

East West Link Needs Study

Social, Demographic and Land Use Analysis

PHASE 3: FINAL OPTIONS ASSESSMENT

FINAL REPORT

Department of Infrastructure

March, 2008

This Report has been prepared for:



This report has been prepared by:
SGS Economics and Planning Pty. Ltd.

ACN 007 437 729

5th Floor, 171 Latrobe Street,
Melbourne Victoria 3000

phone: 61 3 8616 0331

fax: 61 3 8616 0332

email: sgsvic@sgsep.com.au

web: www.sgsep.com.au



Table of Contents

1	Introduction	1
1.1	Project Brief	1
1.2	Study Approach.....	1
1.3	Description of Final Options	2
1.4	Study Area	2
1.5	Report Structure.....	3
2	Identification of Costs and Benefits	4
2.1	Description of Marginal Costs.....	5
2.1.1	Loss of Access to Open Space/ Parkland, Net Impact.....	5
2.1.2	Increased Severance and Loss of Residential Amenity	7
2.1.3	Stimulus to Outward Urban Growth	20
2.2	Description of Marginal Benefits.....	25
2.2.1	Increased Choice/ Access to Jobs and Services	25
2.2.2	Reduced or Eliminated Severance and Improvement to Residential Amenity ..	29
2.2.3	Creation of Regeneration or Urban Consolidation Opportunities	35
2.2.4	Stimulus to Increased Infill Development.....	39
3	Quantification of Costs and Benefits.....	40
3.1	Quantification of Marginal Costs.....	40
3.1.1	Loss of Access to Open Space/ Parkland, Net Impact.....	40
3.1.2	Increased Severance and Loss of Residential Amenity	42
3.1.3	Stimulus to Outward Urban Growth	42
3.2	Quantification of Marginal Benefits.....	44
3.2.1	Increased Choice or Access to Jobs and Services	44
3.2.2	Reduced or Eliminated Severance and Improvement to Residential Amenity ..	46
3.2.3	Creation of Regeneration or Urban Consolidation Opportunities	46
3.2.4	Stimulus to Increased Infill Development.....	47
4	Assessment of Net Benefit	48
4.1	Cost-Benefit Analysis	48
4.2	Sensitivity Analysis.....	50
	Appendix A.....	57

List of Figures

Figure 1	Study Area for Phase 1 and 2	3
Figure 2	Investigation Area for Options A, B & C.....	9
Figure 3	Change in Relative Accessibility (%), 1996-01, SLAs in Metropolitan Melbourne	21
Figure 4	Change in Relative Accessibility (%), Base Case to Option A+D, SLAs in Metropolitan Melbourne	23
Figure 5	Change in Relative Accessibility (%), Base Case to Option B+D, SLAs in Metropolitan Melbourne	24
Figure 6	Change in Relative Accessibility (%), Base Case to Option C+D, SLAs in Metropolitan Melbourne	25
Figure 7:	Truck Ban Area ('Truck Action Plan'), Yarraville and Footscray	30
Figure 8	Traffic Volume Changes over a 24 Hour Period, Option A Compared to Base Case	32
Figure 9	Traffic Volume Changes over a 24 Hour Period, Option B Compared to Base Case	33
Figure 10	Traffic Volume Changes over a 24 Hour Period, Option C Compared to Base Case	34

Figure 11	Annual Net Benefit Flow (\$M undiscounted), Option A + D, Option B + D and Option C + D	48
Figure 12	Composition of Option A + D, B + D and C + D Costs and Benefits, (\$M, present value)*49	
Figure 13	Identified Community Severance and Residential Amenity Impact Areas, Option A	58
Figure 14	Identified Community Severance and Residential Amenity Impact Areas, Option B	59
Figure 15	Identified Community Severance and Residential Amenity Impact Areas, Option C	60
Figure 16	Identified Community Severance and Residential Amenity Impact Areas, Option D – CBD Rail Tunnel	61

List of Tables

Table 1	Social, Demographic and Land Use Assessment Framework.....	4
Table 2	Locational Elasticity of Households to Relative Accessibility in Melbourne	22
Table 3	Net Shifts in Households due to Changes in Relative Accessibility, Option A+D, B+D and C+D Compared to Base Case.....	22
Table 4	Locational Elasticity of Jobs by Industry to Relative Accessibility in Melbourne	26
Table 5	Change in Access to Jobs and Services within 30 minute (Car) Travel Time for Households in the Bottom 3 Quintile.....	28
Table 6	Estimated Annual Parkland Visitations	41
Table 7	Valuation of Loss of Access to Open Space/ Parkland, Net Impact	41
Table 8	Marginal Cost of Network Infrastructure Provision: Fringe vs. Development in Existing Urban Area (per dwelling)	43
Table 9	Regression Estimates, Median Dwelling Price by Jobs Accessible within 30 minutes	45
Table 10	Societal Value of Improved Access to Jobs and Services (per annum)	46
Table 11	Economic Performance Measures (using 6.5% real discount rate), Option A + D, B + D and C + D	49
Table 12	NPV and Benefit Cost Ratio at Selected Discount Rates.	50
Table 13	Social, Demographic and Land Use Impact Assessment, Benefit Cost Analysis – Option A + D	51
Table 14	Social, Demographic and Land Use Impact Assessment, Benefit Cost Analysis – Option B + D	52
Table 15	Social, Demographic and Land Use Impact Assessment, Benefit Cost Analysis – Option C + D	53
Table 16	Social, Demographic and Land Use Impact Assessment, Benefit Cost Analysis – Option A + D, NOT INCLUDING BENEFITS ATTRIBUTABLE TO INCREASED CHOICE/ ACCESS TO JOBS AND SERVICES.....	54
Table 17	Social, Demographic and Land Use Impact Assessment, Benefit Cost Analysis – Option B + D, NOT INCLUDING BENEFITS ATTRIBUTABLE TO INCREASED CHOICE/ ACCESS TO JOBS AND SERVICES.....	55
Table 18	Social, Demographic and Land Use Impact Assessment, Benefit Cost Analysis – Option C + D, NOT INCLUDING BENEFITS ATTRIBUTABLE TO INCREASED CHOICE/ ACCESS TO JOBS AND SERVICES.....	56

1 Introduction

1.1 Project Brief

The Department of Infrastructure (DOI) commissioned SGS Economics and Planning Pty Ltd in May 2007 to undertake a Social, Demographic and Land Use Impacts Study to assess the need for and impact of developing a new East West Link. This was one of the six streams of technical investigations which informed a Study Team led by Sir Rod Eddington, established to make recommendations to the Victorian Government. The other technical streams focus on the following issues:

- Economic Analysis;
- Transport Planning and Costing;
- Environment and Heritage Impact Analysis;
- Commercial and Financial Analysis; and,
- Transport Modelling.

SGS's brief was to assess the social, demographic and land use impacts associated with a range of transport network and infrastructure proposals arising from options for a possible additional east-west transport link.

1.2 Study Approach

The overall approach to this project was based on three Phases as follows:

- Phase 1 – Development of Objectives, Assessment Criteria and Initial Options;
- Phase 2 – Initial Option Assessment
- Phase 3 – Final Option Assessment

This report relates to Phase 3 of the study.

The principal objective of Phase 3 of the study is to undertake a comprehensive local area social cost benefit analysis (CBA) which identifies and where possible quantifies the impacts that are typically considered to be beyond the scope of 'traditional' cost benefit analyses for transportation projects. This traditional approach to CBA for transportation projects plays down some of the urban change and neighbourhood level impacts. Such effects might be acknowledged but are rarely quantified and given equal status alongside travel related impacts such as changes in vehicle operating costs, vehicle kilometres travelled and travel time savings linked externalities. This can result in significant underestimation of the public policy merits or demerits of transport projects which can have significant impact on the social and urban fabric of the city.

The aim of this assessment is to provide a rigorous evaluation of the potential impacts of the three East West Link options which emerged from the Phase 1 and 2 work. This will help inform the DOI study team on the preferred option(s) from a triple bottom line perspective.

1.3 Description of Final Options

Through its first two phases, the East West Link Needs Study has resolved **3 private transport options** for more focussed evaluation in Phase 3. These include:

- Option A – provides for a direct ‘freeway to freeway’ connection between the Eastern Freeway and the Westgate Bridge;
- Option B – connects the Eastern Freeway more directly to the west via Sunshine Road; and
- Option C – entails a range of capacity upgrades and road management initiatives utilising largely, existing infrastructure.

All of these options will be accompanied by **3 major public transport investments** (i.e. “Option D”) as follows:

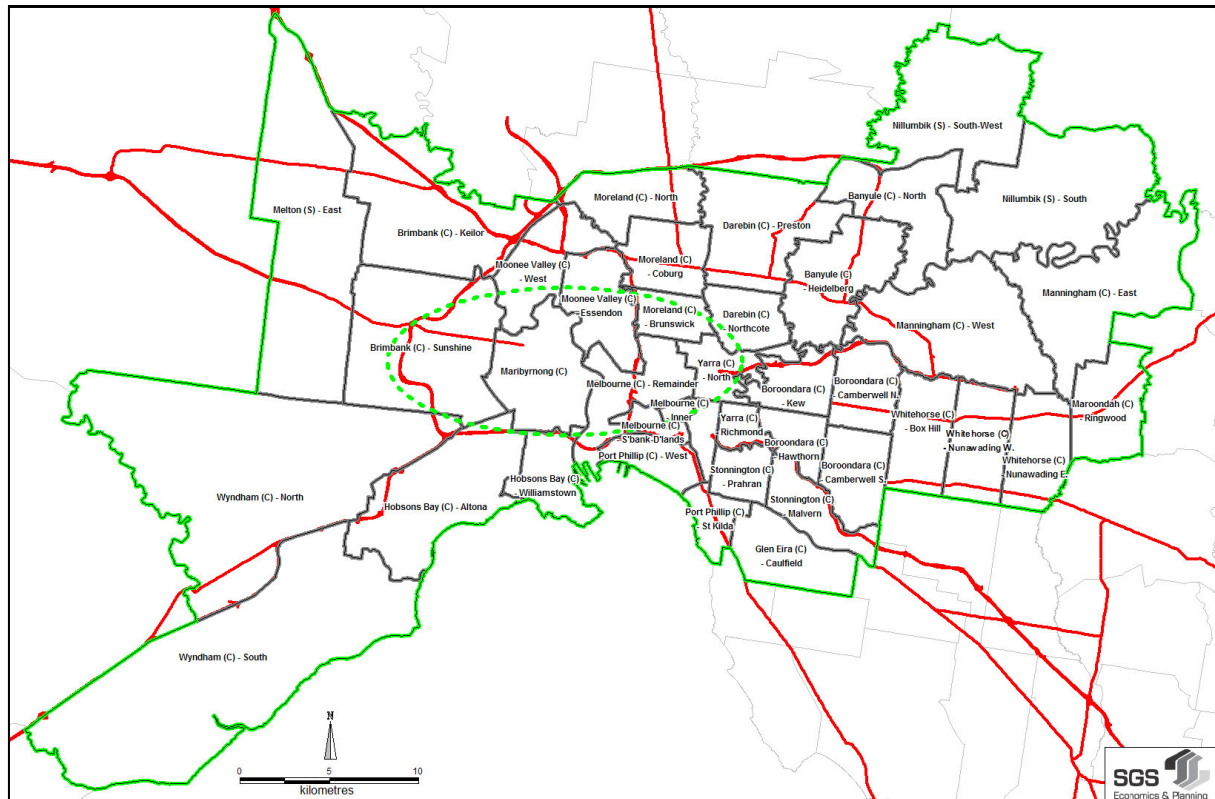
- A rail tunnel stretching from the ‘Caulfield / Domain area’ to the Melbourne University / Parkville district – referred to as CBD rail tunnel in the rest of this report;
- A bus based rapid transit facility operating along the Eastern Freeway; and
- A Tarnet passenger rail link.

The options will variously deliver a range of costs and benefits. The aim of this paper is to identify the principal social, demographic and land use related costs and benefits and quantify these where possible.

1.4 Study Area

While the study area for the purpose of Phase 1 and 2 of this Social, Demographic and Land Use impacts study was defined to include the 39 Statistical Local Area’s (SLA’s) across the Metropolitan Melbourne area (see Figure 1 below), this Phase 3 report takes a wider view . The analysis reported here is undertaken from a whole of Victoria perspective. This avoids identification of benefits and costs that are ‘transfer payments’ within Victoria.

Figure 1 Study Area for Phase 1 and 2



1.5 Report Structure

The remainder of this report is set out as follows:

- | | |
|-----------|---|
| Section 2 | Identifies and describes the marginal social, demographic and land use costs and benefits under each of the final 3 proposed options relative to the base case scenario. |
| Section 3 | Quantifies these marginal costs and benefits in \$ terms. |
| Section 4 | Contrasts the quantified costs and benefits for each of the final 3 proposed options over a 30 year evaluation period extending out to 2037. Discounted cashflow analysis is utilised and standard economic performance measures are calculated. Sensitivity analysis is also undertaken in this section. |

2 Identification of Costs and Benefits

An assessment framework consisting of goals, objectives and indicators was developed in the Phase 1 of this study. During Phase 2 of the study, this assessment framework was further refined as shown below.

Table 1 Social, Demographic and Land Use Assessment Framework

SUB OBJECTIVES	STRATEGIC INDICATORS
Improving accessibility, especially for transport disadvantaged	Impact on the range of jobs and services accessible within a reasonable travel time (30 minutes)
Improving urban amenity	Impact on residential areas affected by trucks
	Impact on parks and public open space
Reducing severance	Impact on the areas suffering existing or future severance

Based on this assessment framework and the detailed examination of each of the three final proposed options (refer to SKM/ Maunsell's engineering reports for more detail on the options) the following costs and benefits relating to the social, demographic and land use impacts can be identified:

Costs

1. Construction phase loss of access to open space/ parkland (quantity and quality).
2. Permanent loss of open space/ parkland amenity due to exposure to increased noise or elevated structures and/ or loss of access to parkland (quantity and quality).
3. Increased severance and loss of residential amenity for properties exposed to additional traffic/ elevated structures.
4. Stimulus to outward urban growth resulting from shifts in relative accessibility contours across the metropolitan area.

Benefits

1. Increased choice/ access to, and reduced metropolitan inequality in access to, jobs, education, health, retail, recreation and other opportunities for households in the metropolitan area.
2. Reduced or eliminated severance effect and improved residential amenity specifically within neighbourhoods currently affected by freight traffic intrusion.
3. Creation of new regeneration/ urban consolidation opportunities.
4. Stimulus to increased development within the existing metropolitan area (i.e. increased infill development) resulting from shifts in relative accessibility contours across the metropolitan area.

These costs and benefits as they relate to each of the final three proposed options are further described in the following sections. It should be noted that all costs and benefits are described in terms of difference from what would have happened anyway in the affected

areas in the absence of the options under consideration, that is, the “Base Case”. Consequently the impacts in question are termed “marginal” costs and benefits.

2.1 Description of Marginal Costs

Graphical overview of various options are provided in Appendix A. For additional detail on the options refer to SKM/ Maunsell’s engineering reports.

2.1.1 Loss of Access to Open Space/ Parkland, Net Impact

Option A

Royal Park

It is proposed that a tunnel would be constructed underneath existing park land including an ‘Urban Camp’ retreat at Royal Park.

Impacts are likely to occur during the construction period, in particular at Royal Park between Brens Drive and Elliott Avenue where a temporary tunnel evacuation site may be located. Following construction, it is anticipated that there would not be any negative impacts given containment of noise and visual dis-amenities in the tunnel.

In addition, a cut and cover method is likely to be used to allow for an entry/exit portal which would be located in the median strip of the Tullamarine Freeway.

The majority of impacts are expected to occur temporarily within the construction period as the road would be cut through a reserve including wetlands, a baseball area and open space. Upon completion, it is unlikely that there would be any negative impacts as noise and visual dis-amenities are expected to be contained within the tunnel.

Following completion of construction, the affected parklands would be re-established/ regenerated and upgraded possibly to a level that is better than the Base Case.

In addition, it is anticipated that the proposed infrastructure projects would lead to net reduction in traffic along Macarthur Road and Elliott Avenue, both of which run through Royal Park. This would improve the amenity levels of the park users, particularly due to lower noise levels (therefore increasing enjoyment and tranquillity of the park), and lower severance, that is, allowing for north/south movement with relative ease and improving pedestrian safety for park users.

JJ Holland Park

It is proposed that the tunnel would be constructed underneath the JJ Holland Park using a cut and cover method. The tunnel would cut through the playing oval, with the remainder of the oval possibly used as a construction area. This would impact significantly on the amenity levels of the park/ oval users.

Upon completion of the construction, the park/ oval would be re-established/ regenerated and upgraded possibly to a level that is better than the existing situation.

Spotswood Oval

It is proposed that an elevated roadway could be constructed which would pass by the perimeter of the Westgate Golf Course and Spotswood Oval along the West Gate Freeway. This would result in visual and noise dis-amenity and therefore loss of parkland amenity. The Spotswood Oval boundary line would also have to be moved as a result of the elevated structure on the north side, although there are opportunities to undertake this connection on the north side of the freeway.

Newells Paddock Wetlands Park

An elevated roadway is proposed to link a new Dynon Road intersection (at grade) to Ballarat Road.

Significant impacts on parkland amenity are likely to occur at the Newells Paddock Wetlands Park. This would be through visual blight, as well as amenity losses at the park during and following construction, including losses to the atmosphere and enjoyment of the park. Although, upon completion of the construction works remediation measures would be put in place to address the likely impacts.

Option B

Royal Park

As per Option A

JJ Holland Park

As per Option A

Newells Paddock Wetlands Park

As per Option A

Option C

Royal Park

As per Option A. However, under Option C, there would be some acquisition of the parkland to allow for widening of the Macarthur Road and sections of Elliott Avenue.

This would lead to significant impact on Royal Park, firstly through the permanent loss of sections of parkland but also through the loss of amenity that would ensue from increases in traffic volumes. This impact would not only be from vehicular noise, which would impact on the amenity of the park, but would also create increased severance whereby park visitors/patrons are likely to stay on a particular side of the park rather than crossing Macarthur Road. This would have implications on perceptions of the park as a unified place. The increase in traffic volumes could also lead to safety concerns for children visiting the park.

Newells Paddock Wetlands Park

As per Option A

2.1.2 Increased Severance and Loss of Residential Amenity

As noted above Options A, B and C relate to the road transport opportunities. The analysis for each of these private transport options has been undertaken for two broad catchment areas; namely the Eastern Region and the Western Region (see Figure 2).

The Eastern Region

The eastern region is generally defined as the area east of CityLink extending to the Yarra River. Specific suburbs within the eastern region include:

- Clifton Hill
- Abbotsford
- Collingwood
- Fitzroy
- Fitzroy North
- Carlton
- Carlton North
- North Melbourne
- Parkville

The eastern region comprises predominantly residential uses. Under **Melbourne 2030** (M2030) – the Victorian Government’s strategy for managing Melbourne’s development and growth over the coming decades - Carlton and Fitzroy have been designated as Major Activity Centres and Parkville has been designated as a Specialised Activity Centre signified by its Medical and Bioscience Precinct. Other significant places within this region include; the University of Melbourne’s Parkville campus, The Melbourne General Cemetery- located 2km north of the city in Carlton and Royal Park – a dominant parkland feature.

