

Proposed

**HUNTINGDALE —
FERNTREE GULLY
LIGHT RAIL**

**Preliminary
Feasibility Study**

Melbourne & Metropolitan Tramways Board

PROPOSED
HUNTINGDALE-FERNTREE GULLY
LIGHT RAIL

PRELIMINARY FEASIBILITY STUDY

DECEMBER 1982

MELBOURNE AND METROPOLITAN TRAMWAYS BOARD

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1.

INTRODUCTION AND SUMMARY

This report is a preliminary study of the feasibility of introducing a light rail service in the corridor from Huntingdale Railway Station through the municipalities of Oakleigh, Waverley and Knox in Melbourne's south-eastern suburbs to Ferntree Gully Station. The route investigated is via North Road, Wellington Road, Jells Road, Ferntree Gully Road, Burwood Highway and Station Street. The evaluation considered two possible termini. Stage 1 would terminate at the Wheelers Hill Shopping Centre in Jells Road, a distance of 9 kilometres. Stage 2 would link the two rail stations, operating over a distance of 20 kilometres.

The report is a preliminary assessment of the system. The main conclusions are detailed below :-

- (i) Overall public transport service levels and journey times would be significantly improved by the introduction of a light rail service. The proposed route does not follow an existing public transport service, but the area is currently serviced by a number of private bus routes generally providing a low level of service.
- (ii) Construction of Stage 1 of the light rail route will cost approximately \$23 million with another \$25 million required for Stage 2 to Ferntree Gully.
- (iii) Stage 1 patronage is expected to be of the order of 10,100 passengers per day, with Stage 2 attracting a further 6,800 per day. Both estimates are projected to increase by 33% after 5 years operation.
- (iv) Initially 6 vehicles will be required to cater for the patronage (Stage 1), increasing to 7 when full patronage is attained.
- (v) Initial cost recovery for Stage 1, excluding capital servicing costs would be 207%. Including capital servicing costs the initial cost recovery of 38% would increase to 77% during the first five years of operation, and to 153% after 15 years.

- (vi) Social benefit-cost evaluation indicates that the Stage 1 light rail project has a benefit cost ratio of 1.32. The base case employed was current bus services along the route. This ratio indicates that the project is a worthwhile public investment, specially when other benefits such as reduced pollution and energy conservation which were not assigned a value in the evaluation are taken into consideration.

Given the preliminary nature of the evaluation, more detailed work is required to fully assess the proposal. Such work would concentrate on estimates of patronage and capital cost.

