F3
SYDNEY-NEWCASTLE FREEWAY

SYDNEY-NEWCASTLE FREEWAY

HISTORY

Newcastle is the second largest city in New South Wales. Although situated only 160 km north of Sydney, it seemed for many years to be surprisingly distant.

Those 160 km contain some of the most rugged terrain to be found on the Australian coast. Additionally, the way is divided by the wide waters and numerous inlets of the Hawkesbury River.

Early overland links with Newcastle involved travelling a wide inland arc that made the journey some 240 km long. A direct link was not available until 1889 when the rail line between Sydney and Newcastle was completed.

The degree of difficulty of this terrain can be gauged from the fact that the rail crossing of the Hawkesbury River was the last obstacle in completing 2,800 km of rail line linking Brisbane, Sydney, Melbourne and Adelaide.

A direct road link was not built until 1930, and even that was not fully completed until a road bridge replaced the ferry across the Hawkesbury in 1945. Thus, it took nearly 150 years from Newcastle's first settlement to establish a direct road link between that city and Sydney.

The completion of the road, the Pacific Highway, coincided with the start of the post-war boom in prosperity and car ownership.

Consequently, the road grew in popularity, carrying commerce between the two cities and holidaymakers to the resorts of the Central and Northern Coasts. It quickly became the most heavily trafficked rural road in New South Wales and probably Australia.

The limitations of the road to meet future needs were recognised in the 1950s and planning commenced on a freeway to link the two cities.

In 1960, as an interim measure, work commenced on an alternative route to the Pacific Highway around Gosford. The route departed from the Highway at Calga and passed through Peats Ridge, Central Mangrove and Somersby before rejoining the Highway at Ourimbah, north of Gosford.

The same year, the Government called for offers for the design, financing, construction and operation of a tollway between Sydney and Newcastle. In effect, private enterprise was invited to build and operate the Freeway as a commercial venture. Three offers were received but none was found acceptable.

The Government decided to adopt the location proposed by the then Department of Main Roads (now the Roads and Traffic Authority) and work commenced on the section immediately north of the Hawkesbury River, using a combination of contractors and the Department's own workforce.

At that time, the planned route of the Freeway was from near Pearces Corner at Wahroonga, north over the Hawkesbury River at the current crossing at Peats Ferry, then from Calga to Ourimbah. From Ourimbah the Freeway was to pass east of Wyong, close to Tuggerah Lake, and continue on the eastern side of Lake Macquarie to the southern suburbs of Newcastle.

In order to commence construction as soon as possible, special loan funds were raised. These funds were to be repaid from a toll applicable to each section of Freeway.

However, in 1974 the Freeway between Berowra and Calga was adopted as part of the National Highway between Sydney and Brisbane. Other Freeway sections were adopted later. This meant the Federal Government would fund future work on the National Highway, thus eliminating the need for future sections of the Freeway to become tollways.

The planned route of the Freeway had been revised in 1968 to pass to the west of Wyong. Further investigations were undertaken to re-examine the route north of Wyong. These supported a location to the west of Lake Macquarie, with link roads to Doyalson and Newcastle.

This route avoids heavily populated areas east of Lake Macquarie and will provide a bypass of Newcastle itself. It will also allow the many vehicles which will use the Freeway to avoid conflict with local urban traffic.

CONSTRUCTION

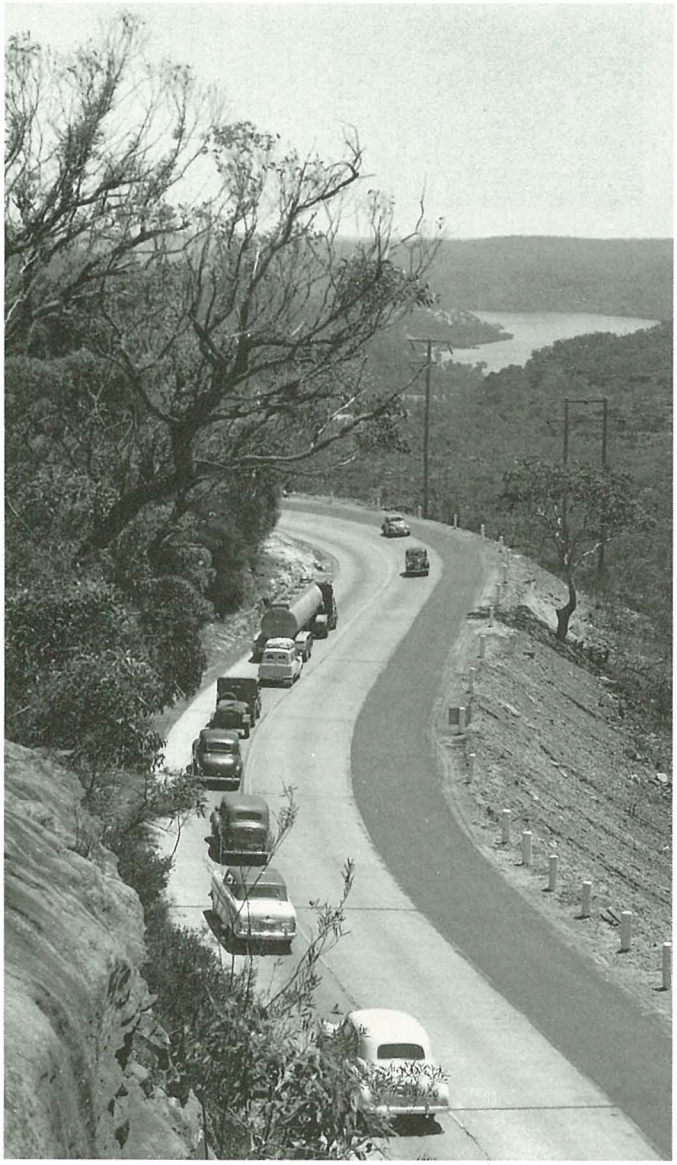
Work first commenced on the Sydney-Newcastle Freeway in April 1963, involving 7 km of dual carriageways from the Hawkesbury River northward to Mount White.

