

RENFREW MOTORWAY

STRATHCLYDE REGIONAL COUNCIL

SOUVENIR BROCHURE

OF THE

OPENING OF

RENFREW MOTORWAY

by

The Rt. Hon. BRUCE MILLAN M.P.

Secretary of State for Scotland

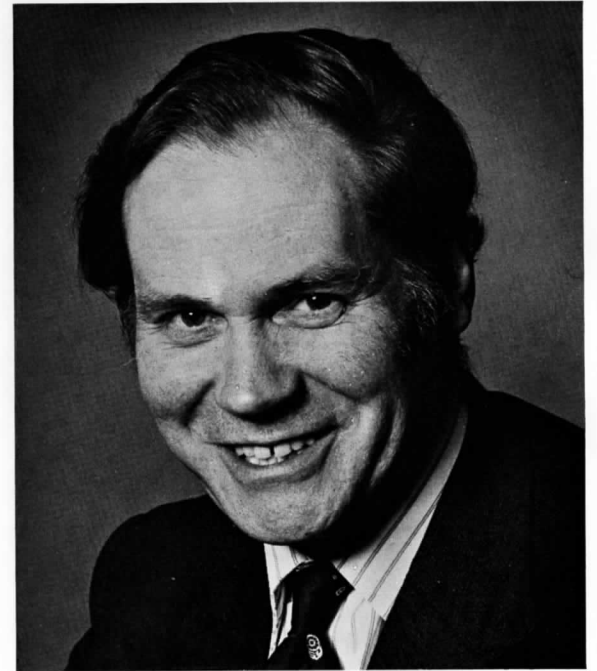
on

15th OCTOBER 1976

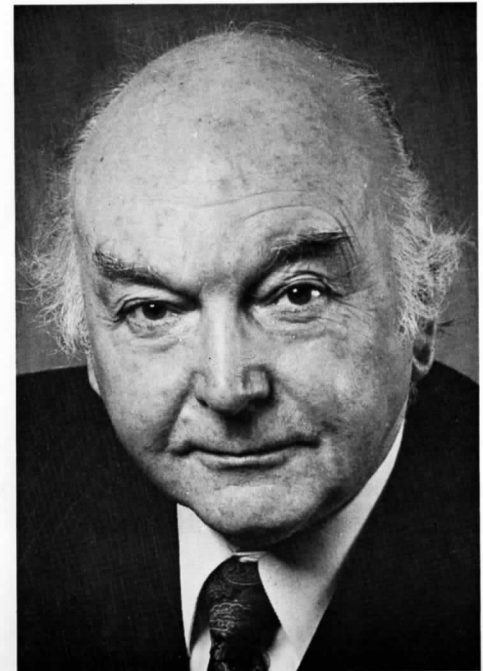
THE RT HON BRUCE MILLAN MP
Secretary of State for Scotland



GEOFFREY M SHAW MA BD
Convener Strathclyde Regional Council



COUNCILLOR THOMAS FULTON JP
Chairman Highways and Transportation Committee



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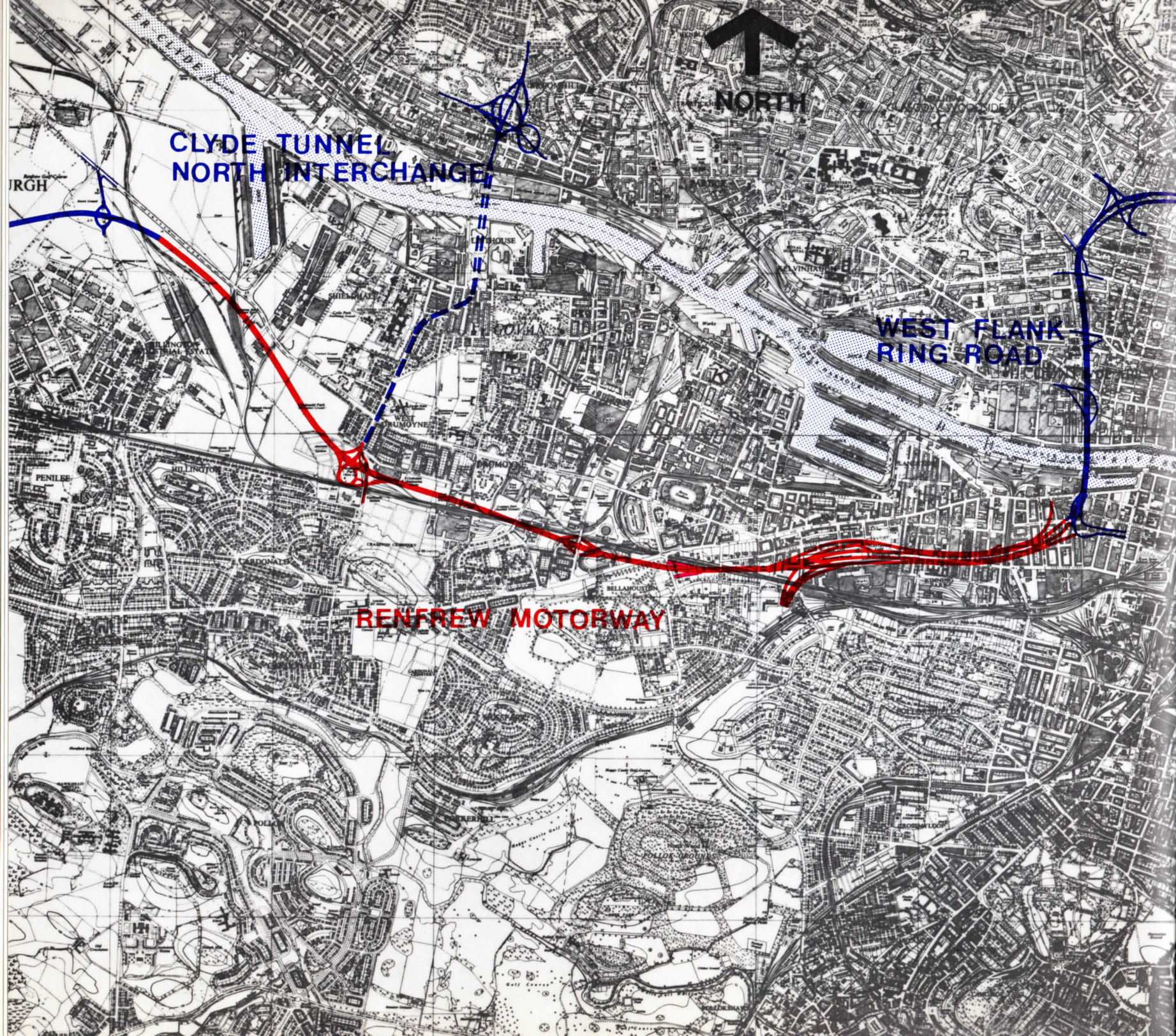
Stage 1
Scott Wilson Kirkpatrick and
Company (Scotland)
Stage 2
W. A. Fairhurst and Partners