2. PUBLIC TRANSPORT PROPOSALS

A. LIGHT RAIL SERVICE

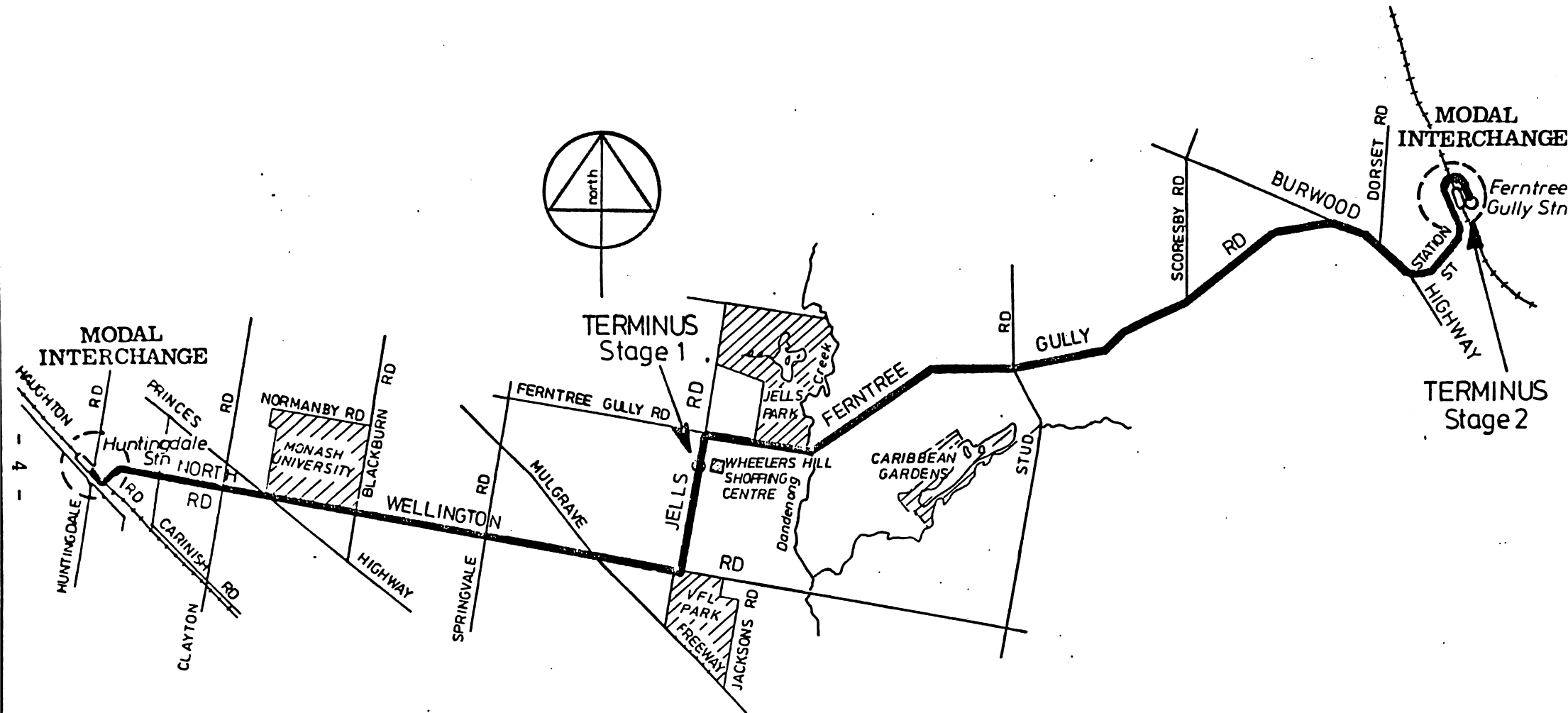
2.1 Routes

The proposed light rail service would operate in the corridor between Huntingdale and Ferntree Gully which is currently serviced by a network of bus routes operated by several private bus companies. These bus routes generally provide a relatively low level of service.

Two termini have been investigated for the light rail service, as indicated in Figure 2.1. The full Huntingdale-Ferntree Gully Service (Stage 2) would operate from Huntingdale Railway Station along North Road and Wellington Road to Jells Road, via Monash University and VFL Park, along Jells Road, Ferntree Gully Road, Burwood Highway and Station Street to Ferntree Gully Railway Station. Stage 1, a shorter service, initially following the same route, but terminating at Jells Road, Wheelers Hill, has also been considered.

<u>Section</u>	<u>Distance (Kilometres)</u>	
	Stage 1	Stage 2
Huntingdale Railway Station - Monash University	2.6	2.6
Monash University - VFL Park	4.8	4.8
VFL Park - Jells Road (Wheelers Hill Shopping Centre)	1.6	1.6
Jells Road (Wheelers Hill Shopping Centre) to Stud Road	-	4.0
Stud Road - Ferntree Gully Railway Station	=	<u>7.0</u>
	<u>9.0</u>	<u>20.0</u>

TABLE 2.1. PROPOSED LIGHT RAIL ROUTE
- STAGE 1 AND STAGE 2.



M.M.T.B.
 HUNTINGDALE - FERNTREE GULLY
 PROPOSED LIGHT RAIL CONNECTION

NOT TO SCALE

FIGURE 2.1

Both routes would provide a convenient, high capacity service to Monash University and the Victorian Football League Park. They would also provide a fixed rail public transport service to residential areas of the Cities of Waverley (Stages 1 and 2) and Knox (Stage 2 only), which are presently remote from the suburban rail network.

Modal interchange facilities would be constructed at Huntingdale Railway Station, Monash University and VFL Park under both proposals, and also at Ferntree Gully Railway Station for Stage 2. This would provide a convenient opportunity for travellers to transfer from trains and feeder buses to light rail. The existing car parking facilities at VFL Park could also be used by all-day commuters.

The services would operate predominately at relatively high speed along the central median of divided roads. All intersections will be at grade except for Princes Highway (both stages) and Burwood Highway (Stage 2) where structures for the light rail route would provide grade separation.

