

# MAIN ROADS

MARCH 1981



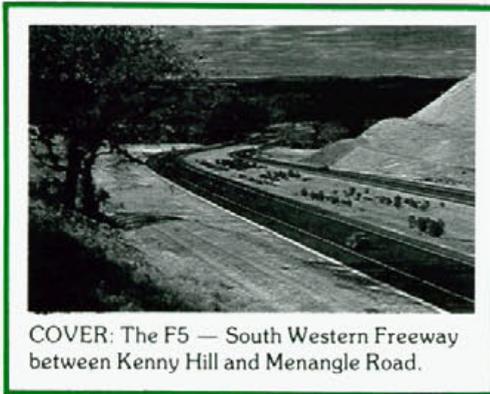
# MAIN ROADS

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COVER: The F5 — South Western Freeway  
between Kenny Hill and Menangle Road.

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## Dreams and Visions

From the fiery prophets of Biblical times, through the intriguing predictions of Nostradamus, to the remarkable models and plans of Leonardo da Vinci, it can be seen that dreams and visions are most valuable when they uncover some hidden truth or lead on to some new development.

In the early days of the Australian colony, Governor Phillip's vision of Sydney was for "principal streets ... two hundred feet wide". But other priorities intervened and the gap between that dream and the ensuing reality was wider than the intended streets ... for a female convict wrote soon after that "we now have two streets, if four rows of the most miserable huts you can possibly conceive of deserve that name". With all the resources of the infant settlement concentrated on crop production and the construction of huts and stores, the state of the roads was not to improve for quite some time.

However, the colony did have men whose vision in time coincided with reality. Some of their achievements were displayed at the "Bridging the Past" exhibition which we review on page 20. This exhibition brought to the present many of the great bridge-building visions of the past.

Dreams and visions do not always evaporate in the cold light of day and have often led to action being taken, as was the case with the story of Fisher's ghost. From the account on page 25 we learn that Mr. Farley's vision led to the discovery of Fred Fisher's body in a nearby creek ... and the subsequent arrest, trial and hanging of Fisher's neighbour George Worrall.

From the days of Fisher's ghost, Campbelltown has become one of the most rapidly expanding centres in Australia. It is linked both to Sydney's south-western suburbs and to the southern highlands by the 64 km long F5 — South Western Freeway ... a dream roadway in itself. Once again, the selection of the route of this freeway reflects the vision of our early pioneers.

Surveyor-General Sir Thomas Mitchell had plans for the improved *Great Road, Southward* in the early 1800s, and his preferred line had much in common with the present route of the South Western Freeway. The construction of this freeway (see page 1) employed engineering skills and technologies far beyond Mitchell's means. His foresight was yesterday's vision, which with today's techniques has, at last, become a reality.

Vision is a necessary ingredient for progress and one of our "visions" into the near future (on page 13) describes further developments for the F3 — Sydney-Newcastle Freeway. We always need to match our dreams with actions, but as Proverbs (Ch. 29, v. 18) so aptly puts it "Where there is no vision, the people perish".

In less than two centuries, the struggling colony has become a prosperous nation, and roads have figured prominently in that growth. Both from the records of our history and from our visible environment, we can find many testimonies to the pioneers whose vision contributed so much to the Australia we now know.

# F5 — SOUTH WESTERN FREEWAY

## THIRD SECTION OPENED TO TRAFFIC



### The story so far

The first 9.8 km long section of the F5 from The Cross Roads to Raby Road near Campbelltown was opened to traffic on 26 October 1973. The second section, 5.8 km long, from Raby Road to Main Road No. 178 (Camden Road) near Kenny Hill was opened on 16 December 1974, completing the 15.6 km length of Stage 1 from The Cross Roads to Camden Road.

The second 13.5 km stage, from the Hume Highway at Yanderra to the Hume Highway at Aylmerton was opened to traffic on 24 May 1977. The third, 35 km stage was from Camden Road to Yanderra. With the completion of this third stage on 15 December 1980 an uninterrupted 64 km length of freeway is now available to roadusers.

With a total cost of approximately \$136 million, including land acquisition, the construction of the F5 from The Cross Roads to Aylmerton has been the biggest project yet undertaken and completed by the Department.

### An overview of the 64 km

The route of the F5 is through country varying from gently undulating pastures in the north to rugged sandstone country on the edge of the Nepean River catchment area in the south. Special attention was paid in the design to the blending of the roadworks and bridge-works into the countryside and extensive landscaping has created an overall visual environment of high standard.

The design of the freeway provides for dual carriageways of ultimate three lane width. Each of the two carriageways is 12.8 m wide, initially having two 3.65 m wide traffic lanes with shoulders on each side. The two carriageways have been designed independently with variable median width to provide maximum flexibility in location.

Construction between The Cross Roads and Aylmerton entailed the excavation and compaction of 10 million cubic metres of earth and rock, as well as the provision of 2.2 million square metres of road pavement and shoulders. The deepest cut is 23 m and the highest fill is 45 m. The pavement is up to 425 mm thick, on lime stabilised selected sub-grade material.

### Bridge construction

The freeway involved the design and construction of 35 bridges of which 14 are twin structures. The total length of these

49 bridge structures is approximately 4.5 km. One structure, on Main Road No. 177 over the Bunbury Curran Creek, was constructed in conjunction with the freeway but is not part of the freeway system. Of the 34 freeway bridges, 13 twin structures carry the freeway over other roads, railway lines and watercourses. To provide complete grade separation of cross traffic, 20 other bridges have been built to carry a State Highway, a Trunk Road, numerous main and local roads, an access road, and a pipeline over the F5. In addition, a temporary pedestrian overbridge was provided at Aylmerton.

Structure types vary from simply supported spans comprised of steel universal beams to continuous spans made up of precast prestressed concrete segmental box girders.

The unit cost of the bridges varied from \$129 per square metre for the bridges over Bunbury Curran Creek to \$730 per square metre for the bridges over Nepean River at Menangle. The total cost of construction for all the 49 bridges was approximately \$30 million.

### Some innovations

Innovative and unusual techniques were used by the Department during construction of the F5. Some of these are mentioned below.

Usually water used to assist in the compaction of road embankments is added to the material after ploughing in the fill. In this work the water was added in the cuttings prior to excavation. Special water tankers were developed from earthmoving equipment so as to operate over the torn surface in the cuts.

During the excavation process, the water was mixed with the material, allowing easier rolling and resulting in less plant congestion in the fill areas. This procedure also meant there was better control of dust during the whole earthmoving operation.

### Swimming pools

Another innovation was the use of above-ground swimming pools for water storage. During construction, large quantities of water were required for dust suppression, compaction of fill material, lime stabilisation and the testing of drainage.

To ensure the minimum delay in refilling water tankers, elevated prefabricated swimming pools were used as storage dams.

The dams or swimming pools were filled from a permanent water supply and were, in turn, used to fill water tankers using a gravity feed system through a large diameter pipe. This quick and uninterrupted supply of water at times reached one million litres per day.

### Batter treatment

Normal road construction practice is to create cuttings with a constant batter slope, such as 2:1. In undulating country, this results in batters of varying height and gives a rather severe appearance to the cuttings.

On this project, in areas other than solid rock, the slope length of each cut batter has been made constant. The result is that, where the cutting depth is reduced towards the ends, the batter "rolls" outwards to blend with the landscape.

### Precast drainage pits

Where many drainage structures of identical, or very similar, dimensions are used in construction, it is generally more economical to have the items constructed in a workshop environment rather than on site.

The drainage pits under the concrete drainage gutters on the F5 are all of identical size and are precast units. Each unit is 1.1 m in diameter, 900 mm deep and had a hole cast in the side. The stormwater pipe was butted against the hole in the precast unit, and a concrete floor was poured to complete the pit.

### Subgrade drains on fills

Water enters a road pavement through cracks and imperfections on the surface and, unless removed, softens the underlying material and leads to premature road failure. Continuous removal of this water is a preventive maintenance measure, which can be built into a pavement during construction.

Modern pavement design requires the top of the filling in subgrade to be water-proofed and given a transverse crossfall so that it will shed any water which has entered and filtered down through the pavement layers.

To collect and dispose of this water, drains were placed along each side of the pavement in the subgrade. These subgrade drains are 600 mm deep and 300 mm wide, with a slotted corrugated plastic pipe in the bottom, and back-filled with a specially designed permeable filter material.



*Between Kenny Hill and Menangle Road; one of the many picturesque sections of the Southern highlands through which the Freeway passes. 1. A portion of the visitors and guests who attended the ceremony. 2. Brian Sexton talks with Mr. Neville Wran after the opening ceremony.*



## Lime stabilisation

Even high standard road pavements can fail if excessive moisture is allowed to reach the subgrade material.

On the F5, as on most other heavily trafficked roads, the "wearing" surface consists of asphaltic concrete. As this material is permeable, the sub-grade beneath it must be rendered moisture resistant if it is to perform satisfactorily.

This result has been achieved on the F5 by means of a lime stabilising process. This process involves mixing a predetermined percentage of lime with the natural material. The chemical reaction provides a stronger, more stable subgrade material less susceptible to weakening by water.

All F5 stabilisation was carried out with quicklime, hydrated on the ground prior to mixing, resulting in appreciable economy. (See article "Lime stabilisation — a special application", in "Main Roads", June 1979, Vol. 44, No. 4, pp. 107-111).

## Slip formed concrete for gutters

The slip forming of concrete gutters has proved to be quite an efficient technique.

Slip form machines are now available with automatic steering and level control. They are also usually fitted with a trimming head to trim the bed of the gutter and minimise the wastage of concrete. They run automatically on accurately preset stringlines and require about seven men in a gang to produce a good quality job.

The concrete used is a specially designed mix which retains its shape after it is extruded from the machine. A typical daily output can be about 1 000 m of gutter, using about 150 cubic metres of concrete.

## Guardrail post driving

For traffic safety, long lengths of guardrail were constructed along the shoulders of the F5 and sections of associated access roads. The guardrail is carried on posts made from rolled steel channel section.

Rapid erection was desirable for economy and consequently, posts were driven with a tractor-mounted mechanical hammer. This method allowed more accurate placement for line and level than excavating and backfilling. As the embankment material is virtually undisturbed, a better embedded post results.

## Erosion control

Great care was taken during construction operations to control erosion and scouring by water. First, the soil was tested for acidity and nutrient requirements. Then appropriate fertiliser, seed and sometimes lime were applied with the assistance and advice of the Soil Conservation Service of New South Wales.

Large disturbed areas, such as batters and medians, were treated by scarifying, fertilising and seeding with appropriate quick growing and heavily rooted grasses, such as millet, oats and clover.

Areas needing special protection from heavy rain and erosion effects were further protected by a hay and bitumen mulch in which the grasses germinated.

Drainage channels were shaped by hand, and a protective layer of jute mesh and bitumen prevented water flow from washing away the grass seeds and seedlings before they were established.

## Landscaping

More than 30,000 trees and shrubs have been planted over the 64 km length of the freeway. Typical species of the trees and shrubs planted are Red Gums, Cootamundra Wattles, River Oaks and Coastal Rosemary.

Before selecting the species, consideration was given to their suitability for the areas affected by the roadworks. Those chosen have a quick and healthy growth rate and provide a natural appearance complementary to other flora in the region.

Bared areas were treated as soon as possible after completion of the earthworks in order to obtain a dense cover of grasses and thereby minimise scouring both during and after construction.

Some of the grasses planted are Rye, Couch, Rhodes, Clover, Kentucky Blue and Bent.

For areas requiring special attention, hydro-mulching accelerated natural regeneration over large areas and retained valuable top soil. On rocky areas, kikuyu turf was used to give immediate protection and close ground cover.

## Attractive bridge abutments

There are two main problems associated with the batters beneath bridges. Firstly, erosion of the batter can lead to settlement of the bridge approaches and secondly the batters themselves can be unsightly unless treated in some way.

Cosmetic treatment is therefore desirable both to prevent batter erosion and to enhance the appearance of the structure. Since vegetation (grass, ivy, etc.) does not thrive within the shadow lines of bridges, a number of contrasting treatments were experimented with along the F5 and found to be successful.

Some of the different materials used were large (150 mm diameter) river stones, precast concrete slabs (with space for grass growth) and V blocks, as well as diamond blocks cast on site and laid corner to corner on a mortar bed.



Earthworks near Yanderra, the northern end of section 2, during May 1976.

## Emergency telephones

An automatic emergency telephone system, incorporating the latest technology, has been provided over the full length of the freeway as a service to motorists who may require road service, police or ambulance assistance.

One hundred emergency telephones have been installed, spaced approximately 1½ km apart. The system was designed in conjunction with Telecom Australia and is possibly the most modern development in this field.

When the user lifts the handpiece and presses a button, the Department's Traffic Control and Emergency Centre in Sydney is dialled automatically. As the call is connected, its location is also automatically displayed on a mimic board in the Emergency Centre. Depending on the assistance required by the motorist, the call to the appropriate service at the appropriate centre is also dialled automatically through a pre-programmed push-button system.

The phone units are so designed that the calls are only connected while the handpiece is held in the hand. The pillar is such that the handpiece cannot be placed anywhere other than back on the hook. If it is left hanging, the call is automatically cut off. This is important as the freeway traverses five STD areas.

No time consuming field repairs are required as all phone units are a "plug out-plug in" type.

## Stage 3. Kenny Hill to Yanderra

### Pavement design

Two methods were used in the design of the freeway pavement south of Kenny Hill. The first was based on elastic theory analysis using pavement deflections at subgrade level as measured by a



*The Kenny Hill — Camden Road interchange during construction in August 1978.*

Benkelmann Beam. The pavement thickness required to take 15 million passages of a Standard Axle load was then calculated. In moisture saturated conditions, an alternative method (using the California Bearing Ratio) was used to cross-check the subgrade bearing capacity. Where the latter calculations indicated a thicker pavement was required, this was adopted.

It was a design requirement that the deflections at base course level (as obtained by the Benkelmann Beam) would be less than 0.4 mm with a target of 0.2 mm and maximum average of 0.3 mm. This was achieved without undue difficulty.

#### **Road construction**

A sub-base layer of 300 mm of selected sandstone or shale was provided in all instances. The top 150 mm of this was stabilised with lime (using quick lime) to make it virtually non-water susceptible. This assisted in collecting and channelling the water entering the pavement to the longitudinal subgrade drains. To ensure that this would occur, a special free draining layer (interface) was achieved by using up to 150 mm blast furnace slag "scull" as the lower base course. A minimum of 125 mm of 20 mm crushed slag was used as the upper base course.

Depending on the quality of subgrade, the total pavement thickness varies from 600 mm to 750 mm. This includes 75 mm of asphaltic concrete wearing surface of which the top 25 mm is open grade asphalt, to reduce the occurrence of aquaplaning.

Longitudinal subgrade drains were provided over the full length of the carriageways, located under the outer edges of the asphaltic wearing surface.

A \$993,704 contract was awarded to White Industries Ltd in May 1976 for the construction of earthworks, drainage and fencing for the 2.9 km length between Avon Dam Road and Yanderra. In February 1977, G. Abignano Pty Ltd contracted to undertake construction of earthworks, drainage and fencing for the 9.5 km length between Pheasants Nest and Avon Dam Road for \$2,302,844. The balance (22.6 km) of the construction work on this 35 km section was undertaken by the Department's own work force, with a number of tasks being carried out by contractors.

