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Department of Premier and Cabinet

Report for East West Link Needs Assessment Response Team

Review

September 2008

INFRASTRUCTURE | MINING & INDUSTRY | DEFENCE | PROPERTY & BUILDINGS | ENVIRONMENT

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1. Introduction

GHD Pty Ltd (GHD) has been engaged by the Department of Premier and Cabinet to undertake a high-level review of the East West Link Needs Assessment Study (EWLNAS) and the potential Northern Link in the context of comparing the relative priorities of the two projects against each other. This review is based on an analysis of the EWLNAS main report, supporting EWLNAS technical reports and preliminary modelling and high-level analysis of the Northern Link.

1.1 Background

In early 2007, the State Government appointed a Study Team led by Sir Rod Eddington to prepare a review of the transport solutions for connecting Melbourne's eastern and western suburbs. A number of recommendations considering road, public transport and freight options were developed, including the following recommendations that are further considered in this review:

- Recommendation 4 – Cross-city road connection extending from the western suburbs to the Eastern Freeway (herein referred to as the East West Link); and
- Recommendation 5 – Truck Action Plan to remove truck traffic from local streets and restore community amenity in the inner west.

1.2 Study Brief

The study brief for this project as provided by the Department of Premier and Cabinet is as follows:

1. East West Link v Northern Link

- How do the road recommendations in the EWLNAS compare in priority to completing the Northern Link. In particular:
  - East West Link (CityLink to Eastern Freeway) v Northern Link; and
  - East West Link (All) v Northern Link.
- What are the positives and negatives of the above options, what are the key drivers to the projects and do they serve different functions?

2. Delivery

Assuming there is a case for the EWLNAS road recommendations:

- Consider the staging recommended for the road projects in the EWLNAS;
- Consider options to remove the construction impacts on JJ Holland Park and identify the impacts of such alternative proposal/s; and
- What options exist for connections to the arterial road network if only the Eastern Freeway to CityLink component of the East West Link is built.

3. Critique

- Generally, review the “road recommendations” outlined in the EWLNAS report and the supporting consultant reports to determine whether there are any critical flaws (A critical flaw refers to any error of such significance that it renders the recommendation(s) flowing from it invalid in the methodology, assumptions, data and analysis underpinning the information presented in the report);
- Specifically, has the "need" for the recommended road projects been established?; and
- Comment on the appropriateness and the timing of the recommended road projects.

1.3 Scope of Report

The scope of this report is as follows:

- Review of future road options;
- Review of the priority for the alternate options;
- Review of the staging of the alternate options;
- Review of preliminary delivery issues associated with options, including staging of projects; and
- A critique of the data prepared for the EWLNAS, particularly considering potential flaws, reviewing project timing and commenting on whether the project “need” has been established.

2. Future Road Options

2.1 East West Link

Recommendation 4 of the EWLNAS stated:

"Planning work should commence on the staged construction of a new 18 kilometre cross city road connection extending from the western suburbs to the Eastern Freeway."

The EWLNAS stated that the basis for this recommendation is:

- The need for an alternative to the West Gate Bridge, particularly the need to secure a second major river crossing from the west;
- Population, economy and traffic volume growth forecast will place further pressure on the West Gate-Monash corridor;
- The growing freight task and the importance of freight efficiency to Melbourne and Victorian industry;
- Increasing travel times, congestion, peak hours and conditions on Melbourne's road network;
- The strong and growing demand for cross city travel (particularly from the west) and the lack of direct cross city connections; and
- The need to provide network flexibility and connectivity by completing the key 'missing links' in Melbourne's transport network.

As part of the study, two options were identified. These options were:

- Option A, a connection between the Eastern Freeway, CityLink (Western Link), Dynon Road and the West Gate Freeway, with an upgrade of the West Gate Freeway from Williamstown Road to Western Ring Road (WRR); and
- Option B, a connection between the Eastern Freeway, CityLink (Western Link), Dynon Road, Sunshine Road and the Western Ring Road linking in near the Deer Park Bypass Interchange.

Option B is considered the more strategically favourable option as it provides an additional link to the western suburbs, rather than upgrading the West Gate Freeway, to accommodate additional traffic. In the instance of the West Gate Bridge or Freeway being unavailable, with Option B the risk of not having an additional link to the west is mitigated.

It is assumed that included in these upgrades is Recommendation 5 of the EWLNAS, which is the Truck Action Plan. The Truck Action Plan's objective is to improve amenity within the inner west, particularly by removing truck traffic from Francis Street and Somerville Road in Yarraville. While a number of options were recommended as part of the Truck Action Plan, based on Option B being the more favourable option, the recommendations that would need to be implemented to support this plan include:

- A new link from the West Gate Freeway to the Port, via Hyde Street;
- A north-south freight route along Paramount Road and Ashley Street, to Geelong Road. As freight vehicles can access the West Gate Freeway via Millers Road extending this link along Cemetery Road to the freeway is not essential; and
- Grade separation of the Paramount Road/Ashley Street and Sunshine Road intersection and the rail line, north of this intersection.

It is considered that these recommendations would need to be developed in the short term in readiness for the opening of the tunnel river crossing to facilitate access to the tunnel and improve freight movement in the inner west.

2.2 Northern Link

The Northern Link is a potential connection between the Metropolitan Ring Road and the Eastern Freeway/EastLink in order to provide a linkage between the northern and eastern suburbs and to complete a Ring Road around Melbourne. The basis for the development of this link includes:

- To meet the increasing demand for travel between the north-west and south-east, particularly for commercial vehicles;
- To provide an effective road connection between the east and north of Melbourne;
- To fill a missing link in the road network around Melbourne by completing the Ring Road;
- To provide a cross-town connection (between north and east) for a movement currently poorly serviced by public transport; and
- To provide an additional strategic crossing of the Yarra River to the east of Bulleen and provide further capacity for north south traffic – removing reliance on Fitzsimmons Lane.

In order to compare the priority of Northern Link with East West Link, GHD has reviewed potential alignments for a Northern Link corridor. While the alignments considered are not exhaustive, three potential options are:

- Option 1 – an eastern option connecting the Metropolitan Ring Road and EastLink near Boronia Road, via Kangaroo Ground and Chirnside Park;
- Option 2 – a central option connecting the Metropolitan Ring Road and EastLink at Ringwood, via Eltham and Warrandyte; and
- Option 3 – a western option connecting the Metropolitan Ring Road and Eastern Freeway at Bulleen Road, via Watsonia and Bulleen.

The three options are shown in Figure 1 overleaf. An analysis of the options indicates that the three options serve different markets and needs.

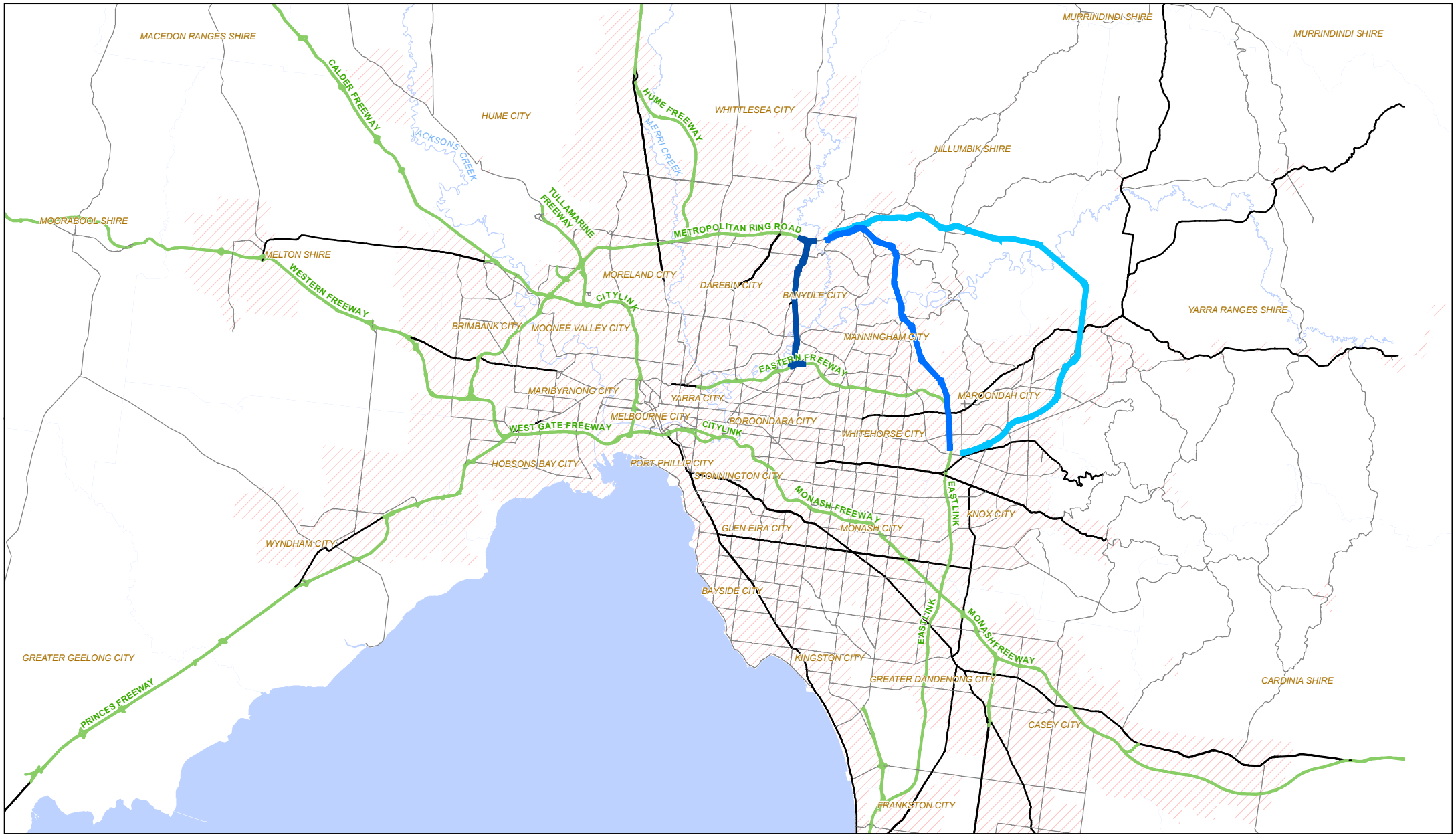
Option 1 impacts on environmentally sensitive areas, particularly through designated Green Wedge areas and does not attract significant traffic volumes due to the indirectness of the connection.

Option 2 provides a more direct link between Metropolitan Ring Road and EastLink and based on the high-level traffic forecasts, the traffic demand for this particular alignment was approximately 80,000 vehicles per day (untolled). An issue with Option 2 is the highly complicated connections required at the southern end where the new link would interchange with EastLink.

Option 3 was considered the more likely alignment for the north-south connection as it attracts high traffic volumes (approximately 145,000 vehicles per day untolled) and is a direct route to the Eastern Freeway. The connection would utilise existing road infrastructure along Greensborough Highway between the Metropolitan Ring Road and Lower Plenty Road. It would then run underground south of Lower Plenty Road,

connecting to the Eastern Freeway near Bulleen Road, requiring works to link in with the existing infrastructure at this location. This connection would reduce demand on Rosanna Road, which currently operates as this north-south connection through residential areas and the shopping precinct of Heidelberg. This option would require works to widen the Eastern Freeway to four lanes between Bulleen Road and Tram Road, provide an auxiliary lane between Tram Road and Blackburn Road and widen to four lanes between Blackburn Road and Springvale Road.

Based on the above high-level analysis of the three options, on balance, Option 3 was considered to be the more likely alignment for the Northern Link and any further reference to this link in this report is based on this alignment. This is not to say that in the long term, the need for Option 2 will not exist, it is just that the benefits of Option 3 are greater at this time and is therefore considered as a higher priority solution.



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0 1.5 3 6 9 12

Kilometres (at A4)

Map Projection: Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia 1994
Grid: Map Grid of Australia, Zone 55

N

Legend

- Alignment Northern Link- Option 1
- Alignment Northern Link- Option 2
- Alignment Northern Link- Option 3
- Freeway
- Highway
- Major Road
- River
- Urban Growth Area

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Northern Link Alignment Options

Figure 1

G:\31\23303\CADD\GIS\Projects\022_Project_Alignments_NL.mxd

Data source: VicMap; ABS; GHD; Client Created by: A Lovell

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2.3 Comparison of Options

While initially, GHD's brief was to compare the options of the East West Link versus the Northern Link (as shown in Figure 2), it is apparent that directly comparing the two options is difficult as they serve different needs and markets. The Northern Link's market and needs include:

- Improving transport networks for the growth area to the north, particularly Whittlesea and Hume;
- Improving freight links from the north (Somerton/Hume Corridor) to the south-east (Dandenong);
- Improving amenity for residents in the north-east;
- Providing an improved network to run high frequency, cross town on-road public transport; and
- Reducing commuter travel time to employment centres from the northern suburbs.

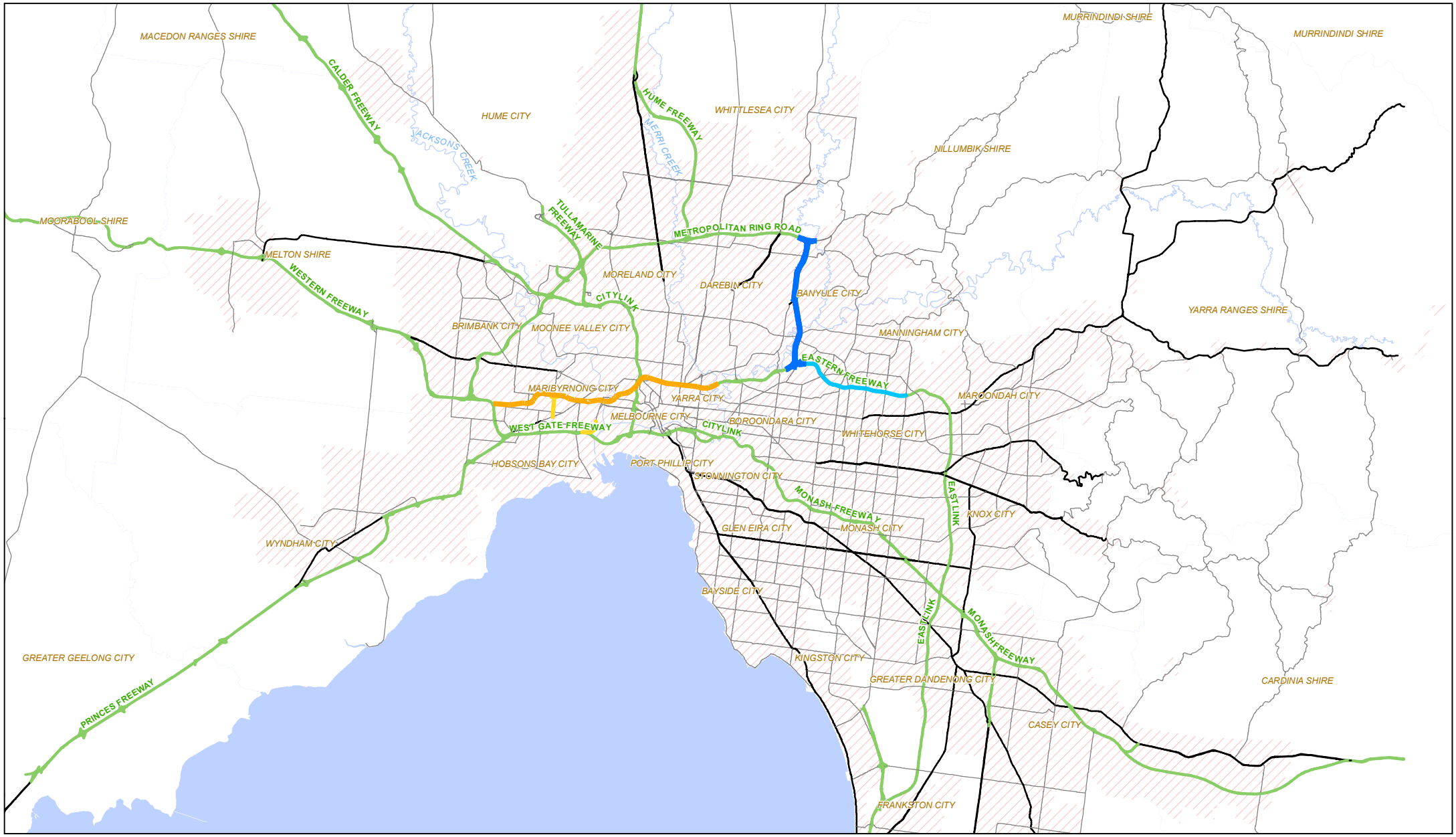
The East West Link's market and needs include:

- Improving cross-city travel links to/from the east to the west;
- Improving freight links to the Port, particularly from the west;
- Improving amenity for the inner west residents, through reduced freight traffic on arterial roads;
- Improving amenity for the inner north residents, through reduced traffic on Alexandra Parade;
- Improving transport networks for the western suburbs to facilitate land use growth in this area; and
- Providing a second crossing of the Yarra/Maribyrnong River.

While the East West Link does provide some improved connectivity between the north and the east (by connecting the Eastern Freeway and CityLink), it is not considered to overlap significantly with the market served by the Northern Link.

Through GHD's high level demand modelling, we have developed plans showing origin-destinations for both links in isolation and they show that the links have different catchment areas. These plans are provided in Figure 3 and Figure 4.

GHD has taken the approach of assessing the projects on their merits and then determining the staging and priority of the projects based on these assessments.



