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Jacobs Group (Australia) Pty Limited
ABN 37 001 024 095
Floor 11, 452 Flinders Street
Melbourne VIC 3000
PO Box 312, Flinders Lane
Melbourne VIC 8009 Australia
T +61 3 8668 3000
F +61 3 8668 3001
www.jacobs.com

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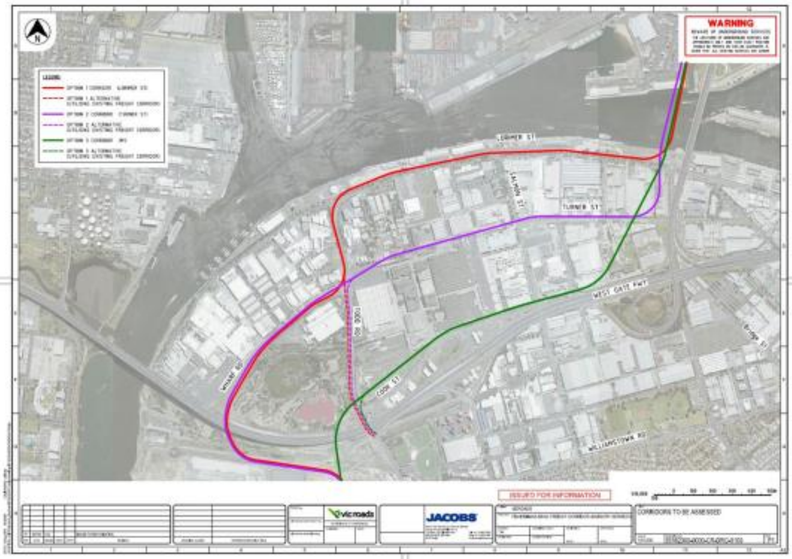
4					

Executive Summary

The *Fishermans Bend Freight Corridor Advisory Services* study was commenced in June 2016 to assist the Fishermans Bend Taskforce to identify a preferred long term corridor for provision of rail and road access to Webb Dock as trade volumes grow and the area more generally develops. There is a current freight route (via Lorimer St and Wurundjeri way), which provides adequate connection at current volumes. In the longer term, however, as volumes grow, additional or dedicated freight capacity may be needed. This study seeks to identify the likely transport moves that can be expected as trade grows and a preferred corridor for upgraded road and rail connections to protect in the case they are needed in the future. The central purpose of undertaking this study was to support the Fishermans Bend Taskforce to identify preferred long term road and rail corridors to Webb Dock Bend in master planning material which may be delivered in the future as the Fishermans Bend Renewal Area develops.

Jacobs was asked to assess three high level corridors for the provision of long term road and rail capacity which are shown to the right. Jacobs also tested whether any alternative corridors might exist.

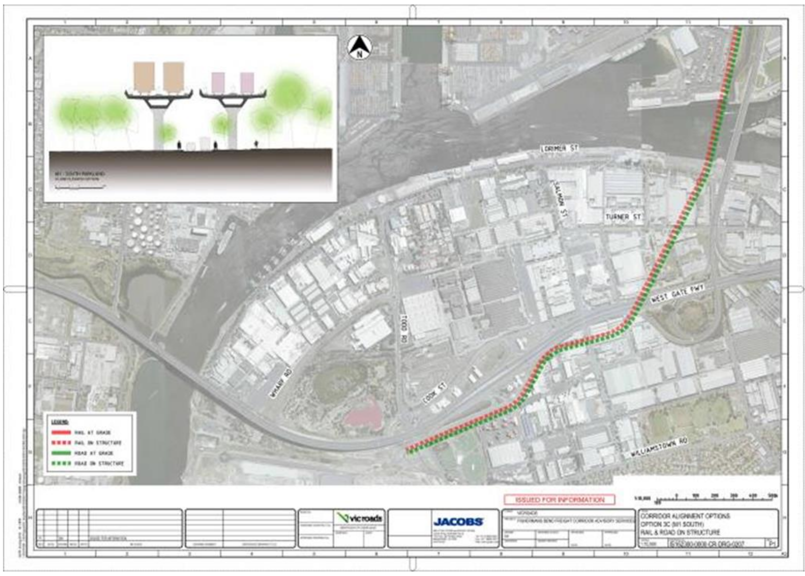


The first stage of work completed by the study assessed the trade volumes that maybe handled at Webb Dock as volumes grow to identify the potential numbers of transport movements that could be generated. These movement numbers were then used to provide a basis for considering the need, capacity and likely timing for delivery of new, dedicated rail and road corridors. The report identifies clearly that for the short to medium term the existing Lorimer St road connection to Wurundjeri Way is expected to remain in place and be adequate to support expected volumes. However, in the longer term, as trade volumes through Webb Dock grow, additional capacity is likely to be needed. In the case Webb Dock reaches its existing design capacity, including 1.2 million international containers plus another 700,000 – 800,000 container equivalents in Bass Strait, coastal and automotive trade, around 8000 truck movements can be expected to and from Webb Dock per day. In future years, Webb Dock could be expanded further to handle far more trade than this. At these higher volumes, Lorimer St may no longer provide adequate capacity. The report also noted future planning now underway for development and renewal of Fishermans Bend that may add to the difficulty of accommodating additional truck movements through the area via Lorimer St only.

The second stage of the study was focused on assessing the alternative options for future road and rail connections that should be protected now to activate in the longer term if or when Lorimer St alone is considered to no longer be an adequate connection. Jacobs assessed the three corridors identified above and identified five strategic options for developing new road and rail capacity in the future. The five options included adding rail to the existing at grade road route on Lorimer St and then three options for delivery of road and rail connections on structure on Lorimer St, Turner St or along a new corridor next to the Bolte Bridge and M1 Freeway. The fifth strategic option involved delivery of new connections along two separate corridors.

Focusing further on these five strategic corridor options, during the third stage of work Jacobs prepared eight separate alignment concepts. The eight alignments included three options for rail and road along Lorimer St both on structure and at grade, and option for a full on structure solution along Turner St, three separate on structure alignments along the M1 corridor and, lastly, a dual corridor option which included rail on structure on Lorimer St and a road on structure option along the M1.

These alignment options were all designed, costed and assessed by Jacobs from delivery, operational and urban design impact perspectives. A Multi Critera Assessment (MCA) workshop was also held with members of the project's working group to assess and score each of these alignments against a range of criteria that had been agreed by the group. The outcome of the MCA process was to identify the options along the M1 corridor as broadly the preferred strategic option. The options along Lorimer St and Turner St were considered to have a greater impact generally on the urban realm and development potential of the area relative to the M1 options. Of the three M1 options, additional consideration by the group determined that 'Option 3C', shown to the left, was, on balance, the preferred long term corridor option. The other two M1 alignments identified were considered to either have an undue impact on Westgate Park or required network changes to Todd Rd that were considered on balance to be less desirable than the overall impacts associated with Option 3C. Option 3C passes through an area of the renewal precinct that is not expected to be developed fully for some years. As such, it was considered by the group that the impact of delivering a new freight corridor in the future could likely be best managed in this area compared to other areas where development is expected to occur sooner.



Following agreement of the preferred long term road and rail freight corridor, Jacobs progressed further urban design work to prepare a three dimensional view of Option 3C for inclusion, if needed, in any Fishermans Bend master planning material. This view, looking east along Cook St near the Salmon St overpass, is shown below.

Whilst Lorimer St is likely to continue to provide adequate connection capacity to Webb Dock for the movements that need this route for some time, as trade grows and development of Fishermans Bend progresses, at some stage in the longer term it is a real possibility that additional road and rail connections that are properly separated from urban areas will be needed. Whilst a range of factors may emerge in the longer term that identifies an alternative preferred route, for now it is vital that a route be identified and protected to ensure an effective road and rail corridor is available for development if and when it is needed.

Contents

	Truganina – Mt Cottrell area. Primarily planned for interstate rail freight but could also be used for international containers.
WSIT	West Swanston Intermodal Terminal – DPW Rail Terminal Adjacent To Footscray Rd near Maribyrnong River

1. Introduction

1.1 Background

Fishermans Bend is an area of Melbourne which has gone through many and varied changes since Melbourne was first established. Since first being a swampy dividing area between the city of Melbourne and development at Williamston and Port Melbourne, Fishermans Bend developed to include an airfield and Melbourne's first modern production line industries. The area was reshaped again by the construction of the West Gate Freeway and the Charles Grimes Bridge in the 1970s and CityLink tollway developments in the late 1990s.

Today, Fishermans Bend is home to a range of businesses that vary significantly in type and scale from large, heavy manufacturing such as Holden's engine plant and defence and aerospace operations through to newer, innovation based businesses such as camera equipment manufactures that occupy smaller land footprints. The Government is now progressing work to plan for the likely next evolution of Fishermans Bend towards further growth of Innovation and knowledge based employment, with larger scale manufacturing expected to reduce in size – the most significant example being Holden ceasing manufacturing engines in Fishermans Bend in 2017.

Whilst Fishermans Bend is expected to evolve in coming years to being home to growing numbers of innovation and knowledge based jobs and substantially increased residential population, one key land use impacting current transport demand through the area will remain and continue to grow – the Port of Melbourne and, in particular, Webb Dock. The Government is currently going through commercial processes to lease the Port of Melbourne for 50 years to a private sector operator. Today, Webb Dock handles a mixed range of cargoes including motor vehicles and coastal trade from Tasmania. In the longer term Webb Dock is considered to have the potential to become the Port of Melbourne's dominant international container handling facility – efficient landside connections will be critical to realising this potential.

A new container handling facility is currently being built at Webb Dock which will provide capacity to handle 1 – 1.5 million containers per annum, bringing the total container handling capacity of the port to around 5.5 – 6 million containers annually..

Appropriate consideration and balance is needed to manage the impacts of any new or upgraded connections with Government's plans for the development and renewal of Fishermans Bend's employment precinct. This report has been prepared to inform preparation of a new plan for transport connections through Fishermans Bend which recognises and accommodates these competing requirements and seeks to ensure the economic benefits of both growth at Webb Dock and wider precinct development can be realised.

The primary road corridor servicing Webb Dock today is the M1 freeway corridor to the east and west and, via Bolte Bridge, to the north. Lorimer St also provides an important connection for heavy vehicles travelling to and from Webb Dock to port and rail terminals at Dynon. Lorimer St is the only route to and from Webb Dock for vehicles operating at 109 tonnes. The legacy rail corridor that once connected Webb Dock to the broader rail network via Docklands is also located on Lorimer St – this link was severed in the early 1990s when the Docklands urban renewal area was first established.