Contractors:

Stage 1
Balfour Beatty Construction
(Scotland) Limited
Stage 2
Leonard Fairclough Limited

Consultant Architects:

William Holford and Associates (Glasgow)



NORTH

CLYDE TUNNEL
NORTH INTERCHANGE

WEST FLANK
RING ROAD

RENFREW MOTORWAY



Kingston Bridge approaches from Renfrew Motorway Stage 1.



Hillington Interchange approach from Renfrew Motorway Stage 2.

INTRODUCTION

This brochure describes briefly the Renfrew Motorway which connects with the West Flank of the Inner Ring Road at the south end of the Kingston Bridge and extends westwards to the Hillington Interchange, a total distance of 6.73 kilometres.

Renfrew Motorway completes the west radial section of the East/West Urban Motorway through the City of Glasgow, and present indications are that the eastern section which connects to the Inner Ring Road at Townhead Interchange and extends eastwards to Baillieston Interchange, will be completed in 1980. A progress map of construction of the Glasgow Urban Motorway (M8) is included at the end of the brochure.

The Renfrew Motorway has been designed and constructed in two stages,

Stage I: from Kingston Bridge to Helen Street

Stage II: from Helen Street to Hillington Interchange.

Travel time to and from Glasgow Airport and the City will be greatly reduced on the opening of the motorway. The multi-carriageway "braided" section of Stage I joins the Interchange to the proposed Dumbreck Road Connection and will provide free-flow conditions with no weaving of traffic since a separate route is provided for every movement between the west flank of the Inner Ring Road and adjoining surface street system to the east, and the Renfrew Motorway and the future Dumbreck Road Connection to the west.





Scotland Street Viaduct viewed from the off ramp to Seaward Street.



Stage 1 at Dumbreck Road Interchange.

Stage 1 looking East towards Kingston Bridge.

STAGE ONE

Consultant: Scott Wilson Kirkpatrick and Company
 Engineers: (Scotland)
 Contractor: Balfour Beatty Construction (Scotland) Limited

The Project

Stage 1 of Renfrew Motorway runs from the southern approaches of the Kingston Bridge to the interchange with Helen Street at Ibrox a distance of 3.3 kilometres. This stage parallels the existing radial roads of Paisley Road, Paisley Road West and Edmiston Drive, which at present carry large volumes of through traffic which will divert to the new motorway.

Midway along its length there is a merging interchange where the proposed Dumbreck Road connection will join at a future date and contribute additional traffic volumes. The motorway has been located, where possible, at or below ground level to reduce its effect on the local environment. For economic and engineering reasons, however, it climbs to cross over the railway at Scotland Street and Beech Avenue.

At Kinning Park, sub-standard housing has been demolished within the comprehensive development area to provide a route for the motorway. At Dumbreck and Bellahouston the motorway is bounded on the north side by the railway line, and to the south by tree-lined residential avenues and parkland.

The Problems

Varying ground conditions over the length of this stage has been one of the principal problems for the Engineer at the design stage and for the Contractor during construction. Between Kingston Bridge and the Interchange with the Dumbreck Road Connection, the ground consists of sands and silts with a high water table, while west of the Interchange are found soft clay and boulder clay overlying sandstone and shales with coal measures. It has been necessary to undertake a comprehensive grouting operation to consolidate worked coal seams underlying the motorway and the railway at Bellahouston. Loose sand covering an area of 4.5 hectares to the east of the Interchange was removed to a depth of 1.3 metres and replaced in compacted layers. To do this it was necessary to lower the water table temporarily by well-pointing.



Stage 1 viewed from Kirkwood Street Footbridge looking East.



Stage 1 viewed from Beech Avenue Footbridge looking West.

The building of an urban motorway brings with it the problems of dealing with both pedestrian and vehicular traffic during construction. On Stage I pedestrian routes crossing the construction site have been maintained until the permanent route is available. New roads to give access to properties have been constructed before construction of the motorway severed the old route.

Structures

Road bridges, footbridges and retaining walls account for half the value of the Contract. The road bridges are of three types:—

1. Prestressed Concrete Box Girder Bridges
2. Prestressed Concrete Precast Beam Bridges
3. Flat Slab Reinforced Concrete Bridges

The five footbridges are of prestressed concrete construction of tabletop form with precast suspended spans. The major road bridge in the Contract, namely Scotland Street Viaduct, which carries four carriageways over Seaward Street, the Underground Railway and British Rail sidings, is also of prestressed tabletop form but with suspended insitu reinforced concrete spans. All bridges are of constant depth and follow the vertical geometry of the road they carry.

