WOODSIDE SECTION - CONTRACT NO. 2

GLASGOW INNER RING ROAD

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Consultant Architects:	William Holford and Associates
Main Contractor:	Balfour Beatty & Co. Ltd.,

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TABLES

FIGURES

October, 1969.

1. INTRODUCTION

The Works to be carried out under the Woodside 2 Contract are shown on Fig. 1. They include the construction of seven bridges (including two viaducts), two footbridges, two pedestrian subways, eleven retaining walls, about 0.8 miles (1.3 km) of dual multi-lane motorway, about 0.7 miles (1.1 km) of surface streets, together with service diversions and drainage works. Their construction started in January 1969 and is due to be completed by the middle of 1971 at a cost of £4 million.

The centre section of the motorway is carried on viaducts so as to ensure environmental continuity at ground level and to lessen the impact of the motorway on the area as a whole.

This Contract completes the North Flank of the Glasgow Inner Ring Road which forms the hub of the highway network recommended by the "Highway Plan for Glasgow" in 1965 and confirmed by the Greater Glasgow Transportation Study in 1968, see Fig. 2.

The design speed for the Ring Road is 50 m.p.h. (80 km/h), with lane widths of 12 ft. (3.65 m) and 10 ft. (3.05 m) hard shoulders. The bridges are designed for M.O.T. HA and HB (45 units) loading.

The principal standards used in the design are shown on Table No. 1.

2. ROAD PROGRAMME AND TRAFFIC ESTIMATES

The implementation of the Highway Network started with the Townhead Interchange and is programmed for completion in the next 25 years.

The Ring Road has a dual function in that it provides a bypass to the City Centre for both long and medium distance traffic and acts as a distributor for traffic wishing to enter the City Centre. Initially the north flank provides a motorway route across the City connecting the Edinburgh road with Great Western Road. In 1975 the roads shown in Fig 3 should have been built and there will then be a motorway route across the City linking Glasgow Airport in the west with the Edinburgh and London roads in the east.

The design of the north flank of the Ring Road is based on the predicted 1990 traffic flow of 86,000 vehicles per day.

3. SITE INVESTIGATION

A Site Investigation was carried out in 1965/66 and showed that generally the strata constisted of made ground overlying soft clays and sands at the west half of the job and overlying boulder clay at the east half. Beneath these strata was rock (sandstones and shales); the depth to rock varying from a few feet to a maximum of 50 ft. (15 m).

The investigation showed nothing untoward considering the geology of the area and the industrial heritage of Glasgow.

4. /

4. EARTHWORKS AND PAVEMENTS

The motorway is generally elevated and filling materials has to be imported to make up the embankments.

A typical cross section of the motorway pavement is shown on Fig. 4.

5. STRUCTURES

The most interesting of the bridges are the two viaducts. These are 1,200 ft. and 1,500 ft. in length (365 m and 460 m) and consist of precast post-tensioned beams supported on inverted 'T' R.C. pier heads as shown in Fig. 5. The foundations consist of pad footings where the depth to rock is 15 ft. (5 m) or less and insitu concrete piles when rock is deeper than this. As with all bridges the soffits of the bridge decks are flush presenting a clean and flowing line.

Precast exposed aggregate concrete panels have been used to form the permanent facework to the retaining walls and exposed bridge abutments, typical details being shown Fig. 6.

6. DRAINAGE AND SERVICES

In general the surface water sewers have been designed for the run-off from a storm with a once-a-year frequency. Sewers at critical points on the road have been designed for a five-year storm frequency. Drainage from the motorway is carried to the River Clyde in a new trunk sewer which also serves the West Flank of the Inner Ring Road.

Services alterations at a cost of nearly £0.2 million have had to be carried out. The major part of this expenditure has been on re-routing trunk telephone cables and electric power transmission cables. Trunk water and gas mains have not been affected as they follow principal traffic routes which the motorway crosses on structure. In general it is desirable for service diversions to be done in advance of the motorway construction, but this could only have been done on this section with a considerable increase in costs.

7. SIGNING, LIGHTING AND ROAD HEATING

Overhead gantry signs are to be used with the possible inclusion of 'Motorsig' units. All roads are to be light at night by means of 100 ft. (30 m) high mast lighting installation.

Road heating will be provided on ramps with steep gradients.

PRINCIPAL DESIGN STANDARDS

TABLE NO. 1

		Motorway	Connecting Ramps
	Design Speed	50 mile/h	40 mile/h
	Sight Distances		
	desirable minimum	425 ft.	300 ft.
	absolute minimum	350 ft.	240 ft.
	Gradients		
	desirable maximum	3%	5%
	absolute max. up	4%	6%
	absolute max. down	5%	6%
	Vertical Curves (crest)		
K	desirable minimum	180 ft.	90 ft.
	absolute minimum	140 ft.	60 ft.
	Superelevation		
	normal	2.5%	2.5%
	maximum	7.0%	7.0%
	Horizontal Curves		
	desirable minimum radius	1450 ft.	900 ft.
	absolute minimum radius	750 ft.	450 ft.
	Lane width	12 ft.	12 ft.
	Hardshoulder width	10 ft.	10 ft. normal
	Central reservation width	12 ft.	-

(K. - is the length of curve required to effect a 1% change in gradient and is approximately equal to 1/100th of the radius of the curve).