This report seeks to identify a preferred staged approach to the provision of rail and road access to Webb Dock as it evolves over time to respond to growth and development in the area as it emerges. There is a current freight route (via Lorimer St and Wurundjerri way), which provides adequate connection at current volumes and will likely be able to accommodate required movements into the medium term. In the longer term, however, additional or dedicated freight capacity is likely to be needed. This study seeks to identify the likely transport moves that can be expected as trade grows and then identify a preferred corridor for higher capacity road and rail connections for delivery in the future in the case its determined they are needed.

1.2 Requirement to protect a freight corridor through Fishermans Bend

The Goal of this study is to:

Identify and agree a preferred long term freight corridor to be protected to for future development to service long term growth at Webb Dock

There is a clear strategic requirement to retain and ensure ongoing availability of road and rail freight corridors through Fishermans Bend to support the development of Webb Dock as trade volumes grow. A freight corridor through the precinct is needed today and into the longer term to accommodate:

- Heavy mass vehicles which cannot access the M1.
- Interport movements between Swanson and Webb Docks and moves to and from the Dynon Rail Terminals.
- Provide an alternative route to ensure access during periods of heavy congestion on the M1.

Webb Dock today is well served by a direct road connection to Melbourne's M1 freeway corridor. Whilst it is recognised that the majority of road freight travelling to or from Webb Dock is able to connect to the broader road network via the M1, avoiding Fishermans Bend, there are many heavy and long vehicles which must use the current route through Fishermans Bend. Also, the Tasmanian trade handled at Webb Dock often moves to and from the Dock to close locations including Swanson Dock, the Dynon rail terminals and near port Tasmanian trade related businesses. Trips to these locations also often use Lorimer St rather than the freeway network.

These factors requiring a route through Fishermans Bend will remain and, as volumes grow, the need for this alternative is likely to become even more critical as volumes at Webb Dock grow whilst congestion pressure on the M1 increase. Whilst Webb Dock benefits greatly from its extremely close connections to the M1 freeway, this very close connection also presents some risk of in terms of overreliance – what happens to Webb Dock when the freeway is closed or restricted? At Swanson Dock there are network alternatives available for trucks to head in any direction when network outages occur. This is not the case at Webb Dock.

As trade through Webb Dock develops in coming decades, the capacity of the M1 to clear vehicles from the area and reach destinations within a reasonable timeframe will be a key component determining the longer term growth potential of Webb Dock. Should access to the M1 become difficult or restricted in any way due to growing traffic volumes, further development of Webb Dock may be constrained. In addition to the importance of retaining a strategic alternative route to Webb Dock, vehicles travelling at higher mass (109 tonnes) will also still need access to the route given current limitations.

Ensuring availability of a strategic, high capacity network alternative will provide confidence that there will be options available to manage growth at Webb Dock. This study assesses the options available for routes through Fishermans Bend to identify a preferred to protect for future long term development as and when it is needed, noting that for the short to medium term the existing access via Lorimer St is likely to remain adequate.

Whilst other alternatives in connection and technology may emerge in future years, it is vital in the meantime that a deliverable long term route be in place and protected now to provide confidence that Webb Dock has a range of options to ensure operational capacity and efficiency as capacity and throughput grows.

1.3 Steps in Identifying a Preferred Long Term Corridor

This report summarises the following steps taken to inform identification of preferred long term road and rail corridors through Fishermans to service Webb Dock that best balance the requirements of efficient freight access against the potential benefits and impacts for urban renewal opportunities:

1. Summary of any relevant previous work undertaken considering freight access arrangements for Webb Dock.

2. Analysis of various scenarios for the development of trade through Webb Dock and identification of the land side connections that may be required to support movement of this trade.
3. Assessment of a full range of road and rail corridor options for providing a connection to Webb Dock via the Fishermans Bend employment area in the longer term.
4. Detailed assessment of deliverable long term corridor options including through preparing concept designs and cross sections and costing for each option.
5. Review of corridor options to assess their impact on development of Fishermans Bend, including consideration of impact on the deliverability of potential public transport connections servicing the precinct.
6. Multi Criteria Assessment (MCA) of options to identify a preferred corridor for delivery of dedicated road and rail capacity in the longer term as trade volumes grow.

2. Summary of Key Findings of Previous Relevant Work

Maunsell AECOM, 2006, 'Proposed Webb Dock Rail Link: Summary of Critical Studies', Port of Melbourne Corporation

This report summarised a series of critical studies that considered the overall technical and operational feasibility of re-establishing the rail link through Webb Dock. The key findings of this report were:

- The cost of a bridge option would be around $80 million (2004 prices), and a tunnel around $360 million. The bridge option had a BCR of 1.20 assuming a discount rate of 4-4.5% at a total rail throughput of 300,000 TEU per annum. A tunnel option would only be economically viable if disbenefits to shipping, noise, and visual intrusion from a bridge option were in reality about $200-250 million in present value terms.
- If an opening style Webb Dock rail bridge is constructed a maximum of 1-2% of all boats would be required to queue per day by 2021 to wait for freight trains, and only 3% by 2030. Note: VicUrban operating criteria for opening bridge operations (2006 source) require that no more than 10% of all boats should be forced to queue at an opening bridge. The estimated proportions for Webb Dock rail link are well within this range.
- The estimated number of trains per day that would use the rail link were between 26 and 37 (52 and 74 movements) for low and high growth scenarios respectively.
- To ensure the State Government's target of achieving 30% of freight movements through the Port of Melbourne by rail the reestablishment of the rail link will be required.
- An economic assessment showed that the bridge option is 'overwhelmingly economically preferable' to the tunnel option and that delay costs to water vessels would be minimal in economic terms.

Parsons Brinckerhoff, 2009, 'Review of Options for Container Handling for the Port of Melbourne: Preliminary Findings'

This study provided a high level overview and assessment of the feasibility and economic benefits and costs of Webb Dock scenarios: Webb Dock with a new freight link, without a link, and for expansion of the Swanson-Appleton-Victoria dock precinct to reduce/eliminate the need for Webb Dock port development altogether. The study focused on rail, but also provided a brief appraisal of a road only link.

The assumptions behind port capacity and the need for Webb Dock used in the analysis are the same as current assumptions underlying more contemporary estimates and timings (4 million TEU at the established port and 4 million TEU at Webb Dock).

The key findings of this study were:

- A bridge and tunnel option were considered for the river crossing, but a bridge is the only viable option as a tunnel would cost considerably more and would create significant environmental issues, namely;
  - Due to constrained rail gradients a tunnel would need to be a shallow dredged trench style tunnel on the river bed. This would adversely affect river flow hydraulics, water quality and sedimentation and would have high ecological impacts.
- Any rail river crossing would require significant additional works like integration with the wider rail network, interface issues with roads and land uses.
- A rail link would have sufficient capacity to handle up to 30% of planned container throughput at Webb Dock (1.2 million TEU); however capacity could be highly dependent on the priority given to river craft. PB estimates that in the worst case scenario (full priority to river craft) only halve the effective capacity of the link could be achieved (around 600,000 TEU).
- A rail bridge would be economically viable (possessing a benefit cost ratio > 1.0) at a minimum rail task of 600,000 TEU per annum (this equates to a 30% mode share of a Webb Dock handling around 2.0 million TEU). A tunnel option would require over double this throughput to achieve a viable BCR. A caveat to these findings is that construction costs have increased since this study at a higher rate than the likely value of supply chain benefits, so in today's climate higher throughput would probably be needed to meet a break-even assessment.
- The report suggests that for the rail link to achieve its potential throughput significant dependencies on the rest of the metropolitan rail freight system exist.
- Reliance on old origin destination data to estimate mode shares for rail from Webb Dock may mean that the 30% assumption may be hard to achieve at Webb Dock. Tasmanian cargo has origins and

destinations close to Webb Dock, and is unlikely to be moved by rail for this reason. Tasmanian trade is expected to account for 1 million TEU by 2030 (1/4 of all Webb Dock trade).

- Localised traffic problems exist around the Monash-CityLink-West Gate (MCW) corridor, and increased truck traffic due to Webb Dock will exacerbate these issues, particularly in the highly congested areas of the corridor directly near Webb Dock.
    - The congested West Gate and Burnley Tunnel section is characterised by steep grades, high proportions of heavy vehicles and limited scope for future capacity expansion.
    - Road capacity is measured in passenger car units (PCUs) and each additional truck adds an equivalent of 3.5 PCUs to congestion.
- Compensation made to Transurban may be required as a rail corridor would likely reduce potential revenues to the toll road concession holder.
- Ultimately all options assessed provide potential ‘solutions’ to the issue of increased trucks into and out of Webb Dock, but further research/investigations were required in order to develop up the options further.
- The multi-criteria analysis ranked all options fairly closely, however it showed that the zero-throughput Webb Dock option, the road only link option, and no-road link options maximised benefits, and minimised costs. However, these options are not viable. The best ranked viable option was a bridge option which assumed 4 million TEU handled at both Webb Dock and the established port.

Parsons Brinckerhoff, 2009, ‘Road capacity review to support the Port of Melbourne development Recommendations report’

This report conducted a comprehensive review of forecast port traffic under multiple scenarios for freight task at Webb Dock and the established port. Its key findings were that:

- The differences between port development scenarios (varying from high to low throughput through Webb Dock) produce little differences in truck trip generation rates before 2025. This is because of the diversity of trades handled at the port (international container, interstate, general cargo, motor vehicles) mean that any trades shifted to/from Webb Dock need to be accommodated elsewhere within the land constrained port precinct anyway.
- Post 2025 the forecasts for truck trips diverge for the various scenarios (see Figure 1 below which shows the separate port truck forecasts and a combined total). Even with no container handling at Webb Dock truck trips increase as existing trade handled at Webb Dock continues, and also trades shifted from the Swanson precinct are relocated to the Webb Dock area to create space for additional container handling at Swanson.

