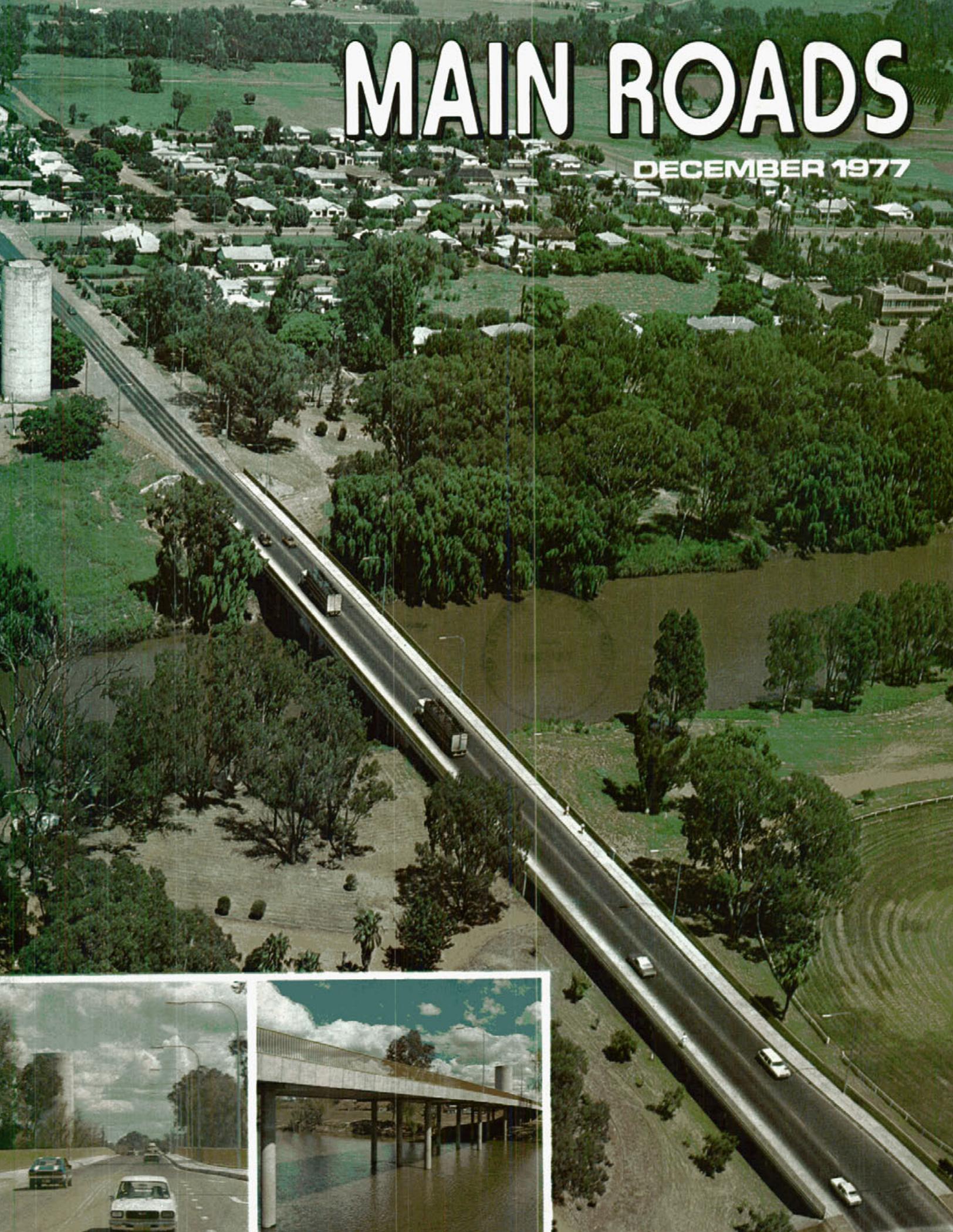
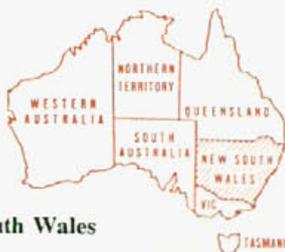
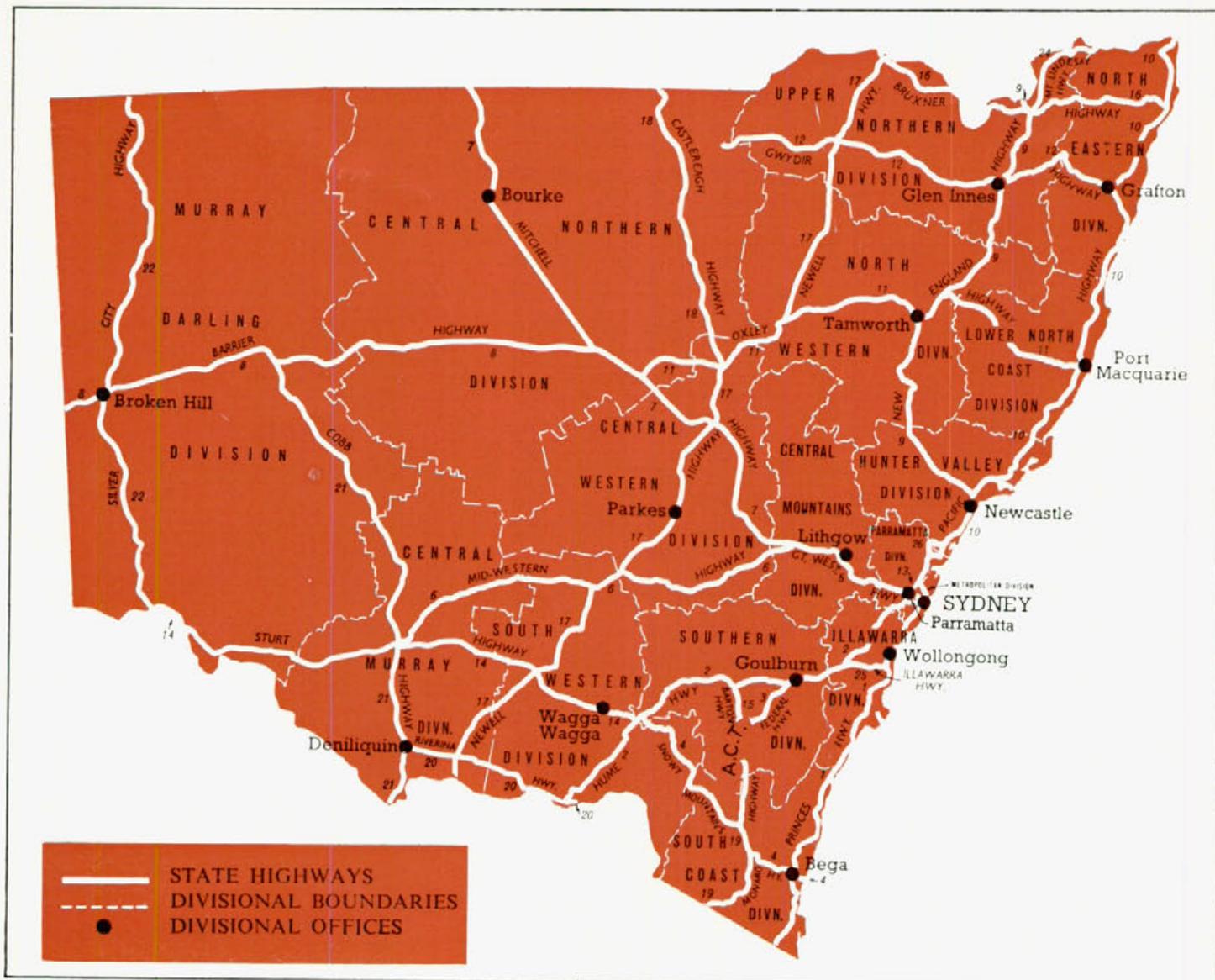


MAIN ROADS

DECEMBER 1977





New South Wales

Area—801 428 km²

Population as at 30 June, 1977—4 956 700

Length of Public Roads—208 804 km

Number of Motor Vehicles registered as at 30 September, 1977—2 271 500*

* This figure has been obtained from the Australian Bureau of Statistics. It should be noted that, due to the exclusion of certain categories of vehicles (such as tractors and trailers), etc., this figure is considerably lower than the statistics published prior to December, 1974, which were obtained from the New South Wales Department of Motor Transport.

ROAD CLASSIFICATIONS AND LENGTHS IN NEW SOUTH WALES

The lengths of roads within various classifications and for which the Commissioner for Main Roads was responsible as at 30 June, 1977 were:

Freeways	..	..	..	..	..	127
State Highways	..	..	..	..	..	10 478
Trunk Roads	..	..	..	..	..	7 075
Ordinary Main Roads	..	..	..	..	..	18 365
Secondary Roads	..	..	..	..	..	287
Tourist Roads	..	..	..	..	..	403
Developmental Roads	3 618
Unclassified Roads	2 478
TOTAL	42 771 km

MAIN ROADS



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CONTENTS

- 34 NEW BRIDGE AT NARRABRI — THE STORY OF THE CREEK THAT
TURNED INTO A RIVER
- 38 THE MAN BEHIND THE NAME — H. H. NEWELL, A PIONEER ROAD
MAN
- 40 A NEW TV CAMERA SYSTEM TO SPEED UP TRAFFIC FLOW ON THE
SYDNEY HARBOUR BRIDGE
- 42 TRAFFIC SIGNALS FOR BLIND PEDESTRIANS — A PROTOTYPE
AUDIO-TACTILE DEVICE
- 45 RETIREMENT OF COMMISSIONER — APPOINTMENT OF SUCCESSOR
- 46 MODEL HORSE DONATED TO SCHOOL FOR BLIND CHILDREN
- 48 PROPOSED F5 BY-PASS OF MITTAGONG AND BERRIMA
—Roads go to the people— Local residents given chance to record their
views on alternative routes
- 58 ANY OLD IRON? VALUABLE INDUSTRIAL RELIC UNCOVERED AT
NORTH WESTERN FREEWAY SITE
- 60 MEMORIAL ON ANZAC PARADE — SIXTY YEARS LATER
- 62 BLINKERS AT BURWOOD — A SPECIAL SCREEN HELPS TRAIN
DRIVERS GET THEIR SIGNALS STRAIGHT
- 63 TENDERS ACCEPTED BY DEPARTMENT
- 64 TENDERS ACCEPTED BY COUNCILS

Front cover: This recently opened bridge is the subject of our first article this issue. It carries the Newell Highway over Narrabri Creek at Narrabri. Inset are two views of the same bridge taken from the same direction, one showing the roadway and the other the bridge from creek level.

Back cover: Linking up with our stories on the Newell Highway at Narrabri and on H. H. Newell himself, this aerial photograph of the Highway shows the Bohena Creek Bridge between Narrabri and Coonabarabran.

VISION SPLENDID

Sight is one of our most precious possessions and we constantly enjoy (although often unconsciously) the rich sensations of seeing. We stop and stare at the splendour of a sunset, we look with affection on the faces of friends, we contemplate the beauty of our countryside from mountain-top look-outs, we admire the architecture of historic buildings, we jet away to "see the sights" in Honolulu, London or Tokyo, at galleries we cast critical glances over paintings and sculptures, at the theatre we take in the beauty of ballet, in movies we see our "heroes" on huge larger-than-life screens, on television we watch "Eye-Witness News" and go with Harry Butler (or the Leyland Brothers) "into the wild", we get excited over eye-catching illustrations in glossy magazines, in summer we put sunglasses on and survey the sunbronzed bodies on the beach, on winter evenings we settle down with a good book or just gaze into the thought-provoking flames of our lounge-room fire.

But to the many in our community who have no sight, life is not like this. Yet, although to be blind is to be denied the joys of seeing things, it is also invariably to be sensitive to other sensations in a way that few sighted people ever are. For blind people learn skills and enjoy experiences differently, through their highly-developed senses of hearing, feeling and smelling.

In this issue, *vision* is at the centre of a number of articles. There are details of new audio-tactile traffic signals which are helping blind people to cross busy streets. We have a story about a "horse" at one of Sydney's schools for blind children. There is the strange case of the train drivers who saw too much. We announce a scheme to give official traffic watchers a better view at the Bridge. We unearth something that has been "out of sight and out of mind" for a long, long time. We tell about Mr Newell, a man of considerable vision who in the twenties saw the potential of the new central roadbuilding authority and moulded it over the years into an efficient instrument of public service. We explain the background to recent meetings and displays designed to let the public view and comment on alternatives for a freeway route near Mittagong.

In reading this issue (which is itself an eye-oriented activity), you will probably agree that sight is certainly not something to be taken for granted. And it doesn't take rose-coloured glasses to see that a community in which blind people can move around freely and participate in everyday activities with dignity, assurance and safety, is a vision worth having and striving for. ●



NEW NARRABRI BRIDGE UNITES A FLOOD-TORN TOWN

— The story of the creek
that turned into a river



A new bridge, opened at Narrabri on 16 September, 1977, by the Hon. R. J. Mulock, LL.B., M.P., Minister of Justice and Minister for Housing, now spans Narrabri Creek which runs through the town. In this case, however, the term "creek" is something of a misnomer, for Narrabri Creek has captured the flow from the Namoi River and in size and importance is now the main water course.

With Narrabri Creek and the Namoi River dividing the town roughly into three parts, and given the fact that the Namoi Valley is subject to frequent and often heavy flooding, it is not surprising that the subject of water and bridges has, in the past, loomed large in the minds of the townspeople of Narrabri.

The central business district of Narrabri borders on Narrabri Creek, which means that many businesspeople and others must regularly commute across the Creek. Very importantly, also, Narrabri Creek lies across the path of the Newell Highway as it passes through Narrabri.

This important highway links Victoria and Queensland and there is a constant intermingling of local traffic with the heavy vehicles, caravans and cars making up the through traffic.

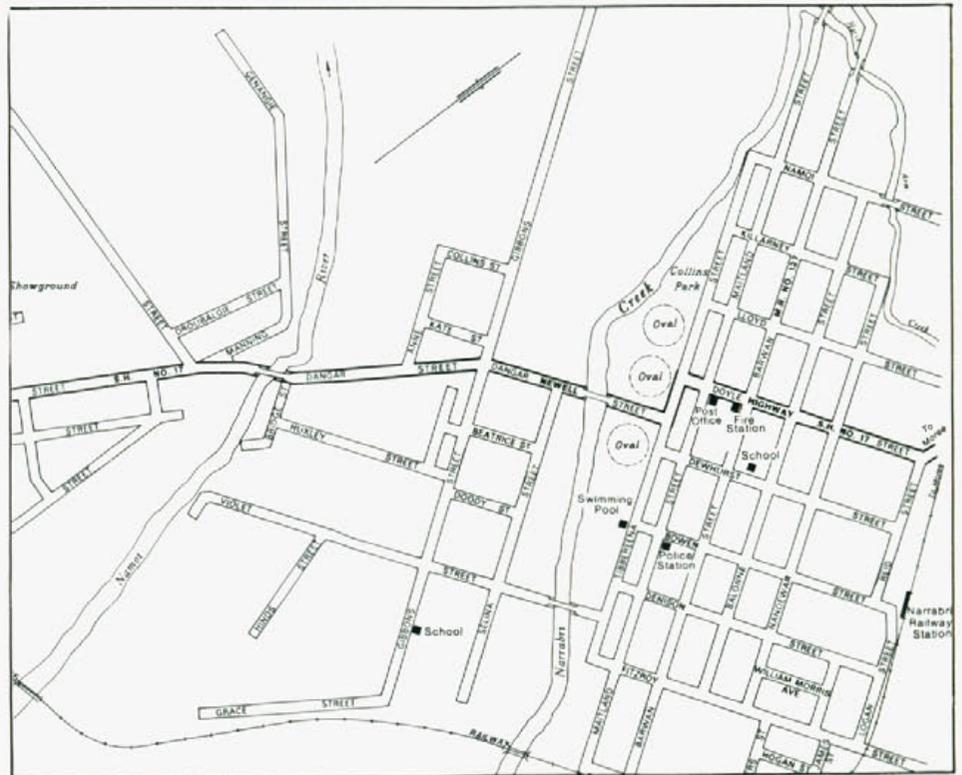
Narrabri is a thriving, industrious town set in the very attractive and picturesque Namoi Valley. It derives its livelihood both from industry—with an emphasis on primary produce—and tourists.