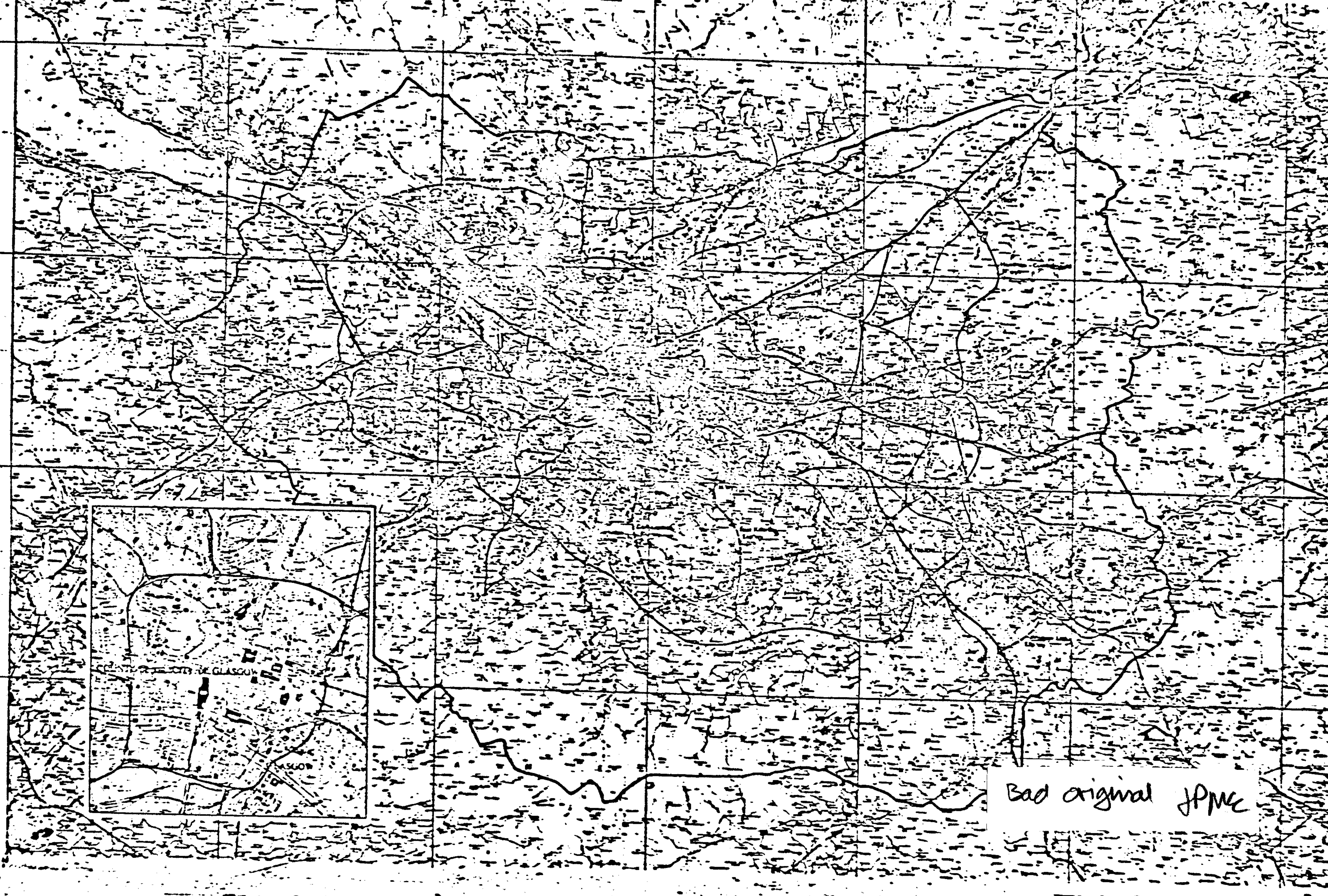


FIG. 2 (SHEET 1): G.C.T.S. RECOMMENDED HIGHWAY NETWORK