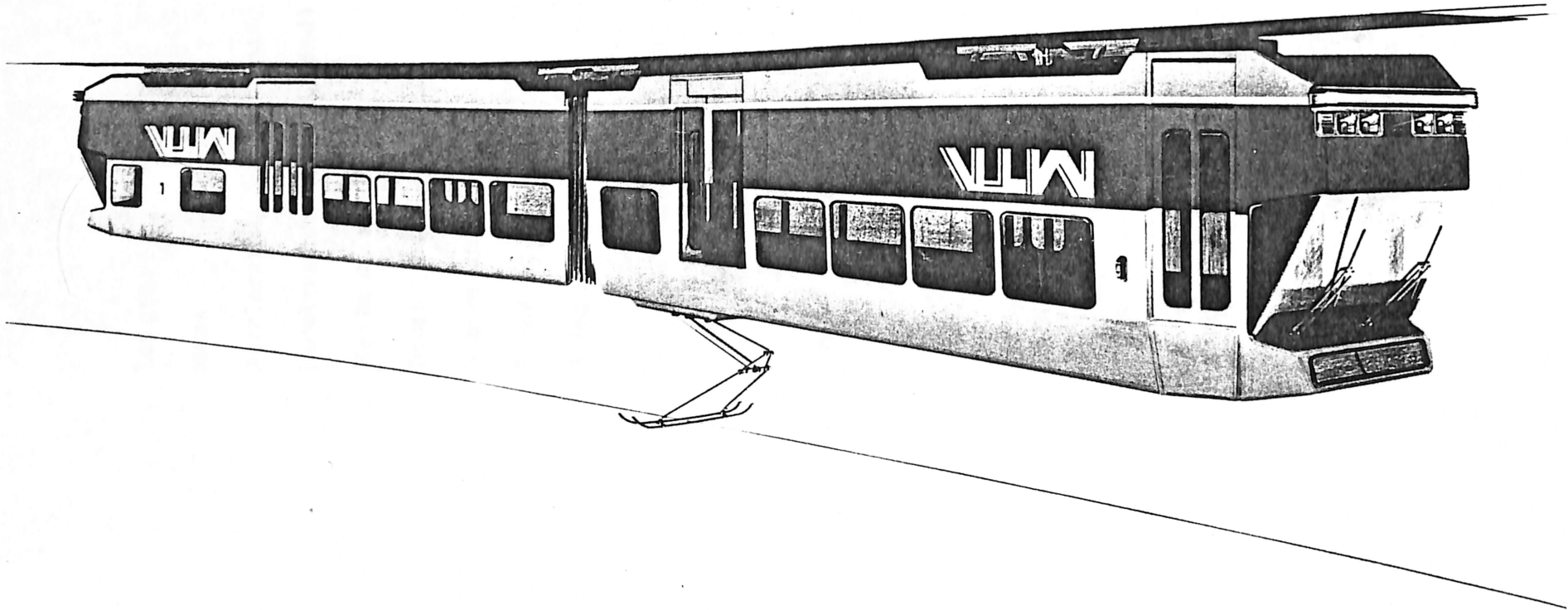
2.2

Vehicles

It is anticipated that the service would be operated by six axle, single articulated light rail vehicles. Figure 2.2 shows the type of vehicle that would be used.

Indicative data specifications for such light rail vehicles (LRV) are provided in table 2.2. Data for the new Z3 trams is included for purposes of comparison.

FIGURE 2.2: PROPOSED ARTICULATED LIGHT RAIL VEHICLE



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Z3 Light Rail
Vehicles

Length	16.6m	23.1m
Mass	22.6t	30.0t
Acceleration (seated load)	1.6m/sec/sec	1.3m/sec/sec
Deceleration (seated load)	1.6m/sec/sec	1.6m/sec/sec
Maximum speed	72 km/h	72 km/h
Doors	5+5	6+6
Seated capacity	42	75
Standing capacity (a)	68	95
Effective capacity (b)	75	125

(a) Assumes 5 standees/sq.m.

(b) Effective capacity is average maximum peak period load for assessing vehicle requirements.

TABLE 2.2. COMPARISON OF TRAMS AND ARTICULATED LRVs.

2.3

Ticketing

To maximise the potential financial and operating advantages of the route the LRVs would be driver only operated with minimum driver involvement with ticket issuing. The vehicles would be equipped with ticket cancelling machines.

Whether the service would require a special ticketing system depends upon developments of the total ticketing system for all public transport in Melbourne.

Provision has been made in the evaluation for the costs of operating a new ticketing system, including ticket machine technicians, a ticket inspecting force and off-vehicle conductors at heavy loading points.

Stops

Stop spacing is a critical aspect of the average operating speed achievable along the route. An average stop spacing of 300-400 metres is likely to be necessary to achieve an operating speed of 30 kph along the sections of the route fully separated from other road traffic. This spacing is greater than that currently provided on the tram network, although it is more frequent than the distance between rail stations (1-2 kms).