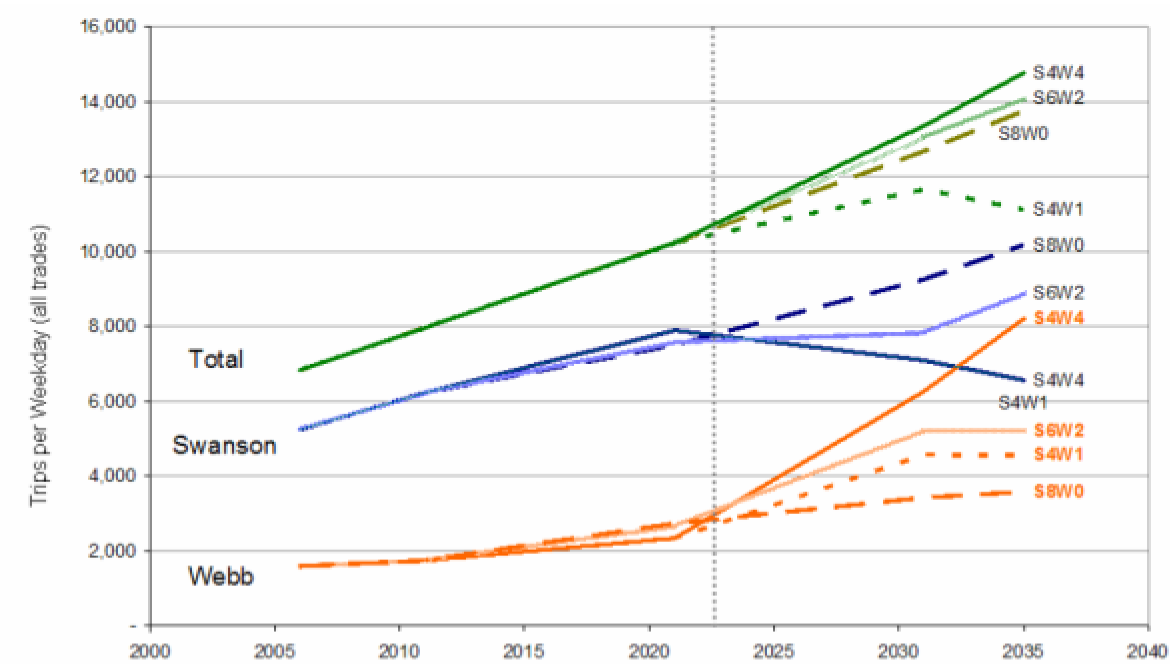


Figure 2.1 – Estimated port truck trips on an average weekday for container port handling scenarios (S stands for Swanson Dock and W for Webb Dock. Numbers indicate millions of TEU handled at each precinct)

- High forecast increases in background traffic not related to the port mean that congestion levels are forecast to be critical for the MCW corridor in all cases despite port development differences.
- Achieving a 30% rail mode share is likely to result in around 3,700 fewer truck trips to the Webb Dock per average weekday. See Figure 2 below.

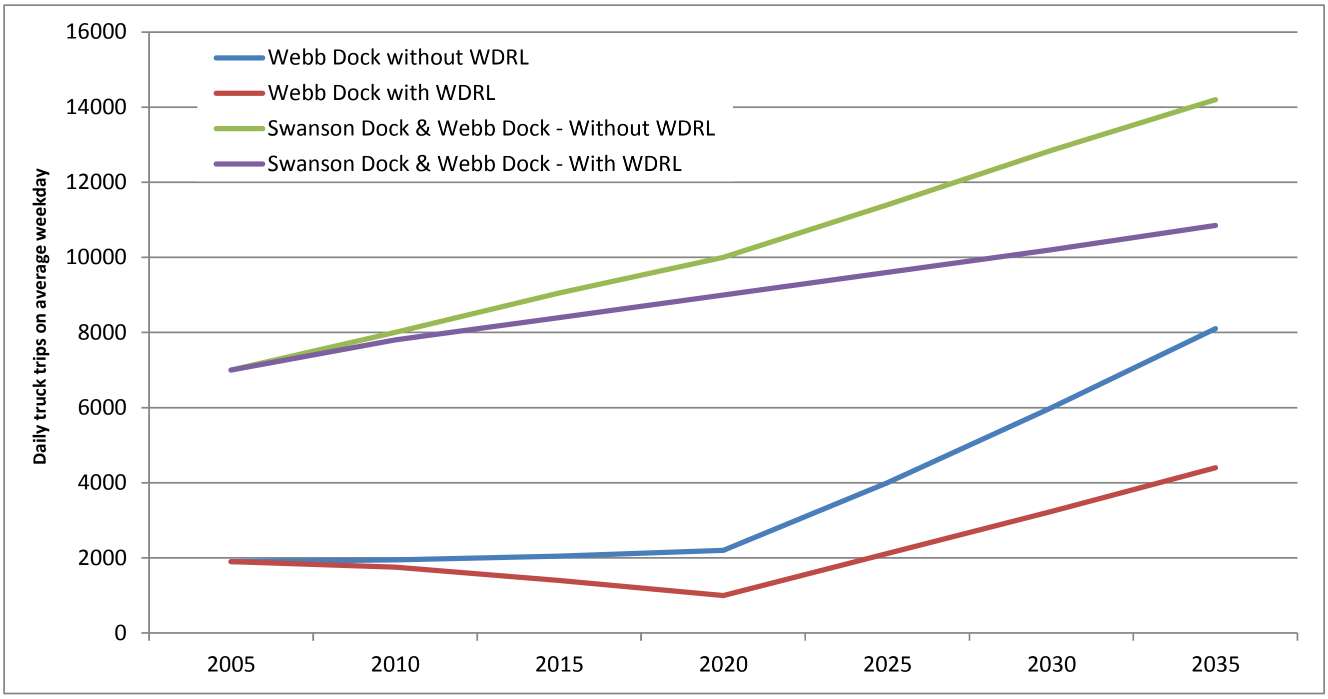


Figure 2.2 – Estimated port truck trips on an average weekday with and without Webb Dock Rail Link (WDRL) assuming 4 million TEU at Webb Dock and 4 million TEU at Swanson Dock (2005-2035)

- The above chart is based on the 'high rail' scenario in the report and relies on assumptions that utilisation and TEU per truck increase over time. It also assumes that the rail mode share of 30% is met by 2025, and exceeded thereafter. Motor vehicles stop being handled at Webb Dock after 2035. Long term break bulk trade operations are concentrated at Appleton and Victoria Docks.
- A more conservative analysis of this report's rail mode share impacts was made which locked in the rail mode share at 30% after 2025. 2035 Webb Dock truck trips were 5,670 in this test and total port trips were 12,120.
- The report indicated that without a rail connection, the Port of Melbourne would generate around 14,000 trucks movements a day split between Swanson and Webb Dock. This number would fall to around 10,800 a day with a 30% rail share in place. For Webb Dock this would represent roughly 3,700 fewer trucks per day.
- An East West link (as per original the East West Links Needs Assessment) did not show results that materially affect congestion around the port but did marginally improve congestion in the Burnley Tunnel and on the West Gate Bridge.
- Achieving efficiency gains in truck utilisation and loads carried would have substantial benefits. Not achieving improvements in efficiency could result in high forecast truck trip generation rates earlier than expected.
- Inter-peak congestion is expected to increase to critical levels (to almost the same as AM and PM peak hours) from relatively free-flowing levels today. Overnight capacity is forecast to remain high, and investigation should focus on increased night operations to take advantage of this resource.

GHD, 2013, 'Port of Melbourne Traffic Surveys: Summary Report', Port of Melbourne Corporation

This report outlines results from surveys on truck volumes to/from the both Webb Dock and the Swanson Dock precincts and specific terminals. For total movements to/from the ports, the key findings were:
At Webb Dock:

- 1,173 inbound trucks and 1,169 outbound trucks were counted over the 24 hour survey period.

- 88% of volumes occurred between 6 am and 8 pm. And the busiest hour was between 11 am and 12 pm (10% of total volumes)
- 56% of all trucks were container trucks

At Swanson Dock precinct:

- 4.728 inbound trucks and 4,816 outbound trucks were counted over 24 hours.
- 80-81% of movements occurred between 6 am and 8 pm. The busiest hour was between 9 am and 10 am for inbound movements (8%) and 11 am to 12 pm for outbound movements (8%).
- 84% of trucks were container trucks

The report also details traffic volumes to/from Webb Dock via route taken. The key findings were:

- Truck origins and destinations:
  - Trips to and from the west via the West Gate Freeway represented 45% of inbound and 47% of outbound trips at Webb Dock
  - Trips to /from CityLink represented 21% of inbound and 25% outbound trips
  - Trips to/from Williamstown Road represented 11% of inbound and 10% of outbound trips
  - <u>**Trips to and from Lorimer Street via Todd Road represented 12% of inbound and 11% of outbound trips**</u>;
  - Trips to and from the east via the West Gate Freeway represented 11% of inbound and 4% of outbound trips; and
  - Trips from Webb Dock via Prohasky Street represented 3% of outbound trips. There were no inbound trips to Webb Dock via Prohasky Street.
- Truck types:
  - 55-56% of trucks were container trucks
  - 18-19% of trucks were pantechs or tautliners
  - 9-10% were car carriers
  - 15-18% were other types of trucks including; tankers, prime movers, low loaders, flatbeds and rigids.
- Port and non-port trucks:
  - At the West Gate Freeway eastbound off ramp, 23% of trucks were bound for Webb Dock, the remainder not related to Webb Dock
  - At the West Gate Freeway eastbound on ramp, 22% of trucks were from Webb Dock, the remainder not related to Webb Dock
  - At the West Gate Freeway westbound off ramp, 39% of trucks were bound for Webb Dock, the remainder not related to Webb Dock
  - At the West Gate Freeway westbound on ramp, 43% of trucks were from for Webb Dock, the remainder not related to Webb Dock
- In 24 hours 584 trucks travelled from Webb Dock to the Swanson-Dynon precinct, and 562 trucks travelled in the opposite direction.
  - 76-79% of the trucks were to/from the Swanson Dock precinct and 21-24% were to/from the Dynon rail precinct.
  - The majority (59%) of trips to/from the Swanson-Dynon Precinct to/from Webb Dock had an intermediate stop and/or took more than 30 minutes.
- The average TEUs carried per truck was between 1.22-1.26

Key findings from previous studies:

- A rail connection to Webb Dock would be economically viable at a throughput of 600,000 TEU per year (equivalent to 30% mode share of Webb Dock handling a total of 2 million TEU per year).
- There is little difference in terms of total truck trips to the port precinct whether Swanson handles 8 million TEU alone, or 4 million and Webb Dock handles 4 million. The only changes are to which part of the port the container handling is concentrated to or spread across. Trades need to be accommodated somewhere in the port and shifting these around makes no change to total truck volumes generated.
- Webb Dock rail link with at 30% mode share would reduce truck trips to/from Webb Dock by between 2,400 and 3,700 trucks per day in 2035.
- An opening bridge style rail link would not significantly delay water craft, however, a requirement to open will reduce the maximum rail path capacity of any connection.

- A road only link could be investigated as an alternative to rail.

3. Operating parameter assumptions and scenarios

This section sets out the scope, structure and assumptions adopted for the parameters used in the operational modelling undertaken for assessing requirements and options for the freight corridor to service Fishermans Bend and Webb Dock port.

These parameters are summarised in **Table 3.1**, including the rationale for selection of the structure and values adopted.

3.1 Port throughput scenario assumptions

Three scenarios for port throughput were agreed, as summarised in **Table 3.1**.