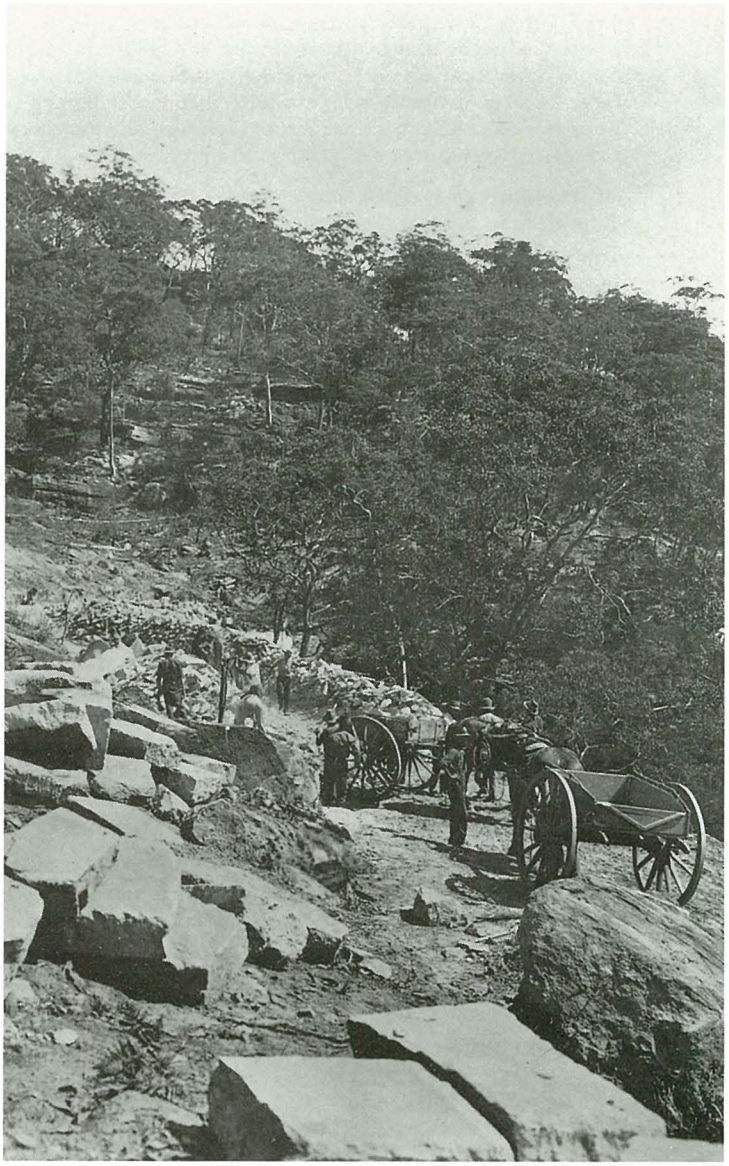
This was completed in December 1965 and was followed by sections from Mount White to Calga (October 1966), Berowra to Hawkesbury (December 1968), Somersby to Ourimbah (December 1983), Ourimbah to Wallarah Creek (December 1983), Calga to Somersby (December 1986), Wallarah Creek to Morisset (September 1987), Morisset to Freemans Interchange (March 1988) and Wahroonga to Berowra (March 1989).

In all some 95 km of Freeway are now open to traffic, providing substantial savings in transport costs, energy and travelling times.