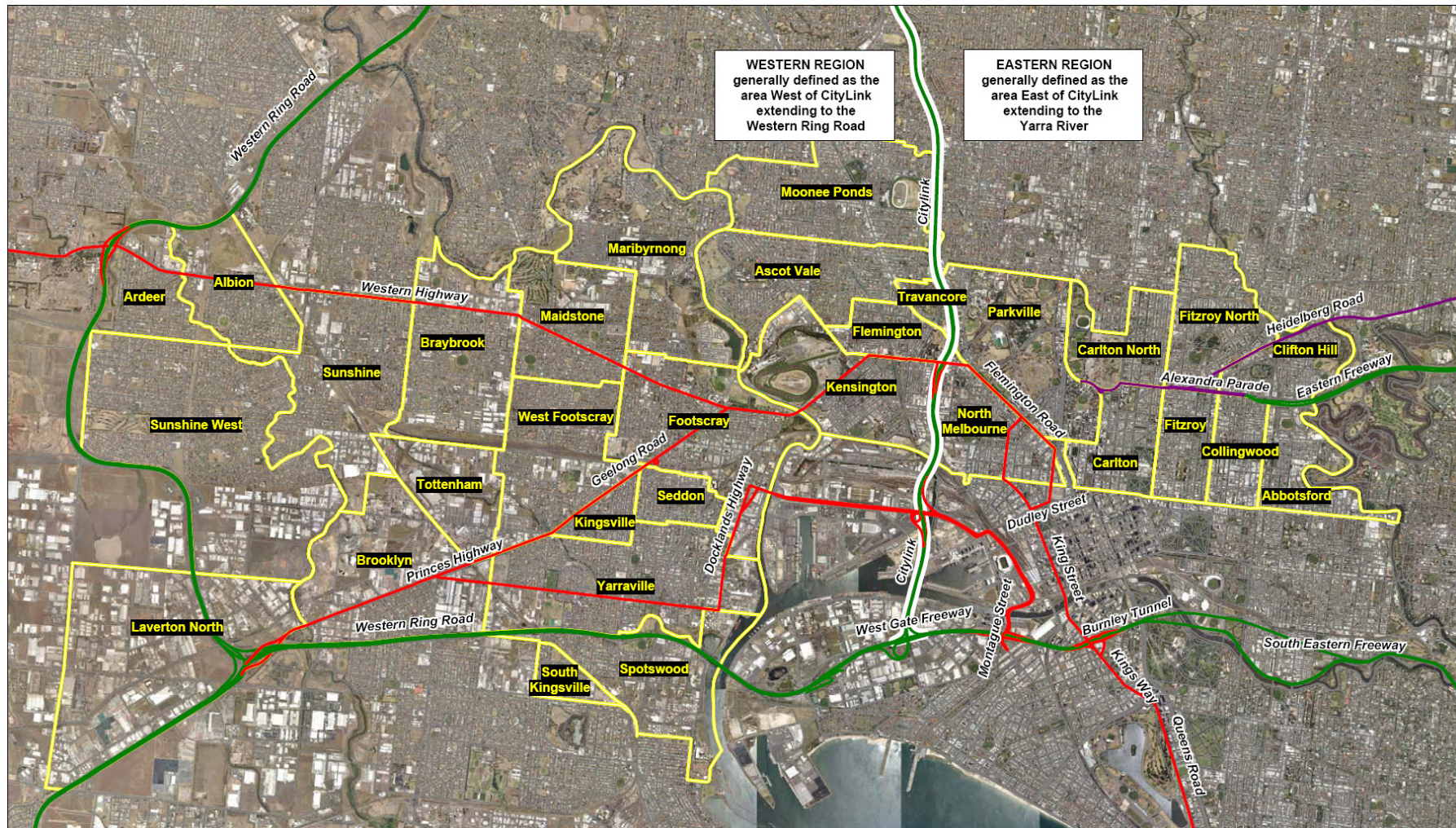
The Western Region

The Western Region is generally defined as the area west of CityLink extending to the Western Ring Road. Specific suburbs within the western region include:

- Maidstone
- Travancore
- Ascot Vale
- Moonee Ponds
- Flemington
- Albion
- Ardeer
- Spotswood
- Braybrook
- West Footscray
- Footscray
- Yarraville
- Kensington
- Maribyrnong
- Seddon
- Kingsville
- Tottenham
- Sunshine
- Sunshine West
- Brooklyn
- South Kingsville
- Laverton North

There is a mixture of land uses in the Western Region. Port related facilities are located directly west of CityLink and north of the West Gate Freeway to approximately Flemington Racecourse. There are residential areas surrounding this industrial area on all sides. Additional industrial activities are located beyond this residential belt further to the west. Footscray, Moonee Ponds and Maribyrnong's 'Highpoint Shopping Centre' are designated Principal Activity Centres, while Ascot Vale 'Union Road' designated as a Major Activity Centre under M2030. Other significant places within this region include Victoria University, recognised as a Specialised Activity Centre located in Footscray, and Flemington Racecourse, which plays host to *The Melbourne Cup*, amongst other things.

Figure 2 Investigation Area for Options A, B & C



As noted, all the above 3 private transport options are accompanied by major public transport investments (referred as Option D).

The analysis for Option D is undertaken in accordance with the varying public transport options proposed, that is the Tarneit Rail Link, the Eastern Suburbs Bus Link and the CBD Rail Tunnel. For the CBD Rail Tunnel, smaller sections of the proposed line are analysed individually based largely on the location of the proposed stations.

Residential amenity losses considered here include noise, visual and pedestrian amenity, as well as the potential loss of community amenity through severance effects.

In analysing the amenity impacts from noise, advice from acoustic experts (Maunsell's Bassett Acoustics) was sought. This suggested that unless at minimum, a doubling or halving of car traffic volumes and one third increase or decline in heavy commercial traffic is anticipated, additional noise amenity impacts would be unlikely.

Initial desk top research was undertaken based on detailed review of the proposed alignments, existing and proposed land uses, zonings, heritage overlays and other planning controls and transport modelling outputs to examine changes in traffic volumes relative to the base case. Field trips were then undertaken to confirm (or otherwise) the results of this desk top exercise.

Option A

Eastern Region

Potential works within the eastern region could include a tunnel using both a cut and cover method and boring machine under existing uses. The cut and cover method involves a high level of dis-amenity in the short (construction) term due to construction externalities including the presence of machinery, noise and pollution. Surface road works may also be undertaken and new lanes constructed. Potentially, these could include pedestrian walkways and plazas exposed to busy main roads.

Due to increased traffic in selected road networks some residential areas would experience decline in their amenity levels. These areas may also be prone to loss of pedestrian amenity. However, the majority of noise and visual dis-amenities that could occur is expected to be contained within the tunnel. Any other noise and traffic related amenity impacts along major arterials, given the situation under the Base Case scenario, are unlikely to be significant.

Specific impacts on areas where road works are highly likely include:

Merri Creek to Lulie Street

The types of proposed works in this area are likely to include surface works in the centre median of the Eastern Freeway and surface works parallel to Alexandra Parade and along Lulie Street. Acquisition of some open space/ buffer for a bus off-ramp is also proposed near Maugie Street and possibly along Alexandra Parade.

Dwellings on the south side of Maugie Street are likely to be exposed to a new bus only off-ramp with the impact felt through the loss of open space/ buffer where the ramp is to be constructed. Noise impacts however may be more perceived than actual given the likely traffic volumes under the Base Case along the Eastern Freeway. Bus traffic volumes may

increase on Lulie Street due to extra surface works and new access from the Eastern Freeway. The new bus only on-ramp along Alexandra Parade is not expected to have significant impact on the area given the likely traffic volumes along the Eastern Freeway under the Base Case. It should however be noted that there are sound barriers along Alexandra Parade and Maugie Street which currently act to negate the noise dis-amenities.

Rutland and Lulie Streets to Nicholson Street

Potential works include a tunnel constructed using a cut and cover method. In this particular area, the tunnel based on the cut and cover method would be constructed using the area of the existing road and median reserves. Some surface restoration works would also occur on existing roads.

Works here could also include a road that would dip below proposed pedestrian walkway crossings at grade. This would occur at strategic locations near parks and reserves.

The majority of impacts from these works are expected to occur temporarily during the construction phase. Upon completion of construction, it is expected that there would not be any impacts as noise and visual dis-amenities are expected to be contained within the tunnel. The exception would be the tunnel portal which can be expected to sustain substantial increase in traffic, and therefore decreases in amenity from increased noise and traffic volumes. Depending on the design and integration of the tunnel portal, visual dis-amenities may also be expected. The tunnel portal would be located around business uses, and a generous median strip and service roads along Queens Parade would also help to mitigate impacts from the tunnel portal and retain pedestrian amenity. Any increases in traffic along Queens Parade, given the likely traffic volumes under the Base Case, and associated noise dis-amenity, are expected to be minimal.

Nicholson Street to JJ Holland Park

The proposed works in this area would include construction of a tunnel underneath existing uses.

Impacts would occur during the construction period, particularly where a temporary tunnel evacuation site may be located. Following construction, it is anticipated that there would not be any negative impacts given containment of noise and visual dis-amenities in the tunnel.

In summary, following residential dis-amenities in the Eastern Region are expected:

- General noise, visual and amenity losses.

Western Region

Potential works within the Western Region could include a tunnel using both a cut and cover method and boring under existing uses. The cut and cover method involves a high levels of dis-amenity in the short (construction) term due to construction externalities including the presence of machinery, noise and pollution. Surface road works and new lane construction would also be undertaken. Other potential works include an open slot road approximately 10 to 15 metres deep, as well as elevated road structures.

A large number of the works highlighted for the Western Region would be undertaken within industrial areas or open space reserves, therefore there would be limited post-construction negative impacts on residents. Visual impacts through the construction of elevated road

structures are likely to occur, particularly within the vicinity of the Footscray Riverside Precinct, which is currently used for commercial and industrial purposes, but has been designated as a long term 'major tourism, mixed commercial, entertainment and leisure development' area in the Maribyrnong Planning Scheme¹. An elevated road structure within this area may impact on the objectives of this future precinct with regard to noise and visual dis-amenity. That being said, the structure would be located south of the designated precinct and therefore may not severely impact on its proposed future functions and possibly may act as a buffer to port related uses.

The proposed elevated road structure is likely to impact on the visual amenity of residents. Noise dis-amenity could also be an issue in some areas especially for dwellings that are outside of the proposed truck ban area (see Section 2.2.2 below).

As a result of the road works that could lead to substantial increases in traffic flow, some residential areas may suffer noise dis-amenity. However, this could be addressed through installation of noise barriers. In other areas, no impacts have been recorded due to the proximity of likely works to non-sensitive uses such as rail lines and industrial areas.

Specific residential amenity impacts include:

Mackenzie Road to Whitehall Street

An elevated roadway is proposed to be constructed over the Maribyrnong River and areas currently occupied by industrial uses.

As noted earlier, this road would run over an industrial area, therefore limited amenity impacts are expected. However, while this area is industrial, the Maribyrnong Planning Scheme has designated an area immediately north as having long term 'major tourism, mixed commercial, entertainment, and leisure development opportunities'². This structure may impact on the 'planning' vision for this area.

Footscray Road to West Gate Freeway (to Williamstown Road)

An elevated roadway would continue over areas that are used for a variety of purposes, including open space, industrial and residential.

In the area where the elevated roadway would cross over a residential area, these properties could be impacted severely. This would be due to both visual blight and increased noise from anticipated increases in heavy commercial and passenger vehicles. This area is located just outside the truck ban area.

West Gate Freeway: Williamstown Road to Grieve Parade

Surface works along the existing roadway are proposed, including outside the freeway reservation and median.

As parts of the West Gate Freeway pass through residential areas such as Spotswood and Altona North, the significant increase in traffic volume may cause additional noise dis-

¹ Maribyrnong Planning Scheme, 'Footscray Riverside Precinct', Clause 22.04-2, p 1.

² Maribyrnong Planning Scheme, 'Footscray Riverside Precinct', Clause 22.04-2, p 1.

amenity. However, this could be addressed through installation of noise barriers. The remaining parts of the West Gate Freeway in this section, which runs through industrial and open space land uses, is unlikely to impact on residential amenity.

Ballarat Road: Geelong Road to Ashley Street

Some dwellings would need to be acquired to allow for widening of Ballarat Road to three lanes in each direction (an addition of two lanes).

This would impact on a variety of uses including community, recreational, commercial and residential. The widening of Ballarat Road is likely to create an unfriendly pedestrian environment and the resultant increase in traffic volumes may lead to safety concerns. This would be detrimental to the overall amenity of the area, particularly where high pedestrian volumes exist. Impacts would also occur to the urban fabric with removal of uses for the road, potentially leaving undesirable street frontages. These impacts would have to be mitigated by incorporating good urban design principles in any redevelopment of residual land.

There are already mixed uses on Ballarat Road and any further deterioration of amenity through loss of pedestrian friendliness and visual impacts on the streetscape could be detrimental to the current regeneration that is taking place. The area is emerging as a location for student accommodation.

Paramount Road/ Ashley Street to Barkly Street

The types of works here could include a road connection constructed at grade through existing industrial areas and an upgrading of roads to four lanes on Dempster and Ashley streets.

Residential amenity impacts are expected to be limited, as the proposed works largely run through industrial areas. Where residential dwellings become the dominant form of land use (area after Indwe Street), the road could potentially divide/ sever the community and erode pedestrian amenity. This area would also be susceptible to increased noise and visual dis-amenity.

In summary, the following residential amenity impacts in the Western Region are expected

- Noise dis-amenity.
- Decreased visual amenity with changes to urban fabric and street frontages and exposure to elevated structures.
- Potential future dis-amenity for the Footscray Riverside Precinct (without mitigating actions).
- Community severance effects.
- Pedestrian amenity and safety impacts.

Option B

Eastern Region

Potential works in the Eastern Region under Option B are the same as those under Option A, therefore the above noted negative residential amenity impacts in Option A apply.

Western Region

Potential works under Option B in the western region include a tunnel using both a cut and cover method and boring under existing uses. Surface road works and construction of new lanes are also likely. Other potential works include an open slot road approximately 10 to 15 metres deep, as well as elevated road structures.

A large number of the works highlighted for the Western Region would be undertaken in industrial areas or open space reserves, therefore there would be limited post-construction negative impacts on residents.

Selected residential areas may suffer from noise and visual dis-amenity, particularly where traffic volumes are expected to increase significantly. However, these are in the context of likely dis-amenities under the Base Case, for example, proximity to existing roads and rail lines. Some areas, however, would be impacted significantly where open space reservations will be used for road works in areas that are relatively free of noise and visual road dis-amenity. This impact would be greatest where proposed works are along residential property boundaries, and would be accentuated by the nature of the change of use, for example, open space to road. Even with sound barriers, these properties are still likely to experience visual amenity losses. Other properties could experience visual dis-amenity due to exposure to elevated structures.

Specific impacts on areas where road works are highly likely include the following:

Sunshine/ Graingers Road to Kororoit Creek

An elevated roadway would be built primarily over rail lines and open space, with some construction over industrial land uses. Any impacts on amenity here are estimated to be visual (on residential dwellings north of the proposed route) rather than through noise given proximity of dwellings to existing railway lines.

Kororoit Creek to Western Ring Road

The types of works anticipated include a surface roadway that would be constructed to link the elevated roadway to other roads including the Western Ring Road and Geelong Road. This would occur initially through vacant land and then possibly through acquisition of some industrial uses.

The anticipated negative impact of these works varies from limited to more notable. The road travels through vacant land and borders industrial uses to its south and a drainage/ sewerage reserve to its north, which would act as a buffer between the road and residential land uses. However, the road widens significantly at a point at the edge of residential dwellings. It is anticipated that dwellings and an educational facility would be significantly impacted by this section of the road, as the proposed works would be along their rear boundaries. Dwellings could be impacted by the construction of the proposed road and loss of amenity through noise relative to the Base Case, that is, the loss of open space buffers. As the proposed use of the land under this option would change from open space to roads, this would accentuate negative amenity impacts, particularly due to exposure to increased noise and visual blight. Even with sound barriers to address noise dis-amenity, visual impacts for immediate dwellings abutting the proposed road way, and the creation of visual blight on the landscape would cause dis-amenity to a large number of dwellings in this area.

Western Ring Road Connections

New surface ramps and connections from the proposed roadway would be created here. Additional surface works would be undertaken along the Western Ring Road, followed by new ramps around Fitzgerald Road. Further surface works to the Western Ring Road would be undertaken on out bound lanes concluding at Forrest Road.

The anticipated negative impacts would be on surrounding dwellings in close proximity to the proposed surface ramps. In addition, significant increases in traffic volumes are anticipated which could lead to further deterioration in visual and noise amenity. Noise dis-amenity is also expected due to new surface works being closer to residential boundaries when compared to the likely situation under the Base Case.

Geelong Road to Barkly Street

As per Option A.

In summary, the following residential amenity impacts in the Western Region are expected

- Visual and noise dis-amenity.
- Pedestrian amenity and safety impacts.
- Severance effects.

Option C

Eastern Region

Potential works in the Eastern Region under the proposed Option C include land acquisition, surface road works to facilitate the widening of roads for extra lanes and provision of additional on-street parking areas.

A loss of dwellings for road widening would see the back of remaining dwellings becoming a frontage to main roads. This may have adverse impacts from a safety perspective, particularly for pedestrians, as the rear of properties would negatively impact on the passive surveillance quality for the street. A street frontage consisting of the rear of properties would also impact on the amenity of the street, which could damage the historic neighbourhood fabric. Similarly, the existence of a busy arterial along heritage streetscapes could also detract the amenity value of such places.

In some areas, negative impacts from increased severance, noise and increased traffic would be minimal, relative to the situation under the Base Case. However, in others the additional traffic volume would create neighbourhood severance effects.

Specific impacts on areas where road works are highly likely include the following:

Nicholson Street to Lygon Street

The types of anticipated works include land acquisition and surface road work to allow for the widening of streets and additional parking areas.

The acquisition of dwellings would result in the back of remaining dwellings becoming a frontage to the newly widened street. This may have a range of adverse impacts as noted,

particularly given the neighbourhood character of current dwellings in the area which consists mainly of period terrace houses. This would also impact the entire Carlton area which has a historic neighbourhood character.

That being said, traffic levels under the Base Case and poor neighbourhood amenity from traffic congestion and noise indicate that further widening would maintain or only slightly decrease existing amenity.

A significant impact would come from a loss of pedestrians in the area, particularly if the quality of the street frontage were to decline. This loss would have implications for larger scale issues such as community integration and severance.

Lygon Street to Royal Parade

Proposed surface works include the widening of roads.

It is anticipated that the impacts of this would vary depending on the surrounding land-uses. To the north where the Melbourne General Cemetery is located and on the south side where residential uses are set back from the road, amenity decreases would be limited. To the west there may be visual amenity impacts, particularly where the historic buildings of various University of Melbourne colleges are located. An increase in traffic along these roads would result in noise dis-amenity.

Of significance in this area is the possibility of the proposed road widening leading to community severance and safety concerns. This may lead to reluctance of college and other residents in accessing Princes Park which is located to the north. Should residents be reluctant to walk around the area and use facilities like Princes Park, a loss of street vitality and safety would further impact on neighbourhood amenity.

In summary, the following residential amenity impacts in the Eastern Region are anticipated:

- Visual dis-amenity.
- Loss of historic neighbourhood character.
- Severance effects.
- Pedestrian amenity and safety impacts.
- Noise dis-amenity.

Western Region

There would be some land acquisition and surface works. A tunnel would also be constructed using a boring machine under existing uses, and a cut and cover method. Some elevated structures are also proposed.

Many residential areas are expected to suffer from additional noise dis-amenity due to increased traffic volumes. Some areas may also experience visual dis-amenity.

Specific impacts on areas where road works are highly likely under this option include:

CityLink ramp to Colett Street

To create a two lane entrance to a proposed tunnel, acquisition and surface works would be required. This is expected to exacerbate the noise dis-amenity currently being experienced by the residents in this area.

An alternative to creating a two lane entrance between CityLink ramp and Colett Street would be to bring the tunnel entrance back to the Royal Park. This would however have significant impact on the parkland amenity.

Dynon Road to Ballarat Road

As per Option A.

Ballarat Road: Geelong Road to Ashley Street

As per Option A.

North South Link: Paramount Road/ Ashley Street to Barkly Street

As per Option A.

In summary, the following residential amenity impacts in the Western Region are anticipated:

- Noise and visual dis-amenity.
- Severance effects.
- Pedestrian amenity and safety impacts.

Option D

Option D consists of the public transport investments that are common to all the final three proposed private transport options, i.e. Option A, B and C.

The potential works under Option D include:

- An underground CBD rail tunnel from Footscray to Caulfield via the City, with possible stations at:
 - West Footscray Station (*existing*)
 - Melbourne University (*proposed*)
 - Within the CBD (*proposed*)
 - Domain Interchange (*proposed*)
 - St Kilda Junction area (*proposed*)
 - Caulfield Station (*existing*)
- The Tarneit Rail Link, a diesel rail service that will link the Melbourne-Ballarat Railway with Melbourne-Geelong Railway, beginning in Ravenhall and terminating in Werribee West.
- A bus rapid transit on a dedicated lane from the eastern suburbs to the inner city, either along Alexandra Parade or Johnston Street. Note that this option can only be provided in conjunction with the road tunnel. Without the provision of alternative route for private traffic, the provision of a dedicated bus lane may not be feasible.

