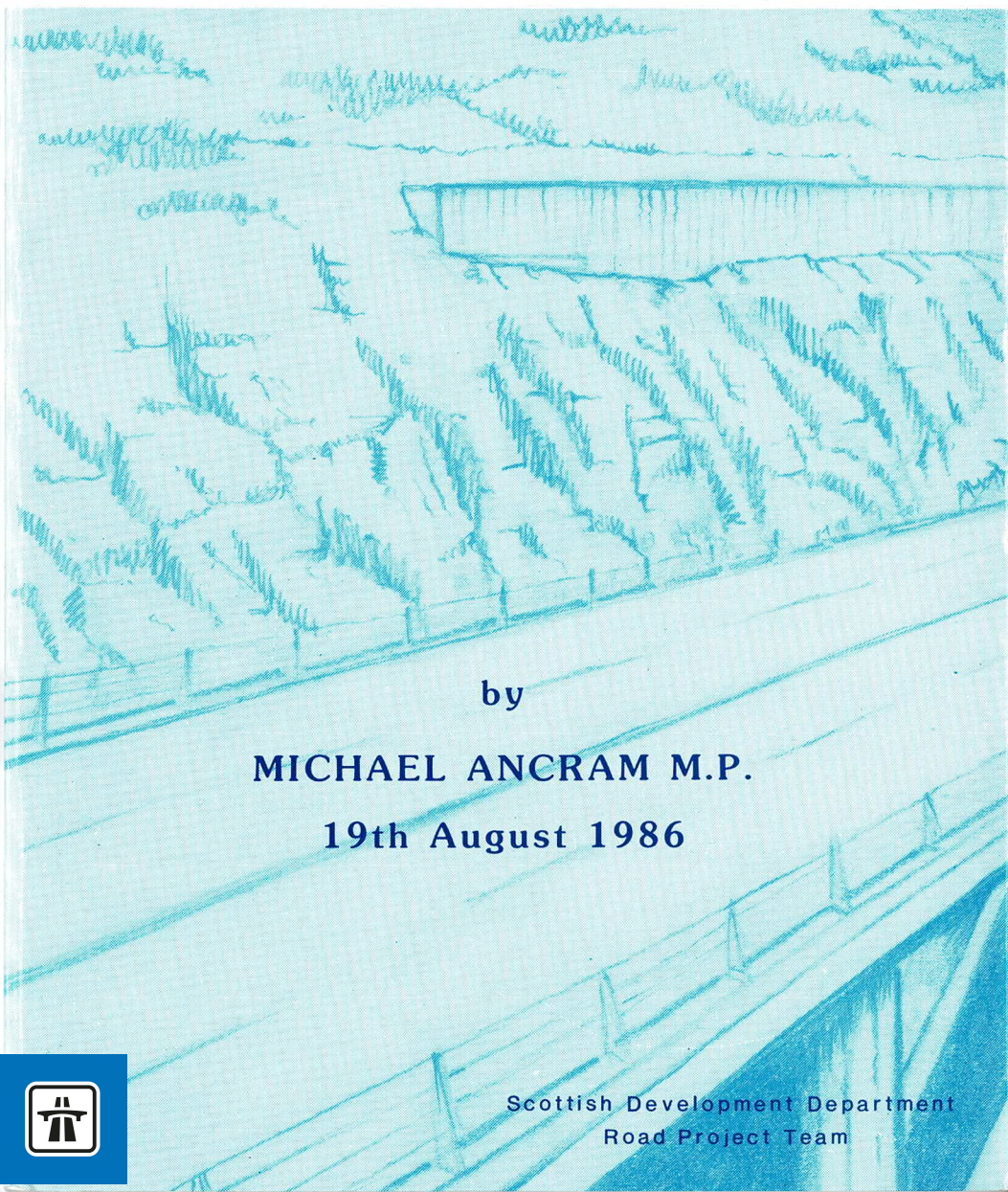




OFFICIAL  OPENING

# KILLIECRANKIE



by

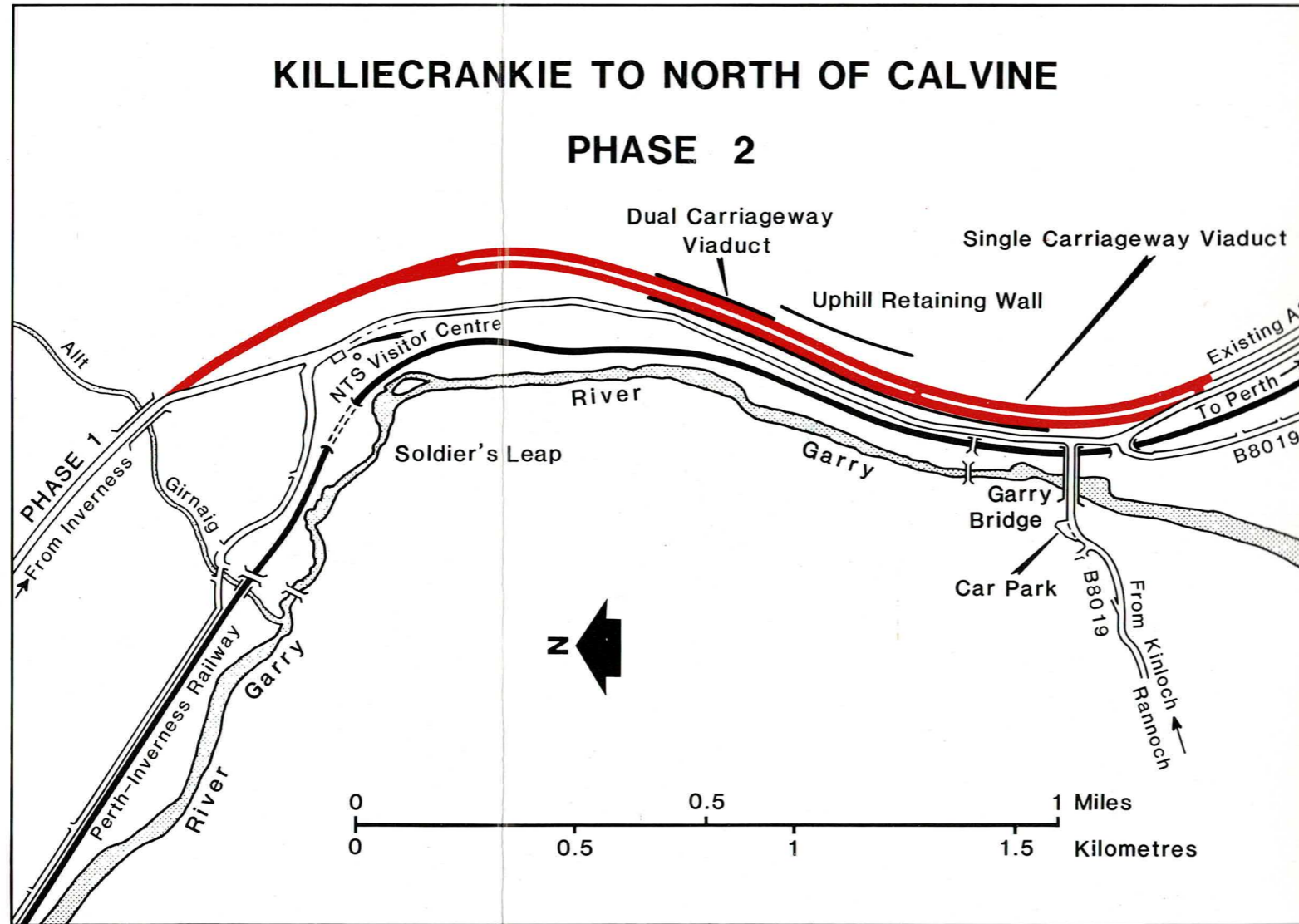
**MICHAEL ANCRAM M.P.**

**19th August 1986**



Scottish Development Department  
Road Project Team





### KILLIECRANKIE TO NORTH OF CALVINE STAGE II OFFICIAL OPENING BROCHURE

#### On Rough Roads

*I'm now arrived — thanks to the Gods  
Thro' pathways rough and muddy  
A certain sign that making roads  
Is no this people's study  
Altho' I'm no wi' scriptures cramm'd  
I'm sure the Bible says  
That heedless sinners shall be dam'd  
Unless they mend their ways*

Robert Burns





## THE GENERAL WADE ROAD

It is quite unlikely that Burns' sentiments would be echoed by the Highland Clans of the time, nor would the name George Wade resound happily in their midst.

General George Wade, an anti-Jacobite, was appointed Commander-in-Chief in Scotland in 1724 and charged with the responsibility of keeping under control a number of Highland Clans who had failed to settle down after the Rising of 1715. Wade found the task "impracticable, for the want of roads and bridges and because of the rainfall."

Edward Burt, who was in the Highlands at the same time as General Wade, and acted as factor on the forfeited estates, writes describing certain roads as being "so rough and rocky that no wheel ever turned upon them since the formation of this globe." Wade decided that it was necessary to have a roadway to the North purely for military purposes, to ensure that troops could be moved swiftly and easily to deal with Highland disturbances. Recognising the strategic importance of the route, Wade commenced his survey about 1725, "laid off the line of the road", and 3 years later began its construction.

Work on the road was carried out entirely by military labour, amounting to some 500 men. In addition to their army pay, the workforce received an additional 2s 6d. a day for subalterns and 6d. a day for soldiers, and the total cost of the work is recorded as £3,270! The route tended to favour the higher ground for obvious military advantage and paid little regard to gradient. The large network of roads built by General Wade catered for horses and foot soldiers with many fords and few bridges. He appears to have had some problems as the road building season was of necessity limited to the period May-September. He wrote to the Lord Advocate "I have had so much plague, vexation and disappointment." It is assumed that this frustration was general rather than specific, and perhaps similar feelings have been experienced by all A9 contractors through the ages. The Wade roads remained very much in their original condition for 100 years and formed the basis of the trunk and county road network in the years to come.

