Ultrasonic Testing in Bridge Construction Presented to the Nineteenth National Welding Convention of the Australian Welding Institute, October 1971. Published in the Australian Welding Journal, September 1971, Vol. 15, No. 7.	R S. Gilmour, B.Sc., A.R.C.S.T. W. A. Pinches
Performance of a Device for Sealing Sample Tubes Published in the Proceedings of Specialty Session on Quality in Soil Sampling, Fourth Asian Regional Conference on Soil Mechanics and Foundation Engineering, Bangkok, July 1971.	J. S. Holden, Dip.C.E., B.E. (Civil), M.Eng.Sc., Ph.D., M.I.E.Aust., A.M.A.S.C.E.
Ultrasonic Inspection of Butt Welds Presented to the Victorian Branch of the Non-Destructive Testing Association of Australia, November 1971. Published in Testing Instruments and Controls, October 1971.	W. A. Pinches
Some Current Developments in Highway Planning Presented to the Gippsland Group, Victoria Division, The Institution of Engineers, Yallourn, October 1971.	D. Pritchard, Dip.C.E., C.E., M.S.C.E., M.I.E.Aust.
The Design of Median Openings on Urban Divided Roads Presented to the Permanent International Association of Road Congresses, Fourteenth World Congress, Prague, August 1971.	R. T. Underwood, M.E., B.C.E., Dip.T.&R.P., C.H.T. (Yale), C.E., A.M.I.T.E., M.R.A.P.I., M.Inst.H.E., M.I.E.Aust.
Service Roads—Problems Associated with Their Continuity Published in MEMO, No. 7, May 1972.	R. T. Underwood, M.E., B.C.E., Dip.T.&R.P., C.H.T. (Yale), C.E., A.M.I.T.E., M.R.A.P.I., M.Inst.H.E., M.I.E.Aust.
Some Aspects of Freeway Design and Operation Report on Churchill Fellowship study tour, 1971.	R. T. Underwood, M.E., B.C.E., Dip.T.&R.P., C.H.T. (Yale), C.E., A.M.I.T.E., M.R.A.P.I., M.Inst.H.E., M.I.E.Aust.
Geometric Design of Divided Roads in Urban Areas Published in Highway Engineering in Australia, Vol. 3, No. 7, August 1971.	R. T. Underwood, M.E., B.C.E., Dip.T.&R.P., C.H.T. (Yale), C.E., A.M.I.T.E., M.R.A.P.I., M.Inst.H.E., M.I.E.Aust.

Three engineering notes were published:

No. 98, "Guide Post Paint."

No. 99, "Temperature Influences on Deflection of a Deep Strength Bituminous Concrete Pavement."

No. 100, "The Assessment of Maintenance Needs for Pavements", by permission of the Institution of Civil Engineers and the authors, R. S. Millard, C.M.G., B.Sc., F.I.C.E., M.I.Struct.E., M.Inst.H.E., and N. W. Lister, B.Sc., M.I.C.E., M.Inst.H.E.

The following Technical Reports were published:

No. 56, "Major Repairs to a 78 in. Diameter Stormwater Drain."

No. 57. "Bitumen Stabilization Using an Emulsion."

STAFF

At 30th June, 1972, the total staff of the Chief Engineer's Branch was 1,280.

The total cost of work performed in 1971/72 by the Board on its own direct works and for other authorities, and by municipalities with funds made available by the Board, was $88,357,000.

My thanks are extended to the staff for their industry and diligence in dealing with the increasingly complex matters encountered in the Board's service.

W. S. BRAKE, B.C.E., C.E., C.T.P. & C., M.I.E.Aust.
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