SOUTHERN PUBLIC TRANSPORT LINK FEASIBILITY STUDY

The Analysis of a Direct Light Rail Link to Flinders Street Station

FINAL REPORT

FOR THE CITIES OF SOUTH MELBOURNE
AND MELBOURNE

by

LODER & BAYLY CONSULTING GROUP

and

CONNELL WAGNER,
ENGINEERS AND MANAGERS

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by

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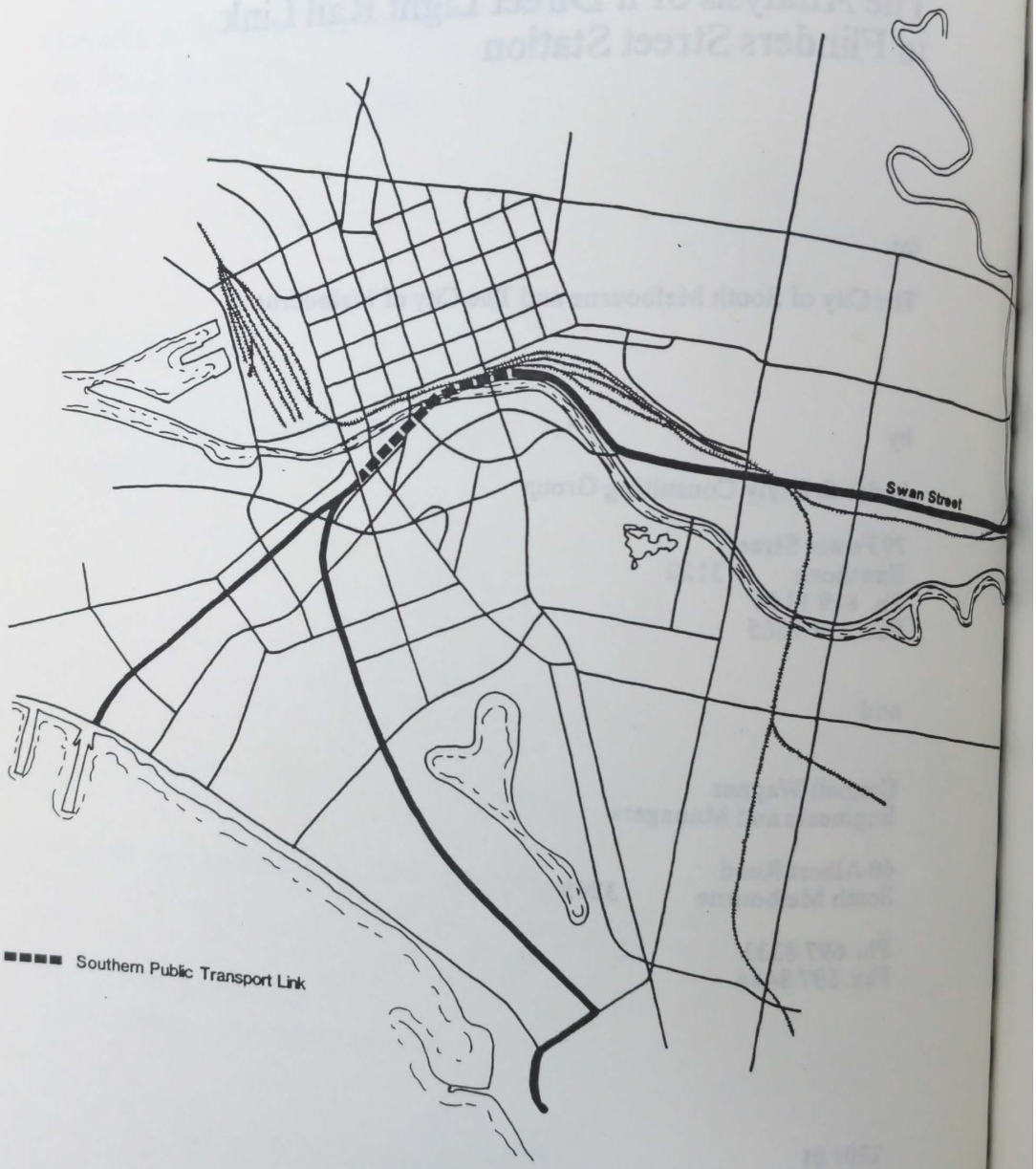
Swan Street
Southern Public Transport Link

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INTRODUCTION

The Cities of Melbourne and South Melbourne wish to pursue the option of a Light Rail facility being established from the existing St. Kilda/Port Melbourne route to the Flinders Street Railway Station and on to connect to the tram line in Batman Avenue.

The timing of the proposed study is critical because it is understood that the State Government plans to demolish the old Railway Bridge across the Yarra in the near future. This would make it far more difficult to connect the Port Melbourne and St. Kilda Light Rail lines to the Flinders Street Railway Station.

There are a large number of alterations to the road network being planned and designed in the vicinity. These generally relate to the redevelopment of the Southbank.

The following is an extract from the Brief.

"The objectives of the study are to:

- *Identify the need for the facility and the opportunities gained therefrom, including quantifying patronage, and time savings on the route.*
- *Prepare a route plan for the proposal.*
- *Provide detailed investigations of the engineering aspects of the proposal including:*
  - *(a) the track alignment for double track.*
  - *(b) The structural integrity and requirements for Light Rail use of the Sandridge Rail bridge and the viaduct at Queensbridge Square.*
  - *(c) The structural and any other relevant modifications required to facilitate a double track Light Rail facility through Flinders Street Station to join the Batman Avenue tram route.*
  - *(d) Passenger platform and accessibility requirements to service a Light Rail stop at Flinders Street Station.*
- *Prepare cost estimates for the construction of this proposal.*
- *Identify concurrence of this proposal with the Government's current transport planning policies and strategies, including the Central Area Transport Strategy.*

It is anticipated that the feasibility of this proposal will be dependent on structural aspects. It is envisaged that the successful consultant will engage specialist structural analysts to investigate these aspects."

SUMMARY OF FINDINGS

The extension of the existing St. Kilda and Port Melbourne LRT service to run through Flinders Street Railway Station and connect with the Batman Avenue tram service has been subject to an evaluation.

A variation in the scheme to terminate a new direct service at the western end of the Flinders Street Railway Station has also been subject to some investigation.

It is technically feasible to create an easement for a light rail link from Clarendon Street to Flinders Street Station.

The link would reinforce the recent Central Area Transport Strategy by fulfilling one its central objectives — to improve public transport accessibility to areas on the fringe of the Central Activities District such as the Southbank development. It would increase accessibility to the train network — particularly for passengers with disabilities — those who have difficulty with boarding trams.

The Link supports the achievement of a public transport system serving the inner Melbourne area which is fast, frequent, safe, secure, accessible, reliable, and attractive and which makes the City's services and activities accessible to all, including people with limited mobility.

Many passengers, especially those who work in Port Melbourne and South Melbourne and who live in the eastern and south eastern suburbs would welcome a direct link to Flinders Street Station. These include workers at future developments at the western end of the Southbank development and at the proposed Bayside development in Port Melbourne.

For residents of South Melbourne and Port Melbourne, it would increase the accessibility of the National Tennis Centre, the Melbourne Sports and Entertainment Centre, Olympic Park and to points further east.

Indicative costs of the construction of the Link would be between $8m and $15.5m depending on the particular version of the scheme selected and depending on the development of the Festival Market over the Flinders Street Railway Station. This cost is about half the cost of constructing an urban dual carriageway arterial road of similar length. The scale of the project is relatively modest compared with other major transport infrastructure works e.g. Western Bypass $194m, Outer Ring Road West $176m, and the Eastern Arterial $138m (Metras 1987 figures).

The findings of this study are grouped under the headings of Passenger Aspects, Operational Aspects and Engineering Aspects.

PASSENGER ASPECTS

The effects of the proposal on passengers depends on whether the LRT vehicles running direct to the Flinders Street Station are **in addition** to existing services or whether existing Bourke Street LRT vehicles would simply be redirected. In this report we have assumed that LRT vehicles servicing a direct link to Flinders Street Station would be **in addition** to existing services.

The nature of the proposed Link is that it would provide a new option for travellers from (and to) the inner southern suburbs. The Link would increase the choices available to passengers. The effects on passengers are somewhat complex because of:

- the complexity of the existing tram, train and bus services;
- the detailed nature of the operational changes which would be required to run the new service; and
- the diversity of passenger needs.

The nature of the main passenger effects would relate to walking distances and the ease of connections between different public transport modes.

A direct link to Flinders Street Station would increase public transport service to the Southbank development between Queensbridge Square and Clarendon Street, the proposed Museum of Victoria, to the National Tennis Centre precinct from the Port Melbourne and St. Kilda areas as well as the Met train network.

The provision of a direct service to the Flinders Street Station would benefit passengers who have difficulty with normal tram stops such as passengers with disabilities and who would prefer a platform and direct connection with the train network. The actual walking distance from the LRT vehicle to railway platforms is shorter at Flinders Street Station than the existing walk at Spencer Street and is under cover.

A survey was conducted of afternoon passengers boarding the inbound LRT service at the Montague stop. This confirmed an earlier 1985 PTC survey which indicated most of these passengers intended to transfer to train for suburban destinations.

The Link would be of benefit on Sundays, when the city loop is not operating, and for LRT passengers who are disadvantaged by the reverse direction of the loop and would prefer to change to train at Flinders Street Station rather than Spencer Street.

The Link would attract some activity to the southern gateway of the Swanston Walk.

A survey was conducted of morning peak hour passengers boarding the inbound Light Rail Transit service (LRT) at the Middle Park stop. It indicated that, if it were to be a question of one or the other, the majority of this particu-

lar sector of the travelling public would prefer the present service to Bourke Street rather than a direct service to Flinders Street Station. This is not surprising given that the survey was of existing passengers.

This survey also indicated significant dissatisfaction with the present service frequency and punctuality. The provision of additional vehicles to service a direct link to Flinders Street Station would directly address this problem by increasing passenger capacity.

Inbound passengers interviewed at the Montague Light Rail stop during the afternoon generally preferred the present route or would be happy with either.

A survey conducted by the City of South Melbourne in 1990 indicated that a significant number of people would value a direct link to Flinders Street.

OPERATIONAL ASPECTS

The direct road traffic effects of the Link would be relatively minor but would need to be addressed in detailed design.

Provided that the PTC agrees to accommodate the current limited use of Platform 13 in another way, and provided that the Festival Market Project does not proceed (or its design is modified) then it is feasible to incorporate a twin track LRT easement through Flinders Street Station. However, as a fall-back position, a feasible single track solution has also been investigated.

The operation of a short length of single track could be controlled by automatic signalling and points machines similar to a heavy rail situation and there will be minimal impact on the timetable envisaged for this service.

There are a number of detailed issues to resolve concerning the routes on which trams servicing the Link would operate. Through routing of the CAD is one alternative.

ENGINEERING ASPECTS

It is technically feasible to create an easement for a light rail link from Clarendon Street to Flinders Street Station at an estimated construction cost of $8m.

Options to extend the light rail through Flinders Street Station to connect to Batman Avenue depend upon negotiations with the PTC and the developer of the proposed Festival Market at the station.

A schematic plan of a feasible route is shown in the fold out plan at the back of this report.

The PTC currently utilises the only available easement to the south of Platform 13 at the Station for some 15 train movements per day. To release this easement for the light rail, it will be necessary to either:

a) Negotiate with the PTC regarding alternative operation strategies which may incur some inefficiencies and consequential costs; or

b) Reduce the width of Platform 12/13 to enable the existing PTC track to be moved northwards clear of the easement for the light rail.

There is a suitable easement to connect between Batman Avenue and the east end of Flinders Street Station utilising the existing carpark to the west of the PTC Metrol building. It will be necessary to provide replacement car parking spaces and to divert electrical and signalling cables which run underground through the carpark.

Allowing reasonable costs for alterations to the station and carpark as described, the connection from the west end of Flinders Street Station to Batman Avenue is estimated to cost about $6m.

The proposed Festival Market project includes recreation and river access features on the south side of Platform 11 which will clash with the easement for the light rail. The development agreement for the Festival Market expires on 31 July 1991 unless a further extension is granted by the Minister. To achieve the inclusion of a light rail easement into the scheme there would be significant cost penalties to the Festival Market. It is outside the scope of this report to estimate these likely cost penalties.

If the Festival Market proceeds with the current design, it is possible to provide a light rail terminus at the west end of Platform 10/11 with connection to the platform and to the Elizabeth Street subway. An additional $1m would be added to the construction cost for this terminus. As an optional extra, the Batman Avenue tram route could be extended down to Platform 13 as described above to provide an under cover pedestrian link between the light rail and the Batman Avenue tram along Platform 11/12 or through the Festival Market.

The bridge across the Yarra and the viaduct south of the Yarra can be restored at reasonable cost for the light rail service. However, unless the design of the proposed road layout at Queensbridge Square is modified, some viaduct spans will need to be realigned at an additional cost of about $1.5m.

Between Queensbridge Square and Clarendon Street there is a route available for the light rail running approximately parallel to and north of the proposed Museum Road. The Victorian Government is currently clearing land in this area for sale as commercial and residential property development and the light rail easement would encroach to the extent of about 0.5ha.

Construction Cost Summary

The indicative construction costs of the options described above are summarised in the following table. The cost of new LRT vehicles to service the link would be around $10m depending on the frequency of service. This cost is additional to those shown in the table.

OPTIONAL STRATEGY	WITH FESTIVAL MARKET		WITHOUT FESTIVAL MARKET	
		PLUS VIADUCT CHANGES		PLUS VIADUCT CHANGES
THROUGH-ROUTE BATMAN AVENUE TO CLARENDON STREET	—	—	$14m	$15.5m
FLINDERS ST STATION TERMINUS	$9m	$10.5m	—	—
FLINDERS ST STATION TERMINUS	—	—	$8m	$9.5m
FLINDERS ST STATION TERMINUS PLUS BATMAN AVENUE TRAM EXTENSION	$14m	$15.5m	—	—

Timing

The southern public transport link would affect the present options for the Southbank development and the Festival Market. It would particularly affect the design of the Festival Market Development.

Construction of Museum Road between Kingsway and Clarendon Street will be implemented in the next six months, and land sales are scheduled to commence in the near future.

Finalisation of road work from Clarendon Street to Queensbridge Square is likely to be deferred due to budget constraints.

On the basis of this information, it would be necessary to reserve an easement for the light rail between Kingsway and Clarendon Street as soon as possible.