Cotton is a product of which the town is justly proud. In 1962, 26 hectares of farmland produced cotton. By the 1970's this had jumped to an incredible 24 000 hectares which produced a crop worth about \$20 million.

Opposite page:

Top: A view of the Narrabri Creek Bridge showing the previously existing section in the foreground. This is joined to the new section, with its round piers, by means of the common concrete abutment which can be seen in the centre of the photograph.

Bottom: Narrabri schoolchildren gathered for the opening ceremony.



Map of Narrabri.

In addition, great contributions to the economy are made by Narrabri's huge oilseed crushing mill, flour mill and stockfeed mills, as well as factories producing a number of diverse products such as concrete pipes and furniture.

Tourists are attracted not only by the town itself, where the curious traveller can be taken from the old and historical (nineteenth century mill, church, hotels and houses) to the modern and bustling (factories, office buildings and research stations), but also by the recreational facilities offered by the natural setting.

In welcoming the Hon. R. J. Mulock to the town to officially open the bridge, the Mayor of Narrabri, Alderman V. A. W. Miller, described the occasion as one of joy. He added that he could not fully explain to the distinguished guests, who had come to Narrabri for the occasion, just how much the townspeople had looked forward to the completion of the bridge. Without the link it provided, Alderman Miller explained, the town could not function, in times of flood, as a proper social and economic unit.

The then Commissioner for Main Roads, Mr A. F. Schmidt, opened the proceedings, and among the speakers

was Mr W. T. J. Murray, M.P., Member for the State Electorate of Barwon. Also assembled on the bridge to see the official opening were many school children who would now have no difficulty in attending school when the Creek flooded.

The Problem at Narrabri Creek

The old timber truss bridge over Narrabri Creek was opened to traffic in 1911.

Immediately adjacent to Narrabri Creek is a second and minor waterway, Narrabri Rivulet, spanned by a reinforced concrete bridge built in 1937. These two waterways, which are anabranches of the Namoi River, carry the flood discharge from the River near Narrabri. The bridges over these two waterways were separated until recently by an earth embankment.

After almost 65 years of withstanding severe flood conditions and highway traffic that was increasing year by year, it became evident that the very old timber structure was reaching the end of its useful life.

While the bridge was capable of carrying normal highway traffic it could not be expected to take above ordinance loads



Left:

The Hon. R. J. Mulock, LL.B., M.P., Minister of Justice and Minister for Housing, cuts the ribbon to open the new bridge officially. With him are, from left, Mr A. F. Schmidt, then Commissioner for Main Roads, Mr W. T. J. Murray, M.P., Member for the State Electorate of Barwon, and Alderman V. A. W. Miller, Mayor of Narrabri.

Opposite page:

Top: The old timber truss bridge which was built in 1911 and demolished in 1975.

Bottom: The new prestressed concrete bridge erected in 1977 to take its place.

for any length of time. Constant excessive loading of the structure had accelerated the evident deterioration.

It was decided to replace the old timber bridge over Narrabri Creek with a new structure and, to allow for both of these operations, highway traffic was diverted over a new low level bridge constructed over Narrabri Creek at Violet Street. This traffic arrangement was made in consultation with Narrabri Municipal Council.

The Violet Street bridge had never been intended as an alternative to the Newell Highway crossing. It was designed to carry local traffic and, being a low-level bridge, was susceptible to flooding. It was inundated five times while the new bridge was being built.

At these times the only link between the two parts of Narrabri was a small, infrequently running passenger train which crossed Narrabri Creek at the southeast edge of the town. Little wonder that the opening of the new bridge turned out to be such a festive occasion, attended by so many townspeople and children.

The Solution

As mentioned on the previous page, up to 1975 the bridges carrying the Newell Highway over Narrabri Creek and Narrabri Rivulet were separated by an earth embankment. Representations

were made by the Narrabri Municipal Council regarding this embankment. It was requested that it be removed in order to allow a greater waterway area in the creek so that flooding in the town would be reduced. An investigation was made into the results of recent floods, and in 1976 it was decided, on the basis of all available information, to extend the new bridge over the Creek to connect with the existing bridge over the Rivulet, by means of a common concrete abutment. This means that, in effect, there is now one long, flood-free bridge spanning both the Creek and the Rivulet.

The new bridge, designed by the Department, has nine spans with a total length of 179 metres. It has a width between kerbs of 8.6 metres and two footways each 2.4 metres wide. The older Rivulet bridge was widened to match the new bridge and, at its junction with Tibbereena Street, was further widened to 11.3 metres between kerbs. This improvement has resulted in a safer junction with more convenience for traffic entering the town.

A tender for the construction of the new bridge was accepted in September, 1975. The work, which was carried out by Bridge and General Pty Ltd on behalf of Peter Verheul Pty Ltd, was noteworthy for the precasting onsite of the 126 pretensioned concrete girders forming the deck of the bridge. The entire

project took about two years to complete at a cost of approximately \$1.2 million.

Traffic flow on the Newell Highway has become increasingly heavier over the years. Approximately 10 000 vehicles a day will be crossing the bridge in 1978. With the flood free bridge over Narrabri Creek and Narrabri Rivulet and the low level bridge at Violet Street, school-children and local traffic can move more safely and more quickly between the two parts of the town.

Let us again quote from Alderman Miller who said at the opening of the new bridge, "*We have watched this tremendous permanent structure taking place with great expectations*".

The expectations were that it would provide a proper and lasting solution to the problem of the division of the town in times of flood. As Alderman Miller said "*. . . this bridge provides a vital link between two parts of our town*".

The new bridge primarily means that the daily life and business of Narrabri can go on normally, whatever the weather. It also means that vehicles carrying primary produce (for which the town is well-known) and those carrying tourists (for whom the town is a pleasant and appropriate stop) will flow efficiently at all times. It will bring both economic and social advantages to this prosperous and vital country town. ●

1911



FROM WOOD TO CONCRETE

The same aspect, the same problem, the same basic solution – but a new era brings advanced technology and materials and a new, streamlined look to the Narrabri Creek Bridge.



1977

THE NEWELL HIGHWAY

NAMED AFTER A PIONEER ROAD MAN

The Newell Highway, State Highway No. 17, is an extremely busy and important one. A glance at a map of New South Wales shows that it is one of those routes that are very basic to the road network, traversing the State virtually from one border to another.

In the case of the Newell, it is from south to north—from the Victorian border near Tocumwal to the Queensland border at Goondiwindi, except for section of the Mid-Western Highway from West Wyalong to Marsden and section of the Oxley Highway from Gilgandra to Coonabarabran. Lying west of the Great Dividing Range, it avoids the traffic problems of the crowded coastal corridor and is the longest highway in the State—extending a distance of 1 060 km.

It is hardly coincidental that the man after whom this highway was named, Hugh Hamilton Newell, was in a very real sense basic to the foundation of the Department of Main Roads as we know it today.

The forerunner and *prototype* of the Department—the Main Roads Board—first saw the light of constitutional day in 1925 as a result of legislation initiated by the Fuller Coalition Nationalist Government. Newell was one of the three original members of this Board, being appointed to the position on 9 March, 1925, when he was 46 years old. The political historian, Professor Don Aitkin*, looking back from a point a little later in Newell's career, describes him as:

“ . . . the one genuine road man on the Board and the man responsible for the Board's rapid expansion since 1925”.

Hugh Newell was born in Belfast, Ireland, on 29 April, 1878, and spent his early childhood in the United States

of America. His family then moved to New South Wales and his education was completed at Newtown Superior Public School and Fort Street Model School.

Newell was always a “road man”. He began his training as a road-builder in 1894 when, just before his sixteenth birthday, he joined the Department of Public Works as an engineering cadet. After an initial period in the Roads and Bridges Section at Head Office, he transferred to field duties in 1897 and filled the positions of Field Assistant and District Engineer in a number of country centres, including Tenterfield, Newcastle and Bathurst. Newell was married in 1903, and returned to Head Office in 1917 to take charge of a section dealing with National Works and Local Government.

By 1924 he was District Engineer, Wollongong, and Manager of Port Kembla Electricity Power Supply and Harbour Works. Over the intervening period of thirty years he had become not only a first-rate, practical road man but also a skilful administrator.

Newell, with the other two members of the newly-formed Main Roads Board (John Garlick, President, and Tom Upton) began in 1925 to chart a course that was soon to make the Board the principal road-building authority in the State.

Colonel M. F. (later Sir Michael) Bruxner—after whom State Highway No. 16 has been named—was Minister for Local Government in the Bavin-Buttenshaw Government, which came into office in October, 1927. Bruxner was a great advocate of improved transport generally and had long known and admired the talents and character of Hugh Newell, having met Newell before World War I when he was working in the Tenterfield district.



*Hugh Hamilton Newell, C.B.E.,
M.Inst. C.E., M.I.E. Aust.*

Newell shared Bruxner's love for the country and concern to improve conditions for those who lived there, while Bruxner shared Newell's specific concern for better roads.

Bruxner set about the task of formulating a detailed policy for undertaking a concerted programme of improvements to the State's roads. The numbers of cars using the roads had increased enormously—and underlined the need for urgent action. In 1923 there were approximately 71 000 motor vehicles registered in New South Wales and by 1928 this had risen to 210 000. Consequently, roads needed to be better designed, better built and better maintained.

It was deemed desirable to assign priorities for such works on the basis of a *hierarchy* of roads. The plan that Bruxner presented to the annual conference of the Shires Association on

22 May, 1928, classified the State's main roads into State Highways, Trunk Roads and Ordinary Main Roads. But, as Professor Aitkin* says:

"The main road classification was not conceived solely nor even largely by Bruxner. He was not an inventor, not an original thinker . . . The details of the system were worked out by Bruxner and Newell one Saturday afternoon, on hands and knees on the map-bestrewn floor of the living-room in Bruxner's Rose Bay house."

It was typical of both of these men to see and attack problems quickly, and they acted with such speed that within seven months of Bruxner becoming Minister, his main roads policy had thus been developed and announced. Its legislative enactment followed a year later in 1929 with the passage of the Main Roads (Amendment) Act in April, 1929.

From January, 1928, until August, 1930, Mr Newell was Deputy President of the Board while Mr Garlick took up a temporary appointment as a Civic Commissioner and later as Chief Civic Commissioner of the Corporation of the City of Sydney (which took over the administrative affairs of the Municipal Council).

A change of Government in November, 1930, saw the Hon. J. T. Lang elected as Premier and Colonial Treasurer. Other changes were not long in coming and in December, 1931, legislation was passed altering the personnel of the Main Roads Board. Mr Garlick (whose seven year term as President was due to expire in January, 1932) was not re-appointed and Mr Newell was appointed in his place. Mr Upton was re-appointed as a member but both appointments were only for one year—or less if changed by other legislation.

In March, 1932, with the passage of the Ministry of Transport Act, a major change in organisation was introduced with the setting up of a Department of Transport. The Main Roads Board ceased to exist and its powers and functions were transferred to a new corporate body—the Board of Transport Commissioners of New South Wales. There was a Transport Commissioner (Mr C. J. Goode) and seven Commissioners each responsible for a separate branch of the new Department. All main roads matters became a responsibility of the Way and Works Branch (which also controlled the

construction and maintenance of railways and tramways) and were under the charge of Mr A. C. Fewtrell. Mr Newell was appointed as Transport Commissioner in charge of the Highway and Roads Transportation Branch and was responsible for *"the registration, licensing and operations of aircraft and highway and road vehicles and traffic matters"*.

Following the dismissal of the Premier, Mr Lang, by the Governor, Sir Philip Game, on Friday, 13 May, 1932, a Liberal-Country Party Coalition under the Hon. B. S. B. Stevens came to power. Lt-Col. Bruxner became Deputy Premier and Minister for Transport—positions he held for nine years until May, 1941. Late in June, 1932, a proclamation was issued transferring the administration of the Main Roads Act back to Mr Newell, who was vested with the full powers of the Transport Commissioners. The road transport aspects of Mr Newell's duties earlier in the year were taken over by Mr S. A. Maddocks when he was appointed in August as Acting Transport Commissioner for Tramways and Road Transport, leaving Mr Newell responsible solely (and solely responsible) for main roads matters.

To round off a year of complicated changes, the passage of the Transport (Division of Functions) Act, 1932, constituted a Ministry of Transport and three Departments, namely Railways, Road Transport and Tramways, and Main Roads. On 29 December, 1932, Mr Newell was formally appointed as the first Commissioner for Main Roads.

It was a fitting appointment for a man who had contributed so much to the establishment of a competent new central roadbuilding authority during such critical formative years. It was, of course, in part at least, Bruxner's recognition of his skill and dedication as a *"road man"* that assured Mr Newell's appointment. Recognition also came to Mr Newell when he was created a Commander of the Most Excellent Order of the British Empire (C.B.E.) in 1936. He was a Member of the Institution of Engineers, Australia, and was President of the New South Wales Advisory Committee of the Institution of Civil Engineers, London.

Mr Newell was still Commissioner when he died of heart failure on 15 March, 1941, at the age of 63 and just over 16 years since his appointment to the Main

Roads Board. Although in some photographs he looked stern and aloof, Hugh Newell was a kind and sympathetic man. He practised his Christianity unobtrusively and, despite the formidable programme of work he set himself, he went out of his way to foster good working and social relations among his staff. The Main Roads Social and Recreation Club—still thriving in 1977—was founded by Mr Newell as early as 1930.

If Hugh Hamilton Newell was a *"road man"* by profession, he was also a *"people man"* by nature. It was therefore fitting that, in July, 1941, State Highway 17—which links the people of three States—should have been named the Newell Highway to commemorate a man who understood so well the vital role of roads in the everyday life of the community. In November, 1941, Bellingen Shire Council gave the name *"Newell Falls"* to a waterfall which cascades its way pleasantly past Trunk Road 76 between Bellingen and Dorrigo. A plaque records *"appreciation of his untiring efforts in providing good roads"*.

In the slim war-time economy edition of the Department's 1940-41 Annual Report, more than one page out of a total of 24 was given to outlining Mr Newell's work. One particular paragraph sums it up so well and is a fitting conclusion to this brief article on his brilliant career and his special place in this Department's and this State's history.