These potential works for each component and the identified negative impacts on residents are discussed below.

CBD Rail Tunnel

West Footscray Station

The tunnel would be constructed using the boring method to West Footscray Station where it would change to a cut and cover method along the line to the Tottenham Rail Yards section. A new underground station is proposed at West Footscray. A rail portal would also be constructed further along from West Footscray station where the rail lines would surface. Realignment of existing tracks would also occur with the station redevelopment.

The cut and cover method would have some negative amenity impacts during construction. However following this no amenity impacts are anticipated. The station itself is located between vacant land and existing car park thus residential amenity impacts would be limited.

Tottenham Rail Yards

These works are expected to include realignment of existing lines as well as new lines on the surface along the Tottenham Rail Yards. Some tracks would be constructed in a tunnel ramp. Various other realignment of tracks would also occur.

Since most of the works would occur within the bounds of the Tottenham Rail Yards, minimal amenity impacts are anticipated.

Underground Rail Tunnel between West Footscray Station and Caulfield Station

A rail tunnel would be constructed from Footscray to Caulfield via the city primarily using boring methods. It would pass under a variety of land uses including roads, commercial, residential, open space and industrial. A number of stations are proposed between West Footscray and Caulfield as noted above. A cut and cover method is expected to be used at the site of each of the proposed stations.

It is anticipated that there may be negative impacts during construction associated with the cut and cover method, i.e. at the site of each of the proposed stations. However, in most cases once the construction is completed any dis-amenity would be contained within the tunnel.

Malvern Station to Princes Highway

The proposed works in this area include an extension to the existing rail bridge over the Princes Highway and surface works to existing rail lines. A tunnel would be constructed using boring methods next to the existing tracks crossing Princes Highway.

The impacts of these works are anticipated to be minimal, only occurring during the construction phase, given the existence of current railway lines which are separated from residential uses by roads along their edges. As the proposed tracks would be in a tunnel, it is expected that any negative amenity impacts, both visual and noise, would be minimal.

Princes Highway to Caulfield Station

Between the Princes Highway and Caulfield Station, the proposed tracks would continue alongside existing tracks. Upon approaching Normanby Road a tunnel portal would be constructed where tracks would then surface and run at grade next to existing tracks. An existing rail bridge running over a small road crossing would be removed with all tracks running at grade. Existing and proposed rail tracks would be slued onto a new formation to avoid entering the Princes Highway. An existing bridge in the around Smith Street would also be widened.

The anticipated negative impacts of this are likely to include exposure to increased noise particularly by residents to the north of the Princes Highway. While separated from rail impacts by the Princes Highway, the removal of vegetation and addition of three new lines would cause visual amenity impacts as well as potential noise impacts. These amenity impacts would not only be from the loss of vegetation, but the additional bulk of new rail infrastructure which would be effectively doubled. The removal of the road that allows vehicles to go underneath the rail line may also restrict access for some residents. This could lead to community severance, creating a perception of being contained to one side of the rail tracks.

Dwellings to the south of Princes Highway would also be impacted, particularly given that there is a smaller buffer (Normanby Road) between dwellings and the proposed and existing rail lines.

Beyond Smith Street predominant land uses include car parks and commercial premises. Residential amenity impacts are not anticipated.

Tarneit Rail Link

The Tarneit rail link is a diesel rail service that will be developed at grade, linking the Melbourne-Ballarat Railway and Melbourne-Geelong Railway. Beginning at Ravenhall where a station will be constructed, the proposed track will pass through vacant land and the Boral Quarries and Masonry site to Truganina. Here a station will be constructed adjacent to Boundary Road. This link will continue south through Truganina and then head west through Tarneit running parallel to Leakes Road. A station is proposed to be established slightly east of Tarneit Road. Following this, the link will travel south through Mount Cottrell near Shanahans Road and through Wyndham Vale near Academy Way before connecting with the Melbourne-Geelong railway line where a station will be constructed within Werribee West.

The anticipated residential amenity impacts due to the construction of the Tarneit Link include:

- Where the track passes through Tarneit: here, to the south of Leakes Road, a large amount of land has been subdivided for future Residential, Community and Commercial development. Thus, these properties would be exposed to noise and visual impacts. However, it is expected that these could be managed through the implementation of barriers and better urban design.
- At the proposed Tarneit Railway Station: it is anticipated that future residential dwellings within a 500m radius of the station may be impacted by noise dis-amenity; this is estimated to be approximately 150 dwellings.

- Where the proposed track travels through Wyndham Vale: the track would be in close proximity to a large amount of existing and proposed residential and commercial land. The negative impacts would be both noise and visual dis-amenity. However, this could also be managed through the implementation of barriers. That being said, some negative impact to this existing area may occur during construction.

Eastern Suburbs Rapid Bus Transit

A “Strasbourg style” dedicated bus lane would be constructed, either along Alexandra Parade or Johnston Street. This will allow for additional dedicated bus services to and from the eastern suburbs.

Note that this option can only be provided in conjunction with the road tunnel. Without the provision of alternative route for private traffic, the provision of a dedicated bus lane would not be feasible.

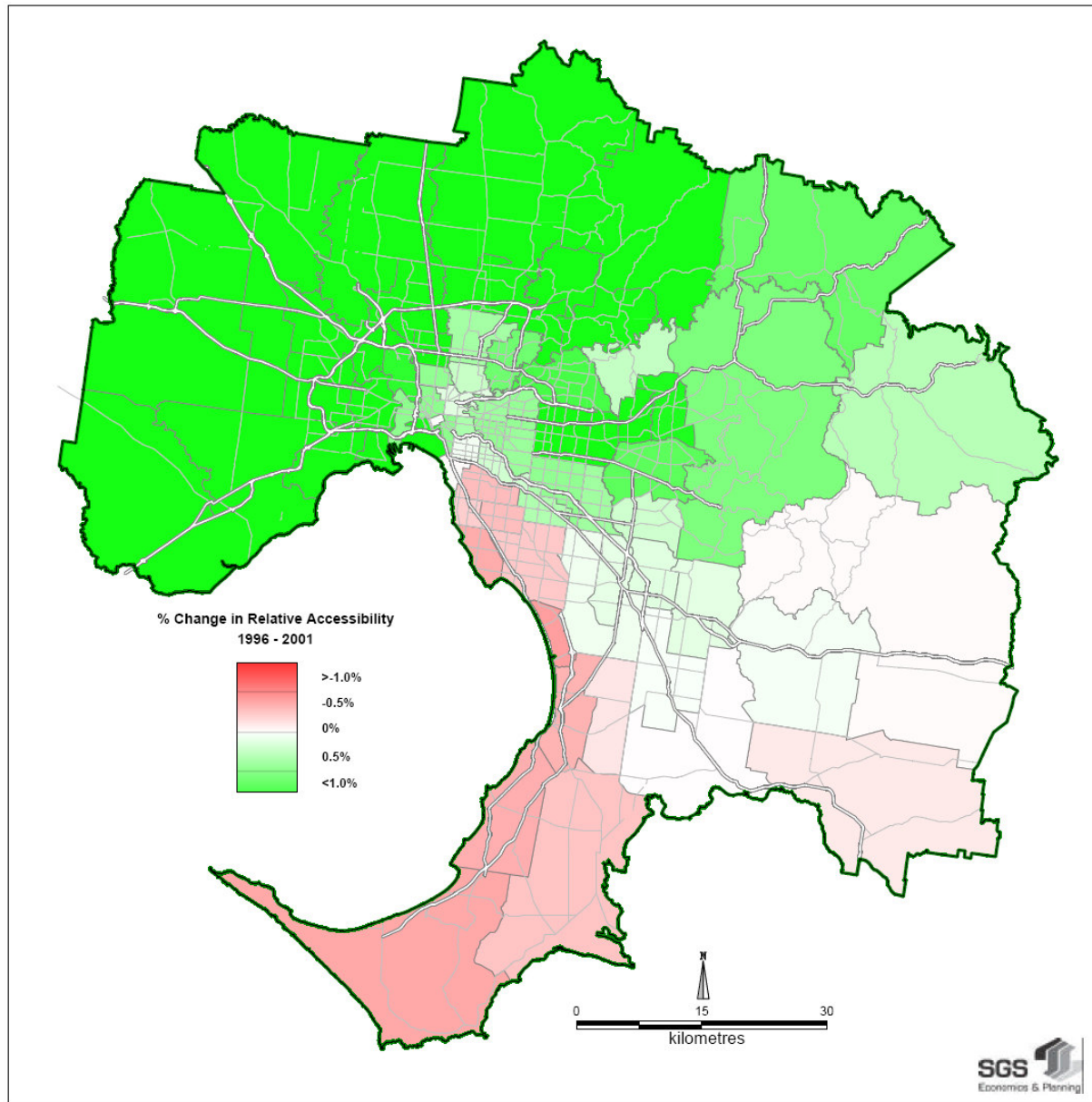
Noise may increase from additional bus traffic. However, closure of lanes for general traffic would mean that car and heavy and commercial vehicle traffic volumes would decline, with the resultant net impact on noise likely to be minor.

2.1.3 Stimulus to Outward Urban Growth

As noted in SGS’s Phase 1 report, accessibility is a significant factor in the locational decisions of households (and firms). Changes in accessibility can significantly alter growth patterns and thus the economic geography of the metropolis. In other words, a lift in a suburb’s accessibility vis a vis other suburbs will improve its capacity to attract and retain households (and jobs). These theoretical predictions are amply borne out by recent experience in Australian cities, particularly with respect to the Western Ring Road, CityLink and EastLink in Melbourne and Westlink (M7) in Sydney.

SGS has estimated household and industry sector specific ‘locational elasticity’ with respect to changes in the accessibility of a given area. Figure 3 shows the changes in relative accessibility experienced across metropolitan Melbourne between 1996 and 2001, a period during which two major road projects came on stream, namely, the Western Ring Road and CityLink. These investments significantly boosted the relative accessibility of the North Eastern, North Western and Western suburbs, sparking significant investment in housing and employment.

Figure 3 Change in Relative Accessibility (%), 1996-01, SLAs in Metropolitan Melbourne



Source: SGS Economics and Planning

The results of SGS's analysis relating changes in households to changes in relative accessibility are summarised in Table 2 (for more detail on accessibility modelling refer to SGS Phase 1 Social, Demographic and Land Use Assessment report). The coefficients indicate the magnitude of the effect that independent variables have on the dependent variable. The t-statistics indicate whether the coefficients estimated are statistically significant.

Table 2 Locational Elasticity of Households to Relative Accessibility in Melbourne

Independent Variable	Dependent Variable	
	Coefficient	T-Statistics
Households (Total Occupied Dwellings)		
Relative Accessibility	217,772.20	14.797
Total Employment	0.23	29.51
Adjusted R-Squared	0.90	

Source: SGS Economics and Planning

Relative accessibility in the analysis is expressed as an index, the value of which ranges from 0 (extreme isolation, a theoretical concept) to 1 (absolute centrality). The regression coefficients therefore provide an indication of the impact that relative accessibility will have on household growth if that Statistical Local Area's (SLAs) accessibility improved from extreme isolation to absolute centrality. Thus, if a SLA's relative accessibility improves from 0 to 1, household growth in that SLA for example will increase by around 217,700.

By applying the above reported regression estimates to the changes in relative accessibility under the various options (See Figure 4, Figure 5 and Figure 6 overleaf) potential shifts in Melbourne's urban structure were estimated.

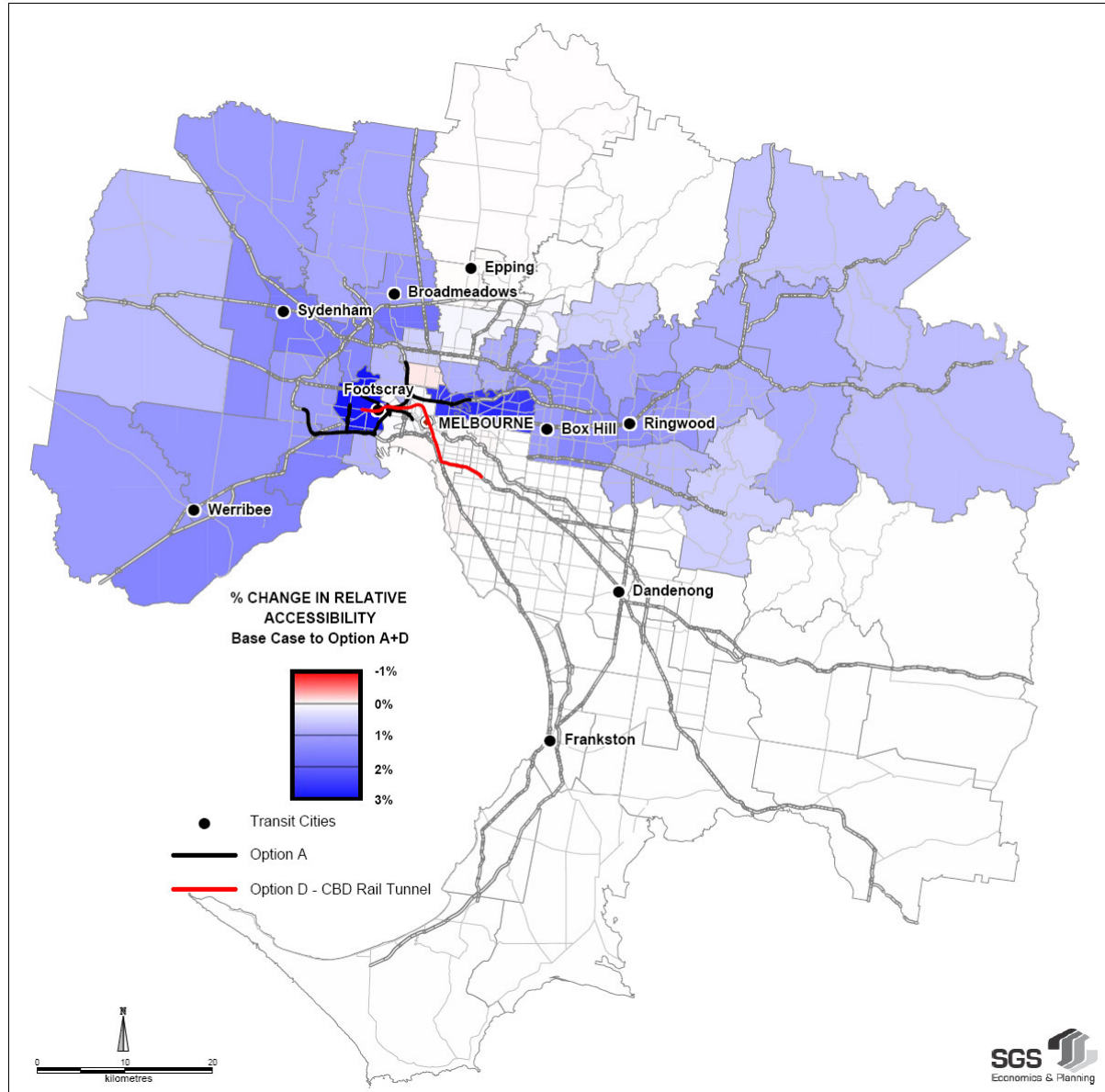
The analysis indicates that, in net terms, Option A + D would lead to additional 500 households locating in the fringe SLAs of Melbourne, compared to the Base Case scenario (i.e. VIF 2004). On the other hand Option B + D is largely urban form neutral; while Option C + D promotes additional development in established areas to the tune of around 3,000 households.

Table 3 Net Shifts in Households due to Changes in Relative Accessibility, Option A+D, B+D and C+D Compared to Base Case

	Change in Number of Households, Option A+D versus Base Case	Change in Number of Households, Option B+D versus Base Case	Change in Number of Households, Option C+D versus Base Case
Additional Household Growth in Established SLAs	-487	25	2,960
Additional Household Growth in Fringe SLAs	487	-25	-2,960

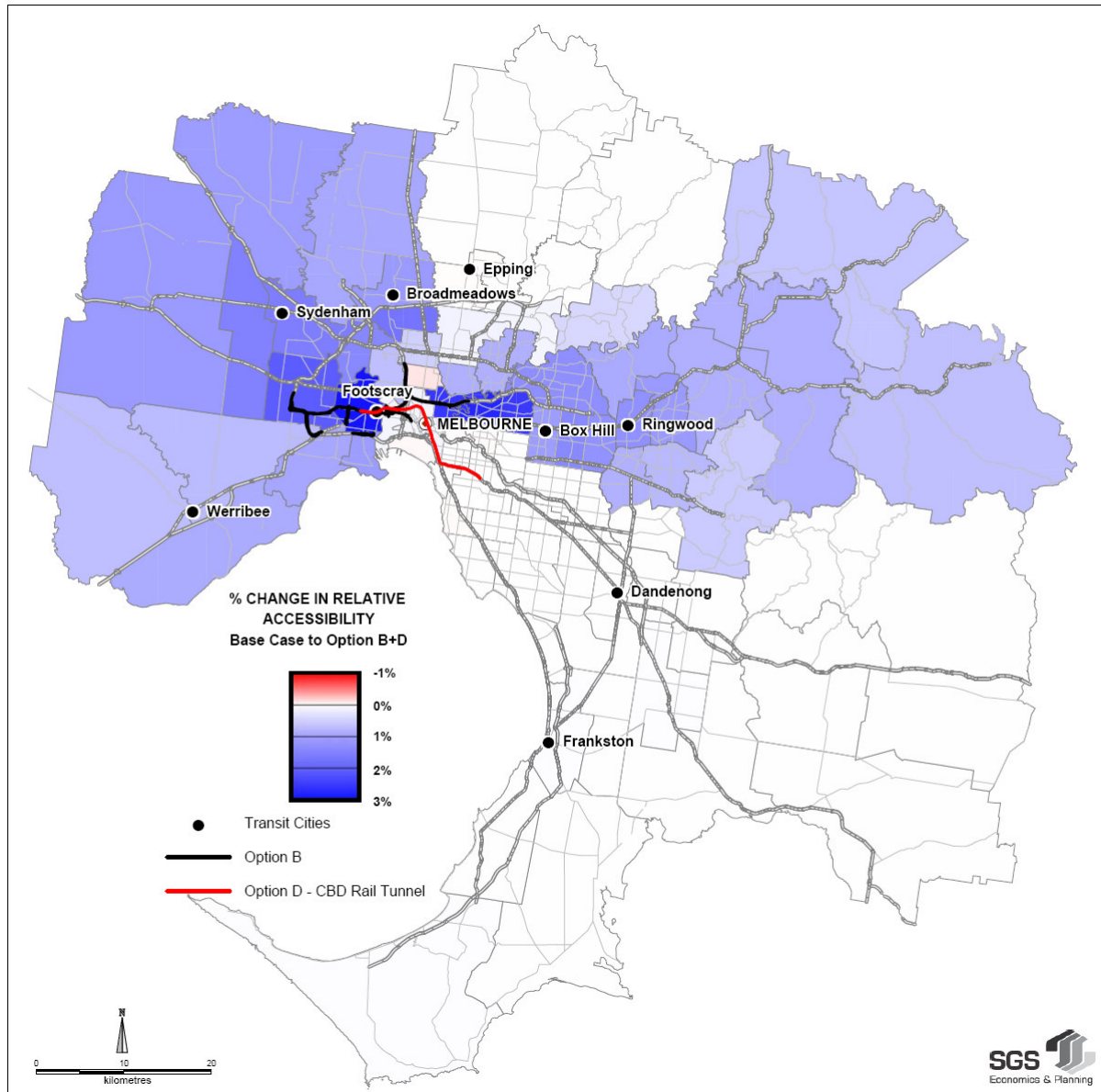
Source: SGS Economics and Planning

Figure 4 Change in Relative Accessibility (%), Base Case to Option A+D, SLAs in Metropolitan Melbourne