In the alignment of retaining walls consideration was given to land use, land form and relationship with adjacent structures. A feature of the walls is the use of vertical precast concrete facing units which also serve as a front shutter. This design was evolved on the Woodside Section of the Inner Ring Road.

Road Pavement

The road pavement is of flexible construction to suit the ground conditions and the frequent varying cross-section of the motorway. The road base is dense bitumen macadam laid on a sub-base of granular material. Road surfacing is hot rolled asphalt.





Paisley Road West at Dumbreck Road Vehicular Bridges.



Stage 1 approach to Helen Street from the East.

Drainage and Services

Surface water from the motorway is carried to the River Clyde in a trunk sewer. The parts of this sewer, which required to be built in tunnel, were constructed under a preliminary contract by Charles Brand & Son Ltd. prior to work starting on the motorway. The cost of this contract was £900,110. Extensive sub-soil and slope drainage has been provided to ensure that water is carried away from the road formation.

Diversion and re-routing of gas, water, post office and electricity services has been carried out by the service authorities both before and during the Contract.

Percy Street Footbridge looking West towards Dumbreck Road Interchange.







Stage 2 approach to Helen Street from the West.



Stage 2 looking East passing over Craigton Railway Tunnel.

STAGE TWO

Consultant

Engineers: W. A. Fairhurst and Partners

Contractor: Leonard Fairclough Limited

The Project

Renfrew Motorway Stage 2 extends from the junction with Stage 1 at Helen Street at the east end to the junction with the existing M8 at the Hillington roundabout, a length of approximately 3.43 km. One interchange is provided near Cardonald Station to link the motorway with the Clyde Tunnel southern approaches.

Earthworks

The motorway for a large part of its length is carried on embankment up to 8 metres high. The ground below the embankments is made up of highly compressible soft estuarine deposits of various sands, silts and laminated silty clays up to 30 metres in depth.

Before building the embankments it was necessary to prepare the formation. This involved the excavation of peat, to a depth of 3 m., often working below standing ground water in soft silty material. The soft formation exposed by this excavation was successfully stabilised using a ground stabilisation fabric in conjunction with rock fill. The rate of construction of the embankment was carefully controlled and monitored by instrumentation installed at varying depths in the underlying ground. Over two lengths of the embankment readings from the instruments were made on a control panel installed in a purpose built instrument house. These were evaluated with the aid of calibration graphs specially prepared from previous laboratory tests. Taking account of the underlying strata it was possible to ensure the stability of the embankments at every stage of the work.

Special measures and precautions were taken in the construction to minimise the effect of settlement caused by the weight of the embankments on the compressible subsoil. Sand drains, i.e. vertical columns of sand at 1.5 metre centres to depths of 21 metres, were constructed to accelerate settlements, and are used in conjunction with surcharge loading on the embankments to reduce settlement after construction.

The material used in the construction of the embankments, was transported by rail from Livingstone to a discharge hopper, constructed by the Contractor in a central position in the works. Approximately $\frac{3}{4}$ million cubic metres of spent oil shale were moved in this way with no interference to the environment of Central Scotland. When this operation was at a peak 9 trains were discharging in a continuous operation over 24 hours per day.

The presence of the adjoining railway influenced the design of the works, and its proximity was an obvious asset in the earthworks operation. The Motorway crosses the Glasgow to Paisley electrified railway line at Craigton and runs alongside it for about 1.5 km. Construction work was subject to severe restrictions to maintain railway traffic at all times. In addition to the main railway line, the Motorway is carried on structures over the Shieldhall branch line and the marshalling yard to King George V docks.

Structures

On this stage of the motorway there are several major structures.

- (i) The Craigton Road Railway Tunnel carries the motorway over the electrified railway line. A pedestrian underpass, on the line of the existing Craigton Road, is suspended below the motorway and above the railway, thus creating three levels of rail, pedestrian, and motorway traffic respectively. The tunnel is formed with precast prestressed concrete beams, set on piled abutments of insitu concrete construction. The pedestrian underpass is a deep beam of composite precast and insitu concrete.
- (ii) The Cardonald Interchange structures are part of the junction which link the motorway with the south approaches to the Clyde Tunnel. At this fairly complex interchange provision had to be made not only for vehicles and pedestrians but also for a miscellany of large and small public utility services, which greatly influenced the proportions and layout of the structures.

The Berryknowes Road Bridge is a reinforced concrete voided slab over the off ramp from the motorway to the Clyde Tunnel. Service ducts within the depth of the slab carry large diameter water and gas mains and other services.

The Berryknowes Road Viaduct is a three span post-tensioned prestressed concrete cellular box beam with large service ducts. The structure is of three continuous spans, and crosses over the motorway and associated ramps. This bridge, with a slight curve in plan, was built using the stage-by-stage construction procedure, where the newly constructed span is prestressed to the adjoining span. A temporary bridge, alongside the existing bridge, was built over the railway at Berryknowes Road to carry vehicles, pedestrians and services during construction of the new bridges.