However, the new Wade road was not without its critics. These were divided into three classes, (1) the chiefs and gentlemen; (2) the middle class; (3) the poor people. Burt in his letter states "the chiefs and other gentlemen complain that easy passage is opened into their country for strangers, their fastnesses being laid open they are deprived of the security which they formerly enjoyed, and that use of the bridges will make the people effeminate and less fit to cross fords without bridges." The middle class, says Burt, "regard the roads as an inconvenience turning them out of their old ways. The hard roads wearing the hooves of their horses and rendering them unserviceable." The poor "who generally go barefoot in summer find the roads too hard for their naked feet." The critics of road projects of today's more affluent society are perhaps of a different quality, but their numbers remain.

## THE TELFORD ROAD

The second upgrade of the A9 came in the 19th century with the advent of the first Transport Act, when the Government of the day, despite tremendous opposition, was able to commence construction of a better road system. The turn of the century brought new impetus and a new wave of construction. The Commission for Highland Roads and Bridges was established by Act of Parliament in 1803 for the purpose of building land communications, 50% of the finance being provided by local interests (landowners, counties, etc.) and 50% by Government. Thomas Telford was engaged as Engineer to the Commission and "entered his duties with earnestness and enthusiasm." He reported his recommendations to Parliament through the Commission and in a report (Parliamentary Papers, 1814-15) Telford specified that the width of a standard carriageway should be 16feet, based logically on the space required for the passing of two horse-drawn waggons (each 7 feet in overall width) or two coaches (5 feet 6 inches). The Wade alignment was altered, gentle gradients introduced and fords replaced by bridges to allow for the passage of stage-coaches. The construction again had its difficulties, and Telford records "that underlying glacial till at the north side of Slochd had a large silt content, which when wet would not give good support to the road" — a condition which was encountered on the current improvement and again caused problems! For the convenience and benefit of the road user, milestones were cut



from granite with faces at 45° to present the distances to travellers, and this courtesy was adopted for all road improvements undertaken by the Commission. This Parliamentary Commission road construction commenced around 1820 and was completed about 1828. The cost varies in reports, but seems on average to have been between £400-£600 per mile excluding bridges. This would give a total cost in the order of £60,000. Such was the quality of this road improvement that a journey from Edinburgh to Sutherland — a distance of 215 miles — was possible in 47½ hours! This represented an average speed of only 4½ miles per hour, but probably reduced the journey by 5 days.

The Commission for Highland Roads and Bridges was terminated in 1863, the same year as the Perth-Inverness Railway line was opened, heralding the decline of the coach and the supremacy of rail as a mode of transport.

## THE MAJOR BRUCE ROAD

Following the pattern of the 100-year cycle, the third major upgrade and realignment of the A9 between Inverness and Blair Atholl was initiated by the Ministry of Transport in the 1920's. Prior to that time, the road between Perth and Inverness had been used less and less every year since the opening of the railway, until the advent of the motor-car brought traffic demands and financial consequences in road repair which the Road Authorities were unable to meet. It was, therefore, once again a Government decision to improve some 78 miles of the A9 — 40 miles of new carriageway and 38 miles of reconstruction — all for an estimated capital outlay of £600,000. With the alterations by Telford and those proposed in the new upgrade, comparatively little of General Wade's original line of road remained.

The commencement of the work was marked by a sod-cutting ceremony on the forenoon of 6 May 1925, at the ninth milestone from Inverness during a continuous downpour of rain. It was — perhaps appropriately — carried out by Mrs Mackintosh of Mackintosh, wife of the then Lord-Lieutenant, Colonel Mackintosh of Mackintosh. She was assisted in cutting the first turf — using a silver spade with an oak handle — by Sir Henry Maybury, Director General of Roads for Great Britain. The ceremony was carried out in the presence

of a large and representative gathering of ladies and gentlemen from various parts of the country, in spite of the formidable weather handicap. It was announced, with some incredulity, that motor-cars would be passing over the new road in years to come at speeds from 20 to 50 miles an hour! Mr. J.T. Garrioch, Chairman of the County Road Board, presided over the ceremony and did not miss the opportunity to say that the Road Board had held the view for years that the arterial roads should be a charge on the National Exchequer, and that the present undertaking was a gesture in that direction. Amid general applause, he went on to say that he hoped the Ministry of Transport would continue their undertaking to pay the cost of arterial roads — a remark which is perhaps consistent with the present day philosophy.

The construction began, and it was again a military man in the form of Major Robert Bruce who was appointed Resident Engineer with the remit to control, construct and complete the project. This entailed overseeing the main Contractors, Messrs Sheppard, an English-based Contractor, who apparently redeemed his unfortunate antecedents in the eyes of the Chairman of the Road Board by being married to a Scotswoman!