Most importantly the improved alignment, wider carriageways and easier grades and curves have made an invaluable contribution to road safety by reducing the number of accidents along the route.

(Front Cover) Part of the Wahroonga to Berowra section of the Freeway opened in March 1989.
(Top) Construction of the first Sydney-Newcastle road in progress in November 1930.
(Left) Winding climbs and descents on the old Highway to Newcastle often resulted in long traffic queues.
(Right) Earthmoving in progress for the original Highway using horse and cart.





WAHROONGA TO BEROWRA

This 15.5 km section forms the southern end of the F3 Sydney-Newcastle Freeway. Work commenced in February 1984 and was completed in March 1989, linking the then existing Freeway at Berowra to the Sydney road network at the Pacific Highway and Pennant Hills Road, near Pearces Corner, Wahroonga.

The section comprises dual carriageways with three lanes in each direction between Wahroonga and Mt Colah and two lanes in each direction north of Mt Colah.

There are 11 bridges over the Freeway including two pedestrian bridges, a bridge for fire access at Berowra and a bridge to carry the North Shore Railway over the Freeway. In addition, large concrete arch culverts were used to cross Spring Gully Creek and Quarry Creek.

Access to this section of Freeway for northbound traffic is provided at Pennant Hills Road and the Pacific Highway, Wahroonga, and at Berowra. Northbound traffic can leave the Freeway at Windybanks Interchange and Ku-ring-gai Chase Road, Mt Colah, where access is also provided for southbound traffic.

This section of the Freeway is adjacent to Ku-ring-gai Chase National Park for 12 kms of its length and was landscaped to blend in with the natural surroundings. Special measures to reduce the impact on the natural environment included an extensive network of catch drains, levee banks and sedimentation ponds to control erosion and sedimentation in local waterways. The Soil Conservation Service assisted in this regard during the course of the work.

The Forestry Commission also assisted with advice on revegetation of the site. Seeds of native species were collected from the site before work began and were planted during the course of the work. Large earthfills have rock facing in which random rock planting pits were provided. Native trees and shrubs were planted in these pits to provide initial revegetation of the large fill embankments.

In residential areas noise barriers were provided to reduce disturbance to adjacent residences. These barriers consist of earth mounds and timber acoustic screens.

Construction was carried out by contract under the supervision of the Roads and Traffic Authority. Work involved approximately 4 million cubic metres of excavation, mostly in Hawkesbury sandstone. The deepest cut was 24 m and the highest fill 65 m. Approximately 480,000 square metres of road pavement and shoulders were constructed, involving the placement of over 160,000 cubic metres of concrete. The most up to date construction methods, including slip form paving of the concrete pavement, were used to minimise construction periods.

In bypassing Hornsby shopping centre, the new route will eliminate a notorious bottleneck and reduce travelling time north of Sydney by more than half an hour in peak periods. More importantly, its completion is expected to reduce accidents in the area by as much as two-thirds.

The Wahroonga to Berowra section of Freeway alone is expected to save 7 million kilometres and 1.3 million hours of motor vehicle travel in its first year of operation. These savings, together with reduced operating costs and accidents are estimated to be worth $11.1 million per annum in 1989 costs.

Total construction costs were $100 million.

(Above) Work nearing completion on the intersection of Pennant Hills Road, the Pacific Highway and the new section of Freeway at Wahroonga.
(Top Right and Below) Asphalting in progress on the newly-completed Freeway at Berowra.

BEROWRA TO HAWKESBURY RIVER

Construction of this 9 km section commenced in June 1966 and was completed and opened to traffic in December 1968 at a cost of $13.2 million.

Cutting and filling constituted the bulk of construction work. The deepest cut was 45 m and the highest fill was 65 m. This one fill required 1.3 million cubic metres of material to bring it up to the required level. Virtually all these works were in sandstone. Shale seams were occasionally encountered but these, and the thin layer of topsoil, represented only a small percentage of all the material to be moved.

Cuttings were constructed by drilling a row of holes along each outer edge and detonating explosives in these holes. This operation is known as presplitting. After presplitting, the rock between the presplit lines was loosened further, either mechanically or by more explosives, and removed. Generally, the rock was taken directly to where it was required in a fill.

About 60 per cent of the material could be shifted by mechanical means alone, usually by using bulldozers with ripper attachments to loosen material for removal by scrapers. The balance had to be blasted.