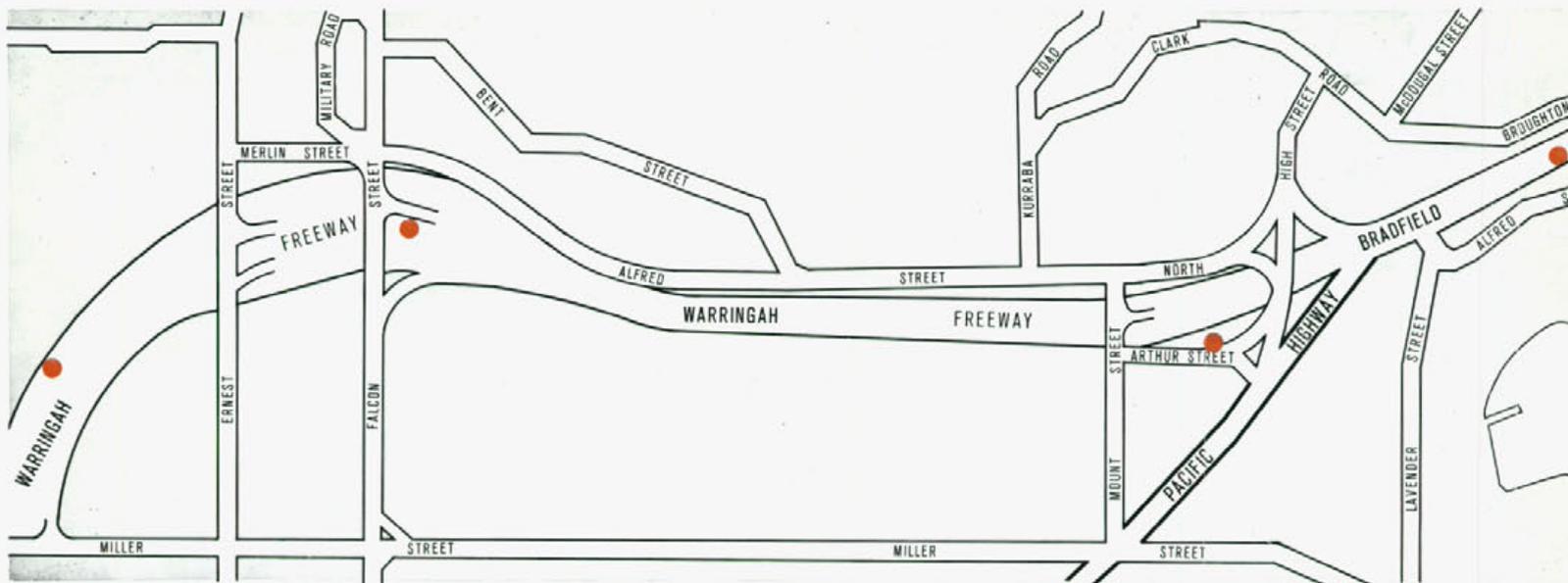
"Mr Newell had a unique knowledge of the whole of the State, acquired during his forty-seven years of public service, and this, together with his undoubted engineering and administrative ability, were invaluable attributes in co-ordinating main roads activities. By his untiring devotion to duty throughout the whole of his years of service he was a guiding influence in pioneering, developing and improving the roads system, which will serve as a lasting monument to him". ●

*AITKIN, DON: *The Colonel: A Political Biography of Sir Michael Bruxner*, A.N.U. Press, Canberra, 1969: pp.112-3.

An article entitled *"Diary of Determined Travellers"*, concerning a journey by Hon. M. F. Bruxner and Mr Newell around the roads in the northeast corner of the State in 1928 was published in the June, 1975, issue of *"Main Roads"*, Vol. 40, No. 4, pp. 107-110.

An article on the Newell Falls (and the nearby Sherrard Falls which were named after a later Commissioner, Mr H. M. Sherrard, in November, 1959) appeared in the March, 1960, issue of *"Main Roads"*, Vol. 25, No. 3, p. 95.

The Department's detailed history *"The Roadmakers"* contains more information on activities, legislation, etc., during Mr Newell's period with the Main Roads Board and the Department.



WITH A VIEW TO SAFER

NEW TV CAMERA SYSTEM TO SPEED UP TRAFFIC FLOW ON SYDNEY HARBOUR BRIDGE

A surveillance system of closed circuit television cameras will soon be installed on the Sydney Harbour Bridge and its approaches to make the Bridge crossing safer and more efficient for drivers. The installation of the twelve cameras in the system is the first major stage in the development of the Department's Driver Aid Scheme for the Bridge. This stage will be followed by further stages which will include overhead changeable message signs and a more extensive system of movable medians, some of which have already been installed.

The twelve cameras will be positioned so that traffic movements on both of the approaches to the bridge and on the bridge itself can be monitored continuously. Their function will be to immediately detect accidents and breakdowns, which are traffic hazards, and to ensure a much quicker removal of these hazards. The faster elimination of dangers and blockages ensures safer, quicker crossings for drivers.

Stationary vehicles as hazards

During 1976 over 53 million vehicles crossed the Sydney Harbour Bridge. Of these, 3062 had problems which forced them to stop on the deck of the bridge. This instantly turned them into hazards to other traffic.

The stoppages were caused by a variety of faults—256 vehicles had tyre or wheel problems, 397 had electrical faults or battery failures, 224 overheated and 637 suffered mechanical breakdowns of some other kind. A further 151 vehicles

were involved in accidents, 1332 ran out of petrol, 62 were abandoned by their drivers, while in three cases the problem had apparently been solved and the vehicle moved before Bridge personnel arrived to assist.

A breakdown service, operating on the Bridge and its approaches, is provided by the Department free of charge. A brief description of the way the service works and how a road user should go about getting assistance in the case of a breakdown can be found at the end of this article.

The new camera system

To ensure maximum surveillance, the specifications for the system provide for cameras to be mounted at given locations (which may be seen on the diagram above), in particular ways and at particular heights.

Two of the twelve cameras are to be mounted on existing buildings: one 65 metres above road level on the northeast corner of the IBM Building in 168 Kent Street, overlooking the southern approach to the bridge, and one on a building at 122 Arthur Street, North Sydney.

Four cameras are to be mounted on the bridge structure itself: two on the arch (one of which will replace an existing camera), one on the southeast corner of the southwest pylon and one on the northwest corner of the northeast pylon.

Of the remaining six cameras, two will be mounted on specially erected poles (one in the bifurcation of the Western Distributor

and one near Falcon Street, North Sydney), one on an existing sign gantry between Miller and Ernest Streets on the northern approaches, one on the southeast parapet of the toll office on the southern approaches and two close to the toll booths on the northern approaches to the bridge for monitoring traffic flow through the northern toll booths.

Each camera will be able to tilt (between 10° and 65°), pan (through 350°) and zoom onto particular targets. These operations will be controlled from the monitoring points.

There are three points at which picture signals from the cameras will be monitored. Firstly, pictures from all twelve cameras will be transmitted by co-axial cable to the Sydney Harbour Bridge Traffic Control Centre which is located in the Old Toll House on the southwest corner of the bridge. From there they will be relayed by cable to the Department's Emergency Centre at No. 1 Oxford Street. (The Emergency Centre was previously located in Brisbane Street, Surry Hills).

The Emergency Centre monitors will receive all pictures except those from one of the two cameras set up near the northern tollbooths. The signals from these two cameras will be relayed to the monitors in the Sydney Harbour Bridge Tollmaster's Office.

Control panel operations at the Traffic Control and Emergency Centres will be able to pick up a particular picture by



FASTER BRIDGE CROSSINGS

selecting the camera number, and then operate that camera by remote control to relay any information within its range. A micro-computer will be installed to sort priorities for camera use between these two Centres. It will also be possible to make video tapes for use in training and research.

Who will do what

The Department is undertaking a portion of the work involved in the installation of the scheme, and the remainder is to be contracted out. The Department's portion of the work includes the installation of some of the camera support structures, supply and installation of control units, monitors, telephone links and micro-computer. The contractor will supply all cameras and associated equipment, design and supply some camera support structures, install some cameras and all cables linking cameras to control centres and provide the link to the Emergency Centre.

Tenders for this contract have already been called and work should commence early in the new year. The T.V. surveillance scheme is expected to be in operation by the end of 1978. Its installation will enable the traffic controllers to see exactly what is going on at any point on the bridge and its approaches at any time. It is the first stage in the Driver Aid Scheme, with other stages (including the complete system of movable medians) flowing logically from it at a later date.

If it happens to you, here's what to do

If you have the misfortune to have your vehicle break down on the Sydney Harbour Bridge or its immediate approaches, don't worry—the Department's breakdown service is there to help you. This service has been in operation since 1945. It was free then—and it still is. Here's what happens.

Basically, there are three ways of getting help: you can telephone for it yourself,

be spotted by a patrolling Departmental tow-truck, or be spotted by a T.V. camera if you happen to be on the Bridge itself, between the north pylon and the southern toll gates, or on the Cahill Expressway between the Macquarie Street entrance and the tunnel.

If you opt to telephone, leave your vehicle with its hazard lights flashing (if it has such a facility) or with the boot up to indicate that it is stationary. And—perhaps an unnecessary warning—do be careful if you have to cross busy lanes of traffic to get to the telephone.

There are 43 emergency telephones, clearly marked in blue, between Cammeray Avenue just north of Ernest Street on the Warringah Freeway on the northern approaches to the Bridge and the Macquarie Street entrance to the Cahill Expressway on the southern approaches. On the bridge proper there are three pairs of telephones, situated at intervals on lanes 1 and 8 (i.e., the two outside lanes).

All emergency telephones have instructions for use inside the cover of the box in which they are housed. They are connected to the Sydney Harbour Bridge Traffic Control Centre which is located at the southern end of the bridge (on the western side, adjacent to the Observatory grounds).

When your call is received, a tow-truck will be despatched to remove your vehicle to a safer place—either Milsons Point or York Street. From there you can make arrangements to get it going again.

The Department's Sydney Harbour Bridge tow-truck organisation has six towing vehicles and any time between 5 a.m. and 8 p.m. there are up to three of them patrolling the Bridge and its approaches looking for road users in trouble. They'll spot you pretty quickly if you break down because of the disturbance you'll cause to normal traffic flow, especially in peak hours. Meanwhile, **REMEMBER THE HAZARD LIGHTS OR OPENED BOOT.**

If you break down in the right place you may be spotted first on one of the two closed-circuit T.V. cameras mentioned above. The Police who man the Emergency Centre in Oxford Street may pick up the problem on their monitoring screens. If they do, they will quickly notify the breakdown service and a tow-truck will be despatched. The Department also receives co-operation from the Police generally, and if a cruising police car spots your predicament the breakdown will be reported by radio to the service via the Emergency Centre.

When the whole of the closed circuit T.V. monitoring system for the bridge comes into operation, breakdowns will be sighted quickly anywhere within camera range on the bridge and its approaches. This is the major function of the new system, after all.

The installation of this system does not mean that the emergency telephones will become redundant. They will be essential for the use of road users during the night and at times when visibility is poor. The T.V. cameras will do the job efficiently under most circumstances, but if traffic is very light it is suggested that the telephones be used. The new arrangements make it safer for you whatever time, or in whatever kind of weather, your car chooses to embarrass you.

It usually is an embarrassment—and an annoyance—to road users when their vehicle breaks down, and especially so on the Bridge when, at most times, all the available road space is being used to its maximum. However, running out of petrol is very easily avoidable, yet more than a third of the vehicles which stop on the bridge do so because of this simple miscalculation.

So please, save everyone—including yourself—a lot of time and trouble by checking your fuel gauge and getting a refill before moving onto the bridge approaches. ●

WATCHING OUT FOR THE TRAFFIC

WITH EARS



AND HANDS

Mrs Diana Braun, who works as the librarian at the Association of Blind Citizens nearby, uses the prototype audio-tactile pedestrian signals at the intersection of Burwood Road and Railway Parade, Burwood.

At left: the picture shows Mrs Braun waiting to cross the intersection. She can hear the signal indicating that she should wait, and she is also able to feel the signal as a vibration through the front of the push-button box.

At right: The "WALK" signal sounds and Mrs Braun crosses the road.



AUDIO-TACTILE PEDESTRIAN SIGNALS

The prototype of a new system designed to assist blind people, and people who are both blind and deaf, to use pedestrian crossings has been installed by the Department at the intersection of Burwood Road and Railway Parade, Burwood, in Sydney. The project was initiated and directed by Mr Frank Hulscher, who is a Supervising Engineer in the Department's Traffic Section. Research and design of the new audio-tactile device was undertaken by Louis A. Challis and Associates Pty Ltd of Kings Cross under contract to the Department.

Marie Shang, writing for "Insight", which is the official organ of the Australian Federation of Blind Citizens, says that the new signal "represents a milestone in what . . . is one of the most exciting projects undertaken for blind people in Australia".

The new device is indeed a milestone, since it is founded on exhaustive research into the reasons why many previously designed signals, both in Australia and overseas, have failed to provide the greatest help possible to blind and deaf pedestrians. In New South Wales vibrating signals have been tried at crossings in Enfield and North Rocks,

while as early as 1967 the Department of Motor Transport (which was responsible for traffic signals until 30 June, 1976) installed experimental audible signals at the intersection of Pitt Street, Rawson Place and Eddy Avenue in the inner City of Sydney. Overseas, braille tiles, vibrating signals and audible signals including clicks, bird songs and verbal commands have been used.

Research, which has sought opinions and responses from the blind people of New South Wales, has shown that a sound signal is preferred. Overseas research has reached the same conclusion. The Department's new signal is based on sound, but includes vibration in order to give the widest range of help to people with both visual and aural impairments. Just what *kind* of sound would be best was one of the main problems to be solved.

The device which is now on trial at the Burwood intersection looks exactly the same as the standard push-button box installed for the use of pedestrians at other traffic light controlled intersections throughout the State. The difference is that it emits an audible signal which tells blind pedestrians whether they may

cross or not. Two readily distinguishable audible signals operate continuously. The "DON'T WALK" signal is a slow, steady "beeping" sound which allows blind people to locate the push-button box and to press the button to obtain a "WALK" signal. The acoustical engineers found, through research and experiment, that for the "DON'T WALK" signal *square wave* tone bursts of 25 to 50 milliseconds duration, repeated at about 2 second intervals gave the best audibility above traffic noise. Blind people were easily able to locate such signals from a distance of about eight metres under normal traffic conditions.

The "WALK" signal is a much faster "beeping" sound which utilises a 500 Hz exponentially decaying *sine wave*, repeated at the rate of 10 times per second. This signal was easily distinguishable both from the "DON'T WALK" signal and from surrounding traffic noise.

Both of the audible signals were selected from a range of alternatives by means of assessing the responses to them by a sample group of blind and non-blind people in a properly set up experimental situation.

In addition to producing an audible signal for blind people, the new device produces a vibration of the front panel of the push-button box which may easily be felt with the fingers. This is the result of the design of the electro-acoustic system which uses the escutcheon plate (that is, the front panel) of the push-button unit as the sound-emitting medium. When this plate vibrates at a fast rate, blind and deaf pedestrians know they can cross the road but when the plate vibrates at a slow rate they know they must wait at the kerb.



The inside of the front plate of a pedestrian pushbutton box showing the prototype audio-tactile device in position.

While devising a scheme for the assistance and protection of blind and blind/deaf pedestrians, it was necessary for the designers to ensure that the audible signals did not add to existing noise pollution levels more than could be helped. This problem was overcome by means of an automatic device which regulates the sound level of the audible signal so that it relates directly to the level of traffic noise at any given time.

Thus the sound of the signals is much softer during the night and is unlikely to cause any annoyance to local residents.

The new device won for Louis A. Challis and Associates Pty Ltd a Merit Award of the Association of Consulting Engineers Australia. However, the

Department, through Mr Hulscher, and the acoustical engineers concerned recognise that any solution to the problem must take account of social as well as engineering issues. Research has indicated a certain mistrust, on the part of blind pedestrians, of mechanical aids at traffic light controlled intersections.