## THE A9 PROJECT

The steady growth of motor-car ownership and its use for business and leisure transport, together with haulage vehicles increasing in both size and number, brought more and more demands for road space throughout Great Britain. The road to Inverness was no exception, particularly due to the growth of Scottish tourism and the attraction of the Highlands. It was evident by the mid 1960's that some extensive improvement was again required to the A9. The route alignment and gradients were totally inadequate to cope with the volume of high season traffic, containing as it did, a large proportion of towed caravans. The journey time from Perth to Inverness was unacceptably long in duration, and the severe winter weather conditions were exacerbated by gradients and road curvature far below the standards demanded for present day traffic.



The pattern of centenary review for improvement of the A9 was broken ahead of schedule, when it was decided that a comprehensive improvement was required, and the White Paper 'Scottish Roads in the 1970's' announced a programme for road building for the 10 years to 1981. The White Paper did not mention specific schemes, but by reference to a "comprehensive appraisal" set out certain priorities within the lengths (1) Perth to Pitlochry, (2) Pitlochry to Inverness and (3) Inverness to Invergordon. A preliminary study showed that the improvements could be contained fairly close to the existing Telford/Bruce alignment, which in the main followed the valley route and the passes of Slochd and Drumochter. A contract for an aerial survey of the complete length from Perth to the south of Inverness was let in June 1971 and the fourth upgrade and improvement of the A9 was underway.

In September 1972 the Scottish Development Department set up the Road Project Team with engineers and administrative officers who were given the special responsibility to progress, process and complete the 8 specific schemes which had been named in the first official announcement in May 1972. Except for the Pass of Killiecrankie, the remaining sections making up the 127 miles from Perth to Arduilie were publicly announced in the same month as the formation of the Road Project Team.

The scale of the task lay not only in the length of the road but in the topography, formidable climate, major river crossings and difficulty of accessibility to rugged and remote areas with construction plant. The total length was divided into 28 individual schemes, and the services of the two Regional Councils and seven Consulting Engineer Partnerships were engaged on the detailed design process.

Once again, the Highlanders were alarmed, not because of the fear of strangers invading their territory and privacy as in the case of the Telford road, but because strangers in the form of tourists and business people would *not* invade their trading premises! The reduction in journey time from Perth to Inverness promoted anxiety from within Highland villages about the future of bypassed communities and their financial well-being if the A9 diverted passing trade from their grasp —

particularly if filling stations and restaurant facilities were allowed to develop on the new improved A9. The Scottish Development Department recognised the basis of these fears and convened a meeting involving both Regional Authorities, all Planning Authorities, the Scottish Tourist Board, the Highland and Islands Development Board and other interested bodies. Agreement was reached and a general policy evolved of no roadside development between Perth and Inverness. This, coupled with road signs indicating the services available within bypassed villages and the development of signposting advising of scenic and alternative tourist routes, appears to have quelled yet another disturbance on the 'Wade' road.

It is believed that the traffic capacity of the new A9 will adequately meet the demands made upon it well into the future. Forecasting traffic trends is, of course, an imprecise science and dependent upon many social and economic factors — very much a job for the 'Wizard' rather than the 'Sorcerer's Apprentice'.

September 1974 saw five projects under construction, with a progression of schemes in various stages of the design process.

Five years later, at the end of 1979, significant progress had been made, with 17 projects completed at a cost of £122m, 5 projects under construction at a cost of a further £51m and the remainder of the sections progressing through the Statutory and design procedures to come on stream for commencement of work. The succession of projects for construction has continued throughout the years, until today, which not only marks the successful completion of the Pass of Killiecrankie, but also the completion of the A9 Project. The 28 individual schemes making up the total 'Project' together form the biggest trunk road improvement in Scotland in this century, completed at a total cost of £240m. £8m of that total was provided from the European Regional Development Fund.