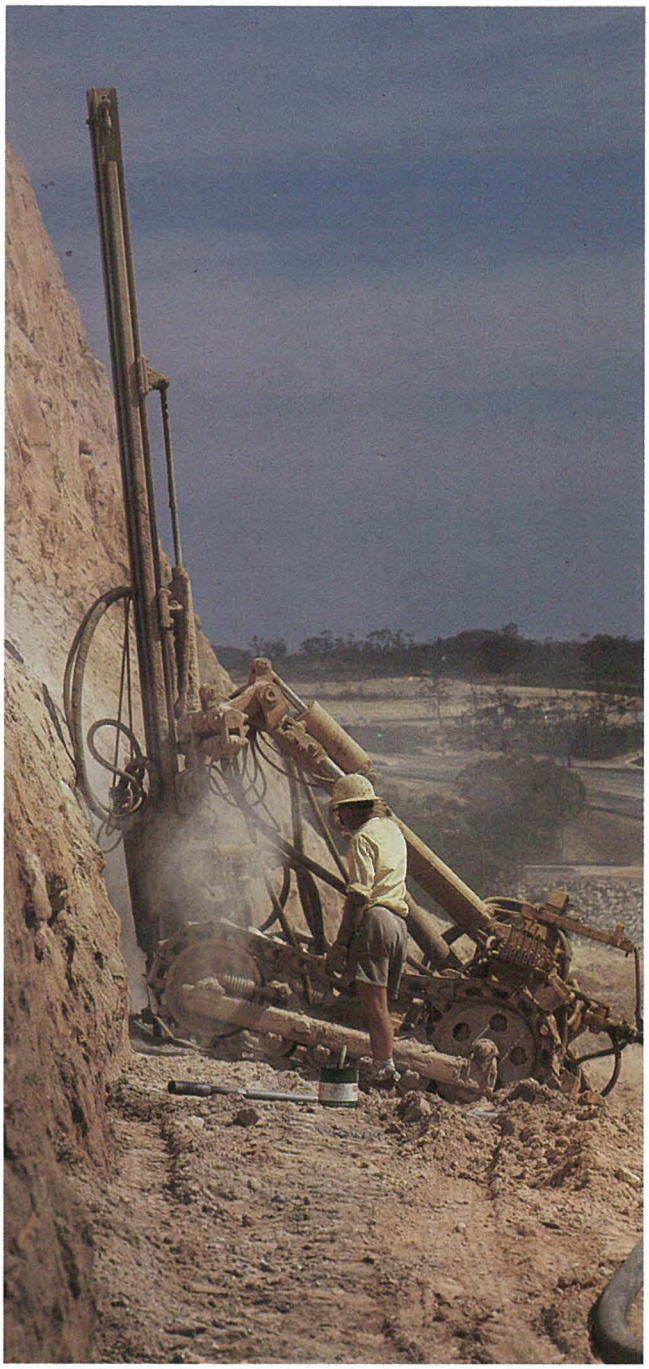
High daily outputs were required to complete the project on time and over 19,000 cubic metres per day were achieved during peak construction periods, using up to 27 bulldozers, 20 scrapers and 22 dump trucks.

Fills were built up in layers of 0.3 m. Each layer was compacted using a variety of rollers.