EXISTING PUBLIC TRANSPORT SERVICES AND CHARACTERISTICS

Figure 1 shows the main existing public transport services in the general area. The major change over the past decade was the introduction of the LRT service via Bourke Street to replace the old tram service which ran direct to Flinders Street. There has also been a number of relatively minor variations in bus services in recent years.

A major survey was undertaken by the PTC in 1985 of public transport passengers — especially those who were travelling by train. These surveys are reported in the following documents.

i) Light Rail Transit System Inner Area North-South Link. Technical Report. Metropolitan Transit Authority 20th Nov. 1985.

ii) North-South Light Rail. Technical Paper No. 4. Origin Destination of Passengers Changing Trains at Flinders Street. Met Planning Division 9th floor, 50 Queen Street. May 1987 LP210/4.2.8.

Following the introduction of the new LRT service the PTC undertook two further surveys of passengers. These were reported in the following.

i) North-South Light Rail Transit System. Patronage Report. Metropolitan Transit Authority Planning Division. July 1988.

ii) Light Rail Study Report on Findings by Yann Campbell Hoare Wheeler for the Public Transport Corporation 1990.

When introduced, the LRT service attracted some passengers from trams — notably about 450 passengers trips per day from the No. 10, 12 service through Middle Park and a similar number from the No. 15,16 St. Kilda Beach services.

The LRT service was not attractive to a significant number of previous Port Melbourne Line train travellers. About 400 train trips per day were transferred to the bus — the bus service runs past Flinders Street Station.

In 1988, soon after the LRT commenced operation there were 11,500 passenger trips on the LRT each weekday. Of these, 5,660 were northbound towards the City and 5,840 were southbound.

Destinations of Existing Passengers

An important aspect of the evaluation of the Link is the distribution of 'city end' destination of passengers. Therefore a limited passenger interview pilot

survey was undertaken at selected locations and times. This survey is reported in Appendix A. The results reinforced the earlier 1985 PTC surveys.

Figure 4 following page 15, shows the destinations of passengers boarding at the Middle Park LRT stop during the morning peak. The 1985 PTC figures are shown for comparison.

The figures are not **strictly** comparable because:

i) the 1985 survey interviewed passengers at many different locations — not only the St. Kilda train line, and

ii) the 1985 survey covered the whole day.

The 1985 train figures are based on the following interpretation of figures in PTC reports.

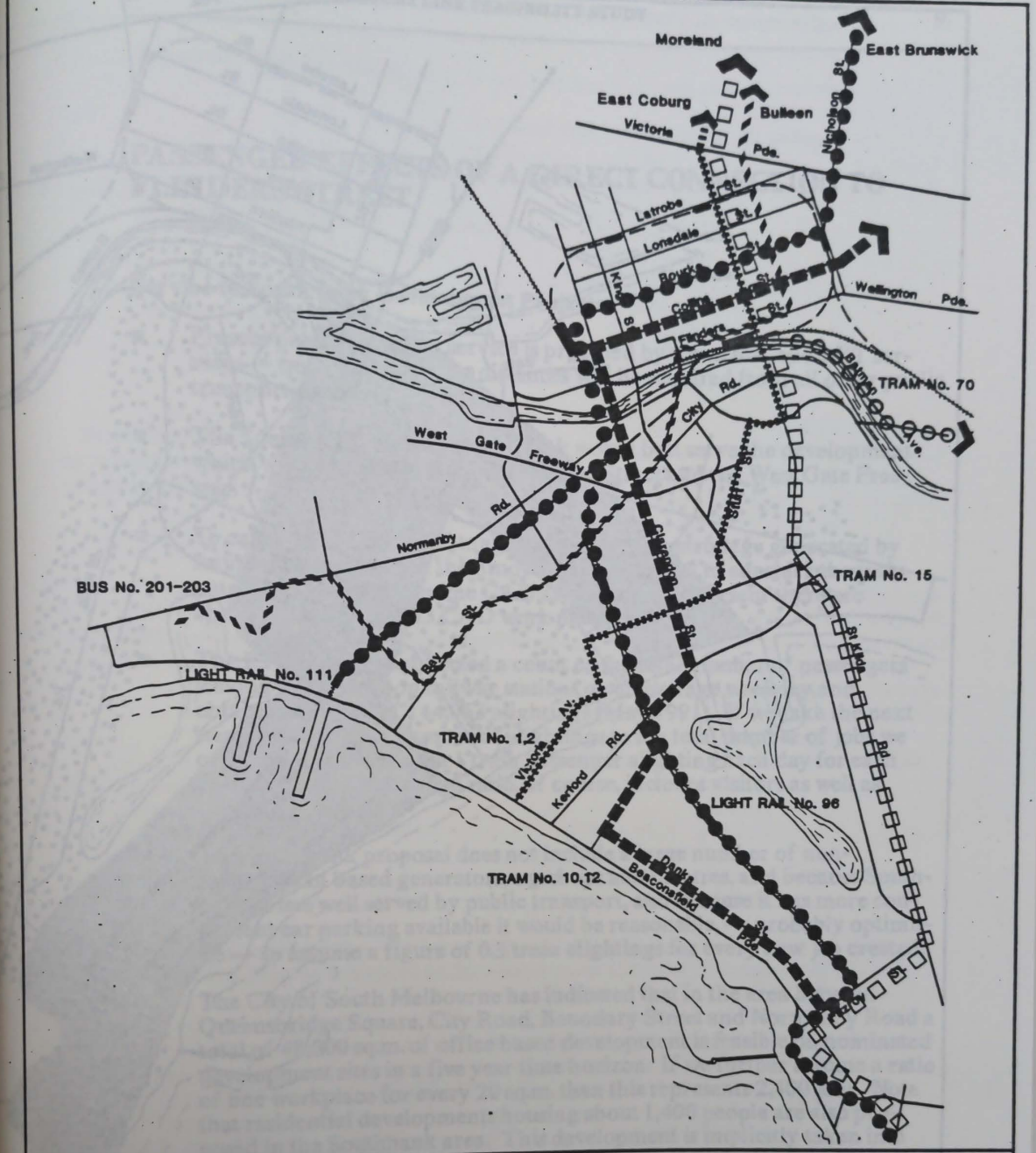
(i) Total number of passengers boarding Port Melbourne and St. Kilda trains = 10,060 and that 5% of these are entirely 'Local'. (Table 3.5, p.16, of 20th Nov. 1985 report).

(ii) Of these remaining 9,560 trips which crossed the Yarra River 37% changed to another train. (Table 1 of Technical Paper No. 4).

(iii) 'CBD' destinations accounted for 54% of St. Kilda line destinations and 30% of Port Melbourne line destinations. (Table 3.7 p.18 of 20th Nov. 85 report).

(iv) 'Golden Mile' destinations were 84% of all 'CBD' destinations (Table 3.8, p.19, of 20th Nov. 85 report).

The recent survey, while limited, suggests that the proportion of travellers changing to another train in the city has dropped since 1985 when the train service was still operating. i.e. 13% of the passengers interviewed at Middle Park intended to transfer to train compared with an overall average of 37% in 1985. See Figure 4. If this were representative, this could amount to several thousand passenger trips per day.



Services not shown:
West Gate bus route
Fishermens Bend bus routes
St. Kilda to Fishermens Bend bus route
Brighton to City bus route

EXISTING PUBLIC TRANSPORT

FIGURE 1

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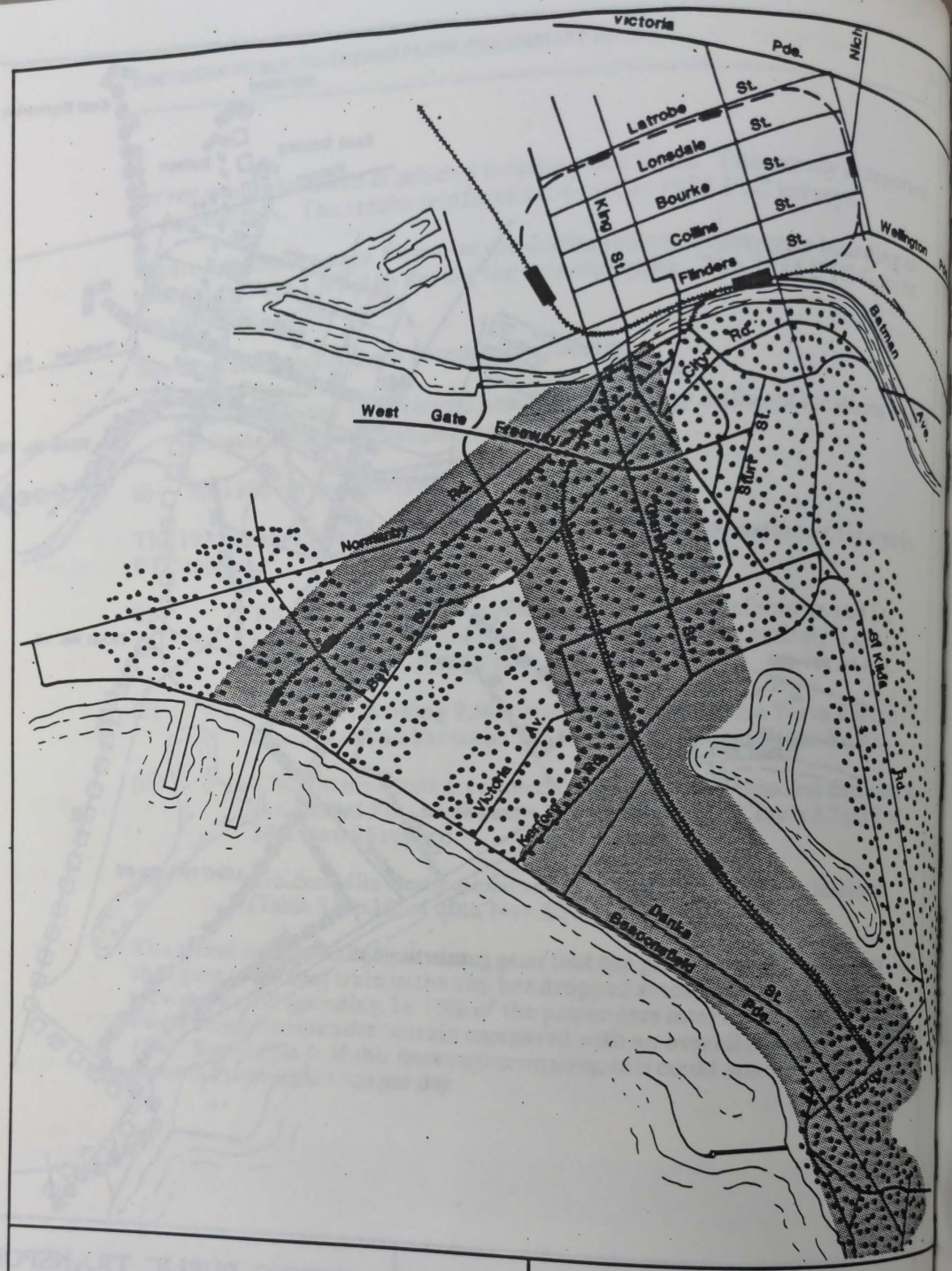

Access to Bourke Street/Collins Street

Access via the intersection of Flinders Street and Swanston Street

EXISTING CAD ACCESS FROM

STUDY AREA

FIGURE

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Southern Public Transport Link Feasibility Study

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PASSENGER EFFECTS OF A DIRECT CONNECTION TO FLINDERS STREET

Service to South Bank Development Projects

- Present public transport service is provided by tram, bus, and LRT services — quite long walking distances will be required from all other public transport services.

- The Southern Public Transport Link would best serve the development which will occur between Queensbridge Street and the West Gate Freeway.

- To calculate the order-of-magnitude of likely patronage generated by future developments in the Study Area, it is useful to consider the train patronage generated by the CAD **as-a-whole**. At present there are approximately 150,333 CAD work places.

- The PTC recently conducted a count of the total number of passengers leaving the City Loop railway stations on an average weekday and obtained a figure of 144,063 alightings (May 1991). If we take the next step of relating the number of alightings to the total number of jobs we calculate a ratio of about 1 train passenger alighting each day for each CAD job. This patronage ratio, of course, includes visitors as well as workers.

- The Southbank proposal does not include a large number of non-employment based generators, e.g. shops and theatres, and because Southbank is less well served by public transport, and because it has more convenient car parking available it would be reasonable, — probably optimistic — to assume a figure of 0.3 train alightings for every new job created.

- The City of South Melbourne has indicated that in the area between Queensbridge Square, City Road, Boundary Street and Normanby Road a total of 48,000 sq.m. of office based development is feasible on nominated development sites in a five year time horizon. If we further assume a ratio of one workplace for every 20 sq.m. then this represents 2,400 jobs. Note that residential developments housing about 1,400 people are also proposed in the Southbank area. This development is implicitly taken into account using this back-of-the-envelope method.

- If we then assume 0.3 train alightings per workplace then we obtain a rough back-of-the-envelope figure of 720 new alightings per day. If we were then to assume that half of these train passengers were to change mode to LRT at its City end terminal then an additional 360 new alightings and 360 new boardings would be generated each day i.e. 720 new one-waytrips per day on the LRT. The other half are assumed to walk from the City Loop railway stations or use the bus, such as route No. 203.

Bayside Development

The present proposal for this development is for:

Commercial	60,000 sq.m.
Retail-general	8,500 sq.m.
Festival Market	4,000 sq.m.
Fish Market	1,000 sq.m.
Other	3,500 sq.m.
Hotel	150 rooms
Picture Theatre	400 seats
Housing	842 units

- If we were to use a similar chain of calculations as for the Southbank Development above but assume all train passengers were to transfer to LRT then an additional 1,800 one-way trips would be generated on the LRT each day.

The Proposed Museum

Estimates of visitation rates and mode usage to the proposed Museum of Victoria have already been made. The figures below have been extracted from the 'Traffic Issues' report for the Museum by the consulting firm of Ove Arup Transportation Planning.

(a) Yearly Attendance

Student	350,000
Tourist	100,000
Visitors	1,400,000
TOTAL	1,850,000

It should be noted that this attendance relates to the ultimate predicted museum attendance. First year of operation attendance is expected to be approximately 1.5 million.

(b) Average Weekly Attendance

	Student	Tourist	Visitor	Total
Each Weekday	1,892	274	3,231	5,397
Saturday	-	274	4,038	4,312
Sunday	-	274	6,731	7,005

For weekdays, the percentages of visitors who were expected to arrive by Met train, tram, or bus were as shown below. When we combine these figures we obtain the following table.