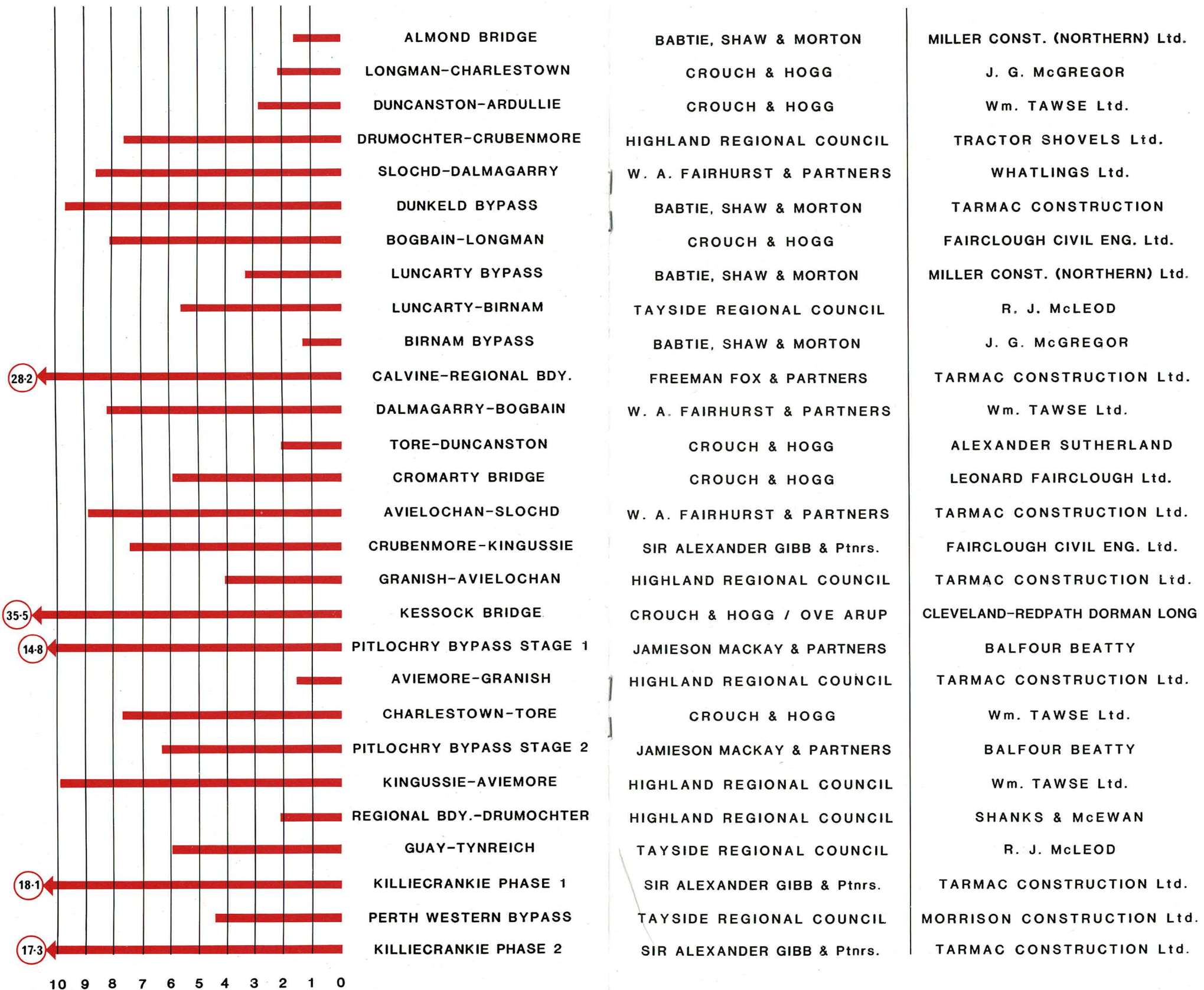


## COST (£m)

## PROJECT

## ENGINEER

## CONTRACTOR



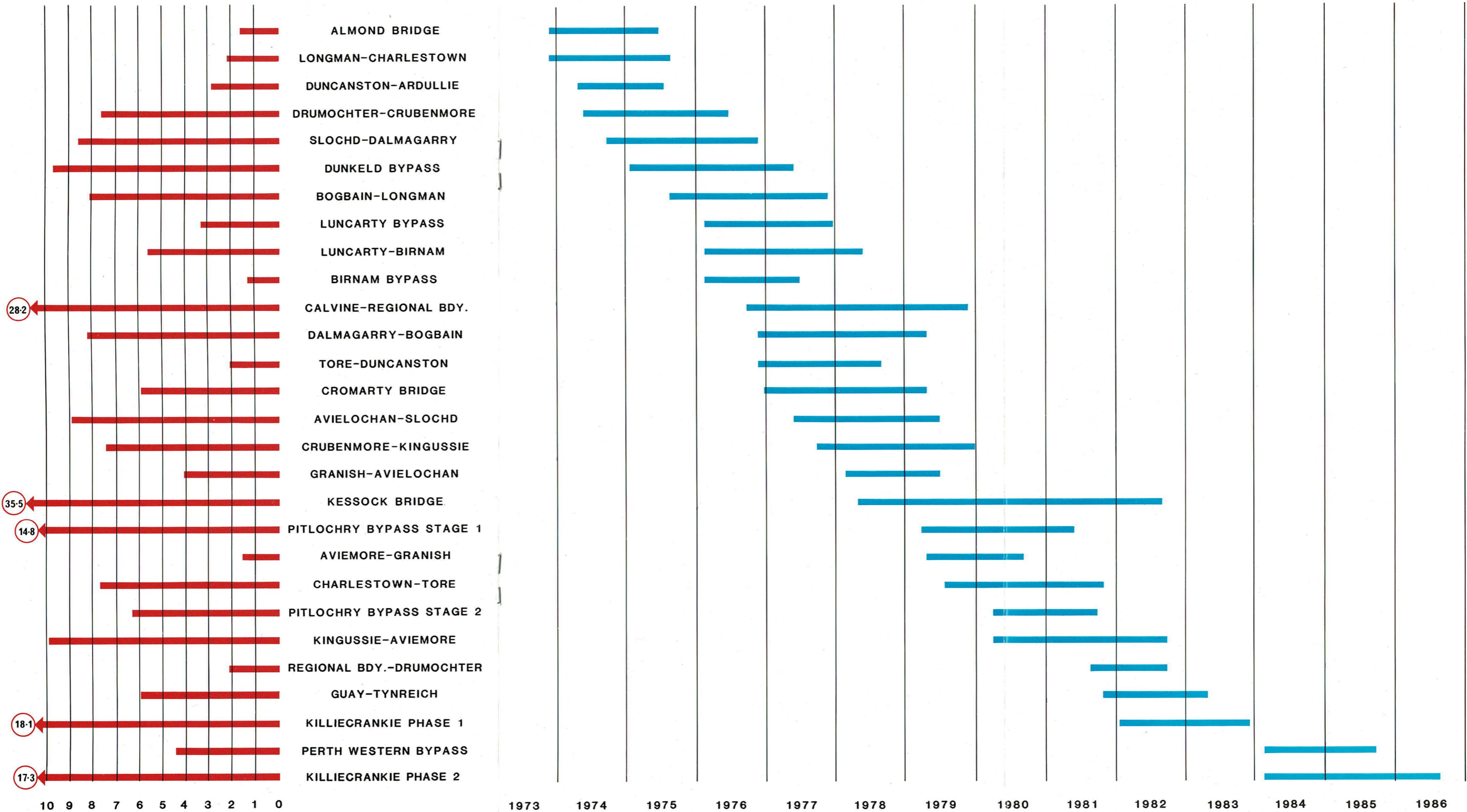
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COST (£m)