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0 1.5 3 6 9 12

Kilometres (at A4)

Map Projection: Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia 1994
Grid: Map Grid of Australia, Zone 55

N

Legend

- Alignment Northern Link
- Eastern Freeway Widening
- Alignment East West Link
- Truck Action Plan
- Freeway
- Highway
- Major Road
- River
- Urban Growth Area

GHD

Northern Link and East West Link Alignment Options

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Figure 2

G:\31\23303\CADD\GIS\Projects\005_Project_Alignments_revA.mxd

Data source: VicMap; ABS; GHD; Client Created by: A Lovell

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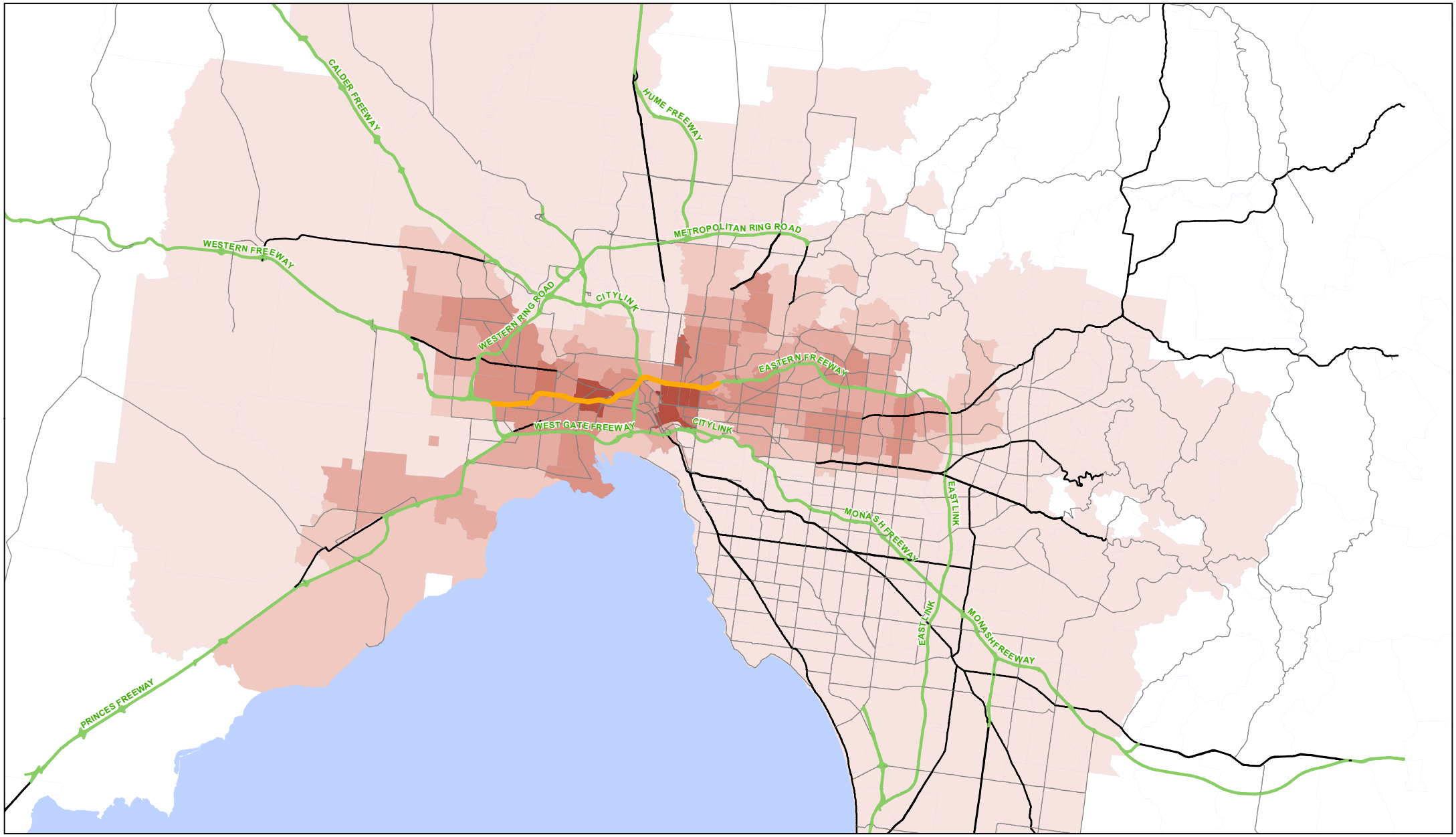

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0 1.5 3 6 9 12

Kilometres (at A4)

Map Projection: Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia 1994
Grid: Map Grid of Australia, Zone 55

N

Legend

- Alignment East West Link
- Freeway
- Highway
- Major Road

Total Trips (Per km²)

0 - 1 | 2 - 50 | 51 - 100 | 101 - 200 | 201 - 500 | 501 - 750 | 751 - 1000 | 1001 - 5000 | > 5000

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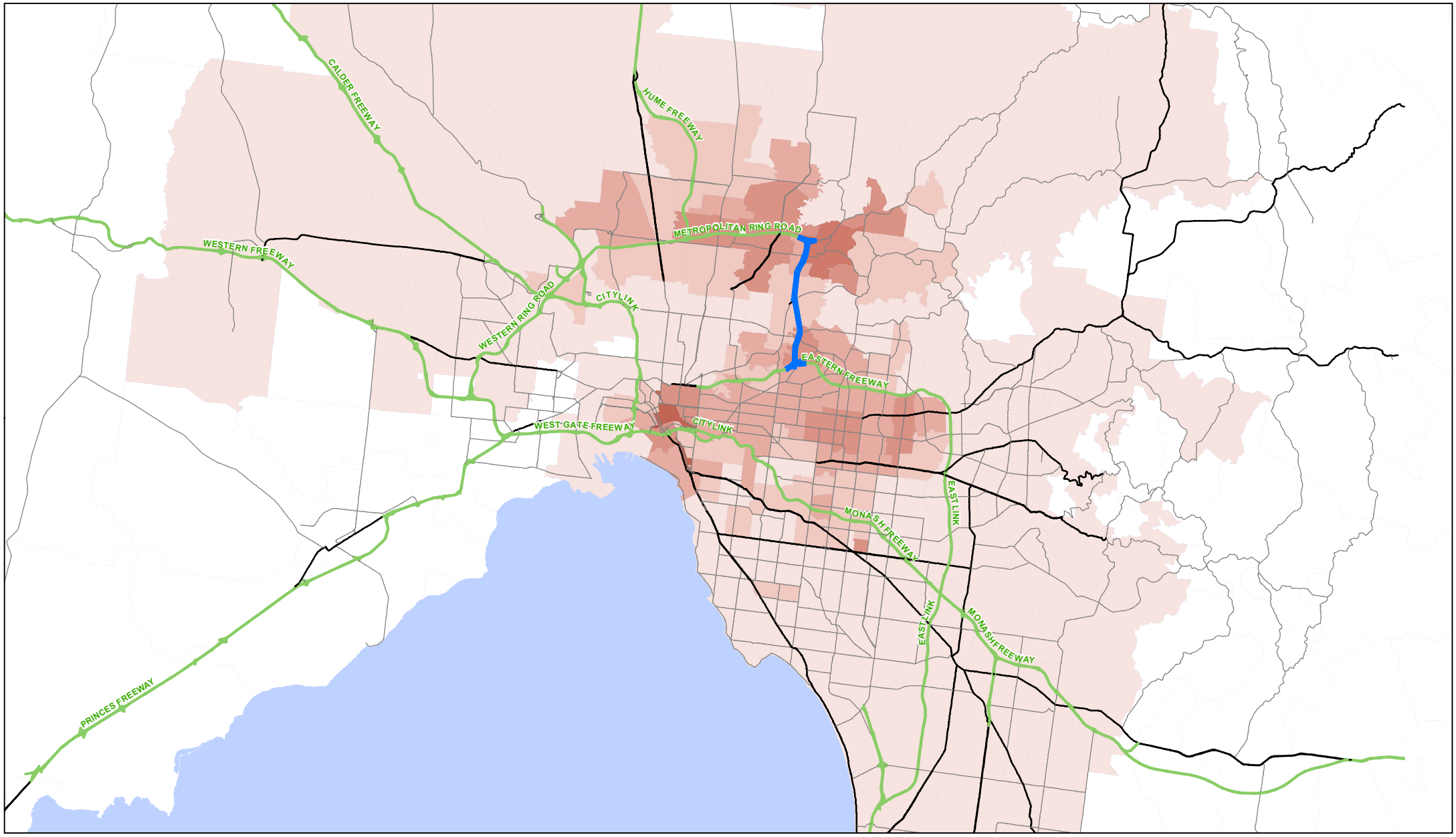
East West Link Origins and Destinations (AM Peak)

Figure 3

G:\31\23303\CADD\GIS\Projects\019_TripsSUM_EW_AllTraffic.mxd

Data source: VicMap; ABS; GHD; Client Created by: A Lovell

8/180 Lonsdale St Melb VIC 3000 Australia **T** 61 3 8687 8000 **F** 61 3 8687 8111 **E** melmail@ghd.com.au **W** www.ghd.com.au



1:400,000

0 1.5 3 6 9 12

Kilometres (at A4)

Map Projection: Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia 1994
Grid: Map Grid of Australia, Zone 55

N

Legend

- Alignment Northern Link
- Freeway
- Highway
- Major Road

Total Trips (Per km²)

1 | 2 - 50 | 51 - 100 | 101 - 200 | 201 - 500 | 501 - 750 | 751 - 1000 | 1001 - 5000 | > 5000

Northern Link Origins and Destinations (AM Peak)

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Revision 0
Date Aug 2008

Figure 4

G:\31\23303\CADD\GIS\Projects\020_TripsSUM_NL_AllTraffic.mxd

Data source: VicMap; ABS; GHD; Client Created by: A Lovell

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3. Priority Comparison

3.1 Definition of Priority

In order to assess the importance and need of each project, the priority of the projects needs to be established. To determine the priority it initially has to be defined against criteria that can be analysed and evaluated. The priority was defined based on the following four criteria:

- Travel demand;
- Reduction of reliance on West Gate Bridge;
- Broader strategic impact; and
- Economic impact.

3.2 Travel Demand

3.2.1 Traffic Volumes

Forecast daily traffic volumes have been modelled by Veitch Lister Consulting (VLC), as part of the EWLNAS, and by GHD, as part of this study. It should be noted that GHD's modelling was only for high-level strategic analysis of the Northern Link and East West Link options. Comparisons between the model forecasts indicate that the volumes being predicted by both models are of a similar quantum.

Table 1 and Table 2 summarise the forecast VLC traffic volumes for the East West Link and the Northern Link, including the forecast year, percentage of commercial vehicles and the tolling scenario. The forecast traffic volumes are also shown in Figure 5. Any tolling scenario could have significant impacts on the forecast volumes depending on the tolling structure and the alternative routes available. It is expected the these new connections would have high volumes during peak periods with tolling in place, however due to the alternative routes (particularly with the Northern Link) it would be expected that the off peak volumes could be greatly affected. The following points are made regarding the modelling assumptions of the possible tolling scenarios. It should be reinforced that these are purely modelling assumptions:

- East West Link will be tolled between the Eastern Freeway and CityLink;
- CityLink (northern connection to Tullamarine Freeway) will remain a tollway;
- Other sections of the East West Link will be untolled as tolling them would discourage their use and maintain pressure on the West Gate Freeway;
- The section of the Northern Link to the north of Lower Plenty Road will be untolled. This is due to this section involving the upgrading of the existing Greensborough Highway, therefore it is not considered practical to apply tolls; and
- The section of the Northern Link between Lower Plenty Road and Eastern Freeway has been tested in both tolled and untolled scenarios (Details regarding the tolled scenario are provided in Section 3.2.3).

It should be noted that the Northern Link volumes have been forecast for 2021, while the East West Link volumes are forecast for 2031. This should be taken into consideration as it is likely that the 2021 volumes would increase significantly by 2031.

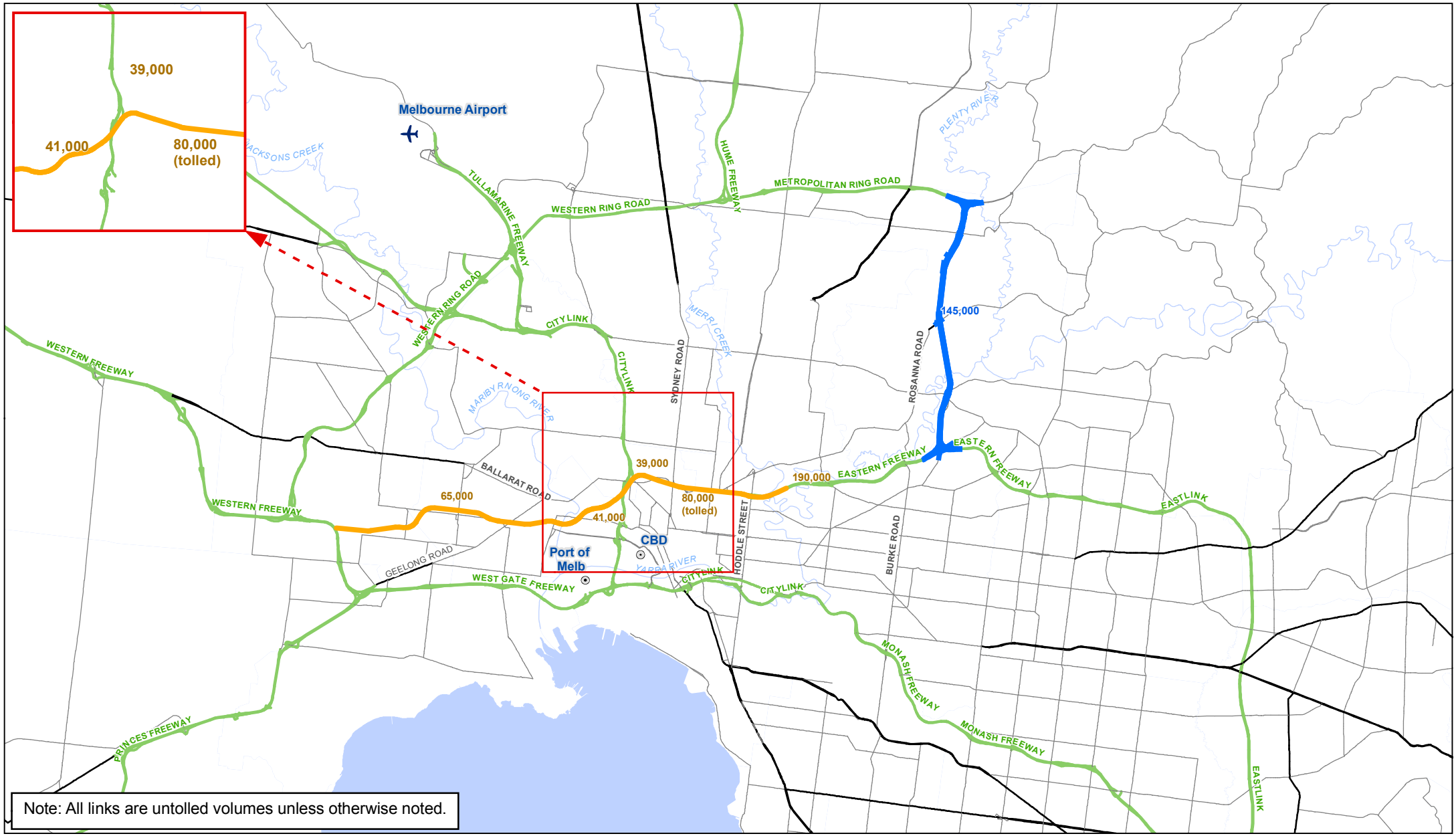
Table 1 Forecast Traffic Volumes for East West Link

Link	Year	Two Way Volumes (vpd)	% CVs	Scenario
Eastern Freeway, east of EWL	2031	190,000	12%	Untolled
EWL (Eastern Fwy to CityLink)	2031	80,000	21%	Tolled
EWL (CityLink Ramps)	2031	39,000	16%	Tolled
EWL (CityLink to Port)	2031	41,000	25%	Untolled
EWL (Port to WRR)	2031	65,000	13%	Untolled

Table 2 Forecast Traffic Volumes for Northern Link

Link	Year	Two Way Volumes (vpd)	% CVs	Scenario
NL (MRR to Eastern Freeway)	2021	145,000	8%	Untolled*

**** Details regarding the tolled scenario are provided in Section 3.2.3***



1:200,000

0 1 2 4 6 8

Kilometres (at A4)

Map Projection: Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia 1994
Grid: Map Grid of Australia, Zone 55

N

Legend

- Alignment East West Link
- Alignment Northern Link
- River
- Freeway
- Highway
- Major Road

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Date Aug 2008

Forecast Traffic Volumes (Two-way daily volumes)

Figure 5

G:\31\23303\CADD\GIS\Projects\010_ForcastVolumes.mxd

Data source: VicMap; ABS; GHD; Client Created by: A Lovell

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The forecast traffic volumes indicate that future volumes along the Eastern Freeway are in the order of 190,000 vehicles per day, with approximately 40% of these vehicles to continue to/from the East West Link. It would be expected that the remaining 60% of the traffic would be accessing the Eastern Freeway to/from Hoddle Street and Alexandra Parade and would still be subject to the network constraints currently occurring, particularly on Hoddle Street. GHD understand that the reason for not providing city access ramps on the Eastern Freeway to CityLink section of the East West Link is to avoid adding to the current congestion problems on existing north-south roads (such as Nicholson Street and Smith Street), to remove the impact of queuing within the tunnel, to maximise the use of the tunnel for cross-city travel and to support any strategy of encouraging travel to the CBD to occur by public transport.

Table 1 and Figure 5 indicate that approximately 39,000 vehicles per day will be using the East West Link to access the northern CityLink connection. It could be expected that the introduction of the Northern Link could reduce the demand for this movement, as there would be an alternative route accessing the north (via the Northern Link and Metropolitan Ring Road). This would reduce the traffic volumes on the eastern end of the East West Link, potentially reducing the viability of this link due to a decrease in volumes. This is particularly relevant for the north-south freight traffic movement, which makes up 16% of this movement to CityLink. It is predicted that a large portion of this freight traffic will be travelling between the Eastern Freeway and the Hume Freeway (the primary freight route between Melbourne and Sydney). By providing a direct link between the Eastern Freeway and the Metropolitan Ring Road it would produce a more direct route for freight to the Hume Freeway, particularly for traffic travelling to/from EastLink. However, the same could be said for the other case, the introduction of the East-West Link would potentially reduce some demand for travel along the Northern Link for the same reasons as it provides an alternate route to the north-west, particularly to destinations such as Tullamarine Airport.

The traffic volumes on the East West Link to the western suburbs are approximately 65,000 vehicles per day, which is a combination of the traffic to/from the Port and cross-city movements. This indicates that a large percentage of east-west traffic is being taken off the West Gate Freeway and arterial roads currently used to access the west.

On the Northern Link, with traffic volumes of 145,000 per day, this indicates there is significant demand for travel along this route. While the traffic volumes on the Northern Link are high and a large portion of these volumes are expected to continue onto the Eastern Freeway, this is not expected to increase the impact at the western end of the Eastern Freeway (at Hoddle Street/Alexandra Parade). This is due to the fact that demand for citybound travel on the Eastern Freeway already exists with vehicles currently using the arterial road network to access the Eastern Freeway. The benefits of the Northern Link is that it removes this demand from arterial roads such as Rosanna Road and Fitzsimmons Lane and decreases the overall travel time for vehicles travelling between the northern suburbs and the Eastern Freeway.

3.2.2 Freight Demands

As shown in Table 1, the modelling predicts that there is a freight demand for both the Northern Link and the East West Link. Melbourne's key industrial areas influenced by the links are shown in Figure 6. The East West Link supports travel to the Port of Melbourne, as shown by the high percentage of commercial vehicles along the link between CityLink and the Port. The East West Link serves a primary freight route demand.

The Northern Link also serves a primary freight route in the north-south movement from the north, such as Somerton, to the south-eastern suburbs, particularly Dandenong. The demand for this movement will increase as the Melbourne Fruit Market is moved from the Port of Melbourne to Epping. The PoMC Port Development Plan has this staged to occur by 2015[1]. The north-south movement is currently being served by one of the following routes:

- Greensborough Highway/Rosanna Road to the Eastern Freeway and EastLink;
- CityLink to Monash Freeway; or
- CityLink to Eastern Freeway and EastLink.

While the percentage of commercial vehicles on the Northern Link is 8%, this equates to approximately 12,000 commercial vehicles per day, which is higher than that forecast to travel along the East West Link and connect north to CityLink.

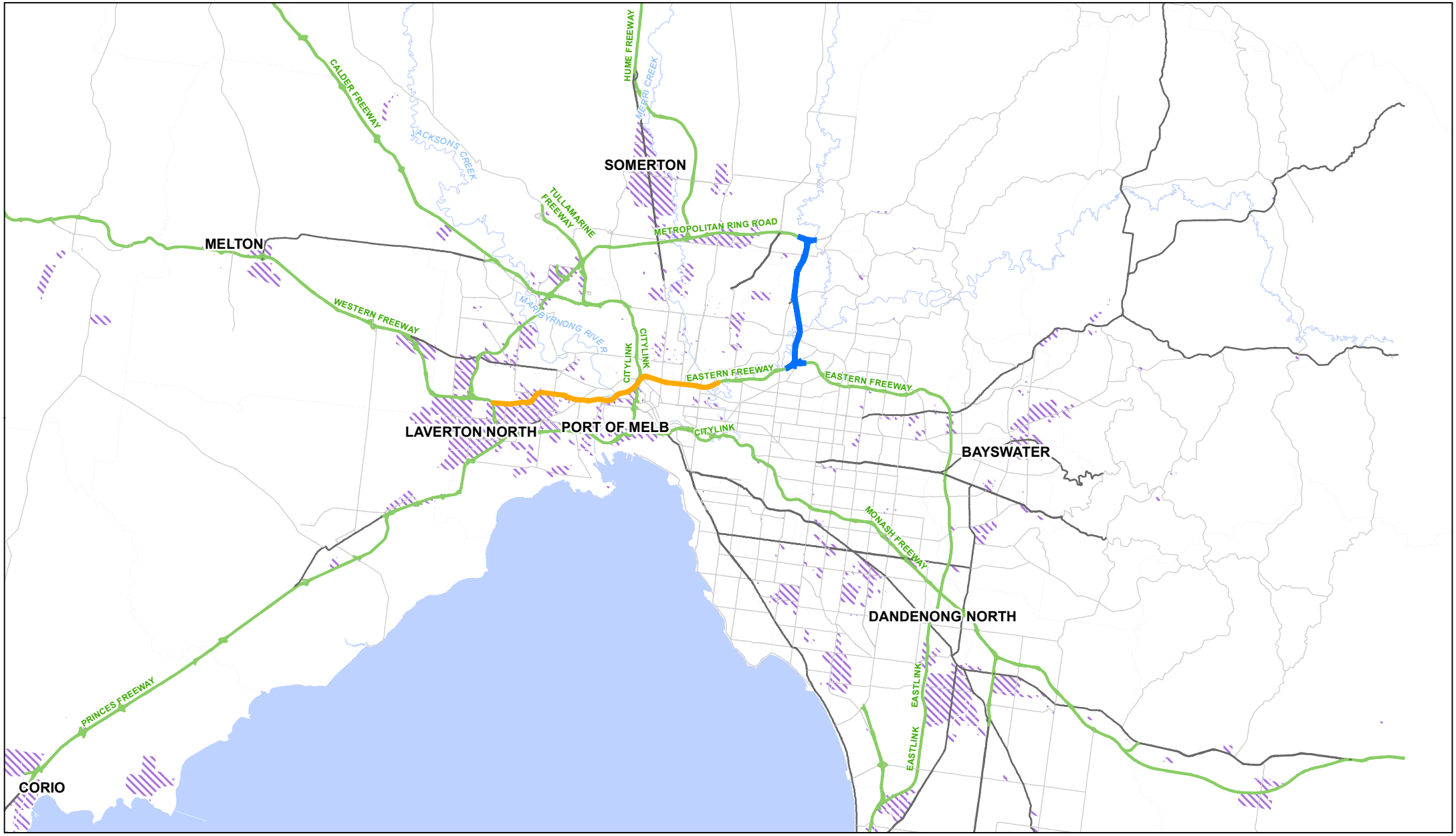
The high percentage of commercial vehicles travelling between CityLink and Eastern Freeway could alter if the Northern Link were constructed. Freight traffic could travel along Eastern Freeway and then Northern Link rather than travelling to CityLink and onto the Tullamarine Freeway to access the Western Ring Road. This would reduce the freight demand movement along East West Link between CityLink and Eastern Freeway and potentially reduce the predicted traffic volumes on the East West Link.