Table 3.1 : Parameters for operational modelling – port throughput

Port throughput scenario				
	Unit	**Low scenario**	**Medium scenario**	**High scenario**
Road rail mode share	%	100% road	20% rail	40% rail
Road mode share	%	100%	80%	60%
Rail mode share	%	0%	20%	40%
Commodity / trade volumes				
International containers	TEU	1,200,000	2,000,000	3,200,000
Cars and small vehicles	Units	250,000	275,000	300,000
Larger roro vehicles	Units	50,000	60,000	75,000
Tasmanian containers	TEU	325,000	375,000	430,000
Mainland containers	TEU	137,500	150,000	180,000
Basis for Webb Dock development option volumes		• VICT WDE B 4+5 developed as planned, lower throughput estimate • Motor vehicles and ro-ro existing volumes less Toyota exports • Tasmania containers and wheeled units existing volumes • Mainland containers existing volumes	• VICT WDE expanded to take over WDE 2+3 • SeaRoad relocated to WDW or elsewhere • Motor vehicle and ro-ro imports continue recent growth patterns • Tasmanian containers and trailers + 15% over low scenario • Mainland containers + 20% over low scenario	• All WD devoted to international containers with enhanced handling methodologies • Motor vehicles and ro-ro relocated (Hastings, Geelong or elsewhere) • All Tasmanian trades and mainland containers relocated away from WD (Appleton Dock, Victoria Dock or elsewhere)

Source: Study team, with review by DEDJTR and project reference group

3.2 Port operating hours assumptions

The opening hours for the port, and what proportion of the maximum throughput capacity is actually used on average can have a substantial impact on how busy the port facility will be when open at any given throughput assumption. While the Port of Melbourne is nominally open for business 24 hours per day, 365 days per year, in reality activity levels are much lower in the evenings, on Saturday afternoons and evenings and on Sundays. There are a number of public holidays, notably around Christmas, New Year and Easter when activity levels are very low and some facilities are closed entirely. The assumptions regarding port operational hours and practices adopted for the low, medium and high scenarios are summarised in **Table 3.2**.

Table 3.2 : Parameters for operational modelling – port operational patterns

Port operational parameters				
	Unit	**Low scenario**	**Medium scenario**	**High scenario**
Monday – Friday **% max worked when open**	Hours %	24 80%	24 85%	24 90%
Saturdays **% max worked when open**	Hours %	24 75%	24 85%	24 90%
Sundays **% max worked when open**	Hours %	24 50%	24 60%	24 75%
Public holidays closed	Days	5	5	5
Effective total working days **% total capacity used**	Days %	269 74%	292.4 80%	315.8 87%

Source: Study team, with review by DEDJTR and project reference group

3.3 Transport mode share and truck and train capacity utilisation assumptions

Assumptions adopted in the landside transport demand model for the various trades currently located at Webb Dock plus for international containers to be established at Webb Dock are summarised in **Table 3.3** to **Table 3.6**. In general, assumptions for current Webb Dock trades are based on current arrangements plus changes anticipated to occur into the future. Assumptions for international containers are based on a combination of practices planned for the VICT terminal as stated by VICTL, current practices for international containers at Swanson Dock and changes expected to occur into the future.

Table 3.3 : Land transport assumptions: international containers

Land transport assumptions – international containers				
Scenario **Road rail mode share**	**Unit**	**Low scenario** **100% road**	**Medium scenario** **20% rail**	**High scenario** **40% rail**
TEU per container truck **Average container truck capacity**	TEU TEU	1.2 2.5	1.5 3.2	1.8 3.5
PRS train configuration	Locos	2	2	2
Container wagons per train	Wagons	42	42	42
TEU per wagon	TEU	2	2	2
Train capacity	TEU	84	84	84
Average train utilisation	%	80%	80%	80%
Average TEU per train	TEU	68	68	68
Time to strip and reload train	Hours	2	2	2

Source: Study team, with review by DEDJTR and project reference group

Assumptions for motor vehicles and larger roll on roll off (roro) vehicles are shown in **Table 3.4**. It is assumed that these remain on road, and that the proportion of larger vehicles driven from the port under their own power (and thus do not need an empty truck movement to the port) will remain at current levels.

Table 3.4 : Land transport assumptions: motor vehicles and larger roll on roll off vehicles

Land transport assumptions – motor vehicles and larger roro vehicles				
Scenario Road rail mode share	**Unit**	**Low scenario 100% road**	**Medium scenario 20% rail**	**High scenario 40% rail**
Cars and small vehicles				
Road mode share	%	100%	100%	100%
Motor vehicles per car carrier truck	Units	7.4	8.3	9.68
Large roro vehicles				
Percentage removed by truck	%	75%	75%	75%
Percentage driven own power	%	25%	25%	25%
Larger roro vehicle per truck	Units	1.2	1.2	1.2

Source: Study team, with review by DEDJTR and project reference group

Table 3.5 shows assumptions for Tasmanian containers and wheeled units (predominantly semitrailer trailers). Much southbound freight is sourced from locations in the inner metropolitan area, and consequently it was considered that rail market shares for this would be lower than for international containers in each throughput scenario. Consequently, and additional factor to reduce rail market share for these containers has been added. It is assumed that landside movements of Tasmanian wheeled units remains entirely on road.

Table 3.5 : Land transport assumptions: Tasmanian containers and wheeled units

Land transport assumptions – Tasmanian trades				
Scenario Road rail mode share	**Unit**	**Low scenario 100% road**	**Medium scenario 20% rail**	**High scenario 40% rail**
Containers				
Percentage of rail mode share for international containers	%	50%	50%	50%
Road mode share	%	100%	90%	80%
Rail mode share	%	100%	10%	20%
Trailers and wheeled units				
Road mode share	%	100%	100%	100%
Percentage of trailers delivered by prime movers that also collect trailer	%	60%	75%	85%
Ratio prime movers to trailers	Ratio	1.4 : 1	1.25 : 1	1.15 : 1

Source: Study team, with review by DEDJTR and project reference group

Table 3.6 shows assumptions for mainland containers, which are the same as for Tasmanian containers.

Table 3.6 : Land transport assumptions: mainland containers

Land transport assumptions – mainland containers				
Scenario **Road rail mode share**	**Unit**	**Low scenario** **100% road**	**Medium scenario** **20% rail**	**High scenario** **40% rail**
Percentage of rail mode share for international containers	%	50%	50%	50%
Road mode share	%	100%	90%	80%
Rail mode share	%	100%	10%	20%
TEU per container truck	TEU	1.2	1.5	1.8
Average container truck capacity	Tue	2.5	3.2	3.5

Source: Study team, with review by DEDJTR and project reference group

Table 2.7 on the following page summarises al landside parameters, and details the Port Rail Shuttle (PRS) operational assumptions based on the conclusions from the Department's PRS studies in 2014.

It should be noted that the medium and high scenarios assume increases in average TEU per container truck. Given that these averages have not changed substantially for over a decade despite considerable increases in average truck sizes, it is likely that some change in policy settings, including potentially regulation by Government, would be needed to achieve these increases. Truck visit numbers will be higher in the case the proposed improvement in utilisation rates is not achieved.

Table 3.7 : Parameters for operational modelling – landside transport arrangements

Landside transport arrangements			
Modal share for containers	**100% road**	**80% road 20% rail**	**60% road 40% rail**
Average TEU / truck	1.2	1.5	1.8
Average truck capacity (TEU)	2.5	3.2	3.5
Modal share for all other trades	100% road	100% road	100% road
Basis of road assumptions	• Existing situation	• Some gains in truck utilisation • Existing trends in truck capacity continue	• Further gains in truck utilisation • Existing trends in truck capacity accelerate
Percentage of cars removed from WDW terminal by truck	100% (Current practice)	100% (Current practice)	-- (Motor vehicles and roro relocated from WDW)
Motor vehicles per car carrier truck	7.4 (80% semis 6.5 cars / truck; 20% b-doubles 11 cars / truck)	8.3 (67% semis 7.0 cars / truck; 33% b-doubles 11 cars / truck)	--
Percentage of larger roro units driven from WDW under their own power (the balance are trucked or floated)	25% (Current practice, Paul Cudmore, MIRRAT terminal WDW)	25% (Current practice, Paul Cudmore, MIRRAT terminal WDW)	--
Other ro-ro units per truck	1.2	1.2	--
Rail operational assumptions	--	• SG consists (ARTC track use to Somerton, Altona and WIFT) • BG consist/s (VicTrack and MTM track to Dandenong South, Somerton, Altona and WIFT) • 2 x 3,000 hp (minimum) locomotives, push-pull formation • Gross trailing load at 100% container slot	• SG consists (ARTC track use to Somerton, Altona and WIFT) • BG consist/s (VicTrack and MTM track to Dandenong South, Somerton, Altona and WIFT) • 2 x 3,000 hp (minimum) locomotives, push-pull formation • Gross trailing load at 100% container slot

Landside transport arrangements			
Modal share for containers	**100% road**	**80% road 20% rail**	**60% road 40% rail**
Rail operational assumptions (continued)	--	utilisation, average 15 t / TEU = 1932 t. • Represents 64% of nominal loco haulage capacity on steepest corridor section, Toorak bank • 42 x 2 TEU slot wagons • Wagons 16 t tare, 60 t capacity, 76 t gross, 19 t axle load • Capacity 84 TEU per train • Total train length 591 m • Reachstacker rail loading and unloading • Maximum 5 reachstackers working simultaneously (1 per 100 m train length) • Train turnaround time in terminals 2 hours (complete strip and load) • Average train utilisation 80% • Average TEU per train 68 • Webb Dock PRS trains operate entirely independently of Swanson Dock / Dynon precinct PRS trains • Separate trains for proposed PRS outer terminals (Dandenong South, Somerton, and Altona / WIFT) • Max track gradient 2.5% (1 in 40) • Webb Dock rail alignment designed for two DG tracks except for Yarra River crossing • Initially constructed with single bi-directional track	utilisation, average 15 t / TEU = 1932 t. • Represents 64% of nominal loco haulage capacity on steepest corridor section, Toorak bank • 42 x 2 TEU slot wagons • Wagons 16 t tare, 60 t capacity, 76 t gross, 19 t axle load • Capacity 84 TEU per train • Total train length 591 m • Reachstacker rail loading and unloading • Maximum 5 reachstackers working simultaneously (1 per 100 m train length) • Train turnaround time in terminals 2 hours (complete strip and load) • Average train utilisation 80% • Average TEU per train 68 • Webb Dock PRS trains operate entirely independently of Swanson Dock / Dynon precinct PRS trains • Separate trains for proposed PRS outer terminals (Dandenong South, Somerton, and Altona / WIFT) • Max track gradient 2.5% (1 in 40) • Webb Dock rail alignment designed for two DG tracks except for Yarra River crossing • Initially constructed with single bi-directional track
Basis of rail operational assumptions	Not applicable	As defined and agreed in PRS project – supply chain analysis report (Jacobs for	As defined and agreed in PRS project – supply chain analysis report (Jacobs for DTPLI 20

Landside transport arrangements			
Modal share for containers	**100% road**	**80% road 20% rail**	**60% road 40% rail**
		DTPLI 20 February 2015)	February 2015)
Tasmanian trailers and wheeled units			
Road mode share	100%	100%	100%
Ratio of prime movers to trailers (where prime mover only delivers or collects)	1.4	1.25	1.15

Source: Study team with review from DEDJTR and project reference group. Rai loperationla assumptions from John Hearsh 27 June 2016

3.4 Public transport service scenarios

The scope of this project specifically includes consideration of possible public transport services and infrastructure. The options included for consideration are summarised in **Error! Reference source not found.** and shown on the map in **Figure 3.1** and **Figure 3.2**. The identified public transport options could ultimately all be delivered in full, or in various combinations. For example, in the case a metro rail connection is provided, it may determine that light rail in addition is not needed. The level of bus service may also be reduced in the case a metro station of light rail is included. Whilst the physical infrastructure required to support the identified public transport options is important to understand to support assessment of the freight corridor requirements and options, the precise operating frequency of each service is not considered to impact the analysis required for this report.