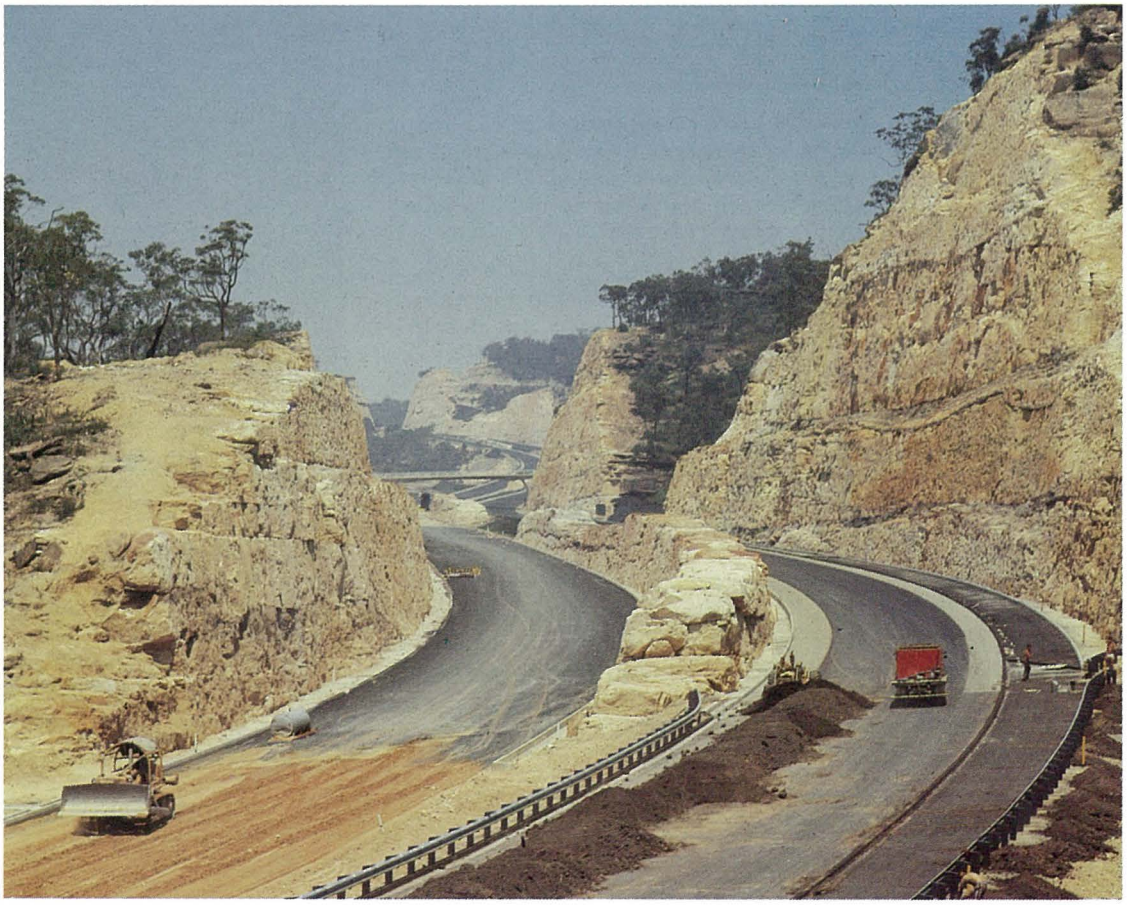
To construct the Berowra Interchange, it was necessary to resite the Lorry Checking Station. The new buildings cater for both the Freeway and Highway traffic. A pedestrian tunnel under the Freeway enables staff to travel between buildings.

The safety and convenience of travellers on the Freeway were of prime concern. Special measures taken included the installation of emergency phones along the route, signs which can be easily read at appropriate travel speeds and a range of lane and edge markers. These markers were designed for visibility during wet weather and at night and they give motorists a warning sound when they cross intentionally or stray from the lane.

Because the Freeway passes mainly through bushland, special provision has been made for firefighting vehicles to cross the Freeway to gain access to fire trails.



(Above) A drill being used to prepare a rockface for blasting.
(Top Right) Completed carriageway on the Berowra to Hawkesbury River section.
(Right) The roadway takes shape between towering rockfaces.



HAWKESBURY RIVER BRIDGE

The six lane bridge over the Hawkesbury River is 615 m long and varies from 21 m above water level at the southern bank to 7 m above water level at the northern bank of the river.

The soft riverbed necessitated very deep foundations and the deepest supporting pile for the bridge extends 85 m below water level. This results in a total bridge height, from foundation to deck, of up to 100 m.

A steel trough girder design was chosen as it represents a considerable weight saving over prestressed concrete girder designs. A heavier structure would have increased the foundation loads and added 40 per cent to the cost of foundations.

The deck of the bridge is comprised of 200 mm thick concrete slabs and a bituminous pavement forms the driving surface. Total width of the bridge is 25.6 m.

The bridge, which cost $5.5 million to construct, was opened in two sections. The northbound carriageway was opened on 10 August 1973 and the southbound carriageway on 26 October 1973. In the intervening period, Freeway and Highway traffic shared the old, adjacent Hawkesbury River Bridge.

Completion of the bridge enabled the toll booths at Mooney Mooney Creek to be removed and motorists paid only a single toll at Berowra. (This toll was lifted in December 1988).

HAWKESBURY RIVER TO CALGA

The Hawkesbury River to Mount White section was the first in a three-stage plan to build the Freeway between the Hawkesbury River and Calga. Work commenced on the final stage in May 1965 while the first two stages were still under construction. The total length of the three stages is 15 km and they were built at a cost of $12.3 million.

To avoid steep climbs and descents, cuttings as deep as 41 m were required and gullies as deep as 42 m were filled. Altogether some 4 million cubic metres of material (nearly all sandstone) were excavated from cuttings and used as fill.

Where practical, rock outcrops were left to form median barriers, effectively separating traffic and preventing headlight glare.

In this area, water seepage occurs all year round. It was necessary to construct in excess of 19 km of culverts and 39 km of subsoil drains to carry water away from the road foundation.