The inverse of the high percentage of commercial vehicles along East West Link is that this indicates that it is predominantly not a commuter route. This impacts on the commercial viability of the route from a Private Public Partnership (PPP) project and the attractiveness to the private sector of this link as a toll road. Alternatively, the Northern Link has a lower commercial vehicle percentage, however this is supported by a higher volume of general private vehicle traffic. This higher volume assists to make the project more attractive to the private market as a PPP. This is further discussed in Section 4.

Through the high level modelling, diagrams of the origins and destinations for freight have been produced and are shown in Figure 7 and Figure 8. These diagrams show the freight catchment areas for the links. It can be seen that from these diagrams there is some partial overlap in the freight catchment areas (particularly in the east and north-west), however generally they do serve different freight markets. It should be

[1] p 69 Port of Melbourne Corporation, Port Development Plan 2006 – 2035 Consultation Draft, August 2006

noted that these figures include light commercial vehicles, which explains the high concentration of freight trips to regions such as the CBD.



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0 1.5 3 6 9 12

Kilometres (at A4)

Map Projection: Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia 1994
Grid: Map Grid of Australia, Zone 55

N

Legend

- Alignment East West Link
- Alignment Northern Link
- Freeway
- Highway
- Major Road
- River
- Industrial Zones

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Melbourne Industrial Areas

Figure 6

G:\31\23303\CADD\GIS\Projects\012_FreightLocations.mxd

Data source: VicMap; ABS; GHD; Client Created by: A Lovell

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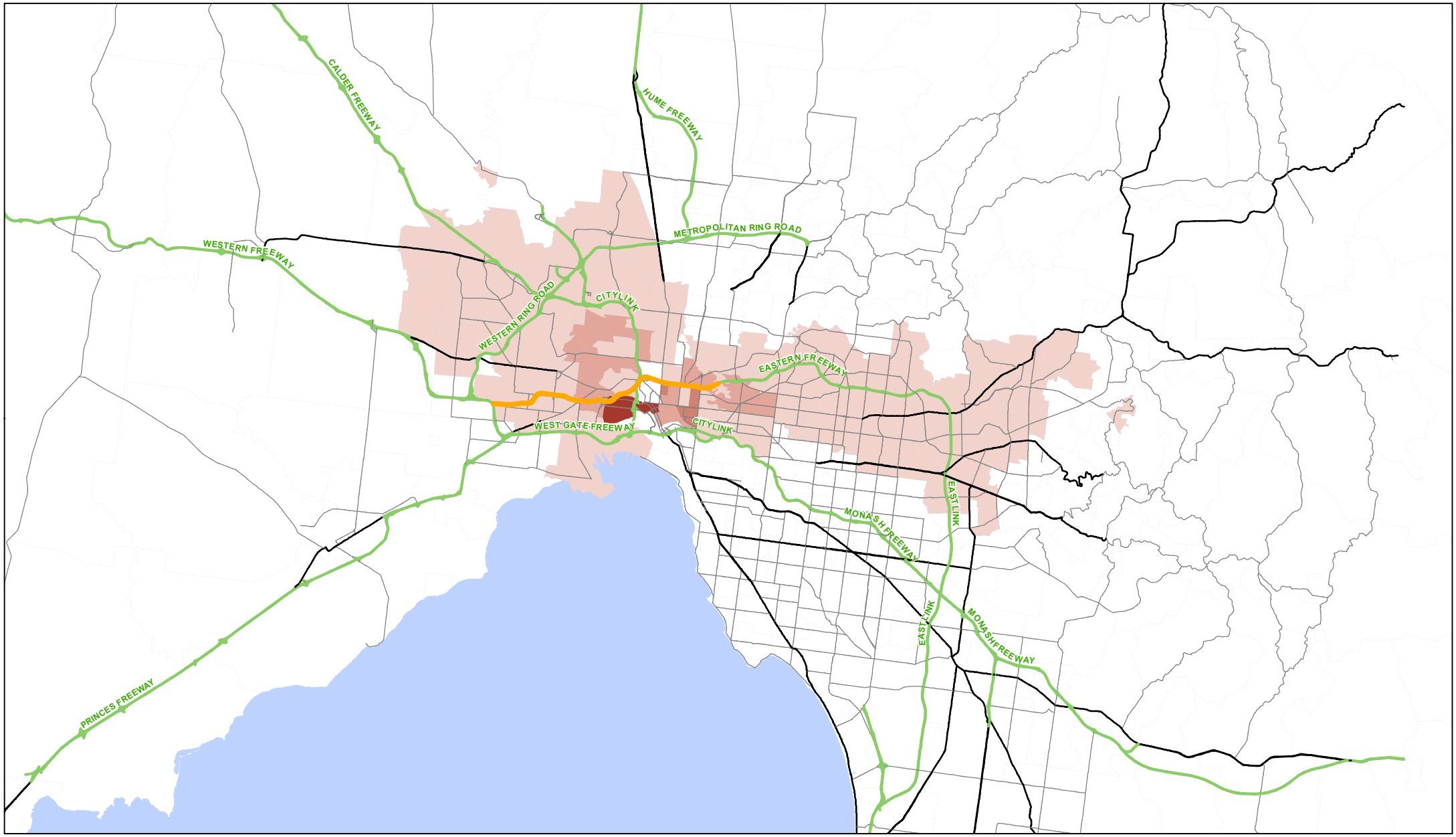

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0 1.5 3 6 9 12

Kilometres (at A4)

Map Projection: Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia 1994
Grid: Map Grid of Australia, Zone 55

N

Legend

- Alignment East West Link
- Freeway
- Highway
- Major Road

Total Freight Trips (Per km²)

0 - 1 | 2 - 5 | 6 - 10 | 11 - 15 | 16 - 20 | > 20

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East West Link
Freight Origins and Destinations (AM Peak)

Figure 7

G:\31\23303\CADD\GIS\Projects\018_TripsSUM_NLEWL_Freight.mxd

Data source: VicMap; ABS; GHD; Client Created by: A Lovell

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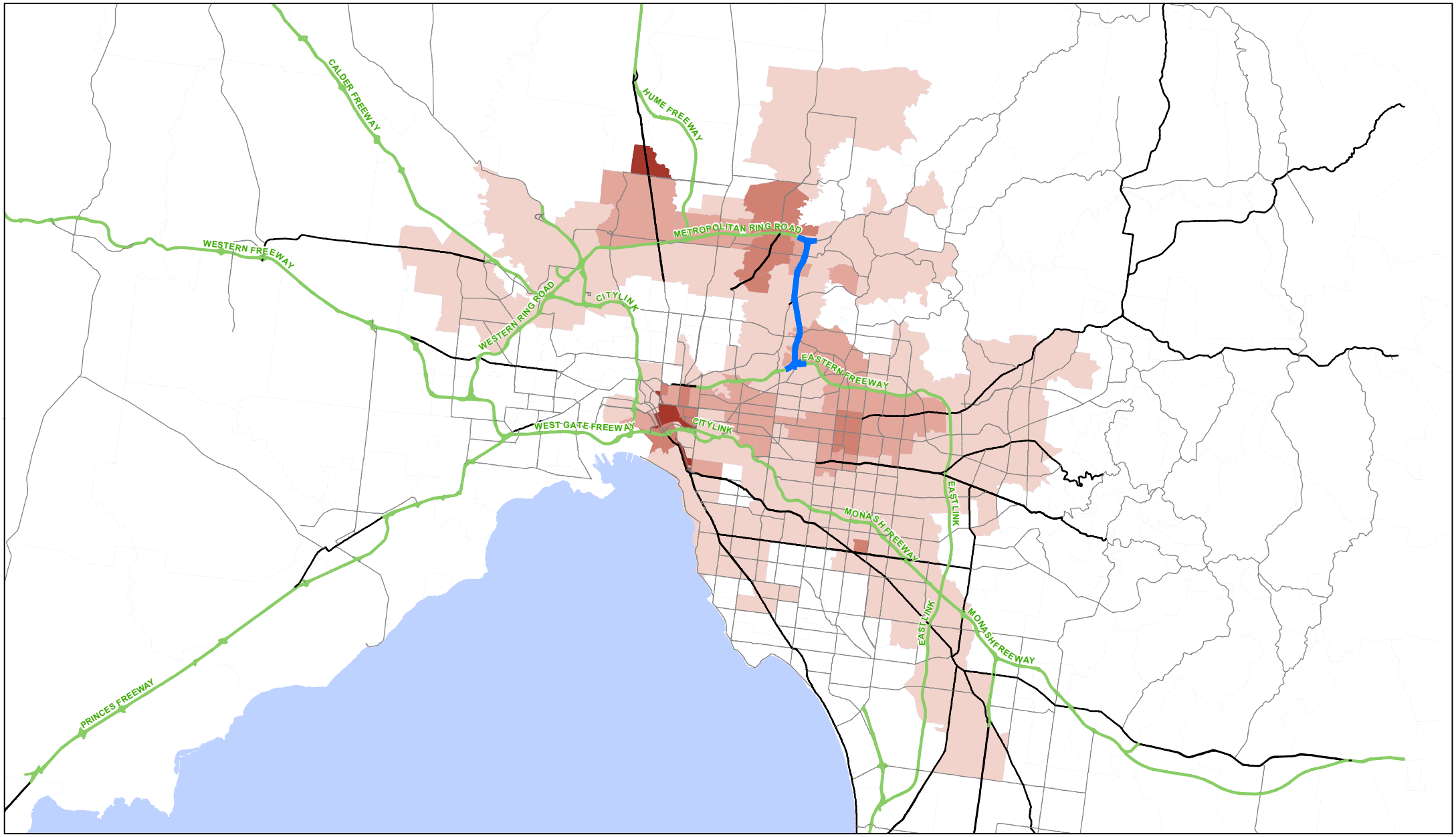

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0 1.5 3 6 9 12

Kilometres (at A4)

Map Projection: Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia 1994
Grid: Map Grid of Australia, Zone 55

N

Legend

- Alignment Northern Link
- Freeway
- Highway
- Major Road

Total Freight Trips (Per km²)

0 - 1 | 2 - 5 | 6 - 10 | 11 - 15 | 16 - 20 | > 20

GHD

Northern Link Freight Origins and Destinations (AM Peak)

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Figure 8

G:\31\23303\CADD\GIS\Projects\017_TripsSUM_NL_Freight.mxd

Data source: VicMap; ABS; GHD; Client Created by: A Lovell

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3.2.3 Northern Link Diversion

The Northern Link has been modelled based on a non-toll scenario and as with all toll roads, it would be expected that there would be some diversion from this link in a tolled scenario. In these instances, arterial routes such as Fitzsimmons Lane/Williamsons Road and Rosanna Road will be carrying some of this diverted traffic. It would be expected that despite this diversion, there would be some relief on these roads. Preliminary toll modelling of this route was undertaken. For this scenario, toll values were assigned to the two sections between Lower Plenty Road and the Eastern Freeway. The northern section between Lower Plenty Road and the Metropolitan Ring Road was not tolled as it is likely this section would be an upgrade of existing infrastructure and therefore not suitable to charge. This modelling indicated a diversion rate of approximately 30%. This diversion is an indication only and would be subject to more detailed modelling and sensitivity analysis of the toll value applied.

3.3 Reduction of Reliance on the West Gate Bridge

3.3.1 East West Link

One of the critical factors in developing the East West Link is that it provides a second freeway standard river crossing of the Yarra/Maribyrnong River. The West Gate Bridge currently provides the major link between the west and the south-eastern suburbs and carries 165,000 vehicles per day, which is forecast to increase to 235,000 vehicles per day in 2031[2]. The impacts of this on the road network if the bridge was to become unavailable for either a short or long term period, include:

- The alternate routes of Footscray Road, Dynon Road and Ballarat Road – Smithfield Road would be severely congested for long periods of the day;
- Increased commercial vehicles on the local road network;
- Increased congestion and commercial vehicles would result in detrimental impacts on the amenity and safety of arterial and local roads;
- Public transport demand would increase significantly impacting on a network already under capacity constraints;
- Freight costs would rise with the increase in transport costs; and
- Operations at the Port of Melbourne would be disrupted.

These impacts indicate that there are significant economic and social implications of maintaining only one freeway standard river crossing. The risk to the community would be of a catastrophic nature if the bridge were to be unavailable. Therefore this section of the East West Link would be considered a requirement from the perspective of risk mitigation despite this section of the link not attracting a high traffic volume either on its own or as part of the overall link.

[2] p 136 Sir Rod Eddington, EWLNAS Team, Investing in Transport – East West Link Needs Assessment, March 2008

3.3.2 Northern Link

The Northern Link, while providing a strategic north-south transport route, does not provide a direct alternate river crossing of the Yarra/Maribyrnong River. Therefore this option has limited benefits based on a reduction of reliance on the West Gate Bridge. While the road will provide an additional crossing of the Yarra River, east of Bulleen, there are alternative routes in this area that undertake this function. If one of these crossings were to be impacted upon for a significant amount of time there would be increased congestion on alternative routes however the transport network would not be severely impacted in the same manner as the West Gate Freeway being unavailable for a short or long-term period. Therefore the link is not being provided as a risk mitigation measure.

3.4 Broader Strategic Impact

3.4.1 Freight

The East West Link and Northern Link both provide for strategic freight movements across the Melbourne network. East West Link provides connections to the Port of Melbourne, particularly from the industries to the west. The key concern regarding the current freight network is that the increasing congestion is making travel times unreliable and therefore freight costs are also increasing. The East West Link provides an alternative route to the West Gate Freeway, which is undergoing increasing commuter demand and delays. The high percentage of commercial vehicles forecast along this route indicates that the East West Link is meeting this need as a freight route.

The Northern Link would be a major route for movements to/from north to the south-east. Distribution centres located at Dandenong and Broadmeadows/Somerton currently do not have a direct link between these two areas. Freight undertaking this movement are either travelling further west towards Tullamarine Freeway before travelling east via CityLink and the Monash Freeway or are using the arterial road network to connect between the Metropolitan Ring Road and the Eastern Freeway. The latter route has become more attractive with the opening of EastLink, as this provides a direct link between the Eastern Freeway and Dandenong. It could be anticipated that this will result in additional trucks on the arterial network between the Metropolitan Ring Road and the Eastern Freeway.

The Port of Melbourne is the primary Victorian port into the future, however the role of the Port of Hastings is expected to increase to support the Port of Melbourne as it reaches capacity. Currently, the Port of Hastings deals primarily with steel and liquid petroleum, however, in the future the port is expected to accommodate container movement. These container movements would be expected to come from the primary industry areas of Somerton/Broadmeadows, which would be supported by the Northern Link. Laverton/Altona and Dandenong would access the Port of Hastings by the existing road network. It is our understanding that the development of the Port of Hastings is in the planning phase.

3.4.2 Land Use Planning

The East West Link services a constrained land use opportunity by opening up the western suburbs to residential and service based industry, which has not developed as substantially as the south-eastern suburbs but is quickly reaching similar growth. The City of Wyndham was identified as one of the five 'Growth Area' Councils as part of Melbourne 2030 and to support this, an improved transport network is required to sustain this growth. The City of Wyndham is shown in Figure 9. The Wyndham population is expected to grow by 100,000 people by 2031 and employment is expected to grow by 90,000 jobs in the same period[3]. This includes the Truganina Employment Precinct and the Werribee Technology Precinct.

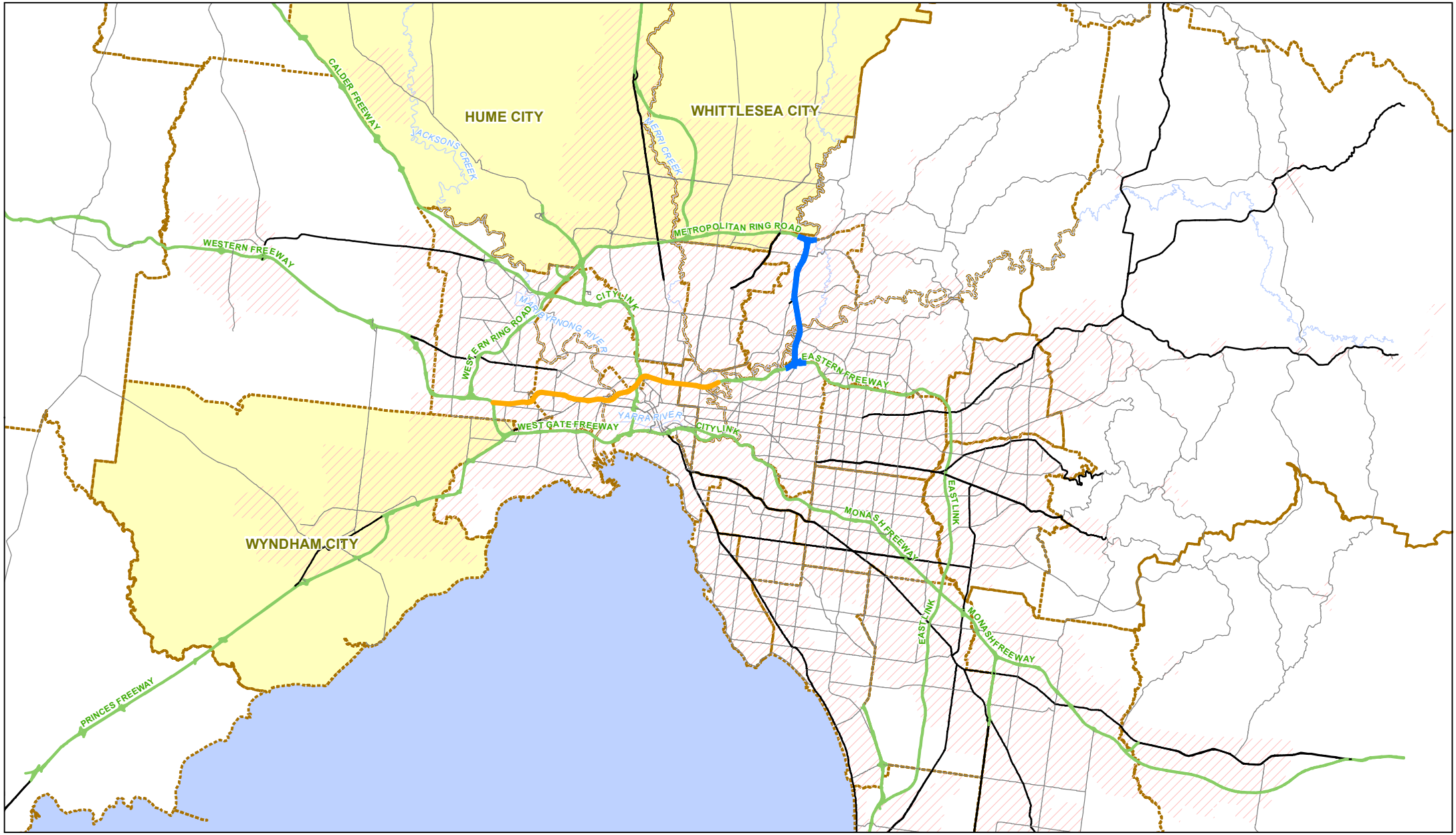
The congestion on the West Gate Freeway could be considered a constraint to future growth in the western suburbs and the construction of an alternative link to the west is considered an important feature that would be required in the short term to develop the area and provide confidence to private industry to invest in developing the area. The benefits in the growth of this area would be similar in nature to the industrial and residential growth that has occurred along the EastLink corridor.