Construction between Kenny Hill and Yanderra involved 5.7 million cubic metres of earthworks and 1.4 million square metres of road pavement, using 250 000 tonnes of asphaltic concrete. The highest fill on this section is 13 m and the deepest cut 23 m.

#### **Bridges**

As listed below, there are 17 bridges, including 7 twin structures, on this section. Of these, 10 were designed by consultants and 7 were designed within the Department.

- Bridge to carry westbound traffic on Main Road No. 178 (Camden Road) over F5 (consultant design).
- Twin bridges to carry F5 over Main Southern Railway Line near Glenlee (consultant design).
- Twin bridges to carry F5 over Sydney Water Supply Channel (consultant design).
- Bridge to carry Minto Road over F5 (consultant design).
- Bridge to carry Main Road No. 179 (Menangle Road) over F5 (consultant design).

- Twin bridges to carry F5 over Nepean River at Menangle (Departmental design).
- Bridge to carry Moreton Park Road over F5 near Menangle (consultant design).
- Bridge to carry Moreton Park Road over F5 near Douglas Park (consultant design).
- Twin bridges to carry F5 over Nepean River at Douglas Park (Departmental design).
- Bridge to carry Mount Keira Road over F5 (consultant design).
- Twin bridges to carry F5 over Moolgun Creek (Departmental design).
- Bridge to carry access road to Niloc Pty Ltd over F5 (consultant design).
- Bridge to carry Trunk Road No. 95 over F5 (Departmental design).
- Twin bridges to carry F5 over Nepean River at Pheasants Nest (Departmental design).
- Bridge to carry Avon Dam Road over F5 (Departmental design).
- Bridge to carry Metropolitan Water Sewerage and Drainage Board pipeline over F5 (Departmental design).
- Twin bridges to carry F5 over Main Southern Railway Line and southbound loading ramp near Yanderra (consultant design).

All bridges were built under contract, with Departmental supervision

#### **Twin Bridges at Moolgun Creek, Douglas Park and Menangle**

For these six bridges, a modular design was evolved, based on a 50 m standard span and variable length approach spans. This enabled total bridge lengths to be varied to suit conditions at each of the three sites, without altering the standard superstructure construction method.

The superstructure of each bridge is a three-cell, precast post-tensioned segmental concrete box girder. The width between kerbs is 12.8 m and the overall width, 13.9 m. The segments for each bridge are identical and horizontal curves were created by tapering the segmental joint.

The piers of these six structures are twin reinforced concrete tapered columns tied together with post-tensioned cross beams, to act as a frame in resisting lateral forces. In each case, the deck is hinged to the taller flexible piers. Expansion bearings were required on the shorter piers.

*This kerbing machine was used extensively on this project. It once "laid" a kilometre of kerb in 5 hours.*



The provision of an expansion bearing in the central span of each bridge and hinged bearings at the abutments enables all longitudinal deck loads to be transmitted to the abutments. Permanent hinges were placed at points of natural inflection in the other spans.

As with the Pheasants Nest bridges, these structures have been designed to cope with earthquake movement and possible settlement following coal mining operations.

**Moolgun Creek.** Twin five-span structures have been constructed at this location, each with an overall length of 235.9 m and consisting of three 50 m spans flanked by 42 m end spans. Pier heights vary from 14 m to 58 m and are all founded on spread footings, as good sandstone lies close to the natural surface. The height of the decks above normal water level is 52 m, that is, higher than the peak of Gladesville Bridge. The abutments are founded on bored piles of 750 mm diameter. In June 1977, White Industries Ltd undertook to build these bridges for the Department at a contract price of \$3,239,253. They were completed in July 1980.

**Douglas Park.** At this site, twin six-span structures were built over the Nepean River, having an overall length of 285.9 m on the western structure and 236.4 m on the eastern structure. The western structure has four 50 m spans flanked by 42 m end spans. The eastern structure has two 50 m spans flanked by 42 m and 25 m spans at each end. Pier heights vary from 12 m to 55 m and the decks are 56 m above normal water level, which again is higher than the peak of Gladesville Bridge. Bored piles were required under the abutments and under the central piers at river level.

A \$4,052,557 contract was let in March 1977 to White Industries Ltd to build these bridges, which were finished in September 1980.

**Menangle.** Here the design was for twin four-span structures over the Nepean River, having an overall length of 185.9 m and consisting of two 50 m spans and 42 m end spans. Piers are approximately 20 m high and are founded on bored piles of 1 000 mm diameter. The abutments are founded on 750 mm diameter bored piles. A \$3,096,485 contract for the construction of these bridges was let to Transbridge Pty Ltd in January 1977. This contract was completed in October 1980.

### **Twin Bridges at Pheasants Nest**

The twin bridges at Pheasants Nest are two independent prestressed concrete bridges which cross the Nepean River at a skew of 40°. The 304.7 m long bridges are identical but are offset relative to each other by 11 m because of the skew, and have a 50 mm gap between them.

The bridges have three spans, a main span of 150 m and two side spans of 77.4 m. Each deck consists of a single cell box girder, 13 m wide and varying in depth from 8.2 m at the piers to 2.5 m at the abutments and at the centre of the bridges.

At their centres, the bridge decks are 76 m above normal water level, making them higher than the deck of the Sydney Harbour Bridge. The two piers, situated part way up the side of the gorge, are 36 m and 44 m high. These piers are rectangular hollow reinforced concrete sections, 6 m by 5 m with walls 600 mm thick. The pier footings are 10 m by 9 m by 3 m deep, reinforced concrete pads, anchored to the ground with rock anchors.

These bridges were built using the cast-in-place, balanced cantilever construction method. A 14.5 m length of the superstructure was constructed on top of each pier, but extending 2.3 m further on one side than the other. The cantilever arms were then constructed in 4.7 m segments with no falsework required from the ground. Formwork carriers to hold the segments were assembled on the pierhead. As each segment was poured and stressed, these carriers were jacked forward ready for the next segment. Segments were poured alternately on each side, starting with the shorter arm of the pierhead, so that one arm of the

cantilever was always one half segment longer than the other.

Work proceeded from the two piers at once and where the cantilever arms met at the centre of the bridge they were joined by a special hinge segment. All expansion movement in the bridge is taken in this segment which will also allow relative rotation between the two cantilever arms.

At the abutment end of the cantilever arms, the superstructure and the abutment are connected by prestressed, high tensile steel bars. The bridges incorporate 22 km of prestressing cable, 1 500 tonnes of steel reinforcement and 27 000 tonnes of concrete.

Prestressed concrete cantilevered bridges are particularly sensitive to shrinkage and creep effects. To monitor these, a joint research project by the Department and the School of Civil Engineering at the University of Sydney was initiated. As part of this project, various instruments were installed on the bridges, including temperature gauges, internal strain gauges linked to a data logger, external strain gauges consisting of targets used in conjunction with a Huggenberger extensometer, and strain gauges measuring abutment reactions. Rotations of the pier tops are measured using an electro-level.

It is envisaged that the information obtained from the project will aid in accurately predicting deflections in these and future prestressed concrete cantilevered bridges.

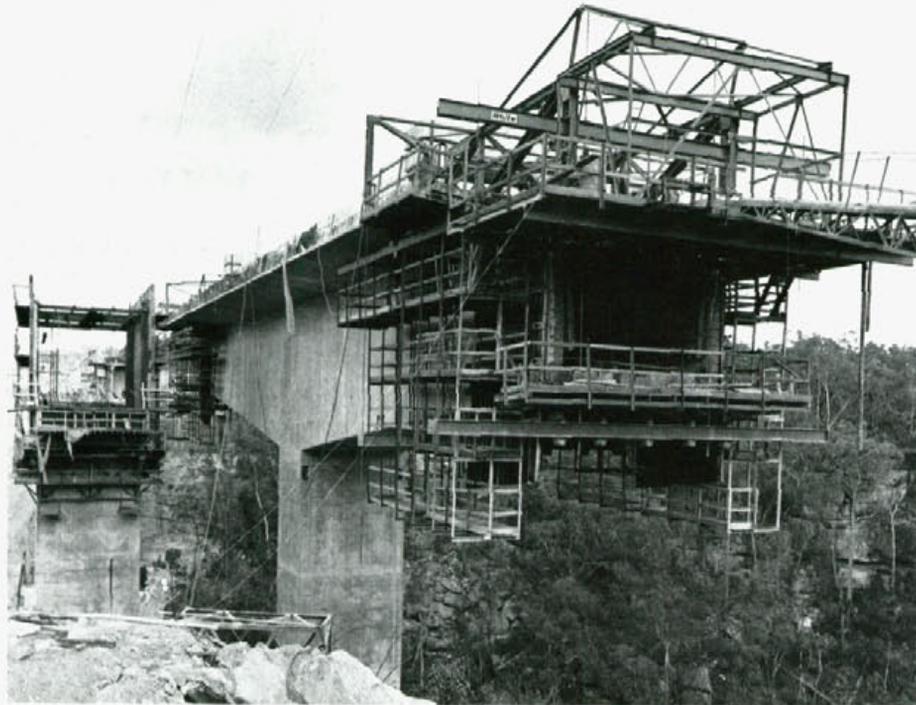
The bridges were also designed to allow for possible stresses due to earthquake and mining subsidence effects.

In June 1978, a \$4,599,560 contract was let to White Industries Ltd to build these

twin bridges. The eastern structure was the last bridge on the whole project to be finished, being completed in November 1980.

A few weeks later, in mid-December, the Pheasants Nest bridges were the focal point of the official opening function, being the back-drop to the speeches and the setting for the ribbon-cutting, the plaque unveiling and the beginning of the motorcade. ●

*Construction of the bridge over the Nepean River at Pheasants Nest, by balanced cantilever method, August 1979.*



*Below: Pheasants Nest bridge . . . higher than the deck of the Sydney Harbour Bridge.*



## OPENING DAY FOR 35 KM LINK IN F5

On Monday, 15 December 1980, the 35 km section of the F5 — South Western Freeway from Kenny Hill (near Campbelltown) to Yanderra was opened to traffic by the Hon. Neville Wran, Q.C., M.P., Premier of New South Wales. This section linked up with already opened sections of the F5 to provide 64 km of continuous freeway from The Cross Roads (near Liverpool) to Aylmerton (near Mittagong).

Over 500 guests and visitors observed the opening ceremony, which received excellent coverage in all the news media.

After "Advance Australia Fair", the Commissioner for Main Roads, Mr. Brian Sexton (now deceased), opened the proceedings, declaring that this day was a proud one for New South Wales and this Department with the completion of the longest section of freeway in Australia constructed in the one length. He noted the coincidence that 15 years ago to the day the first section of rural freeway in New South Wales was opened — and that was the Hawkesbury River to Mount White section of the F3 — Sydney-Newcastle Freeway.

Mr. Sexton explained that the work was supervised by officers of the Department's Outer Freeway Construction Division through works offices at Campbelltown and Bargo and resident engineers at the three major bridge sites, Pheasants Nest, Douglas Park and Menangle. He pointed out that "contrary to misconceptions held in some quarters, the Department does make extensive use of private contractors to do many different tasks — from bridge design down to what might seem a menial task of hay mulching. We still do a fair proportion of the basic work ourselves, so as to retain our expertise in road and bridge building techniques. However, where appropriate we invite commercial organisations to undertake the works in which they have particular competence.

"On this 64 km length, over 30 major construction and supply contracts were let, while more than 200 other contractors have been involved in the supply of materials and services, as well as in the hire of plant and equipment. The maximum workforce on location here at the freeway at any one time reached its peak at the end of 1978 when 650 people were involved on the job. It is significant to note that over half of these were contractors' personnel, including hired plant operators. In all, more than 60% of the total work involved in building this 64 km freeway section was undertaken for the Department by contractors."

Mr. Sexton considered it worthy of special comment to mention that when work was commenced on the Kenny Hill-Yanderra section in 1975, the programmed date of completion was November 1980. He noted that "to have kept so close to that difficult schedule of timing, with so many variables outside their control, officers and workmen of the Department and its contractors deserve the community's



*The Hon. Neville Wran, Q.C., M.P., Premier of New South Wales; Alderman G. K. Fetterplace, Mayor of Campbelltown; and Mr. B. J. Sexton, Commissioner for Main Roads, at the opening ceremony.*

highest commendation. On my own behalf", he added, "I say to all concerned, thank you for a brilliant job of road and bridge building, programmed so effectively and undertaken so skilfully".

Councillor Frank McKay, President of the Shire of Wollondilly, and Alderman Gordon Fetterplace, Mayor of Campbelltown, welcomed visitors. Councillor McKay thanked the Department for taking the heavy interstate traffic out of their towns and villages.

The diversion of heavy commercial vehicles from the Hume Highway should significantly improve safety and living conditions in the townships of Picton, Tahmoor and Bargo. It is also expected that tourism will develop further in these areas and that there will be a general growth in population based on easier access to the larger centres of employment and also on the improved residential environment.

The Hon. Ralph Hunt, M.P., Commonwealth Minister for Transport then addressed the gathering and spoke of the freeway as being "a magnificent example of Commonwealth and State Government co-operation". Mr. Hunt highlighted the fact that the distance between Liverpool and Mittagong has now been reduced by more than 13 km. "This will mean an over all reduction in excess of 30 minutes in travel time between the two centres and ... that should represent a saving of \$13 million a year to the community.

"The new freeway", said Mr. Hunt, "will also eliminate an old section of the highway with one of the worst accident records in the country. It will therefore save lives and lessen the human suffering caused by road accidents ... When I was Minister for Health and travelled around the States, I visited hospitals and saw people, many of them young people, maimed for life as a result of the carnage on the roads. So,

anything we do to improve the road system and anything we do to avoid that sort of carnage is a welcome development".

In his concluding remarks, Mr. Hunt said "This project has been an outstanding example of co-operative Federalism and I'd like to thank the Department for the very close co-operation they extend to the Roads Division of my Department. The New South Wales Government through the Department of Main Roads provided the technical expertise and supervised the work of contractors or carried out the design and construction. Certainly, the Commonwealth funded it, but the State Authority carried out the work ... I'd also like to thank all those private consultants and contractors who were involved and who participated in the continuation of the fine tradition of road and bridge building in Australia".

At this point in the proceedings, Mr. Sexton explained that the Department's employees associated with the work had expressed a wish to make a small presentation to the Premier and to the Minister. Consequently, Mr. Max Burroughs, as their representative, came forward and presented tankards to both Mr. Wran and Mr. Jensen.

The Minister for Roads, the Hon. Harry Jensen, M.P., was the next to speak and his opening remarks went something like this.

"Roads have always been significant in the history of mankind. The road to Damascus saw an event occur, the significance of which has continued for a couple of thousand years. I have always been very impressed with the events described as happening on the Road to Mandalay. I have hoped that one day I might see a road 'where flying fishes play'. But whenever I think about roads and bridges, my thoughts always turn to the bridge on the River Kwai. So, when Neville Wran asked me to become his Minister for Roads, I wrote to Sir Alec Guinness and said 'Look, we've got a lot of bridge building to do in New South Wales, would you be interested?'. His secretary wrote back to say that Sir Alec was not willing to undertake any further bridge construction in the penal colonies!"