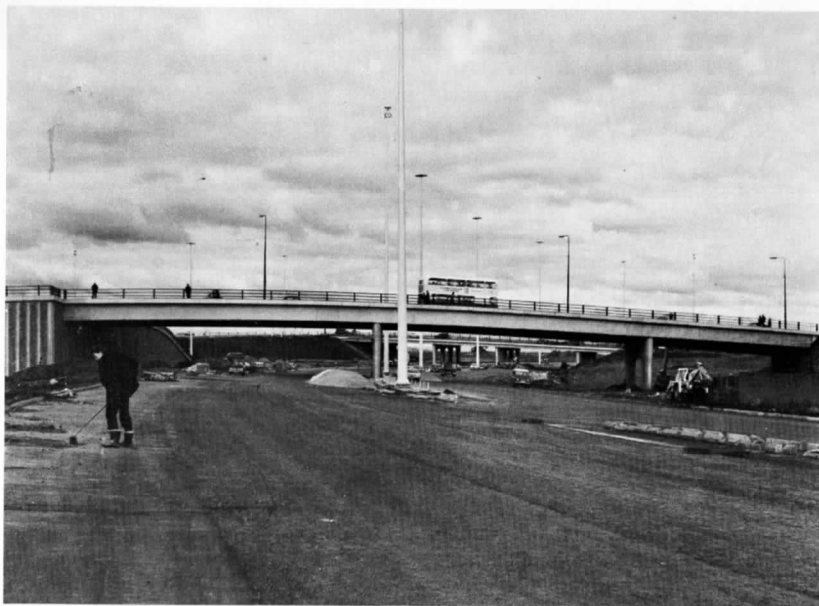
The Clyde Tunnel Approaches Bridge crosses over the motorway and is the direct continuation of the existing approaches to the tunnel. This bridge comprises five simply supported spans, the end spans being of in-situ reinforced concrete, and two of the internal spans are composite precast prestressed concrete M beams; the third internal span comprises precast prestressed concrete box beams transversely post-tensioned. The abutments and piers are of in-situ reinforced concrete and are supported on piles.

Pedestrian movement through the interchange has been provided for by the construction of footbridges and footpaths. The largest of these bridges is a multi-span structure, all in reinforced concrete, except for the precast, prestressed concrete span over the railway. This footbridge links, via a footpath on the Clyde Tunnel Approaches Bridge, with a smaller footbridge over the off ramp from the motorway to the tunnel. This is a simple reinforced concrete structure with raking columns. The arrangement of footpaths in this area provides for pedestrian movement, free from main traffic routes, direct to the improved recreational facilities of Cardonald Playing Fields.

Cardonald Interchange.







Stage 2 approach to Cardonald Interchange from the East.



Stage 2 approach to Cardonald Interchange from the West.

Stage 2 looking West towards Hillington Interchange.

Vehicular and pedestrian access to the playing fields on the South side of the motorway is also available through a large underpass below the motorway. This is a reinforced concrete structure which is unpiled, the ground having been pre-consolidated by surcharge loading with the motorway embankment, which was re-excavated prior to construction.

- (iii) West of Cardonald the motorway is carried on structure over the Shieldhall railway branch line, a timber storage yard, and Bogmoor Road. This structure, referred to in the contract as the Woyka Viaduct, is two separate bridges for each carriageway, each with seven spans in precast prestressed concrete and two in-situ reinforced concrete end spans. The substructure of reinforced concrete is supported on piles driven to rock.
- (iv) The King George V Bridge over the railway marshalling yard is again two separate structures. These skewed three span structures, have insitu reinforced concrete end spans with cantilevers into the centre span, to receive suspended spans of precast prestressed concrete beams, transversely post-tensioned. The substructure of reinforced concrete is supported on piles, end bearing on rock.

Drainage and Services

Over the length of the motorway there was always an involvement with sewers, foul and surface water, and other services. A large 9 foot diameter foul sewer, built early 1930, required to be diverted for part of its length and protected at two other points, where it passes below the new embankments. A large surface water collector drain and outfall to the River Clyde required to be constructed, through some extremely difficult ground conditions mainly in open excavation, except for a length in tunnel below the embankment of the existing Renfrew Road. Extensive diversions and modifications were made to public utilities.

Road Pavement

Flexible road construction is used throughout on motorway, ramps and surface roads. Heating elements are incorporated within the asphalt surfacing on steeper gradients at Cardonald Interchange.





Landscape to the spiral ramp at the South end of Cornwall Street Footbridge.



Concrete paving below the Dumbreck Road Interchange.

The depressed section of Stage 1 at Dumbreck Road and Paisley Road West.

LANDSCAPING

The alignment of Renfrew Motorway has been largely determined by the established important heavy industrial firms distributed throughout this quadrant of the City on the south bank of the River Clyde, consequently it has not been possible to include, within the contract, large tracts of open space commensurate with the scale of the carriageways and structures.