Expected Weekday Met Train, Tram and Bus Patronage to Museum

		Av.Weekday attendance	% p.t.	Total p.t.
Students	Day	1,892	25%	473
	Evening	0	0%	0
Tourists	Day	274	0%	0
	Evening	0	0%	0
Visitors	Day	2,100	40%	840
	Evening	1,131	25%	283
		5,397		1,596

This total estimate of 1,596 public transport passengers includes all public transport - not just LRT. Given the location of the Museum site within walking distance (albeit long) of the Spencer Street railway station and various tram routes it seems reasonable to assume that at least 25% of these public transport passengers would arrive by a direct LRT Link from the Flinders Street Station — less by LRT if existing services were not increased.

The total number of people arriving by LRT at the proposed Museum of Victoria would therefore be;

1,596 x 25% = 399 arrivals

This is equivalent to about 800 one-way trips per day on the LRT when departures are added to it.

A direct connection to Flinders Street Station would give better train connections than the existing connection to Spencer Street. The stop for the Clarendon Street tram is directly outside the Museum site. The LRT stop is to the south. An opportunity exists for an enhanced facility for passengers between the LRT route south of the site and the southern approach to the Museum. We would expect that some visitors to the museum who disembark from trains at Spencer Street Station would catch the first southbound tram (or LRT) that arrives in Spencer Street. Alternatively they may well walk to the Museum from the Spencer Street station or Flinders Street railway station.

A direct light rail link to Flinders StreetStation would provide access to the Museum for passengers with disabilities.

Summary of New Developments

- In summary, these approximate calculations indicate the following. It should be emphasised that the purpose of these calculations is to obtain a rough order of magnitude rather than precise estimates.

Existing Patronage		11,500 trips per day
New Southbank Development	+	720 trips per day
New Bayside Development	+	1,800 trips per day
New Museum	+	800 trips per day
Total		14,820

- The key issue, of course, is not the passenger estimates themselves, but the benefits that would result if a direct connection were to be provided to the Flinders Street Station platforms. The situation with these new developments is that they would generate predominately 'reverse commuters' similar to those interviewed at Montague Railway Station i.e. they will be destined for City Loop **railway stations** rather than the CAD itself. Flinders Street Station would be a more desirable destination than would Spencer Street Station for most of these reverse commuters. These development sites are presently served by some form of public transport but no service to the railway platforms themselves.

Service to NTC, MCG, Entertainment Centre, and Olympic Park

- For people already attending functions at these locations the main benefit will be the easier transfer point at Flinders Street Railway Station. Passengers for South Melbourne and Port Melbourne will have a direct service to the NTC door and an improved service to the MCG via the pedestrian bridge.

- For people presently travelling by car to functions in the NTC/MCG area the main attraction of the new Link will be to those who:

  i) live in the western and southern suburbs;
  ii) attend large events;
  iii) would park at stations on the LRT route in Port Melbourne and South Melbourne.

- The actual numbers of attendees of special events who would be attracted to public transport because of the existence of a direct LRT link is speculative. However, the infrequency of large events means that it would be unwise to rely on this aspect to justify the link.

- The results of previous surveys of the modes used by patrons to major events in the 'Entertainment Precinct' are shown at the end of Appendix B.

- These results predated the construction of the National Tennis Centre. To obtain an estimate of the number of patrons to a major event in the Enter-

tainment Precinct we undertook an observational survey of tram passengers at the Batman Avenue terminus following a major basketball game at the Glasshouse. The official attendance was 6,712.

- The survey confirmed earlier surveys which indicated that only a small percentage of patrons to night-time events use public transport. More importantly, most train passengers who arrived at the terminus did not continue to the Flinders Street Railway Station. Of the total of 153 tram passengers, 44 continued onto Flinders Street Railway Station (29%). The details of this survey are shown in Appendix B.

- Eastbound public transport passengers were not observed e.g. those bound for Richmond Railway Station or those who boarded eastbound trams. It is most unlikely that these eastbound passengers would be directly affected by changes to the Batman Avenue tram terminus.

Policy Implications

- The Metropolitan Public Transport Industry Plan (METPLAN) was released in 1988. This plan has as a goal the provision of a viable alternative to travel by car. To this end the Met have set a patronage growth target of 20% over 15 years.

- The Central Area Transport Strategy (CATS) provides a vision for a revitalised Melbourne serving shopping, business, recreational and cultural activities. It is based on creating a people oriented city, with a cleaner environment through the increased use of public transport, high occupancy cars and bicycles.

- Also proposed is some immediate actions aimed at revitalising Central Melbourne and providing positive alternatives to car usage. These include tram (including Light Rail) service improvements, additional parking at suburban rail stations, transit lanes on main roads, and legislation regarding car pooling.

- The CATS strategy could be summarised as follows:

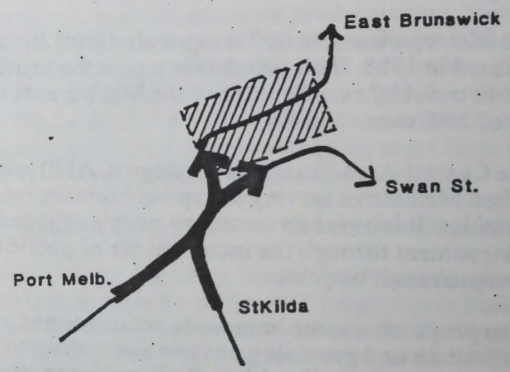
  - Pedestrian emphasis in the city heart;
  - Public transport to provide direct access to the Central Activities District (CAD);
  - Journeys to work to be directed towards public transport;
  - Road traffic to travel around rather than through the city;
  - Parking to favour retail and commercial activities;
  - Freight and commercial vehicles to be specially catered for;
  - The quality of streetscapes and the environment to be enhanced;
  - Bicycle paths to give direct access to the city through linked networks.

- The general nature of the CATS study would support projects to improve public transport — including the Southern Public Transport Link.

Disabled Passengers

- The link would help the disabled in as much as it will increase accessibility to the rail network and the promised low floor LRT vehicles are generally easier to broad than conventional trams. The Montague Special School, Yooralla and an artificial limb factory are located near the LRT route and would benefit significantly.

- If a direct link were made to Flinders Street Station, inbound vehicles from Port Melbourne and St. Kilda would be offered a choice of route at the proposed Clarendon Street roundabout. This would be a more flexible system but require some passengers to alaight and wait for a following LRT vehicle if the vehicle they were in was going in the 'wrong' direction.

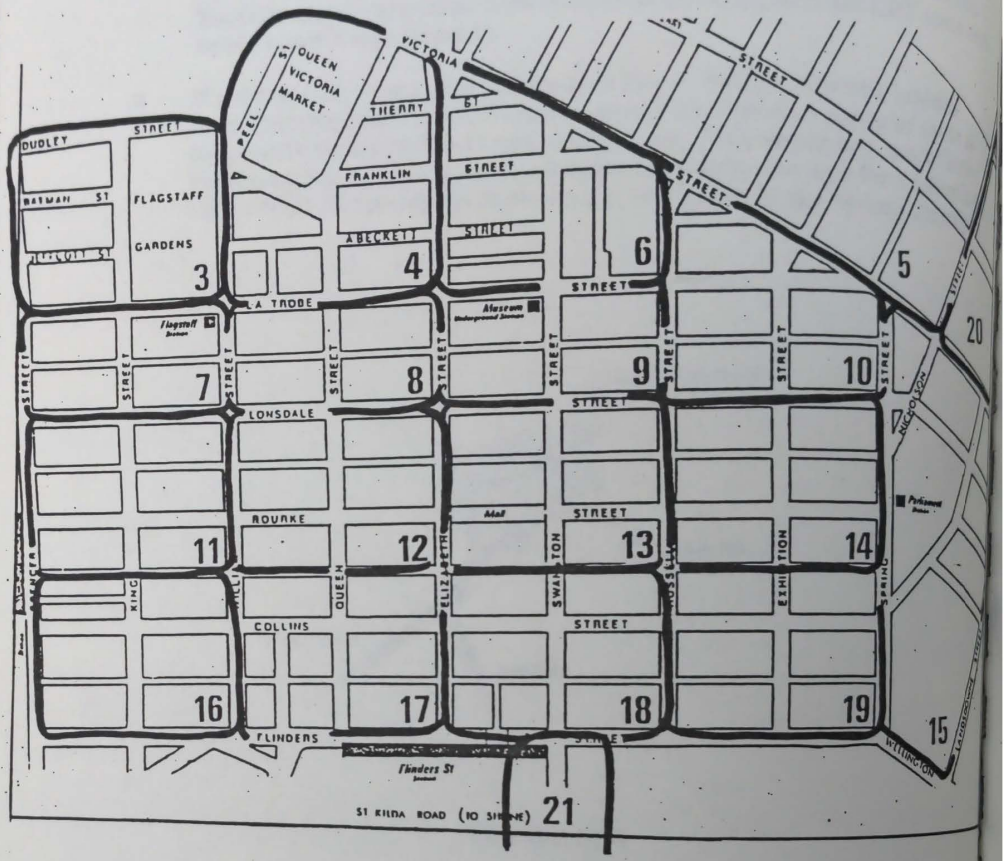


City End Fork

Effects on Batman Avenue Tram Passengers

- Some passengers would be affected with the relocation of the existing tram stop in Batman Avenue because they would disembark at Flinders Street Station or further east along Batman Avenue rather than at their present terminal near Swanston Street. However, if the proposed Princes Plaza extension to the River proceeds an opportunity for further enhancement exists.

- Using passenger counts from the PTC we have estimated that 3,000 to 4,000 passengers board or alight from trams at the Batman Avenue terminal each day.



This map refers to the destination zones in Table A.2, Appendix A.

C.A.D. DESTINATION ZONES

FIGURE

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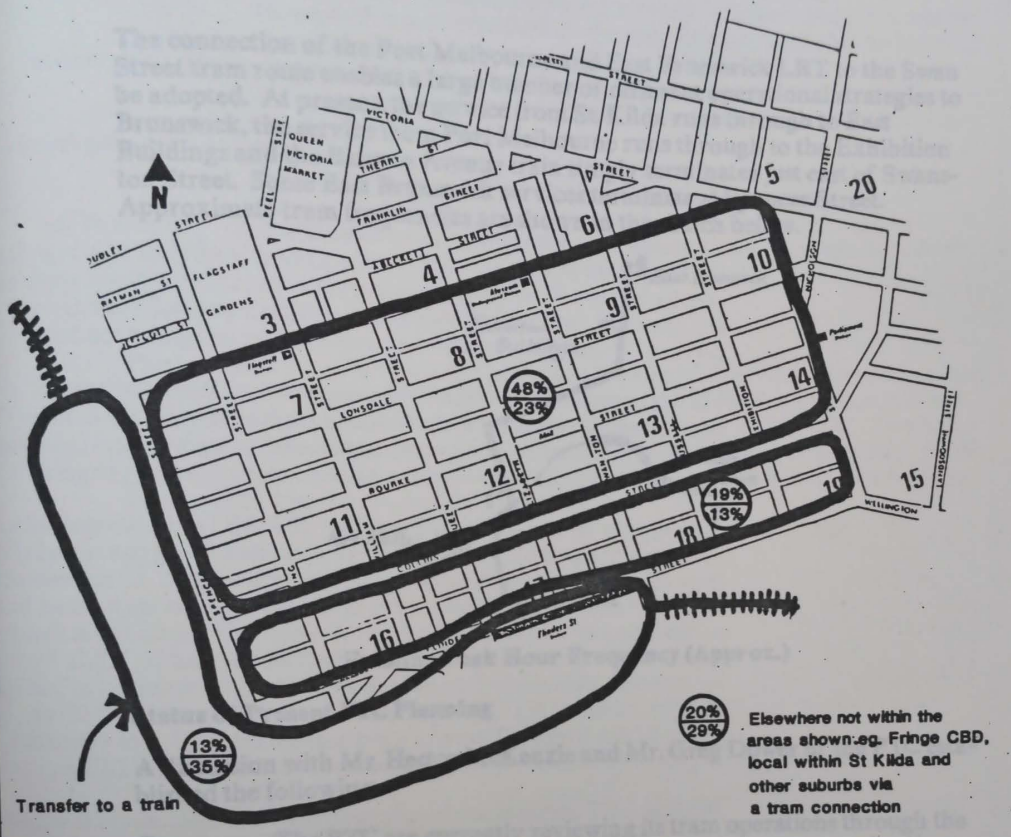

100%
100%

Passengers boarding at Middle Park LRT stop during morning peak 1991 (n=62)

St. Kilda and Pt. Melb train passengers 1985 (n=489 approx.)

DESTINATIONS OF RAIL PASSENGERS

FIGURE 4

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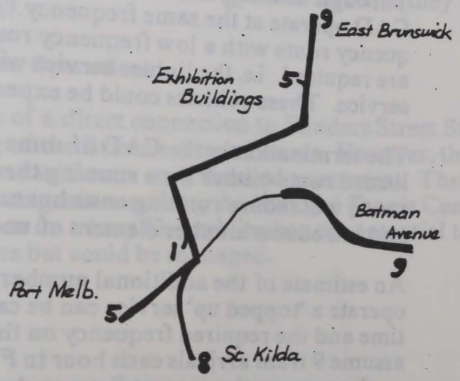
TRAM OPERATIONS

The connection of the Port Melbourne and East Brunswick LRT to the Swan Street tram route enables a large number of different operational strategies to be adopted. At present, the service from St. Kilda runs through to East Brunswick, the service from Port Melbourne runs through to the Exhibition Buildings and the Batman Avenue train simply terminates just east of Swanston Street. Some East Brunswick services terminate at Spencer Street. Approximate tram frequencies are shown in the sketch below.



Existing Peak Hour Frequency (Approx.)

Status of Present PTC Planning

A discussion with Mr. Hector McKenzie and Mr. Greg Dower of the PTC established the following:

(i) The PTC are currently reviewing its tram operations through the CAD with the objective of enabling more 'through running' i.e. a reduction in the number of services which actually terminate in the CAD. Through running is generally more operationally efficient.

(ii) To overcome some operational problems during the Australian Open it is considering the use of Light Rail Vehicles on the Batman Avenue shuttle service — extending to the Hawthorn Tram Depot.

(iii) The Brighton bus service (No. 601 and 602) has recently been diverted from Swanston Street to Queensbridge Street via Maffra Street.