About the F5, Mr. Jensen said "it is imaginative. It is colourful. There are 50,000 lane markers in order to better guide the travelling public. There are 30,000 trees and shrubs adorning the roadway, in order that those who drive along it may enjoy their beauty ... This is a magnificent road. Everybody who has contributed in any way — to its vision in the first place, to the concepts, to the planning and to the work of its construction — has played a part in one of the significant developments of our times".

Finally, it was the Premier's turn to speak and here are some extracts from his interesting and forthright address.

"It's true that I've watched with great pride, and at times some apprehension, the progress of this work. It's equally true that, together with my colleagues, I'm truly delighted to see the results of the skills, the talents, the dedication and the hard work of the many Australians who have contributed to this project.

"First, I should like to say something not connected with roads at all, although in one sense springing from the fact that this great work has been completed on schedule. Sometimes, if you listen to some people you would think that somehow this great country, this great metropolis, just sprang out of the ground like a mushroom. Well it didn't! It occurred because a lot of people had a vision, a lot of people contributed their sweat and their labour and a lot of other people contributed their investment funds.

"If we're to maximise the opportunities for our country, its people and its children, we've got to find answers to pointless strikes and we've got to find answers to pointless provocation on the management side. I think that for too long we Australians have accepted strikes, provocation, poor management as part of our way of life. I come from a working class family, my dad was in the 1917 strike for three months, but I have always believed that we must act sensibly, judiciously and with purpose ... If our country is to achieve the true heights of which it is capable and if our people are to benefit from the produce of our efforts and the produce of the resources of this country, then I think in the '80s we must find a slightly better way of dealing with things than we have in the '70's.

"I particularly want to emphasise the great contributions that have been made by the men who built this road. It's been hard work, but work that has been done skilfully and the project has been brought in on time. So to everyone concerned — from the Commissioner down to the 'billy boy' — congratulations!"

Turning to Mr. Hunt, Mr. Wran added "In this co-operative federalism ... where you (the Commonwealth) provide the money and we (the State) provide the skill ... we can continue these great roadworks which, in our vast country, are so essential for our success and our safety."

After a short walk to the green and gold ribbon stretched across the southbound carriageway (at the northern end of Pheasants Nest Bridge), the Premier, with scissors poised, proudly announced "Ladies and gentlemen, in the absence of any modern day de Groot, I now declare this section of the F5 officially open". ●

# An Opening — and a Parting of the Ways



*Sir Roden and Lady Cutler at the opening of the bridge carrying the Pacific Highway over the Clarence River at Harwood in August 1966.*

*The State's longest-serving Governor after his official farewell.*



Readers of the 1979-80 composite issue of *Main Roads* may remember an article titled "Changes at Nambucca Heads-Bellwood Deviation", describing the design and construction of this major project.

The Deviation by-passes the main shopping and commercial centre of the township of Nambucca Heads. Its construction involved four million dollars' worth of roadworks carried out by the Department's own work force, together with six bridgeworks built by contractors at a cost of approximately \$1.4 million. Although not due for completion until 1981, work was so well advanced on the project that the Department was able, by a concerted effort, to open the deviation before Christmas 1980, in time to handle the peak holiday traffic.

## **A happy occasion**

The occasion of the official opening of the new 5.3 km route on 11 December 1980 was a particularly happy one for both the residents of Nambucca Shire and for the Department of Main Roads. Not only was the new roadway itself a matter for pride and congratulations, but the ceremony was performed by Sir Roden Cutler, making one of his last public appearances as Governor before his retirement from office on 20 January 1981.

Other distinguished guests at the opening function included Mr. Harry Jensen, M.P., State Minister for Local Government and Minister for Roads; Mr. Jim Brown, M.P., Member for the State Electorate of Raleigh; Mr. Ian Robinson, M.P., Member for the Federal Electorate of Cowper; and Mr. George Hicks, President of the Shire of Nambucca.

With 15 years spent in office, Sir Roden Cutler, V.C., K.C.M.G., K.C.V.O., C.B.E., became New South Wales' longest serving Governor. The tributes and good wishes proffered to Sir Roden and Lady Cutler by all speakers at the Bellwood opening ceremony, and the Governor's obvious popularity with the spectators, bore testimony to the high measure of respect and affection which he has earned throughout New South Wales.

Born in Manly in 1916, and educated at Sydney High School and at the University of Sydney, Sir Roden graduated in economics and began his career in the Public Trust Office of New South Wales. His distinguished war record included the winning of the V.C. "for exceptional courage" during desert warfare in Syria.

Sir Roden was then a lieutenant in the 2/5th Field Regiment and in the battle of Damour on 6 July 1941 he became involved in infantry fighting while acting as artillery observation officer. He attacked three machine gun posts and captured eight gunners of the opposing Vichy French forces, who were blocking the Allied advance to Beirut.

Later, while endeavouring to establish a forward telephone link, Sir Roden was seriously wounded in the right leg, which was subsequently amputated. For his gallantry at Damour and earlier at Merdjayoun, he was presented with the Victoria Cross (by the Governor-General, Lord Gowrie at Admiralty House, Sydney on 11 June 1942). Sir Roden was the only Australian artilleryman of either the 1914-18 or 1939-45 wars to have received this honour.

After the war, Sir Roden was appointed Australian High Commissioner to New Zealand, and thereafter held a succession of major diplomatic postings culminating in his appointment as Ambassador to the Netherlands in 1965.

He was knighted for his long and outstanding service in December 1965 but reached a still higher pinnacle in his career when he was sworn in as Governor of New South Wales on 20 January 1966.

## **Past occasions**

In his speech at the Bellwood opening, the Minister for Roads, Mr. Harry Jensen, recalled that this was not the Governor's first association with Department of Main Roads' opening ceremonies. Sir Roden had previously opened the bridge over the Clarence River on the Pacific Highway at Harwood on 20 August 1966; the first section of the Warringah Freeway in Sydney on 18 June 1968; and the Macarthur Bridge over the Nepean River

*Sir James Rowland, 33rd Governor of New South Wales, seen here with Lady Rowland, their daughter Ann and their faithful bitzer-Kelpie, Kirsty. (Reproduced courtesy of News Limited.)*



## **HIS EXCELLENCY, THE GOVERNOR**

Sir Roden Cutler's successor in Government House, Sydney, is 58-year-old Air Marshal Sir James Rowland, K.B.E., D.F.C., A.F.C., K.St.J., who assumed office on Wednesday, 21 January 1981 as the 33rd Governor of New South Wales.

Former head of the R.A.A.F. from 1975 to 1979, Sir James was educated in Sydney at Cranbrook School and at St. Paul's College, University of Sydney where he studied engineering.

In 1943, aged 21, Sir James was commissioned into the R.A.A.F., and a year later became a Master Bomber in the R.A.A.F. Pathfinder Force, the specialist squadron whose job was to mark the targets for the Allied bomber planes. However, in January 1945 his aircraft

crashed near Frankfurt and he was taken prisoner of war.

After the war Sir James remained in the R.A.A.F. and completed his engineering degree. He eventually became the Air Force's most highly qualified engineering test pilot and was Director General of Aircraft Engineering from 1972 until appointed Chief of Air Staff in 1975.

Sir James is married with one daughter. He lists his recreations as swimming, reading and golf. His new job may mean that reading must now take precedence over other pastimes, but his strong background of both practical and administrative experience is certain to serve him well as Governor, and his cheerful informal manner will ensure his popularity among the people of New South Wales. ●

on a new route of the Hume Highway at Camden on 26 March 1973.

The Department also recalls with pleasure that Lady Cutler, who was unfortunately unable to be present at the Bellwood function, performed the opening ceremony on the new bridge to carry the Hume Highway over the Bargo River near Tahmoor on 17 March 1967.

### **Postwar progress**

Speaking at the Bellwood Deviation opening, Sir Roden commended the Department of Main Roads on the progress made in improving the State's road system in the postwar years. He expressed the hope that the new Deviation would give great satisfaction to the people of Nambucca Heads and to the many holiday-makers who visit the area.

Sir Roden recalled that his distant predecessor, Governor Macquarie (the State's previously longest-serving Governor — 1810-1821) was the earliest of Australia's great road builders. He commented that although present-day Governors are no longer concerned with the practical details of roadmaking, he had been "delighted to have been involved in opening several projects by the Department of Main Roads — projects which have been well built and designed to fit into the needs of the community". He continued . . . "In this case, the roadwork on the Bellwood Deviation was undertaken by DMR workmen and that is something of which we can be proud because it is done to a standard which is a very high one."

In conclusion, Sir Roden thanked the previous speakers and the on-lookers for their warm welcome and many compliments, and wished the assembled company a happy Christmas and prosperous New Year. He then cut the ribbon, unveiled the commemorative plaque and ceremonially declared open the Bellwood Deviation.

On 20 January 1981, Sir Roden and Lady Cutler were farewelled by the City of Sydney and a cheering crowd of wellwishers at Sydney's Town Hall. The couple then proceeded to Sydney Airport from where they departed for London to pay their respects to the Queen and enjoy a well-earned holiday. ●



## Sydney to Host 1983 World Road Congress

The 17th World Road Congress is to be held in Sydney at the Opera House in October 1983. About 2,500 delegates are expected to attend. The signing of the formal agreement took place in Canberra on 11 September 1980, with the Commonwealth Minister for Transport, Mr. Ralph Hunt, as President of the Australia Organising Committee, and Mr. Maurice Milne, International President of the Permanent International Association of Road Congresses (PIARC).

The late Brian Sexton, Commissioner for Main Roads, New South Wales, was in attendance to represent the host state. Also at the ceremony were Mr. Marcel Huet of France, PIARC's Secretary General, and Mr. Bertil Ström of Sweden, a member of the PIARC Executive Committee.

PIARC is a consultant to the United Nations Economic and Social Council, and

is a recognised world authority in all road matters. It holds a major world congress every four years to foster progress in the construction, improvement, maintenance, use and economic development of roads and to encourage the growth of road systems throughout the world.

Australia has been a permanent national government member of PIARC for more than 60 years. The first International Congress was held in Paris in 1908 to study "Methods of Improving the Roads to make them Adaptable to the New Forms of Locomotion". The congress has only been staged in the Southern Hemisphere on one other occasion, at Brazil in 1959. ●

*More news on this exciting gathering will be included in "Main Roads" as we get closer to the time.*

*At the ceremony were (seated l to r): Mr. M. Huet of France; Mr. R. J. Hunt, M.P., Minister for Transport; and Mr. M. Milne, International President of PIARC. Standing (l to r): Miss L. Dowling, Interpreter; Mr. N. Waslin, First Assistant Secretary (Roads Division), Transport Australia; Mr. A. Johnke, Commissioner of Highways, South Australia; Mr. C. C. Halton, Secretary, Transport Australia; Mr. B. Ström of Sweden and Mr. B. J. Sexton, Commissioner for Main Roads, New South Wales.*



*Mr. Maurice Milne.*

## GETTING TOGETHER: XTH ARRB CONFERENCE

The 10th Conference of the Australian Road Research Board was held at the University of Sydney, from 25 to 29 August 1980. The conference attracted widespread interest from Australia as well as Southeast Asian and Pacific nations. It was attended by 782 delegates, over half of whom were from local government and State Road Authorities.

The Governor of New South Wales, His Excellency Sir Roden Cutler, performed

the official opening, which was held in the Great Hall of the University. His opening speech was followed by the keynote address by the President of PIARC, Mr. Maurice Milne, whose subject — "Roads and Transportation in a Changing World" — covered the urgency of the need to provide basic road systems in the developing nations.

A number of other distinguished overseas experts also presented special papers at

the Conference. They included . . .

- Mr. Neville Bulman, Head of the Overseas Unit of the Transport and Road Research Laboratory in the United Kingdom
- Mr. Bertil Ström, Head of the Swedish National Road and Traffic Institute
- Mr. Robert Mayes, Associate Executive Director of Research of the Canadian Trucking Association

- Professor C. Swaminathan, Director of the Indian Central Road Research Institute

... all of whom spoke on research activities in their respective countries.

The opening ceremony was followed by the Directors' Prize Session and the first of the Technical Sessions. The prize-winning paper was by Bill Gray and Geoff Robinson of the ARRB and was an attempt to guide and educate road engineers on the use of modern statistical techniques to control the quality of road construction.

The paper was written in the form of a dialogue between a somewhat sceptical site engineer and an expert statistician — a combination that rarely mixes. The paper discussed how the quality of construction work can be measured while evenhandedly taking account of the ability of the contractor and the desires of the road department.

The authors argued that procedures used for quality checking light bulbs could usefully be applied to road construction. From this analogy they then moved on to discuss building roads across the Simpson Desert using powdered snake oil. This was, presumably, a hypothetical example! A discussion was given of the worth to the consumer of work of above and below expected quality. It was suggested that there is usually little benefit in obtaining higher quality work but that the effects of lower quality work, as in a bridge failure, can be catastrophic.

Approximately 90 technical papers were presented at the Conference covering a broad range of areas such as Pavements, Materials and Structures, Traffic Engineering and Transport. Special Technical features included the holding of a number of workshops on local streets; traffic and safety; concrete creep and shrinkage; and heavy vehicle characteristics, operation and regulation. Attendance of the various technical sessions was pleasingly high with much lively discussion.

Nineteen full-time delegates and 42 part-time delegates from the Department attended and nine Departmental authors were directly involved in researching and writing papers presented at the Conference.

Technical displays by ARRB Member Authorities and other government authorities, gave good visual coverage to road research, equipment and recent developments.

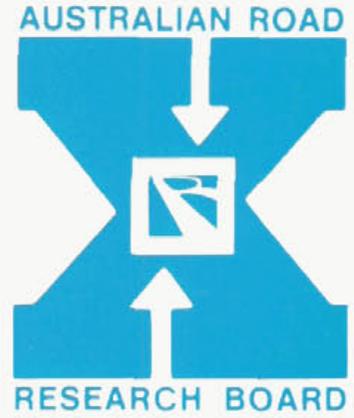
The ARRB's Steering Committee and four Technical Committees held open meetings as part of the Conference programme. For those who attended, opportunity was given to question current

research directions and to suggest alternatives.

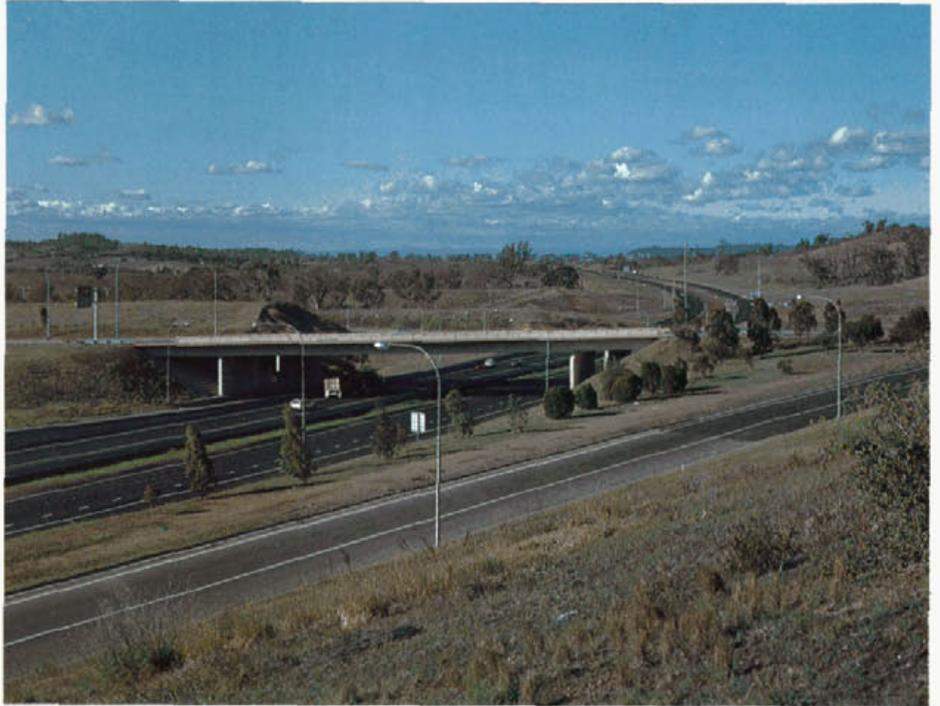
In addition to the Technical Sessions, a full programme of technical inspections was available. These included inspections of the Department's Traffic Control and Emergency Centre, the Foreshore Road and Botany Bay Port Development, the F5 — South Western Freeway, the F4 — Western Freeway and the Parramatta Bypass.