Although the vehicles will provide for boarding and alighting at ground level, high level platform loading will be provided wherever practical. Stops at the modal interchanges and at other heavily used stops would have shelter for passengers, timetables and be well lit. Traffic signals or pedestrian lights would be provided to allow passengers to cross motor traffic lanes.

Many of the stops may be on the departure side of signalised intersections to facilitate the provision of priority using advanced detection.

Traffic Signal Priority

For a large percentage of the route the vehicles will be operating on their own right-of-way. To achieve a high operating speed effective traffic signal priority will be necessary at the major intersections along the routes. It will be necessary to allow these signals to depart from any programmed linking strategies so that full pre-emption facilities can be incorporated. Given the proposed frequency of light rail vehicles these departures from the linking strategies will not significantly delay motor traffic.

Permanent Way

Along the sections of the routes with wide road reservations the light rail right-of-way would be constructed in the central median. On roads with narrower reservations the light rail track would be constructed along the centre of the road. Concrete-to-surface double track construction would be used for all track work.

Two structures will be required to provide grade separation at Princes and Burwood Highways. Grade separation would also be provided at Huntingdale and Ferntree Gully Rail Stations.

2.7

Electrical Work

The routes would be independent of the existing VicRail and MMTB power grids. Three new substations would be required to service the Stage 1 route and an additional 3 substations would be required if the route were extended to Ferntree Gully Station. Power supply to the LRVs would be at 600 DC. Power collection would be via pantographs, similar to existing suburban rail vehicles.

2.8

Depot

The light rail service would be operated from a new depot. Facilities for general maintenance will be required at the depot. For major overhaul, vehicles would be road-freighted to Preston Tramway Workshops. The most suitable location for the depot would be at the north-east corner of the Jells Road/Wellington Road intersection, on existing vacant land.

Storage facilities could also be provided at the depot for a number of W class trams which could be used to supplement services to V.F.L. Park when required.

B. OTHER PUBLIC TRANSPORT OPTIONS

Other proposals which were considered include :

- (a) Provision of a high standard bus route from Huntingdale Station to Ferntree Gully Station. The bus operation proposed would follow essentially the same route as the one proposed for light rail operation. Priority would be provided at signalised intersections enabling a schedule speed of 25 kph to be achieved during peaks. Integrated modal interchange facilities at both railway stations would be provided.
- (b) Provision of a frequent bus service along Burwood Highway from Ferntree Gully to the East Burwood tram terminus. This service would essentially serve a different market and was considered as a general improvement to public transport in the area rather than as an alternative proposal.
- (c) Provision of a conventional heavy rail system to link Huntingdale Station to Ferntree Gully. The route would operate through the developed area along Wellington Road between Huntingdale Station and Jells Road and then continue across presently undeveloped land to Ferntree Gully. It would be possible to construct tracks in the existing road reservation of North Road and Wellington Road, although some road re-alignment will be necessary to retain existing road space. To provide for appropriate grade separation at intersections the heavy rail route would be predominantly in cut or on structures. The construction of these structures will lead to a high capital cost for this option. Total community benefits would be reduced because of the severance and environmental problems associated with a heavy rail line. Rail stations at 1 to 2 km intervals would lead to longer access times than for the light rail service.

3. PATRONAGE

3.1 Population Characteristics

Public transport patronage along the proposed routes is dependent on both residential patronage, travelling to locations within and outside the study areas, and external patronage generated by trip attractors within the study areas. The proposed Huntingdale-Ferntree Gully light rail link (Stage 2) passes through low density suburban areas in the municipalities of Oakleigh, Waverley and Knox, while Stage 1 would be constructed within Oakleigh and Waverley. Household population and residential density statistics for the study areas are presented in Tables 3.1 and 3.2.

Local Government Area	Within 800m of proposed route		Residents per Kilometre of Extension
	Number of Households	Number of Residents	
Oakleigh	4,200	14,090	3,523
Waverley	3,930	14,490	2,898
Knox	-	-	-
TOTAL	8,130	28,580	3,175

TABLE 3.1. HOUSEHOLDS/RESIDENTIAL POPULATION.
Stage 1 : Huntingdale Station to Wheelers Hill Shopping Centre (Jells Road).

Local Government Area	Within 800m of proposed route		Residents per Kilometre of Extension
	Number of Households	Number of Residents	
Oakleigh	4,200	14,090	3,523
Waverley	4,180	15,460	2,342
Knox	6,590	21,410	2,278
TOTAL	14,970	50,960	2,548

TABLE 3.2. HOUSEHOLDS/RESIDENTIAL POPULATION.
Stage 2 : Huntingdale Station - Ferntree Gully. Station.