This is based on fears that the system might malfunction, as well as on doubts about the ability of blind people themselves to locate the correct signal when two signals are operating on the same corner, as is often the case at intersections. Blind people also expressed their fears and uncertainty about having sufficient time to cross the road when the "WALK" signal is operating. These problems, the problems of blind and blind/deaf people themselves, are the ones to which the Department has sought to provide the best possible solutions. The eight audio-tactile push-button boxes at the Burwood intersection were installed on 16 January, 1977, for a six-month trial period, and the site itself was selected on the basis of the number of blind people regularly using it.

During the trial period, information was collected regarding the responses of blind and deaf people to its operation, as well as about the mechanical functioning of the system. This has led to an endorsement of the system by the blind, and to engineering modifications of the design in order to ensure fewer maintenance problems.

The prototype device has now been redesigned, and arrangements are being made for the initial manufacture of a sufficient number for a new trial to be made at another six intersections. These intersections have been selected on the basis of a priority list of crossings with the highest numbers of habitual blind users.

The original Burwood installation will be re-equipped with the new, modified device. The others to be newly equipped are situated at crossings at Burwood Road and Hume Highway, Enfield; North Rocks Road, east of Barclay Road, North Rocks; North Rocks Road and Lawndale Avenue, North Rocks; Burwood Road and Deane Street, Burwood and Burwood Road and Georges River Road, Enfield.

Once this new trial is complete and any further "bugs" have been ironed out, the extension of the scheme to other priority listed intersections will begin.

A committee (LG/6) set up by the Standards Association of Australia has prepared a draft national standard for push-button assemblies—including audio-tactile units—for use with traffic light signals. If adopted, such a national specification would ensure that the audible and tactile signal facilities are uniform throughout the nation.

Mr Roy Hallett, Secretary of the Association of Blind Citizens, whose premises are very close to the Burwood trial intersection, has already said that the Association is in favour of an extension of the scheme. For the pedestrian public in general, who can, of course, also hear the audible signals, the scheme will provide extra safety (and hopefully less delay) at signalised crossings.

* * *

GIVING A HELPING ARM

Perhaps it would be in order at this point to remind sighted pedestrians that blind people usually appreciate their help at crossings. But, it is disconcerting for blind people to have someone grasp their arm without warning and thrust them forward, mistakenly thinking that they are making things easier for them. The best way of giving assistance is first to ask if it is required and, if it is, to allow a blind person to take your arm and follow your movements as you negotiate the obstacles that they cannot see.

For motorists, the first step in helping is to be on the lookout for the white cane which usually identifies a blind person. And then, of course, to follow correct procedures at traffic signals by stopping whenever possible on the amber signal and not "jumping the gun" on the green. To do otherwise is not only unlawful but is dangerous, particularly to pedestrians and especially so to blind people. So please be careful and courteous—it costs nothing and saves lives. And it makes driving much more pleasant. ●



COMMISSIONER FOR MAIN ROADS

RETIREMENT

Mr Andrew Frederick (Pat) Schmidt, B.E., F.I.E. Aust., F.C.I.T., F.R.I.P.A., began his career with the Department of Main Roads on 4 September, 1939 in the Bridge Design Section. It was interrupted by World War II when he enlisted in the 2nd A.I.F. in January, 1942 and served in the Electrical and Mechanical Engineers Corps where he rose to the rank of Captain.

Rejoining the Department early in 1946, Mr Schmidt served a further two years in the Bridge Design Section until he was transferred to the Bega Divisional Office in 1948. He remained there until 1953 when he was made Officer-in-Charge at Windsor. Mr Schmidt's next country move, in 1955, was to Goulburn, where as Supervising Engineer he was appointed Senior Assistant to the Divisional Engineer.

In 1960 he became the Divisional Engineer at Wagga Wagga for two years, after which he returned to Sydney as the Assistant Metropolitan Engineer. During this five year period of his career, Mr Schmidt was principally associated with the administration and supervision of major bridge construction, notably the Gladsville, Captain Cook and Roseville Bridges.

After serving a brief six months as Metropolitan Engineer, Mr Schmidt was appointed Assistant Commissioner for Main Roads on 26 August, 1967. In this capacity, Mr Schmidt was a member of both the Campbelltown Development Committee of the then State Planning Authority and the Council of the Post Graduate Civil Engineering Foundation of the University of Sydney.

On 26 August, 1974, Mr Schmidt was appointed Commissioner for Main Roads, an office he held until his recent retirement on 5 October, 1977. As Commissioner, Mr Schmidt was officially involved in the membership of a number of transport bodies. These included the National Association of Australian State Road Authorities (NAASRA), the Australian Road Research Board (ARRB), the Urban Transport Advisory Committee (URTAC) and the Traffic Authority of New South Wales.

Mr Schmidt holds a Bachelor of Engineering Degree (Mechanical and Electrical) from the University of Sydney and is a Fellow of the Institution of Engineers Australia, a Fellow of the Chartered Institute of Transport and a Fellow of the Royal Institute of Public Administration. As patron of the Main Roads Social and Recreation Club, Mr Schmidt has maintained a deep interest in the welfare of his staff and their good wishes go with him in his retirement.

APPOINTMENT OF SUCCESSOR

Following the retirement of Mr A. F. Schmidt, Mr Brian Joseph Sexton, B.E., F.I.E. Aust., F.C.I.T., was appointed Acting Commissioner for Main Roads from 6 October, 1977 until 16 December, 1977, on which day he was formally appointed to the office of Commissioner for Main Roads. Mr Sexton had previously been Assistant Commissioner from 26 August, 1974 and Deputy Commissioner from 31 January, 1976.

A graduate of the University of Sydney (in Civil Engineering), Mr Sexton began his career with the Department of Main Roads in December, 1942, working on the Stuart Highway from Darwin to Mataranka in the Northern Territory.

Mr Sexton had demonstrated his wide range of capabilities in a variety of positions within the Department. Recent positions he has held have included Divisional Engineer at Broken Hill from 1961 to late 1963, Engineer for Field Organisation and Methods from 1964 to 1967 and Metropolitan Engineer from 1967 to 1972. Mr Sexton was then Acting Advance Planning Engineer and Acting Highways Engineer, while just prior to his appointment as Assistant Commissioner he was Engineer for Programmes and Budgets. He has also been closely involved with the activities of the Main Roads Social and Recreation Club, both as President and as keen participant.

Mr Sexton has been actively associated with the Sydney Division of the Institution of Engineers, Australia, having held the position of Chairman of the Civil Engineering Branch and a member of the Sydney Division Committee. He is a Fellow of the Chartered Institute of Transport and a member of the Council of the Post Graduate Civil Engineering Foundation at the University of Sydney. In 1972, Mr Sexton attended the Australian Administrative Staff College at Mt Eliza, Victoria.



*Mr B. J. Sexton, B.E.,
F.I.E. Aust., F.C.I.T.,
Commissioner for Main Roads*

In October, 1973, Mr Sexton attended the Seventh World Meeting of the International Road Federation, held in Munich, Germany, where he delivered a paper on "Low Cost Road Design and Construction in Sparsely Settled Areas of New South Wales."

On this overseas trip, Mr Sexton also spent considerable time inspecting freeway and other road construction projects in the United Kingdom and Europe.

OTHER APPOINTMENTS

Pending a review of the Department's top management structure by the Review of New South Wales Government Administration (under Professor P. S. Wilenski), no appointment has been made at this time to the position of Deputy Commissioner. Meanwhile, Mr D. C. Jacob, B.E., M.I.E. Aust., M.A.I.T.T., has been

Acting Deputy Commissioner since 6 October, 1977. He had been Engineer-in-Chief of the Department since 18 February, 1977.

Since 6 October, 1977, Mr E. M. Brown, B.E., has been Acting Engineer-in-Chief. His appointment as Deputy Engineer-in-Chief had been made on 18 February, 1977. ●

BUSY GETTING IN TOUCH WITH THE WORLD

In 1975 the Department's exhibit at the Royal Easter Show commemorated 50 years of Main Roads in New South Wales, and a section of the display dealt with old and new surveying techniques. In the early days, and as recently as the 1940's, surveying was frequently done on horseback, and the display included a fibre glass model of a pack horse.

After the show finished the model was stored at Central Workshop for some time, until earlier this year it was given to St Lucy's School for Blind and Visually Handicapped Children, at Wahroonga. The school teaches about 40 children of primary school age, many of whom go on to high school with sighted children after leaving St Lucy's.

Spatial concepts are difficult for the blind to learn and often they can only be comprehended by touch. Teachers at St Lucy's take every opportunity to give the children as much experience as possible. An example of a practical learning experience was when a power pole was being erected near the school.

The children were taken out to walk along the length of the pole as it lay on the ground, and then were lowered into the hole it would occupy, in order to visualise how high it would reach into the sky.

The model horse has been quite a help to the children. Several of them have already "seen" a real horse and understand that the model represents



WHEN YOU CAN'T LOOK A GIFT HORSE IN THE MOUTH

the live animal that they have touched and smelt. The model has an advantage over a live horse in that the children can learn its shape by feeling its eyes, ears, mouth and other sensitive areas, without the risk of upsetting the animal.

For transport to the school, the horse was packed in an open crate and when it arrived the children were able to feel it through the wooden bars. This provided an opportunity for one of the teachers to explain that the horse was in a similar situation to someone who was in prison.

A number of the children are doing a school project on horses and the model has been helpful with this. Other aids include a special copying machine which embosses pictures onto hard plastic

"paper", and books on horses which are available in braille.

The model horse is not the Department's first gift to the blind. Some time ago it donated several models of completed road and bridge projects to the North Rocks Deaf and Blind Children's Centre. An article concerning this appeared in the December, 1972, issue of "Main Roads" (Vol. 38, No. 2, page 44).

The problems that blind people—of all ages—need to overcome are as many as there are things to do in this world. Not least among them is road-crossing. This issue of "Main Roads" also carries an article on a new audio-tactile device for helping blind and blind-deaf people to cross roads. (See pages 42-44). ●



Hands and minds reaching out to learn new things through the language of touch.



For blind children, the feelings of fingertips play an important part in helping them to picture the shapes which we can see and comprehend so easily.



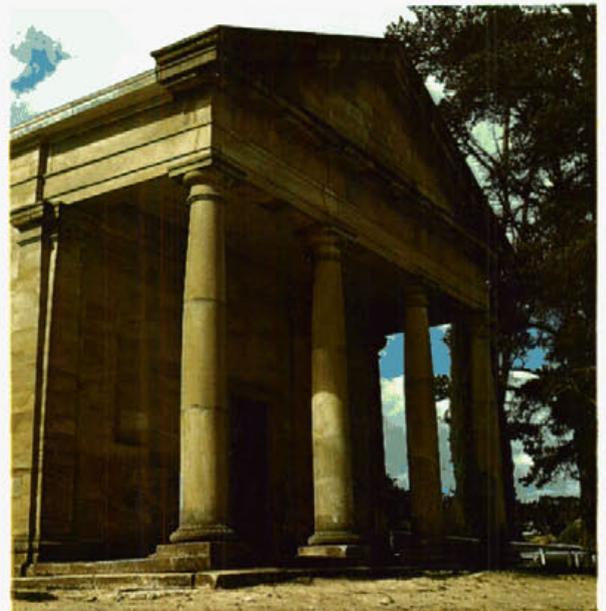
THE MITTAGONG-BERRIMA DISTRICT PROPOSED F5 BY-PASS ALTERNATIVES

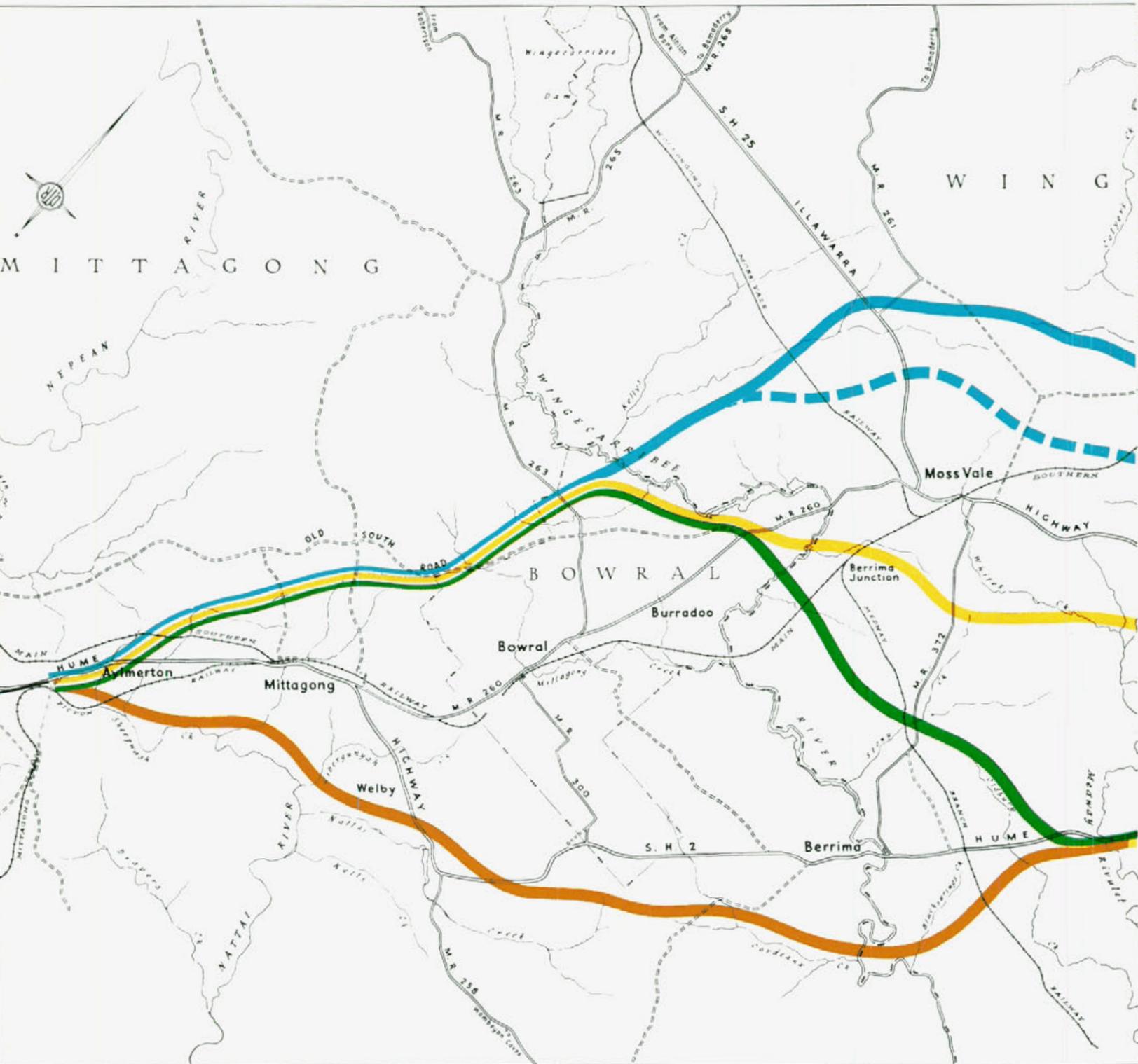




① and ② These outlines indicate the location of the two areas shown in the aerial photographs on the left and above. The cartoons indicate, in light-hearted fashion and in general terms, the land use patterns of the area. An article on the following pages presents a more detailed picture – in words.