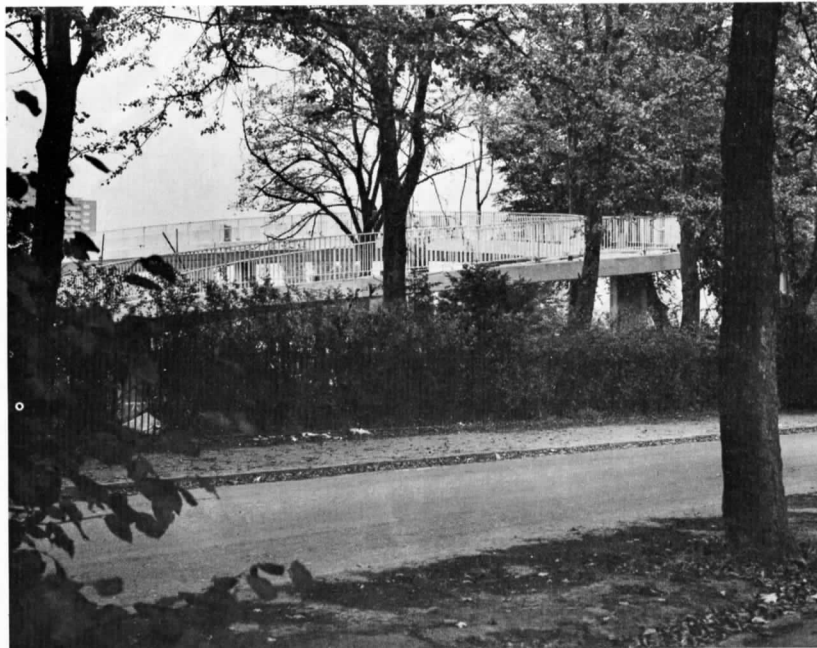
Much of the area through which the motorway passes, however, between the Kingston Bridge and Bellahouston Park, will, in time, be the subject of comprehensive redevelopment within the overall Town Planning proposals for the City and it is hoped that the future land uses will physically recognise the presence and scale of the motorway. The form of the landscaping and planting will maintain the continuity of that previously achieved on the North and West Flanks of the Inner Ring Road. This policy provides a degree of initial foliage cover which will enhance the views from the motorway, act as screening from traffic and at the same time enclose areas of open space to the future benefit of the land uses which exists or are proposed in any plan of redevelopment. This type of planting has proved successful in the past and has given the opportunity of making use of the material to further enhance the landscape of other road and redevelopment projects within the City.

The design of the structures, carriageways and landscaping, has been approved by the Royal Fine Arts Commission and the comments made by them suggesting additional areas of planting have been incorporated in the design. The result of the construction work and landscaping is that the minimum amount of land will be required for the carriageways and structures, and the maximum use of residual land will be associated with adjoining land uses to their visual and physical benefit.

All existing trees where possible have been retained. In many cases this planting has been supplemented by the addition of similar species as well as ground cover to provide visual gradation of foliage, and along pedestrian routes as a means of defining and sheltering the movement pattern. Side slopes have in many cases been maintained at a maximum of 1 to 3, except where these are interrupted by a structure.



Stage 2 looking West passing over Railway at Craigton.



Beech Avenue Footbridge located in existing landscape.

However the steeper slopes have been planted with ground cover to eliminate maintenance. The landscaping and planting design has been carried out in consultation with the City of Glasgow District Parks Department, who are also responsible for the execution and maintenance of the soft landscape.

Throughout the length of both contracts, approximately 116 acres of land has been provided for soft-landscaping and tree planting. The area of tree planting covers some 40 acres and contains approximately 40,000 trees of most ages and 105,000 shrubs. This planting will initially provide screening to major pedestrian routes and side slopes and will improve the visual qualities of the road for both the pedestrian and motorway user and will provide the opportunity in time to add more plant material when this is available.

Stage 2 looking West from Helen Street with Dumbreck Road and Paisley Road West of Stage 1 in the foreground.



GENERAL

Lighting and Signing

The motorway carriageways are lit by high pressure sodium lighting mounted on steel masts varying from 24 to 36 metres high. Connecting ramps are also lit by high pressure sodium lights mounted on conventional columns. Adjoining footpaths and surface roads are lit by conventional means.

Advance and confirmatory direction signing is by messages carried on internally lit gantry signs which are designed to incorporate, in the future, the remotely controlled motorway signal system.

Barriers

Median barrier of the open box type is used over the entire length of the motorway. Barriers are also provided along the tops of embankments and where the motorway is alongside the railway. The motorway corridor is fenced off from the adjoining areas for reasons of safety.

Noise Insulation Works

In terms of the Noise Insulation (Scotland) Regulations 1975, work has been progressing in the installation of double glazing and ventilation units in eligible rooms of dwellings in both stages of Renfrew Motorway. A total number of 373 dwellings in Stage I and 86 dwellings in Stage II are affected at an estimated cost of £229,500.

Stage I

Design and Project Data

Geometric Design Criteria

	Motorway	Ramps
Design Speed (Km/h)	100	60
Radius (minimum) (m)	650	240
Radius (absolute minimum) (m)	350	130
Maximum Gradient (per cent)	5	5
Sight Distance (m)	210	90
Maximum Superelevation (per cent)	7	7

Project Data

Contract Cost	£14.72m.	
Original project cost	20.09m	} including land costs £3.7m
Estimated final project cost	24.41m	
Starting date	17th September, 1973	
Length of motorway	3.3 Km	
Length of surface streets	2.3 Km	
Earthworks excavation	450,000m. ³	
Imported Fill	30,000m. ³	
Number of bridges	13	

twenty-four

Stage II

Geometric Design Criteria

	Motorway	Ramps
Design Speed (Km/h)	120	60
Radius (minimum) (m)	850	240
Radius (absolute minimum) (m)	450	130
Maximum Gradient (per cent)	4	7 (with heating)
Sight Distance (m)	290	90
Maximum Superelevation (per cent)	7	7

Project Data

Contract cost	£12.47m	
Original project cost	15.88m	} including Land costs of £1.6m
Estimated final project cost	18.66m	
Starting date	8th January, 1974	
Length of motorway	3.43 Km	
Length of surface streets	2.30 Km	
Excavation	305,000m. ³	
Imported Fill	850,000m. ³	
Number of bridges	9	

STAGE I

Agents

Consulting Engineers: Scott Wilson Kilpatrick & Co.
(Scotland)

Consulting Architects: William Holford & Associates
(Glasgow)

Material Testing: Sandberg

Consultants: Solus Schall Ltd.

Electrical Engineering

Consultants: Strain & Robertson

Mining Consultants: J. W. H. Ross & Co.

Main Contractor: Balfour Beatty Construction (Scotland)
Ltd.