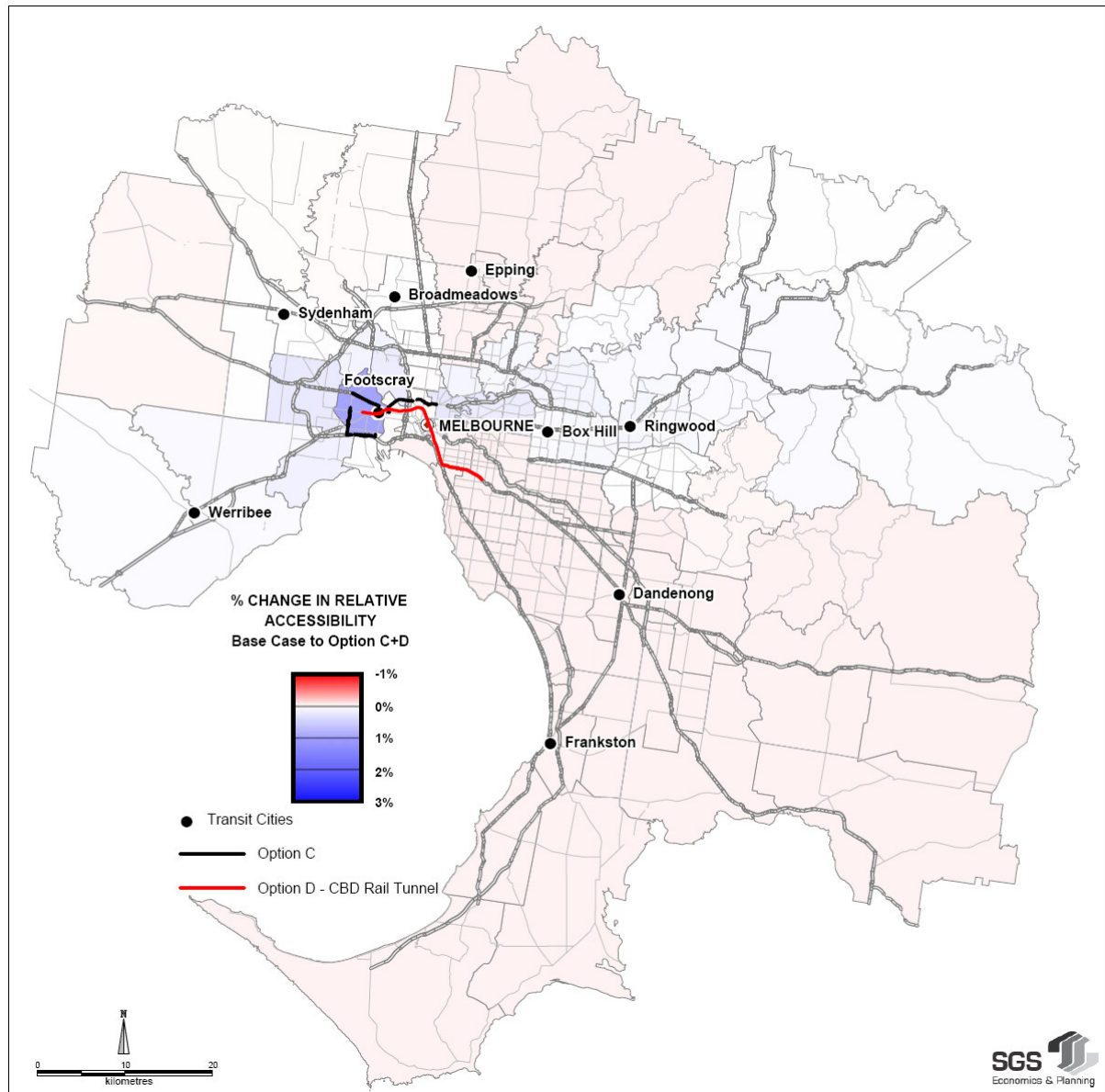
Source: SGS Economics and Planning

Figure 5 Change in Relative Accessibility (%), Base Case to Option B+D, SLAs in Metropolitan Melbourne



Source: SGS Economics and Planning

Figure 6 Change in Relative Accessibility (%), Base Case to Option C+D, SLAs in Metropolitan Melbourne



Source: SGS Economics and Planning

2.2 Description of Marginal Benefits

2.2.1 Increased Choice/ Access to Jobs and Services

The new infrastructure projects under each of the proposed East-West Link options are expected to enhance resident access to jobs, education, health, retail and other services across the metropolitan area. Note that this is different to the travel time savings in trips that would have been undertaken anyway under the Base Case. The latter measures

improvements in access to opportunities already within convenient reach of households whilst the above noted benefit relates to the extension of this reach/ catchment for households.

Changes in a household's ability to access jobs and services arise from two distinct factors as follows:

- 1) Change in access to jobs and services due to firms relocating to more accessible locations across the metropolitan area; and
- 2) Change in accessibility due to reduced travel times across the metropolitan area, and therefore the extension of the catchment within an acceptable travel time of 30 minutes.

As noted in Section 2.1.3 above, a lift in a suburb's accessibility vis a vis other suburbs will improve its capacity to attract and retain households and jobs. SGS estimated the industry sector specific 'locational elasticity' with respect to changes in the accessibility of a given SLA in metropolitan Melbourne (see Table 4 below).

Table 4 Locational Elasticity of Jobs by Industry to Relative Accessibility in Melbourne

Independent Variable	Dependent Variable	
	Coefficient	T-Statistics
Agriculture, Forestry and Fishing		
Relative Accessibility	-133.877	-2.945
Households	-0.001	-2.155
Adjusted R-Squared	0.856	
Mining		
Relative Accessibility	657.408	22.629
Households	-0.007	-27.636
Adjusted R-Squared	0.788	
Manufacturing		
Relative Accessibility	11,121.740	167.675
Households	0.103	45.432
Adjusted R-Squared	0.971	
Electricity, Gas and Water Supply		
Relative Accessibility	987.991	30.414
Households	-0.008	-29.914
Adjusted R-Squared	0.884	
Construction		
Relative Accessibility	2,192.353	18.183
Households	0.016	9.187
Adjusted R-Squared	0.974	
Wholesale Trade		
Relative Accessibility	6,579.014	17.044
Households	-0.006	-1.222
Adjusted R-Squared	0.787	
Retail Trade		

Independent Variable	Dependent Variable	
	Coefficient	T-Statistics
Relative Accessibility	9,570.861	24.587
Households	0.055	82.751
Adjusted R-Squared	0.959	
Accommodation, Cafes and Restaurants		
Relative Accessibility	14,116.840	8.221
Households	0.097	109.587
Adjusted R-Squared	0.900	
Transport and Storage		
Relative Accessibility	4,509.116	9.913
Households	0.034	276.615
Adjusted R-Squared	0.899	
Communication Services		
Relative Accessibility	-4,610.176	-7.108
Households	0.028	37.521
Adjusted R-Squared	0.799	
Finance and Insurance		
Relative Accessibility	22,349.960	19.005
Households	0.219	21.411
Adjusted R-Squared	0.774	
Property and Business Services		
Relative Accessibility	27,477.650	22.837
Households	0.208	14.834
Adjusted R-Squared	0.908	
Government Administration and Defence		
Relative Accessibility	10,940.970	9.024
Households	-0.105	-7.183
Adjusted R-Squared	0.770	
Education		
Relative Accessibility	26,265.010	15.947
Households	0.090	36.292
Adjusted R-Squared	0.899	
Health and Community Services		
Relative Accessibility	11,112.410	56.792
Households	0.034	18.812
Adjusted R-Squared	0.937	
Cultural and Recreational Services		
Relative Accessibility	4,729.788	27.129
Households	0.034	32.984
Adjusted R-Squared	0.756	
Personal and Other Services		
Relative Accessibility	4,590.718	2.780
Households	0.021	8.488
Adjusted R-Squared	0.998	

Source: SGS Economics and Planning

In estimating the changes in household access to jobs and services SGS, in the first instance, applied the above estimated region coefficients to the changes in relative accessibility (See Figure 4, Figure 5 and Figure 6 above) to simulate the changes in the spatial distribution of jobs by industry across all SLAs in Melbourne.

The change in number of jobs and services accessible within 30 minutes of (car) travel time under each of East-West Link option was then estimated.

Each of the three final options was then assessed in terms of their ability to enhance the household access to jobs and services that currently have limited access (i.e. are in the bottom 3 quintiles of the accessibility distribution). The top 30 SLAs that would have limited access to jobs and services under the Base Case, but are expected to benefit most under each of the three proposed options are listed in the table below.

Table 5 Change in Access to Jobs and Services within 30 minute (Car) Travel Time for Households in the Bottom 3 Quintile

Statistical Local Areas	Change in Access to Jobs and Services within 30 min Travel Time, Option A + D	Change in Access to Jobs and Services within 30 min Travel Time, Option B + D	Change in Access to Jobs and Services within 30 min Travel Time, Option C + D
Hobsons Bay (C) - Altona	252,028	114,238	61,307
Brimbank (C) - Sunshine	165,054	256,803	115,568
Brimbank (C) - Keilor	71,368	74,323	29,813
Banyule (C) - Heidelberg	55,113	60,737	23,324
Manningham (C) - West	45,102	34,924	6,939
Hume (C) - Broadmeadows	43,460	41,219	19,197
Bayside (C) - South	14,760	16,554	19,602
Knox (C) - South	14,144	13,854	14,631
Gr. Dandenong (C) Bal	11,529	11,555	10,228
Casey (C) - Hallam	10,396	10,604	10,662
Frankston (C) - West	10,213	10,228	9,345
Knox (C) - North-East	8,180	6,260	2,018
Maroondah (C) - Ringwood	7,938	3,974	3,181
Darebin (C) - Preston	7,226	6,505	6,293
Wyndham (C) - North	6,571	3,559	870
Banyule (C) - North	6,555	6,105	3,477
Nillumbik (S) - South	5,345	6,786	5,602
Casey (C) - Berwick	3,903	3,907	3,270
Yarra Ranges (S) - Lilydale	3,874	3,246	1,011
Whittlesea (C) - South-East	3,318	2,937	-329
Kingston (C) - South	2,967	3,007	1,850
Wyndham (C) - South	2,254	1,256	237

Statistical Local Areas	Change in Access to Jobs and Services within 30 min Travel Time, Option A + D	Change in Access to Jobs and Services within 30 min Travel Time, Option B + D	Change in Access to Jobs and Services within 30 min Travel Time, Option C + D
Melton (S) - East	1,818	2,334	-9,650
Yarra Ranges (S) - Seville	1,602	1,384	127
Yarra Ranges (S) - Dandenongs	1,586	1,411	-69
Frankston (C) - East	1,213	1,079	860
Cardinia (S) - Pakenham	1,028	1,031	785
Hume (C) - Craigieburn	1,013	895	-73
Yarra Ranges (S) - North	851	725	72
Whittlesea (C) - South-West	563	114	-389

Source: SGS Economics and Planning

Note that while we have limited the benefit households derive from improved access to jobs and services to those that are estimated to be within the bottom 3 quintiles of the accessibility distribution, it is likely that **all** households would benefit from improved access to jobs and services. In this sense, the identified benefit from improvement in choice/ access to jobs and services is deemed to be highly conservative.

Overall, the analysis suggests that both Option A and B contribute similarly in terms of improving the range of choice or access to jobs and services for households that have limited access to services. On the other hand, Option C provides relatively limited improvement in choice/ access to jobs and services.

2.2.2 Reduced or Eliminated Severance and Improvement to Residential Amenity

Residential amenity benefits considered include noise, visual and pedestrian amenity improvement, benefits through reduced severance and improvements to community cohesion.

There is significant evidence that the residential amenity (noise and visual) along key collector roads within the East West study area is currently being compromised due to high heavy commercial and passenger traffic volumes on local roads. This is particularly the case along the north and south of Princes Highway and Alexandra Parade and in the inner western suburbs of Yarraville and Footscray. The high levels of passenger and heavy commercial traffic also present significant barriers to pedestrian movement, dividing the local communities.

Any East West Link that leads to significant reduction in traffic (defined as one third reduction in heavy commercial vehicle or halving of passenger vehicles) on the collector roads/ arterials, leading to reduction in noise and visual dis-amenity, increased pedestrianisation and reduced barriers between local communities can be expected to enhance the amenity of residents.

All the final 3 options being evaluated help contribute towards the objective of improved residential amenity and reduced severance effect, albeit to varying degrees.

By far the most important initiative, which is common to all three private transport options, is the proposed ban of heavy commercial traffic under the ‘truck action plan’ in Yarraville and Footscray. A number of roads have been proposed to accommodate freight traffic needs to enable compliance with the truck ban. Heavy and commercial vehicles would thus be expected to utilise the proposed new/ upgraded road infrastructure rather than residential streets. Local roads such as Somerville Road, Francis Street, Williamstown Road and Hyde Street, as well as several residential streets, currently experience significant heavy and commercial vehicle traffic. Improvements to the road network that draw more than 30% of the heavy and commercial traffic from these streets will improve the amenity levels of the residents. The proposed ban on heavy commercial traffic in the ‘truck action plan’ is expected to lead to decreases in noise, improved visual amenity, improved pedestrian amenity and safety and decreased community severance effects. This will lead to improvements to the liveability and general amenity of these areas.

Figure 7: Truck Ban Area (‘Truck Action Plan’), Yarraville and Footscray



Source: Department of Infrastructure

The boundaries of the truck ban area include Ballarat and Geelong Roads to the north, Roberts Street to the west, a line roughly north of West Gate Freeway and Hyde Street to the east.

In addition, the provision of new infrastructure in Option A and B is expected to lead to a significant decline in traffic on Alexandra Parade and Princes Street and on a number of arterials both to the north and south of the tunnel link. This is expected to significantly enhance the amenity of the residents in the Eastern region.

Under Option C, however, the improvement to residential amenity is expected to be more localised around Brunswick, Johnston Street and Racecourse Road area.

Additional benefits associated with all three options include:

- Facilitation of bike lane network improvements – the development of new road infrastructure would allow for expansion of the bike network which could link the eastern and western suburbs, with a connection eventually made to the western suburbs Federation Bike Trail. Other bike improvements could also occur along Johnston Street and Alexandra Parade.
- Amenity improvement due to public transport investments – the proposed public transport investments, common to all three private transport options, can act as a catalyst for regeneration and private sector investment. Train stations provide a central location for development such as retail, commercial and residential which can significantly improve the amenity levels of the local community.

Other specific benefits under each of three options are outlined below.

Option A

While passenger traffic volumes may increase along Alexandra Parade in the Eastern region commercial and other heavy vehicle traffic volumes are expected to decline on the arterials. This would lead to an increase in amenity within the area through reduced severance and a reduction in noise created by commercial and other heavy vehicles. Potentially, this would offset any negative impacts produced by a potential increase in passenger traffic.

The reduction in commercial and other heavy vehicles would make Alexandra Parade and Princes Streets more hospitable to pedestrians, with car parking provision creating a 'barrier' between traffic and pedestrians. This aspect of safety is important given the location of a number of recreational reserves and activities along Alexandra Parade which may see an increase in patronage if the area is perceived more positively. Ultimately this would further improve attractive attributes and the general amenity of the area.

In addition, a number of local roads both to the north and south of the tunnel link would benefit from reduced traffic congestion.

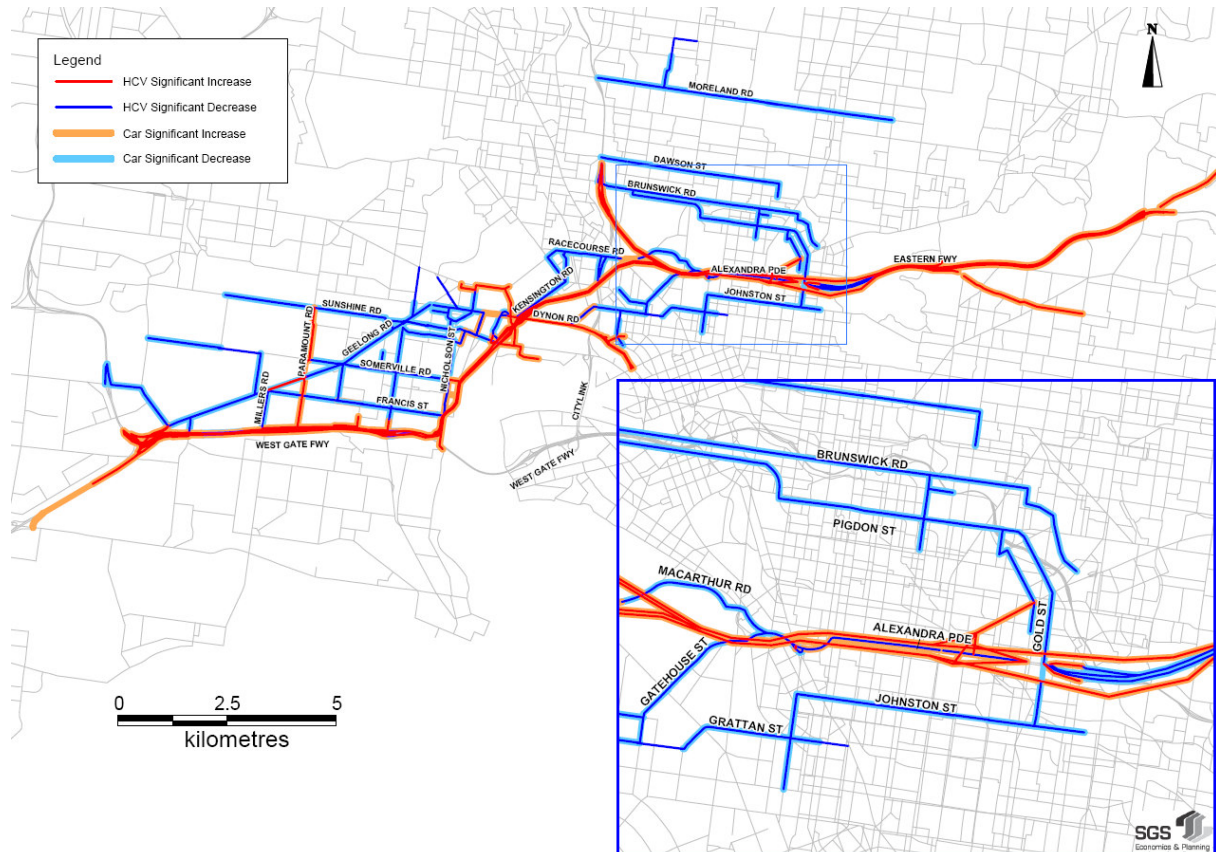
Selected roads that are expected to benefit from this tunnel include:

- North: Cemetery Road East, College Crescent, Cemetery Road West, Macarthur Road, Elliott Avenue, Park Street, Pigdon Street, Brunswick Road, Dawson Street and Moreland Road.
- South: Alexandra Parade/Princes Street (heavy and commercial vehicles only), Johnston Street, Elgin Street, Swanston Street, Gold Street, Gatehouse Street, Arden Street, Grattan Street and Dryburgh Street.

Local communities around these roads/ streets are expected to experience an improvement in their amenity levels. This would principally be due to visual and pedestrian amenity improvements, as well as noise improvements. Transport modelling undertaken by VLC suggests that the private and commercial heavy vehicle traffic volumes are expected to decline significantly³ in this region (see Figure below).

³ A significant reduction in traffic volume is defined as – at least a halving for car traffic volumes and at least a one third decline for heavy commercial traffic volumes.

Figure 8 Traffic Volume Changes over a 24 Hour Period, Option A Compared to Base Case



Source: SGS Economics and Planning based on Transport Modelling Outputs provided by VLC

Johnston Street is expected to experience a significant decline in traffic due to the loss of a lane for car/freight traffic in each direction to allow for “Strasbourg style” bus lanes. These lanes divide buses from other traffic and pedestrians through raised median strips. This would mitigate the noise dis-amenity of the area. In addition, reclaiming some road space from private transport in favour of public transport is expected to improve visual amenity.

A reduction in traffic on Macarthur Road and Elliott Avenue, both of which run through Royal Park, would benefit park users particularly due to noise reduction (therefore increasing enjoyment and tranquillity of the park), lower community severance allowing users to move more freely between north and south of these roads and an increase in safety for park users.

Following construction works, Royal Park is expected to benefit from regeneration due to restoration and upgrades (see Section 2.1.1 above).