A wide range of social activities for the delegates and their partners was provided, and following the Conference, a study workshop and tour was arranged for research representatives.

All in all, it was a hectic but helpful programme which has given a stimulus to road research development through the sharing of new ideas from interstate and overseas. The next ARRB Conference is to be held in Melbourne in 1982 and will bring another opportunity for those involved or interested in road research to share and publicise new information and help to put new research into practice. ●



*Delegates could choose from a number of technical inspections and social activities. Places visited included (1) F5 — South Western Freeway and (2) SCATS Centre in Sydney.*



**MR. B. J. SEXTON,  
B.E., F.I.E.AUST., F.C.I.T.,**

**COMMISSIONER  
FOR MAIN ROADS,  
NEW SOUTH WALES  
1977-1981**

It is with deep regret that we record the death of our Commissioner, Mr. Brian Sexton, at his home in Chatswood on the morning of Monday, 13 April 1981.

Born in 1921, Brian Joseph Sexton spent all his working life with the Department of Main Roads, New South Wales. He graduated from the University of Sydney with a degree in Civil Engineering and joined the Department in December 1942. His first posting was to the Northern Territory, to work on the Stuart Highway between Darwin and Mataranka.

Brian Sexton soon showed himself to possess considerable administrative abilities based on a solid background of academic and practical experience. His progress in the Department was steady and in 1961 he was appointed Divisional Engineer to Murray Darling Division, working at Broken Hill Divisional Office. This post, held until late 1963, was followed by those of Engineer for Field Organisation and Methods (1964 to 1967) and Metropolitan Engineer (1967 to 1972). Mr. Sexton then became Acting Advance Planning Engineer, followed by Acting Highways Engineer and Engineer for Programmes and Budgets. In 1972, Mr. Sexton attended the Advanced Course at the Australian Administrative Staff College at Mt. Eliza, Victoria.

In October 1973, Mr. Sexton attended the Seventh World Meeting of the International Road Federation in Munich where he delivered a paper on "Low Cost Road Design and Construction in Sparsely Settled Areas of New South Wales, Australia". Discussion at this Meeting centred on the political, economic, and social aspects of road matters, progress on road construction, road safety, traffic in cities and densely populated areas and traffic management techniques.

This wide range of experience and Mr. Sexton's demonstrated capabilities made him an obvious choice for the position of Assistant Commissioner in 1974. This appointment was followed by the post of Deputy Commissioner which he held from 31 January 1976. He was designated Acting Commissioner on 6 October 1977, upon the retirement of Mr. A.F. Schmidt, and formally appointed Commissioner for Main Roads on 16 December of the same year.

Throughout his career with the Depart-



ment of Main Roads, Mr. Sexton maintained an active interest in several professional bodies, notably the Institution of Engineers, Australia, of which he was a Fellow. He was one time Chairman of the Civil Engineering Branch of the Institution and was also a member of its Sydney Division Committee. He was 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.

Mr. Sexton was appointed a Director of the Australian Road Research Board on 23 November 1977 and at the time of his death was Chairman of the Board. In September 1979, Mr. Sexton attended the XVIth World Road Congress of the Permanent International Association of Road Congresses (PIARC) held in Vienna, as a member of the Australian delegation of 15. Prior to the conference, Mr. Sexton spent two weeks in London and Paris on inspections and discussions with the Transport and Road Research Laboratory, Crowthorne, the Department of Transport, the Greater London Council, the Organisation for Economic Co-operation and Development Seminar, the French Road Authority and the

Laboratoire Central des Ponts et Chaussées. In November 1980 he was appointed Chairman of the National Association of Australian State Road Authorities.

Within the Department, Mr. Sexton was closely involved with the activities of the Main Roads Social and Recreation Club, both as President and as a keen participant in many functions. Mr. Sexton had a keen interest in many sports and was a cricketer of more than average ability. He was also well known for his interest in the Army Supplementary Reserve Unit, 21 Construction Regiment RAE (SR) of which the Department is a co-sponsor.

On hearing of the death of the Commissioner on Monday, 13 April, Mr. Harry Jensen, Minister for Roads said: "Brian Sexton was one of the great Main Roads Commissioners of this State. His dedication and skill brought about many improvements in the Department of Main Roads and greatly improved the road system of this State".

The Department echoes these sentiments and extends its deepest sympathies to Mr. Sexton's family: his daughters Ann and Trish and sons Peter and Michael. ●

# FURTHER DEVELOPMENTS ON THE F3 – SYDNEY-NEWCASTLE FREEWAY

In the March 1977 issue of *Main Roads* an article appeared outlining some of the problems involved in freeway route location. Titled "Foreseeing Freeway Effects", it emphasised the complexity of the problem, using the Ourimbah to Doyalson section of the F3 — Sydney-Newcastle Freeway as an example.

## Not a simple choice

Some of the environmental factors considered were people and properties, agricultural activities, bushland and birds, historical sites, recreational facilities, scenery and regional and social effects. Naturally, cost consideration and the availability of local construction materials must also be taken into account.

The first approval was for a route passing west of Wyong and roughly paralleling the Main Northern Railway Line. For a number of reasons, including strategic planning for the proposed Warnervale urban development and cost considerations (see the previous article mentioned above), approval was eventually given to a route running further west.

As originally planned, an interchange near Wallarah Creek, known as the Wye Bifurcation, would allow access to a motorway spur which would join Main Road No. 217 near Wye. The freeway itself would continue on in a roughly north-eastern direction to Doyalson, and then skirt east of Lake Macquarie towards Newcastle.

However, this plan has been modified in view of a report published by the Commonwealth Bureau of Roads in 1976 and titled "Report on the General Location in the Vicinity of Newcastle of the National Highway Linking Sydney and Brisbane". This followed a joint study carried out by the Bureau and the Department.

## Commonwealth decision

The main recommendation from the study was that the National Highway should be located on a route to pass west of Lake Macquarie, not east of it as earlier envisaged. The Commonwealth Minister for Transport accepted this finding and, consequently, the western line has become the approved route.

As a result of this decision, the roles of the Wye and Doyalson arms at the northern end, became reversed. The Wye connection will be part of the freeway while the link back to the Pacific Highway at Doyalson (after design adjustments) will be constructed to motorway — and not freeway — standard.

The new line of that part of the freeway from the Wye Bifurcation to near Wye will have little effect on the environment. No parks or historical features will be

adversely affected. The route travels through generally easy terrain, mostly cleared and much of it used for grazing. Some properties will be severed by the road reserve, but measures to reduce the effects have been discussed with the owners concerned.

*Earthworks between Warnervale and Wye, south of the railway bridge. Feb. 1981.*





**F3 —  
SYDNEY-  
NEWCASTLE  
FREEWAY**



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1. The 60 m Kangy Angy cutting is the deepest yet undertaken by the Department (January 1980).

2. Whilst the Kangy Angy cutting in the background is the **deepest**, the cutting in the foreground is the **largest** by volume (January 1980).

3. Mechanised man vs. Tuggerah sandstone, and a resultant yield of over 745 000 cubic metres of material (January 1980).

4. Construction between Alison Road and Sparks Road during February 1981

### As it is now

The major north-south route in the Shire of Wyong is the Pacific Highway. Between Ourimbah Creek and Doyalson this road is essentially only two lanes, and it carried an average of 15,550 vehicles per day in 1976. The projected traffic volume for 1985 is 23,000 vehicles per day.

Many serious accidents have occurred on this length which includes sections of poor alignment, particularly on the sharp curves to the south of the turnoff at Tuggerah, and also on the numerous near right-angle bends, to the north of Wyong.

The poor alignment, and the fact that the highway forms the main street of the shopping area of Wyong, also mean that the capacity of this route (in terms of the number of vehicles per hour which can be carried) is unacceptably low. This is intolerable on a route such as this, where heavy holiday and tourist traffic occurs, and long delays are now being experienced on this length, particularly in holiday time. This problem will grow as traffic demand increases.

To make matters worse, some parts of the route are prone to flooding.

### The immediate solution

The construction now in progress will provide a traffic by-pass around Wyong. This by-pass will consist of . . .

- Freeway standard construction for 15 km from Ourimbah Creek northwards to a point approximately 1.5 km north of Sparks Road, Warnervale i.e., the Wyeef Bifurcation.

The freeway work will have two carriageways, each of two lanes, divided by a wide median. On the steeper grades between Ourimbah Creek and Tuggerah, three lanes will be provided in each direction in order to allow heavy vehicles to move out of the main traffic stream and let other vehicles pass.

- Motorway standard construction for 7 km from the Wyeef Bifurcation to Doyalson. This will provide the link necessary to allow the freeway to be placed into immediate operation as a traffic by-pass.

The motorway will mainly consist of a single carriageway of two lanes, but this will widen out to two carriageways, each of two lanes, on the northern end of the work, in order to provide for the traffic movements expected at the junction of the motorway with the Pacific Highway.

Access to the freeway will be available from grade-separated "diamond" interchanges at Cobbs Road, Tuggerah, and Sparks Road, Warnervale.

The motorway connection to Doyalson will be retained in the ultimate freeway layout and a grade-separated interchange will be provided at the northern end where the link to Doyalson joins the freeway (i.e., the Wyeef Bifurcation). However, no provision will be available at the Wyeef Bifurcation for traffic moving from Doyalson or the motorway to travel northwards Newcastle.

Construction of the continuation of the freeway beyond Wyeef towards Morisset, west of Lake Macquarie, is planned to commence before the motorway link to Doyalson is completed.

### Site problems

Earlier sections of the Sydney-Newcastle Freeway constructed between Berowra and Mt. White were located largely in rock of the Hawkesbury sandstone series. This not only produced the spectacular visual impact of steep gorges and rugged rock cuttings, but also large volumes of material with good engineering properties.

This section now under construction starts out with a massive cutting through a spur of the Blackbutt Range. This cutting is approximately 60 metres deep, and is the deepest ever undertaken by the Department. For comparison, the deepest cutting on the Berowra-Calga Tollway is 45 metres on the section south of the

*Kangy Angy cutting through a spur of the Blackbutt Range: the deepest yet undertaken by the Department. Jan. 1980.*



Hawkesbury River. The yield of the new cutting is calculated to be over 745 000 cubic metres of material. The material of the cutting forms part of the Tuggerah geological series, and ranges from clays and shales to very hard sandstone.

### Geological and subsidence problems

As the construction moves northward, it remains in the Tuggerah series of rocks. However, the topography becomes low-lying and swampy, and the percentage of clay-type materials found in the cuttings rises sharply.

Hence problems in connection with road location and design have arisen relating to settlement and the low strength of the natural materials in embankments. Battered stability in cuttings has also required special investigation. The close proximity of the water table to the finished level of the pavement will tend to make these problems even more difficult to resolve. It will also lead to further problems relating to the strength of the materials.

As the area is underlain by vast coal deposits which will be worked in the foreseeable future, subsidence considerations are also strongly influencing the design of bridge structures and pavement types.

### Freeway/pipeline partnership

Following talks with the Department of Mines and firms involved in the Newcastle to Sydney oil and natural gas pipelines, work is in hand to locate these in an easement next to the freeway reserve. By restricting coal mining activities along the joint corridor, it is hoped that both the freeway and the pipelines will be protected from major subsidence damage.

### Storm problems

The freeway is located in areas subject to intense coastal storms, and provision has had to be made for large volumes of stormwater draining to the sea across the route of the freeway. Coupled with the low-lying topography of the area, this has created special problems in design. Firstly, in defining the actual flow patterns (particularly the direction of flood waters) and secondly, in deciding the most economic configuration of bridge-type structures which would allow this flow across the freeway route with the least restriction and side effect.

### Model research

As it was soon clear that the solution of the problems at the Wyong River would be particularly difficult, officers of this Department consulted the Department of Public Works and arranged the construction of a model of the Wyong River Flood Plain at their Hydraulic and Soils Laboratory at Manly Vale. This model simulated



the behaviour of flood flows, and schemes to cross this flood plain were laid out on this model to determine the best solutions, particularly in respect to bridge locations and lengths.

### Planning and preparations

Location of the freeway and motorway has been undertaken by the Department through its Rural Investigations Section at Head Office. Design of the roadworks has been carried out by the Department's Road Design Section. The design of the required bridges has been undertaken by both Departmental and contract teams. Although none of the bridges are spectacular in length of spans or height above water, the technical problems posed have nevertheless proved very demanding.

Due to the problems of settlement, etc., mentioned earlier, an extensive programme of pre-boring has been undertaken to prove the type of material in areas proposed as cuttings, and also to determine the likely performance of areas where embankments are planned. During this boring, the location of the water table has been established.

Special attention has been paid to the designs for the Wyong River Bridge and the three bridges to be constructed over Deep Creek, as these are on the Wyong River flood plain which has been built up over many years by successive deposits of silt and sand. In forming piles at the Deep Creek sites, the Department's Benoto boring machine has had to penetrate 22 m below the surface.

### Underway

On-site work commenced in September 1977. Depending on the level of funding

*Seemingly toylike plant along the path of the F3 near Wyong Works Office.*

available, it is expected that the new freeway section will be available for traffic during 1983.

Supervision of the construction is by the Department's Outer Freeway Construction Division, through an office specially set up for the project at Wyong. However, construction will be executed using both the Department's own forces and contractors.

Several minor tenders have been let for operations such as fencing, supplies of material, etc. In addition, major contracts have been completed for a large culvert (Jennings Industries), erection and backfilling of the underpass at Kangy Angy (Smiths General Contracting) and earthworks between Ourimbah Creek and Cobbs Road (Dostal and Co.).

### Some special features

A corrugated steel tunnel-shaped structure has been built at Kangy Angy to carry a diversion of Old Tuggerah Road under the freeway. It is believed to be the second largest of this type of structure so far constructed in Australia (the largest is at Weipa). The unit erected at Kangy Angy is 90.4 m in length with a span of 10.7 m and a height of 7.4 m.

Experiments are underway concerning the use of waste material from the local power station in the work. Munmorah Power Station produced considerable quantities of ash, and disposal of this material is a real problem in terms of acceptable procedures and cost. If the



*Above: F3 — Sydney-Newcastle Freeway under construction north-east of Somersby, adjacent to State Highway No. 26 (October, 1981).*

*Below: Construction in progress near Dog Trap Road, 77 km north of Sydney (October, 1981)*



trials are successful, the use of this waste material should result in substantial benefits (both monetary and otherwise) to the Department and the community.

