LEES

MELBOURNE AND METROPOLITAN TRAMWAYS BOARD

ENGINEERING DEPARTMENT

PLANNING BRANCH.

UNDERGROUND TRAM ROUTES - ULTIMATE DEVELOPMENT.

ST.KILDA ROAD SECTION.

August 1969.

UNDERGROUND TRAM ROUTES - ULTIMATE DEVELOPMENT

ST.KILDA ROAD SECTION.

1. INTRODUCTION.

Unless the St.Kilda Road tram route is developed in conjunction with the underground tramway in Swanston Street it would become the bottleneck limiting the capacity of this service, as it will be required to carry almost as many vehicles - if not as many passengers - as the latter even when allowance is made for the Batman Avenue, South Melbourne and Kingsway routes.

A proposal for the ultimate development along St.Kilda Road is illustrated on drawings U83, U84, U85, U86 - refer figures 1, 2, 3 and 4.

2. ASSUMPTIONS.

The following assumptions have been made -

2.1 The "pathway" should be suitable for railway type of operation. As no restrictive curves or grades are involved this creates no problem. "Main line" curvature is limited to 500 feet radius while turnouts are limited to 350 feet radius.

2.2 Grades are limited to 1 in 50 except for acceleration or braking zones where a limit of 1 in 20 has been adopted.

2.3 No structures are to be above street surface level. As St.Kilda Road is developing an important image, transport in keeping with this is considered essential.

2.4 There is to be no interference with other traffic. The tramway should therefore be completely underground at major junctions. While open cutting has been assumed at other locations, it would however, be possible to roof the tracks over, thus making the street surface available for other purposes. Some such openings are however desirable for ventilation purposes as almost all the power consumed by vehicles in the underground is released as heat which must be removed by air movement, that is ventilation. A suitable open cut arrangement is illustrated in Fig. 7.

2.5 Passenger access from either side of St.Kilda Road is to be free of other traffic. All such passages should be free of bends or recesses that could shield undesirable persons.

2.6 Provision is to be made for junctions to the following routes:-

South Melbourne Beach (and South Melbourne Depot) at Nolan Street.

Kingsway at Park Street.

Toorak at Toorak Road.

Camberwell at Commercial Road.

Glen Iris at High Street.

2.7 The St.Kilda Road route is to be on the straight portion of all turnouts, and all such turnouts are to be immediately after stops.

The latter provision is firstly a safety measure and secondly to ensure that such turnouts are at regions such that they do not restrict the speed of vehicles.

3. NUMBER OF TRACKS.

3.1 Two Tracks.

One track is necessary for each direction with the result that during peak hours few vehicles travelling in the direction of heavier traffic flow will be able to "skip" stops. This means that a large number of passengers are unnecessarily delayed at intermediate stops. Vehicle movement in the opposite direction will be in excess of requirements due to the necessity of the vehicles to make return trips and a number of stops in this direction may be "skipped".

3.2 Three Tracks.

With a second track available for travel in the direction of denser peak traffic it would be possible to segregate through passengers from those patronizing intermediate stops and thus give them an express run. This would have the added advantage of reducing the "in and out journey" time for vehicles, thus permitting more vehicles to get in a second peak period trip.

However, to be worth while it should represent a reasonable proportion of the total journey. Three tracks are recommended. Refer section 4 below.

3.3 Four Tracks.

It is considered that 3 tracks in one direction could not be justified while 2 in each direction would also be unnecessary because of the out of balance between the inward and outward passenger patronage during the peak period.

Should patronage in the popular direction reach capacity it is considered that capital would be better spent on other routes to relieve the demand on St.Kilda Road than to install a fourth track.

4. THE THIRD TRACK - THE "TIDAL FLOW" TRACK.

For this track to be successful it should be completely free of all intermediate junctions and stops. When the direction is set it is essential that the junction (turnout) at the trailing end be locked against incoming traffic to prevent entry from the wrong direction. Signalling could be limited to a "green" "amber" system (if necessary at all) - "green" to indicate full speed and "amber" to drive on sight with mandatory speed limits as the vehicle ahead is approached (as at present). "Red" may be necessary at the trailing junction.

The proposed route is from Nolan Street to St.Kilda junction. To proceed north of Nolan Street would necessitate the third track under the Yarra River. It is doubtful whether traffic would ever warrant the third track beyond St.Kilda Junction. It is debatable whether it should not terminate before High Street, Prahran, and thus include the Glen Iris route. If the third track is extended to St.Kilda Junction, then access from High Street, Prahran, is not recommended because of the resulting complication of signalling and other safety precautions considered necessary.

The scheme as drawn does not preclude the possibility of limiting the third track to give access to High Street, Prahran, at the south end.