Table 3.8 : Parameters for operational modelling – public transport services and infrastructure

Public transport service options	
Option 1 – Base Case	• Continued development of existing bus services based on combinations and enhancements to existing routes: - 234 (Garden City – Queen Victoria Market) - 235 (Garden City – Melbourne CBD) - 236 (Garden City – Queen Victoria Market) - 237 (Fishermans Bend – Melbourne CBD)
Option 2	• Light rail service via either Turner St or Lorimer St
Option 3	• Melbourne Metro 2 underground rail service connecting from Southern Cross through to Newport • Station on Turner St near the corner of Turner St and Salmon St

Source: Study team with input from PTV and review from DEDJTR and project reference group

Figure 3.1 : Public transport – Existing Services

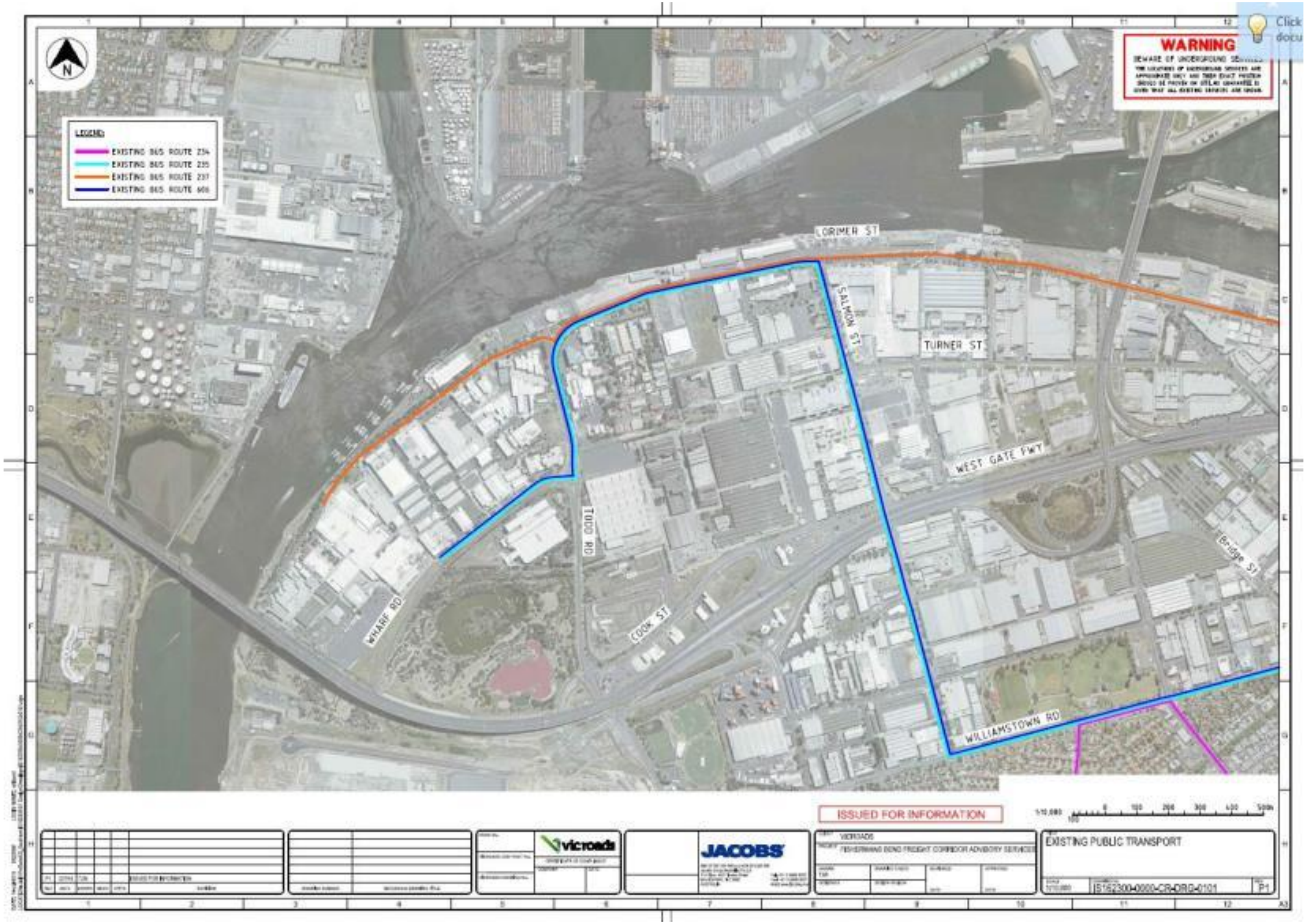
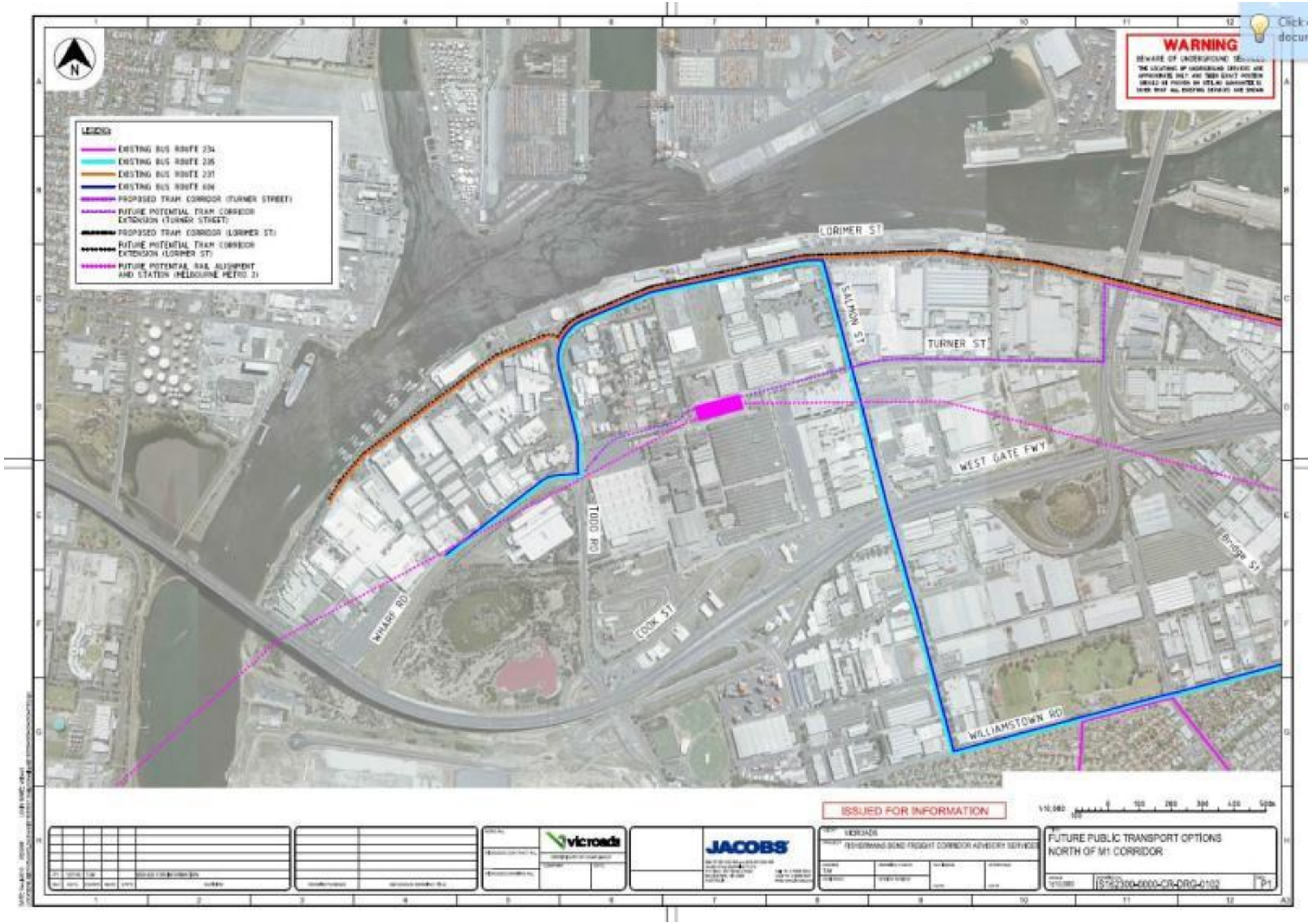


Figure 3.2 : Public transport – Potential Future Services



4. Trucks and trains required for landside freight movements associated with Webb Dock

This section examines the implications of the port throughput scenarios set out in section 3 in terms of the numbers of trucks and trains that would be required to move the cargoes to and from the port.

4.1 Total trucks and trains

Table 4.9 summarises the total number of trucks and trains that would be required under each defined scenario.