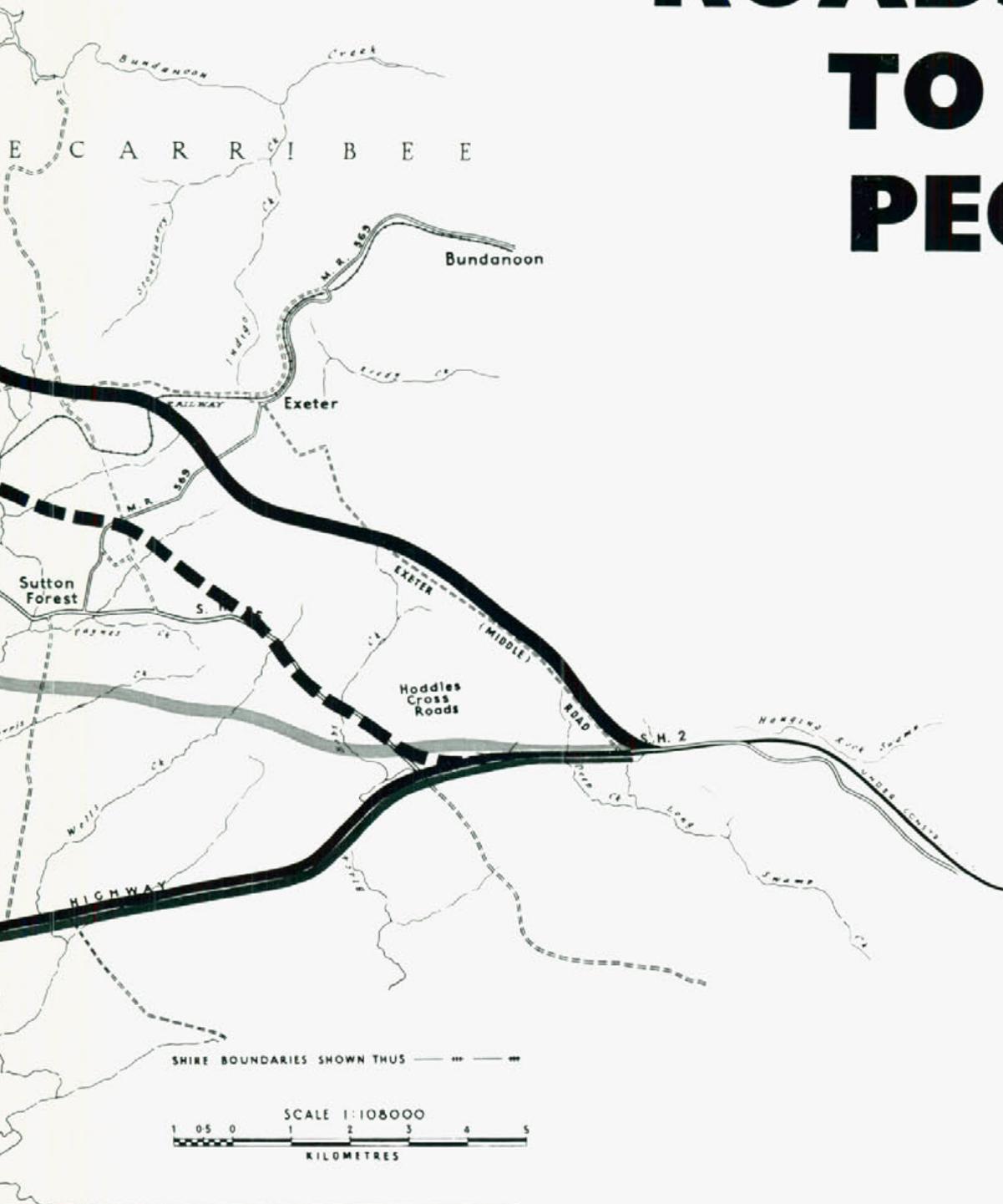
Right: Historic Berrima Court House, built 1838.





-  **Eastern Route**
-  **Modified Eastern Route**
-  **Central Route**
-  **Modified Central Route**
-  **Western Route**

ROADS GO TO THE PEOPLE



LOCAL RESIDENTS GIVEN CHANCE TO RECORD THEIR VIEWS ON ALTERNATIVE ROUTES OF PROPOSED F5 BY-PASS

What are roads for, anyway?

The trouble with roads is that they are so basic to the way we live that we seldom get around to discussing them or seriously assessing their value. We are always using them, but it's a bit like breathing—we do it without thinking.

Roads are for people. All people. Truckies, tourists and holiday-makers, pedestrians, bus passengers, manufacturers and shoppers—everybody. We all need roads to lead our lives normally.

But a big problem arises when a new road, which seems to be in the best interests of the community, disturbs or disadvantages individuals or small groups of people along its route. Peoples' objections to the route of a new road are many and varied. People may be physically affected, for instance by having to move house to make way for the road, or they may be affected in a more abstract way, as in cases where conservationists are concerned about a road's effect on native animals, plants or other resources. Since roads are for

people, the Department must have regard to any problems that roads cause for people and do its best to solve or reduce these problems.

The Mittagong exercise

As part of a State and Commonwealth Government plan to provide a dual carriageway freeway between Sydney and Melbourne, the Department has already completed two sections of the F5—South Western Freeway—and is at present constructing another. A section of the F5 between The Cross Roads (near Liverpool) and Campbelltown was opened on 26 October, 1973, and an extension to Camden Road, to provide about 16 km of freeway, was opened on 16 December, 1974. A further section, between Yanderra and Aylmerton (6 km north of Mittagong) was opened on 24 May, 1977. The section now under construction is the intermediate one between Camden Road, near Campbelltown, and Yanderra. It is expected to be available to traffic in 1981.

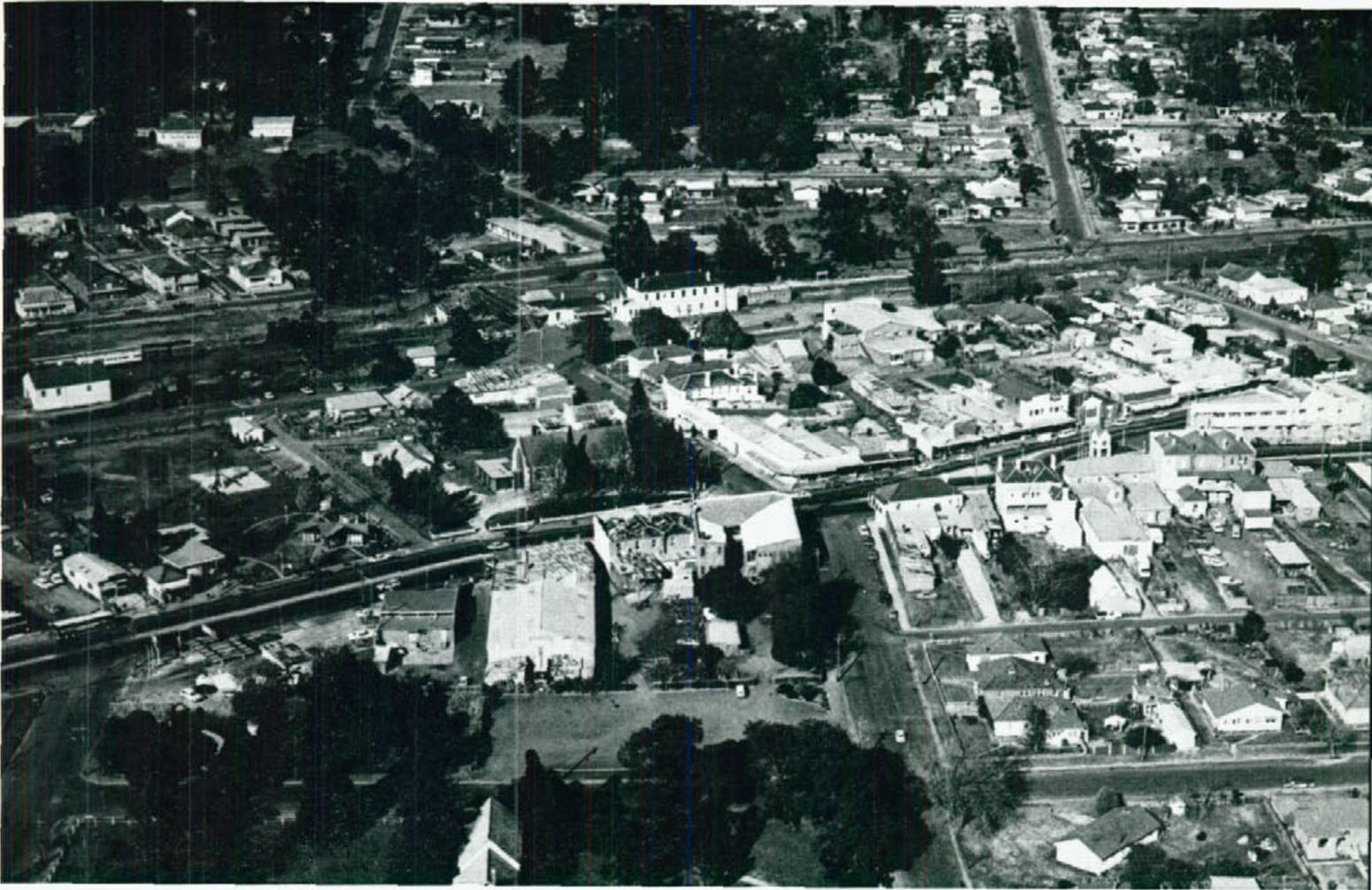
So, on its journey southwest from Sydney to Melbourne, the F5 is now either completed or greatly advanced from near Liverpool to a point just north of Mittagong. This brings the Department to the making of a decision about its route through an area noted for its scenic beauty, industry and historical significance—a district, in fact, classified by the National Trust as a proposed scenic protection area. The area involved can be seen on the map on pages 50–51. The three Councils involved are those of the Shires of Mittagong and Wingecarribee and the Municipality of Bowral.

The Hume Highway passes right through the towns of Mittagong and Berrima on its way from Aylmerton to Hoddles Cross Roads where it is joined by the Illawarra Highway. The Illawarra Highway passes through Moss Vale and Sutton Forest.

The picture at left shows part of the latest section of the F5 to be opened to traffic, the Yanderra to Aylmerton section.

F5 BY-PASS ALTERNATIVES





The Hume Highway at Mittagong.

The Hume Highway is one of the busiest interstate routes in Australia. It carries interstate and other long-distance through traffic—including heavy vehicles which make up about 35 per cent of total traffic on the route—as well as local shire and town traffic. The Annual Average Daily Traffic Volume on the Hume Highway 3.2 km north of Mittagong in 1977 was 10 940. Such a volume of traffic flowing through the main shopping streets and commercial centres of towns is dangerous and inconvenient to both local residents and through travellers. The Department has long recognised the need to have the F5 by-pass towns in the Mittagong-Bowral-Moss Vale-Berrima District. But what route should such a by-pass take?

This was by no means the first time the Department had been faced with such a problem. But every problem is unique because the set of factors affecting the alternative routes is always different.

Most of these factors relate to, or directly affect, people—and since the Department recognised that there were particular and pertinent circumstances relating to this project, what could be more logical or fair than to ask for opinions and suggestions from the people who would be most affected by the by-pass? That is, in this case, from the householders, business people, farmers and so on, of the Mittagong, Bowral, Moss Vale and Berrima region.

The route finally chosen will form part of the National Highway and therefore its construction will be funded by the Commonwealth Government. However, the gathering and assessing of all the information on the area has been carried out by the Department of Main Roads, and the choosing of the most suitable route for concurrence by the Commonwealth authorities, is entirely the Department's responsibility. The point of taking the issue to the people of the area was to ensure that no factor is

overlooked and that the final choice—because it is based on all the factors—will bring the greatest possible benefit to the area while at the same time causing the least disruption to the community and the environment.

By-pass alternatives

As early as 1959, the Department conducted an investigation into the possibilities and limitations of a by-pass of Mittagong. Since that time, design standards and concepts about the nature of freeways have changed and in 1974 a new study was made which ranged over a wider area—both geographically and philosophically. The report of this study described the district as essentially one of non-urban land use bordered by timbered country, but incorporating a marked urban corridor on a north-south axis from Mittagong to Moss Vale. This land use formula for the area was the principal to which other factors considered by the study had eventually

Heavy traffic stops for a pedestrian in Mittagong.



A petrol tanker rumbles past a row of buildings in historic Berrima.



and always to relate. These factors ranged over physical features (such as geology, soils, vegetation, wildlife and climate) and cultural issues (like history, analyses of population, transport systems, recreation facilities and the precise use of the land both existing and planned). In addition, road location and planning criteria had to be met, and engineering costs figured in the sets of pros and cons which were emerging for various alternative routes.

Since 1974, the information in the report has been sifted and discussed, expanded and reformulated. The Department has added to the store of relevant information on the area by approaching the Bureau of Meteorology for reports on the occurrence and effects of fog on various potential routes. A series of noise-level tests has been recommended and the Department of Agriculture was consulted about the probable effect of the different routes on agricultural production.

To help determine future traffic needs in the area and to plan the number and location of interchanges as well as the most appropriate pattern of connecting roads which would be required on various routes, the Department made a study of the origin and destination patterns of traffic using the area. The study took place in November, 1976, and involved the recording of the number plate, location and direction of travel of vehicles.

Of the possible alternative routes for the F5 through the area, four emerged as most suitable for further consideration. The four routes are by no means equally suitable from all points of view, and it is this fact—which is precisely to be expected—that is the whole point of the exercise.

The map on pages 50–51 shows that three of the routes run to the east of Mittagong. The blue route is the most easterly and is generally known as the eastern route. The route shown in yellow is known as the central route, and that in green as the modified central route. The orange route is known as the western route.

The four alternatives vary in length only between 35 and 39 kilometres and, calculating a road reserve width of 90 metres, a total of around 400 hectares of land would be required, whichever route is eventually decided on. This being the case, it is clearly the community value

attached to particular kinds of land-use, rather than the actual amount of land, that will need to be considered, with other factors, in the selection of the route.

As already mentioned, the Department's alternatives had taken account of the land-use factor. The next step was for the people who felt that they would be affected in some way—residentially, in their businesses, or environmentally—to record their specific comments concerning the alternatives.

Factors and routes

The map shows the four alternative routes selected and the relationship of each to existing highways (Hume and Illawarra), main roads, other roads, railway lines, towns, rivers and creeks. What it does not show is the nature and extent of development in the area, or the nature of the terrain itself. These factors which could not practicably be shown on the map are just as relevant as roads, towns and waterways in terms of the constraints exerted by them on freeway construction. Broadly speaking, there is a spread of existing and planned urban and semi-urban development to the east of Mittagong and Bowral, with established farms in attractive, undulating country. To the west of Mittagong the country is undeveloped and rugged.

Eastern route: An interchange is proposed for this route at its intersection with the Illawarra Highway, and this would influence the precise point at which the Highway is crossed by the freeway. Further constraints are exerted on the route by the ridge to the east of Bowral, which is best crossed close to the Old South Road, and the need to avoid historic buildings and to minimise the severance of properties. Something in the order of 73 properties would be affected in some way by the eastern route, as would the developments planned for Mittagong and Bowral.

It would be necessary to consider grade separated crossings (overpasses or underpasses) of the freeway to link areas through which it passed.

The interchange on this route would reduce traffic volumes on the Illawarra Highway west of Moss Vale and on the main road from Mittagong to Moss Vale (Main Road 260). This would mean an improvement in environmental conditions along those roads, and would also make a highway by-pass of Moss Vale unnecessary.