PROJECT

PROGRAMME





The difficulties encountered on the A9 Project were no different to those encountered by Wade, Telford and Bruce. The nature of the terrain, rugged, rocky and remote, combined with an unfriendly, unreliable climate is a natural breeding ground for engineering problems. Even modern construction methods are weather susceptible, underlying alluvial tills are sensitive to increased moisture content, and layers of construction have to be protected from adverse weather.

The successful completion of this A9 Project could not have been achieved in the timescale without full co-operation and understanding between the Department and the seven Consulting Engineers, two Regional Councils and thirteen Contractors, together with the particular skills of each and every person employed on the Project in both workforce and management.

During the first 10 years of construction, up to 1983, the following awards have been presented for the design and construction of the new A9.

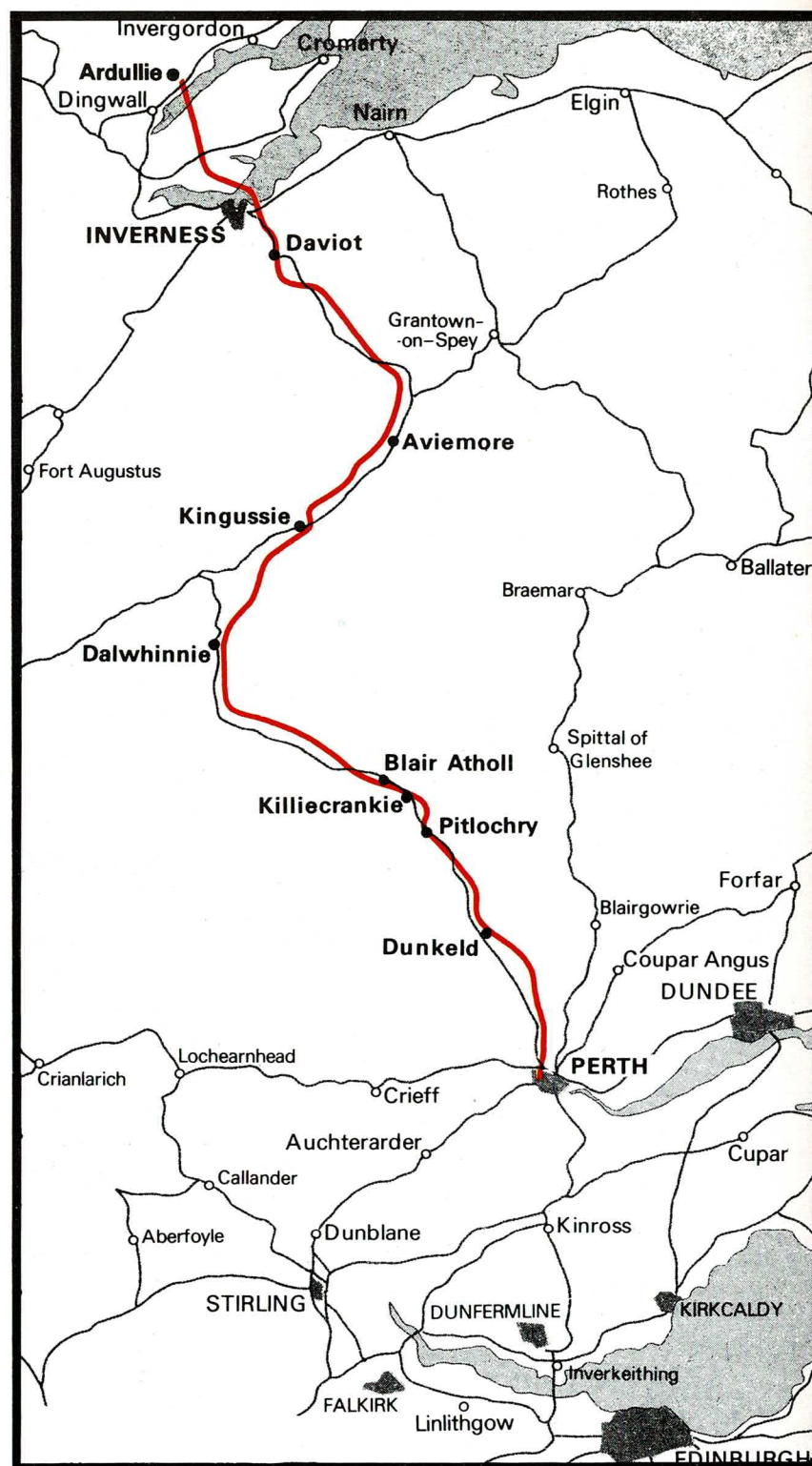
A9 The AA National Motoring Awards Silver Medal 1982