Table 4.9 : Total landside transport resources required

Total land transport resources required				
Scenario Road rail mode share	**Unit**	**Low scenario 100% road**	**Medium scenario 20% rail**	**High scenario 40% rail**
International containers	TEU	1,200,000	2,000,000	3,200,000
Cars and small vehicles	Units	250,000	275,000	300,000
Larger roro vehicles	Units	50,000	60,000	75,000
Tasmania containers	TEU	325,000	375,000	430,000
Tasmania trailers	Trailers	450,000	500,000	575,000
Mainland containers	TEU	137,500	150,000	180,000
Port trucks for				
International containers	Trucks	1,000,000	1,066,667	1,066,667
Cars and roro	Trucks	142,568	156,265	174,483
Tasmanian and mainland containers	Trucks	385,417	315,000	271,111
Tasmania trailers	Trucks	630,000	625,000	661,250
Total port trucks per annum	**Trucks**	**2,157,984**	**2,162,932**	**2,173,511**
Trucks per day, 365 days	Trucks	5,911	5,926	5,955
Trucks per day, operating days only	Trucks	8,022	7,397	6,883
Average trucks per hour, operating days only	Trucks	334	308	287
Percentage increase for peak hour over average	%	61%	37%	22%
Trucks per peak hour	Trucks	539	421	350
Trucks per minute, average over 24 hours, operating days only	Trucks	5.6	5.1	4.8
Trucks per minute, peak hours	Trucks	9.0	7.0	5.8
Total PRS trains per annum for				
International containers	Trains	0	2,941	9,412
Cars and roro	Trains	0	0	0
Tasmanian and mainland containers	Trains	0	386	897

Total land transport resources required				
Scenario **Road rail mode share**	**Unit**	**Low scenario** **100% road**	**Medium scenario** **20% rail**	**High scenario** **40% rail**
Tasmania trailers	Trains	0	0	0
Total PRS trains	Trains	0	3,327	10,309
Rail operating days per week	Days	0	6	7
Trains per rail operating days	Trains	0	11	28
Average trains per hour, 24 hours per day	Trains	0	0.4	1.2

Source: Study team with review from DEDJTR and project reference group

These movement volumes are the total numbers of transport movements required to transfer the forecast trade volumes between the port and their origins and destinations. While all rail movements would need to be accommodated on a new corridor established thorough Fishermans Bend, not all trucks are expected to require or seek a route through Fishermans Bend, as they would use the West Gate Monash M1 Freeway or other routes to and from Webb Dock.

4.2 Trucks anticipated to use a road freight corridor through Fishermans Bend

The assumptions adopted for the proportion of trucks servicing various trades that would seek to use a freight corridor through Fishermans Bend are summarised in **Error! Reference source not found.**.

Table 4.2 : Anticipated landside transport resources expected to use road and rail freight corridors through Fishermans Bend

Landside transport expected to use road and rail freight corridor through Fishermans Bend				
Scenario **Road rail mode share**	**Unit**	**Low scenario** **100% road**	**Medium scenario** **20% rail**	**High scenario** **40% rail**
Road rail mode share	%	100% road	20% rail	40% rail
Road mode share	%	100%	80%	60%
Rail mode share	%	0%	20%	40%
Trucks for traditional Webb Dock trades				
Cars and roro	Trucks	142,568	156,265	174,483
Tasmanian and mainland containers	Trucks	385,417	315,000	271,111
Tasmania trailers	Trucks	630,000	625,000	661,250
Total trucks for traditional Webb Dock trades	**Trucks**	**1,157,984**	**1,096,265**	**1,106,845**
Trucks for traditional Webb Dock trades via:				
Swanson Dynon precinct (via FB corridor)	%	6%	6%	6%
Inner west (via FB corridor)	%	6%	6%	6%
Outer west heavy (via Footscray Rd, Hyde, Francis, Williamstown Rds, WGF) (Via FB corridor)	%	0%	0%	0%
Outer west < 68.5 t via West Gate Bridge and West Gate Freeway	%	45%	45%	45%

Landside transport expected to use road and rail freight corridor through Fishermans Bend				
Scenario **Road rail mode share**	**Unit**	**Low scenario** **100% road**	**Medium scenario** **20% rail**	**High scenario** **40% rail**
(not via FB corridor)				
North via Footscray Rd, Hyde, Francis, Williamstown Rds, West Gate Freeway, Western Ring Rd (via FB corridor)	%	0%	0%	0%
North < 68.5 t via Bolte Bridge not via FB corridor	%	21%	21%	21%
Dandenong SE via M1 corridor (not via FB corridor)	%	11%	11%	11%
Dandenong SE heavy and placarded via Williamstown and Dandenong Rds (not via FB corridor)	%	11%	11%	11%
Total trucks for traditional Webb dock trades using Fishermans Bend corridor	**Trucks**	**266,336**	**252,141**	**254,574**
Trucks for international containers	Trucks	1,000,000	1,066,667	1,066,667
Trucks for international containers at Swanson Dock trade via:				
Webb Dock precinct (via FB corridor)	%	7%	7%	7%
Inner west (via FB corridor)	%	0%	0%	0%
Outer west heavy (via Footscray Rd, Hyde, Francis, Williamstown Rds, WGF) (Via FB corridor)	%	0%	0%	0%
Outer west < 68.5 t via West Gate Bridge and West Gate Freeway (not via FB corridor)	%	72%	72%	72%
North via Footscray Rd, Hyde, Francis, Williamstown Rds, West Gate Freeway, Western Ring Rd (via FB corridor)	%	0%	0%	0%
North < 68.5 t via Bolte Bridge not via FB corridor	%	9%	9%	9%
Dandenong SE via M1 corridor (not via FB corridor)	%	0%	0%	0%
Dandenong SE heavy and placarded via Williamstown and Dandenong Rds (not via FB corridor)	%	12%	12%	12%
Total additional international container trucks using Fishermans Bend corridor	**Trucks**	**190,000**	**202,667**	**202,667**
Total Webb Dock trucks using Fishermans Bend corridor	**Trucks**	**456,336**	**454,808**	**457,241**

Landside transport expected to use road and rail freight corridor through Fishermans Bend				
Scenario **Road rail mode share**	**Unit**	**Low scenario** **100% road**	**Medium scenario** **20% rail**	**High scenario** **40% rail**
Trucks per day, 365 days	Trucks	1,250	1,246	1,253
Trucks per day, operating days only	Trucks	1,696	1,555	1,488
Average trucks per hour, operating days only	Trucks	71	65	60
Percentage increase of peak hour over average	%	61%	37%	22%
Trucks per peak hour	Trucks	113.9	88.6	73.7
Trucks per minute average over 24 hours, operating days only	Trucks	1.2	1.1	1.0
Trucks per minute, peak hours	Trucks	1.9	1.5	1.2

Source: Study team with review from DEDJTR and project reference group

These assumptions have been developed based on data from the Port of Melbourne Traffic Surveys reports (GHD 2013) which undertook detailed truck surveys and various locations which enabled matching of truck observations at different locations to compile estimates of the proportion of trucks using different routes to and from the port.

The main influencing factors in determination of truck routes are:

- Location of origins and destinations
- The road network that is open to the truck concerned, considering:
  - Vehicle type (semitrailer, b-double, super b-double HPFV or a-double HPFV)
  - Vehicle mass (GCM < 42.5 t; < 68.5 t, < 77.5 t, < 85.5 t or < 109 t)
- Congestion on alternative routes that may be open to the vehicle concerned.

4.3 Accommodating anticipated numbers of trains to Webb Dock

4.3.1 Issues

One of the fundamental design parameters for the rail freight corridor to Webb Dock is whether there needs to be two tracks for most or all of the distance, or whether a bidirectional single track would have adequate capacity. A number of options and suggestions for consideration have been identified, including:

- Two tracks for the entire connection from Swanson Dynon precinct to Webb Dock
- A single bidirectional track for the 500 – 600 m crossing of the lower Yarra River, with two tracks for the balance (to reduce costs for the bridge or tunnel crossing) with the assumption that this short section would have little impact on total capacity
- A twin track design, but with initial construction of only one track until demand necessitates greater capacity
- Potential for a rail route to be planned and constructed, but which would be used by port container and other trucks initially.

This raised the issue of accommodating both trucks and trains when the corridor was transformed for rail operation. It had been proposed that the design could be to accommodate trucks and trains, but with initial construction of two lanes. Other lanes could be added when rail was introduced. The issue then arose of whether a single train track would be adequate, implying a three lane design, or whether rail would need two tracks, and that space for two train tracks should be planned and incorporated into the design from the beginning.

The existing remnants of the former Webb Dock rail line consist of a single track between Lorimer St west of the Bolte Bridge and Webb Dock. The original line was a bidirectional single track design, with two sidings at Webb Dock, one of which was intended to be used as a loco runaround.

4.3.2 Assessment

The assessment of train numbers required to accommodate anticipated rail demand is summarised in Table 4.9 on page 22. This shows that 11 trains per day would be required under the medium scenario (2.0 M TEU / annum, 20% rail share and six day per week rail operations) and 28 trains per day under the high scenario (3.2 M TEU / annum, 40% rail share and , seven day per week rail operations). Each train requires two rail movements – one to and one from Webb Dock.

The capacity of a single bidirectional rail track between Webb Dock and the Swanson Dynon precinct is based on the following infrastructure and operating practices:

- Trains of maximum 600 m length
- Push-pull operations (loco on both ends, no requirement for loco runarounds)
- Single, bidirectional track
- Four sidings accommodating 600 m trains at Webb Dock
- Three holding tracks at the Swanson Dynon end of the rail connection, to minimise time lost awaiting arrival of next train to be despatched to Webb Dock
- Signalling to enable follow on train operations in same direction with maximum three minute headway
- Two trains can be scheduled to arrive and depart within 10 minutes of each other, using two closely parallel port terminal loading and unloading tracks)
- Train strip and reload to be completed within two hours, using up to five reachstackers simultaneously on each train. This is analysed further in 9.4.
- Eight trains maximum scheduled per 24 hour period per siding – average time allowance 3 hours per train cycle (arrival-working-despatch-arrival)
- Allowance of 15 minutes for one way train movement between Swanson Dynon precinct and Webb Dock – average speed 20 – 24 km/h for the 5.5 – 6 km journey.

  (Source: Email from John Hearsch 27 June 2016)

The requirement for around two hours to strip and reload each train leads to the assumed maximum of eight trains per day on each siding at Webb Dock. Thus two sidings will be needed for the 11 trains per day in the medium scenario, and four for the high scenario. However, three sidings will be able to accommodate 24 trains per day, and so a fourth siding would probably be seriously considered when the capacity of three appeared likely to be exceeded within a year or two.

The capacity of a single bidirectional rail line between the Swanson Dynon precinct and Webb Dock is assessed as shown in Table , with the assumption of four working sidings at Webb Dock, and three holding tracks at the Swanson precinct end.

The outcome is that 32 trains per day could be handled, with the number of sidings and time required to strip and reload trains the limiting factor. The absolute maximum number of trains a single bidirectional line could accommodate (assuming unlimited sidings and holding tracks) would be limited by the 15 minute transit time, giving a maximum of 96 one way train movements, equating to 48 trains handled per day. These trains would require six sidings at Webb Dock, and likely 4 or 5 holding tracks at the northern end.