As in all cases where the route passes close to settled communities, visual and noise effects are likely. From the point of view of the total road network the eastern route offers the greatest benefits.

Central route: This alternative follows the eastern route as far as its intersection with the Bowral-Fitzroy Falls Road (Main Road 263). From there to Exeter Road it takes the most direct (and therefore the shortest) line consistent with minimising property disturbance. But the disturbance is rather severe nevertheless. In addition to the properties east of Mittagong, a large school property, a private airstrip and industrial land near the railway line in the Wingecarribee Shire would be affected adversely. It could be necessary to provide an additional interchange on this route to cater specifically for traffic to and from Moss Vale. This would be difficult as well as causing additional disturbance, and a future by-pass of Moss Vale by the Illawarra Highway would still be needed.

On this route, effects on existing and proposed development would be the most severe (around 78 properties affected) but, as in all cases, historic buildings would be avoided. The people of Burradoo would probably suffer visual and noise effects from this route as they would from the modified central route.

Modified central route: This route is a composite one, and remarks relevant to the other routes apply to it, except where it runs independently between Burradoo and Medway Rivulet. This section skirts industrial land and development north-west of Moss Vale and avoids the disturbance which would be caused by the central route in that area. However, the other central route problems apply to it as well as extra ones caused by the western route south of Medway Rivulet.

Properties fronting the Hume Highway in that section would suffer disturbance of varying severity, and access adjustments to properties would have to be made. Some 68 properties would be affected along the total length of this route.

Western route: Whereas economic disturbance is a major factor at the northern end of the eastern routes, it becomes significant at the southern end of the western route. (This means that it is significant at both ends of the modified central route). A major problem at the northern end of the western route is environmental. The

nature of the terrain through which the freeway would pass to the west of Mittagong poses two problems. Firstly, the Australian Museum has expressed some concern about faunal habitat in the area and the second is the extra cost that would be incurred as a result of constructing the freeway across such rugged terrain.

To span Gibbergunyah Creek, a bridge 200 metres long might have to be constructed 60 metres above the creek bed—a costly exercise, and it would cross a mining lease near Mount Alexander.

As the route passes west of Berrima to avoid all disturbance of historic material, it would still pass through the Nature Reserve proposed for Berrima by the National Parks and Wildlife Service and through the western tip of the Berrima Visual Catchment Area proposed by the National Trust. (The Visual Catchment Area refers to the view in all directions from any part of the historic town of Berrima). South of Medway Rivulet the route would cross a mining lease and run through two wildlife refuges in the vicinity of Hoddles Cross Roads. At Welby, northwest of Mittagong, the route would sever an area classified as rural residential as it skirted the developed urban core.

The southern portion of the route would pass through country classified as cleared agricultural land, and some disturbance to rural properties there would be inevitable and involve access adjustments.

In total, 61 properties along the length of this route would be affected, but this figure (as with those for the other routes) is difficult to evaluate without considering the size and use of each property, as well as the nature of the likely effect.

An overview

A brief summary of a highly complex situation might state that the eastern routes tend to fall foul of existing and planned urban and rural development more than the western route which crosses a great deal of undeveloped but environmentally important terrain, as well as land already in agricultural use. Preliminary estimates indicate the eastern routes would cost less to construct because the terrain does not present the engineering difficulties presented by the western route which, however, could be constructed in several stages and opened to traffic progressively.

The modified central route could also be constructed in two stages. Lastly, from

the point of view of the total road network, the eastern route offers more benefits than any of the others, while the western route provides no additional benefits to traffic using the Illawarra Highway or other main roads in the area.

Involving the people

Having gathered a tremendous mass of information and selected four alternative routes, the Department was faced with the prospect of presenting the alternatives and the relevant information to the people of the Mittagong and Wingecarribee Shires and the Bowral Municipality. The Department's duty has been to handle all the issues involved as objectively as possible—weighing social, economic, environmental and engineering debits and credits in the balance and offering a number of possible solutions to a complex problem.

The effects of a “no new construction” alternative needed consideration, too. The final solution, to be the best one, should offer the greatest range of benefits to the greatest number of people (local and non-local), consistent with causing the least disturbance to the individuals and groups affected—most of whom would be local residents. To ensure that all instances of potential disturbance—of whatever kind—would be known and taken into account in deciding the by-pass route, the Department organised a travelling exhibition designed to present the alternative routes against their geographical and economic backgrounds. The responses and reactions of individuals and groups to the information presented as a result of the Department's effort will assist in the evaluation of the alternatives.

The travelling exhibition

Most of the information was presented graphically. A very large mosaic made up of coloured aerial photographs was mounted in a standing wooden frame.

It showed topographical features, existing roads and buildings and had the four alternative routes, marked in distinctive colours, superimposed on it. Measuring 1.7 m deep x 4.2 m wide it was large enough to allow several people to examine it at one time.

Besides the aerial mosaic, a series of ten smaller wall maps of the area gave other kinds of information such as contours, physical constraints, human and natural environmental areas, predictions of

traffic flow, planned development and statutory land use zonings. These had been prepared not only to assist Departmental officers in the planning process but also for interested residents to assess the effects of the proposals and determine their attitudes to route preferences.

In addition, a specially-prepared brochure displaying a map marked with the alternative routes and a summary of the pros and cons of each route was available to all interested persons. At the invitation of each Council, the exhibition was presented to the public at Mittagong, Bowral and Moss Vale Town Halls at various times during November, 1977. At each centre, a member of the Department's engineering or planning staff was on hand to answer questions from people attending.

A fifth alternative added

As a result of the public airing of the question and the debate it generated, a fifth route was suggested which seems to have sufficient merit as an alternative to warrant consideration.

It is a modification of the eastern route, leaving that route north of its crossing with the Illawarra Highway and joining the green and orange routes just south of the Hoddles Cross Roads junction with the Hume Highway. In doing this, it automatically by-passes Moss Vale and Sutton Forest, which is one of the advantages claimed for it. Another advantage is a reduction in property disturbance in comparison with the other eastern routes. This fifth alternative is shown on the map on pages 50–51 as a broken blue line.

Public meetings

On 10 November, 1977, one of the biggest local public meetings in recent memory was held in the Mittagong Memorial Hall. It was called by the Mittagong Shire Council to discuss the freeway by-pass proposals and it was to be the first of three such meetings in the area. The others were held at Moss Vale on 15 November, and at Bowral on 21 November.

At the Mittagong meeting three of the Department's senior engineers gave addresses and answered questions. A vote was taken in which residents present expressed their preference for the various alternative routes. On this occasion the vote was two to one in favour of the western route, but only half of the people there voted.

However, Mr H. B. Korff, the Department's Chief Engineer (Rural), stressed at the first Mittagong meeting that the route finally decided on jointly by State and Commonwealth authorities would not be selected on district preferences. The main objective of the exercise was the gathering of information relating to peoples' attitudes to certain routes, so that the ultimate decision could take account of this as well as other relevant factors.

Decisions, decisions, decisions

One of the questions most often asked of the Department's staff since the exercise began is "When will a decision be made?" This is still a burning issue—and naturally so—since all sorts of local decisions are dependent on that decision. Well aware of this, the Department has further detailed investigation well in hand and is intent on making its final assessment as quickly as possible.

All the constructive comments received on the benefits and impact of each route will assist the Department to determine what steps, if any, can be taken to reduce any adverse effects. It can then compare all the options, re-assess their impact and select the route which, while meeting the requirements of the freeway, suits, as far as practicable, the needs of the whole community.

It may be pertinent to point out here that uncomplicated decisions seldom become social issues which lead to public debate and awareness. The people of the Mittagong-Berrima-Bowral-Moss Vale district now know a lot more about the problems and advantages of major road construction than many other people in New South Wales. And this brings us back to the idea mentioned at the beginning of this article—that roads are for people and that people can and should be conscientious consumers of roads.

Although it will probably be quite a few years before traffic flows on the F5 around (rather than through) Mittagong and Berrima, it will be well worthwhile when it does. This by-pass will mean that the hazards and disadvantages of through traffic will be removed from the main streets of these centres.

They will then be able to regain their appeal both as attractive tourist centres and as focal points for local community business and recreation. Gone will be the constant noise of heavy vehicles and the dangers brought by impatient

through traffic hurrying through the townships day and night. The flow of traffic will then become a reflection of the area's cultural, historical, tourist and commercial appeal rather than of the geographical position of the towns astride one of the State's major interstate routes.

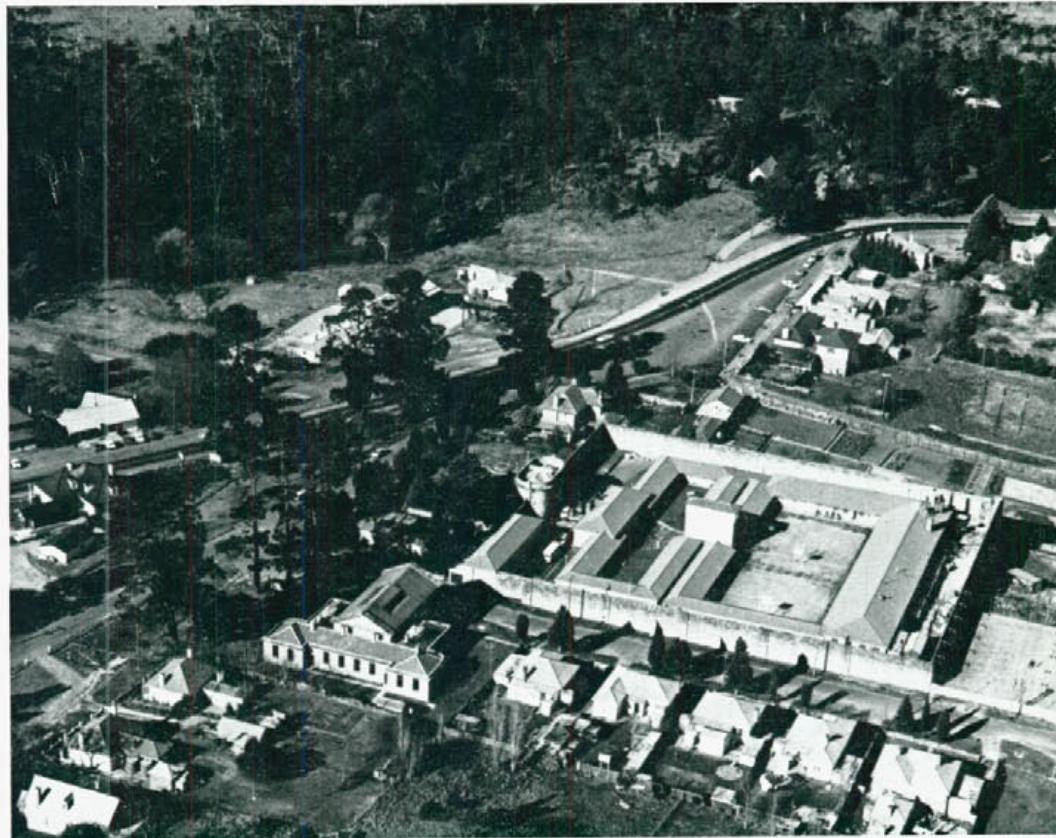
Even though a decision on the alternatives is unlikely for some time, this Departmental experiment has already chalked up some notable achievements. Although by no means the first time public opinion has been actively sought by the Department, this exercise has brought roads to the people in a bigger, more organised way, making people more aware of roads as a service to them, and enabling individual and group voices to be heard and taken into account in the decision-making process.

It has also taught the Department a great deal about the organising and running of such exercises.

Notable, too, is the commendation of the Department's approach to the whole problem by bodies such as the three Councils directly involved. Comments have also been made by many people appreciating the opportunity for individuals to participate in discussion and express their views on a matter of considerable local concern.

All in all, considering that this was a major Departmental effort to present proposals for a road location to the public, it could well be said that, whatever the decision is, the people of the district learned a lot more about roads and the Department learned a lot more about people as a result of the experience. ●

The Hume Highway as it passes through Berrima, showing the old court-house and gaol complex.



The June, 1977 (Vol. 42, No. 4), issue of "Main Roads" carries the most recent article on the F5. The September, 1976 (Vol. 42, No. 1), issue listed, on page 4, all articles on the F5 published previously. In the same issue an environmental impact study on the Campbelltown to Yanderra section of the F5 is examined.

The leaflet mentioned in our article, above, which was prepared in the Department to assist in the understanding of geographical and social issues connected with the F5 by-pass of Mittagong, is available to anybody requiring it. Call in to the Public Relations Section, Third Floor, Head Office in Sydney, or phone 2 0933 and we'll send you one.

The display material used in the travelling exhibition—including the large aerial mosaic—is now in our model room on the third floor at Head Office. Interested persons are welcome to see it there.

"Main Roads" will naturally be following up the F5 by-pass story, so watch for further information when a decision on the route has been made.

ANY OLD IRON ...



In December, 1976, while excavating with a bulldozer in Day Street, as part of the construction of the North Western Freeway across Darling Harbour, some Departmental workmen found a section of a very old boiler.

The Department's Area Engineer for the North Western Freeway Construction, Mr M. Underhill took the initiative to seek an opinion from the Museum of Applied Arts and Sciences on the unusually shaped section. His telephoned description of the relic indicated that the boiler section was of very early manufacture and that an inspection was indeed warranted.

The Keeper of Transport and Engineering at the Museum (Mr N. Harwood) subsequently summed it up succinctly by saying . . . "A Civil Engineer with a keen sense of history may well be responsible for the industrial archaeology find of the century".

The boiler section has been identified as an end section of a waggon boiler of the type introduced by Boulton & Watt before the end of the 18th century. A waggon boiler is a long rectangular vessel with a rounded top, like that of a carrier's waggon of the horse age, from which it derives its name.

During the ensuing years Boulton & Watt manufactured a wide range of low-pressure waggon boilers for land use and the shape and dimensions of the boiler section unearthed in Day Street are almost identical to those of a Boulton & Watt 20 hp waggon boiler illustrated in John Bourne's 1846 publication *A Treatise on the Steam Engine*.

The boiler is constructed on three-eighths inch thick iron plates which are pre-shaped and rivetted to each other to form the pressure vessel. The torn boiler plates on the recovered section could be the result of a boiler explosion. This theory is yet to be checked through press reports of the time, as it is likely

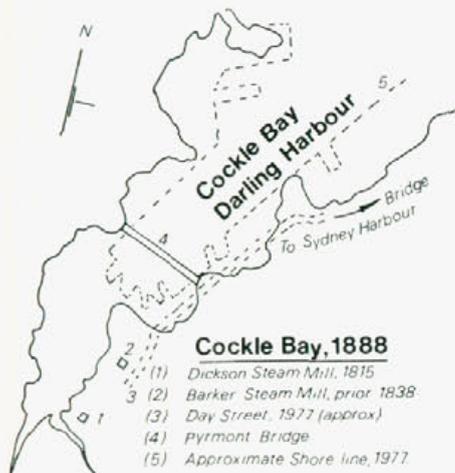
VALUABLE INDUSTRIAL RELIC

UNCOVERED AT NORTH WESTERN FREEWAY SITE

that a boiler explosion in the early days of the colony would have featured in the newspapers of the colony.

On checking the location of the discarded boiler section against early plans of Sydney, it is obvious that it was dumped in Darling Harbour before or during the reclamation of the foreshores. This will also be the subject of further research by the Museum of Applied Arts and Sciences.

It would seem logical to assume that the boiler came from a nearby steam mill.