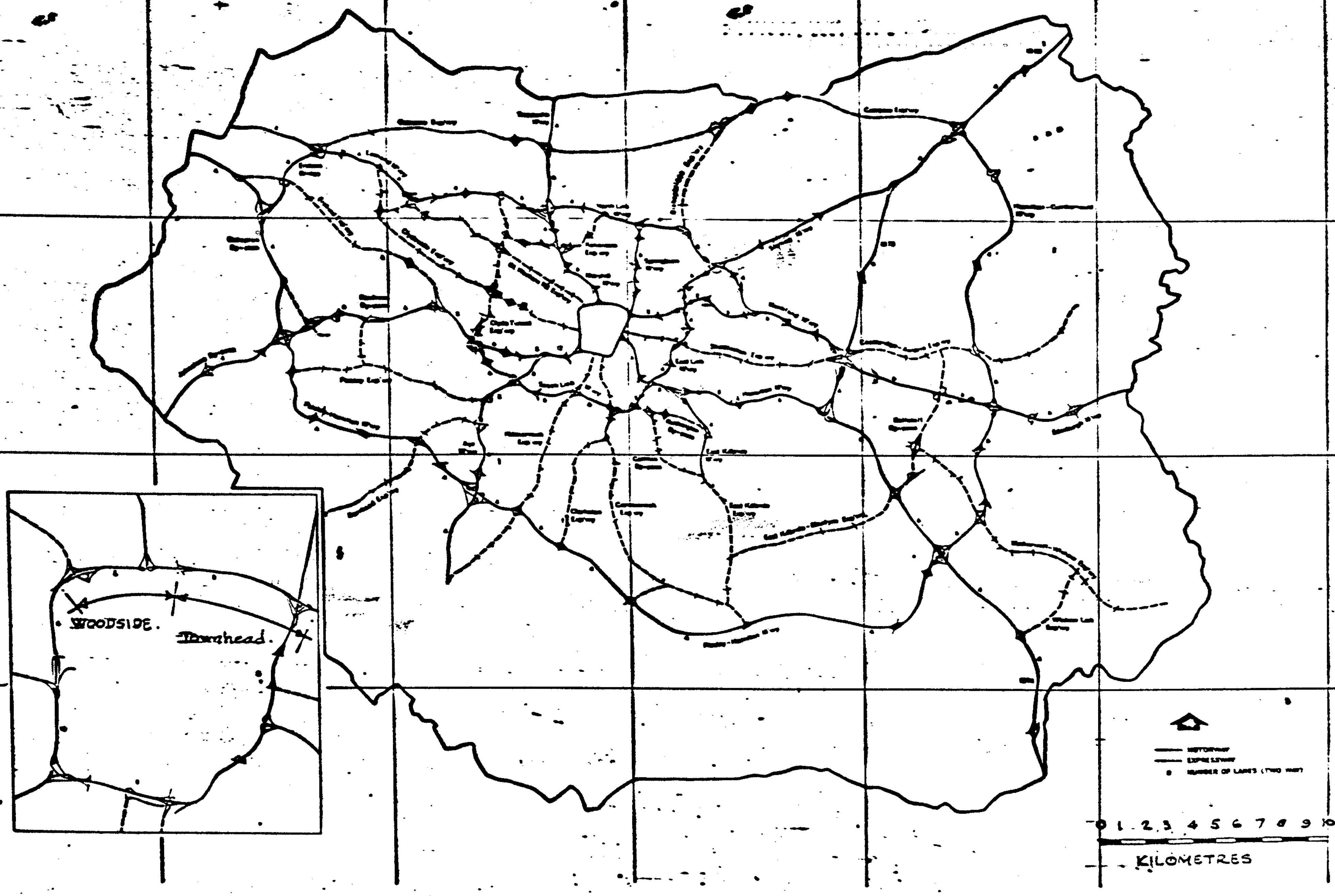


FIG. 2 (SHEET 2) : G.G.T.S. RECOMMENDED HIGHWAY NETWORK