#### **Some benefits**

From Ourimbah Creek to Doyalson via the Pacific Highway is 22.6 km whereas along the new route it will be 22.7 km. However, despite the fact that the total distances are practically the same, travel times and costs will be significantly reduced.

The alignment of the freeway with long, smooth curves and minimal grades (the steepest is a 75 m stretch with a 4.5% grade) will allow drivers to maintain steady cruising speeds, with much less need for wasteful acceleration and braking. The carefully designed long sight distances are important safety factors.

By-passing Wyong's main street will not only benefit through traffic, but will free that section of the Pacific Highway from much of its present through traffic load, especially during holiday times. The people of Wyong will have a safer, quieter and cleaner town — with less conflicting traffic, less traffic noise and less vehicle emission.

The final cost of the 15 km freeway length and the 7 km link back to Doyalson has been estimated at approximately \$42 million. From the many benefits to the community, this will certainly be money well spent. Due mainly to savings in travel times and fuel, net roaduser benefits after completion of this section are estimated to be about \$6 million each year.

#### **NOT ONLY . . . BUT ALSO MORE F3 NEWS**

With the completion of the Campbelltown-Yanderra Section of the F5 late last year, more of the Department's workforce and funds can now be concentrated on the F3.

Like the F5, the F3 north of Wahroonga is being fully funded by the Commonwealth Government as a National Highway project. It is confidently expected that in the next few years, there will be an increasing level of construction activity on other than the Ourimbah Creek-Wyee Section described in the preceding article.

Here's a brief summary of what is planned and what benefits it will bring.

#### **North of Wyee to Wallsend**

Some work is already being undertaken on the section of the F3 from near Wyee towards Morisset. Investigations are also nearing completion on the location of the route northwards towards Wallsend.

This 37 km section of freeway is currently estimated to cost about \$66 million. The annual roaduser benefits have been calculated to be in the order of \$24 million.

### Calga to Ourimbah Creek

With regard to the section of the F3 between Calga and Ourimbah Creek, a more direct link is needed to supersede the present road (State Highway No. 26) via Peats Ridge. Following detailed examination of various alternatives, the Department has selected a route crossing Mooney Mooney Creek about 1 km upstream from the existing Pacific Highway bridge.

It will be necessary to construct a major new freeway bridge across Mooney Mooney Creek. An interchange to link this section of freeway with the Pacific Highway near Ourimbah Creek is also planned.

The Department, with the assistance of outside experts, has carried out detailed studies of the topography, sociology, flora, fauna, aboriginal relics and carvings along this corridor and an alternative route via Mt. White. A very detailed Environmental Impact Statement has been published and exhibited. This demonstrates that the construction of the proposed freeway from Calga to Ourimbah can be carried out without any permanent detrimental effect on the ecology of the area.

This 25 km section of freeway is estimated to cost in the region of \$60 million. Owing to the shortening of distance by 11.6 km (4.8 km to Gosford traffic) and the consequent savings in time and fuel (13 million litres per annum) the annual roaduser benefits following the completion of this section will be at least \$23 million.

Work has already commenced on part of this section, which will probably take about seven years to complete.

### Wahroonga to Berowra

Investigation, survey, design and preparation of an Environmental Impact Statement is in hand by the Department's staff and consultants.

Work may begin next year on the 15 km section from Pearce's Corner, Wahroonga to Berowra. Estimated to cost about \$60 million, this section should be complete late in 1987 bringing annual roaduser benefits of about \$11 million, as well as freeing the shopping and commercial centres at Hornsby and Asquith from the congestion, noise and fumes of through traffic. ●



*A compactor in operation near Sparks Road, looking south. Feb. 1981.*



*The bridge over Wallarah Creek under construction. Feb. 1981.*

*In view of the production timing of this issue, it has been possible for some photographs, taken after March 1981, to be included in this article.*

# Bridging the Past — a look at bridges old and new

A fascinating exhibition with the title "Bridging the Past" was staged at the National Trust's S.H. Ervin Museum and Art Gallery, at the Trust Centre, Observatory Hill, Sydney from 2 through 19 October last year. Arranged by the Department of Main Roads in conjunction with the National Trust, it presented a comprehensive view of bridge-building in New South Wales, from the founding of the colony almost 200 years ago up to some of the Department's recent projects of the '70's.

A total of 40 original oil paintings, watercolours, etchings and engravings by 22 different artists had been assembled by the National Trust, on loan from various private and public collections. These ranged from an 1803 engraving of Sydney Cove by C.A. Leseur (from the Mitchell Library) showing a timber bridge over the Tank Stream to two oil paintings (belonging to the Department) of the Gladesville Bridge by Rhys Williams — one view showing construction in 1962 and another showing the completed bridge in 1965. Also included were attractive watercolours by Conrad Martens, Samuel Elyard and Frank McNamara, engravings by F.C. Terry and etchings by Sydney Ure Smith and Jessie Traill.

In addition, the exhibition contained a large display of over 150 photographs, in black and white, sepia and colour, prepared by the Department, together with over a dozen large original bridge plans and blueprints, mostly over 100 years old. Four display cases of books, newspaper clippings and various items of memorabilia were included. Here one could view a silver trowel used in the ceremonial laying of the foundation stone of Pyrmont Bridge in 1899; chrome plated rivets and a section of cable as thick as a man's arm from the Sydney Harbour Bridge; the brass bell from the Raymond Terrace ferry (ferries were given honorary mention!); and various plans, books and reports by early engineers and bridge builders, including the very valuable "Report upon the Progress Made in Roads and Public Works in New South Wales 1827-1855" by Surveyor-General Sir Thomas Mitchell.

Of particular interest was a case devoted to the works, plans and personal items of

David Lennox, the Scottish-born engineer who arrived in Sydney in 1832 and became one of the greatest of the Colony's pioneer bridge-builders. His compass, an inscribed hymn book and two of his letters were exhibited, with a signed bridge plan recently located in the Department's records.

Also on display were the Department's two latest scale models, constructed in the Model-Making Section at Head Office, and these proved immensely popular with visitors, especially school children. At the touch of a button the swing span of the Pyrmont Bridge model opened and shut while the model of a vehicular ferry carrying its complement of traffic, tirelessly traversed its river crossing. (The fine work of the Department's model-makers was featured in the June 1978 issue of *Main Roads* and it is proposed to include a special article on the making of the Pyrmont Bridge model in a future issue.)

The exhibition was arranged by people who are very much aware of both the great functional asset and the great historical heritage we have in the 6025 road bridges on Main Roads in this State. It grew out of meetings of a joint Bridges Sub-committee on which members of the National Trust of Australia (N.S.W.), (particularly the Industrial Archaeology Group) and officers of the Department discuss and share information concerning matters of mutual concern. This Sub-committee, a first of its kind, is working towards establishing guidelines to ensure that representative samples of our road bridges will be retained so that future generations can admire the style and skill of past bridge designers and builders.

It is inevitable that new structures must replace old ones and that many old bridges will live on only in those photographs, plans and other records which are retained. "Bridging the Past" provided a rare opportunity to view some of the bridges that have long since disappeared and to trace the evolution of bridges from the simple timber structures of the early settlers to the slender prestressed concrete structures of today. In doing so, it also paid tribute to the skill and ingenuity of the men who designed and built them.

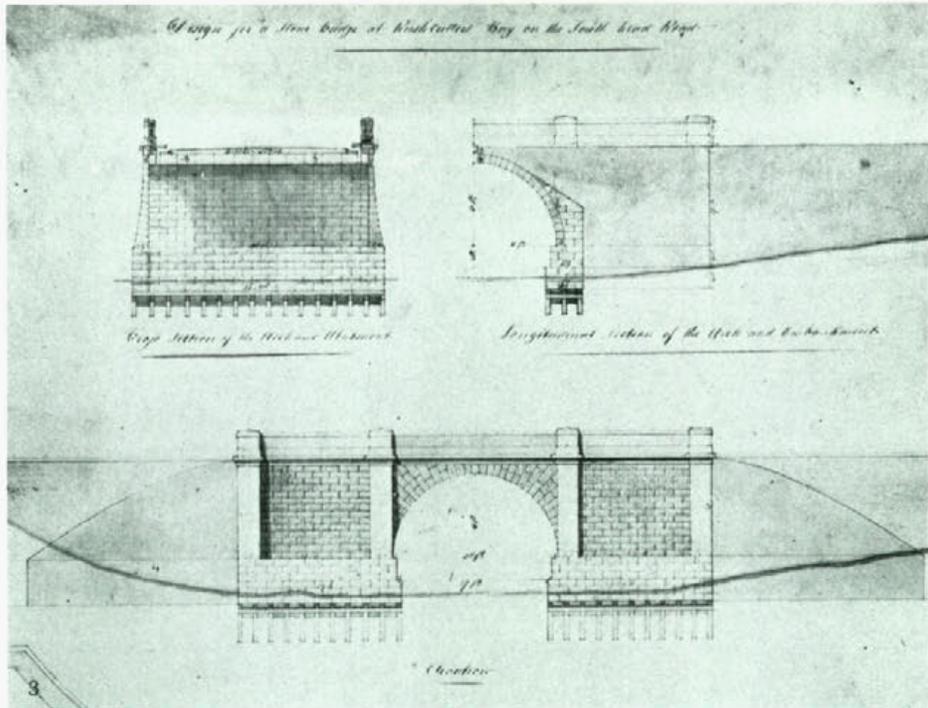
Although the paintings were returned to their various owners, the photographs

were retained by the Department on their display panels ready for use again when required.

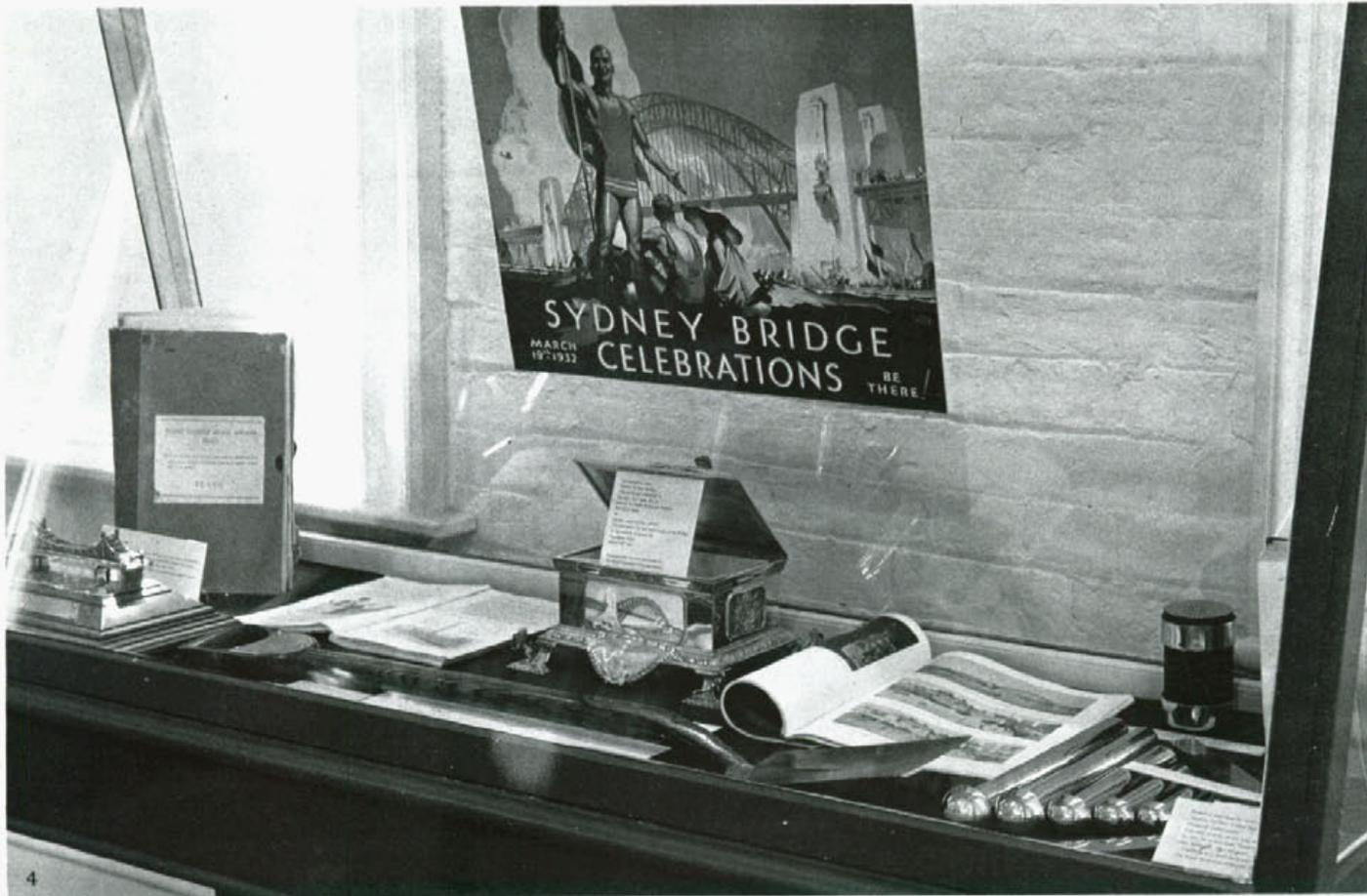
This opportunity came quickly with the organisation of New South Wales' first "Heritage Week" from 23 to 29 March this year. With the co-operation of the Council of the City of Sydney, the exhibition was set up adjacent to the foyer of the Queen Victoria Building with a window display as well, to draw attention to it. With press publicity and a convenient location in the heart of the city, the exhibition drew large crowds from 9 a.m. to 7 p.m. daily during the week and on Saturday morning.

So it is hoped that "Bridging the Past" has helped (and will again assist) to generate a renewed interest in these fascinating structures of our built environment and introduce to a wider audience the rich pleasure of "looking at bridges". The exhibition is still being kept together in the expectation that it can present its visual message again and again. Any enquiries concerning its availability should be directed to the Department's Public Relations Officer (tel. 20933 Ext. 224).





1. The mechanised Mortlake Ferry model attracted a number of on-lookers, including the Department's Chief Engineer (Bridges), Mr. Brian Pearson, second from the right. 2. The exhibition was attended by all age groups. 3. Portion of an 1837 David Lennox bridge plan, which was displayed at the exhibition. 4. Display cases exhibited various items of memorabilia, including material from the Sydney Harbour Bridge.