5. UNDERGROUND SERVICES.

5.1 Sewers.

The sewerage system in this area is based on the South Yarra Main which crosses under St.Kilda Road at Domain Road at approximately 60 feet below the surface which is well below the proposed tramway. Other sewers cross St.Kilda Road as follows :-

9" dia. at Wadey Street	-	will probably be above tunnels.
9" dia. at Park Street	--	will probably be above tunnels.
6" dia. south of Domain Road	-	will require relocation.
9" dia. at Kingsway	-	will probably be above tunnels.
9" dia. at Leopold Street	-	will require relocation.
12" dia. at Commercial Road	-	will probably be above tunnels.
9" dia. at Moubray Street	-	will require relocation.
9" dia. at High Street	-	will probably be above tunnels.
12" dia. at Union Street	-	will require relocation.

The locations of the sewers are indicated on drawings U91 and U92 - refer figures 5 and 6.

5.2 Stormwater Drains.

2 at 3 ft. dia. semi circular drains between Domain Road and Bromby Street will probably be above the tunnels.

2'6" dia. drain nearer Bromby Street will require relocation.

5'-6" x 1'-4½" drain at Toorak Road will probably be above the tunnels.

6'-6" dia. drain at Commercial Road will probably be above the tunnels.

2'-6" dia. drain at High Street will probably be above the tunnels.

The large drains at Union Street will require relocation.

The locations of the stormwater drains are indicated on drawings U91 and U92 - refer figures 5 and 6.

5.3 Other Services.

These are expected to be minor as they are generally along St.Kilda Road near the building lines.

5.4 Sumps.

Provision should be made for about 6 sumps equipped with automatically controlled pumps.

6. ESTIMATE OF COSTS.

6.1 Basic Data.

The following are rates which were applicable to recent M.M.B.W. projects.

Excavation carting and disposal of material that can be ripped	$0.82/yd.^{3}
Excavation carting and disposal of silurian that cannot be ripped	$1.42/yd.^{3}
Excavation rock in trenches	$5.35/yd.^{3}
9" concrete paving - plain	$5.32/yd.^{2}
6" concrete paving - plain	$3.52/yd.^{2}
4" concrete paving - plain	$2.78/yd.^{2}
Steel mesh - supply and placing	$202/ton
Long road overhead bridges with a lot of repetition	$13/ft.^{2}
S.E. Freeway overhead cast in situ	$19/ft.^{2}
Wilson Street Bridge deck only	$10/ft.^{2}
St.Kilda Road bridge curved span	$6.76/ft.^{2}
Retaining Walls and Bases - Queens Road approach	$32.50/yd.^{3}
Reinforcing - 1 to 2% of volume - Queens Road approach	$200/ton
Parapets, footway and kerbs	$44/yd.^{3}

General provisions	plus	12½%
General day labour	plus	8-10%
Supervision	plus	7½%

6.2 Assumed for St.Kilda Road Route.

Excavation 95% at	$1.00/yd.^{3}
5% at	$1.10/yd.^{3}
Base slab	$9.00/yd.^{2}
Tunnel walls and roof	$50.00/yd.^{3} (reinforced)
Bridge decking	$8.00/ft.^{2}
6" slabs, platforms etc.	$4.00/yd.^{2}
Rail, single track 85 lb./yd.	$15,000/mile single track
Rail fittings	$40,000/mile single track
Laying track	$4,000/mile single track
Overhead wiring	$10,000/mile single track
Lighting	$20,000/mile of tunnel

General provision	plus	15%
General day labour	plus	12½%
Supervision		10%

Over and above these items some provision should be made for minor sewers and other services and in particular the stormwater drain near Union Street. $2,000,000 should be adequate for this purpose while a further $2,000,000 is allowed for floodwater sumps.

6.3 Assumed Method of Construction.

For estimating purposes the method of construction is assumed to be as follows -

(a) unrestricted occupancy is available.