(Source : 1981 - Census - Australian Bureau of Statistics).

The residential densities are generally lighter than those usually found along the outer portions of the existing tram network, although the estimates for the Oakleigh section are more consistent with these corresponding tram catchment densities. Stage 1 offers a 25% higher residential density per kilometre of route than does Stage 2.

Car access is generally higher than average for the Melbourne Statistical Division (M.S.D). The study area municipalities (Stage 2) have an average of 1.55 cars per household, although Oakleigh individually has only 1.31 cars per household. The corresponding indicator for the M.S.D. is 1.37 cars per household. Households without cars comprise only 5.1% of Waverley and 6.5% of Knox households, compared to 15.6% for the M.S.D. Oakleigh's zero-car household percentage (15.2%) accords fairly closely with the Melbourne average.

For the journey to work public transport usage in Waverley and Knox is below average for the M.S.D. but train usage in isolation exceeds the Melbourne average of 10.1%. This reflects both the importance of the train mode for CBD-oriented trips from these suburbs and the lack of an effective bus network in the area. Oakleigh's journey to work mode split corresponds reasonably well to the Melbourne average.

3.2

Trip Attractors

This section analyses trip attractors in terms of major attractors, work trips, school/education trips, shopping trips and other trips.

(i) Major Trip Attractors

For both stages the catchment area has two major trip attractors, Monash University and V.F.L. Park. Monash is Victoria's second largest university with a 1982 enrolment of 14,221 students, of whom 69% are full-time. In addition almost 3,000 staff are employed on campus and nearly 1,000 students live in halls of residence.

V.F.L. Park attracts an average Saturday crowd of 20-30,000, rising to as much as 80,000 for important games or final series matches. The VFL has plans to increase the capacity of the ground which is also used for mid-week night fixtures to 104,000. On a busy

day, public transport could achieve a 30% mode share and special service provision would be required commensurate with expected demand.

(ii) Employment Trip Attractors

The route would service a number of light industrial and distribution centres, notably the Safeway Stores complex (both stages) adjacent to V.F.L. Park. It would also act as a distributor for rail-based C.B.D. and inner-suburban work trips. Data from the Ministry of Transport's 1978 Home Interview Survey indicate a high level of public transport (train) usage for C.B.D./St.Kilda Road work trips from these areas, averaging 44%. However 1981 census data indicates that for Waverley, Oakleigh and Knox more work trips are made to destinations within the L.G.A. of origin than to any other L.G.A.

(iii) School/Education Trips

Monash University has already been discussed in (i) above. There are three private secondary schools and two state high schools within the full route catchment area (Stage 2), as itemized below*, as well as a number of primary schools. It is expected that the private secondary schools will be responsible for the bulk of scholar patronage.

* Secondary Schools within 800m of proposed route. All schools would be covered under the full route proposal (Stage 2). However the two Ferntree Gully Schools would not be served under the Stage 1 proposal.

(a) Private

- . Caulfield Grammar School (Glen Waverley).
- . Corpus Christi R.C. College (Clayton).
- . St.Joseph's R.C. College (Ferntree Gully).

(b) State

- . Wheeler's Hill High School.
- . Ferntree Gully High School.

(iv) Shopping and Other Trips

The full route provides access to five reasonably sized local shopping centres :- Huntingdale and Wheeler's Hill Shopping Centres would be served by either proposal but the Scoresby Village, Mountain Gate and Fern-tree Gully centres would only be served by the Stage 2 proposal. Further, the routes provide convenient public transport access to city and inner suburban shopping centres for local residents. A number of parks and recreation areas line the proposed route.

3.3

Patronage Estimation

Utilizing journey to work information from the 1981 census and making assumptions regarding public transport usage by various worker groups, it is estimated that Stage 1 will cater for 3,700 work trips per day in its first full year of operation. Similarly, Stage 2 is expected to attract 6,500 work trips.

On the basis of public transport usage to other tertiary educational institutions in Melbourne, it is estimated that Monash University will attract 3,000 trips per day for the Stage 2 route less 5% for Stage 1. Other educational institutions along the route are expected to attract daily patronage of 2,000 in Stage 2, less 60% for Stage 1. Personal, shopping and other trips are estimated, on the basis of M.M.T.B. general trip purpose data, at 5,400 per day for Stage 2, less 50% for Stage 1.

When the service is fully operational it is expected that demographic factors (population, age structure) and increases in real motoring costs will cause patronage increases of approximately 2% per annum over 15 years. The attractiveness of the new service is expected to generate a further 4.5% p.a. patronage increase over the first five years.