# STATEMENT OF RECEIPTS AND PAYMENTS FOR THE YEAR ENDED 30 JUNE 1980

County of  
Cumberland  
Fund

## RECEIPTS

### States Sources

|   |            |
|---|------------|
| Motor Vehicle Registration Weight Tax and Tax Levy .....                                      | 38,283,291 |
| Charges on Heavy Commercial Vehicles for Maintenance of Roads .....                           | 244,577    |
| Motor Vehicle Registration fee — allocation from the Road Transport and Traffic Fund .....    |            |
| Loans — from State General Loan Account .....   | 24,000,000 |
| — raised by the Commissioner under Semi-Government Loan Allocation .....                      | 15,000,000 |
| Road Tolls (Net of Collection Costs) .....  | 5,870,383  |
| Interest — On Sinking Fund Investments .....  | 1,851,588  |
| — On Treasury Fund Balances .....   | 333,443    |
| Contributions for Specified Works .....   |            |
| — from Other Departments .....  | 1,473,228  |
| — from Other Sources .....  | 193,480    |
| Contributions by Councils for works carried out in conjunction with works on Main Roads ..... | 586,074    |
| Rents from Properties Acquired for Works .....  | 1,807,369  |
| Natural Disasters — State/Commonwealth Grant for Restoration Works .....                      |            |
| Miscellaneous .....   | 348,949    |

### Commonwealth Grants

|  |            |
|--|------------|
| — National Roads .....   |            |
| — Arterial Roads — Urban .....                                 |            |
| — Rural .....  | 32,990,000 |
| — Local Roads — Urban .....                                    |            |
| — Rural .....  |            |
| — Minor Traffic Engineering and Road Safety Improvements ..... |            |
| — Planning Research .....                                      |            |

Total Receipts

|  |                    |
|--|--------------------|
| Cash at Treasury as at 1 July 1979 ..... | 122,982,382        |
| Total Funds Available .....              | 6,170,714          |
|  | <u>129,153,096</u> |

## PAYMENTS

### State Road System

|   |            |
|---|------------|
| — Construction and Reconstruction .....       | 59,150,479 |
| — Property Acquisitions .....                 | 13,836,930 |
| — Maintenance and Minor Improvements .....    | 20,678,832 |
| — Natural Disasters — Restoration Works ..... | 9,326      |

### Local Roads

|   |  |
|---|--|
| — Construction and Maintenance .....          |  |
| — Natural Disasters — Restoration Works ..... |  |

### Traffic Signals, Signs and Road Markings — All Roads

|   |  |
|---|--|
| — Construction and Reconstruction ..... |  |
| — Maintenance and Operations .....      |  |

### Land and Buildings —

|                              |           |
|------------------------------|-----------|
| — For Works Operations ..... | 1,219,316 |
| — For Administration .....   | 13,736    |

### General Administrative Expenses

|                               |           |
|-------------------------------|-----------|
| — Planning and Research ..... | 4,626,491 |
| — Debt Charges .....          | 1,231,291 |

### Debt Charges

|   |           |
|---|-----------|
| — Repayable Treasury Advances — Interest .....                              | 649,293   |
| — General Loan Account — Interest and Management Expenses .....             | 5,000,400 |
| — Loans raised by the Commissioner — Interest and Management Expenses ..... | 6,578,510 |

Sub-Total

|  |                    |
|--|--------------------|
| Net Transactions of Operating and Suspense Accounts and Inter-Fund Transfers ..... | 112,994,604        |
| Sub-Total .....  | 2,957,108          |
|  | <u>115,951,712</u> |

### Capital Debt Repayments

|  |           |
|--|-----------|
| — Repayable Treasury Advances — Principal .....      | 227,968   |
| — General Loan Account — Sinking Fund .....          | 521,800   |
| — Loans raised by the Commissioner — Principal ..... | 1,881,502 |
| — Investments for Loan Repayments .....              | 3,714,700 |

Total Payments

|   |                    |
|---|--------------------|
| Cash at Treasury as at 30 June 1980 ..... | 122,297,682        |
|   | 6,855,414          |
|   | <u>129,153,096</u> |

B. J. Sexton  
COMMISSIONER FOR MAIN ROADS

E. C. Cooper  
CHIEF ACCOUNTANT

| Country Fund | Commonwealth Fund | Traffic Facilities | Sydney Harbour Bridge Accounts | Total 1979/80 | 1978/79     |
|--------------|-------------------|--------------------|--------------------------------|---------------|-------------|
| \$           | \$                | \$                 | \$                             | \$            | \$          |
| 98,343,029   |                   | 6,852,000          |                                | 143,478,320   | 130,195,756 |
| 978,308      |                   |                    |                                | 1,222,885     | 19,578,019  |
|              |                   | 19,127,717         |                                | 19,127,717    | 14,544,595  |
| 12,850,000   |                   |                    |                                | 36,850,000    | 13,400,000  |
| 55,174,960   |                   |                    |                                | 70,174,960    | 38,000,000  |
|              |                   | 1,971,193          | 2,365,225                      | 10,206,801    | 10,041,421  |
| 611,173      |                   |                    | 480,281                        | 2,943,042     | 2,387,050   |
| 1,126,414    |                   |                    | 277,500                        | 1,737,357     | 1,759,307   |
|              |                   | 350,000            | 549,521                        | 4,092,359     | 5,650,869   |
| 1,719,610    |                   | 344,230            |                                | 872,212       | 1,696,702   |
| 334,502      |                   |                    |                                | 843,793       | 670,765     |
| 257,719      |                   |                    | 271,786                        | 2,245,970     | 2,717,052   |
| 166,815      |                   |                    |                                | 1,499,214     | 5,438,293   |
| 1,499,214    |                   |                    |                                | 1,408,099     | 1,517,546   |
| 1,059,150    |                   |                    |                                |               |             |
|              | 79,435,124        | 1,717,876          |                                | 81,153,000    | 75,505,000  |
|              |                   |                    |                                | 32,990,000    | 30,694,000  |
| 20,691,000   |                   |                    |                                | 20,691,000    | 19,251,000  |
|              | 8,506,000         |                    |                                | 8,506,000     | 7,914,000   |
|              | 29,656,000        |                    |                                | 29,656,000    | 27,592,000  |
|              |                   | 3,793,000          |                                | 3,793,000     | 3,529,000   |
|              | 1,229,986         |                    |                                | 1,229,986     | 1,200,741   |
| 194,811,894  | 118,827,110       | 34,156,016         | 3,944,313                      | 474,721,715   | 413,283,116 |
| 20,050,447   | 946,242           |                    | 4,545,307                      | 31,712,710    | 34,726,847  |
| 214,862,341  | 119,773,352       | 34,156,016         | 8,489,620                      | 506,434,425   | 448,009,963 |
|              |                   |                    |                                |               |             |
| 98,427,730   | 66,352,578        |                    |                                | 223,930,787   | 189,235,053 |
| 3,730,244    | 1,555,547         |                    |                                | 19,122,721    | 17,737,721  |
| 67,771,223   | 8,471,801         |                    | 1,742,901                      | 98,664,757    | 89,248,104  |
| 209,051      |                   |                    |                                | 218,377       | 2,636,971   |
|              | 37,361,214        |                    |                                | 37,361,214    | 35,788,973  |
| 738,446      |                   |                    |                                | 738,446       | 3,167,555   |
|              |                   | 9,779,070          |                                | 9,779,070     | 8,043,827   |
|              |                   | 21,345,662         |                                | 21,345,662    | 19,500,467  |
|              |                   | 851,762            |                                | 2,790,496     | 2,131,945   |
| 719,418      |                   |                    |                                | 270,706       | 31,705      |
| 256,970      |                   |                    |                                | 17,509,400    | 15,235,927  |
| 7,796,959    | 3,460,044         | 1,435,906          | 190,000                        | 4,291,324     | 3,704,785   |
| 1,845,458    | 1,214,575         |                    |                                |               |             |
|              |                   |                    |                                | 1,205,830     | 1,061,699   |
| 556,537      |                   |                    |                                | 8,851,500     | 6,923,017   |
| 3,062,600    |                   |                    | 788,500                        | 15,524,134    | 8,916,804   |
| 8,430,941    |                   |                    | 514,683                        |               |             |
| 193,545,577  | 118,415,759       | 33,412,400         | 3,236,084                      | 461,604,424   | 403,364,553 |
| 5,667,722    |                   | 743,616            |                                | 9,368,446     | 4,534,431   |
| 199,213,299  | 118,415,759       | 34,156,016         | 3,236,084                      | 470,972,870   | 407,898,984 |
|              |                   |                    |                                | 423,370       |             |
| 195,402      |                   |                    | 52,500                         | 1,041,500     | 906,983     |
| 467,200      |                   |                    | 113,826                        | 2,723,636     | 1,993,486   |
| 728,308      |                   |                    | 726,000                        | 6,113,500     | 5,497,800   |
| 1,672,800    |                   |                    |                                |               |             |
| 202,277,009  | 118,415,759       | 34,156,016         | 4,128,410                      | 481,274,876   | 416,297,253 |
| 12,585,332   | 1,357,593         |                    | 4,361,210                      | 25,159,549    | 31,712,710  |
| 214,862,341  | 119,773,352       | 34,156,016         | 8,489,620                      | 506,434,425   | 448,009,963 |

The accounts of the Department of Main Roads have been audited in accordance with the provisions of the Audit Act, 1902. The above statement and the accompanying summary of loan liabilities is a true and fair statement of transactions on the several Funds and Accounts of the balances remaining at the close of the year.

The Traffic Facilities Fund reflects only Department of Main Road's transactions through the Fund on behalf of the Traffic Authority of New South Wales.

J. O'Donnell

SYDNEY, 1 September 1980

AUDITOR-GENERAL OF NEW SOUTH WALES

# MOORE-OXLEY BY-PASS OPENS AT CAMPBELLTOWN

Campbelltown is one of New South Wales' historic towns. The area was visited by Governor Macquarie in 1810, and named "Airds" after his wife's family estate. He subsequently ordered 175 acres of land to be reserved for the building of a township.

In 1820, the Governor again visited the site to mark out the limits of a settlement and to decree the site of a schoolhouse and a chapel. In his journal Macquarie wrote: "the ceremony having been gone through, I named the new township Campbelltown in honor of Mrs Macquarie's maiden name . . ."

Campbelltown today is a thriving city at the centre of a rapidly expanding growth area. Commercial and industrial enterprises are being attracted to the region, as are ever-increasing numbers of young people in search of housing they can afford set in a pleasant environment. The area now has the fastest growing level of population in Australia.

The full length of the Moore-Oxley By-pass was made available to traffic on Monday 24 November 1980, with the opening of the final section from Camden Road to Appin Road, near The Parkway.

Although some parts of the project — mainly pavement widening — remained to be completed in 1981, it was felt that all efforts should be made to open the road before the busy Christmas shopping period.

The By-pass allows traffic on Main Road No. 177 to divert at the northern end of Queen Street (for southbound traffic) or at the northern end of Appin Road (for northbound traffic), thus avoiding Campbelltown's busy commercial centre in Queen Street. There is also a link with Camden Road (Main Road No. 178) at the southern end of the By-pass.

Plans for a deviation here were first mooted in the mid-fifties. But it was not until 1974 that construction was begun by

Campbelltown City Council, working to plans prepared by the Department of Main Roads.

The building of the By-pass from Bradbury Avenue north to the railway overbridge was undertaken by Council. As sections between side streets were completed, they were made available to traffic, ending with the northernmost section near the railway bridge, which was opened in October last year.

The final two sections of the project, from Bradbury Avenue to The Parkway, and from Appin Road to Camden Road, were both constructed by the Department's own personnel operating from Picton Works Office. Construction included a multicell box culvert over Fishers Ghost Creek and a pedestrian subway for access to Bradbury Park.

The building of the By-pass and associated works to date has been financed entirely from Departmental funds. Grants

to Council have amounted to approximately \$1,400,000, and the remainder of the work, carried out by the Department, has cost in the order of \$2,500,000, making a total of almost \$4 million.

Altogether a total length of 3.7 km of roadway has been constructed providing generally for three lanes of traffic. The full proposal was for dual carriageways, with only one half to be built initially and the balance to be constructed when warranted by traffic volumes. The opening of the F5 — South Western Freeway Section (from Kenny Hill, just west of Campbelltown, to Yanderra) has relieved Campbelltown of a certain amount of through traffic. However, the area is one of rapid development with associated population growth (again contributed to by the new South Western Freeway Section) and so it is likely that traffic levels in the future will eventually demand the duplication of the carriageway. ●

## Campbelltown hasn't given up the ghost . . . of Fred Fisher

At the southern end of Campbelltown's new Moore-Oxley By-pass, the roadway crosses a small creek by way of an 8.1 m long three cell reinforced concrete box culvert. The creek it spans is named Fishers Ghost Creek. How the creek received its name is a good story worth another telling.

### A terrible tale

Frederick George James Fisher, a convict from England, arrived on the transport *Atlas* in 1816. After receiving a ticket-of-leave shortly afterwards, he settled on a 12 hectare farm south of Campbelltown (bounded on the north by the line of Lithgow Street, on the south by a line from Allman Street, on the east by Queen (formerly High) Street, and on the west by Bow Bowing Creek). On the night of 17 June 1826, Fisher disappeared. His overseer, George Worrall, said that Fisher had returned to England, leaving him in full power of his estate.

*The by-pass was soon being used by the many motorists who wanted to avoid the busy commercial area along Queen Street.*



One evening some months later a neighbour, Mr. Farley thought he saw a blood-soaked Fisher sitting on the fence of his paddock. As Farley approached, Fisher retreated into the field and vanished from sight. Farley reported that he had seen Fisher and made a deposition before the magistrate. A native tracker was taken to the fence where Fisher was sighted, and soon found Fisher's partly decomposed body beside a pool nearby. Subsequently, Worrall was tried and hanged for the murder of Fisher.

Every year on the anniversary of the bizarre disappearance, Fisher supposedly returns to the site of his murder. The fact that he has never been sighted is no doubt a disappointment for some ... and a considerable relief for others.

### The evidence

The details which surround this tale are understandably sketchy, but it appears that this is what happened.

A reward of £20 for the discovery of the body was offered by the Government on 27 September 1826, at which stage Fisher had been dead for three months. Although the reward was offered on this date, the authorities didn't request a special search until 20 October, after Farley told the magistrate his tale. George Luland, the constable who conducted the search, told the court that he "went to a place where some blood was said to have been discovered" and saw traces of it on several rails of a fence at the corner of Fisher's paddock.

The search party was joined by "two black natives", and they came to a creek where one of them saw something on the water. One of them went into the water "scumming some off the top with a leaf" which he then tasted, declaring that "there was the fat of a white man". Led by the natives, the party then proceeded to another creek, where one of them struck some marshy ground with a rod and discovered something buried among the reeds.

Digging commenced and soon revealed Fisher's body (see the report in *The Monitor* of 3 November 1826). An inquest was held and a verdict of wilful murder by "some person or persons unknown" was returned. Meanwhile, Constable Luland obtained a warrant and arrested Worrall. At Worrall's trial, Mr. Daniel Cooper mentioned that he was owed money by Fisher and that Worrall offered to pay this debt if Cooper would give to him certain title-deeds of Fisher's. When Cooper

replied that he would wait for Fisher to repay the debt, Worrall exhibited uneasiness, and promised to show a written commission to act for Fisher. This document was never produced.

Giving testimony, James Hamilton swore that in August 1826 when he told Worrall that foul play was suspected, Worrall "turned pale and endeavoured to force a smile". Worrall said vaguely that Fisher was "on salt water" but did not name the ship.

With other substantial evidence before them, the jury returned a verdict of guilty and a sentence of death was passed. The *Sydney Gazette* of 6 February 1827 reported that "George Worrall, convicted on Friday last of the murder of Frederick Fisher, yesterday suffered the last penalty of the law. Till about 5 o'clock on the morning of his execution, he persisted in asserting his innocence, when he was induced to confess to a gentleman who had sat up with him during the night, that he alone had perpetrated the murder, but positively affirmed it was not his intention at the time to do so". (See also *The Australian* of 3 February 1927.)