(b) excavation is allowed to proceed without interruption

(c) base slabs are cast separately

(d) walls, roofs and decks are either precast or cast in situ to suit

(e) "back fill" is from "forward" excavation

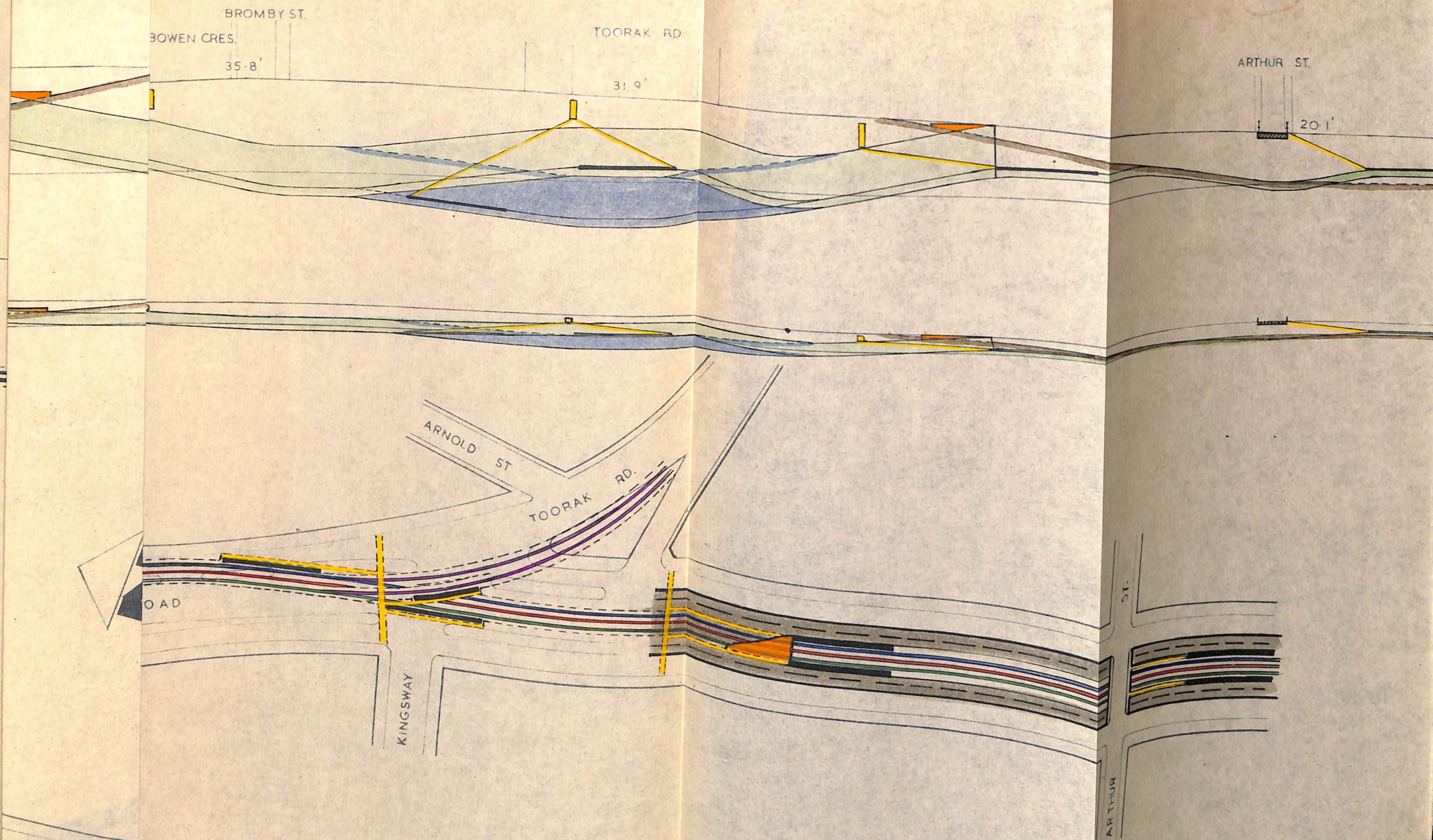
(f) construction of access tunnels and ramps is planned in conjunction with construction of new tunnels to achieve greater economy.

7. SUMMARY OF ESTIMATED COST (Refer Table 1).

Excavation	$ 1,300,000
Bridges	300,000
Pedestrian access & platforms	550,000
Tunnels, cuttings and retaining walls	5,800,000
Track work	620,000
Electrical lighting	180,000
Overhead wiring	220,000
General provisions	1,330,000
General day labour	1,100,000
Supervision	900,000
Sumps, pumps etc.	2,000,000
Relocation of services	2,000,000
	$16,300,000

Route Length 13,700 feet

= 2 miles 47½ ch.



LONGITUDINAL SECTIONS OF PARK ST.

SCALE: HOR. 160 TO 1"
VERT. 160 TO 1"

LEGEND:

(BLUE) — DENOTES SOUTH BOUND TRAM
(RED) — DENOTES EXPRESS TRAM
(GREEN) — DENOTES NORTH BOUND TRAM
(PURPLE) — DENOTES BRANCH
(BLACK) — DENOTES LOADING PLATFORM
(ORANGE) — DENOTES TUNNEL ENTRANCE
(GREY) — DENOTES MOTOR TRAFFIC
(YELLOW) — DENOTES PEDESTRIAN

MELBOURNE & METROPOLITAN TRAMWAYS BOARD

ST. KILDA RD. TRAM ROUTE
PROPOSAL FOR ULTIMATE DEVELOPMENT
ALEXANDRA AVE. TO ARTHUR ST.

U. 83

HIGH ST.

LORNE ST.

26.9'

RALEIGH ST.

23.7'

UNION ST.

24.1'

HENRY ST.

26.4'

MOTOR TRAFFIC

HIGH ST.

RALEIGH ST.

ST.

HENRY ST.

ST. KILDA

ROAD

LORNE ST.

UNION

LEGEND

(BLUE)	DENOTES SOUTH BOUND TRAM
(RED)	DENOTES EXPRESS TRAM
(GREEN)	DENOTES NORTH BOUND TRAM
(PURPLE)	DENOTES BRANCH
(BLACK)	DENOTES LOADING PLATFORM
(ORANGE)	DENOTES TUNNEL ENTRANCE
(GREY)	DENOTES MOTOR TRAFFIC
(YELLOW)	DENOTES PEDESTRIAN

MELBOUR

PROP

A