Principal Sub-Contractors:

G.E.C. (Street Lighting) Ltd. High Mast Lighting

Balfour Kilpatrick Ltd. Underdeck Lighting

Willings International Contracts
Ltd. Gantry Signs

W. Reid & Sons Ltd. Fencing

Wimpey Laboratories Ltd. Consolidation of Mine
Workings

Limmer Roads (Scotland) Ltd. Road Base and Surfacing

Progressive Reinforcement
Services Ltd. Steelfixing

Stent Piling Ltd. Piling

Leonard Fairclough Ltd. Precast Beams

Acutevil Ltd. ; Wharfedale
Agricultural Services Ltd. Earthworks

Millars Wellpointing
International Ltd. Well-Pointing

Principal Suppliers

Amalgamated Quarries
(Scotland) Ltd. Road Aggregate

Hargreaves Coal and
Shipping P.F.A.

J. & W. Henderson Cement

Kings & Co. Road Surfacing Materials

W. H. Malcolm Imported Fill

Reinforcement Steel
Services Reinforcing Steel

Scottish Aggregates Ltd. Road Aggregate

Springbank Sand & Gravel Concrete Aggregate

Tilcon Road Aggregate

Samuel Walker & Son Specialist Steel

The Hepworth Iron Co.
Ltd. Drainage Pipes

Naylor Bros (Denby
Dale) Ltd. Drainage Pipes

Colorguard Fencing

B.T.R. Silvertown Bridge Bearings

P.S.C. Bridge Expansion
Joints

Hill & Smith Ltd. Safety Barriers

James K. Millar Ltd. }
Costain Concrete Co. Ltd. } P.C. Cladding Panels

STAGE II

Agents

Consulting Engineers: W. A. Fairhurst and Partners

Consulting Architects: William Holford and Associates
(Glasgow)

Material Testing Consultants: Sandberg

Electrical Engineering Consultants: Strain & Robertson

Main Contractor: Leonard Fairclough Ltd.