In summary the residential amenity levels in the whole of the Eastern Region can be expected to improve significantly due to:

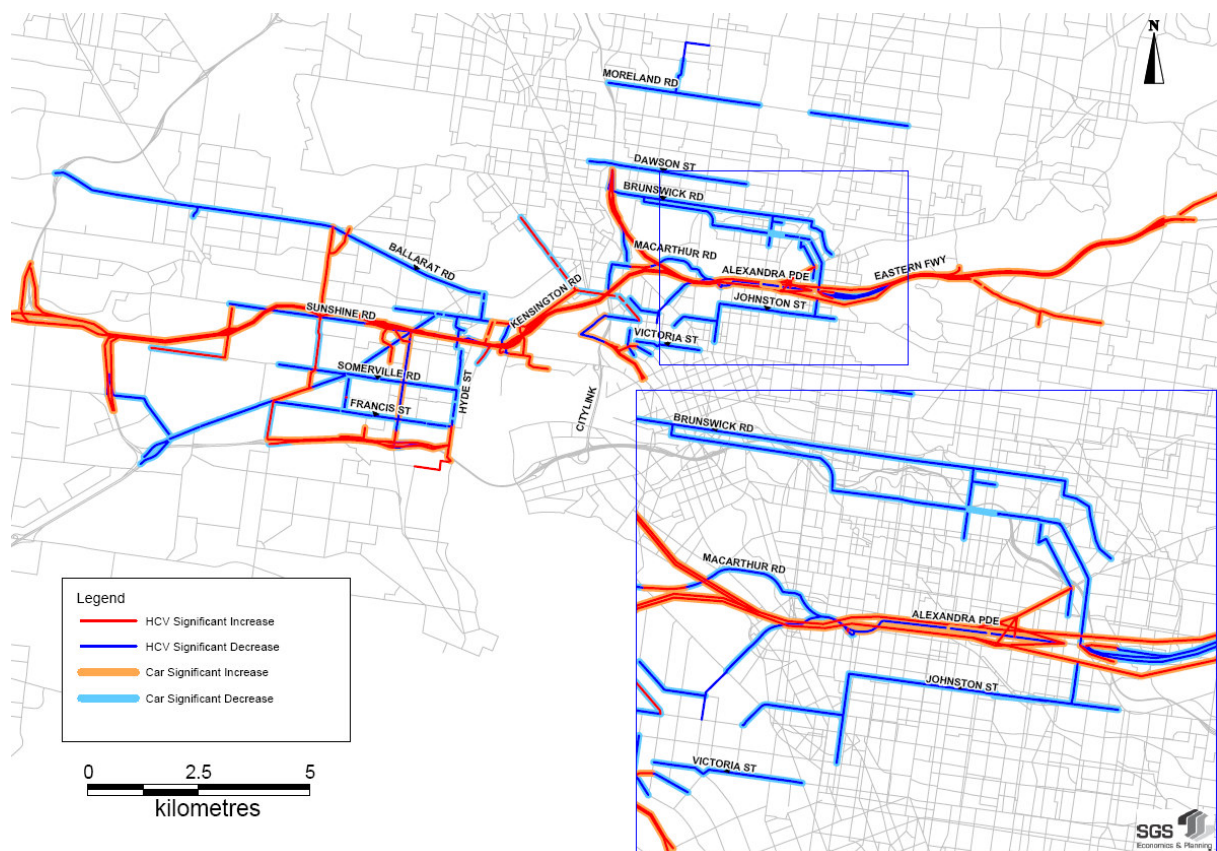
- Reduced traffic on local roads leading to improved noise amenity
- Improvements to visual amenity.
- Improved pedestrian interface and safety.
- Reduced severance on Macarthur Road and Elliott Avenue.

As noted above, residents in the Western Region would experience significant improvement in their amenity levels due to the proposed ban of heavy commercial traffic in the 'truck action plan'.

Option B

Similar to Option A, the transport modelling undertaken by VLC suggests that traffic volumes on local roads would decline significantly (see Figure below). This would lead to improved residential amenity and reduced community severance in the Eastern Region.

Figure 9 Traffic Volume Changes over a 24 Hour Period, Option B Compared to Base Case



Source: SGS Economics and Planning based on Transport Modelling Outputs provided by VLC

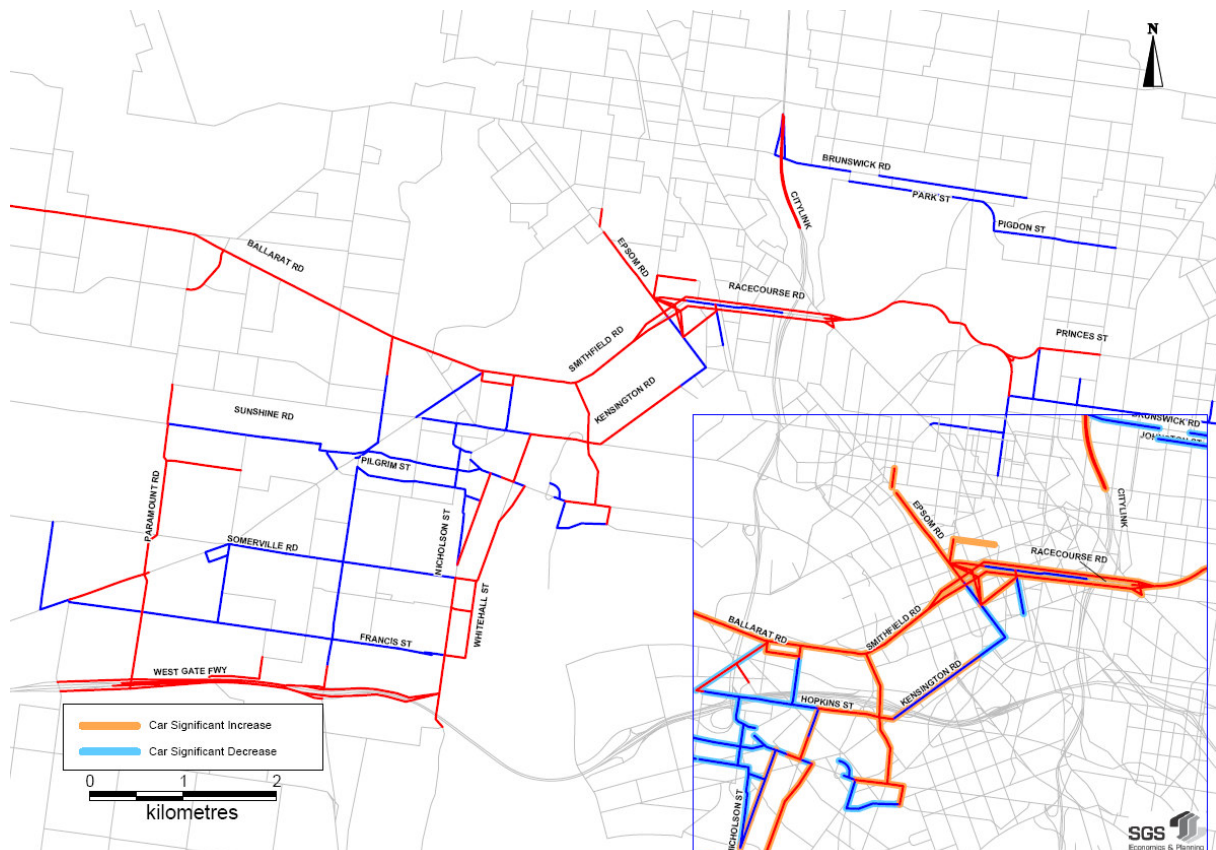
Consistent with Option A, a truck ban area would be implemented in the inner western suburbs of Yarraville and Footscray. The proposed roads would enable significant reduction in heavy and commercial vehicles in local residential areas, therefore improving local amenity and reducing community severance.

Option C

Eastern Region

A number of communities surrounding the proposed works would experience a significant reduction in private and heavy commercial traffic volumes (see Figure below).

Figure 10 Traffic Volume Changes over a 24 Hour Period, Option C Compared to Base Case



Source: SGS Economics and Planning based on Transport Modelling Outputs provided by VLC

Two clusters would be formed, one to the north (the suburbs of Brunswick, Princes Hill and Fitzroy North) and one to the south (Carlton, Fitzroy, Collingwood and Abbotsford) of works from Princes Street to Racecourse Road where traffic volumes are expected to decline.

Selected roads in the Brunswick area that would benefit under this option include Brunswick Road, Park Street and Pigdon Street. Selected roads in the Johnston Street area that would benefit from works include Johnston, Elgin, Gold, Canning, Lygon, Grattan and Swanston Streets. The residential communities around these roads would experience significant improvements in visual, noise and pedestrian amenity levels.

Western Region

A reduction in traffic congestion and enhanced traffic calming would assist with pedestrian amenity in Flemington, particularly along Racecourse Road. The Racecourse Road shopping precinct is designated as Major Activity Centre under the Melbourne 2030 and any increases

in amenity would benefit the centre positively. A perceived increase in pedestrian safety could result in community interaction through enhancement of the centre as a focal point, as well as increasing potential customer catchments. It may promote investment in the centre which would lead to further improvement in amenity levels.

As noted earlier, a truck ban in the 'truck action plan' would improve local visual and noise amenity and reduce community severance.

Option D

CBD Rail Tunnel

West Footscray Station

A new underground station is proposed at West Footscray. This will provide an opportunity to improve the above ground amenity and liveability of the local community; including opportunities for regeneration and mixed use development (see Section 2.2.3 below).

Underground Rail Tunnel between West Footscray Station and Caulfield Station

The anticipated positive impacts would be to the areas surrounding the train stations, especially around the Melbourne University. These areas would see an increase in activity and investment, with some regeneration opportunities being created (see Section 2.2.3 below). This would improve the amenity and liveability of the surrounding areas.

Tarneit Rail Link

The anticipated positive impacts are likely to be in the areas surrounding the proposed stations at Ravenhall, Tarneit and Wyndham Vale. These train stations are surrounded by existing or proposed future residential development. With the development of the train stations, it is likely there would be further increases in activity and investment, thus contributing to amenity and liveability.

Eastern Suburbs Bus Link

A dedicated bus lane could be constructed either along Alexandra Parade or Johnston Street. This will allow for additional dedicated bus services to and from the eastern suburbs. The anticipated positive impacts include an increase of public transport patronage and movement of people. This would in turn result in benefits for the local area by providing viable local shopping facilities and improved amenity, ultimately providing stimulus to regeneration of the area.

2.2.3 Creation of Regeneration or Urban Consolidation Opportunities

The proposed East-West Link options are expected to create several opportunities for regeneration and urban consolidation. Various factors that are expected to stimulate regeneration include reduction/ elimination of severance effects, improvement in local amenity, opportunity to amalgamate small vacant/ or not fully utilised sites, improved access to public transport infrastructure etc. These opportunities are identified below.

All Options

Victoria Park

This section refers to an area defined by Victoria Park station and the railway line to the west, Maugie Street to the north, Trenerry Crescent to the east and Johnston Street to the south. While a small portion of this area, between Federation Lane and Maugie Street is covered by a heritage overlay as part of the Yarra Planning Scheme, most of this site is free of such constraints and would be ideal for regeneration/ redevelopment.

A regeneration site has been identified between Lulie Street and Victoria Park station and railway line. The area immediately east of Victoria Park station is used as a car park, with the remainder of the area vacant and unused.

This site is in close proximity to public transport (rail and bus) and represents a good opportunity for mixed use development. This could include medium to high density residential and retail/ commercial uses. Retail/ commercial uses would be located closest to the railway line to limit negative amenity impacts on residential uses (which would front Lulie Street), as well as to utilise pedestrian flows at Victoria Park Station. However, the development would predominantly be residential. Suitable retail uses could include convenience outlets to serve the immediate community. If a suitable pedestrian linkage were to be provided, the catchment could extend across to residents on Rutland Street and Alexandra Parade East.

The total land area in this site is estimated to be around 2.62 hectares. Applying relatively conservative gross density of 40 dwellings per hectare (to allow for retail/ commercial uses and existing dwellings) it is estimated that approximately 100 net additional dwellings could be developed in this area.

Johnston Street

If the dedicated bus lane were to be developed along Johnston Street, the span of Johnston Street from Nicholson Street, Abbotsford to Nicholson Street, Carlton would benefit greatly from regeneration opportunities. While a “Strasburg style” bus lane would have the effect of calming traffic along Johnston Street, pedestrian amenity measures such as tree planting, seating and footpath widening and/or improvement would improve amenity along this once bustling shopping strip.

Provision of a dedicated bus lane would be beneficial in facilitating such improvements and would encourage private sector investment in the strip. This provision would have to be carefully considered and integrated with design aspects, including bus stops that promote ease of use and efficient travel times. Should the service be regarded as effective as tram lines, which are synonymous with effective and thriving strip shopping centres in Melbourne, Johnston Street could once again become a vibrant strip centre. This however would have to be undertaken in conjunction with significant investment and regeneration initiatives.

Some areas of Johnston Street, such as from Nicholson to Brunswick Streets provide a number of restaurants, shops and bars, making it a popular spot for those visiting the Brunswick area. Tram provision on Nicholson, Brunswick and Smith Streets has assisted in providing patrons for these areas.

Johnston Street itself is seen as a 'drive through' area, with possible customers and pedestrians simply passing through. Consequently, areas east of Smith Street have become tired and run down.

In particular, Johnston Street between Nicholson and Hoddle Streets (Abbotsford) has become a quiet area with very little pedestrian activity, despite the presence of Victoria Park Station. This intersection of train and bus would normally result in a vibrant centre; however a dominance of vehicles, as well as poor amenity in the area has been a negative factor.

Possible uses for this area could include upcoming businesses, particularly fashion design boutiques to complement new art galleries that are located west of Hoddle Street. This would create a niche market to attract customers from a metropolitan catchment, as well as drawing traditional customers from the Brunswick and Smith Street area. Residential uses would be encouraged behind and above shops.

Across Hoddle Street, Johnston Street has many business uses, particularly to Smith Street. While galleries and small businesses are beginning to appear along Johnston Street, regeneration could see more businesses and commercial opportunities that would revive the strip. Residential activities should also be encouraged behind and above frontages.

In summary, significant investment and careful attention to detail and design could assist private sector investment and regeneration.

The total land area is estimated to be around 18.65 hectares. Applying relatively conservative gross density of 25 dwellings per hectare (to allow for retail/ commercial uses and existing dwellings) it is estimated that approximately 466 net additional dwellings could be developed on this site.

Option A

Alexandra Parade

A site located north of Alexandra Parade between Napier and George Streets in Fitzroy (where a tunnel portal is proposed) could be redeveloped for commercial purposes. Commercial development within this site would support existing retail and community facilities (on the south side of Alexandra Parade), including Fitzroy Pool, Fry's Self Storage and Office Works. Furthermore, existing tramlines on both nearby Brunswick and Smith Streets would allow this potential commercial site to be easily accessible by the community.

There are also a number of sites north of Alexandra Parade and slightly west of Brunswick Street Major Activity Centre that have the potential to be acquired and redeveloped for medium to high density housing. This would support the objectives of *Melbourne 2030* to, 'encourage higher density development on sites well located in relation to activity centres and public transport.'

The total land area is estimated to be around 2.25 hectares. Applying relatively conservative gross density of 40 dwellings per hectare (to allow for retail/ commercial uses and existing dwellings) it is estimated that approximately 90 net additional dwellings could be developed on this site.

Ballarat Road: Geelong Road to Ashley Street

As previously mentioned, some residential dwellings would need to be acquired to allow for the widening of Ballarat Road to three lanes in each direction (an addition of two lanes). Although this is the case, a significant amount of land would remain available for re-development. As such, potential regeneration opportunities on Ballarat Road include;

- Between Geelong Road and Droop Street, a number of sites could be acquired and amalgamated for medium and high density housing. There is a strong potential for student housing and professional city workers, as this area is in close proximity to Victoria University and is easily accessible to the city by tram.

The total land area is estimated to be around 1.91 hectares. Applying average dwelling density of 50 dwellings per hectare it is estimated that approximately 95 net additional dwellings could be developed on this site.

- Between Commercial Road and Gordon Street there is the potential to amalgamate a number of sites. These sites could be used for residential purposes. Other properties in this area could be zoned for commercial uses including retail or office space to coincide with surrounding uses and further support the growing resident population.

The total land area is estimated to be around 7.14 hectares. Applying average dwelling density of 35 dwellings per hectare it is estimated that approximately 250 net additional dwellings could be developed on this site.

Option B

Alexandra Parade

As per Option A.

Option C

Princes Street

The types of works anticipated in this area include the acquisition of residential land for the widening of Princess Street. Specifically, only part of the acquired land would be used for road works; some residential land would remain available, for re-development. Potential uses include medium density housing given the areas close proximity to Lygon Street Major Activity Centre, public transport, existing community uses including Carlton Baths and Community Centre, Carlton Health Centre and to the Central Activities District (<1.5km).

The total land area is estimated to be around 3.09 hectares. Applying average dwelling density of 40 dwellings per hectare it is estimated that approximately 124 net additional dwellings could be developed on this site

Ballarat Road: Geelong Road to Ashley Street

As per Option A.

Option D

West Footscray Railway Station

The regeneration opportunities by redeveloping the West Footscray Station underground would be significant; this would allow improvement to the above ground amenity, and possible opportunities for mixed use development. Furthermore, its proposed role as a destination point to access the proposed underground rail tunnel will further encourage private sector investment.

The total land area on this site is estimated to be around 6.69 hectares. Applying an average dwelling density of 35 dwellings per hectare it is estimated that approximately 235 net additional dwellings could be developed on this site.

2.2.4 Stimulus to Increased Infill Development

As noted in Section 2.1.3 above, shifts in relative accessibility contours under Option C are highly conducive to infill, and is estimated to promote additional development in the established areas across Melbourne to the tune of around 3,000 households (see Table 3 above).

3 Quantification of Costs and Benefits

The above described costs and benefits have been quantified in \$ terms. The methodologies used for the various items of external costs and benefits are detailed below.

3.1 Quantification of Marginal Costs

3.1.1 Loss of Access to Open Space/ Parkland, Net Impact

Section 2.1.1 above identified several impacts on open space/ parkland amenity (both quantity and quality) under each of the final 3 proposed options.

Access to the open space/ parklands impacted under each of the final 3 proposed options are un-priced. Consequently, willingness to pay for enhanced park benefits must be estimated via alternative means.

Available data on current visitation to these parks is incomplete. SGS has therefore resorted to simulating visitation with the 3 proposed options and under the Base Case scenario by using a model created by Parks Victoria⁴. This model was developed by regressing actual visits to 29 major parks in Melbourne against a measure of the standard of each park, the catchment population of the park and the accessible area of the park.

Parks Victoria's preferred form for the model is as follows:

$$\text{Visits} = 27 \times \text{Service Standard}^{1.04} \times \text{Catchment Population}^{0.19} \times \text{Area}^{0.11} \times \text{Public Awareness}^{0.47}$$

This was found to explain 75% of the variation in observed visitation at the sample parks.

The service standard of the parklands is defined on a scale on 0-100 based on 17 park attributes that are important to visitors. The catchment population is based on that population which lives within a 15 minute drive of the parkland. Awareness is defined on a scale on 0-100 based on how well known the parklands are to the community.

By applying the Parks Victoria model, annual visitation to each of the parklands impacted under various options were estimated and are detailed in Table 6.

⁴ Zanon, D. (1998) *A Model for Estimating Urban Park Visitation* An Occasional Paper published by Parks Victoria

Table 6 Estimated Annual Parkland Visitations

Parkland Affected	Service Standard	Area	Catchment Population	Awareness	Estimated Visitation Per Year
JJ Holland Park	56	11.18	369,720	40	150,000
Royal Park	69	170	584,376	60	332,000
Spotswood Oval	29	8.56	399,984	10	39,000
Newells Paddock Wetlands Park	34	20.12	422,760	25	78,000

Source: SGS Economics and Planning

In a study undertaken in 2000, Read Sturges & Associates found, by modelling visitation to major parks in Melbourne, that visitors spent approximately \$14.00 in travel costs each visit, including vehicle and time costs. The derived demand function for this recreational opportunity indicated that, on average, the consumer surplus for each visit was \$7.00. Thus total willingness to pay for a park visit was \$21.00. However, for the purposes of this analysis, we have applied a standard \$10/hour willingness to pay factor, based on an average 2 hour visit.

There is substantial evidence in the Australian literature that non-usage and option benefits actually outweigh user benefits in aggregate externalities (Throsby and O'Shea, 1980, Throsby and Withers, 1982). These findings are supported by a number of international studies which have shown that people are often willing to pay for arts / culture / heritage and parkland facilities even if they are not the direct users (Bille Hansen, 1997, Mysercough et al., 1988, Navrud et al., 1992).

On the basis of this evidence it is reasonable to suggest that the benefit enjoyed by users should be doubled to include the willingness to pay of non users.