Operation of a Direct Connection

A basic assumption in the scheme evaluated in this report is that existing services would be 'topped up' with **additional** services from Port Melbourne and St. Kilda running directly to Flinders Street Station.

There are a number of different ways in which a direct connection could be operated. Several are illustrated on Figure 5.

In evaluating the most appropriate one, or combination, the following factors should be considered.

(i) Through running is best when the services on each side of the CAD operate at the same frequency. The connection of a high frequency route with a low frequency route means that more vehicles are required. i.e. the lighter service will increase in frequency of service. These vehicles could be expected to be lightly loaded.

(ii) The termination in the CAD of some services from the heavily loaded route (rather than running through to the lightly loaded route) will reduce running costs but can cause operational problems and introduces another element of uncertainty for passengers.

(iii) An estimate of the additional number of LRT vehicles required to operate a 'topped up' service can be calculated using the round trip time and the required frequency on the new service. If we were to assume 9 tram arrivals each hour to Flinders Street on a direct link — the same as the present Batman Avenue service, and that these would be divided between the Port Melbourne and St. Kilda lines we estimate that about 7 more vehicles would be required to run the service. A new LRT vehicle costs around $1.9m (articulated) or about $1.4m (rigid). Therefore the capital cost of 7 new vehicles (rigid) to operate a topped up service would be around $10m.

(iv) Because LRT vehicles are larger than conventional trams fewer are required — except where the service frequency is set to a minimum acceptable standard.

(v) Provided that the PTC agrees to accommodate the current limited use of Platform 13 in another way, and provided that the Festival Market Project does not proceed (or its design is modified) then it is feasible to incorporate a twin track LRT easement through Flinders Street Station. However, as a fall-back position, a feasible single track solution has also been investigated.

The operation of a short length of single track could be controlled by automatic signalling and points machines similar to a heavy rail situation and there will be minimal impact on the timetable envisaged for this service.

(vi) A fork introduced to the city end of a service introduces a degree of uncertainty for passengers e.g. similar to the Loder & Bayly Connell Wagner

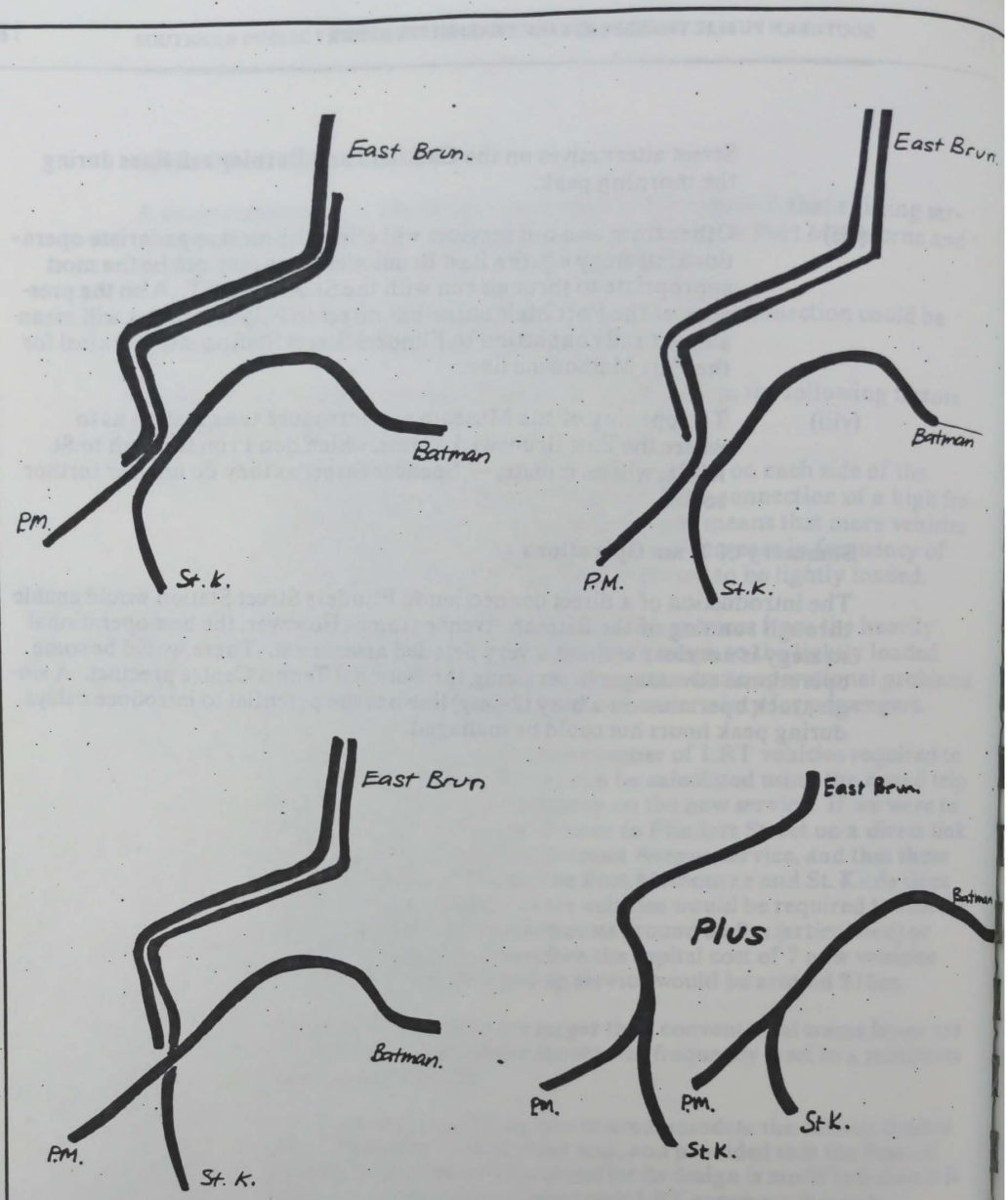
Street alternatives on the Caulfield and Burnley rail lines during the morning peak.

(vii) Other tram and bus services will effect the most appropriate operational strategy e.g. the East Brunswick lines may not be the most appropriate to through run with the St. Kilda LRT. Also the presence of the Port Melbourne bus direct to Flinders Street will mean a direct rail connection to Flinders Street Station is less critical for the Port Melbourne line.

(viii) The opening of the Museum will introduce the question as to where the East Brunswick trams, which don't run through to St. Kilda, will terminate, — Spencer Street as they do now, or further south?

Summary of Tram Operations

The introduction of a direct connection to Flinders Street Station would enable through running of the Batman Avenue trams. However, the best operational strategy is not clear without a very detailed assessment. There would be some operational advantages in servicing the National Tennis Centre precinct. A single track operation on a busy (2-way) line has the potential to introduce delays during peak hours but could be managed.



Note that other arrangements are possible, including through running with other lines.

ALTERNATIVE OPERATIONAL STRATEGIES

FIGURE

N

Southern Public Transport Link Feasibility Study

Loder & Bayly Connell Wag

ROAD TRAFFIC EFFECTS

The notes below outline the direct effect on road traffic operations. There will be some indirect effects due to passenger transfers and traffic diversions.

Clarendon Street Roundabout

A direct connection would introduce one more crossing of the circulating roadway, although the total number of trams passing through the roundabout would remain about the same.

This would have little effect on traffic capacity (i.e. peak period delay). It would merely delay a different stream of traffic. There may be a capacity problem if significantly more trams used the intersection such as may occur if trams east of Clarendon Street were to terminate just west of Clarendon Street.

Kingsway Low Level Bridges

The introduction of an at grade crossing just north of the proposed extension of Whiteman Street would reduce traffic capacity across the low level bridges. The degree to which this is significant depends the amount of time which traffic would be stopped. The table below gives indicative figures for different assumptions of LRT service frequency and the amount of time taken by each tram.

TABLE : RED SIGNAL TIME PER HOUR (SECONDS)

Trams per hour (2 way)	Red Time Per Tram 10s	15s	20s
10	100	150	200
18	180	270	360

The 'worst case' is if LRT vehicles were to run at the same frequency as on the Swan Street tram route (9 trams each way per hour) and each were to take 20 seconds away from road traffic. This represents 360 seconds per hour or 10% red time during the peak. More optimistic assumptions would give a figure of

3% of time during the peak lost to road traffic. In either case it is unlikely that this junction would represent a capacity constraint on the road network.

The most immediate operational effects are outlined below.

(i) A queue back will occur across Lower Kings Bridge (east) when a platoon of traffic reaches the crossing just after a tram switches the signal to red. This is unlikely to be a significant problem.

(ii) A queue back will occur of traffic turning left from Whiteman Street into the Kings Bridge low level Bridge (west). There is approximately 80m storage space to the Clarendon Street roundabout which is equivalent to a queue length of 13 cars. This is a potential problem as this queue may interfere with the operation of the roundabout however there are ways to minimise this effect.

(iii) A queue back will occur of traffic turning right from Whiteman Street to the Lower Kings Bridge (west). This movement presently has a 50m turning slot which is enough for about 8 cars. This is a potential problem but would probably not be significant.

Queensbridge Square

As discussed in later sections of this report there are a variety of ways in which a direct LRT link could be accommodated in this vicinity. They involve a trade-off between:

- capital cost,
- road height clearance,
- traffic capacity and
- LRT operations.

As a first cut we have adopted the view that an alternative design would have the same traffic performance as the alternative presently proposed. The trade-off was assumed to be be towards a higher capital cost rather than a reduction in traffic service.

Batman Avenue

The proposed closure of Swanston Street will reduce traffic volumes through the intersection of Batman Avenue and Swanston Street.

However an additional traffic signal control would be required at the point where the LRT track would join Batman Avenue a few hundred metres or so east of Swanston Street. This would have little effect on westbound traffic but would cause occasional small delays to east bound road traffic.

ROUTE DESCRIPTION INCLUDING COMMENTARY ON EXISTING FEATURES

(i) Batman Avenue to Flinders Street Station

There are two options for this section of the route:

(a) a rapid turn southwards from the east end of Flinders Street Station through the PTC car park adjacent to the Metrol building and on to Batman Avenue.

(b) a continuation eastwards from Flinders Street Station following PTC tracks past Metrol and the electrical workshops/crew change facilities and then turn south through car park facilities to join Batman Avenue. A sub-option is to continue further eastward in the PTC sidings, past the State Swimming Centre and then turn south to Batman Avenue.

Each of these options involves relocation of some PTC assets as well as negotiations with PTC unions regarding replacement of car parking spaces taken for the SPTL easement.

The first and preferred option involves replacement of 26 car parking spaces and relocation of a high voltage underground power cable and major signalling and communication cables.

The second option involves at least 30 car parking spaces plus expensive modifications of PTC heavy rail trackwork including points and crossings as well as overhead traction power equipment.

The junction of the SPTL with Batman Avenue will need careful design to manage the traffic and pedestrian interfaces. A pair of LRT tracks can be accommodated in this easement, but if constraints in the Station area so dictate, the SPTL will emerge from Flinders Street Station as a single track and then transition to two tracks in the Metrol Carpark before joining the Batman Avenue LRV route.

The crossing work to join to two tracks will be constructed in Batman Avenue in the straight road alignment adjacent the Metrol building Centre.

(ii) Flinders Street Station Precinct

The proposed route for the SPTL passes along the south side of the station adjacent Platform 11/13. This location clashes with both the proposed commercial development plans for the west end of the station (Platform 11) and with PTC plans to retain the Platform face 13 for terminating some trains, and handling defective and out of sequence trains in peak periods.

Development Plans

- There is a binding agreement between the PTC and Flinders Festival Market Place Pty Ltd based upon an agreed development concept for Flinders Street station and this also ties into the approved planning permit. Some physical works have been carried out, but the developer has been granted an "extension of time" until 31 July 1991 to modify his financing arrangements.

- It is understood that the Developer has asked for a further "extension of time" beyond 31 July 1991 and this may defer the current programme which anticipates that construction work will recommence in late 1991 and continue for three years to December 1994.

- The development concept has minimal effect on train operations at platform level. The activity centres are on two levels above platform level with access by lift, stairs and escalators at several locations from Flinders and Swanston streets. In addition, the upper floors extend southwards to the centreline of the existing track adjacent Platform 11 with four large feature towers on this building line for column support and to house toilets, shops, lifts and stairs.

- Between the towers, at platform level, it is proposed to locate an entertainment amphitheatre, the "Sports Bar" and a "Grand Stair" (including a water feature) which leads people from the river front into the Festival Market. This river front promenade and jetty area for ferries is fundamental to the development concept in providing another mode of travel to the market as well as an attractive recreation area.

- The PTC is unable to release a plan of the Developer's current proposal, but a copy of a poster (Figure 6) has been included at the rear of this report to illustrate the concept.

- The promenade width between the towers and the river front is about 10 metres and it is within this width that the light rail tracks could be located. It is evident that a double track or single track LRV route in this location will jeopardise the promenade concept as presently proposed and a major revision of the design of the river front access and recreation facilities would be necessary to suit the reduced width. It is outside the scope of this Report to judge the impact of such a revised concept on the operations of the Festival Market, but the Developer may be able to justify a loss of opportunity claim which would destroy the viability of the proposed light rail link.

PTC Plans

- At the east end of the station there is one existing track between Platform 13 and the south abutment of the St. Kilda Road (Swanston Street) bridge above. Two LRT tracks could be accommodated in this area if the PTC was to revise its train operations to obviate the need to terminate trains at Platform 13. In this situation, the width of Platform 12/13 would be reduced to serve only Platform 12, leaving space for two LRT tracks on the south side of the platform.

- Indications that the Platform 13 track is surplus to requirements have been checked:

  - The Festival Market Developer has negotiated an agreement to use this track for construction access but only in occupations (nights and weekends).

  - The PTC investigated a proposal in the early 1980s to extend the Batman Avenue tram route into Platform 13, based on the assumption that the Jolimont train maintenance deport and stabling were to be decentralised. As this programme has been deferred, the track to Platform 13 was not released.

The current requirements for the track into Platform 13 were clarified with the senior operations and marketing personnel at the PTC (R Razga, A Walker and W Uren). The log of train movements kept at Metrol by the PTC shows that, on average, 15 trains per day terminate at Platform 13. Three of these trains are timetabled to terminate at Platform 13; the balance is made up of trains moving in and out of workshops, trains which have been stabled incorrectly in the yards, or which have been transposed due to defective features, accidents, etc. If these train movements are to be accommodated somewhere else in the congested Flinders Street network, it is inevitable that "dead running" and delays to in-service trains will occur. It is also notable that the Platform 13 track is currently used with the Caulfield Group of lines which is experiencing growth (Dandenong/Pakenham corridor). It may be possible to ameliorate much of this disruption by timetabling more trains through the underground loop. Furthermore, it is doubtful that train depot servicing will be completely removed from the Jolimont yards in the foreseeable future. Further examination on revised operating procedures to remove the need for Platform 13 will be required.