In summary, as shown in Tables 3.3 and 3.4, estimated daily patronage in the first year of operation is 10,100 for the Stage 1 route and 16,900 for Stage 2. In both cases, patronage is expected to increase by 50% over 15 years.

Trip Purpose	First Year	After 5 Years	After 15 Years
Work	3,700	4,900	5,600
School/Education	3,700	4,900	5,600
Other	2,700	3,600	4,100
TOTAL	10,100	13,400	15,300

TABLE 3.3. ESTIMATED DAILY TRIPS - STAGE 1.

Trip Purpose	First Year	After 5 Years	After 15 Years
Work	6,500	8,600	9,800
School/Education	5,000	6,600	7,500
Other	5,400	7,200	8,100
TOTAL	16,900	22,400	25,400

TABLE 3.4. ESTIMATED DAILY TRIPS - STAGE 2.

It should be noted that the first year patronage estimates for the corresponding mode in the 1969 Melbourne Transport Study were 17,100 (Stage 1) and 19,100 (Stage 2). After 5 years, Stage 1 patronage was forecast at 23,700 per day, with Stage 2 patronage at 28,200. While these estimates are significantly greater than the estimates calculated in this report, they were based on Metropolitan Transportation Committee (M.T.C.) projections which tended to provide an over-optimistic forecast of population and transport demand.

EXISTING PUBLIC TRANSPORT SERVICES

The proposed route will link the Dandenong rail line at Huntingdale with the Belgrave rail line at Ferntree Gully. The Glen Waverley rail line lies three kilometres to the north and parallels the first four kilometres of the proposed route.

A number of bus routes, operated by private bus companies, currently provide services along substantial parts of the proposed route (see Figure 4.1). A brief description of their operations follows. A summary of service levels of these and other bus routes operating along the proposed route is shown in Table 4.1.

Croydon Bus Service operates a service (Route 693) between Chadstone and Belgrave via Ferntree Gully. The proposed light rail route would duplicate this bus route for a distance of 11 kilometres, essentially along Ferntree Gully Road. Duplication would also occur over a distance of 5.6 kilometres along Ferntree Gully Road with Bus Route 753 operated by Ventura Motors between Glen Waverley and Boronia.

Both these services operate essentially a 20 to 30 minute headway during peak periods reducing to 60 minutes off-peak and on Saturdays. No services are provided on Sundays or Public Holidays.

The proposed route would also duplicate the services of Bus Routes 802 and 804 along Wellington Road for a distance of 6.3 kilometres. This service is operated by Grenda Nominees between Chadstone and Dandenong. A 20 minute service is provided during peak hours with 30 minute headways operating during off-peak periods and Saturdays.

W. Sinclair & Sons operate a bus service for 2.6 kms along the proposed route. This service operates between Elwood and Monash University. This is the most frequent of the affected routes with a level of service during peak periods of 12 minutes, off-peak periods 20 minutes, Saturdays 24 minutes and Sundays 35 to 60 minutes.

Another six bus routes currently operate along sections of the proposed route for distances varying from 1.3 kilometres to 2.5 kilometres. One is operated by Grenda Nominees and the other five by Ventura Motors. Services on these routes vary from 6 trips per day to headways of 20 minutes during peak periods and 30 minutes off-peak and on Saturdays.