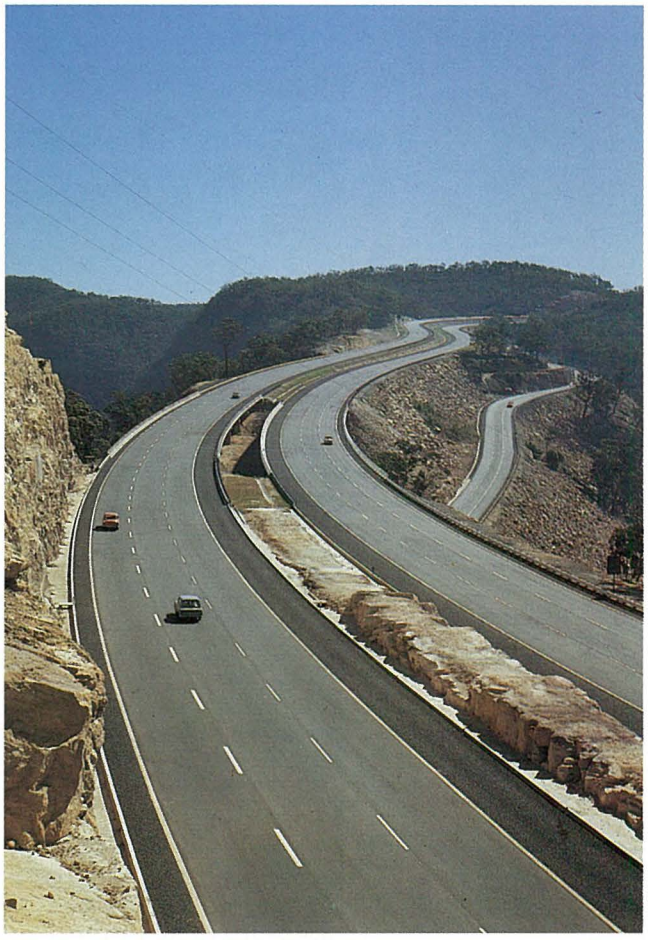
During construction up to 215 major items of plant were in use at any one time. These plant items included bulldozers, scrapers, drills, graders, rollers and spreaders, as well as trucks and compressors.

The aesthetics of the project were considered from the design stage. Impact on the landscape, which is inevitable when constructing a new road, was kept to a minimum. The alignment was chosen to harmonise with the topography, and where practical the natural scenery has been used to screen the Freeway.

Other measures taken to ensure the road blended as much as possible with the environment included retaining as many trees as practicable, planting areas where construction was complete, preserving natural rock outcrops, contouring interchange areas, colouring concrete drains and boundary posts to blend with their setting and painting the backs of all roadsigns.

The topographical features which deterred early roadbuilders for so long were no less a problem for the Freeway's builders. The narrow ridges, broken spurs and deep gullies provided considerable engineering problems. At one point, at Jolls Lookout, the Freeway had to travel along a section of ridge too narrow to take both carriageways and with sides too steep to build up with fill. The most economical solution was to construct bridges to carry each carriageway of the Freeway along this section.

The Hawkesbury River to Mount White stage of the Freeway was opened to traffic in December 1965. In October 1966, the stage between Mount White and Calga was also completed and opened.



(Above) Twin bridges carry the Freeway along a narrow spur at Jolls Lookout.
(Top Right) View of the newly-opened Hawkesbury River Bridge in October 1973.
(Right) Massive earthworks being undertaken during construction between the Hawkesbury River and Mount White.

CALGA TO SOMERSBY

Opened to traffic in December 1986, the completion of this 15 km section of Freeway has produced community benefits of a scale never before reached by any roadworks in New South Wales. The project is now saving the community an estimated $43 million each year, because of dramatic reductions in travelling times and distances.

Until completion of this section, road-users travelling between Calga and Somersby had to negotiate a circuitous 29 km route via Peats Ridge. By cutting a massive 14 km off the old route, it is estimated that this new section of Freeway saved motorists 84 million kilometres and 1.7 million hours of vehicle travel in its first year of operation.

The section includes three interchanges and 20 bridges, including a spectacular crossing of Mooney Mooney Creek.

The scale of the project was huge. Some 4.7 million cubic metres of earthworks were undertaken, 120 km of subsoil drainage were installed and 137,000 cubic metres of concrete were laid.

As this section of the Freeway passes through large areas of natural bushland, including a section of Brisbane Water National Park, special measures were developed to ensure rapid revegetation of completed works areas. Keeping the destruction of native vegetation to a minimum also mitigated the effect on fauna in the area. A steel arch underpass was provided to allow wildlife free movement under the Freeway route, while a 1.5 m wallaby-proof fence was installed to deter them from crossing the road.

Numerous Aboriginal rock carvings were located in the area and the Freeway was designed to avoid all significant sites.

The total cost of the section was $80 million, including $19.5 million for Mooney Mooney Creek Bridge.

MOONEY MOONEY CREEK BRIDGE

The twin bridge structure over Mooney Mooney Creek is a spectacular feat of modern engineering.