### Not a ghost of a chance

It is intriguing to note that no mention of the ghost was made during the court proceedings. A precedent was perhaps set in 1753 at Edinburgh, when, in the face of overpowering evidence against them, the accused were acquitted because two witnesses admitted to having seen the ghost of the murdered man. The advocate made such fun of the ghost story that the jury, not believing the tale, also apparently disregarded the evidence of the witness who saw the crime.

Chief Justice Sir Francis Forbes who presided at Worrall's trial had notes on the whole proceedings, "... with the exception of the references to the apparition, which although it led to the discovery of Fisher's body, could not be alluded to in a court of justice..." (G.W. Rusden in his *History of Australia*. 1883 Vol. 2, pp 44-45).

Nevertheless, it was Farley's vision of Fisher's ghost which revealed the exact spot where Fisher had been struck down, leaving traces of his blood, which no evidence shows to have been previously noticed. It seems improbable that if Farley knew of the crime and was lured by the reward of £20, he would act as informer under such a transparent cover as a ghost story.



Fred Fisher, as sketched by Norman Lindsay.\*

\* Permission to reproduce the illustration by Norman Lindsay courtesy of the copyright holder, Janet Glad C/- Curtis Brown (Aust.) Pty. Ltd., Sydney.

### The scene of the crime

In a paper on Fisher, prepared by Mr. Ivor G. Thomas (based on information in the *Campbelltown and Airds Historical Society's Journal and Proceedings*, Vol. 1, No. 11, 1949), the author gives some interesting information on the early bridge and its doubtful connection with the story.

"The Ghost Story is first mentioned in Robert Montgomery Martin's *History of the British Colonies*, Vol. 4, page 303-4, published in London in 1835, and an account is given in *Tegg's Magazine*, March 1836. In 1853, John Lang mentions the story in a magazine (*Charles Dicken's Household Words*) and in 1859 published a fuller account in a book of stories called 'Botany Bay'. In this book the site of the appearance of the Ghost is described as 'the cross fence that divided Fisher's farm from Smith's, near the old bridge, at the bottom of Iron Gang Hill'; and again, 'The Ghost ... seen sitting on a rail not far from the old bridge at the bottom of the Hill'.

Thus, the 1859 account of the story is the first to mention a bridge, and then only to help describe the location of the part of a fence on which the Ghost appeared. The name 'Smith' in Lang's account is fictitious for Bradbury. Lang warns that the tale is fictitious and he sets it at Penrith to avoid libellous implications.

The bridge referred to was across the fresh water creek, later formed into the concrete-lined canal at the side of Dumaresq Street. The late Mr. J. McGuane, in his 'Centenary of Campbelltown 1920', described it as a slightly-raised Corduroy Bridge. I would make one other comment about 'The old bridge at the bottom of Iron Gang Hill'. Probably the bridge was not there during Fisher's lifetime. An Iron Gang was sent to Campbelltown in the early thirties to construct the reservoirs at the upper end of Dumaresq Street. Iron Gang Hill is the hill at the top of that street. The gang was under the command of Captain Francis Allman, and it is probable they constructed the bridge over the fresh-water stream overflowing from the reservoirs.

So, if Campbelltown is to retain its Ghost, and tradition seems to demand it, and perhaps its tourist value advises it, then let

us sit the Ghost in his proper place. Hon. T.D. Mutch has pin-pointed the site of murder and the bloodstained rails from a contemporary sketch plan. The Ghost, therefore, sits on the southern boundary of Fisher's Farm, 55 rods (276 m) westward from Queen Street. The sign board at the end of our town, 'Fisher's Ghost Creek', although not the site of the Ghost, is correct enough, because it was in the banks of that creek, lower down near the present railway, that Fisher's body was buried and found. But we hear too often the term Fisher's Ghost Bridge."

### Getting into the spirit of things

Yes, we should try to keep our ghosts in place, but that's no easy task, of course. For 25 years now, Campbelltown City Council has organised an annual Festival of Fisher's Ghost during October, with a wide range of social, recreational and cultural activities. It's a lot of fun and even includes a Miss Spirit competition!

But perhaps the most permanent visual records of this legend are still the signs on two crossings of Fishers Ghost Creek at the southern end of Campbelltown. One is the new Moore-Oxley By-pass and the other is at the end of Queen Street, near

its junction with the Campbelltown-Camden Road (Main Road No. 178). In the latter case, a 32 m long three cell reinforced concrete box culvert, located immediately west of the old timber bridge, was brought fully into use in early December 1974. A section of this culvert was initially put into service in May 1974, and the 91.4 m long timber beam bridge with sandstone abutments was demolished.

Fisher was buried in the cemetery at St. Peters Church of England, Campbelltown on 27 October 1826, but no headstone marks his grave. His house has long since gone, replaced by John Hurley's public house which later served as the Bank of New South Wales, although it no longer trades as such.

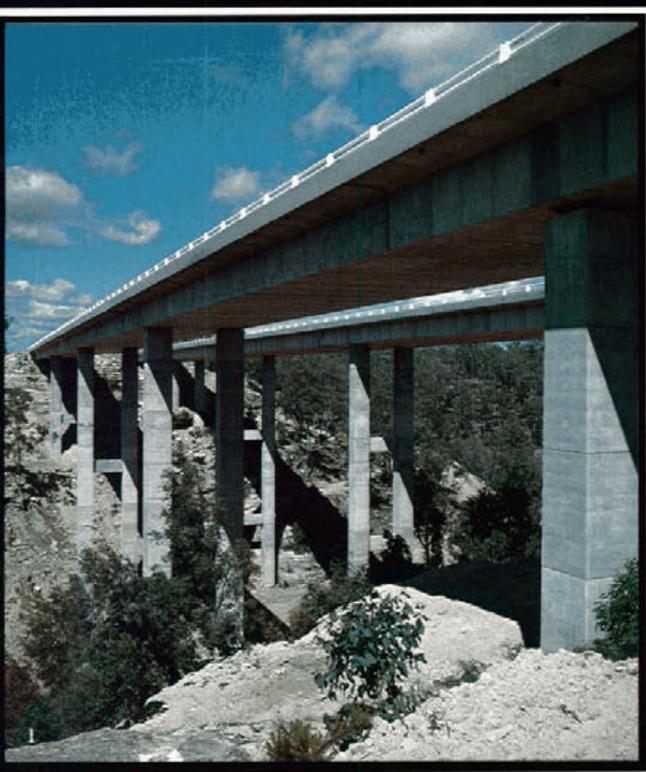
With no home and no epitaph, Fred Fisher's ghost has probably forsaken his lonely and uncomfortable fence. Perhaps he may be met frolicking with the revellers who come each year to share the pleasures of the festival which perpetuates his name. If so, he must be fascinated to see how his macabre personal tragedy has been transformed into a community festival. ●

## Tenders Accepted by Councils

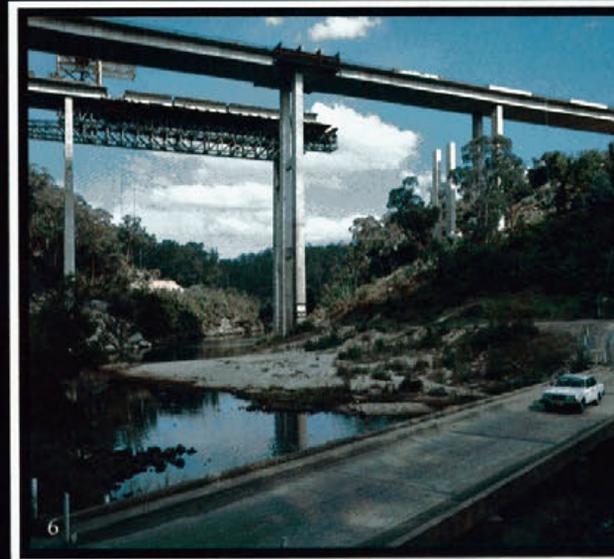
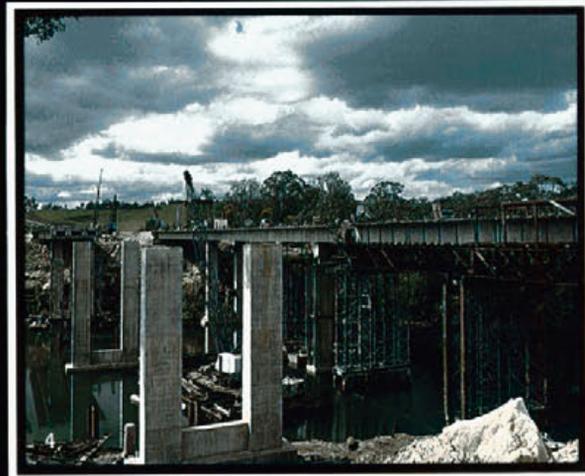
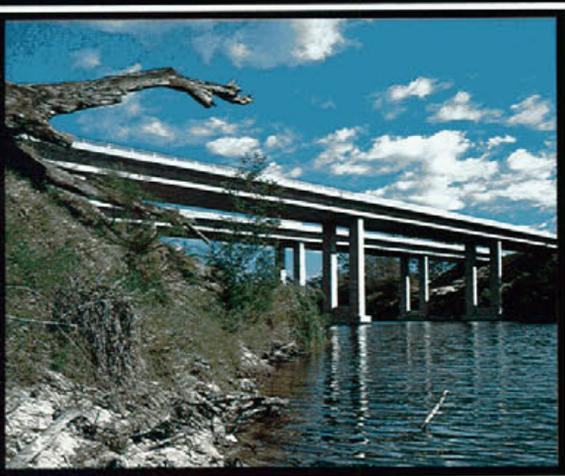
1. The following tenders (in excess of \$20,000) for road and bridgeworks were accepted for the three months ended 30 June 1980.

| Council                         | Road No.                                     | Work or Service  | Name of Successful Tenderer                  | Amount                                      |
|---------------------------------|--|--|--|---|
| Blue Mountains City             | Rural Local Road                             | Reconstruction and improvements to Railway Parade, Woodford  | McGregor Constructions Australia             | \$198,538.95                                |
| Bombala                         | SH 19  | Reconstruction 14.57 to 17.15 km south of Bombala  | Monaro Road Construction Pty Ltd             | \$94,212.28                                 |
| Bombala                         | MR 394                                       | Construction to sub-grade level  | Monaro Road Constructions Pty Ltd            | \$26,810.00                                 |
| Carrathool                      | MR 418                                       | Construction to sub-grade level from 0.0 km to 1.6 km west of Monaro Highway   | Herbert Bros. Unit Trust                     | \$93,928.44                                 |
| Culcairn                        | Various                                      | Construction of bridge over Merrowie Creek at 18.7 km north of Hillston  | Emoleum (Aust.) Ltd                          | \$48,731.91                                 |
| Dungog                          | Rural Local Road                             | Bitumen sealing works on various trunk and main roads within the Shire   | A.R. Dickinson Pty Ltd                       | \$178,944.00                                |
| Dungog                          | Rural Local Road                             | Construction of Gringhi bridge — a 3 span prestressed concrete bridge over the Allyn River, 20.8 km from East Gresford | Lockyer Constructions Pty Ltd                | \$185,650.00                                |
| Gilgandra                       | TR 77  | Construction of Eccleston bridge — a 3 span prestressed concrete bridge over the Allyn River, 23.4 km from Gresford    | G. & E.M. Tincknell                          | \$76,480.40                                 |
| Inverell                        | TR 63 & 73<br>MR 134, 135, 136,<br>137 & 187 | Construction of bridge over Appletree Flat Creek, 34.2 km east of Gilgandra  | Emoleum (Aust.) Ltd                          | \$66,149.24                                 |
| Mumbulla                        | MR 272                                       | Supply and heat, haul and spray C160 bitumen   | Rocla Concrete Pipes Ltd                     | \$36,879.80                                 |
| Mumbulla                        | MR 272                                       | Supply and delivery of bridge planks for Barragoot Lake bridge   | McConnel, Dowell Constructions Ltd           | \$830,632.00                                |
| Narraburra                      | MR 387                                       | Construction of bridge over Bermagui River at Bermagui   | Herbert Bros                                 | \$71,628.39                                 |
| Snowy River Tallaganda Tamarang | Unclassified Rural Local Road MR 130         | Construction of bridge over Trigalong Creek at 3.1 km west of Temora   | K.E. Bottom Hornibrook Group Tamenco Pty Ltd | \$103,177.00<br>\$42,680.00<br>\$221,665.00 |
| Wollondilly                     | MR 177                                       | Construction of bridge over Molong Creek   | Allen Bros Asphalt Ltd                       | \$32,964.25                                 |
|                                 |  | Piledriving on bridge over Corang River on Oallan Road   |  |   |
|                                 |  | Construction of reinforced concrete bridge over Box Gully at 9.2 km north of Quirindi                                  |  |   |
|                                 |  | Maintenance works in connection with County of Cumberland Main Roads Maintenance and Improvement Programme 1979/80     |  |   |

1. The completed twin bridges over Moolgun Creek, south of Douglas Park, and 2. during construction in April 1979. 3. The bridge over the Nepean River near Menangle, and 4. under construction (and threatening skies) in August 1979. 5. The towering bridge at Douglas Park, and 6. as it appeared in April 1980.