In addition, the East West Link and in particular the Truck Action Plan, supports the development of Footscray as a Transit City by removing freight from the inner west and supporting its integration into an extended CBD. The direct links to the Port of Melbourne will reduce traffic travelling along Moore Street and provide opportunities to develop the Transit City.

The Northern Link supports the growth areas of Whittlesea and Hume, which are other 'Growth Area' Councils identified in Melbourne 2030, as shown in Figure 9. Whittlesea is forecast to grow by up to 65,000 people by 2031, while Hume is expected to grow by about 35,000[4]. However, this area does not have as substantial employment precincts as the western suburbs. Therefore, much of this commuter traffic will be required to travel external to the area to access employment and the Northern Link will assist with moving this external traffic to their destinations.

[3] http://www.gaa.vic.gov.au/ /

[4] http://www.gaa.vic.gov.au/ga_whittlesea



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0 1.5 3 6 9 12

Kilometres (at A4)

Map Projection: Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia 1994
Grid: Map Grid of Australia, Zone 55

N

Legend

- Alignment East West Link
- Alignment Northern Link
- River
- Local Government Area
- Urban Growth Area
- Land Use Planning - Growth Areas
- Freeway
- Highway
- Major Road

GHD

Land Use
Growth Areas

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Figure 9

G:\31\23303\CADD\GIS\Projects\013_GrowthAreas.mxd

Data source: VicMap; ABS; GHD; Client Created by: A Lovell

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3.4.3 Public Transport

The East West Link allows for improved north-south bus and tram movements across Alexandra Parade and by not providing CBD access supports any strategies of encouraging travel to the CBD by public transport. As mentioned previously the Truck Action Plan improves opportunities for traffic to bypass Footscray and facilitate Transit City growth.

As shown in Figure 4, the principal origins and destinations for the Northern Link are between the northern suburbs and the south-eastern suburbs, particularly the employment areas along the EastLink corridor. A high-capacity, efficient public transport route does not support the movement between these two areas. The Yellow Orbital SmartBus Route does connect these two areas. The principles behind SmartBus are to provide connections between the radial rail corridors and activity centres and it would not be expected to transport high volumes of people undertaking this movement. The long travel times by bus for this north-south movement would also make it unattractive to travellers. As shown, by the origin-destinations, the Northern Link better accommodates this movement. If the Northern Link were developed, a dedicated transit service could utilise this connection or the spare capacity it would release on the arterial roads.

3.5 Economic Impact

Due to the strong freight movement on the East West Link, the economic benefits of constructing this link are based around the improvements in travel time and operating costs for moving freight across Melbourne and the potential savings this will have on freight costs. A key element of this is the improvement in freight access to the Port of Melbourne and also the Melbourne Airport. In addition, the East West Link supports economic growth in the west and moving more employment, particularly service-based employment, to the western suburbs and allowing the area to diversify providing alternatives to manufacturing based employment.

The economic benefits the Northern Link will provide are primarily based around the private vehicle and freight travel time savings and operational cost savings that will be achieved with the introduction of the link. As the Melbourne Fruit Market is moved to Epping this benefit, particularly for freight, is expected to increase into the future. As stated previously, linking the major freight centres of Dandenong and Hume will provide significant benefits to that industry which will have flow-on benefits to the economy.

A more important economic consideration is the impact if the links are not built, particularly the East West Link. If the link is not built, the West Gate Freeway congestion will increase and its impacts on the cost of freight movement to the Port and the western suburbs will cost the community substantially. Freight routes that will improve not only travel time, but also travel time reliability allow industry to become efficient in the transport and logistics activities they undertake and minimise the costs associated with these activities that ultimately get passed on to the consumer.

4. Staging of Projects

4.1 Overview

In looking at the staging of these projects, GHD consider it is worthwhile dividing the East West Link into three sections:

- Port Access and River Crossing – The section from Geelong Road to the Port of Melbourne;
- East West Link (West) – The section between the Western Ring Road and Geelong Road; and
- East West Link (East) – The section between the Eastern Freeway and CityLink.

It should be noted that the road section between the Port and CityLink would need to be built as part of one of the adjacent sections, depending on the staging. It is not expected that this section would be built in isolation.

The optimal staging of the thress sections (Port Access and River Crossing, East West Link (West) and East West Link (East)) and the Northern Link can be considered from a number of different viewpoints depending on the factors considered most important. These factors include:

- Strategic fit;
- What would the private sector prefer to construct first? (given it was delivered as a PPP);
- How must the staging be developed to ensure contractors/banks are willing to build/finance the projects?
- What happens if we don't construct each project?;
- What do the public expect?; and
- Where does the Truck Action Plan fit into the mix?

The following sections consider the staging from a number of different viewpoints, with consideration of the impacts this staging would have on the key stakeholders.

4.2 Potential Staging Scenarios

Before considering the issues associated with staging from the different viewpoints and drivers, GHD consider it worthwhile to define the most likely staging scenarios. Therefore we have developed three staging scenarios A, B and C.

Scenario A:

1. River Crossing and Port Access, including Truck Action Plan;
2. East West Link (West) - Geelong Road to Western Ring Road;
3. Northern Link; and
4. East West Link (East).

Scenario B

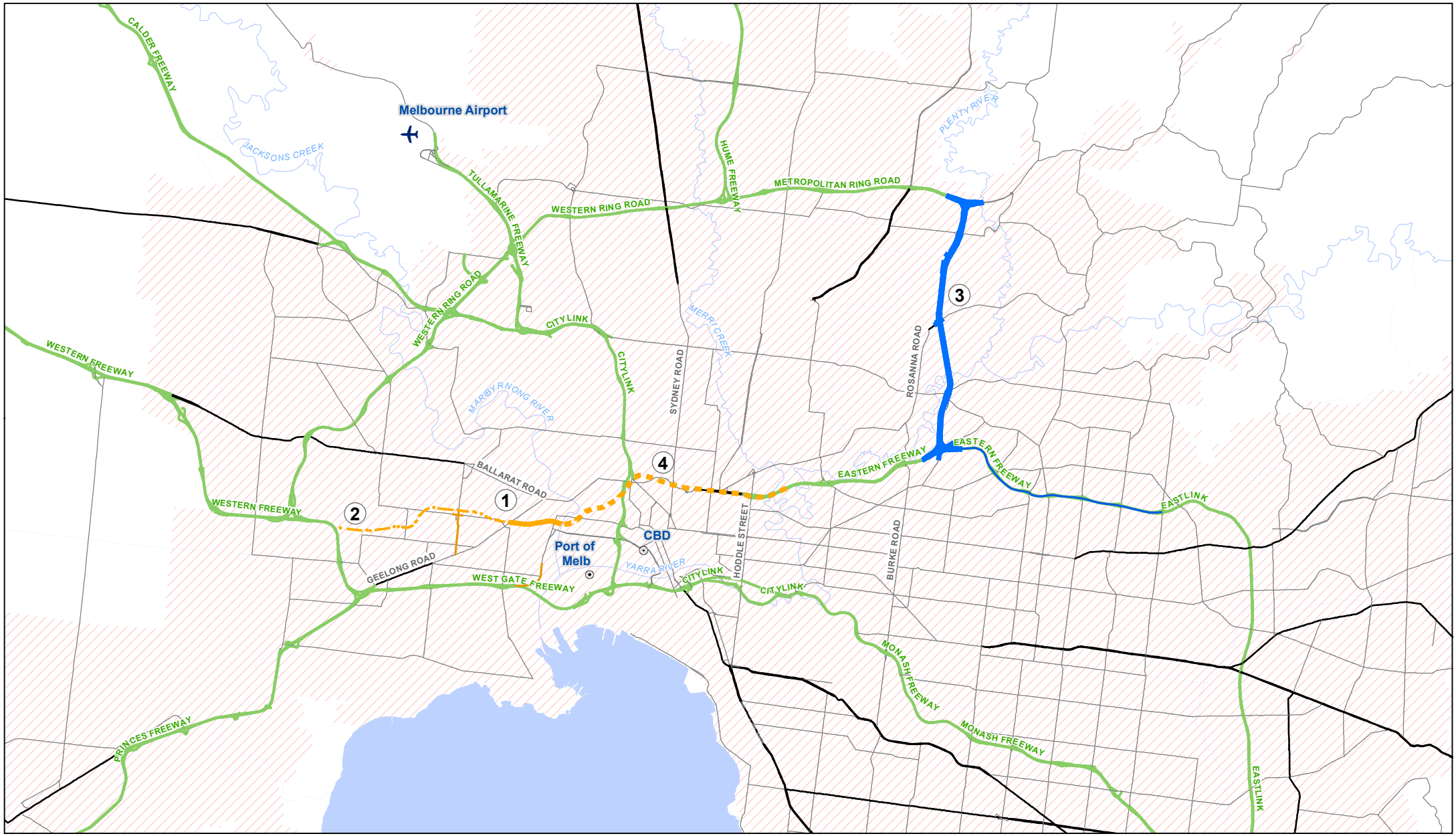
1. River Crossing and Port Access, including Truck Action Plan;
2. East West Link (East);
3. Northern Link; and
4. East West Link (West) - Geelong Road to Western Ring Road.

Scenario C

1. Northern Link
2. River Crossing and Port Access, including Truck Action Plan;
3. East West Link (West) - Geelong Road to Western Ring Road; and
4. East West Link (East).

These three scenarios are shown in Figure 10, Figure 11 and Figure 12 on the following pages.

It should be worth noting that as the Northern Link is an isolated project separate from the other elements associated with the East West Link it has the most flexibility in terms of staging. It could actually be brought forward as one of the first projects.



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0 1 2 4 6 8

Kilometres (at A4)

Map Projection: Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia 1994
Grid: Map Grid of Australia, Zone 55

N

Legend

- Urban Growth Area
- River
- Freeway
- Highway
- Major Road
- (1) Order of Staging

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Staging of Projects - Scenario A

Figure 10

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Data source: VicMap; ABS; GHD; Client Created by: A Lovell

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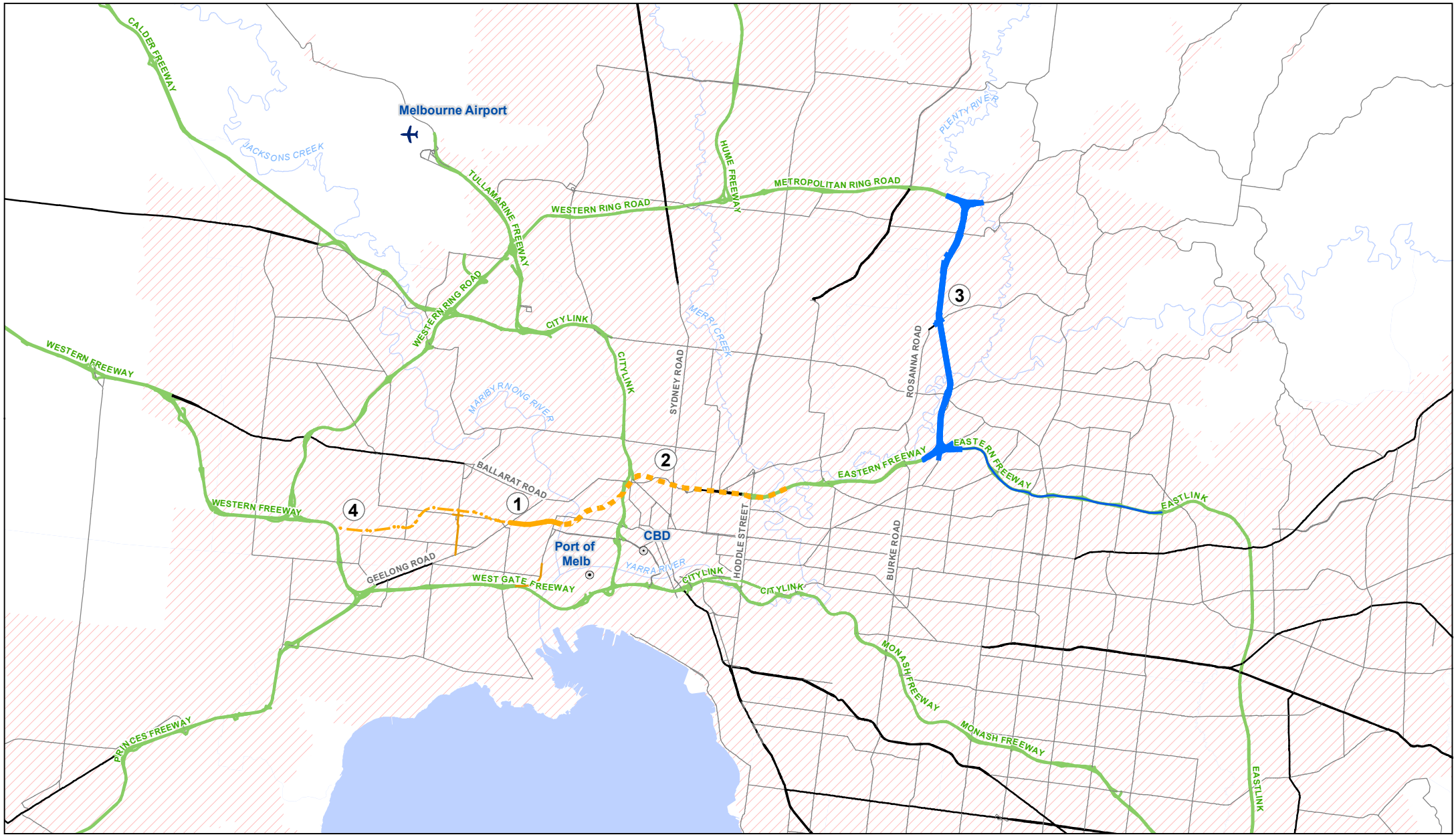

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Kilometres (at A4)

Map Projection: Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia 1994
Grid: Map Grid of Australia, Zone 55

N

Legend

- Urban Growth Area
- River
- Freeway
- Highway
- Major Road
- (1) Order of Staging

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Staging of Projects - Scenario B

Figure 11

G:\31\23303\CADD\GIS\Projects\024_Project_Alignments_Staging_B.mxd

Data source: VicMap; ABS; GHD; Client Created by: A Lovell

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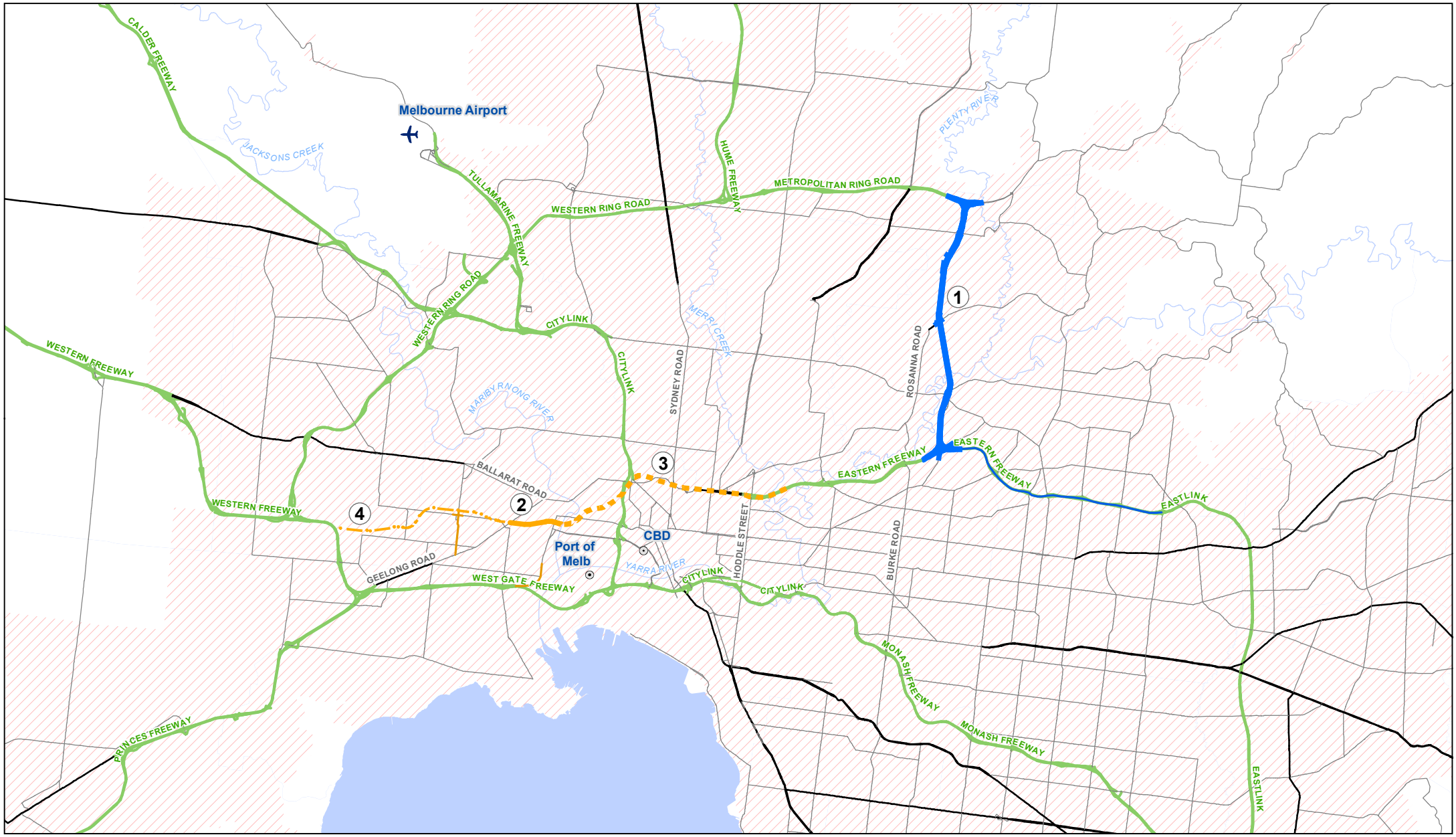

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0 1 2 4 6 8

Kilometres (at A4)

Map Projection: Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia 1994
Grid: Map Grid of Australia, Zone 55

N

Legend

- Urban Growth Area
- River
- Freeway
- Highway
- Major Road
- (1) Order of Staging

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Staging of Projects - Scenario C

Figure 12

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Data source: VicMap; ABS; GHD; Client Created by: A Lovell

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4.3 Strategic Fit

The EWLNAS states that the most pressing strategic need of Melbourne's road system is a second crossing of the Yarra and Maribyrnong Rivers on the western side of the city. The study team analysed the impact to Melbourne of the closure of the West Gate Bridge, and concluded that the western side of the city would be severely affected.

Additionally, the opportunity to improve freight movements from the Port of Melbourne to the existing freeway network represents considerable value to the entire state, and is also considered to be of high strategic benefit. Therefore the strategic need for an East West Link (West) in isolation has been shown, however there are limited benefits for the East West Link (East) in isolation as the demand to CityLink (north) is only 20% of the Eastern Freeway traffic and the strategic need for this link in isolation is minimal as it does not serve growth areas or serve as a vital freight route need. The strategic merit for East West Link (East) improves dramatically when considered in combination with East West Link (West) as it then provides the cross-city alternative to the M1 corridor.

Currently, the strategic need to construct the Northern Link has been identified from freight and capacity requirements as discussed in the previous section. Changes to the land use throughout Melbourne in the future, particularly with the growth areas to the north and the impact of Eastlink on the traffic patterns of Melbourne, may place more strain on this area of Melbourne and may increase the strategic need of this link into the future.