The height of the bridge deck is approximately 75 m above normal water level. This is 16 m higher than the deck of the Sydney Harbour Bridge.

Each of the twin bridges consists of a single concrete box girder with three spans of 130 m, 220 m and 130 m. The girder varies in depth from 12.5 m at the piers to 4.25 m at the ends of the deck and at the centre of the bridge, giving the structure a sweeping, streamlined effect.

The piers vary in height from 57 m to 63 m and each comprises a pair of tapered reinforced concrete hollow box columns.

The structure has an overall length of 485 m. It contains 22,000 cubic metres of concrete and 4,000 tonnes of steel reinforcement.

(Above) Completed Calga Interchange in the Calga to Somersby section of the Freeway.
(Top Right) A wombat makes use of the steel arch underpass provided for the safety of fauna.
(Right) The spectacular twin bridges over Mooney Mooney Creek.

SOMERSBY TO WALLARAH CREEK

Opened to traffic on 16 December 1983 at a cost of $47 million, this 15 km section forms a bypass of Wyong.

Conditions on the Pacific Highway through Wyong caused intolerable delays to motorists. The mixing of highway and local traffic in the town created constant hold-ups, a problem aggravated by the flow of holiday traffic to and from the many resorts around the lakes in the area. In holiday periods, traffic regularly slowed to a crawl.

The route crosses country encompassing rugged sandstone ranges, undulating pasture and low-lying wetlands. Some construction problems were caused by several swampy areas and the need for a very large cutting at Kangy Angy.

Extensive investigations were required to determine the best route across the Wyong River flood plain. This was done by building a model of the flood plain at the Department of Public Work's Hydraulic and Soils Laboratory at Manly Vale. The model simulated flood flows and schemes to cross the flood plain were laid out on this model to determine the best solution, particularly in respect to bridge locations and lengths.

In swampy areas, it was necessary to construct a working platform through the swamp, using an excavator to remove the soft material along the path of the road. This path was then filled with firm material and widened, using a scraper and bulldozer, until it was wide enough to support the full width of the Freeway.

At Kangy Angy, a cutting 60 m deep was required which was the deepest cut ever undertaken by the Authority at the time. Approximately 784,000 cubic metres of material were removed, nearly all of it sandstone. The lower 24 m of the cut was hard lithic sandstone which could only be loosened using double the normal loading of explosives.

A concrete pavement has been used on the Freeway between the Wyong River and the Wallarah Creek Interchange. It consists of a 150 mm thick concrete sub-base and a 230 mm unreinforced base. The surface has been textured to provide good surface drainage and tyre grip.

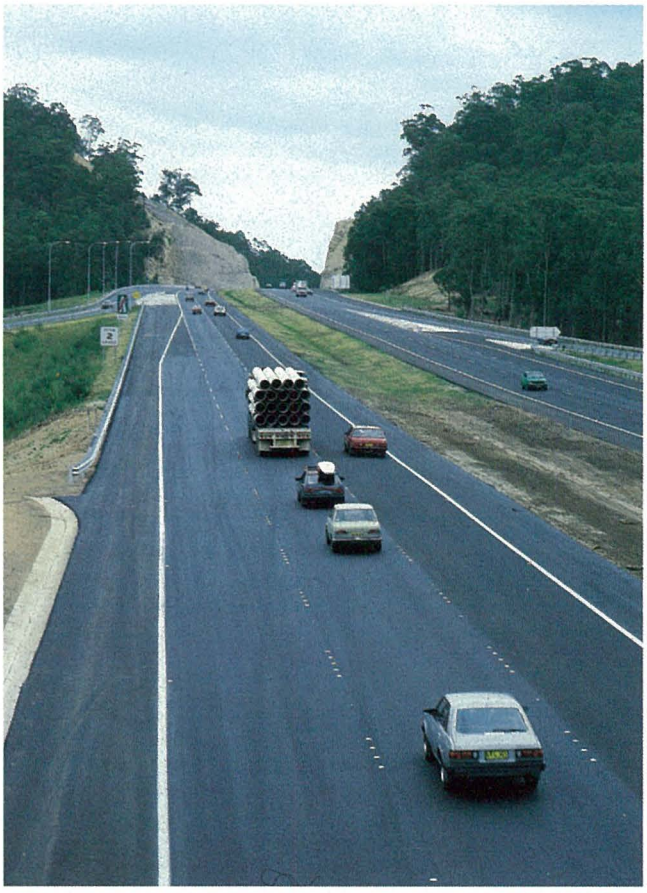
Before deciding on a concrete pavement a study was commissioned into the effects of mining subsidence, a possibility when coal reserves along the route are mined. At the University of New South Wales a mathematical model was developed to gauge the effect of mine subsidence on subgrade and pavement. The results showed there would be no adverse effects on a rigid pavement.