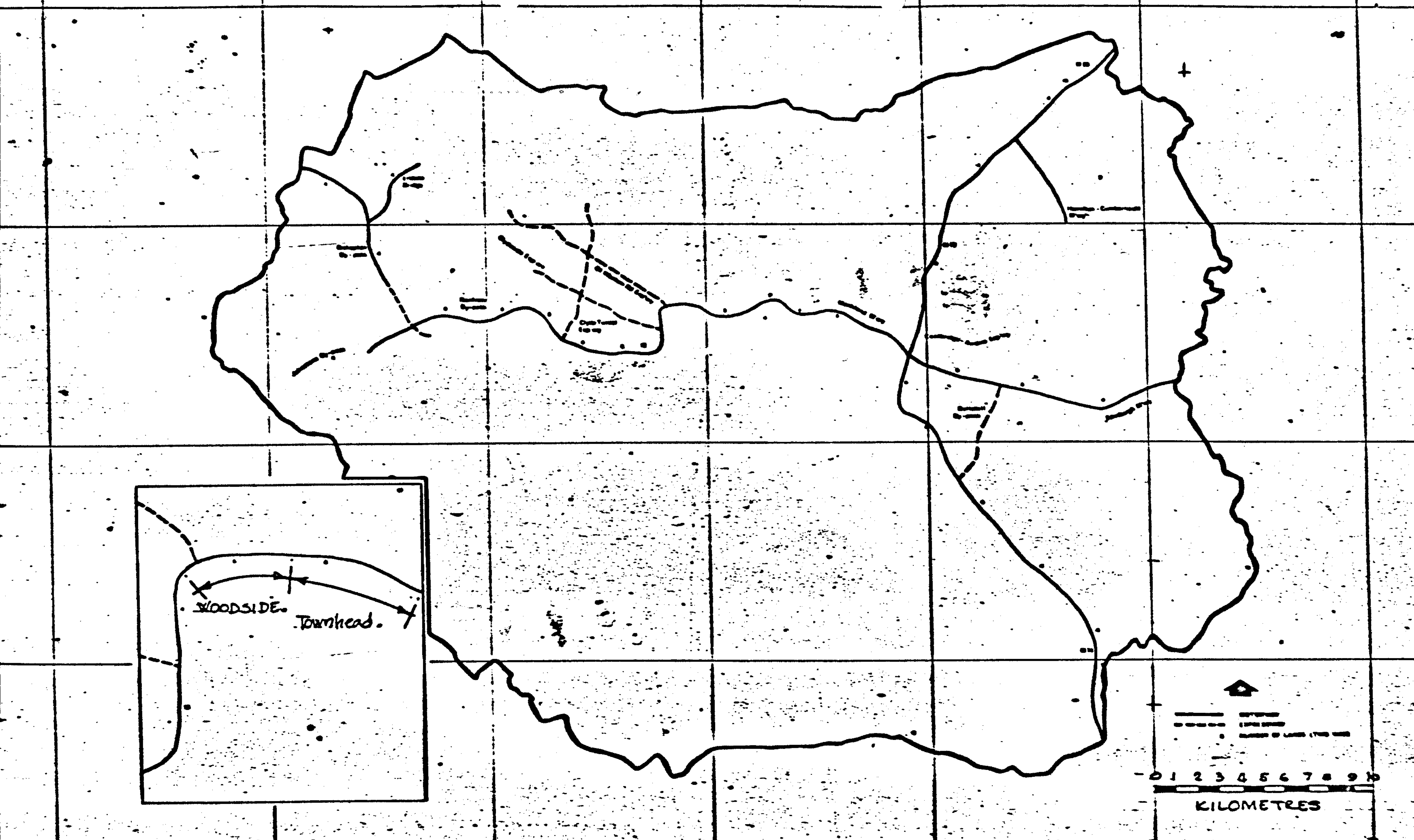
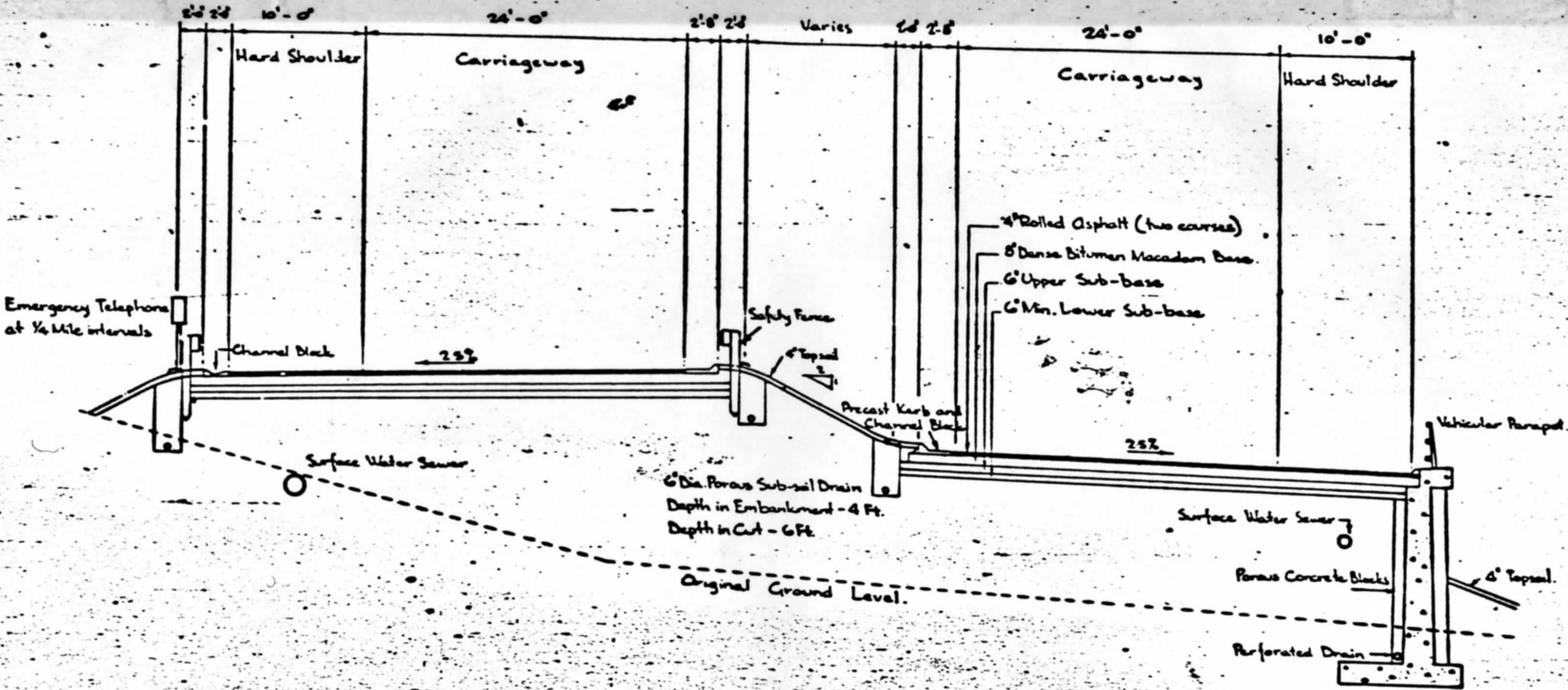
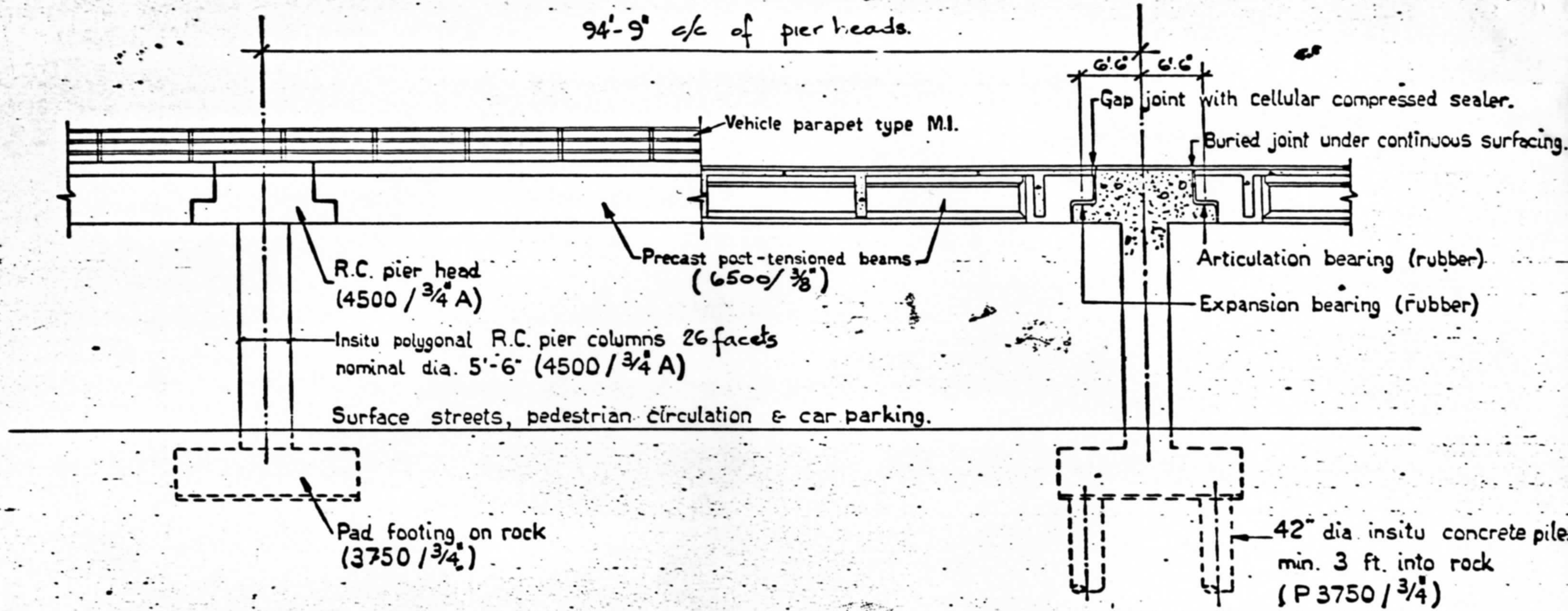