The *Sydney Gazette* reports that the steam-powered flour mill established by John Dickson near the headwaters of Cockle Bay (now Darling Harbour) was set in motion by Governor Lachlan Macquarie on 29 May, 1815. It is also fact that John Dickson's son-in-law, Thomas Barker, erected another steam-powered mill on the foreshores of Darling Harbour, near Goulburn Street, some twelve years later.

It is claimed that John Dickson imported a Boulton & Watt rotative beam engine

to drive his mill and it is conceivable that he imported a Boulton & Watt wagon boiler at the same time.

However, more research is required to establish the size or horsepower of the engine as this is directly related to the horsepower potential of the boiler. The type and horsepower of Barker's engine is not known at this juncture but a similar wagon boiler could have been employed.

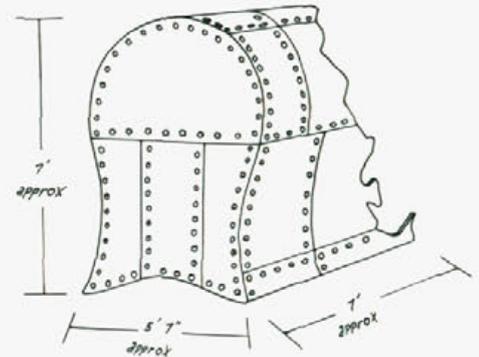
The only other wagon boiler known to exist in New South Wales has been preserved at the Marsden Steam Museum, Goulburn. Originally, it was installed at the Goulburn Brewery in 1837 and provided steam for driving a Maudsley beam engine which has been preserved by the Museum of Applied Arts and Sciences in Sydney. (Visitors may inspect this engine on application to the Chief Attendant).

The Day Street boiler appears to be of earlier manufacture than the Goulburn boiler and, if this assumption proves to be correct, it would indicate that the Day Street boiler came to Australia prior to 1837 and in all probability was installed in either Dickson's or Barker's mill. In any event, this type of low pressure boiler would be unlikely to have been installed after 1840 as by this date more efficient high pressure boilers had generally superseded the earlier wagon boilers.

Although the origin of the boiler has still not been determined, this relic is considered to be an historically important reminder of Sydney's industrial past. ●

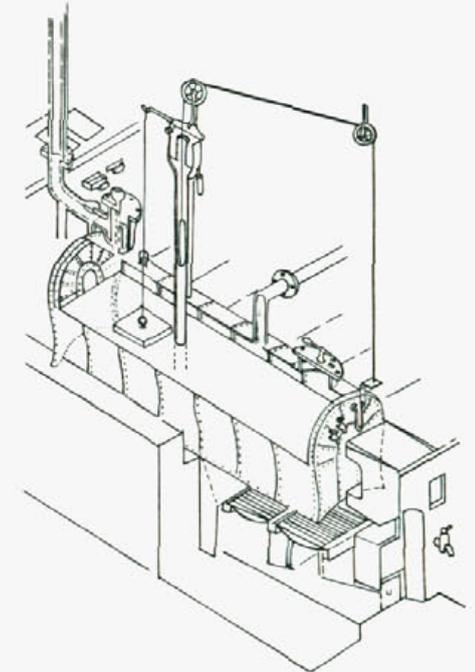
This article has been adapted from a paper published by Mr N. Harwood, Keeper of Transport and Engineering, Museum of Applied Arts and Sciences in the June, 1977 (Vol. 7, No. 2) Newsletter of the "Australian Society for Historical Archaeology".

It is satisfying to note that the editorial in that issue concluded "Let us . . . be grateful that some Government Departments and



Above: Sketch of end section of boiler, as found. After Harwood, *Aust. Soc. for Historical Archaeology Newsletter*, Vol. 7, No. 2, June 1977, page 7.

Below: Sketch of operation of a Boulton & Watt 20hp wagon boiler. After Bourne, J., *A Treatise on the Steam Engine*, 1846, page 33.



individual public servants do care about Australia's cultural, historical and archaeological heritage".

An article in the March, 1977 issue of "Main Roads", Vol. 42, No. 3, documents the use of divers to clean the deep, water-filled rock socket foundations for the piles of the viaduct structures which will traverse areas reclaimed from Darling Harbour.

ANZAC PARADE 1917 — 1977

SIXTY YEARS LATER



Sixty years ago this year, on 15 March, 1917, Anzac Parade in Sydney was officially opened to traffic.

An article in the Sydney Morning Herald of 16 March, 1917 carried the photograph, which is reproduced on the left, and this report.

"The new stone obelisk at the head of Anzac-parade, Moore Park, was the scene of a brief ceremony yesterday at noon, when the thoroughfare was formally declared open and the bronze lettering on the pillar unveiled by the Lady Mayoress (Mrs Meagher). Those present included the Lord Mayor, the town clerk, (Mr Nesbitt), assistant town clerk (Mr Layton), Aldermen Walker, McElhone, Vernon and Barlow. The city surveyor (Mr A. H. Brigg), under whose supervision the construction of the new roadway was carried out; Mr R. H. Brodrick, who designed the obelisk; the Mayor of Randwick (Alderman J. Fenton), the town clerk of Randwick (Mr Percival), and Mr C. W. Cropper, secretary of the Australian Jockey Club, which body contributed £3,000 towards the cost the new thoroughfare.

The Lord Mayor made a short speech, dealing with the history of the locality from 1811, when Moore Park was dedicated to the citizens. The new road, formerly known as Randwick-road, cost in all £15,374, and is 63 ft wide, including the flower bed running along the centre. Alderman Meagher said that eventually there would be a continuous thoroughfare over six miles long from Moore Park right to the La Perouse monument".

On the same morning, the opening was also described by the Daily Telegraph, which reported that:

"At the head of the roadway stands a monument in memory of those after whom the road has been christened. The name is made out in large sized letters of bronze in Roman type, and the year 1917 is encircled in a wreath of bronze near the top of the monument".

The Lord Mayor was reported as saying that Anzac Parade would eventually extend to:

"... the sacred spot where Captain Cook first set foot on Australian soil." Whether this meant Kurnell or mistakenly referred to La Perouse is not quite certain.

The photograph of the obelisk on the right is from a booklet published in 1926 by the Municipal Council of Sydney. Carriages, horsed and horseless, can be distinguished on the road.

The plaque on the obelisk reads: This remodelled roadway was officially opened by the Lady Mayoress of Sydney, Mrs R. D. Meagher, 15th March, 1917. The Rt. Hon. R. D. Meagher, M.L.A., Speaker, Lord Mayor of Sydney; R. H. Brodrick, City Architect; A. H. Brigg, City Surveyor; Thomas H. Nesbitt, Town Clerk.

From the book (sub-titled "Vade Medum") on the City of Sydney published by the Sydney Municipal Council in 1926, we learn that the Lord Mayor in 1916 and 1917 was the Right Hon. Richard D. Meagher, who was also Speaker of the Legislative Assembly from December, 1913 to April, 1917. The book also tells us that the designer of the obelisk, Mr Robert H. Brodrick, F.I.A. N.S.W., was City Architect and City Building Surveyor in 1926.

In this book, Anzac Parade is described as *"The main artery for traffic to Randwick and the adjoining suburbs and the Randwick and Kensington Racecourses".* Passing through Moore Park, it was *"planted on either side with Moreton Bay figtrees, Norfolk Island pines, stone pines, etc."*

Anzac Parade extends approximately 13 km from Moore Park Road to La Perouse. It has two formal classifications—being part of Main Road 171 to Kingsford Junction, then Secondary Road 2074 from there (via Maroubra and Malabar Junctions) to Yarra Junction, and then MR 171 again to La Perouse. The annual average daily traffic volumes (i.e., total both ways) range from 53 930 vehicles at Moore Park north of Dacey Avenue to 1 760 at La Perouse (1975 figures). It is not only a very important thoroughfare in Sydney's road network but is still among the most significant roads historically, linking as it does the memory or the Anzacs of the First World War with the earlier memory of the founding of European settlement in Australia.

If at Botany Bay in 1770 a new Australian tradition was born, then on the shores of Gallipoli in 1915 the soldiers of the Australian and New Zealand Army Corps—or the Anzacs as they became known—certainly played a major part in the

perpetuation of that tradition. The term Anzac had only been coined as a code name for the Corps in January, 1915, but on 25 April, 1915 when the Anzacs landed on Gallipoli, the bay where they put ashore was named Anzac Cove.

Here, having gained a precarious foothold in the nearby hills, the Anzacs with other Empire units held their positions against the entrenched Turkish forces under terrible conditions until, to end the stalemate, it was decided to withdraw from the peninsula. The evacuation took place in December, 1915 and January, 1916 with hardly any loss of life . . . but over 8 500 Australians had already been killed in this exercise.

The bravery and determination of the Australian and New Zealand forces captured the imagination of both nations and in an aura of patriotic fervour and pride, this unsuccessful venture became the symbol of national manhood and extreme courage. So, less than two years after the landing, the remodelled Randwick Road was named Anzac Parade and the monument was dedicated to the memory of the original Anzacs. Thus, this obelisk predates both the Cenotaph in Martin Place (dedicated in 1927) and the Anzac Memorial in Hyde Park (completed in 1934).

In the sixty years since, the image of the Anzacs has widened to include other men in other battles and in other wars—many of whom paid the supreme sacrifice in defending our continuing freedom. And yet, of the thousands of drivers and passengers who pass this obelisk each day—or drive down the first impressive length of this wide tree-lined park-surrounded avenue—how few are aware of or remember the story behind the name?

Lest we forget. ●]



BLINKERS AT BURWOOD



The photograph shows how the special screen blocks a train driver's view of the road traffic signals (they can be seen level with the eaves of the house) until he has passed the critical point where confusion could occur.

SPECIAL SCREEN HELPS TRAIN DRIVERS GET THEIR SIGNALS STRAIGHT

Back in the "good old days" of horses and carts, foot-power and the occasional pumpkin coach, getting from point A to point B was pretty simple—arduous, but simple and generally fairly safe. Getting trampled by a runaway horse was just about the only traffic danger. After all, horses usually have more sense than to run into each other. So do most people, at least when they're afoot. Things did not start to get complicated until after the invention of the railway and the motor vehicle, which although designed to make life easy, have been the source of many a frustration, especially when they have had to exist side by side.

Take the case of the traffic signals at the intersection of Wentworth Road, Railway Parade and Morwick Street, Burwood and the Public Transport Commission's signals on the adjacent train tracks. Before the traffic lights were brought into operation, the usual preliminary night testing was carried out in conjunction with engineers of the P.T.C.'s Rail Division. This testing revealed a probable source of confusion

to train drivers and so the "switching on" of the signals for general use had to be delayed.

It must have been bewildering to Burwood residents to have had a set of traffic signals which seemed to be serving no other purpose than decoration. It was particularly frustrating to drivers, as this intersection did not have a good accident record and, with poor sight distance, it certainly met all the prerequisites for the installation of a set of signals. But the problem that arose was an unusual one and a potentially dangerous one.

Because of the location of the intersection, westbound train drivers on their approach to a series of rail signalling lamps (downtrack of a curved section west of Burwood Railway Station) could also clearly see the street traffic signals ahead of them and could easily mistake them for their own signals, especially at night or in bad weather.

Attempts to shield the lights of the road signals and aim them only at the road

users by using extended cowls and louvres were unsuccessful—the train drivers still might not have known whether they should have been coming or "slowing". The solution adopted was the building of a screen fence on the northern boundary of Railway Parade between Stanley and Oxford Streets to block the train drivers' view of the traffic signals.

The result was an aluminium screen fence, consisting of two rows of vertical slats, about 80 metres long and 5.5 metres high, painted dark green and supported on galvanised steel posts and rails. Costing approximately \$25,000, the screen was designed and fabricated by the Department's Central Workshop at Granville, while its posts and rails were manufactured by a sub-contractor. The screen is now maintained by the Department. Once the screen was found to be completely effective in eliminating any possibility of confusion between the signals, the traffic lights were placed in operation at 3 p.m., on 5 August, 1977. ●

TENDERS ACCEPTED BY THE DEPARTMENT OF MAIN ROADS

The following tenders (in excess of \$20,000) for road and bridge works were accepted by the Department for the three months ended 30 September, 1977.

Road No.	Work or Service	Name of Successful Tenderer	Amount
F5 South Western Freeway	Shire of Mittagong. Construction of new twin bridges over the Main Southern Railway and on-loading ramp at Yanderra—102.6 km south of Sydney.	Leewil Constructions Pty Ltd	\$ 554,929.90
F5 South Western Freeway	Shire of Wollondilly. Construction of new twin bridges over Moolgun Creek 73.1 km south of Sydney.	White Industries Ltd	3,239,253.00
State Highway No. 1	Princes Highway. Shire of Imlay. Construction of new bridge over Kingswood Creek 6.8 km south of Bega.	Mr N. J. McIntosh	160,000.00
State Highway No. 2	Hume Highway. Municipality of Yass. Supply, delivery and laying of asphaltic concrete on approaches and deck of new bridge over Yass River.	Allen Bros	31,836.00
State Highway No. 2	Hume Highway. Municipality of Yass. Supply and delivery of up to 500 m ³ of readymix concrete for new bridge over Yass River at Yass.	Allan Fisher & Sons	23,337.50
State Highways No. 2 & No. 15	Hume Highway and Barton Highway. Various Council areas. Supply of premix for National Highway maintenance and improvements.	Department of Construction	30,150.00
State Highways No. 2 & No. 15	Hume Highway and Barton Highway. Various Council areas. Supply of premix for National Highway construction and maintenance.	Department of Construction	30,075.00
State Highway No. 5	Great Western Highway. City of Greater Lithgow. Pressure grouting of concrete pavement 3.0 km east of Lithgow to 2.0 km west of Lithgow.	Concrete Industries (Monier)	45,700.00
State Highway No. 5	Great Western Highway. City of Greater Lithgow. Pressure grouting of concrete pavement at the new intersection with Main Road No. 531 and repair of broken pavement 2.0 km west of Lithgow.	Concrete Industries (Monier)	22,120.00
State Highway No. 5	Great Western Highway. City of Greater Lithgow. Supply and lay asphaltic concrete at approaches to Marrangaroo bridge 5.8 km west of Lithgow.	Bituminous Pavements Pty Ltd	20,565.00
State Highway No. 5 & Main Road No. 184	Great Western Highway and Bells Line of Road. City of Blue Mountains and City of Greater Lithgow. Supply and delivery of 14 mm and 20 mm precoated sealing aggregate to various sites.	Pioneer Concrete (N.S.W.) Pty Ltd.	24,937.00
State Highway No. 9	New England Highway. City of Maitland. Supply and lay up to 1 250 tonnes of 10 mm dense graded asphalt concrete to extension of dual carriageways between 25.9 km and 28.2 km west of Newcastle.	Bitupave Ltd	39,725.00
State Highway No. 9	New England Highway. Shire of Singleton. Supply and delivery of up to 18 000 m ³ of fill material to construction site between Mudies Creek and Kelso Street, 38.9 km to 44.4 km west of Maitland.	Les Russell & Sons Pty Ltd	36,900.00
State Highway No. 10	Pacific Highway. Shire of Hastings. Supply, heat and spray R. 90 bitumen from 96.0 km to 102.0 km north of Taree.	Shorncliffe Pty Ltd	25,450.00
State Highway No. 10	Pacific Highway. Shire of Kempsey. Supply, heat and spray R. 90 bitumen from 17.0 km south of Kempsey to 33.0 km north of Kempsey.	Shorncliffe Pty Ltd	42,530.00
State Highway No. 10	Pacific Highway. Shire of Manning. Supply, heat and spray R. 90 bitumen from 20.0 km south of Taree to 25.0 km north of Taree.	Shorncliffe Pty Ltd	40,330.00
State Highway No. 10	Pacific Highway. Shire of Hastings. Supply, heat and spray R. 90 bitumen from 66.0 km north of Taree to 17.0 km south of Kempsey.	Shorncliffe Pty Ltd	39,180.00
State Highway No. 10	Pacific Highway. Shire of Manning. Supply, heat and spray R. 90 bitumen from 37.0 km to 25.0 km south of Taree.	Shorncliffe Pty Ltd	35,560.00
State Highway No. 10	Pacific Highway. Shire of Nambucca. Supply, heat and spray R. 90 bitumen from 33.0 km north of Kempsey to 25.0 km south of Macksville.	Shorncliffe Pty Ltd	44,950.00
State Highway No. 10	Pacific Highway. Shires of Hastings and Manning. Supply, heat and spray R. 90 bitumen from 20.0 km to 66.0 km north of Taree.	Shorncliffe Pty Ltd	43,286.00
State Highway No. 10	Pacific Highway. Supply and delivery of up to 1 600 tonnes of hot mixed cold laid bituminous plant mix.	Bitupave Ltd	40,896.00
State Highway No. 10	Pacific Highway. Supply, heat, haul and spray of up to 1 250 000 tonnes of R. 90 bitumen.	Boral Resources (Qld.) Pty Ltd	250,600.00
State Highways No. 10 & No. 12	Pacific Highway and Gwydir Highway. Supply and delivery of up to 1 700 tonnes of hot mixed cold laid bituminous plant mix.	Bitupave Ltd	53,377.00
State Highways No. 10 & No. 12	Pacific Highway and Gwydir Highway. Supply, heat haul and spray of up to 450 000 tonnes of R.90 bitumen.	Shorncliffe Pty Ltd	109,380.00
State Highways No. 10 & No. 12	Supply, heat, haul and spray of up to 100 000 tonnes of R. 90 bitumen.	Boral Resources (Qld) Pty Ltd	24,146.50