- The PTC, on current operations practice, can quantify the costs of delays to in-service trains and the cost of "dead running" and thus substantiate the reasons for retaining the Platform 13 track. Those costs have to be balanced against any benefits of dual track LRV operation, this could be the subject of further negotiation and investigation.

- If it is not possible to negotiate the release of Platform face 13 with the PTC, then it is possible to include a single LRT track adjacent a relocated PTC heavy rail track. This would be accomplished by demolishing a portion of the width of Platform 12/13. The PTC has not agreed to this concept but by inspection the remaining, say, 50% width of the platform should be sufficient for the infrequent service envisaged for trains using platform faces 12 and 13.

  Similarly, it appears feasible to modify the existing stairway leading to the concourse from this platform and retain sufficient capacity. Main bridge beams will not have to be altered, but concourse supports will need adjustment, and an office/control room near the stairway must be demolished.

- Heritage controls on these alterations to Platform 13 have been investigated by reading the "Flinders Street Station" file held by the Historic Buildings Council. The file records the Council's view that the July 1988 Concept Statement prepared by the PTC in relation to "refurbishment of platform areas....." "..is considered reasonable". This statement allows for removal of platform canopies and recommends possible reuse of original trusses and columns. Accordingly, it appears feasible to modify Platform 13 as outlined above within the accepted guidelines.

(iii) Yarra Bridge

The bridge consists of hollow iron piers filled with concrete which support the steel plate girders and crossgirders. The piers are set parallel to river flow in groups of three. The five spans of the bridge, each of about 40 metres, are supported by riveted iron arches between the piers.

Superstructure

The existing bridge has been the subject of a number of investigations and reports within the PTC as to its structural adequacy. The most recent, in 1981 confirms that the main beams are basically sound, that crossbeams are in need of substantial repair and that the decking is unserviceable.

This assessment has been confirmed as far as is possible in a brief inspection conducted during this prefeasibility study, and certain other rectification works have been identified. In short, all metalwork must be protected from corrosion, the main bearings cleaned and restored, the upper flanges of cross beams replaced, and a new concrete deck constructed.

Substructure

There is no PTC file record of the condition of the iron caissons or concrete infill of the piers. However during this study, the iron was inspected by binoculars and it was apparent that above the waterline there was no significant rust pitting, and at the waterline there was a considerable amount of weed growth.

It is possible that the seaweed growth has inhibited the corrosion on the caissons, but this would require confirmation by underwater inspection.

The substantial width of the piers suggests that a significant factor of safety exists to cope with loss of section due to caisson corrosion. Should the project proceed further, an exploratory drillhole in one pier will confirm the apparent robust nature of the concrete infill.

The original design computations for the bridge are not available, but subsequent assessments by bridge engineers rated its capacity at E13 locomotive loading. This loading has been converted to current design parameters and is approximately equivalent to the loading requirements for the "Comeng" articulated tram (LRV concept). Observed heavy freight trains on the bridge in the past decade would have been subject to speed restrictions and special rolling stock configurations were adopted to minimise peak loadings.

Although a detailed inspection of the bridge sub-structure and superstructure has not been carried out, it is reasonable to conclude from the assessment outlined above that the bridge can accept an LRV service, provided restoration is carried out as described in this Report.

The bridge is classified by the National Trust and is on the Register of the National Estate; however neither of these classifications places any heritage control on the structure. The bridge was nominated for the Register of Historic Buildings, but has not been registered. The PTC has responsibility for the bridge as far as the south abutment and then responsibility passes to the Victorian Government Major Projects Unit. Should the SPTL not proceed it will be the responsibility of these two organisations to maintain or demolish the bridge and viaduct structures and to meet the attendant costs.

The bridge consists of twin structures each designed to carry two heavy rail tracks. It is envisaged that the SPTL will use one of the structures and the other can be:

- Restored for use as a pedestrian and cycle access, or for flea market activities or similar.
- Stripped of its deck and restored superficially to match the SPTL structure as a facade.

- Demolished completely.

The latter options are costly and serve no purpose other than aesthetics. The first option is constructive but is outside the scope of this Report.

It is understood that the Festival Market Developer intends to use the bridge for construction vehicle access. For this purpose, the Developer will upgrade the existing bridge deck to cope with desired vehicle loads. In this event there is scope for cost sharing so that the construction upgrade can be used as part of the permanent restoration work needed for the SPTL. The delay in the Festival Market project may jeopardise the availability of this access. However, parallel delays in implementing the south bank road works due to Government budget constraints may retain the relativity between the projects and keep the access option available.

(iv) Queensbridge Square

Existing Conditions

- In summary, the old Sandridge line bridge viaduct imposes a significant restriction upon road and tram traffic because of limited vertical and lateral clearance and tight turning radii. However, restrictions exist elsewhere in the region to a lesser extent with width restrictions at Queensbridge proper and vertical clearances at the Flinders Street overpass. Proposals for improvements to the road and tram general arrangement in the area cease at the south side of Queensbridge.

- In structural terms, whilst the main girders following preliminary assessment, are considered to be adequate, the cross beams and deck would require reconstruction to a degree before being subject to in-traffic loads (light-rail).

- The main girders of the Yarra River bridge are adjacent to the Maffra Street skew bridge deck. These two spans are approximately 18 metres each and are highly skewed at 60 degrees.

- The vertical road clearance of 3.6 metres is quite limiting. A vaulted masonry abutment lies between Maffra and Queensbridge Streets. Over Queensbridge is a three span bridge deck at a skew angle of 45 degrees and average span of 15 metres. The vertical road clearance varies between 3.7 and 3.9 metres. To the west of Queensbridge Street is a small masonry abutment followed by a four span square deck bridge, each of span approximately 13 metres and vertical road clearance of 3.8 metres.

- The issue of vertical road clearance must be seen in context of the regional road system. Aside from the old Sandridge line viaduct, the Flinders Street - Spencer Street viaduct imposes a height restriction of 3.8 to 4.2 metres. Any proposed works to the existing bridge structure should include a clearance adjustment to give at least 4.0 metres at all locations and possible 4.2 metres. Should a new bridge structure be considered in the event of the old bridge being demolished, then a clearance of 4.2 to 4.5 metres should be adopted depending upon the exact location.

Proposals to Accommodate SPTL

- For the purpose of this study, two light rail alignments have been considered, as follows:

  a) Retain existing spans and abutment as much as possible.
  b) Existing structure demolished to suit new road system.

- These options are considered as being two basic scenarios typical of a range of minor variants and should not be considered as fixed proposals.

- The first option considers an upgrading of the road system but within the confines of the existing spans and structures which are retained as much as possible. The light rail alignment utilises the northern pair of bridges so as to permit easing of road turning movements.

- That portion of the existing structure not utilised could be demolished. The existing spans would be structurally upgraded with new deck and repaired cross beams and the substructure would be adjusted so as to give a minimum clearance of 4.0 metres. (Refer to Figure 7.)

- The upgrading of the road system would allow southbound traffic and trams to utilise the three central spans. Northbound traffic would be carried on a new carriageway just to the west of the three central spans. The existing deck over Queensbridge and Maffra Streets would be upgraded, together with lifting of the abutment seats to increase clearance to 4.0 metres. To allow for the new northbound lanes, a new clear span bridge would be required, together with new abutments.

- The second option adopts the Victorian Government Major Projects Unit (VGMPU) proposals for road upgrade in the region as a base network. These proposals consist of a number of works packages which are at various stages of planning and/or development and comprise the following:

a) Museum Road, Stage 1 west of Clarendon Street
- Under construction

b) Museum Road (Whiteman Street) to the east of Clarendon Street including intersection with Queensbridge Street up to the south of the old railway viaduct.
- Tender documentation complete

c) Queensbridge Square, Queensbridge Street and Maffra Street intersection works, includes demolition of old railway structures.
- Preliminary investigation only

- o A new light rail alignment would pass just to the north of the Maffra Street intersection so as to minimise the length of bridge structure. (Refer Figure 8.)
- o The form of superstructure could be either standard precast concrete beam with in situ deck or open steel truss of older influence but with modern styling. The concrete option would possibly be cheaper than steel but suffers from increased structure depth and hence approach earthworks and aesthetically could be displeasing.
- o Having passed over Queensbridge Street, the track returns to the existing grade close to the proposed Museum Road-Queensbridge intersection.
- o A tram stop would be located close to this intersection to permit route and modal interchange. The exact location of the tram stop depends upon the route selected to cross over Queensbridge Street. For Option (a) retaining existing structures, the tram stop would be located on the western approach to the intersection, owing to the approach grades from the bridge structure. Because the approach grades for Option (b) start further to the north, the location of the tram stop is closer to the intersection.

(v) Queensbridge to Clarendon Street

Between Queensbridge and Kingsway the proposed light rail closely follows the proposed Museum Road for about 170 metres.

At Kingsway the alignment must take into account several factors which include the existing bridge pier locations, an MMBW drain and pumping station and the at-grade crossing of the Kingsway on and off ramps.

The net result is that the light rail alignment deviates to the north away from the Museum Road such that it passes close to the old railway alignment. A tram stop should be located at Kingsway.

From Kingsway to Clarendon Street, the alignment of this 90 metre section of track is predicated by the road alignment at both Kingsway and at the Clarendon Street roundabout intersection with Museum Road. Along this section the SPTL encroaches onto property recently cleared by the VGMPU for realization into residential and commercial properties. The sale of this land is imminent and prompt action will be needed if a route for the SPTL is to be reserved.

The light rail geometry at the proposed roundabout must accommodate three LRV lines entering and leaving the intersection. Some modification to the roundabout details would be required to give acceptable geometric standards but it is not appropriate to detail these at this stage.

OPTIONAL STRATEGIES TO EQUATE COST AND DEMAND

Given the significant cost impact associated with some of the works involved in creating an easement for the SPTL, particularly the interfacing with the Festival Market Development, it is prudent to examine options which reduce these costs for a reduced light rail service.

The options available are:

Through-Route Option

If the Festival Market Project does not proceed, it is possible to provide a single light rail track from Batman Avenue to Flinders Street Station east expanding to a double track and interchange platform at the western end of the station. The double tracks can then continue over a restored Yarra bridge and viaducts on the South Bank, and proceed in a redefined easement to the north of the new Museum Road and connect to the existing light rail alignment in the roundabout recently constructed at Clarendon Street.

Pending negotiations with the PTC regarding Platform 13 at Flinders Street Station, it is possible to provide a double track for the LRT throughout.

Flinders Street Terminus Option

If the Festival Market proceeds, then it is feasible to provide a light rail route from Clarendon Street to the Yarra bridge as described above but with a terminus at the west end of Flinders Street Station Platform 11 near the existing Elizabeth Street subway, and clear of the Festival Market buildings and ramps. A new platform/stop plus a ramp extension to the Elizabeth Street subway would be provided.

Option for Terminus in Existing Flinders Street Station

If the Festival Market does not proceed then a terminus for the light rail can be provided using the existing Platform 11 with minimal alteration to existing facilities.

Flinders Street Terminus Plus Batman Avenue Option

In the event that the Festival Market proceeds, it is possible to provide a light rail link from Clarendon Street to a terminus at the west end of Flinders Street Station as described above, and to complement this with an extension of the Batman Avenue tram route through Metrol carpark into the east end of Flinders Street railway station adjacent Platform 13. Any through-travel passengers will have to transfer, possibly utilising escalators, through the Festival Market or along Platform 10/12.

SCOPE OF WORKS AND COSTS TO CREATE THE SPTL EASEMENT

Scope of Works

The following schedule summarises the works required to create the SPTL easement:

Item	Description
1.	Revise Clarendon Street roundabout for LRV tracks.
2.	Prepare easement adjacent Museum Road including spanning of existing MMBW drain and provision of landscape buffer zone adjacent residential and commercial properties.
3.	Earthworks embankment leading to Queensbridge Square Viaduct.
4.	Restore existing Queensbridge Square Viaduct and modify some spans, if required to suit the M.P.U. road layout.
5.	Restore Yarra Bridge: . Demolition . Protective treatment of metalwork . Repairs to cross beams and bearings . New deck . Deal with unused half of bridge
6.	Credit for demolition and/or maintenance cost of bridges required if SPTL does not take over responsibility for the bridges.
7.	Demolition platform 13 and extension.
8.	Modifications of Platform 13, stairs, concourse, control room, PIDS, and communications facilities.
9.	Relocate PTC trackwork, overhead and signals to Platform 13.
10.	Relocate underground HV cables and signalling cables in Metrol car park and along embankment south of Platform 11.
11.	Demolition of Batman Avenue tram terminus and road restoration.
12.	LRV track and drainage Clarendon Street to Batman Avenue.
13.	LRV traction power system Clarendon Street to Batman Avenue.
14.	LRV Signalling Controls at Clarendon Street, Flinders Street Station and Batman Avenue.
15.	Tram stops, road restoration and landscaping. Note, a special stop is required at the west end of Platform 11 if the Festival Market proceeds and a SPTL terminus is provided. This includes ramp access to the Elizabeth Street subway.

Cost Estimate

Indicative costs at June 1991 prices for these works items have been estimated excluding the consequential costs associated with:

- o Land acquisition at South Bank
- o Redesign and loss of opportunity costs at Flinders Street Station
- o Road Upgrade at Queensbridge Square (MPU funded)

In the event that the viaduct bridge at Queensbridge Square is reconstructed to suit the Government's proposed road alignment in this area, an additional $1.5 Million would be added to the estimate for the Clarendon Street to Flinders Street station section of the route.

For the purposes of comparison the estimates have been grouped into the optional strategies outlined in the previous section of this Report.