Principal Sub-Contractors

Amasco Roads (Scotland) Road Surfacing

A. Johnson Construction Co. Herkules P.C. Concrete Piles

Willings International Contracts Ltd. Gantry Signs

G.E.C. (Street Lighting) Ltd. High Mast Lighting

T. W. Broadbent (Scotland) Ltd. Underdeck Lighting

Semple & Cochrane Ltd. Road Heating

A. M. Tweedie & Co. Ltd. Fencing

Durafencing (Northern) Ltd. Safety Barriers

Braidbar Nurseries Soiling

Piggot Foundations Ltd. Bored Piling

Foraky Ltd. Ground Freezing

Cementation Co. Ltd. Sand Drains

Sifran Sealants Ltd. Deck Waterproofing

Sanders Tubecrafts Ltd. Gantry Steelwork

Ferro Frank Ltd. Demolition

Principal Suppliers

Leonard Fairclough Ltd. Precast Concrete Beams

Leonard Fairclough Ltd. Aluminium & Steel Parapets

Springbank Quarry Co. Ltd. Sand and Gravel

British Steel Corporation Reinforcement

D. Anderson & Sons Waterproof Membrane

I.C.I. Ltd. & Fibertex Sub Grade Stabilisation Fabric

Tunnel & Clyde Cement Ltd. Cement

P.S.C. Equipment Ltd. } Bridge Bearings
Andre Rubber }

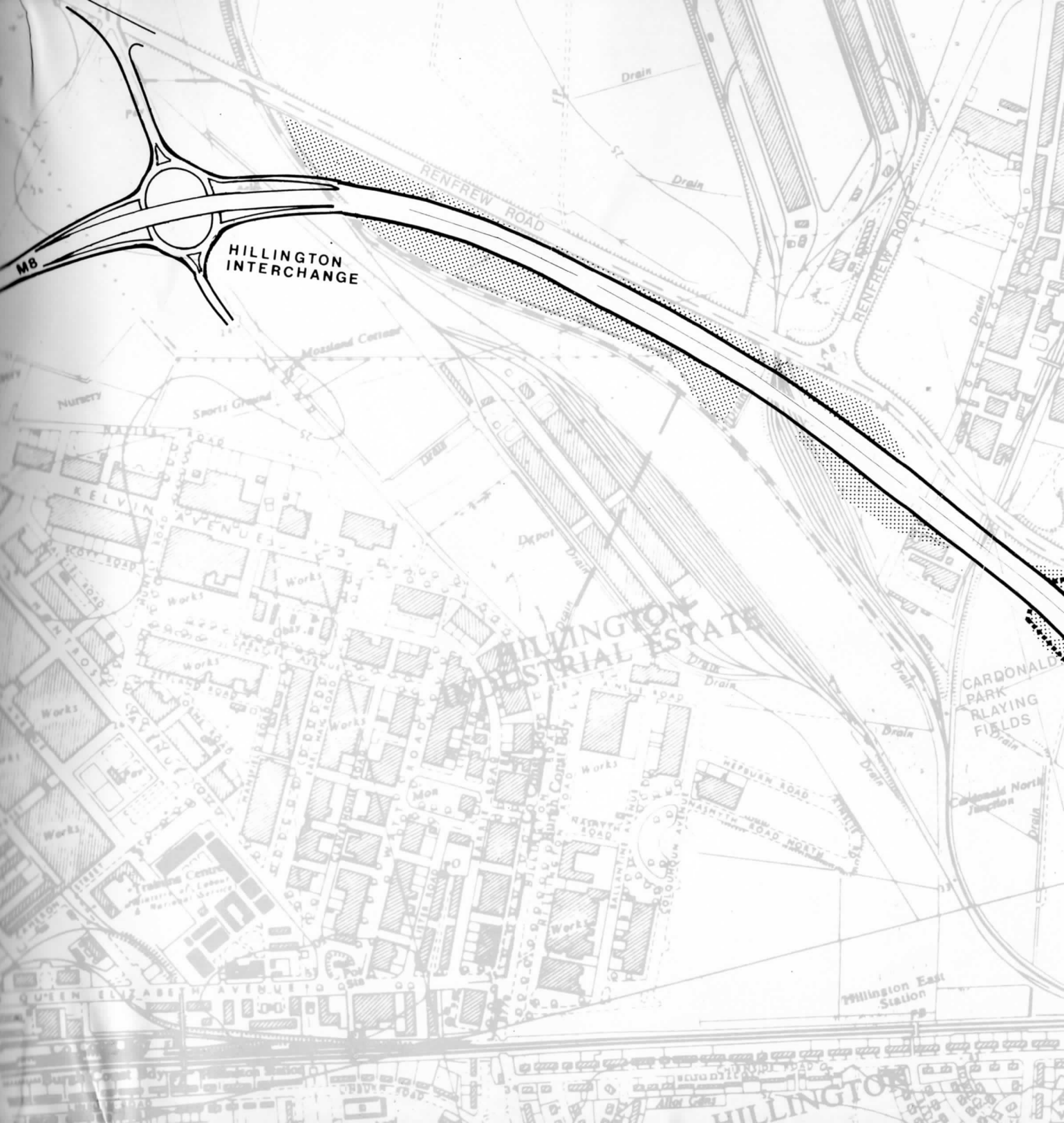
William Griffiths Imported Fill

Colorguard Fencing

Costain Concrete Co. Ltd. P.C. Cladding Panels

Acknowledgement

W. A. RALSTON, (Aerial coloured photographs)





SHIELDHALL

SOUTHERN GENERAL HOSPITAL

Coila Park (Recreation Ground)

Football Ground
Shieldhall Hospital

CARDONALD PARK
PLAYING FIELDS

TO CLYDE TUNNEL

WEST
DRUMOYNE

SHIELDHALL ROAD

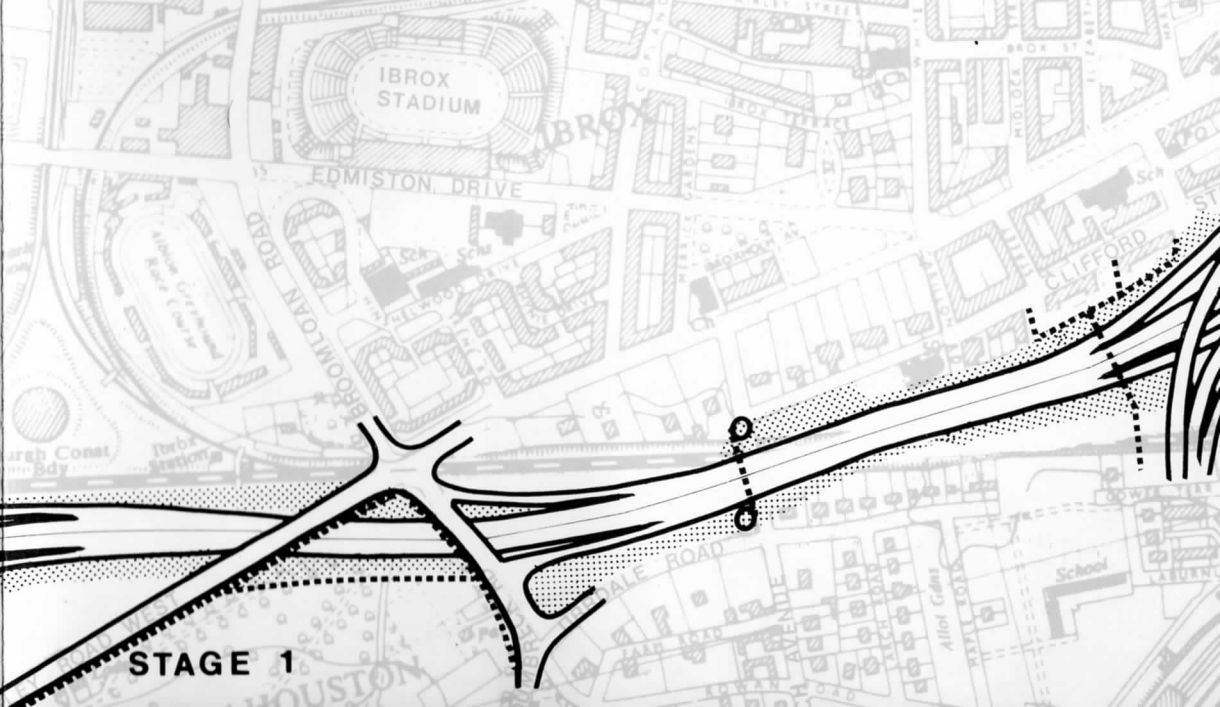
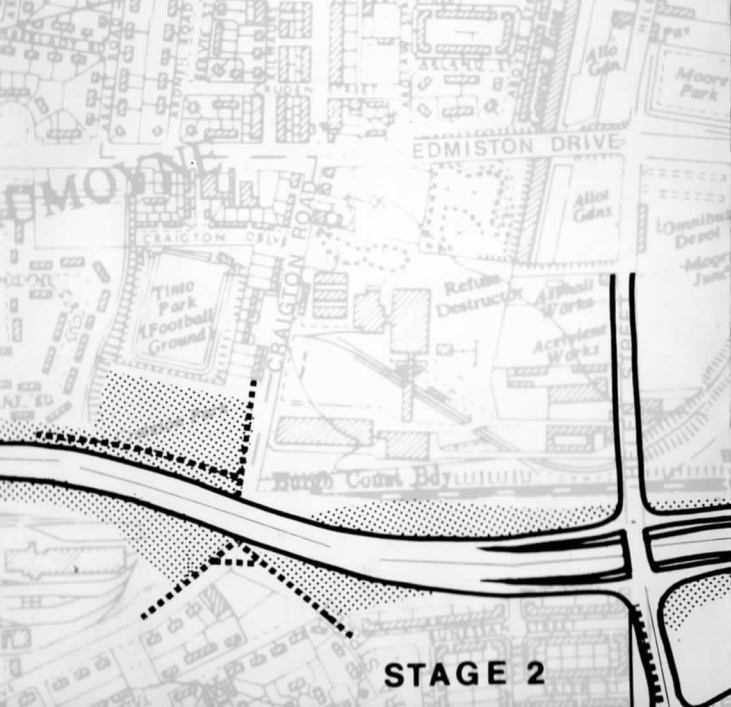
MEIKLEWOOD ROAD