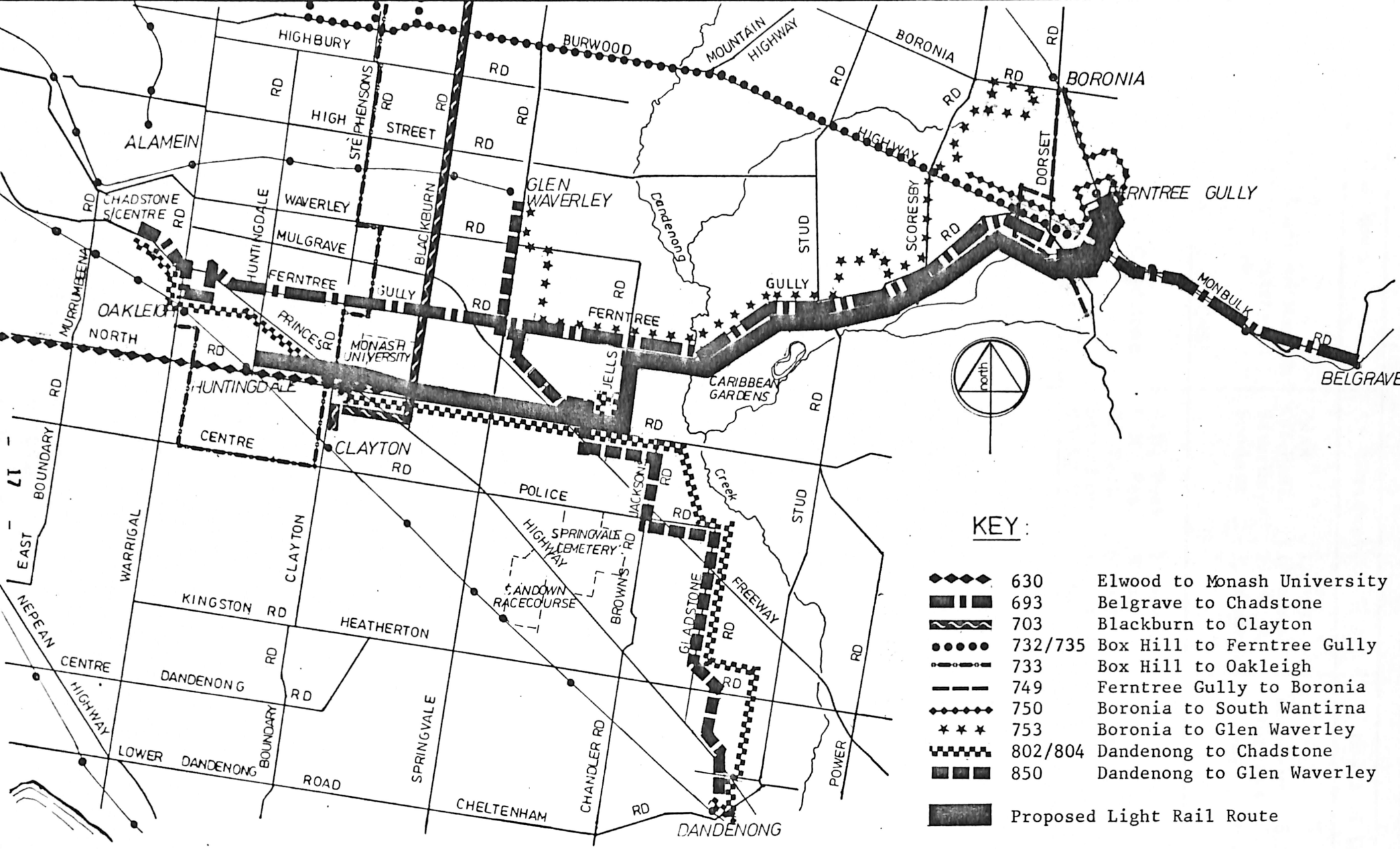


FIGURE 4.1 EXISTING BUS SERVICES ALONG PROPOSED LIGHT RAIL ROUTE

8. COMMUNITY ASSESSMENT

A. Social Benefit-Cost Evaluation

In addition to the analysis of direct costs and benefits of the project a social benefit-cost analysis, evaluating some of its community and social effects, has been carried out.

The methodology used is based on that employed by the Bureau of Transport Economics for evaluations of this type.

The Project Cast in the evaluation is the construction of the light rail service from Wheelers Hill Shopping Centre in Jells Road to the Huntingdale Railway Station.

The operation of the present bus services in the area constitutes the Base Case. The operating costs of the light rail service have been treated as negative benefits in the evaluation.

The analysis covers a 30 years project period using a 10% discount rate. In the analysis all costs and benefits are discounted back to present values.

8.1 Costs

The capital costs of the project - vehicle purchase costs, track and overhead construction and provision of infrastructure - were discussed in Chapter 6. The present value of these costs is \$28.4 million.

8.2 Benefits

(i) Capital Cost Savings

The construction of the light rail line will lead to a reduction in bus services currently operating in the area. It has been estimated that 5 buses will be saved. The present value of these savings is \$515,000.

(ii) Operating Costs

The annual cost of operating the light rail system, including vehicle and track maintenance costs, energy costs and crewing costs would amount to \$1.02 million in the initial year of operation increasing to \$1.1 million after 15 years. In addition, the light rail vehicles would require major overhauls estimated to cost \$51,500 per vehicle after 15 years' service. The present value of LRV operation over the life of the project is \$9.96 million.

However, the project would save the costs of operating part of the present bus system. The net present value of these operating savings is \$4.82 million.

(iii) Passenger Benefits

Benefits will accrue to current public transport passengers who will be making use of the proposed light rail services. These benefits have been evaluated for passengers taking account of differences between the bus and light rail services in comfort, access, waiting, in-vehicle and egress times. All ex-vehicle times have been weighted at twice in-vehicle time in determining generalised trip costs for the various modes.