The recommended staging based on strategic need is indicated in Table 3.

Table 3 Staging based on Strategic Fit – Staging Scenario A

Priority	Construction Staging
1	Port Access and River Crossing including the Truck Action Plan
2	East West Link (West)
3	Northern Link
4	East West Link (East)

4.4 Traffic Impacts of Staging

Building the River Crossing and Port Access, East West Link (West) and the Truck Action Plan in isolation as proposed in staging Scenario A will have the eastern end of the link terminating at an interchange with Dynon Road and Footscray Road. This is likely to create traffic congestion issues around this eastern end of the link. It is expected that in developing more detailed plans for this work, options would be investigated to ease the flow of traffic between Footscray Road, Dynon Road and the West Gate Freeway.

If the East West Link (East) is staged to occur some time after the East West Link (West) as proposed in the above staging, then some form of congestion relief would most likely be required to support an interim east-west connection between the East West Link (West) and the Monash Freeway. If the East West Link (East) was to occur sequentially then this work may not be required.

Section 1 of the East West Link (West) is proposed to commence at an interchange at Sunshine Road and Geelong Road. This interchange will require a substantial amount of acquisition of industrial land at this location. By extending this section to Ashley Street and constructing the interchange at the Paramount Road/Ashley Street link, the land acquisition and construction issues are able to be avoided at this interchange.

The development of the Northern Link will also require widening of the Eastern Freeway, east of the interchange with Bulleen Road. The full extent of Eastern Freeway widening would be considered as part of further investigations however VicRoads advised that there are currently issues near Bulleen Road where four lanes are reduced to three lanes. The major constraint with widening of the Freeway would be achieving sufficient pavement width between abutments at overpasses. This link would also require significant modifications to the freeway ramps at Bulleen Road and potentially Burke Road.

4.5 Staging Based on Financing

From a Private Public Partnership (PPP) arrangement perspective, the Northern Link would be considered more attractive as it would produce higher tolled traffic volumes, that would have a core market of private vehicle traffic. While the East West Link is considered to service a freight market, the commuter traffic volume is low and therefore the overall financial viability of the route in comparison to the Northern Link is lower. Alternatively, the Northern Link has a lower commercial vehicle percentage but its overall traffic volumes are high and therefore this makes the project more attractive to the private market as a PPP and would be the link that the financial market would most likely want to see built first as a PPP.

However, if connections were provided from the East West Link (East) to the north of the CBD then this would alter the situation. If this were to occur, traffic volumes would then increase significantly along the link and this project may be more desirable to the financial market as a PPP. The issues associated with providing these connections and the reasons against doing this are to avoid adding to the current congestion problems on existing north-south roads (such as Nicholson Street and Smith Street), to remove the impact of queuing within the tunnel, to maximise the use of the tunnel for cross-city travel and to support any strategy of encouraging travel to the CBD to occur by public transport. Therefore it is unlikely that northern CBD connections would be considered in the future.

Considering the East-West Link (West), the traffic volumes indicate that insufficient traffic will use a connection to the port from the west as an isolated project, and the return on investment will not be sufficient for a financier to construct this stage alone. It is recognised that the potential may exist to construct the link to the west from federal

funding based on its strategic need as a key freight route. While GHD has separated East West Link (West) staging into Port to the Geelong Road and Geelong Road to the Western Ring Road, there is the option of extending from the Port to the Ashley Street interchange. This would reduce the need for an interchange at Geelong Road, where large areas of industrial land acquisition are required. Following on from this would be the connection to the Western Ring Road.

East West Link (East) would need to be constructed in a single stage, as there will be little incentive for a financier to construct the link between the Tullamarine Freeway and the Port in isolation. Potentially, East West Link (East) could be more attractive as a PPP particularly with East West Link (West) already constructed, as this will allow the financier to achieve the potential traffic volumes based on a fully constructed route that attracts the cross-city traffic. By building East West Link (East) first without East West Link (West), the link is likely not to achieve its full potential traffic volumes and will not provide the highest potential for return on their investment.

The likely preferred staging based on industry preference is shown in Table 4.

Table 4 Staging Based on Construction Industry Preference

Priority	Construction Staging	Funding
1	Northern Link	PPP
2	River Crossing and Port Access	Potential Federal Funding
3	East West Link (West)	Potential Federal Funding
4	East West Link (East)	PPP (reliant on Priority 2 occurring)

4.6 Truck Action Plan

In comparing the staging of the East West Link versus the Northern Link, it is considered that some of the recommendations of the Truck Action Plan will almost certainly form the first stage of projects flowing from the recommendations of the East West Needs Assessment. The report acknowledges the amenity of residents in the inner western suburbs must be improved and steps should be taken to remove the large numbers of trucks from these roads.

It is also considered that some of these projects will be the easiest to implement, both in terms of project financing and the degree of preliminary works required.

4.7 Staging Evaluation

Based on the above assessment of staging scenarios from different strategic viewpoints, GHD have developed a staging evaluation. This evaluation is provided on the following pages.

Staging Evaluation – Scenario A

1. River Crossing and Port Access, including Truck Action Plan;
2. East West Link (West) - Geelong Road to Western Ring Road;
3. Northern Link, including Eastern Freeway widening; and
4. East West Link (East).

Opportunities

» The River Crossing and Port Access would be a candidate for federal funding based on its strategic freight benefits;

» By opening East West Link (West) prior to East West Link (East) it would provide a higher traffic volume and catchment area, thereby making the East West Link (East) section more appealing as a PPP;

» North Dynon activities can be re-located over a longer period while Stages 1 - 3 are occurring, which would then provide a sufficient space for a construction works area for the tunnel portals;

» If Northern Link is built prior to East West Link (East) the need for the link between Eastern Freeway and Tullamarine Freeway may not be as vital.

» Providing the East West Link (West) early in the staging removes the need to construct ramps from the Western Ring Road to Geelong Road and extending the Ashley Street upgrade north, which would become obsolete as other stages are developed.

Limitations

» Grade separations or at least major works at Wurundjeri Way/Flinders Street and Wurundjeri Way/Dudley Street would most likely be needed to accommodate traffic distribution from the end of the East West Link (West).

» In relation to the point above and resulting from it, there is likely to be lower traffic volumes on the East West Link (West) section until the East West Link (East) section is developed.

Staging Strategy – Scenario B

1. River Crossing and Port Access, including Truck Action Plan;
2. East West Link (East);
3. Northern Link; and
4. East West Link (West) - Geelong Road to Western Ring Road.

Opportunities

» The River Crossing and Port Access would be a candidate for federal funding based on it's strategic freight benefits;

» Geelong Road could be used as an alternative to the west connection while East West Link (West) is being built. This would provide a 'pseudo' complete east west connection. This would be a short-term option as there is capacity on Geelong Road.

» Significant works at Wurundjeri Way/Flinders Street and Wurundjeri Way/Dudley Street would most likely not be needed to accommodate traffic distribution from the end of the East West Link (West) as East West Link (East) would be available to carry this traffic.

Limitations

» Additional infrastructure, such as Geelong Road Ramps and Ballarat Road widening, would need to occur in Stage 1 to provide connections to Geelong Road from Western Ring Road;

» Relocation of North Dynon activities would need to occur in Stage 1 to allow the East West Link (East) tunnel portal to be located at North Dynon. This would require these activities in a short time span to ensure there are no delays to building Stage 2 - East West Link (East);

» East West Link (West) has low traffic volumes and is unlikely to be attractive as a PPP for private industry on its own. Therefore if it is not built as a whole, but rather in sections, the section between the Western Ring Road and Geelong Road if left until last, may not be built at all as it would be harder to get state and federal funding for that section alone. It would also be difficult to develop as a PPP as tolling the East West Link (West) would divert a large volume of traffic back to the West Gate Freeway

Staging Evaluation – Scenario C

1. Northern Link
2. River Crossing and Port Access, including Truck Action Plan;
3. East West Link (West) - Geelong Road to Western Ring Road; and
4. East West Link (East).

Opportunities

» The Northern Link could be funded through PPP and planning could begin almost immediately.

» Significant works at Wurundjeri Way/Flinders Street and Wurundjeri Way/Dudley Street would most likely not be needed to accommodate traffic distribution from the end of the East West Link (West) as East West Link (East) would follow soon after; and

» North Dynon activities can be re-located over a longer period while Stages 1 and 2 are occurring, which would then provide a sufficient space for a construction works area for the tunnel portals.

Limitations

» The vital second river crossing is not completed as a first priority; and

» Truck Action Plan not implemented immediately or supported by other significant infrastructure in the short term.

4.8 Conclusion

Based on the high level staging assessment and evaluation detailed above, GHD recommends staging Scenario A as summarised in Table 5.

Table 5 Recommended Staging based on High Level Analysis

Priority	Staging
1	Port Access and River Crossing including the Truck Action Plan
2	East West Link (West)
3	Northern Link
4	East West Link (East)

It is considered that the strategic need for the East West Link (West) and Northern Link has been established based on freight and growth area benefits, while the strategic benefit of the East West Link (East) is limited to finalisation of the east-west connection.

The following works are associated with each staging:

Port Access and River Crossing including the Truck Action Plan:

- Tunnel from Geelong Road to Port linking with an at-grade intersection connecting Footscray Road and Dynon Road. The Truck Action Plan works that would be required are:
  - A new link from the West Gate Freeway to Whitehall Street, via Hyde Street;
  - A north south freight route along Paramount Road and Ashley Street, to Geelong Road. As freight vehicles can access the West Gate Freeway via Millers Road extending this along Cemetery Road to the freeway is not essential; and
  - Grade separation of the Paramount Road/Ashley Street and Sunshine Road intersection and the rail line north of this intersection.
  - Some other upgrade works may be required between the eastern end of the link and the M1 corridor.

Why Priority 1:

- Provides alternative crossing to Yarra River

East West Link (West) Works

- Geelong Road to Western Ring Road

Why Priority 2:

- Provides a complete alternative to West Gate Bridge;
- Supports growth in the western suburbs for residential, industrial and commercial land uses;
- Removes the requirement for Ashley Street north link;
- Removes the requirement for ramps to Geelong Road from Western Ring Road;
- Provides a complete freight link for the west; and
- Potential for Federal funding with the river crossing and port access section

Northern Link Works

- Upgrade existing Greensborough Highway from Western Ring Road to Lower Plenty Road and combination Tunnel and structure to Eastern Freeway at Bulleen Road. The other possibility is for the road to remain in tunnel from Lower Plenty Road to the Eastern Freeway.
- Widen Eastern Freeway to four lanes in each direction between Bulleen Road and Tram Road, provide an auxiliary lane between Tram Road and Blackburn Road and widen to four lanes between Blackburn Road and Springvale Road, also in each direction.
- Modification to the ramps at the Eastern Freeway interchanges with Bulleen Road and Burke Road and the ramps and Metropolitan Ring Road interchange.

Why Priority 3:

- High traffic demand with a split of 60% bound for eastern/south-eastern suburbs and 40% bound for CBD/western suburbs;
- Provides connectivity to freight and major employment areas in south eastern suburbs;
- Provides for cross-town connection that has limited public transport links (also has the potential to assist with some form of transit in this area);
- Supports growth areas to the north; and
- Financially viable as a PPP.

East West Link (East) Works

- Tunnel from Port to Eastern Freeway, with northern connections to Tullamarine Freeway

Why Priority 4:

- Completes the East West Link and 'fills the gap'; and
- Limited financial viability as a PPP without East West Link (West)

5. Project Delivery

5.1 Impacts on JJ Holland Park

5.1.1 Current Proposed Portal Location

The concept alignment for the current proposed portal location is included in Appendix A. The following observations have been made in relation to this alignment proposal through JJ Holland Park:

- A single 'portal' is located at CH 18450 on the alignment drawings. The long-sections indicate a 450m section of cut and cover tunnel will be required between CH 18450 (Childers Street) and CH 18000 (Altona Street);
- Two-lane, twin tube driven tunnels are likely to start at CH 18000 (driven tunnel portal) where ground cover reaches around 10m;
- The 450m long cut and cover box will be constructed within Quaternary sediments of the Yarra Delta. Specifically, within a deep trough of Coode Island Silt;
- At Altona Street a sharp contact between the Tertiary older volcanics and the Quaternary Yarra sediments exists. The driven tunnel portal is likely to coincide with this contact. The contact appears to dip at approximately 1:10 to the west. The older volcanics are a good geological unit to construct a tunnel within;
- It is understood that JJ Holland Park was once known as 'Seagull Swamp'. It was reclaimed with fill in the 1960's;
- Alignment Option B crosses a set of rail lines. These rail lines are part of the suburban network heading to the western suburbs; and
- The position of the cut and cover box is likely to result in partial closure of the park during construction. Post construction, the site could be reinstated and the park reopened.

5.1.2 Options for Portal Relocation

Alternative road alignments have been considered to reduce the impact of construction on the park. The following options have been considered as part of this assessment:

Moving North

- Little benefit is gained by pushing the alignment further north within the park. Impacts on the community are likely to be greater due to the proximity of the cut and cover box to Kensington Mews Estate.

Moving West

- Moving the portal and the cut and cover box further to the west is not practical due to the proximity of the Maribyrnong River.
- The geotechnical conditions (deep trough of Coode Island Silt) do not support driven tunnel construction. Moving the portal further west also pushes it further

away from the geological contact where the older volcanics rise sharply to the surface (at Altona Street).

Moving East

- Moving the tunnel portal further to the east is restricted due to presence of residential properties.

Moving South (200m)

- The alignment could be moved approximately 200m to the south. It would pass through the Dynon Road Freight terminal. This option is preferred and will be discussed further.

Moving South (600m)

- The alignment could be modified such that the portal is approximately 600m further south from the current proposed location within the park.
- A cut and cover box could be constructed south of Dynon Road within the land currently occupied by Pacific National.
- This is not preferred, as a driven tunnel would be difficult to construct within the Coode Island Silt. It is understood that this location is a long way from the geological contact where the Older Volcanics meet the Yarra sediments north of Dynon Road.

5.1.3 Preferred Alternative Portal Location

The alignment could be pushed approximately 200m south of its current location to avoid any contact with the JJ Holland Park. The concept alignment for the alternative Portal Location is included in Appendix A.

The alignment would need to run north of the Dynon Road Freight Terminal.

It is understood that this land is currently owned and management by VicTrack.

5.1.4 Benefits of Relocation

The following benefits have been identified with this option:

- Avoids any impact on the JJ Holland Park;
- Maintains close proximity to the geological contact between the older volcanics and the Yarra sediments. This allows for driven tunnel construction to commence before (south of) the suburban rail lines;
- The land would appear to have limited existing surface infrastructure to be removed prior to construction;
- Ventilation stack could be easily located at a further distance from the residents adjacent to the park;
- The timing of construction could suit any redevelopment plans that may be currently being considered by the Government. As this land is adjacent to the Port,

it is recommended that development be of a commercial nature rather than residential which would create amenity issues; and

» Likely to have minimal impact on suburban rail lines if current geological information is correct. Limited impact on the rail lines within the freight terminal.

5.1.5 Issues to be resolved due to Relocation Proposal

» Commercial arrangements of rail land;

» It is understood that the northern side of the current freight terminal may be leased by VicTrack to P&O Trans as a container terminal in the near future;

» Single freight rail line running parallel (and south) to the suburban lines is strategic for VicTrack. It is currently the only open access longer train standard gauge siding in the Melbourne area (non Pacific National). It can accommodate trains of 1200-1500 m in length. Broad gauge trains can be received via the Dynon Intermodal Terminal area in to the VicTrack Arrival Yards. Long trains (broad gauge) can be received into these yards. It is possible to dual gauge this alignment; and

» Strategic planning and timing. Could road tunnel construction activities fit with redevelopment/port/freight transport strategic planning plans?

5.2 Dynon Road Freight Terminal – Strategy and Timing for Road Tunnel Portal Works

5.2.1 Current Development Plans for the Dynon Intermodal Terminal (Southern Side of North Dynon)

The following points summarise GHD's understanding of the current development plans for the southern side of this facility:

» VicTrack and P&OTrans are currently finalising an Agreement for management services at the Dynon Intermodal Terminal (DIT). This is the terminal immediately to the north of Dynon Road;

» The Agreement is in the form of a 5-year license arrangement and will be presented to the VicTrack Board for approval on the week commencing Monday the 25th of August;

» The Agreement includes a termination clause for VicTrack prior to the expiration of the 5-year term where the site is required by government for other purposes (although GHD is not sure of the exact wording of this "exit" clause);

» The intent is to use the DIT for intermodal activities relating to both domestic (interstate) and port containers on an open access arrangement (ie. available for any rail operator);

» It is understood that QR and possibly El Zorro are currently utilising the facilities at this site;

- VicTrack have recently received funding of $3M via the Department of Transport to upgrade the hardstand and make some track adjustments to facilitate this business; and
- VicTrack will receive income via a container throughput charge and an annual license fee (charged monthly). It is believed that the license fee has been calculated to an amount roughly equivalent to the $3M investment allocated over the 5-year period.

5.2.2 Current Development Plans for the Fast Track and Agents Area (Northern Side of North Dynon)

The following points summarise GHD's understanding of the current development plans for the northern side of this facility:

- The area adjacent to the DIT (referred to as the Fast Track and Agents area) located to the north of the intermodal terminal and south of the suburban corridor is also earmarked for possible future inclusion in the above Agreement;
- The idea is to demolish the old Fast Track sheds (which are the ones on an angle if you look at an aerial photo) to consolidate with the Agents area to the west and bounded by the freight line;
- The newer Fast Track shed (further to the east) would not form part of this plan at this stage. This additional site would be suitable for empty container storage and operationally complement the activities at the DIT. Apart from the demolition of the old sheds, minimal investment is envisaged to be required to achieve this; and
- VicTrack would like to proceed with this in the very near future (it is assumed that this means soon after finalising the initial agreement through their Board and with P&OTrans). It is assumed an additional leasing/license fee structure would be determined in relation to this.

5.2.3 Impact of Road Tunnel Portal Works on the Agents Area

In relation to impacts/issues for VicTrack if the East West Road tunnel portal work were to be undertaken through the northern side of this facility, GHD would suggest that these could include:

- Loss of income in relation to the Agents/Fast Track site;
- Loss of operational flexibility (and potentially capacity) into/out of the DIT due to loss of ability to use the agents siding; and
- Potential loss of capacity to arrive/stand other rail activities in the agents siding area.

It is our belief there are possible options to minimise operational impacts by further investment in DIT rail sidings.

5.2.4 Methods for Minimising Road Tunnel Impacts on the Agents Area

GHD believe the following methods and options could be pursued to minimise the impact of the road tunnel construction on this site:

- Extending the existing rail siding eastwards; and
- Cut and cover tunnel construction to ensure the original land use function can be maintained. This would include the design of concrete cut and cover structures that could handle rail loads.

6. Southern Connection

As part of the assessment of potential staging options of the East West Link, the ability for a southern connection to link to the existing arterial road network near CityLink (Western Link) was considered.

6.1.1 Current Proposals

The current proposals developed in the East West Link Needs Assessment do not provide any links to the existing arterial road network in this area. Traffic travelling westbound on the East West Link from the Eastern Freeway is required to either connect directly northbound onto CityLink (no southbound CityLink connection is proposed), or continue westbound in a tunnel, with the first exit point from the freeway at Dynon Road and the Port of Melbourne.

6.1.2 Why is a Connection Required?

If the first stage of the project involves constructing the tunnel from the Eastern Freeway to CityLink only, leaving the tunnel through to the Port until a later stage, it is considered insufficient to provide no connection to the arterial road network near CityLink. Under this first stage of construction, traffic entering the tunnel at the Eastern Freeway can only access CityLink northbound, with the tunnel providing no assistance to east-west traffic travelling across the top of the city to/from the western suburbs, which is seen as a major driver for the overall project. The new tunnel will be largely underutilised under such a staging arrangement unless the east-west movements can be catered for in some form.

6.1.3 What Arterial Roads Can We Connect To?

In order to minimise the scope of the first stage of works, the connection to the arterial road network will only be viable if it is constructed near the CityLink connection. If the connection is pushed any further to the west, the advantages to the overall cost of Stage One of not constructing through to the Port Interchange will be substantially reduced.