FIG. 3. G. G. T. S. HIGHWAY DEVELOPMENT - PHASE 1.



Typical Motorway Cross-Section.
Figure 6.



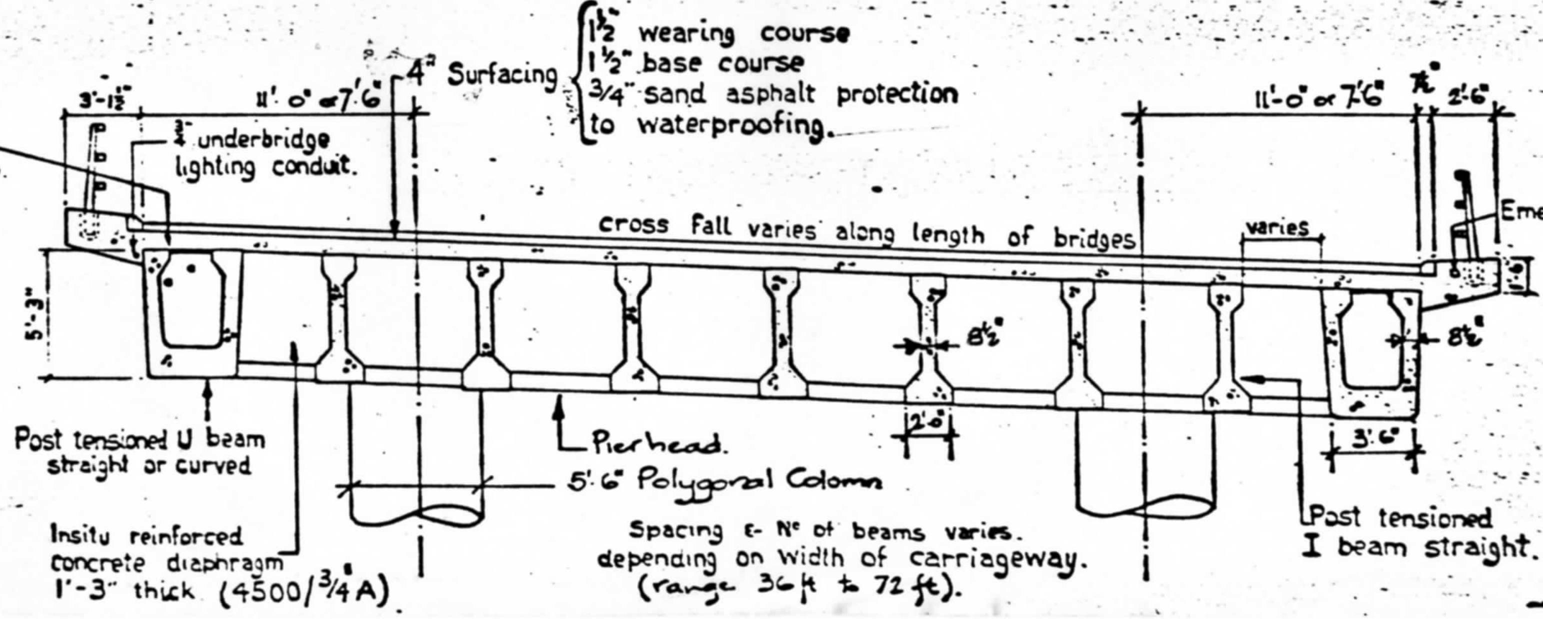


Figure 5
Bridges 11 & 12
Typical Details

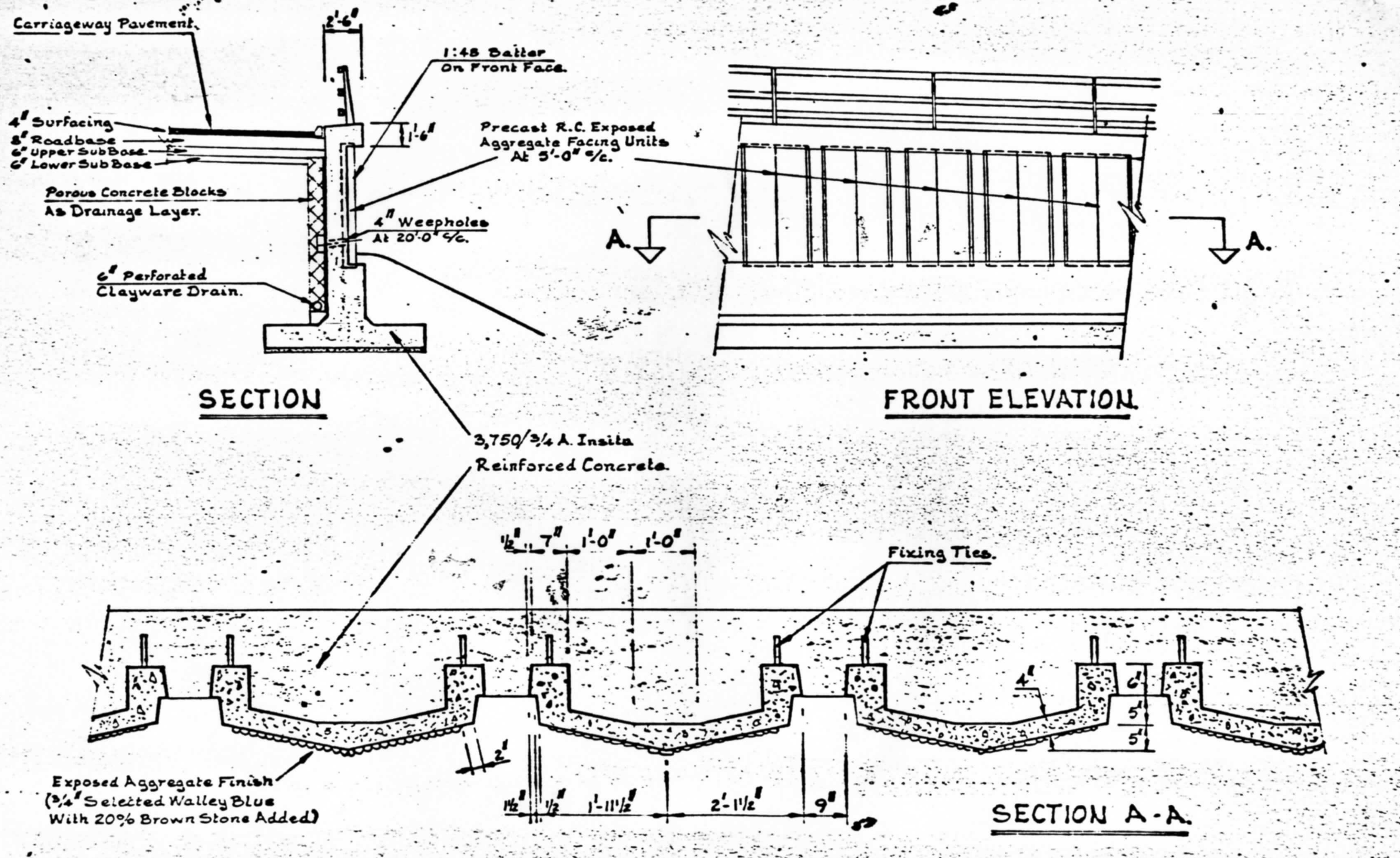