Dunkeld Bypass Civic Trust Award 1978

Pitlochry Bypass The Saltire Civil Engineering Awards  
Construction Award 1983  
Design Commendation 1983

Kessock Bridge The Saltire Civil Engineering Award  
Design and Construction 1983  
Structural Steel Design Award 1983

During the period 1973-1983, there was a reduction of personal injury accidents on the A9 of 72.9%. During the same period, the percentage reduction on all other Scottish roads was 13.9%





## KILLIECRANKIE TO CALVINE STAGE II — THE HOME RUN

Excluding the major bridge crossings, the Pass of Killiecrankie has presented the greatest challenge to engineering in terms of both design and construction on the whole A9. The degree of difficulty caused by the narrow Pass is reflected in the cost per unit length — £4.72m per kilometre at tender stage.

The physical restraint imposed by the steep sided Pass, where the congested valley floor already accommodated the River Garry, the Perth-Inverness railway and the existing A9 trunk road, was not a helpful factor in the route-finding process. Geologically, the sub-surface ground conditions were known to have been subjected to major disruption and folding through the ages, and also varied in both quality and type.



In 1973, the Department issued a Planning Brief and commissioned Allen, Gordon & Co., Consulting Engineers, to carry out a geotechnical survey of the section south of the Pass of Killiecrankie to North of Calvine. In the same year, a brief was issued to Sir Alexander Gibb and Partners appointing them to undertake a feasibility study of the various possible routes outlined in the brief.

Following the completion of an extensive and comprehensive geotechnical investigation and receipt of the interpretative reports and expert opinions on sub-surface conditions, the preliminary design of the route progressed on the basis of 'side long' cut and fill on the steep slope on the eastern side of the valley. An Order in draft was published in May 1975 announcing the Secretary of State's preferred line for the new road, and following a decision to undertake further site investigation in the Pass of Killiecrankie, the project was divided into two stages to avoid delay in the construction of the northern section. The first stage covered the 7.9 miles to the north of the Pass and was completed by Tarmac Construction Ltd in October 1983.

In the meanwhile, with the benefit of further study and the information made available by additional site investigation, it was becoming increasingly obvious that the side cut into the steep slope of the valley would require not only a massive retaining wall above the rock cut to retain the uphill overburden, but also substantial stable rockfill embankments and retaining walls for support to the new road on the downhill side, avoiding encroachment onto the existing road below.

The concept in engineering terms was possible, but the scale of the walls, cuttings and embankments would have been environmentally unacceptable. The Department instructed Sir Alexander Gibb and Partners to explore a structural solution on a similar alignment, avoiding the need for the extensive side cut, and uphill retaining wall in some areas and reducing the size of the cuttings, embankments and walls in other areas. In the critical central section of the Pass, this

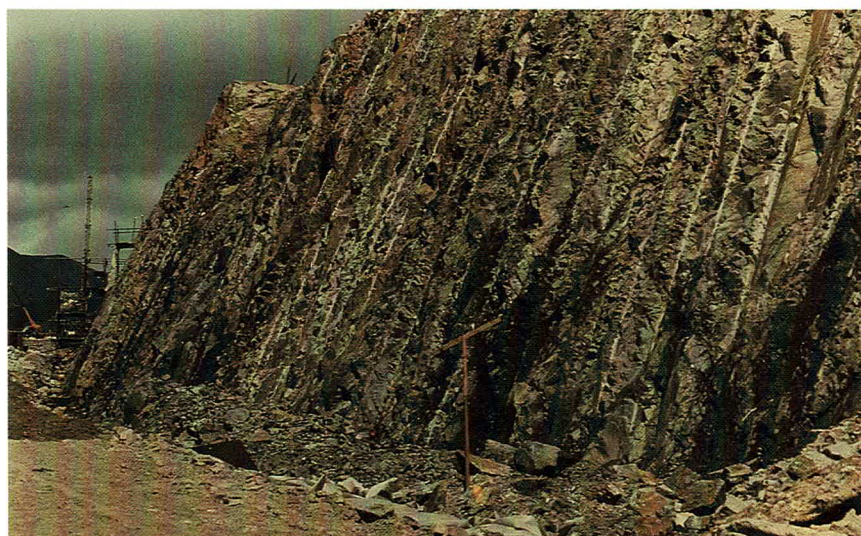


could only be achieved by a combination of a viaduct structure supporting the northbound carriageway and retaining walls supporting the southbound carriageway and retaining the uphill overburden. The preliminary outline design was completed in February 1982, submitted to the Royal Fine Art Commission and received their approval in March 1982.