It was therefore considered that an arterial road connection should be to either Flemington Road, Racecourse Road or Elliot Avenue.

6.1.4 Constructability – What Can We Actually Build?

When considering the constructability of a connection to the arterial road network, the ability to construct the proposed connection and the ability to construct the next stages of the project further to the west while Stage One is operational and under traffic are vital considerations. It will be very difficult to use the proposed horizontal alignment of the tunnels to the west of the CityLink connections to access the arterial roads, as constructing the tunnels while maintaining traffic on the ramps is seemingly impossible. The alignment of these connections will need to allow room to the west for the Stage

Two construction activities to continue. These factors make connecting to Racecourse Road and even Flemington Road very difficult.

Further, these connections will effectively form an underground interchange, with widening required of the tunnels for the merge and diverge tapers and noses. It is not considered that boring tunnels of the required width for such arrangements is an option, and the construction method of the underground interchange will need to be "cut and cover".

It is seen that underneath Royal Park is the logical place for the construction of this interchange, for similar reasons to the basis behind the location of the CityLink connection interchange. Please note however this opinion is based on the constructability of the interchange only, and does not consider the environmental impacts of further construction activities in Royal Park.

The proposed tunnel arrangements under Royal Park involve stacking the two tunnels to simplify the connections to CityLink, and to minimise the "cut and cover" construction footprint in Royal Park. The eastbound tunnel is proposed to be under the westbound tunnel, and as a result the depth of the eastbound tunnel is between 30 and 40 metres under Royal Park.

6.1.5 Option One – Interchange North of Elliot Avenue with Ramps Connecting to Elliot Avenue

Two interchange options were assessed in Royal Park. The first option looked at using the proposed cut and cover trench near the State Netball Hockey Centre, resulting in ramps departing from the East-West tunnels on the north side to the Tullamarine Freeway, and on the south side connecting to Elliot Avenue, as shown in Appendix B. Ramps connecting to Flemington Road were not considered for constructability reasons due to the proximity of the ramp alignments to the proposed bored tunnels to the Port. Although it will be difficult, the arrangement shown could allow for the tunnel to the port to be constructed while the Stage One works are operational. The exit ramp to Elliot Avenue could create a signalised T-intersection with Elliot Avenue, or pass underneath Elliot Avenue and loop to form a westbound slip lane. This will not allow vehicles to exit the East-West tunnel and turn left (east), but the volumes performing this movement are seen to be insignificant. If it is preferred to allow for this vehicle movement, the entry ramp could pass under Elliot Avenue and loop around to create a cross intersection opposite the entrance to the State Netball Hockey Centre. Note that it is assumed both the entry and exit ramps would need to be constructed using "cut and cover" techniques, and this will result in a substantial additional area of disturbance (both temporary and permanent) to Royal Park.

The design of the westbound Elliot Avenue exit ramp is feasible, with a gentle uphill grade from the ramp nose to the connection with Elliot Avenue.

However the design of the eastbound Elliot Avenue entry ramp is not feasible. There is over 30 metres vertical difference between Elliot Avenue and the design line of the eastbound tunnel, as this tunnel is proposed to be underneath the westbound tunnel. As a result, the grade of the entry ramp shown will be almost 10%. Also, this

arrangement will result in a right hand merge entry ramp (from Elliot Avenue) located opposite a left hand entry (from Tullamarine Freeway). The right hand merge entry ramp is considered to be unsafe in itself, but locating a right hand merge opposite a left hand merge is unsafe, and will not be agreed to by a Road Safety Auditor, especially in a tunnel environment.

6.1.6 Option Two – Interchange South of MacArthur Road with Ramps Connecting to Elliot Avenue

Assuming the need for a "cut and cover" treatment at the entry and exit ramps, the only other location with room for such a construction footprint (without the need for large amounts of land acquisition) is in the eastern section of Royal Park, on the southern side of MacArthur Road. The second option considered commencing the ramp tapers as close to The Avenue as possible on the eastern side of the Park, with the ramps then rising from the tunnels to intersect with MacArthur Road/Elliot Avenue near to the signalised tram crossing. As with Option One, the two tunnels are vertically separated here with the eastbound tunnel underneath the westbound tunnel. As a result, there is over 40m vertical difference between Elliot Avenue and the design line of the eastbound tunnel at the ramp nose, with only approximately 300 metres distance to achieve this vertical change. This does not produce a viable solution for the eastbound entry ramp.

As with Option One, because the westbound tunnel is much higher, and the ramp taper requirements for an exit ramp are shorter than for an entry ramp, a westbound exit ramp at this location would be possible, although the ramp grades would still be significant.

6.1.7 Conclusion

For constructability reasons, it is considered that a connection to the arterial road network from the East –West Link tunnels in the vicinity of Flemington Road would need to be constructed in Royal Park using "cut and cover" techniques, and the preferred connection is with Elliot Avenue.

Due to the tunnel stacking of the current design, a feasible vertical design of the ramp to the lower eastbound tunnel from Elliot Avenue is not possible. Additionally, there are safety concerns with the close proximity of two entry ramps to the eastbound tunnel, for both the Option One and Option Two.

It does seem possible to produce a feasible design of the ramp to Elliot Ramp from the upper westbound tunnel, in either the western or eastern sections of Royal Park. However, the environmental and social disturbance to Royal Park of such an entry ramp would be significant and would make the option unfeasible.

7. Northern Link Staging

In addition to investigating staging opportunities for the East West Link, GHD has reviewed staging opportunities for the Northern Link, between Metropolitan Ring Road and Eastern Freeway. In considering the staging opportunities for a north-south connection, GHD has considered a potential alignment, which could be made up of the following stages:

- Upgrade the existing Greensborough Highway to six-lane freeway standard, between Metropolitan Ring Road and Watsonia Road with grade-separated interchanges at Metropolitan Ring Road and Grimshaw Street,
- Between Watsonia Road and Lower Plenty Road, six-lane freeway standard road east of the existing Greensborough Highway with a northerly-oriented half-diamond interchange at Lower Plenty Road. Greensborough Highway would be retained as a local arterial;
- Between Lower Plenty Road and Bulleen Road, six-lane freeway tunnel under residential areas and Yarra River;
- Between Bulleen Road and Eastern Freeway, there were two options developed for the section along Bulleen Road:
  - Continuation of tunnel along Bulleen Road with interchanges at Eastern Freeway and Manningham Road (**Option 1**); or
  - Viaduct over Bulleen Road with interchanges at Eastern Freeway and Manningham Road (**Option 2**).
- Works along Eastern Freeway include:
  - Widening to four lanes between Bulleen Road and Tram Road;
  - Provide an auxiliary lane between Tram Road and Blackburn Road;
  - Widening to four lanes between Blackburn Road and Springvale Road; and
  - Widening to Chandler Highway.

It should be noted that more detailed planning work is required to determine a preferred alignment and interchange configurations.

The potential works along the Northern Link could be staged based on short, medium and long-term works. Much of this staging is dependent on the planning, land acquisition and Environmental Effects Statement (EES) processes. The following outlines the potential works that could occur in each stage and the reasoning and issues associated with them. A diagram outlining the staging of these works is included in Figure 14.

7.1 Short-term works

The following works are considered to be possible for commencement in the short-term. These could be undertaken in the following priority order based on the needs and benefits they would provide;

1. Widening along Eastern Freeway;
2. Grade-separate the interchange of Metropolitan Ring Road and Greensborough Highway;
3. Upgrade Greensborough Highway to three lanes of freeway standard, between Metropolitan Ring Road and Grimshaw Street;
4. Grade-separate the interchange of Grimshaw Street and Greensborough Highway; and
5. Upgrade Greensborough Highway to three lanes, between Grimshaw Street and Watsonia Road.

Reasoning

These works are determined to be able to occur in the short term for the following reasons:

» The majority of the works occur within the existing road reserve with minimal land acquisition;

» The projects can be linked into the existing road network with low impacts on the network;

» The projects could either be staged as smaller projects in the priority order recommended or as two packages consisting of Eastern Freeway upgrades and Greensborough Highway upgrades; and

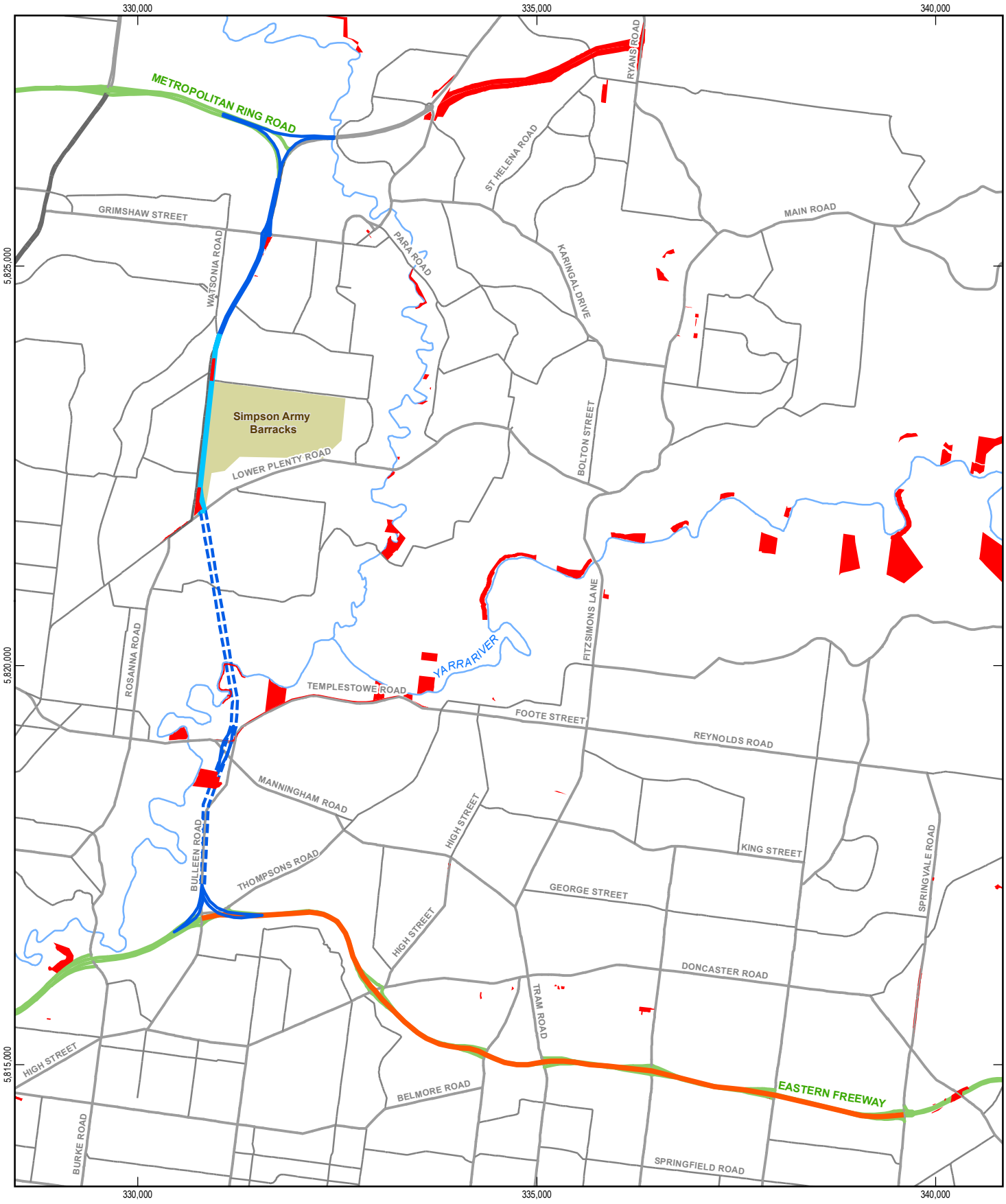
» Staging the projects may assist with funding the works.

Benefits and Issues

Undertaking these works in either isolation or as packages would be beneficial to traffic flow and congestion in the short term without necessarily putting increased traffic demands on the route further to the south. Widening the Eastern Freeway would relieve current traffic congestion and provide benefits to a high number of road users.

The grade separation of the Metropolitan Ring Road would improve the queuing at the end of the freeway and would allow for the distribution of traffic to the north and south along Greensborough Highway to occur in a free flow manner. It should be noted that this would put additional pressure on the Grimshaw Street intersection, however much of the queuing traffic would be travelling through that intersection, regardless of any Metropolitan Ring Road grade separation.

The main area of land acquisition that would be required is on the north-east corner of Grimshaw street for the grade separation, which is subject to a Public Acquisition Overlay. The existing Public Acquisition Overlay locations along the route are shown in Figure 13. If these projects were undertaken in isolation, an Environmental Effects Statement may not need to be undertaken and as it is within road reserve, the environmental impacts would be expected to be low.



Legend

- Eastern Freeway Widening
- Short Term
- Medium Term
- Long Term
- PA Overlay
- Simpson Army Barracks

INDICATIVE ALIGNMENT ONLY

1:65,000 (at A4)

0 250 500 1,000 1,500

Metres

Map Projection: Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia 1994
Grid: Map Grid of Australia 1994, Zone 55

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Existing Public Acquisition Overlay

Figure 13

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8/180 Lonsdale St Melb VIC 3000 Australia T 61 3 8687 8000 F 61 3 8687 8111 E melmail@ghd.com.au W www.ghd.com.au

Data source: VicMap; GHD; Client. Created by: D Parkington

7.2 Medium Term Works

The following works are considered to be possible for commencement in the medium-term. These could be undertaken in the following priority order based on the needs and benefits they would provide;

1. Construct six-lane freeway in cut, east of the existing Greensborough Highway, between Watsonia Road and Lower Plenty Road.

Reasoning

These works are determined to be able to occur in the medium term for the following reasons:

- The need for this section is required to support the demand for a complete north-south route linking to the CBD and EastLink, however this section would be able to be completed prior to the tunnel; and
- An Environmental Effects Statement would be required from Watsonia Road to Eastern Freeway.

Benefits and Issues

From a traffic impact perspective, it would be expected that upgrading the section between Watsonia Road and Lower Plenty Road in isolation would improve travel times and reduce congestion along the route however it would put additional pressure on Rosanna Road, which is four lanes with a number of signalised intersections. Therefore the completion of this section should only be one to two years ahead of the completion of the tunnel section.

The potential staging of these works would be dependent on the land acquisition and Environmental Effects Statement process. Land acquisition would be required on the eastern side between Watsonia Road and Lower Plenty Road. Between Watsonia Road and Yallambie Road, is subject to a Public Acquisition Overlay. At the Army Barracks, there is no Overlay along this length of the route as it is Commonwealth Land. As there is no Overlay in place at the Barracks, negotiations regarding the purchase or transfer of this land may extend the planning process and is why it would be considered medium term works.

7.3 Long Term Works

The following works are considered to be possible for commencement in the long-term. These could be undertaken in the following priority order based on the needs and benefits they would provide;

1. Tunnel between Lower Plenty Road and Bulleen Road, six-lane freeway tunnel under residential areas and Yarra River;
2. Half-diamond interchange at Lower Plenty Road; and
3. Along Bulleen Road, either tunnel or viaduct option with connections to Eastern Freeway.

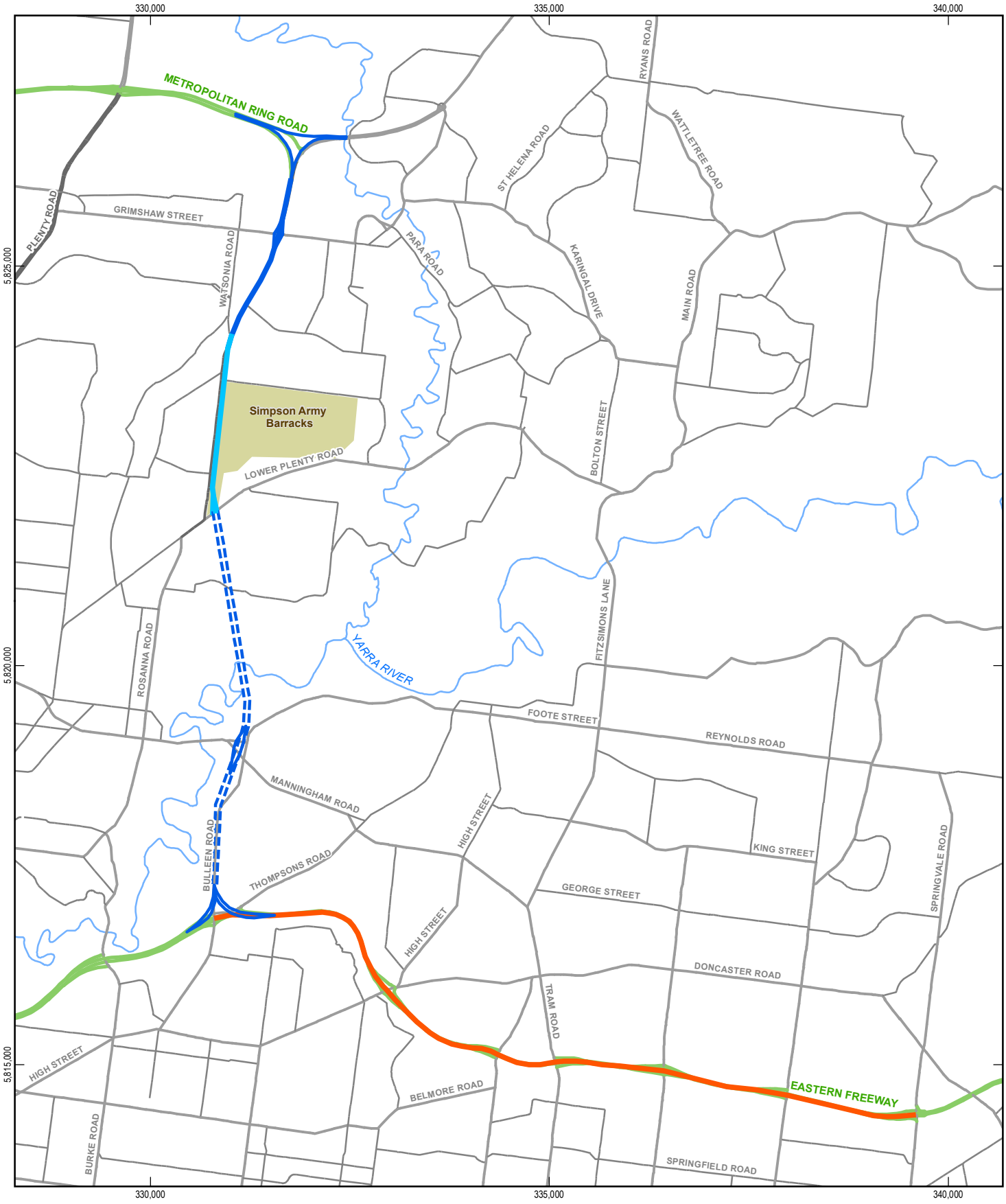
Reasoning

These works are determined to be able to occur in the long term for the following reasons:

- Although there is current demand for these linkages, due to the significant infrastructure required a long term timeframe is expected; and
- Widening only to Lower Plenty Road would put increased pressure on the connecting routes of Rosanna Road, Lower Heidelberg Road and Burke Road impacting on amenity and connectivity.

Benefits and Issues

Along Bulleen Road, the options of a tunnel to the Eastern Freeway or a viaduct could be considered. The benefit of a tunnel to the Freeway is that it does not impact on the local amenity, pedestrian connectivity and there are no visual impacts. The tunnel does make connections to the Eastern Freeway more difficult however and is significantly more expensive. The viaduct option will impact on visual and local amenity but is less expensive and connections to the Eastern Freeway are easier to develop.