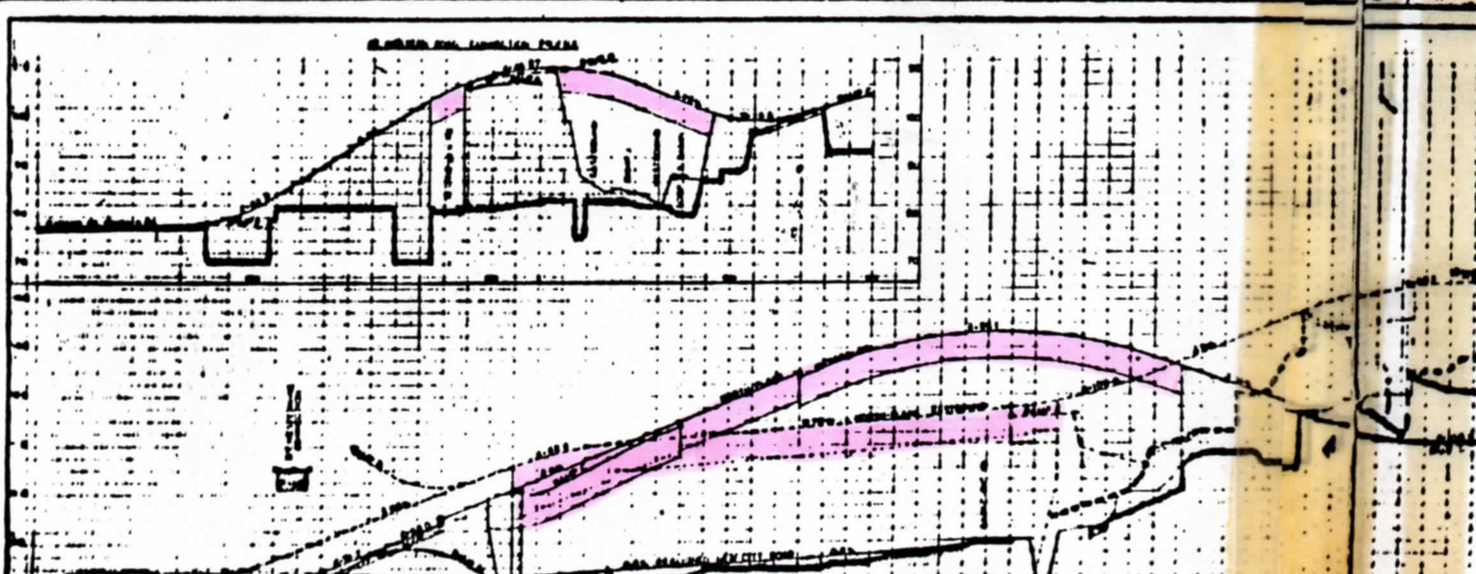
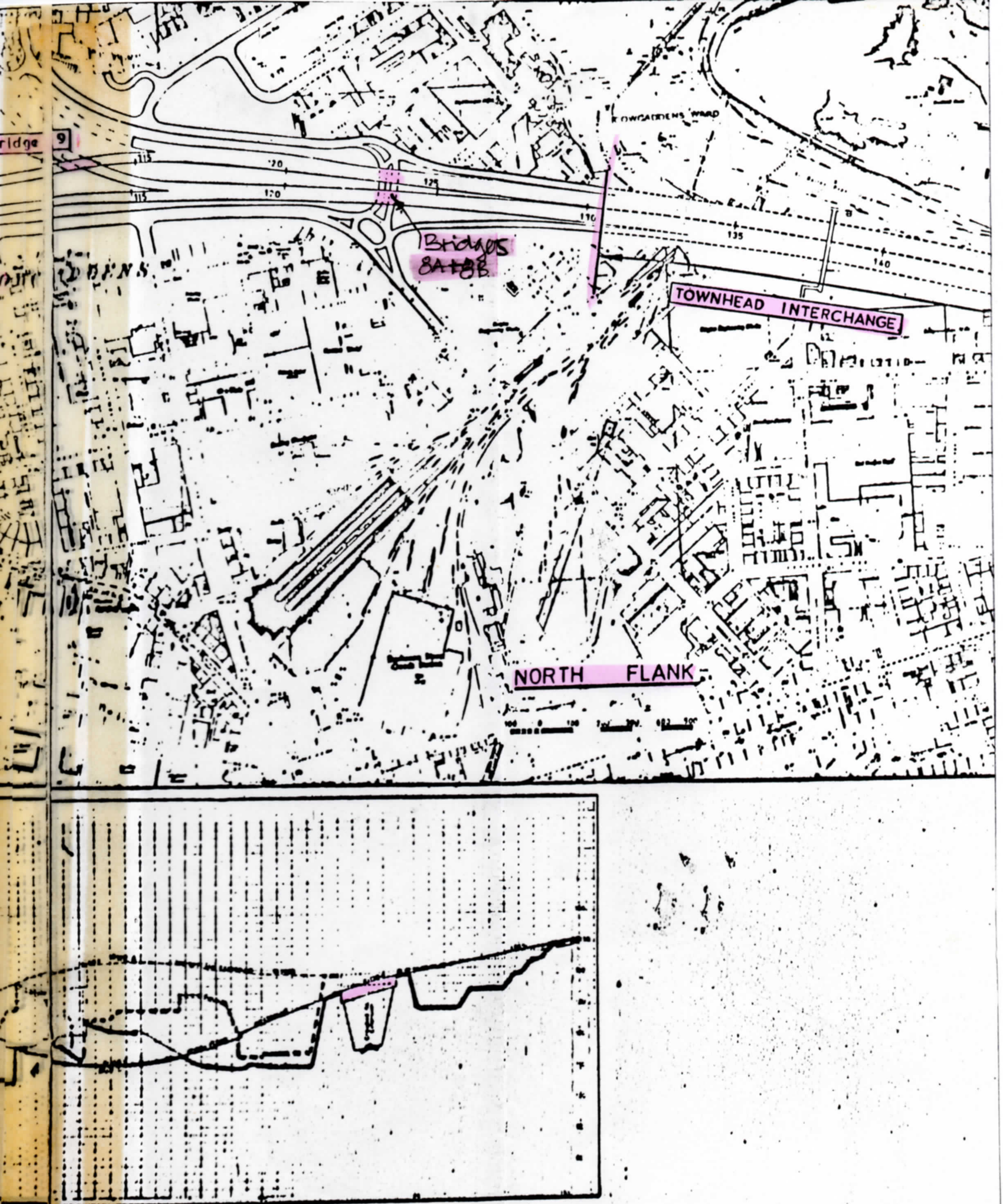