Table 4.3 : Webb Dock rail line capacity assessment – single bidirectional track

Start time	Activity	Finish time	Webb Dock siding situation	One way rail movements completed
0000	Train movement Swanson to Webb	0015	Work train on siding 1	1
0010	Train movement Swanson to Webb	0025	Work train on siding 2	2
0020	Train movement Swanson to Webb	0035	Work train on siding 3	3
0030	Train movement Swanson to Webb	0045	Work train on siding 4	4
0215	Train movement Webb to Swanson	0230	Clears siding 1	5
0225	Train movement Webb to Swanson	0240	Clears siding 2	6
0235	Train movement Webb to Swanson	0250	Clears siding 3	7
0245	Train movement Webb to Swanson	0300	Clears siding 4	8
0300	Train movement Swanson to Webb	0315	Work train on siding 1	9
0310	Train movement Swanson to Webb	0325	Work train on siding 2	10
0320	Train movement Swanson to Webb	0355	Work train on siding 3	11
0330	Train movement Swanson to Webb	0345	Work train on siding 4	12
0515	Train movement Webb to Swanson	0530	Clears siding 1	13
0525	Train movement Webb to Swanson	0640	Clears siding 2	14
0535	Train movement Webb to Swanson	0650	Clears siding 3	15
0545	Train movement Webb to Swanson	0600	Clears siding 4	16
0600	Train movement Swanson to Webb	0615	Work train on siding 1	17
0610	Train movement Swanson to Webb	0625	Work train on siding 2	18
0620	Train movement Swanson to Webb	0635	Work train on siding 3	19
0630	Train movement Swanson to Webb	0645	Work train on siding 4	20
0815	Train movement Webb to Swanson	0830	Clears siding 1	21
0825	Train movement Webb to Swanson	0840	Clears siding 2	22
0835	Train movement Webb to Swanson	0850	Clears siding 3	23
0845	Train movement Webb to Swanson	0900	Clears siding 4	24
0900	Train movement Swanson to Webb	0915	Work train on siding 1	25
0910	Train movement Swanson to Webb	0925	Work train on siding 2	26
0920	Train movement Swanson to Webb	0935	Work train on siding 3	27
0930	Train movement Swanson to Webb	0945	Work train on siding 4	28
1115	Train movement Webb to Swanson	1130	Clears siding 1	29
1125	Train movement Webb to Swanson	1140	Clears siding 2	30
1135	Train movement Webb to Swanson	1150	Clears siding 3	31
1145	Train movement Webb to Swanson	1200	Clears siding 4	32
1200	Train movement Swanson to Webb	1215	Work train on siding 1	33
1210	Train movement Swanson to Webb	1225	Work train on siding 2	34
1220	Train movement Swanson to Webb	1235	Work train on siding 3	35
1230	Train movement Swanson to Webb	1245	Work train on siding 4	36
1415	Train movement Webb to Swanson	1430	Clears siding 1	37
1425	Train movement Webb to Swanson	1440	Clears siding 2	38
1435	Train movement Webb to Swanson	1450	Clears siding 3	39
1445	Train movement Webb to Swanson	1500	Clears siding 4	40
1500	Train movement Swanson to Webb	1515	Work train on siding 1	41
1510	Train movement Swanson to Webb	1525	Work train on siding 2	42
1520	Train movement Swanson to Webb	1555	Work train on siding 3	43
1530	Train movement Swanson to Webb	1545	Work train on siding 4	44
1715	Train movement Webb to Swanson	1730	Clears siding 1	45
1725	Train movement Webb to Swanson	1740	Clears siding 2	46
1735	Train movement Webb to Swanson	1750	Clears siding 3	47
1745	Train movement Webb to Swanson	1800	Clears siding 4	48

Start time	Activity	Finish time	Webb Dock siding situation	One way rail movements completed
1800	Train movement Swanson to Webb	1815	Work train on siding 1	49
1810	Train movement Swanson to Webb	1825	Work train on siding 2	50
1820	Train movement Swanson to Webb	1835	Work train on siding 3	51
1830	Train movement Swanson to Webb	1845	Work train on siding 4	52
2015	Train movement Webb to Swanson	2030	Clears siding 1	53
2025	Train movement Webb to Swanson	2040	Clears siding 2	54
2035	Train movement Webb to Swanson	2050	Clears siding 3	55
2045	Train movement Webb to Swanson	2100	Clears siding 4	56
2100	Train movement Swanson to Webb	2115	Work train on siding 1	57
2110	Train movement Swanson to Webb	2125	Work train on siding 2	58
2120	Train movement Swanson to Webb	2135	Work train on siding 3	59
2130	Train movement Swanson to Webb	2145	Work train on siding 4	60
2315	Train movement Webb to Swanson	2330	Clears siding 1	61
2325	Train movement Webb to Swanson	2340	Clears siding 2	62
2335	Train movement Webb to Swanson	2350	Clears siding 3	63
2345	Train movement Webb to Swanson	2300	Clears siding 4	64

4.4 Port rail shuttle (PRS) trains and regional trains

The assessment above has assumed that all trains servicing Webb Dock would be metropolitan PRS trains with the operational characteristics summarised in Table 3.7. Trains visiting the Swanson Dock rail terminals and many handled at Qube's North Dynon terminal at present are regional trains predominantly carrying exports from regional Victorian and Riverina locations to the port, and empty containers to regional locations. These differ from PRS trains in two significant ways that would compromise the capacity of rail operations at Webb Dock:

- They are commonly longer than 600 m, typically 750 – 1,000 m, and up to 1,500 m at times
- Nearly all are hauled by head end loco/s only
- They have substantial dwell times at the Swanson Dynon terminals, much longer than the two hours envisaged for PRS operations.

  This is mostly due to lack of operational necessity to turn them around any quicker to make room for following trains, and the need to stable them somewhere until the next journey back to regional areas.

An examination of timetable scheduling for Qube's North Dynon terminal from 2013 shows that the average train dwell time was 19 hours 16 minutes. While this is likely to have changed somewhat, the overall patterns are understood to be similar.

Handling regional trains at Webb Dock would require two main changes to accommodate anticipated operating patterns:

- Establishment of train holding facilities elsewhere if these extended dwell times remain operational practice
- Splitting and reassembling trains so that they are a maximum of 600 m including locos at both ends.

5. Freight corridor route options – Initial assessment

5.1 Corridors to be assessed

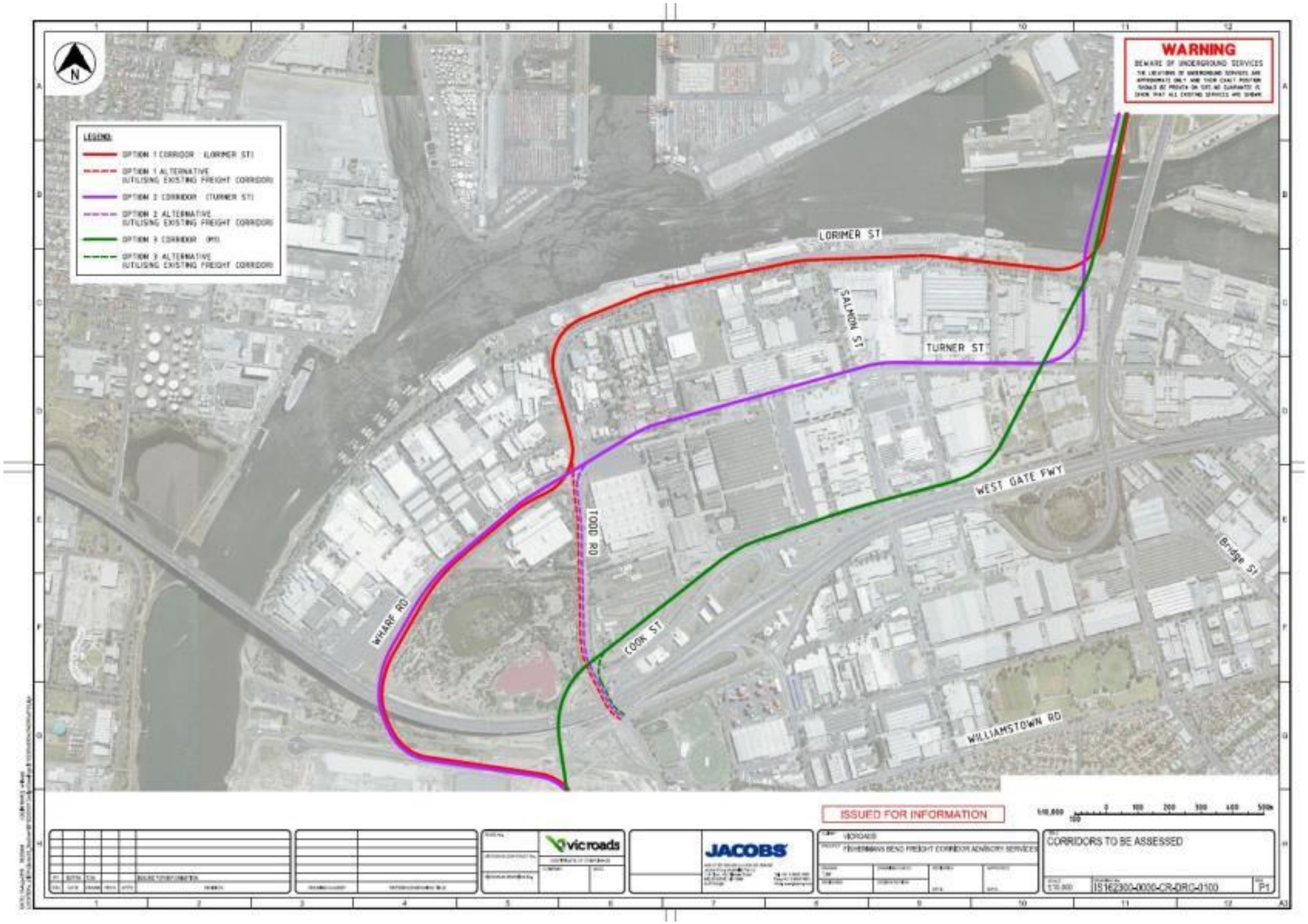
The project scope required assessment of road and rail transport connections via three possible route alignment options for connecting Webb Dock to the port area on the north bank of the Yarra. The three corridor options are broadly described below.