Legend

- Eastern Freeway Widening
- Short Term
- Medium Term
- Long Term
- Simpson Army Barracks

INDICATIVE ALIGNMENT ONLY

1:65,000 (at A4)

0 250 500 1,000 1,500

Metres

Map Projection: Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia 1994
Grid: Map Grid of Australia 1994, Zone 55

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Potential Staging Opportunities for Northern Link Figure 14

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Data source: VicMap; GHD; Client. Created by: D Parkington

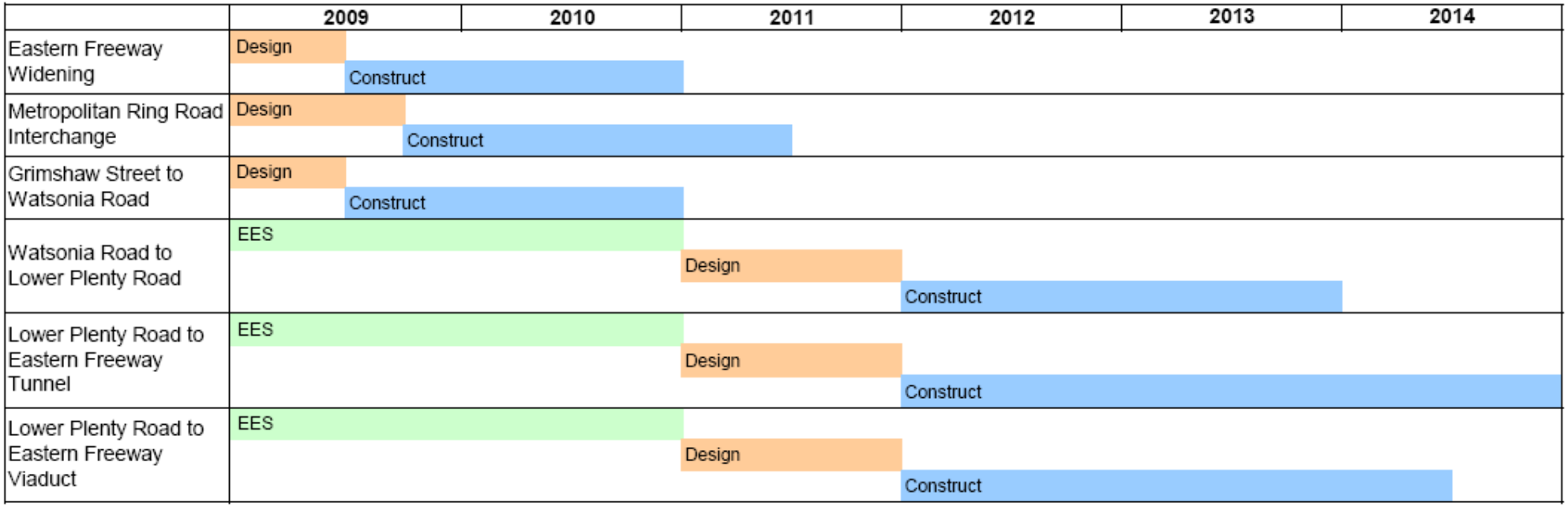
Timing

The potential timing of the works is included in Figure 15. This assumes an imminent start to the projects.

The timing process is based on an Environmental Effects Statement only being required for the length between Watsonia Road and Eastern Freeway that is not aligned within the existing road reserve. The works to the north could be done as a separate project, staged upgrades with minor land acquisition or as part of the Western Ring Road Upgrade.

If the entire route from Metropolitan Ring Road to Eastern Freeway was decided to be undertaken as one project or there are environmental issues that require a submission under the Environment Protection and Biodiversity Conservation (EPBC) Act, an Environmental Effects Statement would be required for the entire route this would be an 18 – 24 month process at the start of the project.

Figure 15 Potential Northern Link Timing



7.4 Conclusion

Based on this review of the potential staging opportunities for the Northern Link, GHD consider that the staging of the Northern Link could occur in a program of short, medium and long-term works as follows:

Short Term Works

1. Widening along Eastern Freeway;
2. Grade-separate the interchange of Metropolitan Ring Road and Greensborough Highway;
3. Upgrade Greensborough Highway to 3 lanes of freeway standard, between Metropolitan Ring Road and Grimshaw Street;
4. Grade-separate the interchange of Grimshaw Street and Greensborough Highway; and
5. Upgrade Greensborough Highway to 3 lanes, between Grimshaw Street and Watsonia Road.

Medium Term Works

1. Construct six-lane freeway in cut, east of the existing Greensborough Highway, between Watsonia Road and Lower Plenty Road;

Long Term Works

1. Tunnel between Lower Plenty Road and Bulleen Road, six-lane freeway tunnel under residential areas and Yarra River;
2. Half-diamond interchange at Lower Plenty Road;
3. Along Bulleen Road, either tunnel or viaduct option with connections to Eastern Freeway.

8. Critique of East West Link Needs Assessment Study

8.1 EWLNAS Documentation

The EWLNAS was released in March 2008. The following documents have been produced as part of the EWLNAS and have been reviewed to gain an understanding of the detail of work entered into the study:

1. Sinclair Knight Merz, Maunsell and Evans & Peck (n.d.). East West Needs Study – Transport Supply and Demand (Existing and Future);
2. Veitch Lister Consulting Pty Ltd (n.d.). East-West Link Needs Assessment Modelling Outputs;
3. Veitch Lister Consulting Pty Ltd (2008, March). Background Modelling Assumptions for the East-West Link Needs Assessment Study;
4. Veitch Lister Consulting Pty Ltd (2008, March). Zenith Model Establishment and Validation Report;
5. Sinclair Knight Merz, Maunsell and Evans & Peck (n.d.). East West Needs Study – Engineering Design and Costing Report;
6. Public Transport Division, Department of Infrastructure (2008, March). East West Rail Link – Analysis on Rail Capacity;
7. Sir Rod Eddington, ELWNAS Team (2008, March). Investing in Transport – East West Link Needs Assessment; and
8. Sir Rod Eddington, ELWNAS Team (2008, March). Investing in Transport – *Overview:* East West Link Needs Assessment.

8.2 Identification of Critical Flaws

To form the foundation of the EWLNAS, Veitch Lister's Zenith travel forecasting model was used to produce medium and long-term travel forecasts for the study area. The outputs from the model have then been used to assist in determining the recommendations of the study. The reports listed as items 1, 2, 3 and 4 in Section 8.1 are all related to Veitch Lister's Zenith travel forecasting model. After reviewing these documents, a number of key inputs to the model and assumptions made can be identified.

8.2.1 Inputs

The major inputs to the Zenith model revolve around the structure of the road and public transport and its associated components. Aside from these inputs and any economic inputs into the generalised cost equation, other external data that has been input into the model includes:

- The 2001 ABS Census data has been used to produce the household trip production model, which determines the travel desires of households of various types. This data has been updated to reflect the current ABS estimates of residential population (ERP), however the most recent 2006 ABS Census data was not available for use in the project;
- The 2001 Victorian Activity and Travel Survey (VATS) involved comprehensive household travel surveys that are used in the Zenith model to simulate people's travel behaviour and assist in the derivation of travel matrices;
- Population and employment forecasts for the modelled area have been revised by VLC and endorsed by the Department of Infrastructure (DoI) and the Department of Sustainability and the Environment. This data provides the land use projections for the model together with demographic and land-use forecasts developed by SGS; and
- VicRoads and the Public Transport Division of DoI have undergone detailed discussions with the project team to outline likely road and public transport network developments and public transport operational changes through to 2031.

8.2.2 Assumptions

The *VLC Background Modelling Assumptions Report*[5] covers assumptions relating to the future public transport network, land use/demographic forecasts and policies.

Discussions with VicRoads and the Public Transport Division of DoI identified the following development and operational changes:

- All upgrades identified in the Meeting out Transport Challenges (MOTC) document;
- All major road projects already identified and upgrades expected under a "business as usual" regime; and
- Other public transport and policy changes.

While these future changes have been listed in the *VLC Background Modelling Assumptions Report* along with figures showing the extent of the improvements, there is no information on the details of the individual upgrades, such as when they are expected to be implemented and the extent of the changes. There are no details provided on how these changes have been incorporated into the model, if at all. If they have been incorporated then the assumption is being made that all changes and developments will take place in line with the timeframes and scope predicted at this early planning stage.

Policy issues have been discussed in the *VLC Background Modelling Assumptions Report*. Specific pricing and policies issues identified were:

- Real movements in public transport fares;
- Parking supply and pricing;

[5] Veitch Lister Consulting Pty Ltd (2008, March). Background Modelling Assumptions for the East-West Link Needs Assessment Study

- Fuel price movements; and
- Toll Levels.

These issues have not been addressed in the Zenith model, assuming no real increase in price/income levels other than for sensitivity purposes.

The *VLC Zenith Model Establishment and Validation Report*[6] has summarised a number of limitations of the model, including:

- **Land Use Changes Over Time -** As accessibility to a region is altered, the land use and its density will most likely change in response to these altered access conditions. The future distribution of population, employment, school, shopping centres and other traffic generating land uses is a fixed input into the Zenith model. Therefore, no changes in the distribution of land use are allowed for in the model;
- **Peak Spreading –** As peak periods become more congested, travellers tend to reschedule their journeys to the shoulders of the peaks, hence extending the peak period and contributing to peak spreading. This applies for both the road and public transport network. In the Zenith model, the number of daily journeys for a given land use is fixed and distributed over the AM, PM and off-peak periods using factors derived from household surveys. Therefore peak spreading is not accounted for.
- **Intense Traffic Congestion –** The Zenith model determines travel speeds on a road link based on the traffic demand of the link. The model does not simulate delays or queuing at intersections. Therefore when vehicle queuing from one intersection extends into adjacent intersections, the model can breakdown.
- **Unconstrained Public Transport Network –** All public transport systems have a maximum capacity, beyond which they will break down. The Zenith model does not take this into account, assuming that the public transport network has an infinite capacity.
- **Lack of Available Parking –** The Zenith model includes a parking charge variable that incorporates the disincentive to travel to a destination with a lack of parking. However the model does not predict how this balance between parking supply and demand may change over time.
- **Shifts in Travel Behaviour** – Various household travel survey data has been used to calibrate the Zenith Model. Travel behaviour of individuals is likely to change over time, however the model assumes this to be constant.

Although these limitations have not specifically been defined as assumptions, upon drawing from the results of the model to make recommendations, one is assuming that these limitations do not have a significant impact on the validity of the results.

Despite several assumptions being made throughout the modelling process, all of which will impact the modelling results, it is not predicted that these assumptions will significantly alter the recommendations made and GHD believes that the

[6] Veitch Lister Consulting Pty Ltd (2008, March). Zenith Model Establishment and Validation Report

recommendations made in the report are supportable by the assumptions and analysis conducted.

8.2.3 Identification of Potential Critical Flaws in Modelling

GHD has reviewed the *EWLNAS Investing in Transport* Report and associated background reports. In general, GHD agree with the overall findings of the report however, from our review it is understood that many of the recommendations are based on the Veitch Lister Consulting (VLC) Zenith Model. As the key findings of the EWLNAS are based and supported by this model, it is important that the model is calibrated and validated.

Following a review of the VLC Modelling Reports GHD had some concerns regarding the validity of the model. Through subsequent correspondence several of these concerns were allayed. However, some issues remain which prevent GHD from fully supporting the validity of the modelling. These are:

- The screenlines were not assessed using the widely accepted GEH criteria. When assessed against this criteria, it was found that critical screenlines did not fall within the acceptable range. Discussions with VLC identified that the model has adhered to the *VicRoads Model Validation Guidelines*[7], which do not make any reference to the GEH statistic as a method of validating screenline traffic count data. VLC indicated that they do not believe the GEH criteria is a valid method of evaluating screenlines. However, GHD believes that the GEH is a valid method of evaluating screenlines and this method is widely used in strategic modelling both in Australia and internationally;
- Key rail groupings relevant to this project had high percentage differences from the observed data. Data provided in the *VLC Zenith Model Establishment and Validation Report* indicates that overall, the modelled passenger boardings are lower than the observed passenger boardings. It is understood that the observed rail data used by VLC to validate the Zenith model is based on a combination of ticket validations and sample observations. Ticket validations are known to under report rail patronage. Therefore it is expected that the actual passenger boardings are higher than the observed rail data used for validation, further increasing the percentage difference of modelled data that under predicts passenger boardings;
- R^2 values were not provided in the VLC Modelling Reports for the AM and PM peak models for the rail patronage data. Additional information provided indicates that an R^2 value of 0.78 was achieved for the AM peak, which GHD believes is an acceptable result. No data was available for the PM peak;
- A number of the tram routes modelled had high percentage differences from the observed data. VLC has indicated that there is significant uncertainly in the observed tram data;
- No references are made regarding the validity of the R^2 factors achieved for public transport. The *VicRoads Model Validation Guidelines* do not specify an R^2 criteria

[7] VicRoads (2008). Guidelines on the Validation Process and Criteria for Strategic Transport Modelling

for public transport. GHD and VLC are not aware of an agreed standard available, however a lower R^2 value would be acceptable for public transport given the range of outputs possible and the high level of uncertainty in the observed data;

- Very little validation data is provided for the bus network. However, it is understood that limited data for validation was available and the quality of this data was uncertain;
- No validation to travel times was provided for assessment. Through correspondence with VLC it is understood that no travel time data was available. However travel time validation is a requirement of the *VicRoads Model Validation Guidelines* and GHD believes this is required to be confident that the model has been appropriately validated; and
- There was no evidence of a model audit or review undertaken to assess the various model characteristics. It is understood that the Zenith model has been audited in the past, however the details of the recency and thoroughness of these audits has not been provided.

Based on the above, GHD cannot agree that validation has been proven as the modelling reports and subsequent correspondence do not provide sufficient detail to reach that conclusion. While the concerns raised above do highlight some limitations in the modelling and reporting, it is important to note that this is not necessarily considered a critical flaw in the study but rather as an area of the study that is open to criticism.

8.3 Establishment of Project Need

The study identified a number of factors that led to the recommendation of the cross-city road connection from the east to the west and the project benefits. The following summarises these factors and benefits with comments on whether GHD consider that the need has been established. The factors that led to the recommendation were:

- *Melbourne's pressing need for an alternative to the West Gate Bridge* – East West Link (West) supports this need;
- *Forecasts in population, economic and traffic growth that will place further pressure on Melbourne's only major east-west link, the West Gate-Monash corridor* – East West Link (West and East) supports this need;
- *The growing freight task and the importance of freight efficiency to Melbourne and Victorian industry* - East West Link (West) and Northern Link supports this need;
- *Increasing travel times, congestion and travel time volatility on Melbourne's road network, with peak conditions now extending across the day* – East West Link (West) and Northern Link supports this need however the East West Link (East) only partially supports this need, as the Hoddle Street congestion issues will remain;
- *The strong and growing demand for cross city travel (particularly from the west) and the lack of direct cross city connections* – East West Link (West and East) support this need;

- *The need to provide network flexibility and connectivity by completing the key 'missing links' in Melbourne's transport network* – East West Link (West and East) and Northern Link complete the 'missing links'. The Northern Link and East West Link (West) would be considered more needed in completing the gaps in terms of travel demand.

The stated project benefits were:

1. Provides a long term alternative to the West Gate Bridge – East West Link (West) provides this benefit;
2. Will carry more than 150,000 vehicles, relieving surface roads of this traffic – The East West Link (East and West) provide this benefit;
3. Delivers another freeway standard river crossing from the west that has connections across the north of of the CBD from the western suburbs to the Eastern Freeway, with connections to the Port – Agree that East West Link (West) supports this benefit however it is similar to Benefit 1 and could be combined;
4. Provides enhanced port connectivity and freeway connectivity, encouraging more trucks on to the appropriate freeway network and improving freight efficiency – East West Link (West) provides this benefit and it is agreed that it is required;
5. *Helps to relieve congestion at the end of the Eastern Freeway by removing through traffic* – The congestion issues at the end of the Eastern Freeway are predominantly due to the Hoddle Street movement and the East West Link (East) will not reduce demand for this movement. While the East West Link (East) will remove some of the through traffic onto Alexandra Parade, demand for this movement will remain. Therefore, the East West Link (East) will have minimal impact on relieving congestion at the end of the Eastern Freeway;
6. Facilitates more road space beneath the north of the city, creating the potential to improve public transport, create more walking and cycling opportunities and improve amenity – East West Link (East) supports this benefit;
7. *Provides the opportunity to reduce 'rat running' through the inner north* – East West Link (East) supports this benefit however it is likely that a large proportion of this traffic would also be accessing the CBD which would not be removed by the proposed link;
8. Creates the opportunity to improve north-south public transport movements on some of Melbourne's busiest tram routes – Agree that East West Link (East) supports this benefit however it is similar to Benefit 6 and could be combined;
9. Facilitates separated and dedicated bus lanes on either Johnston Street or Alexandra Parade, enhancing bus service travel times – see Benefit 8;
10. Reduces travel time volatility by providing network alternatives to the West Gate corridor and by increasing capacity – East West Link (West) supports this benefit;
11. *Greatly enhances the connectivity of both Melbourne and Avalon airports* – It is considered that there would be limited benefits to the Avalon airport based on proximity. The East West Link (East) would improve links to the Melbourne airport

for the outer east however traffic north of the Eastern Freeway is still likely to use the arterial road network to access Tullamarine Freeway or Western Ring Road;

12. Delivers a significant boost to amenity in the inner west by diverting through traffic and stimulating the Footscray Transit City - East West Link (West) and Truck Action Plan supports this benefit;

13. *Improves amenity and enhances the liveability of the city centre* – East West Link (West and East) does not remove traffic from the CBD therefore it is not agreed that this benefit exists.

Based on the above, GHD consider that in isolation the need for the East West Link (West) and the Northern Link have been established however the need for the East West Link (East) has not been established. Data provided by the EWLNAS indicates that only 20% of the Eastern Freeway traffic would use the link to the Tullamarine Freeway. Therefore, based on that demand and the other issues previously outlined, the need for the eastern connection on its own has not been established. However, when viewing it as a complete link from East to West, the demand increases, as does the strategic merit of the proposal.

8.4 Timing of Projects

8.4.1 Overview

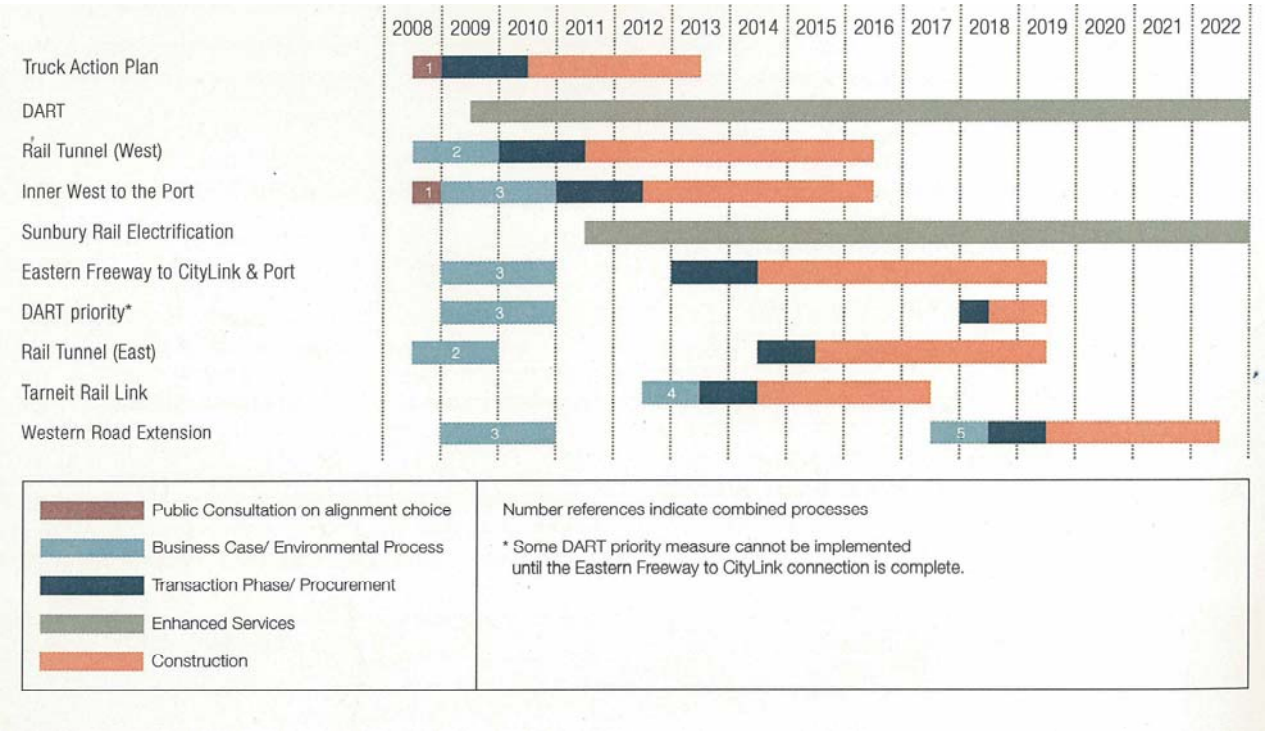
The EWLNAS recommends a staged approach to the delivery of the recommended projects. A proposed timeline is also included that gives broad details of a possible sequencing and timing.