## A SPAN IN TIME



# Tenders Accepted by Councils

2. The following tenders (in excess of \$20,000) for road and bridgeworks were accepted for the three months ended 30 September 1980.

| Council       | Road No.                                      | Work or Service   | Name of Successful Tender          | Amount                     |
|---------------|---|---|------------------------------------|----------------------------|
| Bowral        | MR 260  | Reconstruction at "The Briars" between 10.3 and 10.7 km from the Hume Highway                         | A.C. Hill & Sons                   | \$59,676.00                |
| Bogan         | TR 70   | Earthworks construction for reconstruction and bitumen sealing 16.1 to 18.3 km east of Coolabah       | Cartwright Nominees                | \$69,400.00                |
| Boomi         | Local Rural Road No. 5 (Combadello to Gurley) | Construction of a five span 45 m long prestressed concrete bridge over Moomin Creek at Carrington     | Bridge and General Pty Ltd         | \$164,306.46               |
| Cabonne       | Various                                       | Supply and spraying of bitumen within the Shire   | Emoleum (Aust.) Ltd                | \$27,639.86                |
| Coonabarabran | TR 4053                                       | (a) Bridge planks for bridge over Castlereagh River<br>(b) Piling on bridge over Castlereagh River    | Frankipile (Aust.) Pty Ltd         | \$21,528.00<br>\$38,000.00 |
| Copmanhurst   | Various                                       | Supply, heat, haul and spray C160 bitumen to various sections of roads within the Shire               | Polson & McKinley                  | \$35,055.21                |
| Dungog        | Various                                       | Supply of 133 423 l of bitumen for sealing various roads within the Shire                             | Boral Road Services Pty Ltd        | \$41,136.24                |
| Gosford       | MR 349  | Demolition of disused railway bridge over Brisbane Waters   | Baxter Contractor Pty Ltd          | \$64,749.00                |
| Liverpool     | Haig Avenue                                   | Construction of underpass under Newbridge Road near Georges River bridge                              | John R. Burton Contractors Pty Ltd | \$37,977.54                |
| Mittagong     | MR 263  | Demolition of bridge and construction of a two cell reinforced concrete box culvert at Elliotts Creek | Thiess Bros. Pty Ltd               | \$27,245.00                |
| Muswellbrook  | MR 213  | Construction of Saddlers Creek bridge 15.87 km west of Jerrys Plains                                  | A. R. Dickinson Construction & Co. | \$282,261.00               |
| Tamarang      | MR 130  | Construction of new structure over Box Gully, 9.2 km north of Quirindi                                | Tamenco Pty Ltd                    | \$221,665.00               |
| Wakool        | MR 319  | Construction of bridge over Cow Creek at 8.7 km north of Barham                                       | Nelmac Pty Ltd                     | \$235,492.50               |
| Warren        | MR 333  | Construction of bridge over Marra Creek   | Steve Perry Manufacturing          | \$104,041.20               |
| Wollondilly   | MR 177  | Widening of Kings Falls bridge over Georges River near Appin, 17.1 km south of Campbelltown           | Ripma Constructions                | \$114,271.00               |
| Wollondilly   | MR 177  | Construction of passing lane between 6.3 km and 7.1 km east of Appin                                  | Boral Resources (NSW) Pty Ltd      | \$99,209.10                |
| Yallaro       | Shire Road No. 14                             | Construction of a three span 32.3 m long prestressed concrete bridge over Mosquito Creek              | Bricul Civil Constructions Pty Ltd | \$90,854.04                |

# Tenders Accepted by Department

1. The following tenders (in excess of \$20,000) for road and bridge works were accepted for the three months ended 30 June 1980.

| Road No.                  | Work or Service  | Name of Successful Tender              | Amount       |
|---------------------------|--|--|--------------|
| Western Freeway           | Municipality of Auburn. Construction of bridge over Western Freeway at Stubbs Street, Auburn.  | Enpro Constructions Pty Ltd            | \$438,556.00 |
| Western Freeway           | Municipalities of Concord and Strathfield. Construction of Pier 9 for bridge over northern railway at North Strathfield.   | A.A.M.M. Constructions Pty Ltd         | \$65,726.50  |
| State Highways Nos. 2 & 3 | Hume Highway and Federal Highway, Shires of Yarrowlumba, Gunning and Mulwaree. Supply and delivery of up to 1 000 t of 10 mm coldmix.  | Allen Bros Asphalt Ltd                 | \$28,250.00  |
| State Highway No. 5       | Great Western Highway. City of Blue Mountains. Reconstruction and provision of four lanes from Knapsack Gully bridge to Mount Street, Lapstone.  | Mr. A.J. Gregoreako                    | \$20,134.00  |
| State Highway No. 5       | Great Western Highway Municipalities of Concord and Strathfield. Manufacture, supply and delivery of precast, prestressed concrete beams for bridge over Powells Creek near Station Street, Homebush.                            | Humes Ltd                              | \$20,367.00  |
| State Highway No. 9       | New England Highway. Shire of Severn. Supply and delivery of up to 400 m <sup>3</sup> of ready mixed concrete to Stonehenge bridge site at 90.93 km north of Armidale.   | Glen Innes Ready Mixed Concrete        | \$21,160.00  |
| State Highway No. 9       | New England Highway, Shires of Parry and Uralla. Hay mulching, fertilizing and seeding on "Moonbies" and "Uralla-Barleyfields" deviation.  | Spray Grass Services Pty Ltd           | \$20,920.80  |
| State Highway No. 10      | Pacific Highway. Shire of Nambucca. Construction of bridge over Deep Creek, 7.5 km north of Nambucca Heads   | McDougall-Ireland                      | \$503,740.00 |
| State Highway No. 10      | Pacific Highway. Shire of Gosford. Installation of traffic light signals at intersection of Pacific Highway and Racecourse Road.   | C. & K. Aldridge                       | \$43,304.00  |
| State Highway No. 10      | Pacific Highway. Shire of Nambucca. Construction of a 23.6/25.0 m extension to the existing three cell 2.44 x 1.83 m reinforced concrete box culvert over Cow Creek, 71.3 km north of Kempsey.                                   | Geoffrey Stewart Constructions Pty Ltd | \$59,373.80  |
| State Highway No. 10      | Pacific Highway. Shire of Byron. Supply, haul and laying of up to 810 t of asphaltic concrete to intersection of Pacific Highway and Trunk Road No. 65 at Bangalow.  | Bitupave Ltd                           | \$37,978.20  |
| State Highway No. 10      | Pacific Highway. Municipality of Lake Macquarie. Supply, delivery and laying of up to 10 mm asphaltic concrete for pavement widening and construction of dual carriageway between Swansea bridge and Soldiers Road, Blacksmiths. | Bitupave Ltd                           | \$35,737.00  |
| State Highway No. 10      | Pacific Highway. Municipality of Lake Macquarie. Supply and laying of up to 1050 t of 20 mm asphaltic concrete for improvement to intersection of Pacific Highway with Nords Wharf Road.   | Bitupave Ltd                           | \$49,980.00  |
| State Highway No. 10      | Pacific Highway. Municipality of Lake Macquarie. Supply and lay 920 t of dense graded 20 mm asphaltic concrete between Swansea bridge and Lake Macquarie Municipal Caravan Park.   | Boral Road Surfaces                    | \$42,964.00  |
| State Highway No. 10      | Pacific Highway. Municipality of Lake Macquarie. Supply and laying of 1 000 t of dense graded 20 mm asphaltic concrete at Blacksmiths between Lake Macquarie Caravan Park and Karog Street.                                      | Boral Road Surfaces                    | \$46,700.00  |
| State Highway No. 10      | Pacific Highway. Shire of Port Stephens. Haulage of 10 000 t of slag skulls to construction work between Glenelg and Carpenter Streets, Raymond Terrace.   | J.J. & B.W. Johnson                    | \$26,000.00  |
| State Highway No. 10      | Pacific Highway. Shire of Wyong. Supply and delivery of 8 000 m <sup>3</sup> of lower base material to pavement widening and construction of dual carriageways from Vales Road to Sallena Avenue, Doyalson.                      | R.L. Scadden Pty Ltd                   | \$40,000.00  |

| Road No.             | Work or Service  | Name of Successful Tender    | Amount      |
|----------------------|--|------------------------------|-------------|
| State Highway No. 10 | Pacific Highway. Shire of Port Stephens. Supply and lay 950 t of 10 mm asphaltic concrete at Motto Farm near Raymond Terrace.                              | Bitupave Ltd                 | \$44,507.00 |
| State Highway No. 17 | Newell Highway. Shire of Timbreebongie. Widening of bridge over Ugumjil Creek, 39.0 km north of Peak Hill.   | G. & E.M. Tincknell          | \$55,445.93 |
| Main Road No. 574    | Kissing Point Road. City of Parramatta. Construction of reinforced concrete cast-in-place piles for bridge over Vineyard Creek, 1.4 km east of Parramatta. | Gervay Constructions Pty Ltd | \$41,129.00 |
| Various              | Supply and load 1 500 t of 10 mm dense graded asphaltic concrete for routine patching in various shire areas within Hunter Valley Division.                | Bitupave Ltd                 | \$51,825.00 |
| Various              | Shire of Inverell. Supply, heat, haul and spray C160 bitumen on various roads within the Shire area.   | Emoleum (Aust.) Ltd          | \$66,149.24 |

**2. The following tenders (in excess of \$20,000) for road and bridge works were accepted for the period ended 30 September 1980.**

|                               |  |   |                |
|-------------------------------|--|---|----------------|
| F3 — North Western Freeway    | City of Sydney. Demolition of Pyrmont bridge — eastern stone portion.  | P. Menere Demolitions Pty Ltd             | \$68,000.00    |
| F3 — Sydney Newcastle Freeway | Shire of Wyong. Construction of sub-structures for twin bridges at Deep Creek, 89.01 km north of Sydney.   | E. Saunders & Son                         | \$174,145.40   |
| F4 — Western Freeway          | Municipalities of Concord and Strathfield. Construction of Abutment B for bridge over northern railway line at North Strathfield.  | Hornbrook Group, Southern Division        | \$143,735.00   |
| F4 — Western Freeway          | City of Parramatta. Construction of bridge over Deniehy Street, Auburn.  | Christie Civil Contracting                | \$470,342.00   |
| F4 — Western Freeway          | Municipality of Holroyd. Construction of bridge over Burnett Street, Merrylands West.  | Enpro Constructions Pty Ltd               | \$449,563.00   |
| State Highway No. 2           | Hume Highway. Shire of Gundagai. Construction of Tumblong Deviation, 13.5 to 23.3 km south of Gundagai.  | White Industries Ltd                      | \$4,988,276.00 |
| State Highways Nos. 2 & 3     | Hume and Federal Highways. Shires of Mulwaree, Gunning and Yarrawluma. Supply of 10 mm cold mix for maintenance and construction works.  | Allen Bros Asphalt Ltd                    | \$28,250.00    |
| State Highways Nos. 2 & 15    | Hume and Barton Highways. Municipality of Yass, Shires of Harden and Gundagai. Supply of 10 mm asphaltic concrete.   | Department of Housing and Constructions   | \$42,750.00    |
| State Highways Nos. 2 & 15    | Hume and Barton Highways. Municipality of Yass, Shires of Yarrawluma, Harden and Gundagai.   | Canberra Asphalts                         | \$60,450.00    |
| State Highway No. 4           | Snowy Mountains Highway. Shire of Mumbulla. Construction of bridge over Nunnock River, 41.0 km west of Bega.   | Mr. N.J. McIntosh                         | \$363,000.00   |
| State Highway No. 1           | Princes Highway. Municipality of Kogarah. Installation of moveable medians on the Georges River bridge.  | P.W. Kirby Pty Ltd                        | \$40,855.00    |
| State Highway No. 7           | Mitchell Highway. Various Council areas within the Central Western Division. Protection of bridge abutments using 125 mm filter point fabricform at various bridges.   | Foreshore Protection                      | \$29,740.00    |
| State Highway No. 9           | New England Highway. City of Cessnock. Supply and delivery of 11000 m <sup>3</sup> of lower base gravel for reconstruction of pavement, Kaludah Creek to Harpers Hill, 13.7 to 15.6 km west of Maitland.   | Reynolds Hire Service                     | \$34,100.00    |
| State Highway No. 9           | New England Highway. City of Maitland. Supply and delivery of 850 m <sup>3</sup> of 10 MPa concrete for the reconstruction of the intersection of the New England Highway and Melbourne Street, East Maitland.   | Blue Metal and Gravel (North)             | \$34,935.00    |
| State Highway No. 9           | New England Highway. City of Maitland. Supply and delivery of 800 m <sup>3</sup> of 30 MPa concrete to reconstruct the intersection of the New England Highway and Melbourne Street, East Maitland.  | Blue Metal and Gravel (North)             | \$39,984.00    |
| State Highway No. 10          | Pacific Highway. Shire of Port Stephens. Supply and delivery of 150 m <sup>3</sup> of 15 MPa ready mixed concrete and reconstruction bitumen for use in kerbing, sumps, etc. at Glenelg and Carpenter Streets, Raymond Terrace.                                | Metford Concrete                          | \$27,260.00    |
| State Highway No. 10          | Pacific Highway. Shire of Port Stephens. Supply and lay 1000 t of 20 mm asphaltic concrete for reconstruction and widening from Glenelg to Carpenter Streets, Raymond Terrace.   | G. Hawkins & Sons Pty Ltd                 | \$43,000.00    |
| State Highway No. 10          | Pacific Highway. Shires of Port Stephens and Great Lakes. Supply and delivery of 1500 m <sup>3</sup> of 10 mm precoated sealing aggregate for highway maintenance.   | Blue Metal & Gravel (North)               | \$31,580.60    |
| State Highway No. 10          | Pacific Highway. Shire of Port Stephens. Supply and deliver 4500 m <sup>3</sup> of 20 mm fine crushed rock.  | Blue Metal & Gravel (North)               | \$42,014.48    |
| State Highway No. 10          | Pacific Highway. Shire of Wyong. Supply and delivery of 10 000 m <sup>3</sup> of selected sub-grade for pavement widening and construction of dual carriageways from Vales Road to Saliens Avenue, Doyalson.   | D. & J. Constructions Pty Ltd             | \$41,900.00    |
| State Highway No. 10          | Pacific Highway. Municipality of Lake Macquarie and Shire of Wyong. Supply and delivery of 5000 m <sup>3</sup> of shear gravel for shoulder maintenance on highway.  | D. & J. Constructions Pty Ltd             | \$24,500.00    |
| State Highway No. 10          | Pacific Highway. Shire of Wyong. Supply and delivery of 8000 m <sup>3</sup> of upper base material for pavement widening and construction of dual carriageways from Vales Road to Saliens Avenue, Doyalson.  | D. & J. Constructions Pty Ltd             | \$47,600.00    |
| State Highway No. 10          | Pacific Highway. Municipality of Lake Macquarie. Haulage of 10 000 t of slag skulls from B.H.P. to construct dual carriageways from Swansea bridge to Soldiers Road, Pelican.  | K. Matthews                               | \$28,900.00    |
| State Highway No. 10          | Pacific Highway. Shires of Port Stephens and Great Lakes. Supply and spray up to 10 000 l of C160 bitumen for patching and primer sealing work.  | Boral Road Surfaces                       | \$39,440.00    |
| State Highway No. 10          | Pacific Highway. Shire of Manning. Supply and laying of asphaltic concrete at the following sites:<br>1. Stitts Creek Bridge, 2.16 km south of Taree<br>2. Cubba Cubba Creek bridge, 1.15 km south of Taree<br>3. Stoney Creek bridge, 42.36 km north of Taree | Pioneer Asphalts Pty Ltd                  | \$25,561.25    |
| Main Road No. 108             | City of Newcastle. Painting steelwork of bridge over Hunter River at Stockton.   | K. & G. Bradica Pty Ltd                   | \$88,266.00    |
| Main Road No. 157             | Shire of Baulkham Hills. Widening of bridge over Cattai Creek in Showground Road 3.5 km west of Castle Hill.   | I.S.K. Constructions Pty Ltd              | \$143,620.00   |
| Main Road No. 184             | Shire of Hawkesbury. Installation of traffic signals at East Market Street and Windsor Street, Richmond and East Market Street and March Street, Richmond.   | P. W. Kirby Pty Ltd                       | \$31,312.00    |
| Main Road No. 226             | Shire of Berrigan. Construction of bridge over Bullanginya Lagoon, Barooga   | Nelmac Pty Ltd                            | \$881,652.00   |
| Main Road No. 289             | Shire of Great Lakes. Construction of Washpool Bridge over Karuah River, 3.5 km west of Trunk Road No. 90.   | A. R. Dickinson Construction Co. Pty Ltd. | \$487,118.50   |
| Main Road No. 503             | Shire of Singleton. Construction of bridge over Darkey Creek south at 40.6 km south of New England Highway   | Wrightson Contracting Pty Ltd             | \$266,600.00   |
| Main Road No. 503             | Shire of Singleton. Construction of cast-in-place reinforced concrete piles for bridge over Bilga Creek at 27.1 km south of Singleton.   | Godfreypile Pty Ltd                       | \$49,152.00    |
| County Road                   | City of Parramatta. Parramatta By-pass. Construction of bridge over Toongabbie Creek at Harris Road, Wentworthville.   | Enpro Constructions Pty Ltd               | \$642,520.50   |