Based on the above estimated visitations per year under the Base Case and the likely visitation numbers, given the anticipated impact of the proposed options (see Section 2.1.1 above) on the service standard, area and public awareness, SGS estimated the net value of parkland effects. The willingness to pay for users and non users was used to calculate the changes in value of the parkland to the Victorian community as follows.

Table 7 Valuation of Loss of Access to Open Space/ Parkland, Net Impact

	Option A + D, \$m p.a.	Option B + D, \$m p.a.	Option C + D, \$m p.a.
Construction Phase Impact	-5.5	-5.4	-2.5
Permanent Impact	0.6	-0.5	-0.7

Source: SGS Economics and Planning

We have assumed that the construction phase impact on parkland will occur in line with the construction timing and permanent impact will accrue every year upon completion of construction and will remain constant.

Applying the above assumptions and reasoning over a 30 year evaluation period the parkland amenity impacts for Option A+D, B+D and C+D are estimated at some \$22.4 million

(net cost), \$21.7 million (net cost) and \$15.2 million (net cost) respectively in present value terms.

3.1.2 Increased Severance and Loss of Residential Amenity

As discussed in Section 2.1.2 above, all the final 3 options being evaluated are expected to lead to some severance and/ or loss of residential amenity. All residential properties (existing or planned) impacted, by type of impact, under each of the 3 proposed Options that are within 0-100, 100-200 and 200-500 meters of the proposed infrastructure were counted (see Appendix A). The aggregate market value of these properties by suburb was estimated using the 2007 median values (based data obtained from the Valuer-General/ Landata, Department of Sustainability and Environment).

SGS then sought independent advice from Charter Keck Cramer (CKC)⁵, firstly on whether the SGS identified impacts were deemed reasonable in their expert opinion and secondly on the appropriate discount on property value warranted by exposure to the agreed disamenities.

By applying CKC's estimate of appropriate discount rates, the increased severance and loss of residential amenity impact for Option A+D, B+D and C+D was valued at \$1,587 million, \$782 million and \$992 million respectively in present value terms over the 30 year evaluation period.

3.1.3 Stimulus to Outward Urban Growth

As noted in Section 2.1.3 above, the changes in accessibility contours across metropolitan Melbourne under each of the proposed final 3 Options would lead to changes in urban structure as it relates to the location of households. Under Option A + D, it was estimated that approximately 500 additional households (net) would locate in Melbourne's fringe compared to the Base Case. Option B + D, however, was estimated to be largely urban form neutral with just 25 additional households estimated to locate to the outer fringes of Melbourne. On the other hand, Option C+D was estimated to promote infill development to the tune of around 3,000 households.

It is widely accepted that additional infrastructure network 'connection' costs are incurred by the service providers for every dwelling that is transferred from the established urban area to the outer fringes. There has been substantial study of the connection cost savings delivered by urban consolidation and the broad consensus is that the quantum of savings is considerable, ranging from \$8000 upwards to \$50,000 per dwelling and beyond.

Table 8 outlines the results of a detailed review of infrastructure connection costs by urban form scenario.

⁵ A strategic property consulting and valuation firm with extensive experience in quantifying residential amenity impacts for various infrastructure projects.

It is noted that the studies of most relevance to Melbourne (i.e. Birrell (1991) and Hughes Trueman Lundlow et al (1991)), have considerably higher estimates than the averaged results in Table 8.

Table 8 Marginal Cost of Network Infrastructure Provision: Fringe vs. Development in Existing Urban Area (per dwelling)

Item	\$ / Dwelling (\$2001)					
	Urban Fringe - Contiguous Development ¹		Urban Fringe - Non-Contiguous Development ²			
	Lower	Upper	Lower	Upper		
Road Provision	2,500	5,000	7,500	25,000		
Water and Sewerage	2,000	4,000	8,000	19,000		
Telecommunications	500	1,000	1,500	3,000		
Electricity	2,000	3,000	4,000	7,000		
Gas	500	1,500	2,000	4,000		
Public Transport	500	1,000	2,500	1,000		
Public Open Space	NRV	NRV	NRV	NRV		
Total	8,000	15,500	25,500	59,000		
NRV = No Reliable Value						
¹ Assumes pre-existing mains infrastructure and contiguous urban development						
² Assumes no existing infrastructure and non-contiguous urban development						
Studies include coverage as follows:	Road Provision	Water & Sewerage	Electricity & Gas	Telecoms	Public Transport	Public Open Space
Birrell (1991)	✓	✓	✓		✓	
Hughes Trueman Lundlow et al (1991)	✓	✓	✓	✓		
Industry Commission (1993a)	✓	✓	✓	✓	✓	
Industry Commission (1993b)		✓				
Local Government and Urban Development					✓	
Nielson Associates (1987)	✓	✓	✓	✓		
Newman, Kenworthy and Vintila (1992)	✓	✓	✓	✓	✓	
P.G. Pak Poy (1973)	✓	✓	✓	✓		
Voran (1991)	✓	✓	✓	✓	✓	
Water Authority of WA (1990)	✓	✓	✓	✓	✓	

For the purposes of this study, we have assumed that each additional dwelling that needs to be accommodated in the outer fringe of Melbourne by virtue of the changes in the accessibility contours will cost (net) \$20,000 (in 2001 dollars or \$23,400 in 2007 dollars) in infrastructure 'connection'.

In present value terms this represents a cost of \$3.2 million under Option A + D and \$0.2 million under Option B + D over the 30 year evaluation period.

3.2 Quantification of Marginal Benefits

3.2.1 Increased Choice or Access to Jobs and Services

As noted in Section 2.2.1, the proposed final 3 options are expected to significantly enhance resident access to jobs and services within a reasonable (car) travel time of 30 minutes. In order to estimate the value households place on improved access to jobs and services, SGS synthesised a multiple linear regression model that estimates the relationship between jobs accessible within 30 minutes and median dwelling values.

Areas of Melbourne which already have high levels of access to jobs and services are unlikely to benefit much from marginal improvements in their accessibility. Therefore, inner Melbourne (defined to include the municipalities of Melbourne, Port Phillip and Yarra) which under the Base Case scenario is estimated to have access to over 1 million jobs within 30 minutes was excluded from the analysis. To account for the distinct factors driving the property market in each of the different regions of Melbourne (West, North, East and South) a separate regression analysis for each of these regions was undertaken.

The historical data (1996, 2001 and 2006) on the median dwelling price was sourced from the Valuer-General/ Landata, Department of Sustainability and Environment. The data on jobs accessible within 30 minutes was estimated using the travel time matrix for 1996, 2001 and 2006 as provided by Veitch Lister Consulting and employment data from the ABS Census.

Given the data is two dimensional – cross-section and time series (1996, 2001 & 2006) – a panel data regression with both cross-sectional and time series fixed effects components was estimated. Generalised least squares were applied to solve the regression equations. Due to the nature of the data there is bound to be some degree of correlation between time periods and between different localities. Therefore, a fixed effects constant was used which enables the unobserved component (or fixed effect) to be correlated with the observed cross-sectional or time series components. By using cross-sectional fixed effect components, one can take account of the “individuality” of each locality by allowing the constant to vary across each locale. Additionally, by using time series fixed effect components, one can take account of the “property market cycle” that might have been in place during each time period (i.e. 1996, 2001 & 2006). This allows one to take into account the broader annual increases in property prices that are due to factors other than accessibility, such as the general property market cycle and economic trends.

Regression Results

The following table provides the summary results of the regression analysis. The coefficient indicates the magnitude of the effect that the independent variable (jobs within 30 minutes) has on the dependent variable (median dwelling price). The t-statistics indicate whether the estimated coefficients are statistically significant. The signs of each coefficient in each of the regression equations are, as expected, positive. Examination of the t-statistics suggests that

all the variables are statistically significant at 80% level of confidence and all the regression equations have a high adjusted r-squared.

Table 9 Regression Estimates, Median Dwelling Price by Jobs Accessible within 30 minutes

Independent Variable	Dependent Variable/ Median Dwelling Price	
	Coefficient	T-Statistic
East Region		
Jobs Accessible within 30 minutes	0.432	1.732
Adjusted R-Squared	0.922	
West Region		
Jobs Accessible within 30 minutes	0.808	3.727
Adjusted R-Squared	0.951	
North Region		
Jobs Accessible within 30 minutes	0.247	1.428
Adjusted R-Squared	0.943	
South Region		
Jobs Accessible within 30 minutes	0.866	1.806
Adjusted R-Squared	0.867	

Source: SGS Economics and Planning

The regression coefficients indicate the effect access to one additional job within 30 minutes has on the median dwelling price in that area. Therefore, in the Eastern suburbs for example, every additional job that is accessible within 30 minutes is expected to lead to an increase in median dwelling price by 43.2 cents, other things equal.

Using the estimated change in the number of jobs accessible within 30 minutes (see Section 2.2.1 above) for households that would be in the bottom 3 quintiles of the accessibility distribution under the Base Case, the above estimated regression estimates and the total number of households in that SLA, an estimate of the value of enhanced access to jobs and services was estimated (see table overleaf).

Over the 30 year evaluation period this represents a benefit to Victorian society of approximately \$8.0 billion under Option A + D, \$7.9 billion under Option B + D and \$8.8 billion under Option C + D in present value terms⁶.

⁶ Note that while Option C + D generates the least benefit in terms of improved access to jobs and services on a per annum basis, due to the earlier anticipated completion of Option C + D in 2019 (as opposed to 2026 for Option A + D and B + D), over a 30 year evaluation period Option C + D generates relatively higher benefit in present value terms. Were these analyses to be undertaken over a 40 or 50 year evaluation period, the benefit derived from improved access to jobs and services under Option A + D and B + D would be expected to be relatively higher.

Table 10 Societal Value of Improved Access to Jobs and Services (per annum)

Independent Variable	Option A + D	Option B + D	Option C + D
Total societal value of improved access for households that are at the bottom 3 quintile of the accessibility distribution	\$3,668m	\$3,618m	\$1,843m
Average change per household	\$1,943	\$1,917	\$976

Source: SGS Economics and Planning

As mentioned, it is likely that all households would benefit from improved access to jobs and services, not just those within the bottom 3 quintiles of the accessibility distribution. In this sense, the above estimate is deemed to be highly conservative. For context purpose, if we were to not limit the benefit households derive from access to jobs and services to those that are expected to be within the bottom 3 quintile (but still excluding households within the inner city municipalities of Melbourne, Port Phillip and Yarra), the benefit to the Victorian society under Option A + D, B + D and C + D would be in the order of \$44 billion, \$41 billion and \$39 billion respectively in present value terms.

3.2.2 Reduced or Eliminated Severance and Improvement to Residential Amenity

Similar to the valuation of increased severance and loss of residential amenity (see Section 3.1.2 above), SGS identified all dwellings that would experience improved amenity under each of the final 3 options and consulted Charter Keck Cramer on the appropriate uplift factor on the aggregate property value due to reduced or eliminated severance and/ or improvement to residential amenity (see Appendix A).

Over the 30 year evaluation period, the reduced/ eliminated severance and improvement to residential amenity under both Option A + D and B + D are valued at \$2.8 billion and C + D at \$1.1 billion in present value terms.

3.2.3 Creation of Regeneration or Urban Consolidation Opportunities

As noted in Section 2.2.3, each of the 3 final options are expected to provide opportunities for regeneration/ urban consolidation.

Section 3.1.3 noted that the provision of dwellings within the established urban area leads to significant network infrastructure 'cost' savings compared to accommodating an additional dwelling in a new suburb on the urban fringe. This was assumed to result in net cost savings of \$23,400 (in 2007 dollars) per dwelling.

Applying this per dwelling cost saving to the estimated number of dwellings that can be reasonably expected to be accommodated in each of the identified regeneration/ urban consolidation sites, it is estimated that Option A + D, B + D and C + D would deliver a cost savings of \$13.6 million, \$9.6 million and \$17.0 million respectively in present value terms.

Note that this is highly conservative as benefits related to improved urban amenity resulting from the regeneration of the identified areas have not been quantified and only network infrastructure costs savings have been included.

3.2.4 Stimulus to Increased Infill Development

Section 2.2.4 noted that accessibility shifts under Option C + D is highly conducive to infill development and is expected to promote additional development in established areas to the tune of around 3,000 households.

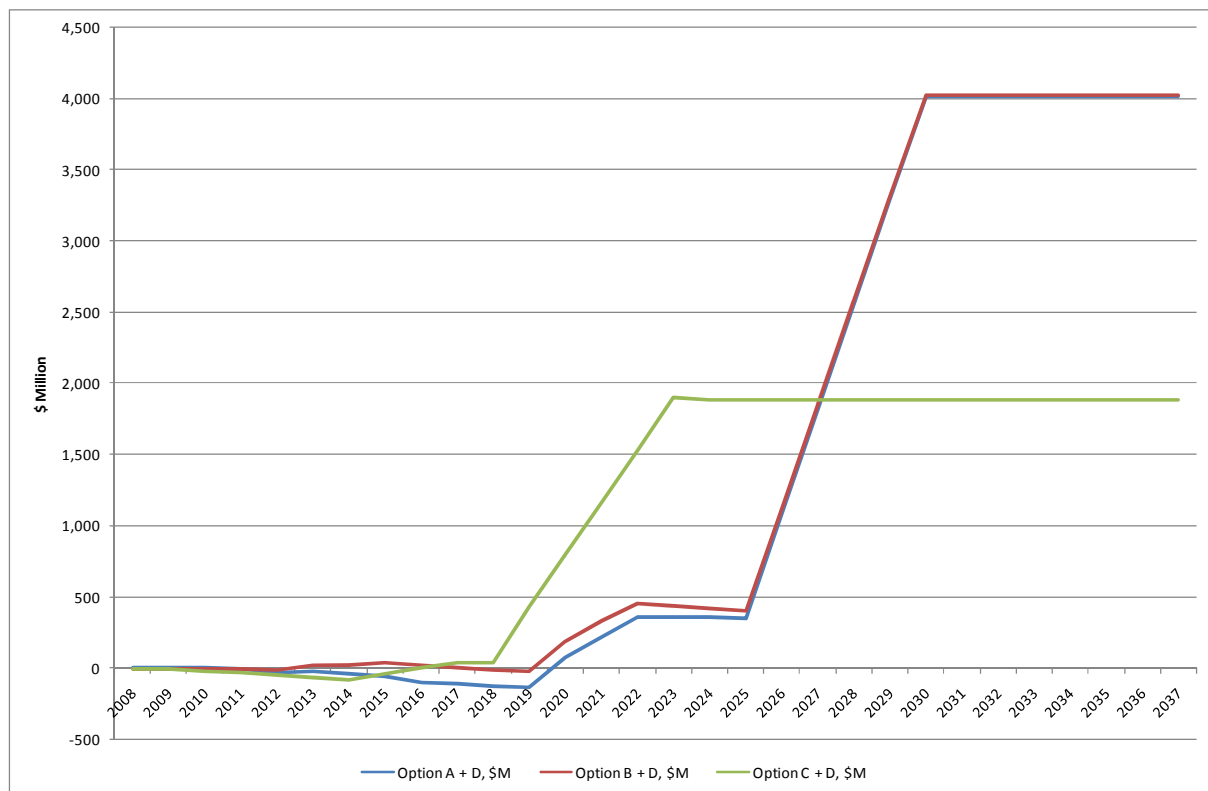
Applying the per dwelling network infrastructure 'cost' savings of \$23,400 suggests that Option C + D would deliver the cost savings of \$30.7 million to the Victorian society in present value terms.

4 Assessment of Net Benefit

4.1 Cost-Benefit Analysis

To compare the quantified costs and benefits over an appropriate evaluation period (i.e. out to 2037), discounted cashflow analysis (DCF) has been used and is reported in Table 13, Table 14 and Table 15. These tables respectively indicate the societal costs and benefits associated with each of the final 3 options (Option A + D, B + D and C + D) relative to the base case scenario as it relates to the social, demographic and land use impacts. Note that constant 2007 dollars have been applied throughout, with a real discount rate of 6.5%. The DCF results are summarised in the figures below.

Figure 11 Annual Net Benefit Flow (\$M undiscounted), Option A + D, Option B + D and Option C + D



Source: SGS Economics and Planning

The analysis indicates that on the defined set of social, demographic and land use impacts, all the 3 final options generate a positive net present value, a benefit cost ratio that is greater than 1 and an economic internal rate of return that is substantially greater than the cost of capital (say 6.5%).

Table 11 Economic Performance Measures (using 6.5% real discount rate), Option A + D, B + D and C + D

	Option A + D	Option B + D	Option C + D
Net Present Value (\$ m)	9,309.1	10,004.5	8,967.2
Benefit Cost Ratio	6.8	13.4	9.9
Economic Internal Rate of Return	36%	103%	48%

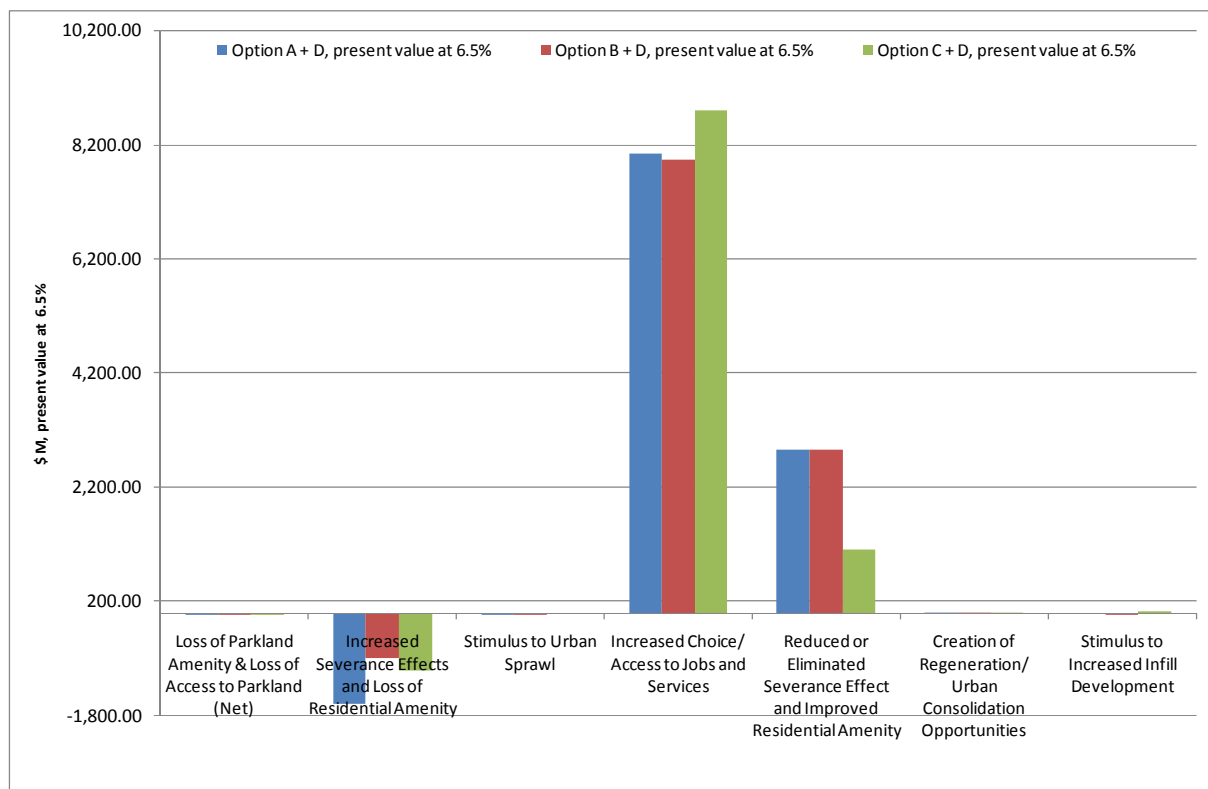
Source: SGS Economics and Planning

Option B + D, however provides the highest net present value of some \$10.0 billion and a benefit cost ratio of 13.4 to 1. Its economic internal rate of return is estimated at 103% (real).

This suggests that the Option B provides the better return to the investment of community capital. This is because Option B generates similar benefits to the Victorian community to those in Option A + D but higher than those provided by Option C + D, while at the same time limiting its impact on community severance and residential dis-amenity. In addition, unlike Option A + D, Option B + D do not contribute to urban sprawl.

Option B + D is therefore the preferred East-West Link option from a social, demographic and land use impacts perspective.