Cost Comparison Summary

OPTIONAL STRATEGIES	WITH FESTIVAL MARKET		WITHOUT FESTIVAL MARKET	
		PLUS VIADUCT CHANGES	-	PLUS VIADUCT CHANGES
THROUGH-ROUTE BATMAN AVENUE TO CLARENDON STREET	-	-	$14M	$15.5M
FLINDERS STREET TERMINUS	$9M	$10.5M	-	-
FLINDERS STREET TERMINUS	-	-	$ 8M	$9.5M
FLINDERS STREET TERMINUS PLUS BATMAN AVENUE TRAM EXTENSION	$14M	$15.5M	-	-

MELBOURNE'S FESTIVAL MARKETPLACE

FLINDERS STREET STATION

EXISTING ALIGNMENT
PLATFORM 10/12
TO BE RETAINED

EXISTING ALIGNMENT
PLATFORM 11/13
(PLATFORM 11 TO BE REMOVED)

Ground Level

Upper Level

Merchandising Overview

Interior Finish Description

Merchandising Overview

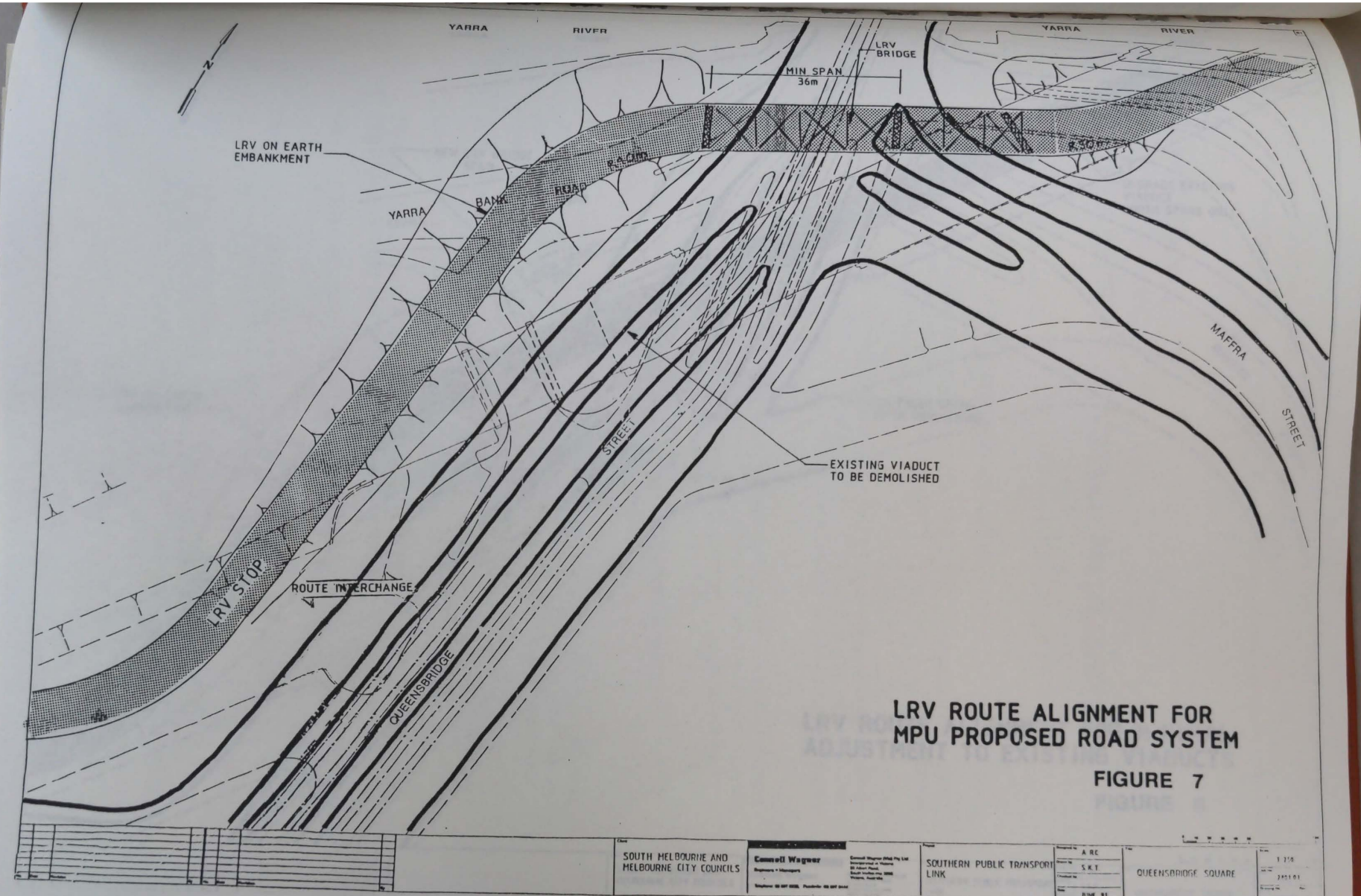
Whats in Store... The Ground Level

As Melbourne is the centre of Australian fashion, the arcades, courts and streets of the ground level of Flinders Street Station will offer the best in specialty and mainstream retail. From the serious to the casual; from the CBD commuter to the suburban visitor; from the local resident to the visitors from around Australia and around the world, each will find something for them at Flinders Street Station. In addition to this fashion focus, the unique and wonderful range of related goods and services will also be found. Along the way you will be able to stop and enjoy one of the numerous cafes and specialty food establishments spread throughout the Station. Last but not least, you will find the best in customer related goods and services available at 'Flinders to Go', which will make Flinders Street Station THE one-stop location for all your daily needs.

Whats in Store... The Upper Level

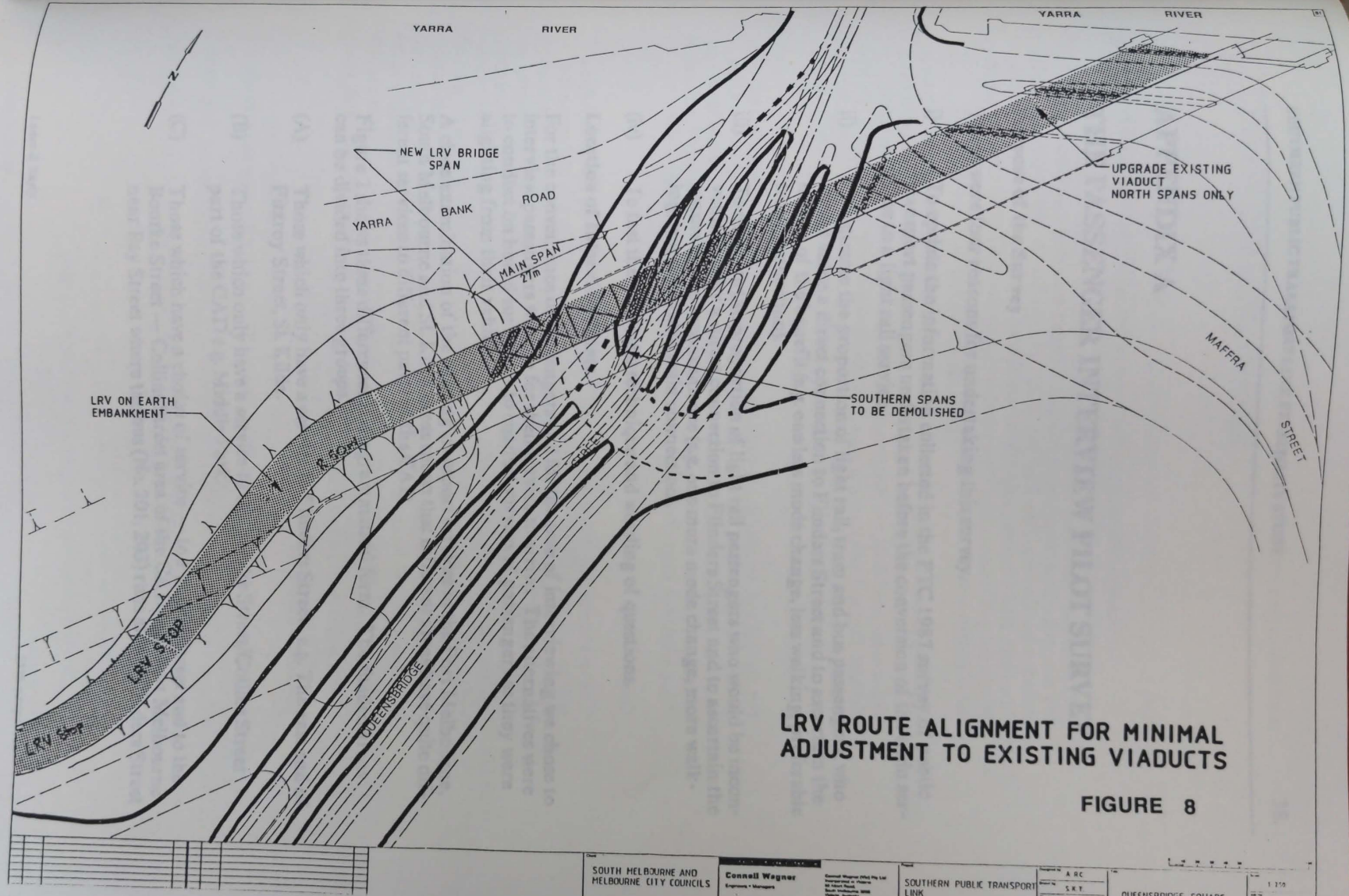
The great vaulted market halls of the upper level of Flinders Street Station will house a 'Festival' of food and goods with a even more fun and purposeful frivolity vista. The Grand Cafe, Bazaar Markets, Restaurants, Retail Shops and Riverfront Terraces will bring to Melbourne a world of goods, food and experiences all under one roof in an unparalleled environment. We see at this time developing an array of possibilities for one of a kind merchandising experiences for you to enjoy, with focus on everything from the inner arts and crafts of Australia to a children's extravaganza of goods, services and entertainment.

FIGURE 6
PROPOSED FESTIVAL MARKET
SCHEMATIC PLANS



LRV ROUTE ALIGNMENT FOR MPU PROPOSED ROAD SYSTEM

FIGURE 7


YARRA RIVER
YARRA RIVER
N
NEW LRV BRIDGE SPAN
YARRA BANK ROAD
MAIN SPAN 27m
UPGRADE EXISTING VIADUCT NORTH SPANS ONLY
LRV ON EARTH EMBANKMENT
SOUTHERN SPANS TO BE DEMOLISHED
MAFFRA STREET
GRADE
QUEENSBRIDGE
LRV STOP
LRV STOP
R 50m
LRV ROUTE ALIGNMENT FOR MINIMAL ADJUSTMENT TO EXISTING VIADUCTS
FIGURE 8
SOUTH MELBOURNE AND MELBOURNE CITY COUNCILS
Connell Wagner
SOUTHERN PUBLIC TRANSPORT LINK
A RC
S.R.T.
QUEENSBRIDGE SQUARE

APPENDIX A

THE PASSENGER INTERVIEW PILOT SURVEY

Purpose of the Survey

There were four reasons for undertaking this survey.

i) To update the information collected in the PTC 1987 survey of public transport passengers undertaken before the conversion of the train service to a light rail service.

ii) To estimate the proportion of light rail, tram and bus passengers, who would value a direct connection to Flinders Street and to ascertain the nature of the benefit (e.g. one less mode change, less walking, preferable train connection).

iii) To estimate the proportion of light rail passengers who would be inconvenienced by a direct connection to Flinders Street and to ascertain the nature of the inconvenience (e.g. one more mode change, more walking, less preferable train connection).

(iv) To test the interview technique and wording of questions.

Location of Interview Points

For the convenience of passengers and for the ease of interviewing we chose to interview passengers waiting for their service to arrive. The alternatives were to conduct on board surveys or to conduct surveys of passengers as they were alighting from their vehicle.

A close examination of the existing transport services in the Port Melbourne, South Melbourne and St. Kilda areas shows that different areas have quite different services to different parts of the CAD.

Figure 2 shows these differences in diagrammatical form. The shaded areas can be divided into three groups.

(A) Those which only have a service to Flinders Street. e.g. The east end of Fitzroy Street, St. Kilda.

(B) Those which only have a service to the Bourke Street/Collins Street part of the CAD e.g. Middle Park.

(C) Those which have a choice of service — to Flinders Street and to the Bourke Street — Collins Street area of the CAD. e.g. Port Melbourne near Bay Street where the bus (No. 201, 203) runs along Flinders Street

on its route through to Bulleen and the LRT runs along Bourke Street on its route to the Exhibition Buildings (No. 96).

We recognise that the existing 'Flinders Street services' category which includes the Garden City Bus (No. 201, 203), the South Melbourne tram (No. 1, 2), and St. Kilda beach trams (No. 10, 12), and the Fitzroy Street trams (No. 15, 16) do not provide exactly the same service to the CAD and they do not service the Flinders Street railway station **platforms** as a LRT service would.

If the LRT services from Port Melbourne and St. Kilda were to terminate at the Flinders Street railway station then the choices available to passengers from various parts of Port Melbourne, South Melbourne, and St. Kilda would change. Some areas would have a greater choice of services e.g. Middle Park residents would have both a Bourke Street destination and a Flinders Street destinations, while others would have less choice e.g. Bay Street Port Melbourne passengers would be captive to Flinders Street.

For the sake of simplicity, in undertaking the passenger survey, we have assumed that all the LRT services from Port Melbourne and from St. Kilda would terminate at Flinders Street. As discussed previously, the practicalities of tram operation may mean that not all services would necessary terminate at Flinders Street even if the physical connection were provided.

Time of Day

The uneven mix of employment and residential uses across the Study Area means that the time that passenger interviews take place will influence the results. As a general rule the residential areas produce outbound movements to employment destinations in the morning peak, with the reverse happening for employment areas. The Port Melbourne area has a net inflow of passengers during the morning peak — from residential areas throughout the metropolitan region. These passengers are therefore likely to involve a train for part of the journey and thus prefer a Flinders Street connection. On the other hand, trips from the residential areas during the morning peak could be expected to be more localised because of the large number of jobs nearby, especially in the City area. These outbound morning passengers from residential areas could be expected not to use a train later in their trip and thus would be less likely to prefer a direct connection to Flinders Street Station.

Induced Passengers

The provision of a new LRT service direct to Flinders Street station would:

i) attract some people from other public transport modes e.g. bus, tram;

ii) attract some people from cars or people who would not be making the trip at all;

PILOT QUESTIONNAIRE

Date ☐ Time ☐ Interview Location ☐ Serial No. ☐

Good Morning/Afternoon.

I am doing a travel survey for Melbourne and South Melbourne Councils. Would you mind answering a few simple questions for me?

Q1. Will you be using a train later on this trip? Yes ☐ (go to Q2) No ☐ (go to Q5)

Q2. Where will you get onto the train?