With regard to the road based projects, the program is broken into several phases, ie:

- Public consultation on alignment choice;
- Business Case preparation;
- Environmental clearance/approval process;
- Procurement; and
- Construction.

The program as presented is shown in Figure 16.

Figure 16 East West Link Needs Assessment Study Program[8]



This report has considered a more detailed analysis of the possible staging scenarios of the combination of EWLNAS and Northern Link Projects (See Section 4.5).

8.4.2 Discussion

When considering the timing aspects of major projects such as these, a number of factors need to be considered – these are discussed in more detail below:

(a) Need for Planning/Environmental Approvals

At this stage it is not clear which of the projects (or parts of the individual projects) will require formal approvals. However, there is little doubt that a full EES will be required for virtually all of the projects.

- **Truck Action Plan**
  the various components of the Truck Action Plan are located in various locations:
  - Hyde Street connection – possibly only need Planning approvals;
  - Paramount Road/Ashley Street link – it is understood that a reservation already exists, so only planning matters need to be dealt with;

[8] p 90 Sir Rod Eddington, EWLNAS Team, Investing in Transport – East West Link Needs Assessment, March 2008

- New road connecting Ballarat Road with Footscray/Dynon Roads. The proposed road crosses the “Newells Paddock Wetlands Park” and a new crossing of the Maribyrnong River. There may be sensitive environmental issues in this area and it could possibly require an EES.

- **Road Tunnels between Clifton Hill and Geelong Road**
  Given the scale and nature of the project it is highly likely that an EES will be required, subject to further detailed investigations.

- **Northern Link**
  Given the scale and nature of the project it is highly likely that an EES will be required, subject to further detailed investigations.

From a timing perspective, planning issues can be resolved relatively quickly, whereas if a full ESS is required, a duration of 18 months to two years should be made.

(b) Government Approvals

A proper allowance needs to be made for business case development and final approvals. This is especially the case for major projects such as the road tunnel.

(c) Delivery Mode

The choice of delivery mode and its associated funding will have a major impact of timing. The quickest mode of delivery would be by PPP as any funding limitations can be better addressed. The timing and packaging of any staging options would need to be carefully considered to ensure that viable lengths of project are made available for the private sector.

(d) Industry Capacity

A possible issue in the delivery of these projects will be the capacity of the industry to resource and deliver them. This is particularly the case with planning design and specialist construction resources (eg tunnel boring machines). The level of activity will be critical in the availability and timing of resources.

8.4.3 Summary

The timing review for the EWLNAS projects is based on the available information and is considered to be very high-level. The timing appears reasonable however as there is limited information available GHD cannot comment further on this aspect as it requires more detailed analysis and information. The issues outlined such as planning/environmental approvals, government approvals, delivery mode and the capacity of the industry should be taken into consideration in a detailed analysis of project timings.

8.5 Project Costs

The estimated costs associated with the East West Link as stated in the EWLNAS and the Northern Link based our indicative understanding of options, are:

1. Port Access and River Crossing including the Truck Action Plan - $2.5 billion;
2. East West Link (West) - $1.5 billion;
3. Northern Link - $4-5 billion; and
4. East West Link (East) - $5.5 billion.

These cost estimates are preliminary and appear reasonable however further information would be required to review the costs in any detail. These high-level costs are in the order of magnitude of similar projects and issues such as environmental impact mitigation, industry capacity and construction techniques may impact on detailed cost estimates and should be considered during the planning of these projects.

9. Conclusion

9.1 Project Need

GHD's high-level review of the East West Link and the Northern Link has shown that there is a need for both links and each project will provide benefits to the freight industry and the general community. The links have a strategic need and it has been shown in this report that they serve different markets and have significantly differently catchment areas. The report details the needs and benefits of the links. The report also details how the East West Link can be separated into the projects of East West Link (West) and East West Link (East) based on the different requirements of the projects. It is considered that the strategic need for the East West Link (West) and Northern Link has been established based on freight and growth area benefits, while the strategic benefit of the East West Link (East) is limited to finalisation of the east-west connection.

9.2 Recommended Staging

The proposed staging based on GHD's high-level review of the strategic needs of each project is summarised in Table 5.

Table 6 Recommended Staging (Staging Scenario A)

Priority	Staging
1	Port Access and River Crossing including the Truck Action Plan
2	East West Link (West)
3	Northern Link
4	East West Link (East)

This staging is based on the strategic needs for the East West Link (West) and the Northern Link being established while the East West Link (East) benefits are limited to the finalisation of the East West Link connection.

The following works are associated with each staging:

East West Link (West) Works Section A:

- Tunnel from Geelong Road to Port linking with an at-grade intersection connecting Footscray Road and Dynon Road with priority emphasis on Dynon Road. The Truck Action Plan works that would be required are:
  - A new link from the West Gate Freeway to Whitehall Street, via Hyde Street;
  - A north south freight route along Paramount Road and Ashley Street, to Geelong Road. As freight vehicles can access the West Gate Freeway via Millers Road extending this along Cemetery Road to the freeway is not essential;

- Grade separation of the Paramount Road/Ashley Street and Sunshine Road intersection and the rail line north of this intersection; and
- Upgrading Dynon Road and constructing a link to Wurundjeri Drive, providing access to the Monash Freeway. This link may require grade separation of Wurundjeri Way at Dudley Street and Flinders Street.

Why Priority 1:

- Provides alternative crossing to Yarra River.

East West Link (West) Works Section B

- Geelong Road to Western Ring Road

Why Priority 2:

- Provides a complete alternative to West Gate Bridge;
- Supports growth in the western suburbs for residential, industrial and commercial land uses;
- Removes the requirement for Ashley Street north link;
- Removes the requirement for ramps to Geelong Road from WRR;
- Provides a complete freight link for the west; and
- Potential for Federal funding with Section A

Northern Link Works

- Upgrade existing Greensborough Highway from Western Ring Road to Lower Plenty Road and combination Tunnel and structure to Eastern Freeway at Bulleen Road.
- Widen Eastern Freeway to four lanes between Bulleen Road and Tram Road, provide an auxiliary lane between Tram Road and Blackburn Road and widen to four lanes between Blackburn Road and Springvale Road.

Why Priority 3:

- High traffic demand with a split of 60% bound for eastern/south-eastern suburbs and 40% bound for CBD/western suburbs;
- Provides connectivity to freight and major employment areas in south eastern suburbs;
- Provides for cross-town connection that has limited public transport links;
- Supports growth areas to the north; and
- Financially viable as a PPP.

East West Link (East) Works

- Tunnel from Port to Eastern Freeway, with northern connections to Tullamarine Freeway

Why Priority 4:

- Completes the East West Link and 'fills the gap'; and
- Limited financial viability as a PPP without East West Link (West)

The opportunities and limitations associated with the recommended staging scenario are summarised in Table 7.

Table 7 Opportunities and Limitations for Recommended Staging

Opportunities	Limitations
◗ The River Crossing and Port Access would be a candidate for federal funding based on its strategic freight benefits; ◗ By having the East West Link (West) opened prior to East West Link (East) it would allow a higher traffic volume and catchment area, thereby making the East West Link (East) section more appealing as a PPP; ◗ North Dynon activities can be re-located over a longer period while Stages 1 - 3 are occurring, which would then provide a sufficient space for a construction works area for the tunnel portals; ◗ If Northern Link is built prior to the East West Link (East) the need for the link between Eastern Freeway and Tullamarine Freeway may not be as vital. ◗ Providing the East West Link (West) early in the staging removes the need to construct ramps from the Western Ring Road to Geelong road and extending the Ashley Street upgrade north, which would become obsolete as other stages are developed.	◗ Grade separations or at least major works at Wurundjeri Way/Flinders Street and Wurundjeri Way/Dudley Street would most likely be needed to accommodate traffic distribution from the end of the East West Link (West). ◗ In relation to the point above and resulting from it, there is likely to be lower traffic volumes on the East West Link (West) section until the East West Link (East) section is developed.

9.3 Alignment – JJ Holland Park

A review of the alignment was undertaken in an effort to avoid JJ Holland Park. This review showed that the alignment could be relocated approximately 200 metres south of its current location to avoid any contact with the JJ Holland Park, with the alignment needing to run across the top of the Dynon Road Freight Terminal.

9.4 Southern Connection

A review of the opportunity for a Southern connection to the arterial network near the Western Link identified that a westbound connection would need to be built in Royal Park which would have significant environmental implications and would not be considered suitable. The eastbound connection is not possible due to vertical grade that would be required to access the tunnels that would be double stacked at this location.

9.5 Critical Flaws

In general, GHD agree with the overall findings of the *EWLNAS Investing in Transport* Report however from our review it is understood that many of the recommendations are based on the VLC Zenith Model. In reviewing the documentation GHD cannot agree that the model has been appropriately validated in line with common modelling practices. While GHD cannot agree either way that validation has been proven, as the modelling reports do not provide enough detail, this is not considered a critical flaw in the study but rather as an area of the study that could be open to criticism.

9.6 Establishment of Need

GHD consider that in isolation the need for the East West Link (West) and the Northern Link have been established however the need for the East West Link (East) in isolation has not been established. However, when viewing it as a complete link from East to West, the demand and need for the strategic merit of the proposal.

9.7 Timing and Costs of Projects

The timing and costs of the projects outlined in this report are preliminary and further information and project planning would need occur to undertake detailed analysis of timing and costs. The preliminary timing and costs appear to be reasonable with the factors outlined required to be taken into consideration during the planning phases of the projects.

Appendix A

Alternative Portal Location Concept

PLAN

0 20 40 60m

SCALE 1:2000 AT ORIGINAL SIZE

PRELIMINARY

No	Revision	Note: * indicates signatures on original issue of drawing or last revision of drawing	Drawn	Checked	Approved	Date
B	MINOR AMENDMENTS					
A	ISSUED FOR COMMENT		JT			

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Drafting Check		Design Check	
Approved			
Date			
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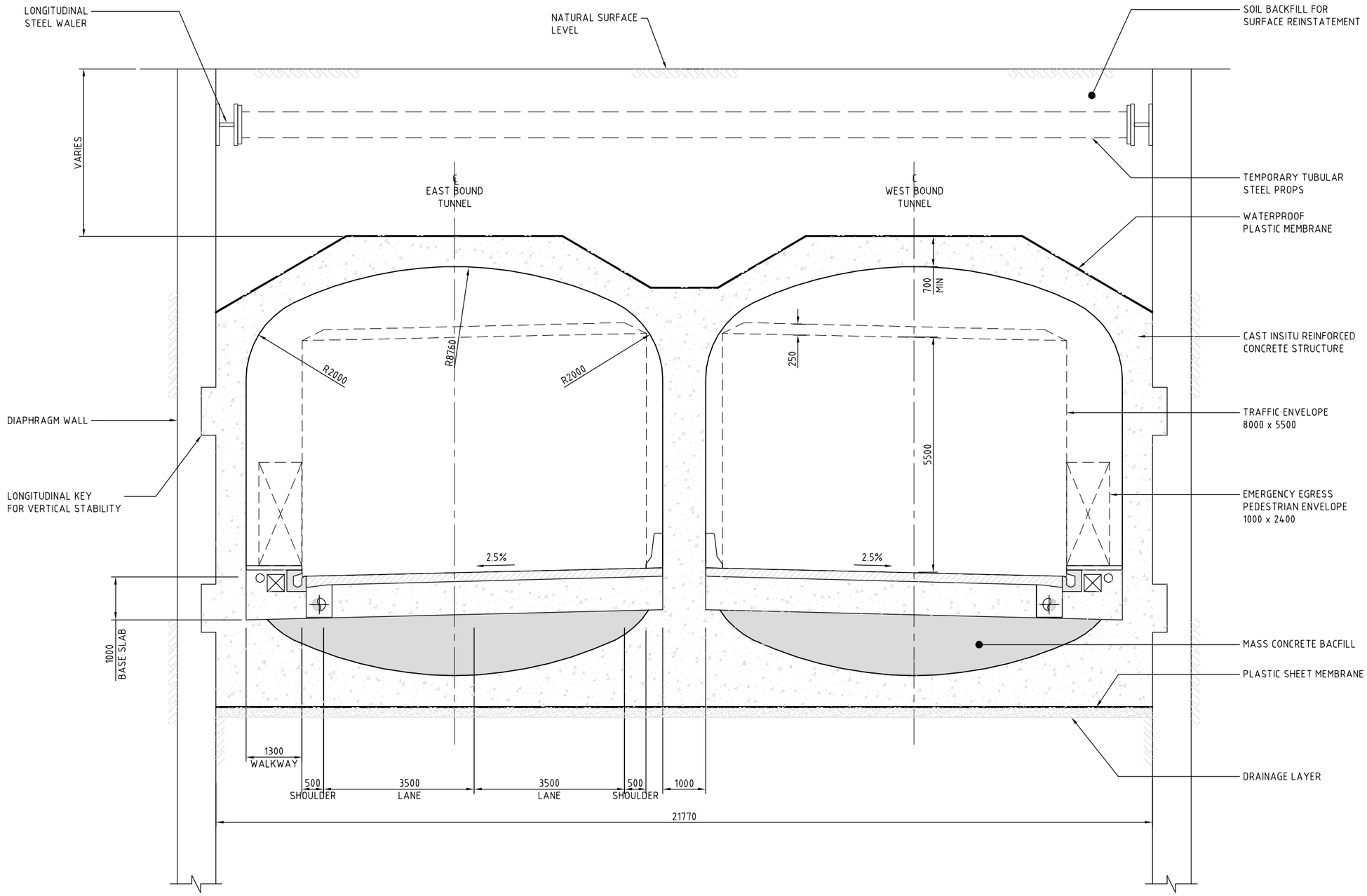
Client

Project

Title **KENSINGTON TUNNEL PORTAL PLAN**

Original Size **A3** Drawing No: **31-23303-FIG001** Rev: **B**

Plot Date: 5 December 2008 - 12:49 PM Cad File No: G:\31\23303\CADD\Drawings\31-23303-FIG001.dwg



A FIG001 SECTION (TWIN TUBE, 2-LANE CUT AND COVER TUNNEL-TYPICAL SECTION)
SCALE 1:100

PRELIMINARY

No	Revision	Note: * indicates signatures on original issue of drawing or last revision of drawing	Drawn	Checked	Approved	Date
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0 1000 2000 3000mm
SCALE 1:100 AT ORIGINAL SIZE

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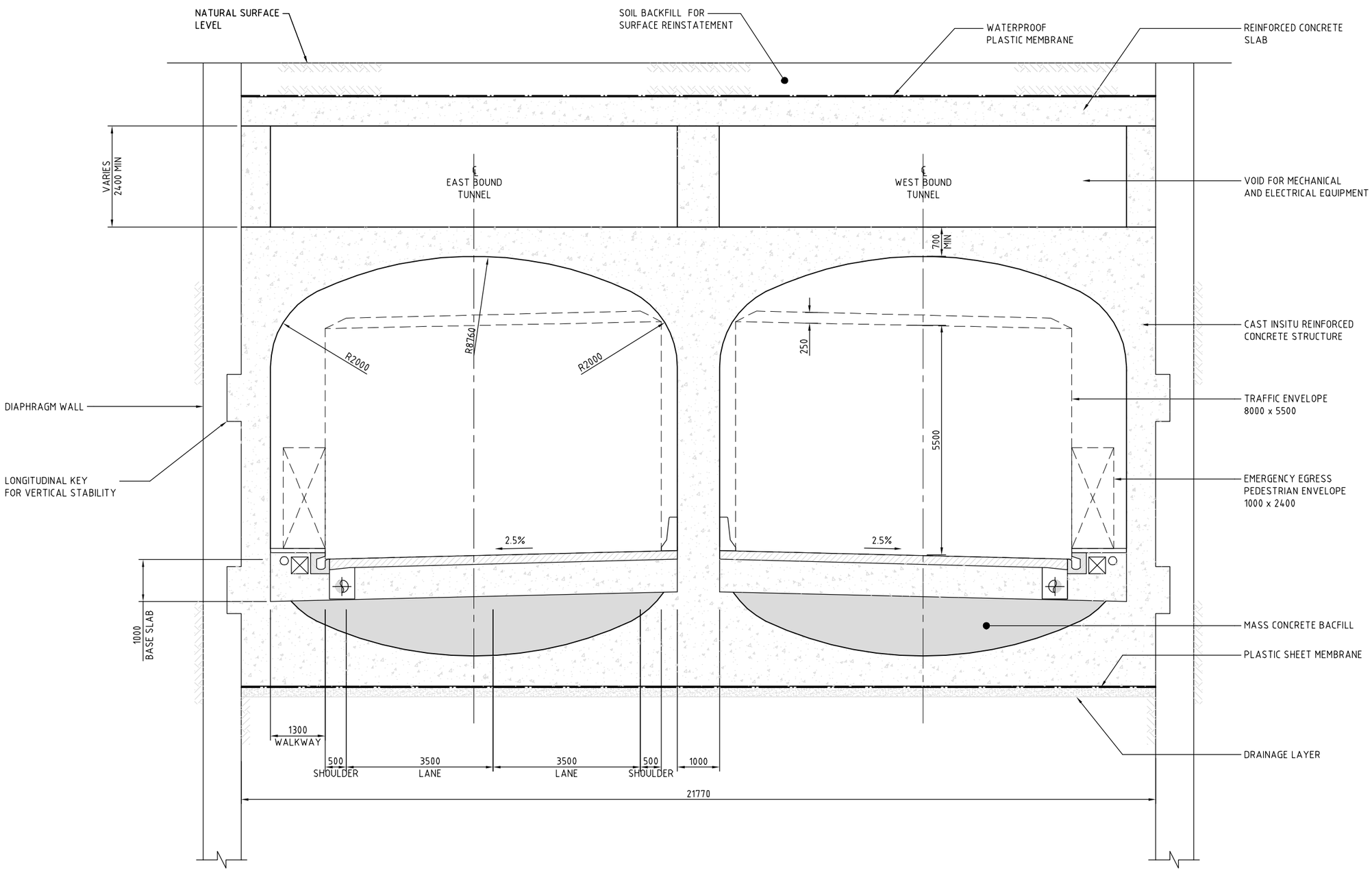
Project
Title **KENSINGTON TUNNEL PORTAL**
TYPICAL CROSS SECTION, CUT AND COVER TUNNEL

Original Size **A3** **Drawing No: 31-23303-FIG002** **Rev: A**

Plot Date: 5 December 2008 - 12:48 PM Cad File No: G:\31\23303\CADD\Drawings\31-23303-FIG002_003.dwg



B FIG001 SECTION (TWIN TUBE, 2-LANE CUT AND COVER TUNNEL-TRANSITION STRUCTURE)

SCALE 1:100

PRELIMINARY

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Drafting Check	Design Check	Project	
Approved		Title	KENSINGTON TUNNEL PORTAL TYPICAL CROSS SECTION, TRANSITION STRUCTURE
Date			
Scale AS SHOWN	This Drawing must not be used for Construction unless signed as Approved	Original Size A3	Drawing No: 31-23303-FIG003 Rev: A

Plot Date: 5 December 2008 - 12:47 PM Cad File No: G:\31\23303\CADD\Drawings\31-23303-FIG002_003.dwg

Appendix B

Option One – Southern Connections

PRELIMINARY

rev	description	app'd	date
B	MINOR AMENDMENTS		
A	INITIAL ISSUE		

ARTERIAL RD CONNECTIONS OPTION ONE

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date | AUG 2008 rev no. | B

approved SK001

Plot Date: 8 September 2008 - 12:22 PM Cad File No: G:\31\23303\CADD\Drawings\31-23303-SK001.dwg

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Document Status

Rev No.	Author	Reviewer		Approved for Issue		
		Name	Signature	Name	Signature	Date
0	L O'Meara S Smedley	R Warwick	* R Warwick	R Warwick	* R Warwick	
1	L O'Meara S Smedley L Renton	R Warwick		R Warwick		17/9/08

* Denotes signature on original document