The proposed service is anticipated to generate some new patronage. Benefits accruing to generated passengers are calculated as being half the rate applying to current passengers.

It is estimated that approximately one-third of daily patronage will be converted car travellers. This mode transfer will save the resource costs of these car trips and provision of car parking facilities. The removal of these vehicles from congested roads will lead to further resource cost savings.

The present value of passenger benefits and benefits for remaining road users is \$42.2 million.

8.3

Summary

The present value of benefits and costs of the project and the benefit-cost ratio are thus :

Capital Cost		\$28.4 million
Benefits	\$ million	
Capital Costs Saving	0.52	
Operating Costs	4.82	
Passenger Benefits	<u>42.18</u>	
	47.52	
less L/R operating costs	<u>9.96</u>	\$37.56 million
Net Present Value		\$ 9.16 million
Benefit-Cost Ratio		1.32

B. Other Community Effects

There are a number of factors not quantified in the foregoing benefit-cost evaluation which should be considered in the evaluation of the light rail proposal. These factors strengthen the case for public transport provision and although they are not amenable to easy quantification, it is important that they be at least recognized. By generating new public transport patronage and diverting some trips from motor cars, the light rail proposal would :-

- provide improved mobility and access for residents in Oakleigh and Waverley, particularly those who have no option other than public transport.
- reduce the number of road accidents, as public transport journeys are less prone to accidents than private car trips.
- reduce the levels of pollution both from exhaust emissions and noise levels.

- contribute towards energy conservation. A light rail system relies on plentiful local supplies of brown coal as its prime energy source whereas private cars use scarce oil reserves.

On the basis of previous tramway extension experience, it would be expected that the introduction of a light rail service would have a beneficial effect on local business trade and local real estate values.

APPENDIX 1.

ESTIMATE OF CAPITAL COSTS.

PROPOSED LIGHT RAIL BETWEEN HUNTINGDALE AND
FERNTREE GULLY STATIONS.

STAGE 1 - HUNTINGDALE RAIL STATION TO WHEELERS HILL SHOPPING
CENTRE.

	<u>\$ 000</u>
1. <u>Track Work</u>	
(a) 9 kilometres of Double Track	5,400
(b) Depot Track and Special Work	1,000
2. <u>Structures</u>	
(a) Grade separation at Princes Highway	1,600
(b) New bridge over Mulgrave Freeway	1,200
(c) Modal interchange at Huntingdale Station - (including tunnelling for access)	1,500
3. <u>Land Resumption</u>	
(a) Provision for Depot on N.E. corner of Wellington Road and Jells Road. (Approx. 1 hectares)	250
(b) Widening of Jells Road	500
4. <u>Road Works</u>	
(a) Re-instatement and Construction	4,750
(b) Flaring at intersections	500
(c) Alterations and relocation of services	1,000

	<u>\$ 000</u>
5. <u>Buildings</u>	
Depot, Traffic Offices, Workshop Facilities and amenities for staff	750
6. <u>Signalization</u>	
New traffic signals and modifications to existing systems	250
7. <u>Electrical Network</u>	
Electrical work, land acquisition and buildings for three (3) substations and overhead network	3,400
8. <u>Passenger Facilities</u>	
Passenger shelters	150
Interchange outside Monash University	<u>50</u>
Sub-Total - STAGE 1	22,300

STAGE 2 - WHEELERS HILL SHOPPING CENTRE TO FERNTREE GULLY
RAIL STATION.

	<u>\$ 000</u>
1. <u>Track Work</u>	
11.5 kilometres of Double Track	6,900
2. <u>Structures</u>	
(a) Three new bridges over Dandenong Creek and drains	1,600
(b) Grade separation at intersection of Burwood Highway and Ferntree Gully Road	1,500
(c) Modal interchange at Ferntree Gully Station - (including tunnelling for access)	1,200
3. <u>Land Resumption</u>	
Widening of Station Street	1,300
4. <u>Road Works</u>	
(a) Re-instatement and Construction	7,350
(b) Flaring at intersections	500
(c) Alterations and relocation of services	1,000
5. <u>Signalization</u>	
New traffic signals and modifications to existing systems	100
6. <u>Electrical Network</u>	
Electrical work, land acquisition and buildings for three (3) substations and overhead network	4,150
7. <u>Passenger Facilities</u>	
Passenger shelters	<u>50</u>
Sub-Total - STAGE 2	25,650
TOTAL STAGES 1 and 2	47,950
	<u>Say 48 million</u>