☐ Flinders Street Station (go to Q3 if waiting for vehicle not passing Flinders Street otherwise go to Q4)
☐ Spencer Street Station (go to Q4)
☐ Other _____

Q3. How will you get to Flinders Street Station from this tram?

☐ Walk
☐ Another tram
☐ Other _____

Q4. Where will you get off the train? _____ (station)

Q5. Could you show me on this map your destination on this trip?

☐ (Code number from map)

Q6. What is the purpose of your trip? ☐ work ☐ school ☐ other .....

Q7. (For passengers waiting for the LRT only)

For the trip you are undertaking now, would you have preferred this tram (LRT) to have terminated at Flinders Street Railway Station, or its present route, or it doesn't matter?

☐ Flinders Street Station
☐ Present Route
☐ Doesn't matter

Why? _____

END INTERVIEW. 'Thank you for your co-operation'

Q8. (For tram and bus users i.e. not LRT)

For the trip you are undertaking now, would you have used the tram running on the old train track (LRT) rather than this tram (or bus) if the tram running on the old railway (LRT) were to terminate at Flinders Street Railway Station.

☐ Would have used LRT
☐ Stayed with present mode
☐ Don't know

Why? _____

END INTERVIEW 'Thank you for your co-operation'

iii) divert some people from the LRT service to bus and tram because it no longer served their destinations; and

iv) divert some people from the LRT to cars or stop them making the trip at all.

The substitution of the train service with LRT showed that there was significant mode switching i.e. from the Fitzroy Street and Middle Park trams to LRT and from the Port Melbourne train to the Port Melbourne bus. In broad terms these changes were in the order of 10% to 15% of the total number of passengers carried by LRT. That is, about 85% to 90% of train passengers stuck with the LRT service and merely benefited, or were inconvenienced by the City end change.

Therefore, it is appropriate that the bulk of the survey effort should be concentrated on existing LRT passengers rather than casting a wider net in the hope of identifying people who may divert to a direct service to Flinders Street railway station.

The most likely group to be attracted to a new direct LRT connection to Flinders Street railway station are Garden City bus passengers who travel to the Port Melbourne and South Melbourne areas to work. Some of these people were interviewed in the pilot survey.

A total of 93 passengers were interviewed.

TABLE A1: INTERVIEWS OF INWARD BOUND PASSENGERS

The figures indicate the number of interviews completed in the pilot survey on Wednesday 26th June 1991.

Location	AM peak	PM peak
Middle Park Light Rail Stop	62	—
Montague Light Rail Stop	—	23
Bay Street Bus	—	8

The Interview Form

The wording of the interview form was satisfactory and was readily understood by interviewees. However minor changes to the wording of Question 8 were trialled successfully. The open ended second part of Questions 7 and Question 8 ought to be restricted to a 'tick-the-box' type format due to the limited number of answers given to this question in the pilot survey.

About 5% to 10% of passengers approached declined to be interviewed.

Each interview took about 60 seconds and almost every passenger who boarded the vehicle was interviewed during the time when the interviewers were present. At Montague, most of the time was spent waiting for passengers to interview.

General Comments

Many passengers at the Middle Park LRT stop complained about the irregular service and the recent cut back in service frequency. Several suggested that this was because the LRT service got caught up in the congested CAD streets (i.e. Bourke Street) and were forced to run late. They suggested a shuttle service from St. Kilda which would terminate at Spencer Street.

The interview was deliberately structured to obtained factual information about the trip and the subjective opinions about the option of terminating the LRT service at Flinders Street Station for the trip the passenger was undertaking. There were occasional inconsistencies between the two e.g. a passenger destined for Bourke Street (Q5) said that he would have preferred the LRT to terminate at Flinders Street Railway Station (Q7). Some of these passengers who gave seemingly inconsistent replies were carefully quizzed when these inconsistencies were pointed out. It was clear that they generally understood the questions. We have left their answers intact.

Many of the passengers interviewed at the Montague LRT stop were returning home from the Montague Special School.

Destinations of Trips

Table A2 shows the destinations of the passengers interviewed. As expected a large proportion of the Middle Park boarding passengers were destined for the CAD — generally to work. Many of their destinations were along the present LRT route.

As expected passengers boarding at the Montague LRT stop had a very wide range of destinations including Baccus Marsh, Craigieburn and Frankston. Almost all those bound from suburban destinations transferred to a train. The only exception was one passenger who took a tram to North Melbourne. Therefore we grouped the suburbs according to the train line which serviced it.

TABLE A2: DESTINATIONS OF PASSENGERS BOARDING INWARD BOUND PUBLIC TRANSPORT

Destination See Figure 3	Boarding Location		
	Middle Park LRT Stop	Montague LRT Stop	Bay Street Bus Montague
3	—	—	—
4	—	—	—
5	3	—	—
6	1	—	—
7	—	—	—
8	—	—	—
9	2	—	—
10	1	—	—
11	4	—	—
12	15	1	—
13	4	1	—
14	4	—	—
15	—	—	—
16	5	1	—
17	5	—	4
18	1	—	—
19	1	—	—
20	1	—	—
21 St. Kilda Rd	—	—	—
23 Southbank	1	—	—
24 P.M. and Sth Melb.	5	—	1
25 Bayside Suburbs.	—	—	—
26 S and SE Suburbs.	4	2	—
27 Eastern Suburbs.	3	1	1
28 Nth and West Suburbs.	1	17	2
29 World Trade Centre	1	—	—
TOTAL	62	23	8

Boarding Station for Passengers Transfering to the Train

Table A3 shows that the majority of Middle Park passengers did not intend to transfer to a train later in their trip. However the majority of passengers at Montague did.

TABLE A3: PROPORTION OF PASSENGERS INTENDING TO TRANSFER TO TRAIN

Transfer to Train?	Boarding Location at Interview		
	Middle Park LRT Stop	Montague LRT Stop	Bay Street Bus Montague
Yes	7	19	3
No	55	4	5
TOTAL	62	23	8

Table A4 shows the stations at which these waiting passengers intended to board trains. Spencer Street was the most common boarding point — especially for passengers interviewed at the Montague LRT stop.

TABLE A4: INTENDED BOARDING STATION FOR PASSENGERS TRANSFERING TO THE TRAIN

Intended Transfer Station	Boarding Location		
	Middle Park LRT Stop	Montague LRT Stop	Bay Street Bus Montague
Flinders St Station	3	1	3
Spencer St Station	4	18	—
Other	—	—	—
No reply	1	—	—
TOTAL	7	19	3

For passengers who intended to transfer at Flinders Street from a service which did not pass Flinders Street station, a further question was asked (Q3). Table A5 summarises the results. It is interesting to note that the LRT passenger who transferred to the Flinders Street railway station by tram intended to use the Swanston Street tram from Bourke Street instead of the Flinders Street services (No. 48 and No. 75) from Spencer Street.

TABLE A5: ACCESS MODE TO FLINDERS STREET STATION FROM SERVICES WHICH DID NOT CONNECT

Access Mode	Boarding Location	
	Middle Park LRT Stop	Montague LRT Stop
Walk	—	1
Another tram	1	—
Other	—	—
No reply	2	—
TOTAL	3	1

Preferred City Terminal of LRT Service

Table A6 shows that most LRT passengers interviewed prefer the present route of the LRT for the trip that they were making when interviewed.

TABLE A6: PREFERED CITY ROUTE FOR THE INTENDED TRIP

City End of LRT Route	Boarding Location	
	Middle Park LRT Stop	Montague LRT Stop
Flinders Street Station	9	2
Present Route	38	11
Doesn't Matter	15	10
TOTAL	62	23

Diversion of Bay Street Bus Passengers to LRT

Table A7 shows that most bus passengers interviewed (of the tiny sample) would have continued to use the bus even if the LRT terminated at Flinders Street. Part of the reason is that most of the eight passengers who arrived at this bus stop came from the residential area to the south which is on the opposite side of the bus route to the LRT route.

TABLE A7: POTENTIAL DIVERSION FROM THE BAY STREET BUS (NO. 201, 203)

Responses from passengers boarding City bound buses from the Montague Street bus stop during the afternoon.

Would have used LRT	1
Stayed with bus	6
Don't know	—
No answer	1
TOTAL	8

Significance of the Results from the Pilot Survey

Although the sample size of the Pilot survey was small, a number of tentative conclusions could be drawn.

(i) The passengers boarding the Port Melbourne LRT during the afternoon peak have quite different travel patterns than those boarding the LRT service at the Middle Park stop during the morning.

(ii) More passengers preferred the present LRT route than a terminal at Flinders Street Station. The high proportion of passengers who either preferred the present route or who would have been happy with either, is surprising given the information from the 1987 PTC surveys. There are a number of possible explanations for this. One partial explanation is that public transport passengers could well be inherently conservative and do not like change. The destinations of morning peak inbound passengers are cllearly concentrated along the Bourke Street route.

APPENDIX B

TRAM PASSENGER SURVEY OF A MAJOR EVENT AT THE 'GLASSHOUSE'

The purpose of this survey was to obtain information which would assist in assessing the value of a direct link from Batman Avenue to Flinders Street Railway Station.

Procedure

Constraints on time meant that there were no major events taking place at the National Tennis Centre in the 'Entertainment Precinct' during the time period of the study. However some major events took place at the Melbourne Sports and Entertainment Centre — The Glasshouse. The details of the event selected for survey are given below.

Event:	National Basketball Annual All Star Game South All Stars versus North All Stars
Location:	The Glasshouse
Date:	Saturday 13th July 1991
Schedule Finish Time:	10.30pm
Official Attendance:	6,712 (300 people turned away)
Weather:	Cool with drizzle

From 10.00pm on the night of the event a person continually patrolled the area between the Glasshouse and Flinders Street Railway Station and noted relevant behaviour. This continued until 11.40pm at which time all significant activity at the Glasshouse has ceased.

Results

- Continuous car parking extended approximately 600m towards the City from the Glasshouse and to Punt Road.
- A special tram (Vehicle No. 189) ran for the night — in addition to normal Saturday night services.
- Dozens of cars arrived around 10.20pm to pick up passengers.
- Swanston Street was closed just north of Flinders Street on the night of the survey.
- Tram passengers were predominantly in their mid to late teens.

- At the conclusion of the survey there were 9 people waiting for a inbound tram at the Glasshouse tram stop.
- Table B1 summarises the results of a survey of all pedestrians and tram passengers who arrived at Swanston Street from Batman Avenue. It has been assumed that all these people attended the basketball game. Our judgement is that this assumption is substantially correct.

The following conclusions can be drawn:

(i) Most people arriving at Swanston Street walked northwards.

(ii) Significant percentages of people walked to the southbound tram stop in Swanston Street or the Flinders Street Railway Station.

(iii) A total of 55 people from the event reached Flinders Street Railway Station via Batman Avenue. Of these, 44 arrived by tram.

(iv) On the night of the survey one could conclude that a direct tram link to Flinders Street Railway Station from Batman Avenue would be seen by more tram passengers as an inconvenience than who would see it as a benefit. This judgement depends on the value placed on being under cover, the inconvenience of changing levels, and the ultimate destination of each tram passenger.

TABLE B1: DESTINATIONS OF WESTBOUND PEDESTRIANS AND TRAM PASSENGERS

Time: 10.40pm to 11.40pm
Sample: All pedestrians arriving at Swanston Street from Batman Avenue

Destination	Arrive on Batman Ave Tram	Arrive on Foot	Total
Flinders Street Railway Station	44	11	55
Swanston Street (North) or St. Kilda Road (South)	109	54	163
TOTAL	153	65	218

14th July '91

BASKETBALL

Driving force: North's Mike Mitchell outpaces Mark Davis.

Southern All★Stars win by 14

By Michael Lovett

THE National Basketball League's entertainment showcase — the annual All★Star game — produced night of entertainment, high drama and a record crowd at the Glasshouse last night.

The crowd of 6712 saw the South All★Stars overcome the North All★Stars 168-154.

As the scores indicate, defence was almost a dirty word, with 96 points scored in the first quarter.

Only three players failed to reach double figures as the NBL's finest talent turned on a dazzling display.

The night was soured for North Melbourne's star import Scott Fisher who rolled an ankle in the second quarter and took no further part.

The injury is not serious and he is expected to play next next week. It capped a mixed night for Fisher, who earlier had won the three-point shoot-out.

More than 300 people were turned away. Those inside saw 13 dunks, highlighted by Mike Mitchell's one-handed slam in the fourth quarter to win him the dunk of the game.

The most valuable player award went to Adelaide power forward Mark Davis, who came into the game at the last minute to replace club team-mate Mark Bradtke for South.

South's victory levelled the series at two all.

The Victorians in the South team included a strangely subdued Andrew Gaze whose illness late in the week was reflected in his final tally of 14 points.

Mitchell was the game high scorer with 39 points for North, followed by Sydney's Dwayne McClain (23) and Newcastle veteran Al Green (18).

South 168 (Davis 31, Crawford 27, Grace 21, Reese 18, Bolden 15, Uthoff 15, Gaze 14, Parkinson 13, Heal 10). North 154: (Mitchell 39, McLain 23, Green 18, La Fleur 14, Keogh 14, Loggins 13, Withers 10, Moore 10).

On the attack: North's Andre La Fleur moves past Ricky Grace.

Pictures: IAN KENNS

Newspaper Report From The Sunday Age

TABLE 4.1 - BACKGROUND DETAILS OF SURVEYS

	Date	Official attdnce (1)	Survey Organ. (2)	No.of intrvws	Venue
VFL Sunday Football	2.8.81	64,149	ORSP	314	MCG
VFL Sunday Football	9.8.81	24,287	ORSP	374	MCG
Day/Night Cricket	17.2.85	83,000	TTM	235	MCG
VFL Qualifying Sunday Final	8.9.85	58,449	L & B	489	MCG
VFL Grand Final	28.9.85	100,042	L & B	1,432	MCG
Greyhound Meeting	19.10.84	2,900	KP&A	-	No.2 Oval
Greyhound Meeting	17.3.86	2,208	L & B	-	No.2 Oval
Soccer	4.11.84	900	KP&A	-	No.1 Oval
Julio Iglesias Concert	10.11.84	7,200	KP&A	-	MSEC
Charlie Pride Concert	24.3.86	6,400	L & B	201	MSEC

Notes: (1) Official attendance. This does not normally include officials, police, staff, caterers, TV crews etc.

(2) ORSP= Office of Research and Social Policy, Department of Community Welfare Services.

TTM = Transport and Traffic Management Pty. Ltd. for Ministry of Transport.