Road No.	Work or Service	Name of Successful Tenderer	Amount
State Highway No. 11	Oxley Highway. Shire of Hastings. Supply, heat and spray R. 90 bitumen from Port Macquarie to 80.0 km west of Port Macquarie.	Shorncliffe Pty Ltd	\$ 44,440.00
State Highway No. 14	Sturt Highway. Shire of Mitchell. Construction of 25 cell 1.8 m x 0.6 m precast concrete box culvert with cast-in-situ slab wingwalls (excluding precast concrete crown sections) at 51.4 km west of Wagga Wagga.	Siebels Concrete Constructions Pty Ltd	55,546.40
State Highway No. 14	Sturt Highway. Shire of Kyeamba. Construction of a 3 span bridge, 24.0 m long, 9.2 m between kerbs over Kyeamba Creek, 14.0 km east of Wagga Wagga and a 210.0 m long bridge over Kyeamba Creek flood plain 13.4 km east of Wagga Wagga.	Siebels Concrete Constructions Pty Ltd	432,853.00
State Highway No. 19	Monaro Highway. Shire of Monaro. Construction of new bridge over Bredbo River at Bredbo.	Mr N. J. McIntosh	390,000.00
Main Road No. 170	Municipality of Botany. Supply and delivery of 85 pre-cast reinforced concrete box culvert units for 3 utility culverts on Botany Road between Foreshore Road and McCauley Street, Botany.	Rescrete Industries Pty Ltd	36,070.00
Main Road No. 172	Municipality of Woollahra. Manufacture, delivery and placing of pre-cast concrete girders for new viaduct between Vernon and Adelaide Sts, Bondi Junction.	Transbridge Pty Ltd	1,246,140.00
Main Roads No. 184 & No. 516.	City of Blue Mountains and City of Greater Lithgow. Removal of existing cable fencing and replacement with new chainwire fencing.	N. & R. McCook and R. & S. Calvert.	21,528.00
County Road No. 5037	Shire of Baulkham Hills. New overpass bridge structure at North Rocks Road, Northmead.	Prestressed Concrete (Aust.) Pty Ltd.	45,303.00

TENDERS ACCEPTED BY COUNCILS

The following tenders (in excess of \$20,000) for road and bridge works were accepted by Councils for the three months ended 30 September, 1977.

Council	Road No.	Work or Service	Name of Successful Tenderer	Amount
Bellingen Colo	Various M.R. 181	Resealing Works. Webbs Creek Ferry Service at Hawkesbury River.	Shorncliffe Pty Ltd. W. E. White	\$ 26,000.00 48,380 p.a. for 3 years
Colo	M.R. 182	Sackville Ferry Service over Hawkesbury River.	J. O'Toole	34,269 p.a. for 3 years
Maitland Nundle	Woodberry Road. M.R. 106	Construction of single span reinforced concrete bridge over Greenways Creek, 3.2 km south of M.R. 104. Construction of bridge over Nundle Creek 2.98 km west of Nundle.	Moylan & Sharp Constructions Pty Ltd. A. R. Dickinson Constructions.	58,954.00 91,743.00
Penrith	M.R. 155	Construction of new bridge over Surveyors Creek, Penrith.	Smithfield Contractors	139,029.00
Shellharbour	M.R. 522	Manufacture and delivery of precast concrete bridge units for widening and duplication of bridge over unnamed creek at Mary Street, Shellharbour.	Humes Limited	29,295.00
Singleton	M.R. 213	Reconstruction of Piers 1, 2 and 3 at bridge over Hunter River at Bowman's Crossing, 44.3 km west of Singleton.	Civilbuild Pty Ltd	102,538.80
Snowy River Wakool	Developmental Road 1297 M.R. 319	Construction of bridge over Pinch River at 10.1 km south of Jacobs River. Construction of new bridge over Barber Creek, 8.0 km north of Barham.	Nelmac Pty Ltd Nelmac Pty Ltd	132,146.50 112,638.70
Wakool Wakool Walcha	Various Various Developmental Road 1317	Supply of aggregate Bitumen sealing Construction of bridge over Ingleba Creek, 31.4 km south of Walcha.	Lake Boga Quarries Allen Bros A. R. Dickinson Constructions	30,000.00 80,000.00 88,797.00
Wollondilly	M.R. 177	Construction of passing lane 2.4 km to 4 km east of Appin.	E. E. Emmett & Sons Pty Ltd	99,243.00
Wollongong	M.R. 295	Construction of footbridge in connection with construction of railway overbridge and approaches at Port Kembla North railway station.	The Hornibrook Group	74,772.00
Wollongong	M.R. 186	Construction of crib-block retaining wall between Allan and Sprint Streets on Mt Keira Road.	Fred Berridge Constructions	29,365.70

MAIN ROADS STANDARD SPECIFICATIONS

Note: Imperial drawings are prefixed by letter A, metric drawings by the letters SD, instructions are so described, all other items are specifications.

ROAD SURVEY AND DESIGN	Form No.
Design of two-lane rural roads (Instruction—1964)	355
Data for design of two-lane rural roads (1973)	892 (Metric)
Flat country cross sections—bitumen sealed pavement (Instruction—1972)	A 6132
Plan and longsection—Two lane rural roads	SD 6215
Standard cross sections for bitumen surfaced two-lane rural roads (1973)	SD 6056

URBAN DRAINAGE

Concrete converter	A 1418
Concrete work other than bridges	738 (Metric)
Design of subsoil and subgrade drainage (Instruction—1973)	513 (Metric)
Gully grating (1969)	A 190
Gully pit with grating	A 1042
With kerb inlet only	A 1043
With grating and extended kerb inlet	A 1352
With extended kerb inlet only	A 1353
With grating for mountable kerb	A 4832
Kerb and gutter shapes (1975)	SD 6246
Perambulator ramp	A 3491
Vehicle gutter crossings (1974)	SD 6247
Waterway calculations for urban drainage (Instruction—1963)	371B

CULVERTS

(a) Cast in place reinforced concrete box culverts—	
Box culverts with wearing surface	SD 6270
Single cell box culvert under fill from 1 m	SD 6271
Single cell box culvert under fill from 0.3 to 1 m	SD 6272
Multiple cell box culvert under fill from 1 m	SD 6273
Multiple cell box culvert under fill from 0.3 to 1 m	SD 6274
(b) Precast reinforced concrete box culverts—	
Erection of precast concrete box culverts (1975)	138B (Metric)
Supply of precast concrete box culverts (1975)	138A (Metric)
(c) Pipe culverts—	
Construction of concrete pipe culverts (1974)	25 (Metric)
Design of concrete pipe culverts (1974)	25A (Metric)
Headwalls for pipe culverts—	
Single row—	
600, 750, 900 mm dia.	SD 139
375, 450, 525 mm dia.	SD 143
1 050 mm dia.	SD 172
1 200 mm dia.	SD 173
1 350 mm dia.	SD 174
1 500 mm dia.	SD 175
1 800 mm dia.	SD 177
Supply and laying of asbestos cement drainage pipes (1972)	861

BRIDGES

Concrete work for bridges (1976)	350 (Metric)
Data for bridge design (1973)	18 (Metric)
Erection of precast, prestressed concrete bridge units and planks (1975)	557 (Metric)
Erection of precast, prestressed concrete piles (1976)	558 (Metric)
Erection of precast, prestressed concrete bridge girders	561 (Metric)
Excavation for bridges (1974)	563 (Metric)
Extermination of termites in bridges (Instruction—1958)	326
Erection of structural steelwork (1975)	262 (Metric)
Manufacture of precast or cast-in-situ, prestressed concrete bridge members (1976)	556 (Metric)
Manufacture of elastomeric bearings for bridge units and girders (1967)	562
Preparation and pretreatment of metal surfaces prior to protective coating or painting—Method Selection Guide	1032 (Metric)
Prestressed concrete bridge drawings—	
(a) Prestressed concrete piles—	
14 in octagonal—45 tons	A 4943
16 in octagonal—50 tons	A 4944
Reinforced concrete piles 35 and 45 tons (1963)	A 1207-8
Reinforced concrete piles (precast) for bridge foundations (1976)	564 (Metric)
Superstructure for bridges	568
Supply of high strength steel bolts (1976)	261 (Metric)
Supply of ready mixed concrete (for bridgeworks and roadworks) (1977)	895 (Metric)
Timber for bridges (1976)	140 (Metric)
Waterway diagram (0 to 200 acres)	A 26

BITUMINOUS SURFACES

Bituminous emulsions (cationic) (1973)	304 (Metric)
Bituminous surfacing daily record (1974)	400 (Metric)
Bituminous surfacing job summary (1974)	1011 (Metric)
Cutback chart for bitumen seal coats (1973)	466 (Metric)
Performance requirements for mechanical sprayers	272 (Metric)
Sprayed bitumen surfacing (1974)	93 (Metric)
Sprayer loading slip (1974)	401 (Metric)
Supply and spraying of bitumen (1973)	898 (Metric)
Supply and delivery of bitumen emulsion (1977)	305 (Metric)
Supply and delivery of residual bitumen (1977)	337 (Metric)
Supply and delivery of aggregate for use in bituminous plant mix (1975)	952 (Metric)
Supply and delivery of asphaltic concrete (1975)	953 (Metric)
Supply and laying of asphaltic concrete (1975)	612 (Metric)
Supply and laying of dense graded tar plant mix (1975)	954 (Metric)
Supply and delivery of dense graded tar plant mix (1975)	955 (Metric)
Supply and laying of open graded bituminous plant mix (1975)	956 (Metric)
Supply and delivery of open graded bituminous plant mix (1975)	957 (Metric)
Supply of prepared cutback bitumen for sealing purposes (1966)	740
Supply and delivery of cover aggregate for sealing and resealing with bitumen (1975)	351 (Metric)
Tar for plant mix, supply and delivery (1976)	870 (Metric)

FENCING

Chain wire guard fencing—erection (1974)	144 (Metric)
Chain wire—supply—(1974)	SD 149
Corrugated steel guard rail—supply—(1976)	132 (Metric)
Corrugated steel guard rail—erection (1976)	SD 5595
Corrugated steel guard rail—anchor plates (1976)	680 (Metric)
Corrugated steel guard rail—steel posts (1976)	SD 5829
Delineators for attachment to guard rails (1976)	SD 6264
Drawings: Sheep fence (1974)	SD 6277
Rabbit-proof fence (1974)	SD 6280
Cattle fence (1974)	SD 494
Floodgate (1974)	SD 498
"Manproof" pipe and chainwire boundary fence (1976)	SD 1705
Post and wire fencing (1974)	SD 316
Removal and re-erection of fencing (1974)	611 (Metric)
Tubular steel and hardwood post and rail fencing (1976)	SD 6278
Warrants for use of guard fences (Instruction—1973)	141 (Metric)
	224 (Metric)
	143 (Metric)
	SD 6284
	246 (Metric)

Form No.

Form No.

FORMATION, INCLUDING EARTHWORKS AND RURAL DRAINAGE

Corrugated PVC subsoil drainage pipe (1972)	907 (Metric)
Earthworks and formation including surface drainage (1976)	70 (Metric)
Installation of lateral drains (1974)	1013 (Metric)
Shoulders and table drains (1973)	827 (Metric)
Standard rubble retaining wall (1941)	A 114
Standard mass concrete retaining wall (1959)	A 4934
Subsoil drains (1973)	528 (Metric)
Waterway calculations for bridges and culverts (1976)*	371A (Metric)

PAVEMENTS

Cement concrete pavement (1960)	A 1147
Construction of natural gravel or crushed rock road pavement (bitumen surfaced) (1975)	743 (Metric)
Construction or resheeting of natural gravel or crushed rock road pavement (not bitumen surfaced) (1975)	800 (Metric)
Prefomed expansion joint fillers (1976)	610 (Metric)
Supply of natural gravel or crushed rock for road pavement (bitumen surfaces) (1975)	744 (Metric)
Supply of natural gravel or crushed rock for road pavement (not bitumen surfaced) (1975)	801 (Metric)
Supply of ready mixed concrete (1973)	609 (Metric)

ROADSIDE

Roadside fireplace (1974)	SD 4671
Roadside litter bin (1975)	SD 5841

TRAFFIC PROVISIONS AND PROTECTION

Control of traffic at Roads and Bridge-works (1975)	121 (Metric)
Guide posts—supply (1973)	252 (Metric)
Guide posts—erection (1973)	253 (Metric)
Manufacture of warning signs (1971)	682
Motor grids—24 ft (1964)	A 5770
Plastic guide posts (1972)	880
Plastic traffic cones—supply spec. (1976)	1045 (Metric)
Roadmarking paint (1966)	671

CONTRACTS

Bulk sum tender form, Council contract (1966)	39
Bulk sum contract form, Council contract (1975)	38
Cover sheet for specifications, Council contract	342
Caretaking and operating ferries	498
General conditions of contract, Council contract (1976)	24B
Schedule of quantities (1966)	64

MANUALS *

Manuals, No. 1—Plant; No. 3—Materials; No. 4—Roadside Trees; No. 5—Explosives; No. 6—Bridge Maintenance; No. 7—Road Maintenance.	
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D.M.R. BOOKLETS

Guide to Main Roads Administration, Duties of a Superintending Officer.	
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N.A.A.S.R.A. BOOKLETS

Guide to Publications and Policy of N.A.A.S.R.A.	
List of current publications.	

All standards may be purchased from the Plan Room at the Department's Head Office, 309 Castlereagh Street, Sydney. Single copies are free to Councils except those marked*. A charge will be made for sets of standards.