Mining subsidence was also an overriding factor in the design of bridges along the route. Since this condition demands a flexible structure, most of the bridges are simply supported, or supported on thick elastomeric bearings.

Prior to further extension of the Freeway, a 7 km two-lane motorway link was built at a cost of $15.7 million to provide a connection to the Pacific Highway at Doyalson. The motorway link was used to trial a material known as 'bottom ash'. The ash, a waste product from nearby Munmorah Power Station, is in the form of small granules which are light in weight. It has no commercial value and its disposal is an ever-present cost.

The ash was used in the sub-base of the motorway. Its cost in place was only one-third of the equivalent quarry products which would otherwise have been used.

An important feature of the design of this section of the Freeway was the inclusion of special measures to control erosion and sedimentation along the Freeway and on adjoining properties. Silt arrestors and special structures to slow down water velocity in the drainage systems were included after consultation with the Soil Conservation Service.



(Above) Construction of the Wyong Bypass eliminated constant delays experienced on the Highway in holiday periods.
(Top Right) Looking north through the Kangy Angy cut towards the Cobbs Road overbridge.
(Right) Work commencing on the rugged terrain at Kangy Angy.

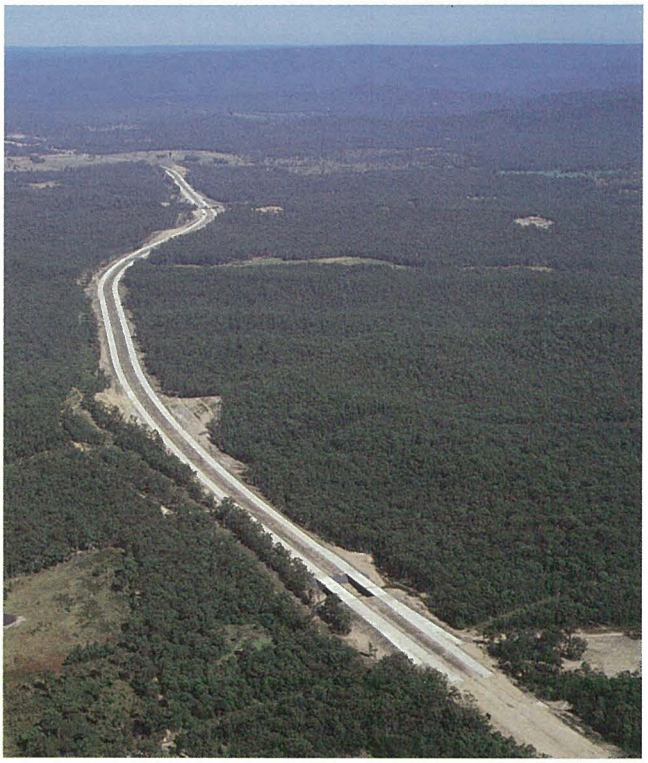
WALLARAH CREEK TO FREEMANS INTERCHANGE

A further 26 km of Freeway, from Wallarah Creek to Freemans Interchange, was built at a cost of $79 million.

The 13 km section from the Wallarah Creek Interchange near Doyalson to Mandalong Road, Morisset was opened on 20 September 1987. The dual concrete carriageway includes construction of ten bridges where the route traverses creeks and other roads.

An additional 13 km from Morisset to Freemans Interchange was opened on 29 March 1988. Twin concrete overbridges were constructed at five local road locations and four separate creek systems, including the 191 m long twin bridges over Dora Creek.

The new section traverses undulating farming areas and extensive revegetation within the road boundaries was carried out to allow the Freeway to blend in with the surroundings.



(Near Right) Construction nearing completion between Morisset and Freemans Waterhole.
(Far Right) The same section on opening day in March 1988.
(Below Right) Aerial view of Freemans Interchange, currently the northernmost completed point of the F3 Freeway.

FREEMANS INTERCHANGE TO WEST WALLSEND

In January 1989 a $40 million contract, the biggest ever let by the Roads and Traffic Authority, was let for construction of a 6.8 km section extending from Palmers Road north towards George Booth Drive.

This will include construction of the Palmers Road Interchange and will involve three million cubic metres of earthworks and almost 100,000 square metres of concrete pavement.

Tenders for further contracts will be invited to complete the Freeway to George Booth Drive at West Wallsend and to Lenaghans Drive at Minmi. The two projects will proceed concurrently.

When completed, motorists will be able to enjoy 118 km of uninterrupted freeway conditions from Wahroonga to West Wallsend, with major benefits in terms of increased safety and reduced travelling times as well as improved conditions in residential areas.