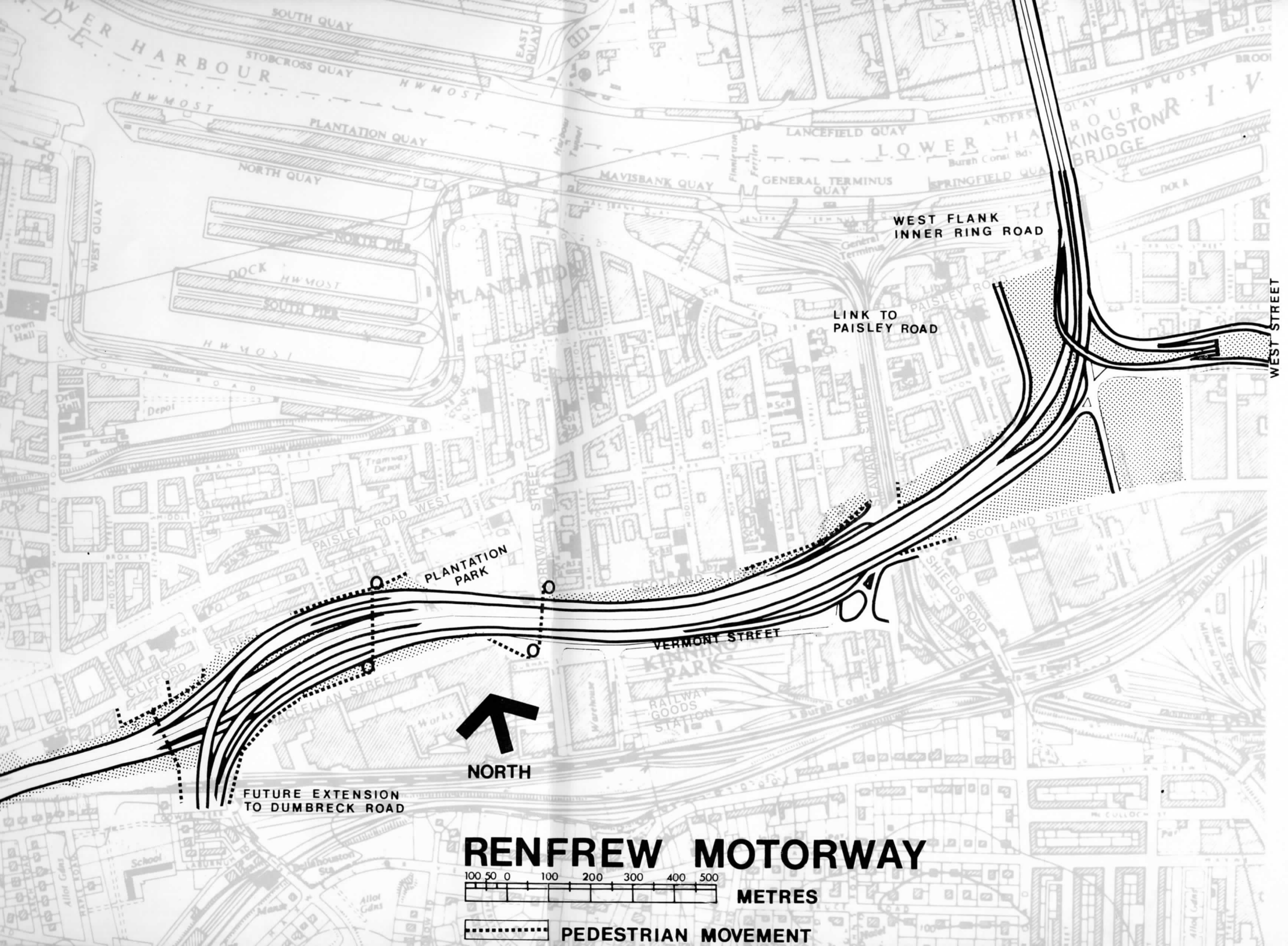
CARDONALD
RAILWAY STATION

QUEENSLAND DRIVE

GOV

S





WEST FLANK
INNER RING ROAD

LINK TO
PAISLEY ROAD

PLANTATION
PARK

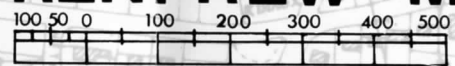
VERMONT STREET



NORTH

FUTURE EXTENSION
TO DUMBRECK ROAD

RENFREW MOTORWAY



METRES

PEDESTRIAN MOVEMENT

GLASGOW URBAN MOTORWAY—M8