FIG. 6 — RETAINING WALL — TYPICAL DETAILS.


Footbridge No.1
Bridge 9
Footbridge No.2
Bridge 13
Bridge 11
Bridge 14
Bridge 15
Bridge 12
underpass
CHARING CROSS SECTION



Profile.



General Plan & Profile
Figure 1.

J P McCafferty

WOODSIDE SECTION - CONTRACT No. 2.

DESCRIPTION OF STRUCTURES

BRIDGE 9. R.C. T-beam construction continuous of 2 spans. Columns and open abutment, on 30" φ cast-in-situ bored piles. Cantilever wall abutment on rock. Max skew 60°. Max span approx 160' split into 100' & 60'. Mild steel in columns high yield in deck. 4500 concrete in columns and deck. 3750 in all other parts.

BRIDGES 11 & 12 See page 2 of hand-out.

Beams are approx 85' long. I beams weigh approx 40 ton; Edge beams weigh approx 80 ton. Stressing system is CCL Multiforce (all the strands in tendon pulled together) but because of difficulties in obtaining jacks have actually used Stressomatic System (each strand pulled separately). Each strand consists of seven circular wires. Load in each strand on I-beam is 12 ton and in each strand in edge beam is 16 ton. Hog on beam after stressing about 1½". I-beams erected with single crane 125 ton capacity. Edge beams erected with two cranes — 125 ton and 80 ton.

7 wires 0.6 in Edge Beam
7 wires. 0.5 in I Beam.

S.D. 400

2 Beams / day. 240 Beams

Notes by
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Notes (APE(B))

BRIDGE 13. All columns on spread footings. Hollow continuous box beam on a tight curve. Has a heavy shear connector at fixed end to hold the whole thing together. 4500 concrete in deck and columns. Mild steel throughout.

BRIDGE 14. All columns and abuts. on 30" ϕ cast-in-situ bored piles. Six span continuous beam and slab construction. 4500 concrete in columns, beams and deck. Mild steel in columns and main steel in beams. High yield in beam stirrups and deck. Deck thickness 9".

BRIDGE 15. Cantilever wall abuts. 6' thick at base which is 24' wide and 4' thick. Precast prestressed beams with an 8" thick deck slab. Abut. walls and beams have mild steel. Deck has high yield steel. Concrete to walls 3750, deck 4500 and beams 6500.

FOOTBRIDGES. Continuous prestressed hollow box beams.

WALLS See handout. Most of them on clay or fill.

CONCRETE GENERALLY. All exposed concrete air-entrained. Columns on Bridge 14 and Bridges 11 & 12 use steel shutters. Nearly all concrete poured with a Mark-Thomson mobile concrete pump.