Figure 12 Composition of Option A + D, B + D and C + D Costs and Benefits, (\$M, present value)*



Source: SGS Economics and Planning

* Note that while Option C + D generates the least benefit in terms of improved access to jobs and services on a per annum basis, due to the earlier anticipated completion of Option C + D in 2019 (as opposed to 2026 for Option A + D and B + D), over a

30 year evaluation period Option C + D generates relatively higher benefit in present value terms. Were these analyses to be undertaken over a 40 or 50 year evaluation period, the benefit derived from improved access to jobs and services under Option A + D and B + D would be expected to be relatively higher.

4.2 Sensitivity Analysis

The sensitivity of these findings to changes in the real discount rate is indicated in Table 12 below.

Table 12 NPV and Benefit Cost Ratio at Selected Discount Rates.

Option A + D			
Real Discount Rate	6.5%	8.5%	10.5%
Net Present Value (\$ m)	\$9,309.1	\$5,996.0	\$3,897.1
Benefit Cost Ratio	6.8	4.5	3.0
Option B + D			
Real Discount Rate	6.5%	8.5%	10.5%
Net Present Value (\$m)	\$10,004.5	\$6,568.1	\$4,372.0
Benefit Cost Ratio	13.4	8.9	6.0
Option C + D			
Real Discount Rate	6.5%	8.5%	10.5%
Net Present Value (\$m)	\$8,967.2	\$6,251.2	\$4,414.8
Benefit Cost Ratio	9.9	7.0	5.0

Source: SGS Economics and Planning

As highlighted by Figure 12 the great bulk of the benefits in all the 3 final options are attributable to increased choice/ access to jobs and services

Even if one dis-regards this benefit, the benefit cost analysis of all the options still returns a positive NPV, a BCR that is higher than 1 and an EIRR greater than the likely cost of capital (say 6.5%). Among the final three proposed options, Option B + D generates the highest return to community capital (see Table 16, Table 17 and Table 18 below).

Table 13 Social, Demographic and Land Use Impact Assessment, Benefit Cost Analysis – Option A + D

Option A + D (\$Million - 2007 Constant Prices)											
COSTS				BENEFITS							
Year	Loss of Parkland Amenity & Loss of Access to Parkland (Net)	Increased Severance Effects and Loss of Residential Amenity	Stimulus to Urban Sprawl	TOTAL COSTS	Increased Choice/ Access to Jobs and Services	Reduced or Eliminated Severance Effect and Improved Residential Amenity	Creation of Regeneration/ Urban Consolidation Opportunities	Stimulus to Increased Infill Development	TOTAL BENEFITS	NET BENEFIT FLOW	
1 2008	-	-	-	-	-	-	-	-	-	-	-
2 2009	-	-	-	-	-	-	-	-	-	-	-
3 2010	-	(2.3)	-	(2.3)	-	-	-	-	-	-	(2.3)
4 2011	-	(4.7)	-	(4.7)	-	-	-	-	-	-	(4.7)
5 2012	(0.1)	(31.1)	-	(31.2)	-	-	-	-	-	-	(31.2)
6 2013	(0.1)	(55.2)	-	(55.2)	-	29.3	-	-	29.3	-	(25.9)
7 2014	(5.5)	(96.8)	-	(102.2)	-	58.6	-	-	58.6	-	(43.6)
8 2015	(5.5)	(140.4)	-	(145.9)	-	89.1	1.1	-	90.2	-	(55.6)
9 2016	(5.5)	(184.1)	-	(189.5)	-	90.3	1.1	-	91.4	-	(98.1)
10 2017	(5.5)	(203.7)	-	(209.1)	-	91.5	2.7	-	94.2	-	(114.9)
11 2018	(5.5)	(218.3)	-	(223.7)	-	95.0	2.7	-	97.7	-	(126.0)
12 2019	(5.5)	(232.9)	-	(238.3)	-	98.5	2.7	-	101.2	-	(137.1)
13 2020	(0.6)	(172.6)	-	(173.2)	-	243.0	4.7	-	247.7	-	74.6
14 2021	(0.6)	(172.6)	-	(173.2)	-	384.0	4.7	-	388.8	-	215.6
15 2022	(0.6)	(172.6)	-	(173.2)	-	525.1	3.1	-	528.2	-	355.0
16 2023	(0.6)	(172.6)	-	(173.2)	-	525.1	3.1	-	528.2	-	355.0
17 2024	(0.6)	(172.6)	-	(173.2)	-	525.1	3.1	-	528.2	-	355.0
18 2025	(0.6)	(172.6)	-	(173.2)	-	525.1	-	-	525.1	-	351.9
19 2026	(0.6)	(172.6)	(2.3)	(175.5)	733.6	525.1	-	-	1,258.7	-	1,083.2
20 2027	(0.6)	(172.6)	(2.3)	(175.5)	1,467.3	525.1	-	-	1,992.3	-	1,816.9
21 2028	(0.6)	(172.6)	(2.3)	(175.5)	2,200.9	525.1	-	-	2,726.0	-	2,550.5
22 2029	(0.6)	(172.6)	(2.3)	(175.5)	2,934.5	525.1	-	-	3,459.6	-	3,284.1
23 2030	(0.6)	(172.6)	(2.3)	(175.5)	3,668.2	525.1	-	-	4,193.2	-	4,017.8
24 2031	(0.6)	(172.6)	-	(173.2)	3,668.2	525.1	-	-	4,193.2	-	4,020.1
25 2032	(0.6)	(172.6)	-	(173.2)	3,668.2	525.1	-	-	4,193.2	-	4,020.1
26 2033	(0.6)	(172.6)	-	(173.2)	3,668.2	525.1	-	-	4,193.2	-	4,020.1
27 2034	(0.6)	(172.6)	-	(173.2)	3,668.2	525.1	-	-	4,193.2	-	4,020.1
28 2035	(0.6)	(172.6)	-	(173.2)	3,668.2	525.1	-	-	4,193.2	-	4,020.1
29 2036	(0.6)	(172.6)	-	(173.2)	3,668.2	525.1	-	-	4,193.2	-	4,020.1
30 2037	(0.6)	(172.6)	-	(173.2)	3,668.2	525.1	-	-	4,193.2	-	4,020.1
TOTAL	(43.5)	(4,276.1)	(11.4)	(4,331.0)	36,681.9	9,580.3	29.1	-	46,291.2	-	41,960.2
Present	(22.4)	(1,587.3)	(3.2)	(1,613.0)	8,037.9	2,870.6	13.6	-	10,922.1	-	9,309.1
Net Present Value @ 6.5%										9,309.1	
Benefit Cost Ratio (BCR)										6.8	
Economic Internal Rate of Return (EIRR)										36%	

Table 14 Social, Demographic and Land Use Impact Assessment, Benefit Cost Analysis – Option B + D

Option B + D										
(\$Million - 2007 Constant Prices)										
COSTS				BENEFITS						
Year	Loss of Parkland Amenity & Loss of Access to Parkland (Net)	Increased Severance Effects and Loss of Residential Amenity	Stimulus to Urban Sprawl	TOTAL COSTS	Increased Choice/ Access to Jobs and Services	Reduced or Eliminated Severance Effect and Improved Residential Amenity	Creation of Regeneration/ Urban Consolidation Opportunities	Stimulus to Increased Infill Development	TOTAL BENEFITS	NET BENEFIT FLOW
1 2008	-	-	-	-	-	-	-	-	-	-
2 2009	-	-	-	-	-	-	-	-	-	-
3 2010	-	(2.3)	-	(2.3)	-	-	-	-	-	(2.3)
4 2011	-	(4.7)	-	(4.7)	-	-	-	-	-	(4.7)
5 2012	-	(7.0)	-	(7.0)	-	-	-	-	-	(7.0)
6 2013	-	(7.1)	-	(7.1)	-	29.3	-	-	29.3	22.3
7 2014	(5.4)	(24.6)	-	(30.0)	-	58.6	-	-	58.6	28.7
8 2015	(5.4)	(44.1)	-	(49.5)	-	89.1	1.1	-	90.2	40.7
9 2016	(5.4)	(63.7)	-	(69.1)	-	90.3	1.1	-	91.4	22.3
10 2017	(5.4)	(83.3)	-	(88.7)	-	91.5	1.1	-	92.6	3.9
11 2018	(5.4)	(97.9)	-	(103.3)	-	95.0	1.1	-	96.1	(7.2)
12 2019	(5.4)	(112.5)	-	(117.9)	-	98.5	1.1	-	99.6	(18.3)
13 2020	(0.5)	(52.2)	-	(52.7)	-	243.0	3.1	-	246.1	193.4
14 2021	(0.5)	(52.2)	-	(52.7)	-	384.0	3.1	-	387.1	334.4
15 2022	(0.5)	(69.3)	-	(69.8)	-	525.1	3.1	-	528.2	458.3
16 2023	(0.5)	(86.4)	-	(86.9)	-	525.1	3.1	-	528.2	441.2
17 2024	(0.5)	(103.5)	-	(104.0)	-	525.1	3.1	-	528.2	424.1
18 2025	(0.5)	(120.6)	-	(121.1)	-	525.1	-	-	525.1	403.9
19 2026	(0.5)	(120.6)	(0.1)	(121.2)	723.6	525.1	-	0.1	1,248.8	1,127.6
20 2027	(0.5)	(120.6)	(0.1)	(121.2)	1,447.3	525.1	-	0.1	1,972.5	1,851.2
21 2028	(0.5)	(120.6)	(0.1)	(121.2)	2,170.9	525.1	-	0.1	2,696.1	2,574.9
22 2029	(0.5)	(120.6)	(0.1)	(121.2)	2,894.6	525.1	-	0.1	3,419.7	3,298.5
23 2030	(0.5)	(120.6)	(0.1)	(121.2)	3,618.2	525.1	-	0.1	4,143.4	4,022.2
24 2031	(0.5)	(120.6)	-	(121.1)	3,618.2	525.1	-	-	4,143.3	4,022.2
25 2032	(0.5)	(120.6)	-	(121.1)	3,618.2	525.1	-	-	4,143.3	4,022.2
26 2033	(0.5)	(120.6)	-	(121.1)	3,618.2	525.1	-	-	4,143.3	4,022.2
27 2034	(0.5)	(120.6)	-	(121.1)	3,618.2	525.1	-	-	4,143.3	4,022.2
28 2035	(0.5)	(120.6)	-	(121.1)	3,618.2	525.1	-	-	4,143.3	4,022.2
29 2036	(0.5)	(120.6)	-	(121.1)	3,618.2	525.1	-	-	4,143.3	4,022.2
30 2037	(0.5)	(120.6)	-	(121.1)	3,618.2	525.1	-	-	4,143.3	4,022.2
TOTAL	(41.5)	(2,379.0)	(0.6)	(2,421.0)	36,182.1	9,580.3	21.0	0.6	45,784.0	43,363.0
Present	(21.7)	(782.4)	(0.2)	(804.3)	7,928.4	2,870.6	9.6	0.2	10,808.7	10,004.5
Net Present Value @ 6.5%									10,004.5	
Benefit Cost Ratio (BCR)									13.4	
Economic Internal Rate of Return (EIRR)									103%	

Table 15 Social, Demographic and Land Use Impact Assessment, Benefit Cost Analysis – Option C + D

Option C + D										
(\$Million - 2007 Constant Prices)										
COSTS				BENEFITS						
Year	Loss of Parkland Amenity & Loss of Access to Parkland (Net)	Increased Severance Effects and Loss of Residential Amenity	Stimulus to Urban Sprawl	TOTAL COSTS	Increased Choice/ Access to Jobs and Services	Reduced or Eliminated Severance Effect and Improved Residential Amenity	Creation of Regeneration/ Urban Consolidation Opportunities	Stimulus to Increased Infill Development	TOTAL BENEFITS	NET BENEFIT FLOW
1 2008	-	-	-	-	-	-	-	-	-	-
2 2009	-	-	-	-	-	-	-	-	-	-
3 2010	(2.5)	(14.3)	-	(16.8)	-	-	-	-	-	(16.8)
4 2011	(2.5)	(28.7)	-	(31.2)	-	-	-	-	-	(31.2)
5 2012	(2.5)	(43.0)	-	(45.5)	-	-	-	-	-	(45.5)
6 2013	(2.5)	(57.4)	-	(59.9)	-	-	-	-	-	(59.9)
7 2014	(2.5)	(77.4)	-	(79.9)	-	-	-	-	-	(79.9)
8 2015	(0.7)	(85.2)	-	(85.8)	-	46.7	6.0	-	52.6	(33.2)
9 2016	(0.7)	(93.0)	-	(93.6)	-	93.3	6.0	-	99.3	5.7
10 2017	(0.7)	(100.8)	-	(101.5)	-	140.0	6.0	-	146.0	44.5
11 2018	(0.7)	(103.6)	-	(104.3)	-	143.5	6.0	-	149.5	45.2
12 2019	(0.7)	(105.7)	-	(106.3)	368.6	148.4	6.0	13.9	536.8	430.5
13 2020	(0.7)	(105.7)	-	(106.3)	737.2	153.3	-	13.9	904.3	797.9
14 2021	(0.7)	(105.7)	-	(106.3)	1,105.7	154.6	-	13.9	1,274.2	1,167.9
15 2022	(0.7)	(105.7)	-	(106.3)	1,474.3	154.6	-	13.9	1,642.8	1,536.4
16 2023	(0.7)	(105.7)	-	(106.3)	1,842.9	154.6	-	13.9	2,011.4	1,905.0
17 2024	(0.7)	(105.7)	-	(106.3)	1,842.9	154.6	-	-	1,997.5	1,891.2
18 2025	(0.7)	(105.7)	-	(106.3)	1,842.9	154.6	-	-	1,997.5	1,891.2
19 2026	(0.7)	(105.7)	-	(106.3)	1,842.9	154.6	-	-	1,997.5	1,891.2
20 2027	(0.7)	(105.7)	-	(106.3)	1,842.9	154.6	-	-	1,997.5	1,891.2
21 2028	(0.7)	(105.7)	-	(106.3)	1,842.9	154.6	-	-	1,997.5	1,891.2
22 2029	(0.7)	(105.7)	-	(106.3)	1,842.9	154.6	-	-	1,997.5	1,891.2
23 2030	(0.7)	(105.7)	-	(106.3)	1,842.9	154.6	-	-	1,997.5	1,891.2
24 2031	(0.7)	(105.7)	-	(106.3)	1,842.9	154.6	-	-	1,997.5	1,891.2
25 2032	(0.7)	(105.7)	-	(106.3)	1,842.9	154.6	-	-	1,997.5	1,891.2
26 2033	(0.7)	(105.7)	-	(106.3)	1,842.9	154.6	-	-	1,997.5	1,891.2
27 2034	(0.7)	(105.7)	-	(106.3)	1,842.9	154.6	-	-	1,997.5	1,891.2
28 2035	(0.7)	(105.7)	-	(106.3)	1,842.9	154.6	-	-	1,997.5	1,891.2
29 2036	(0.7)	(105.7)	-	(106.3)	1,842.9	154.6	-	-	1,997.5	1,891.2
30 2037	(0.7)	(105.7)	-	(106.3)	1,842.9	154.6	-	-	1,997.5	1,891.2
TOTAL	(27.9)	(2,611.1)	-	(2,639.0)	31,329.0	3,353.6	29.9	69.4	34,781.8	32,142.8
Present	(15.2)	(992.4)	-	(1,007.6)	8,804.3	1,122.7	17.0	30.7	9,974.7	8,967.2
									Net Present Value @ 6.5%	
									Benefit Cost Ratio (BCR)	
									Economic Internal Rate of Return (EIRR)	
									8,967.2	
									9.9	
									48%	

Table 16 Social, Demographic and Land Use Impact Assessment, Benefit Cost Analysis – Option A + D, NOT INCLUDING BENEFITS ATTRIBUTABLE TO INCREASED CHOICE/ ACCESS TO JOBS AND SERVICES

Option A + D - NOT INCLUDING BENEFITS ATTRIBUTABLE TO INCREASED CHOICE/ ACCESS TO JOBS AND SERVICES

(\$Million - 2007 Constant Prices)

Year	COSTS			BENEFITS					TOTAL BENEFITS	NET BENEFIT FLOW
	Loss of Parkland Amenity & Loss of Access to Parkland (Net)	Increased Severance Effects and Loss of Residential Amenity	Stimulus to Urban Sprawl	TOTAL COSTS	Increased Choice/ Access to Jobs and Services	Reduced or Eliminated Severance Effect and Improved Residential Amenity	Creation of Regeneration/ Urban Consolidation Opportunities	Stimulus to Increased Infill Development		
1 2008	-	-	-	-	-	-	-	-	-	-
2 2009	-	-	-	-	-	-	-	-	-	-
3 2010	-	(2.3)	-	(2.3)	-	-	-	-	-	(2.3)
4 2011	-	(4.7)	-	(4.7)	-	-	-	-	-	(4.7)
5 2012	(0.1)	(31.1)	-	(31.2)	-	-	-	-	-	(31.2)
6 2013	(0.1)	(55.2)	-	(55.2)	-	29.3	-	-	29.3	(25.9)
7 2014	(5.5)	(96.8)	-	(102.2)	-	58.6	-	-	58.6	(43.6)
8 2015	(5.5)	(140.4)	-	(145.9)	-	89.1	1.1	-	90.2	(55.6)
9 2016	(5.5)	(184.1)	-	(189.5)	-	90.3	1.1	-	91.4	(98.1)
10 2017	(5.5)	(203.7)	-	(209.1)	-	91.5	2.7	-	94.2	(114.9)
11 2018	(5.5)	(218.3)	-	(223.7)	-	95.0	2.7	-	97.7	(126.0)
12 2019	(5.5)	(232.9)	-	(238.3)	-	98.5	2.7	-	101.2	(137.1)
13 2020	(0.6)	(172.6)	-	(173.2)	-	243.0	4.7	-	247.7	74.6
14 2021	(0.6)	(172.6)	-	(173.2)	-	384.0	4.7	-	388.8	215.6
15 2022	(0.6)	(172.6)	-	(173.2)	-	525.1	3.1	-	528.2	355.0
16 2023	(0.6)	(172.6)	-	(173.2)	-	525.1	3.1	-	528.2	355.0
17 2024	(0.6)	(172.6)	-	(173.2)	-	525.1	3.1	-	528.2	355.0
18 2025	(0.6)	(172.6)	-	(173.2)	-	525.1	-	-	525.1	351.9
19 2026	(0.6)	(172.6)	(2.3)	(175.5)	-	525.1	-	-	525.1	349.6
20 2027	(0.6)	(172.6)	(2.3)	(175.5)	-	525.1	-	-	525.1	349.6
21 2028	(0.6)	(172.6)	(2.3)	(175.5)	-	525.1	-	-	525.1	349.6
22 2029	(0.6)	(172.6)	(2.3)	(175.5)	-	525.1	-	-	525.1	349.6
23 2030	(0.6)	(172.6)	(2.3)	(175.5)	-	525.1	-	-	525.1	349.6
24 2031	(0.6)	(172.6)	-	(173.2)	-	525.1	-	-	525.1	351.9
25 2032	(0.6)	(172.6)	-	(173.2)	-	525.1	-	-	525.1	351.9
26 2033	(0.6)	(172.6)	-	(173.2)	-	525.1	-	-	525.1	351.9
27 2034	(0.6)	(172.6)	-	(173.2)	-	525.1	-	-	525.1	351.9
28 2035	(0.6)	(172.6)	-	(173.2)	-	525.1	-	-	525.1	351.9
29 2036	(0.6)	(172.6)	-	(173.2)	-	525.1	-	-	525.1	351.9
30 2037	(0.6)	(172.6)	-	(173.2)	-	525.1	-	-	525.1	351.9
TOTAL	(43.5)	(4,276.1)	(11.4)	(4,331.0)	-	9,580.3	29.1	-	9,609.4	5,278.3
Present	(22.4)	(1,587.3)	(3.2)	(1,613.0)	-	2,870.6	13.6	-	2,884.2	1,271.2
Net Present Value @ 6.5%									1,271.2	
Benefit Cost Ratio (BCR)									1.8	
Economic Internal Rate of Return (EIRR)									23%	

Table 17 Social, Demographic and Land Use Impact Assessment, Benefit Cost Analysis – Option B + D, NOT INCLUDING BENEFITS ATTRIBUTABLE TO INCREASED CHOICE/ ACCESS TO JOBS AND SERVICES

Option B + D - NOT INCLUDING BENEFITS ATTRIBUTABLE TO INCREASED CHOICE/ ACCESS TO JOBS AND SERVICES

(\$Million - 2007 Constant Prices)