L&B = Loder & Bayly Pty. Ltd. for Yarra Park Study (MCC) or this study

KP&A= Keith Pearson & Associates for Tennis Centre EES.

Extract from 'Flinders Park/Yarra Park Development Plan' by Loder & Bayly and TTM Consulting May 1986

	Mode (1)						Car Occupancy		Cars Parked
	Train	Tram	Bus	Parked Car	Car drop off	Other	Ques(3)	Obs(4)	
VFL Sunday Football	-	-	-	59%		-	-	-	11,800(6)
VFL Sunday Football	-	-	-	59%		-	-	-	4,400(6)
Day/Night Cricket	24%	6%	7%	62%		-	3.0	2.6	15,800(6)
VFL Qlfying Sunday Final	26%	8%	2%	56%	5%	4%	3.0	2.7	12,100
VFL Grand Final	30%	12%	3%	36%	10%	9%	-	-	13,800
Greyhound Meeting	-	-	-	-	-	-	-	-	1,370(7)
Greyhound Meeting	-	-	-	-	-	-	-	1.7	1,127(7)
Soccer	-	-	-	-	-	-	-	-	300(7)
Julio Iglesias	-	-	-	-	-	-	-	-	2,080(7)
Charlie Pride Concert	2%	2%	5%	85%	3%	4%	2.9	2.6	1,870

Table Footnotes

(1) Access mode can be defined as the last vehicle used before walking to the event eg. a person driving to a suburban railway station would be categorised as 'train'. Also, the mode of leaving the event sometimes is different from the mode of arrival.

(2) The symbol "-" indicates that this data was either not collected or not reported.

(3) Questionnaire results

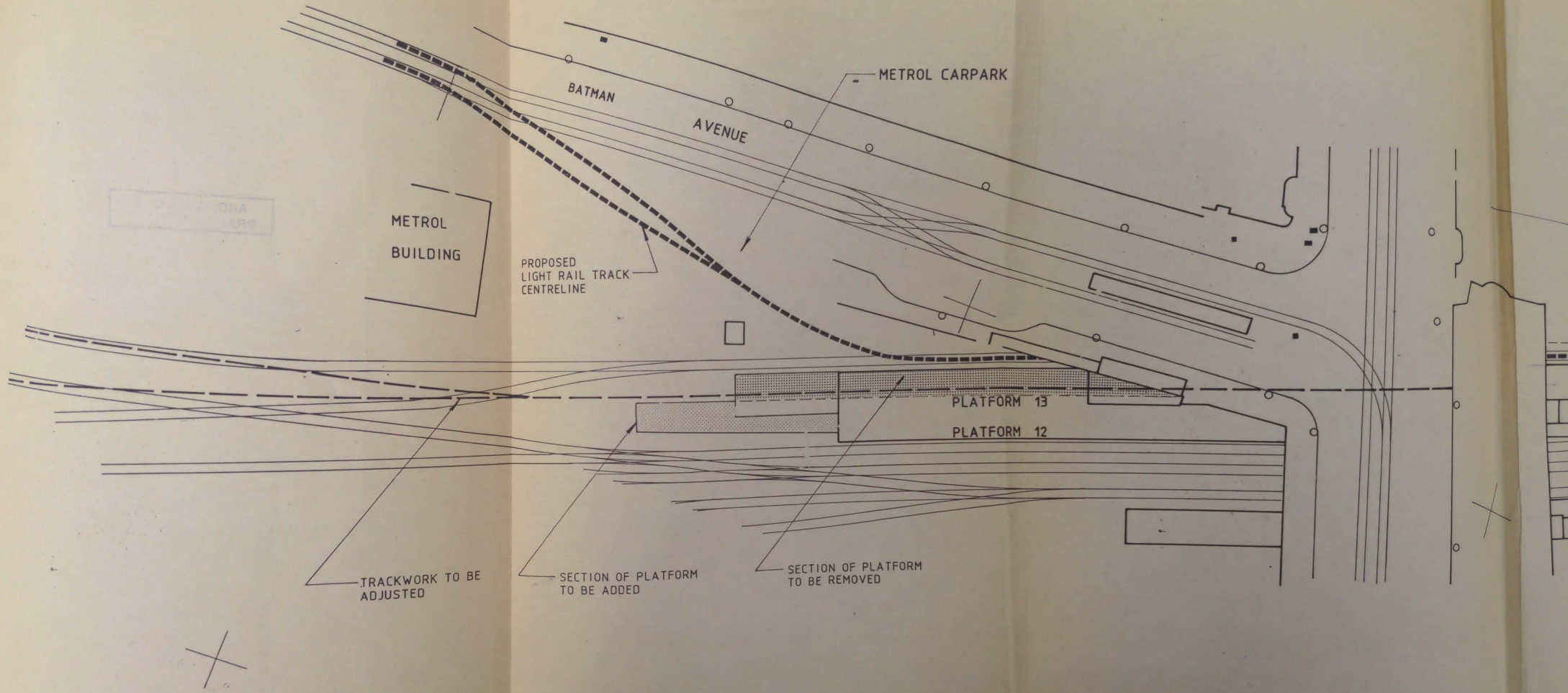
(4) direct observations of car occupancy. For events at the MCG these observations were of cars entering Yarra Park. For other events these observations were of cars entering the Olympic Park car parks.

(5) This is an estimate of the total number of cars parked in the vicinity due to people attending the event. It includes those in formal car parks eg. Yarra Park, and those in surrounding residential streets.

(6) These estimates were calculated by multiplying the official crowd size by the proportion who answered 'car' to the access mode question, minus 5% for chauffeuring, and dividing by 3 occupants per car. They may therefore be a little low because they omit the carparking of officials.

(7) These estimates were obtained by car counts in the immediate vicinity of the event. Their accuracy therefore depends on the degree which all the cars parked near the venue could be attributed to the event and the degree which cars parked at remote locations could be omitted.

Extract from 'Flinders Park/Yarra Park Development Plan' by Loder & Bayly and TTM Consulting May 1986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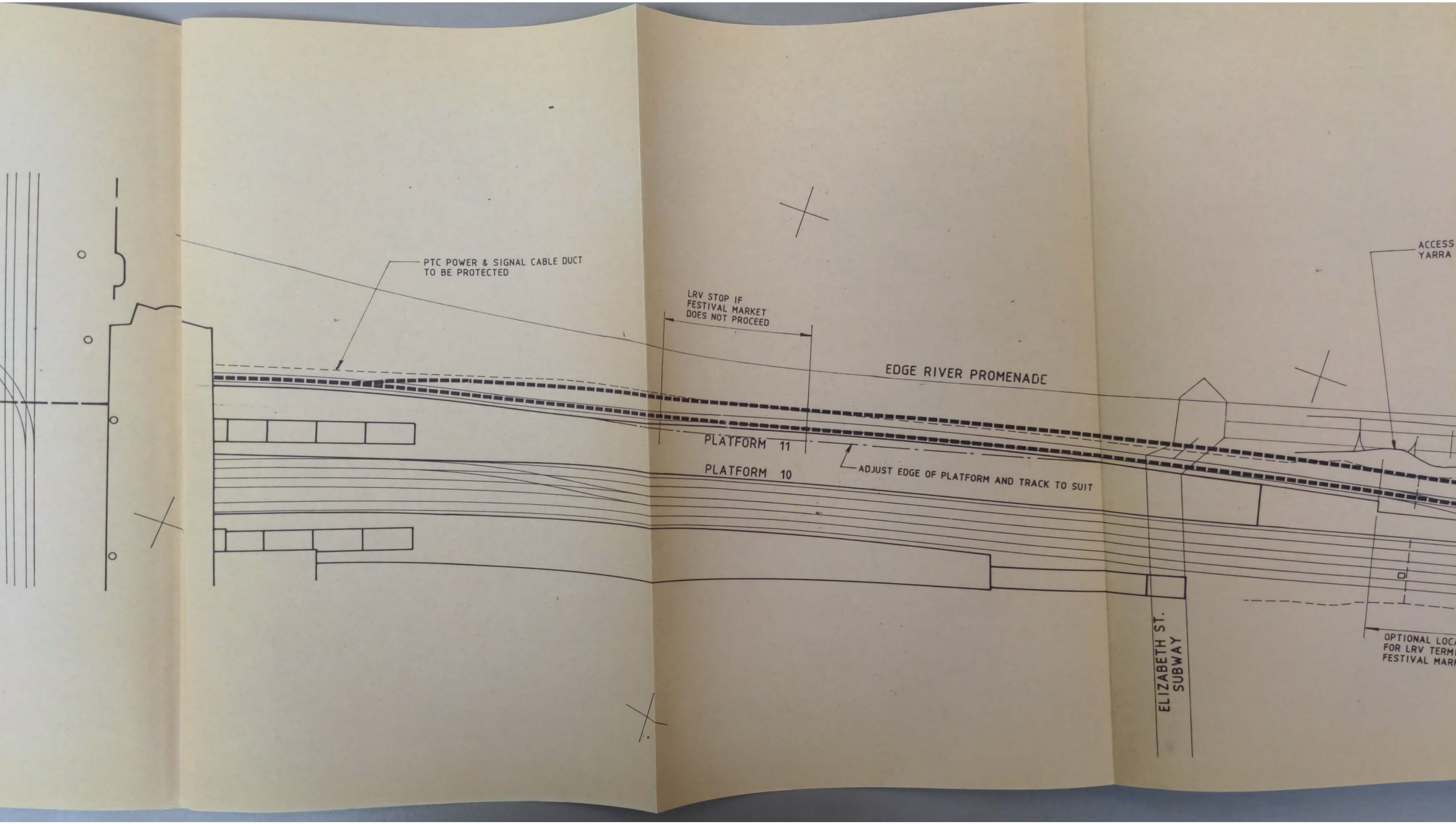
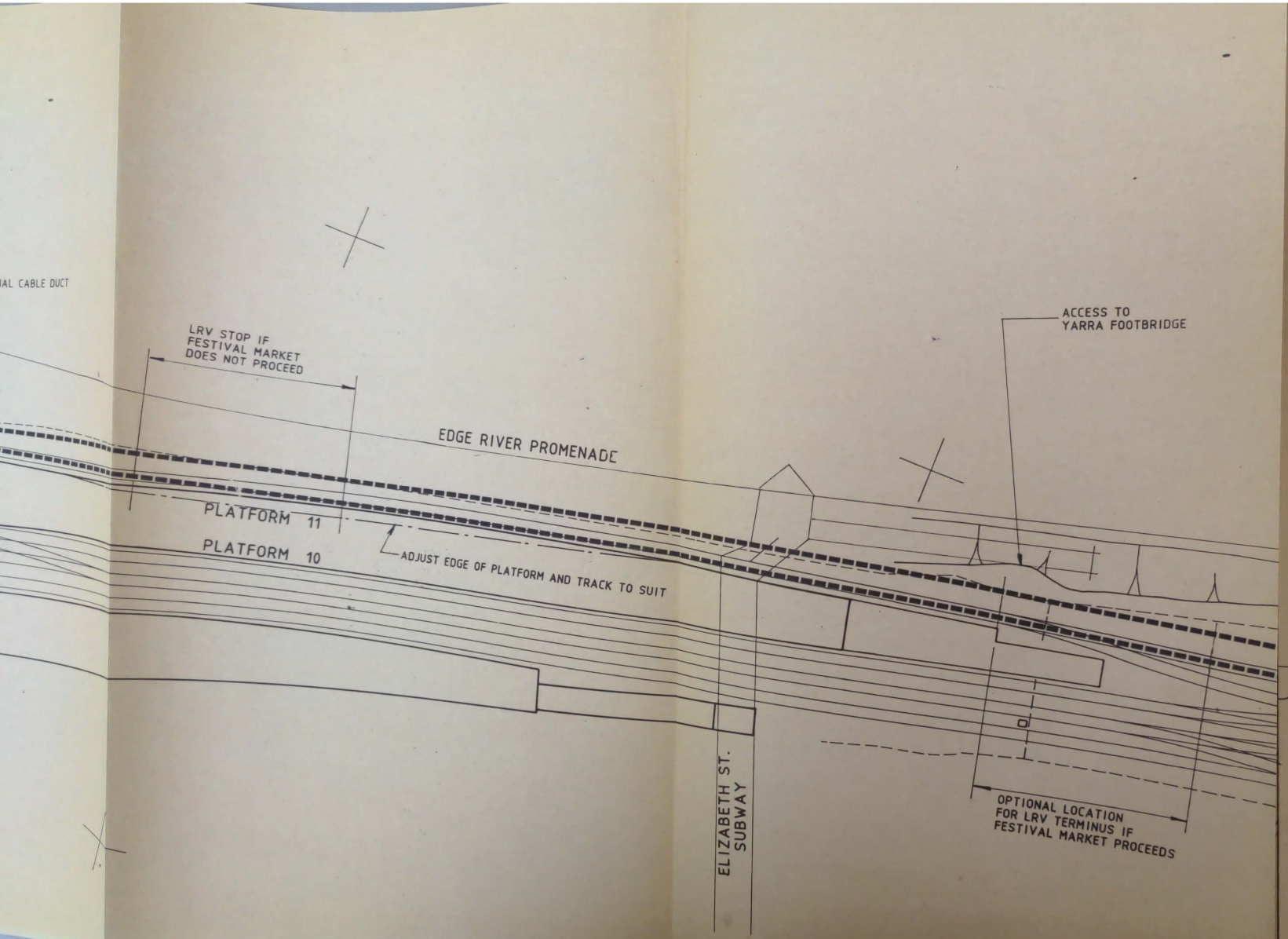
AVENUE
METROL CARPARK
METROL
BUILDING
PROPOSED
LIGHT RAIL TRACK
CENTRELINE
PLATFORM 13
PLATFORM 12
TRACKWORK TO BE
ADJUSTED
SECTION OF PLATFORM
TO BE ADDED
SECTION OF PLATFORM
TO BE REMOVED


PTC POWER & SIGNAL CABLE DUCT
TO BE PROTECTED
LRV STOP IF
FESTIVAL MARKET
DOES NOT PROCEED
EDGE RIVER PROMENADE
PLATFORM 11
PLATFORM 10
ADJUST EDGE OF PLATFORM AND TRACK TO SUIT
ELIZABETH ST.
SUBWAY
ACCESS
YARRA
OPTIONAL LOCA
FOR LRV TERMI
FESTIVAL MARK



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SOUTHERN PUBLIC TRANSPORT LINK
CONCEPTUAL ARRANGEMENTS AT
FLINDERS STREET STATION

SCALE 1 : 500 APPROX.