The structural option was developed in detail, each viaduct consisting of short 15 metre deck spans constructed with pre-cast tensioned beams joined with in situ concrete over dual octagonal columns, each seated on 4 metre square bases founded on rock.

The route through the central length of the Pass is substantially on bridge with 615 metres of northbound carriageway viaduct, 285 metres of southbound carriageway viaduct, and 285 metres of the southbound carriageway partly in cut and partly in fill supported by 330 metres of central reserve retaining wall. The scale of the requirement for uphill support was considerably reduced by adoption of the structural solution, but it was still found necessary to provide 320 metres of uphill retaining wall to protect the new carriageway and stabilise the overburden. A downhill wall 255 metres long was also required south of the viaduct to prevent the fill encroaching onto the existing road.



The rock exposed on the uphill side of the viaduct was excavated by pre-split techniques (parallel holes drilled and pre-blasted at the face of the cut) to minimise blast disturbance to the standing rock face.



The pre-split face slope is 2 vertical to 1 horizontal, with a rock trap at the base of the slope to prevent any loose falling rock reaching the carriageway. A proportion of the excavated rock was used in the 'composite' embankments to form an 8 metres wide front skin of rock fill, keyed into the existing ground. The surface is dressed with a blanket of peat to encourage indigenous plant growth and a natural blend with the local environment. The retaining walls are up to 14 metres high and are anchored down to the rock.





Throughout the Project there has been complete unanimity of purpose between the Department, Consultant and the Contractor in striving for and achieving the highest standard of technical excellence in the work. The successful completion of this Project will stand as a monument to the engineering accomplishment of all those concerned with it.



## THE CITATION

"The A9 demonstrates the value of the development of all-purpose roads to a high standard, and it has already made a significant contribution to the Highlands by way of improved safety standards, in terms of journey time, energy saving and amenity benefits for bypassed communities."







## **ENGINEER:**

### **SIR ALEXANDER GIBB & PARTNERS**

Over the years, Sir Alexander Gibb & Partners have been engaged on a variety of major works in Scotland and overseas. Among these have been extensive road developments on behalf of the Scottish Development Department — in particular on the A9, but also on the M8, A75, A929 and other trunk road schemes.

## **CONTRACTOR:**

### **TARMAC CONSTRUCTION LTD**

Tarmac Construction have carried out several contracts in Scotland including work on the M90, M74, M8, M9 and the M876. Since 1975, they have been responsible for the completion of 7 separate schemes on the new A9, totalling some 43 miles of new road.

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#### **Principal Sub-Contractors**

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Rocklift Ltd	Drilling and Blasting
Fondedile Foundations	Rock Anchors
K.P.C. Contracts Ltd.	Earthworks
Kings & Company Contracting	Bituminous Road Surfacing
Sifran Sealants Ltd.	Waterproofing and Expansion Joints
Grundy Parapets Ltd.	Parapet Rails
A. Butter	Horticulture and Fencing
A.J. McLeod Ltd.	Joiner (Labour only)

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#### **Principal Suppliers**

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Ready Mix Concrete (Scotland) Ltd.	Concrete
Reinforcement Steel Services	Reinforcement
Dowmac Concrete Ltd.	Prestressed Concrete Beams
P.S.C. Freyssinet Ltd.	Bridge Bearings

Published by The Road Project Team  
Scottish Development Department



## KILLIECRANKIE TO NORTH OF CALVINE STAGE II

### FACT SHEET

Tender Price	£11.242m
Length of Road	2.5Km (1.5 miles)
Dual Carriageway	1.6Km (1.0 mile )
S/B Carriageway Viaduct	285 metres
N/B Carriageway Viaduct	615 metres
Maximum Gradient	4%
Uphill Retaining Wall	320 metres
Central Reserve Wall	330 metres
Downhill Retaining Wall	370 metres
Excavated Soft Material	208,000 cu. metres
Excavated Rock	146,000 cu. metres
Imported Soft Material	77,000 cu. metres
Imported Rock	64,000 cu. metres
Asphalt Wearing Course	40,000 sq. metres
Structural Concrete	46,000 cu.metres
Reinforcing Steel	2,300 tonnes
No.of Spans (N/B)	41
(S/B)	19
Span Length	15 metres
No.of Columns	116
Maximum Height of Columns	16 metres
Minimum Height of Columns	3 metres

To minimise maintenance problems with expansion joints the deck spans are continuous over a maximum of 11 spans (165 metres) giving three intermediate expansion joints over the length of the Viaduct.