COSTS				BENEFITS					TOTAL BENEFITS	NET BENEFIT FLOW
Year	Loss of Parkland Amenity & Loss of Access to Parkland (Net)	Increased Severance Effects and Loss of Residential Amenity	Stimulus to Urban Sprawl	TOTAL COSTS	Increased Choice/ Access to Jobs and Services	Reduced or Eliminated Severance Effect and Improved Residential Amenity	Creation of Regeneration/ Urban Consolidation Opportunities	Stimulus to Increased Infill Development		
1 2008	-	-	-	-	-	-	-	-	-	-
2 2009	-	-	-	-	-	-	-	-	-	-
3 2010	-	(2.3)	-	(2.3)	-	-	-	-	-	(2.3)
4 2011	-	(4.7)	-	(4.7)	-	-	-	-	-	(4.7)
5 2012	-	(7.0)	-	(7.0)	-	-	-	-	-	(7.0)
6 2013	-	(7.1)	-	(7.1)	-	29.3	-	-	29.3	22.3
7 2014	(5.4)	(24.6)	-	(30.0)	-	58.6	-	-	58.6	28.7
8 2015	(5.4)	(44.1)	-	(49.5)	-	89.1	1.1	-	90.2	40.7
9 2016	(5.4)	(63.7)	-	(69.1)	-	90.3	1.1	-	91.4	22.3
10 2017	(5.4)	(83.3)	-	(88.7)	-	91.5	1.1	-	92.6	3.9
11 2018	(5.4)	(97.9)	-	(103.3)	-	95.0	1.1	-	96.1	(7.2)
12 2019	(5.4)	(112.5)	-	(117.9)	-	98.5	1.1	-	99.6	(18.3)
13 2020	(0.5)	(52.2)	-	(52.7)	-	243.0	3.1	-	246.1	193.4
14 2021	(0.5)	(52.2)	-	(52.7)	-	384.0	3.1	-	387.1	334.4
15 2022	(0.5)	(69.3)	-	(69.8)	-	525.1	3.1	-	528.2	458.3
16 2023	(0.5)	(86.4)	-	(86.9)	-	525.1	3.1	-	528.2	441.2
17 2024	(0.5)	(103.5)	-	(104.0)	-	525.1	3.1	-	528.2	424.1
18 2025	(0.5)	(120.6)	-	(121.1)	-	525.1	-	-	525.1	403.9
19 2026	(0.5)	(120.6)	(0.1)	(121.2)	-	525.1	-	0.1	525.2	403.9
20 2027	(0.5)	(120.6)	(0.1)	(121.2)	-	525.1	-	0.1	525.2	403.9
21 2028	(0.5)	(120.6)	(0.1)	(121.2)	-	525.1	-	0.1	525.2	403.9
22 2029	(0.5)	(120.6)	(0.1)	(121.2)	-	525.1	-	0.1	525.2	403.9
23 2030	(0.5)	(120.6)	(0.1)	(121.2)	-	525.1	-	0.1	525.2	403.9
24 2031	(0.5)	(120.6)	-	(121.1)	-	525.1	-	-	525.1	403.9
25 2032	(0.5)	(120.6)	-	(121.1)	-	525.1	-	-	525.1	403.9
26 2033	(0.5)	(120.6)	-	(121.1)	-	525.1	-	-	525.1	403.9
27 2034	(0.5)	(120.6)	-	(121.1)	-	525.1	-	-	525.1	403.9
28 2035	(0.5)	(120.6)	-	(121.1)	-	525.1	-	-	525.1	403.9
29 2036	(0.5)	(120.6)	-	(121.1)	-	525.1	-	-	525.1	403.9
30 2037	(0.5)	(120.6)	-	(121.1)	-	525.1	-	-	525.1	403.9
TOTAL	(41.5)	(2,379.0)	(0.6)	(2,421.0)	-	9,580.3	21.0	0.6	9,601.9	7,180.8
Present	(21.7)	(782.4)	(0.2)	(804.3)	-	2,870.6	9.6	0.2	2,880.3	2,076.1
Net Present Value @ 6.5%									2,076.1	
Benefit Cost Ratio (BCR)									3.6	
Economic Internal Rate of Return (EIRR)									102%	

Table 18 Social, Demographic and Land Use Impact Assessment, Benefit Cost Analysis – Option C + D, NOT INCLUDING BENEFITS ATTRIBUTABLE TO INCREASED CHOICE/ ACCESS TO JOBS AND SERVICES

Option C + D - NOT INCLUDING BENEFITS ATTRIBUTABLE TO INCREASED CHOICE/ ACCESS TO JOBS AND SERVICES

(\$Million - 2007 Constant Prices)

Year	COSTS			BENEFITS					TOTAL BENEFITS	NET BENEFIT FLOW
	Loss of Parkland Amenity & Loss of Access to Parkland (Net)	Increased Severance Effects and Loss of Residential Amenity	Stimulus to Urban Sprawl	TOTAL COSTS	Increased Choice/ Access to Jobs and Services	Reduced or Eliminated Severance Effect and Improved Residential Amenity	Creation of Regeneration/ Urban Consolidation Opportunities	Stimulus to Increased Infill Development		
1 2008	-	-	-	-	-	-	-	-	-	-
2 2009	-	-	-	-	-	-	-	-	-	-
3 2010	(2.5)	(14.3)	-	(16.8)	-	-	-	-	-	(16.8)
4 2011	(2.5)	(28.7)	-	(31.2)	-	-	-	-	-	(31.2)
5 2012	(2.5)	(43.0)	-	(45.5)	-	-	-	-	-	(45.5)
6 2013	(2.5)	(57.4)	-	(59.9)	-	-	-	-	-	(59.9)
7 2014	(2.5)	(77.4)	-	(79.9)	-	-	-	-	-	(79.9)
8 2015	(0.7)	(85.2)	-	(85.8)	-	46.7	6.0	-	52.6	(33.2)
9 2016	(0.7)	(93.0)	-	(93.6)	-	93.3	6.0	-	99.3	5.7
10 2017	(0.7)	(100.8)	-	(101.5)	-	140.0	6.0	-	146.0	44.5
11 2018	(0.7)	(103.6)	-	(104.3)	-	143.5	6.0	-	149.5	45.2
12 2019	(0.7)	(105.7)	-	(106.3)	-	148.4	6.0	13.9	168.2	61.9
13 2020	(0.7)	(105.7)	-	(106.3)	-	153.3	-	13.9	167.1	60.8
14 2021	(0.7)	(105.7)	-	(106.3)	-	154.6	-	13.9	168.5	62.1
15 2022	(0.7)	(105.7)	-	(106.3)	-	154.6	-	13.9	168.5	62.1
16 2023	(0.7)	(105.7)	-	(106.3)	-	154.6	-	13.9	168.5	62.1
17 2024	(0.7)	(105.7)	-	(106.3)	-	154.6	-	-	154.6	48.3
18 2025	(0.7)	(105.7)	-	(106.3)	-	154.6	-	-	154.6	48.3
19 2026	(0.7)	(105.7)	-	(106.3)	-	154.6	-	-	154.6	48.3
20 2027	(0.7)	(105.7)	-	(106.3)	-	154.6	-	-	154.6	48.3
21 2028	(0.7)	(105.7)	-	(106.3)	-	154.6	-	-	154.6	48.3
22 2029	(0.7)	(105.7)	-	(106.3)	-	154.6	-	-	154.6	48.3
23 2030	(0.7)	(105.7)	-	(106.3)	-	154.6	-	-	154.6	48.3
24 2031	(0.7)	(105.7)	-	(106.3)	-	154.6	-	-	154.6	48.3
25 2032	(0.7)	(105.7)	-	(106.3)	-	154.6	-	-	154.6	48.3
26 2033	(0.7)	(105.7)	-	(106.3)	-	154.6	-	-	154.6	48.3
27 2034	(0.7)	(105.7)	-	(106.3)	-	154.6	-	-	154.6	48.3
28 2035	(0.7)	(105.7)	-	(106.3)	-	154.6	-	-	154.6	48.3
29 2036	(0.7)	(105.7)	-	(106.3)	-	154.6	-	-	154.6	48.3
30 2037	(0.7)	(105.7)	-	(106.3)	-	154.6	-	-	154.6	48.3
TOTAL	(27.9)	(2,611.1)	-	(2,639.0)	-	3,353.6	29.9	69.4	3,452.8	813.8
Present	(15.2)	(992.4)	-	(1,007.6)	-	1,122.7	17.0	30.7	1,170.5	162.9

Net Present Value @ 6.5%

Benefit Cost Ratio (BCR)

Economic Internal Rate of Return (EIRR)

162.9
1.2
13%

Appendix A

Figure 13 Identified Community Severance and Residential Amenity Impact Areas, Option A

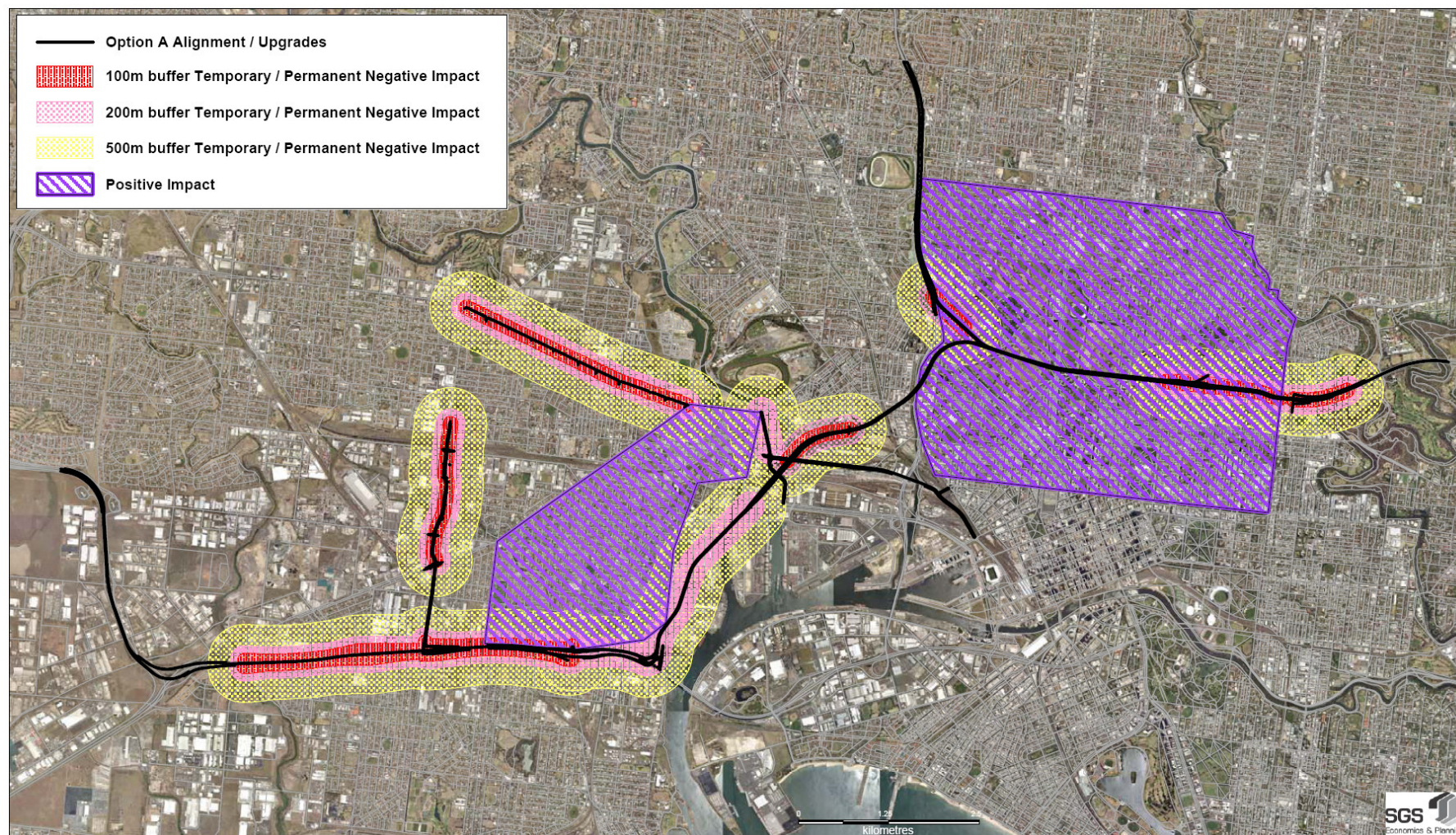


Figure 14 Identified Community Severance and Residential Amenity Impact Areas, Option B

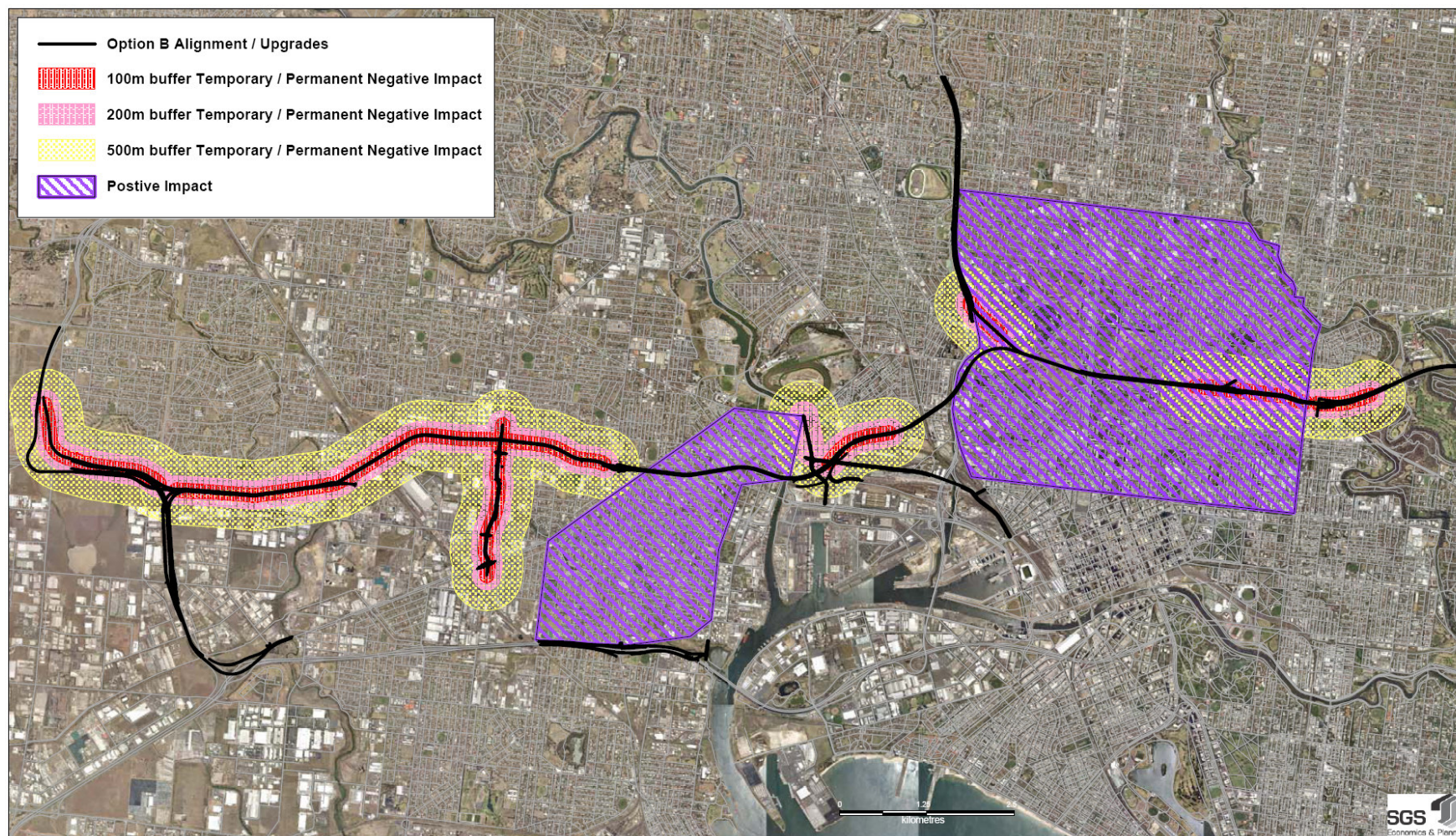


Figure 15 Identified Community Severance and Residential Amenity Impact Areas, Option C

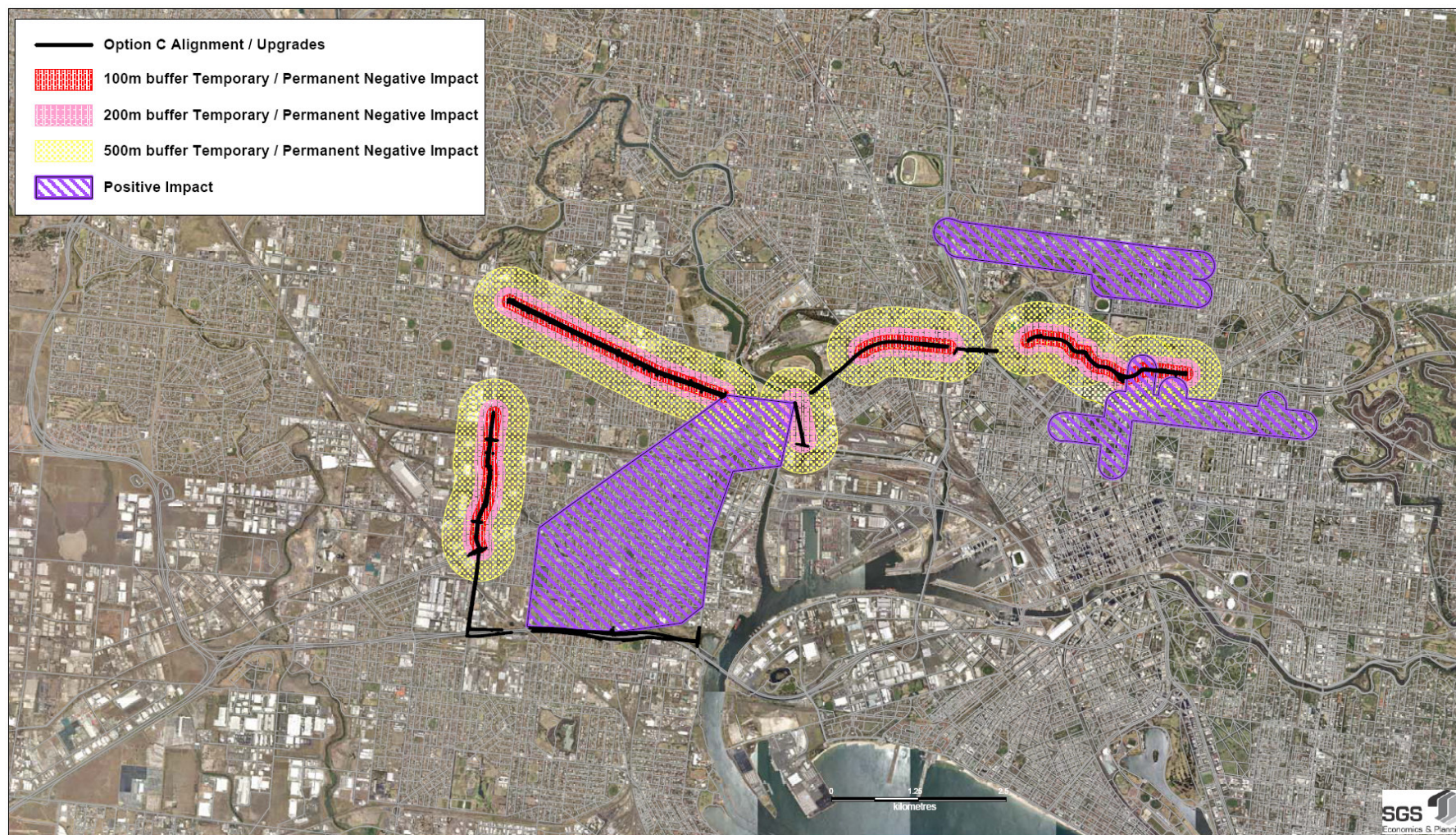


Figure 16 Identified Community Severance and Residential Amenity Impact Areas, Option D – CBD Rail Tunnel