Fishermans Bend Freight corridor Options		
Mode	**Road**	**Rail**
Option 1 **Lorimer St route** (largely existing heavy freight route)	• Webb Dock Drive • Todd Rd • Lorimer St • New crossing of Yarra River west of Bolte Bridge	• Existing rail route from Webb Dock under West Gate Fwy • Existing corridor immediately south of Wharf Rd • Existing corridor on west side of Todd Rd • Existing corridor on north side of Lorimer St • New crossing of Yarra River immediately west of Bolte Bridge • Connection to rail network near Victoria Harbour
Option 2 **Turner St route** (New route which would require new connection to extend Turner St to Todd Rd)	• Webb Dock Drive • Todd Rd • New road alignment from Todd Rd at or near Wharf Rd roundabout heading east to Salmon St / Turner St intersection • Turner St • Graham St • New crossing of Yarra River west of Bolte Bridge	• Existing rail route from Webb Dock under West Gate Fwy • Existing corridor immediately south of Wharf Rd • New alignment from Todd Rd at or near Wharf Rd roundabout heading east to Salmon St / Turner St intersection • Turner St • New alignment heading north immediately west of Bolte Bridge • New crossing of Yarra River immediately west of Bolte Bridge • Connection to rail network near Victoria Harbour

Fishermans Bend Freight corridor Options		
Mode	**Road**	**Rail**
Option 3 **M1 route** (New route which would require a new connection to link Cook St with a new river crossing)	• Webb Dock Drive • Cook St along north side of the M1 • New road alignment to connect Cook St to new crossing of the Yarra • New crossing of Yarra River west of Bolte Bridge	• New surface rail alignment under / over the West Gate Fwy and along Cook St almost to Western Link (Bolte Bridge) • New rail alignment heading north to new crossing of Yarra River • New crossing of Yarra River immediately west of Bolte Bridge • Connection to rail network near Victoria Harbour

Jacobs has also been asked to consider potential alternate corridors through Fishermans Bend which might include a variation of mix of the three corridors, or some other alternative through the precinct. Whilst no separate alternative corridors were identified, some variations around the 3 core corridors have been considered which are documented in more detail in Chapter 6.

Figure 5.1: Freight corridor options to be assessed



5.2 Rapid Assessment

At a conceptual level, there are three main options for construction approaches that can be adopted for adding major transport corridors into substantially developed brownfield areas:

- On an elevated structure
- At the surface (at grade)
- In a below ground tunnel.

For the purpose of this study, a below ground long tunnel fully bypassing the precinct has not been assessed. Whilst, in the longer term, a tunnel completely bypassing an interaction with Fishermans Bend may be considered, the purpose of this study is to identify a preferred above ground route to ensure there is a route protected and available for the future in the case its needed.

In order to best target work on concept design, urban design and costing, Jacobs undertook an initial ‘rapid’ assessment of potential variations for each corridor to eliminate further consideration of options that are most likely, for reasons of construction cost and complexity, impact on amenity and urban development and impact on development of additional public transport services, largely undeliverable. Table 5.1 below details the project team’s assessment of which corridor options should be further assessed. The recommended treatment of each option is indicated as follows:

Rapid Assessment Finding	**Description**
	On balance it was **agreed to not take this option forward** for concept design and assessment
	On balance it was **agreed to take the is option forward** for concept design and assessment

Table 5.1: Fishermans Bend freight corridor options rapid assessment of constructability, impact on urban design and impact on development of PT services

	Lorimer St	Turner St	M1 Alignment / Cook St
Road			
At grade connecting to bridge, tunnel or existing route(s)	Existing route - would only require connection across the Yarra. Whilst the bank of the Yarra will continue to be port area under the 50 year lease, long term retention of a heavy truck route would probably impact urban renewal opportunities. Should be further assessed as the base case. Jacobs considers there is likely room along the corridor for a tram to operate whilst trucks continued to use the route. Longer term, overnight only access could be considered given low residential population expected. ✓	Given plans for the development of a high quality employment precinct in Fishermans Bend, an at grade heavy road freight route along Turner St, at the centre of the precinct, would very likely have an unacceptable impact on the amenity and urban development of the precinct and make delivery of a new tram route difficult. Whilst feasible, this route is not considered an improvement on the existing route. ✗	It may be possible to upgrade Cook St and back through to Lorimer St. However, connecting this route back to Lorimer St would send trucks on a north-south route back through the middle of the new employment precinct, having a negative effect on the urban amenity. Whilst feasible, this route is not considered an improvement on the existing route. Upgrade of the Bolte Bridge to take higher mass would be preferable. ✗
On structure connecting to bridge or tunnel	This option is constructible connecting via a low bridge of short tunnel, but likely to have a significant impact on urban amenity and renewal with the medium or longer term possible opening up of Lorimer Street to the Yarra to the north. A tram could operate underneath a structure utilising the current at grade rail corridor. ✓	Constructible, however some land acquisition likely (turning corner from the Bolte Bridge onto Turner St). Would impact development potential along Turner St. Tram could be delivered under a structure. Route provides for good linkage to the existing alignment into Webb Dock. . Could connect to a bridge across the Yarra. ✓	Constructible, however land acquisition likely and probably more complex (cost) than the other two corridors. Lowest urban impacts and no impact on options for new PT, but challenges include accessing Webb Dock and limitations due to proximity of AusNet Services terminal station. Could connect to a bridge across the Yarra ✓
Rail			
At grade connecting to bridge or tunnel	Whilst feasible, reinstatement of this route would significantly impact urban renewal	An at grade rail link running the length of Turner St would significantly impact renewal opportunities and	An at grade rail connection would likely be extremely difficult to deliver along the M1 corridor without

	Lorimer St	Turner St	M1 Alignment / Cook St
	opportunities and lower precinct amenity. Would also be difficult for an at grade freight route to operate alongside an at grade tram service. However, as the existing protected option for rail (no acquisition), Jacobs propose this option be further assessed as the base case to compare with the alternatives. Would require at least one grade separation. ✓	require a number of grade separations and land acquisition. An at grade connection would largely preclude significant urban renewal on Turner St and make very difficult delivery of a new tram route. Whilst likely constructible, the expected impacts on renewal and PT development considered to be unacceptable. ✗	significant land acquisitions, grade separations and other operational impacts. Would need to pass the AusNet power facility and cut north across future tram connections impacting renewal. Broadly considered undeliverable. ✗
On structure connecting to bridge or tunnel	Constructible, but likely impact on urban amenity and renewal opportunities in the longer term. Could connect via a low bridge. Connection to a tunnel would reduce the advantages of an on structure option. Deliverable and, given using the existing land corridor, likely strong value for money option. A tram could be built underneath the structure. ✓	Likely adverse urban amenity impact with a noisy diesel train operating along the heart of the urban renewal and employment precinct. However, is constructible and a tram could be built underneath a rail freight structure. Provides good linkage to the existing alignment into Webb Dock. Could connect across the Yarra via a bridge. A tunnel connection would impact land. ✓	Lower urban impacts compared to other two corridors, however, deliverability challenges include connecting the route to Webb Dock and limitations due to proximity of AusNet Services' Fishermans Bend high voltage electricity terminal station in Turner St. Could connect across the Yarra via a bridge. Likely to be highest cost corridor option. ✓

Source: Study team

5.3 Strategic Corridor Options agreed for Further Design and Assessment

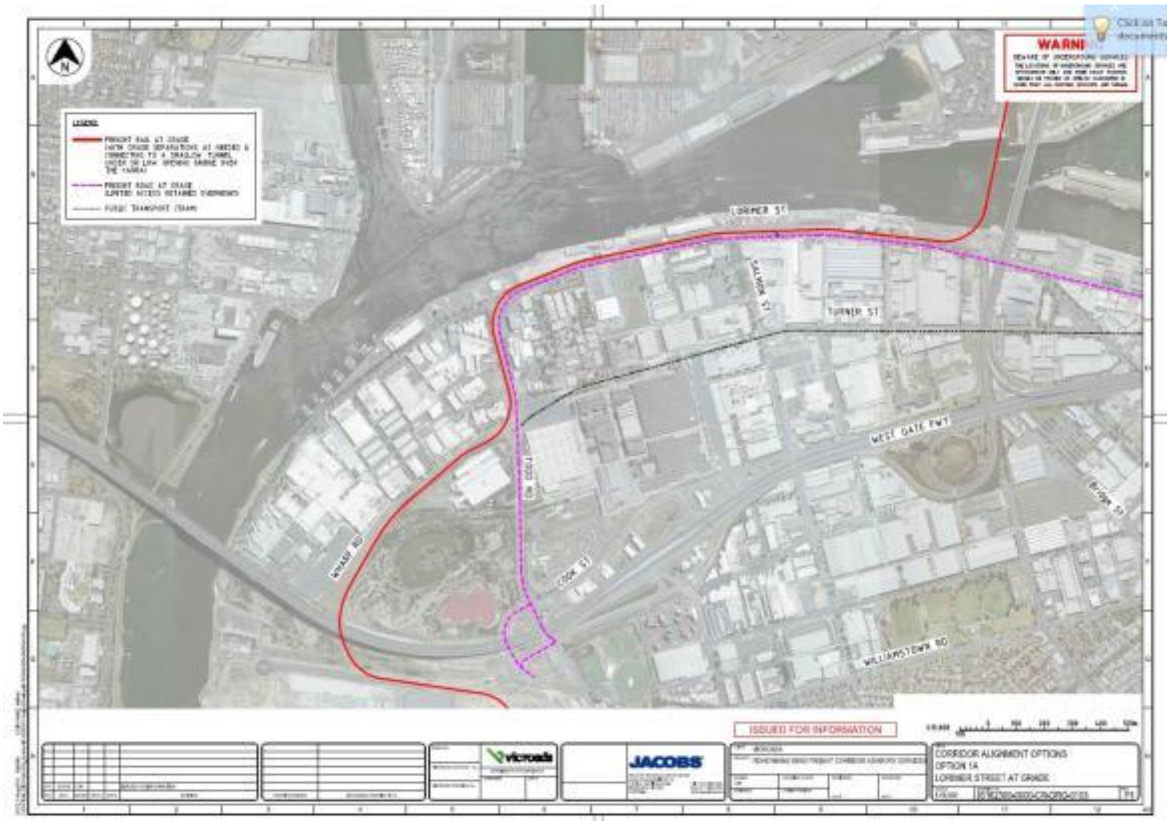
Based on the rapid analysis of the various freight corridor and how they would impact urban renewal opportunities and operate with options being considered for providing public transport into the precinct, the study team identified five strategic paths that could be followed which are detailed in the table below. Options 1a and 1b are lower intervention options which utilise the existing, available freight corridor, whilst Options 2 and 3 involve heavier intervention and investment given that all the land needed for a connection is not yet available. An Option 4 has also been identified – given the need to identify corridors for road and rail, Jacobs will consider an option that provides road and rail running along separate corridors. To support more detailed assessment of each option, Jacobs will progress these options through concept design, high level costing and urban design consideration – the corridor options to be further assessed are shown on maps following the table. Through the design process, variations for some corridors may emerge for consideration and comparison.

Table 5.2 : Long term strategic corridor options to support throughput of up to 4 million TEU at Webb Dock

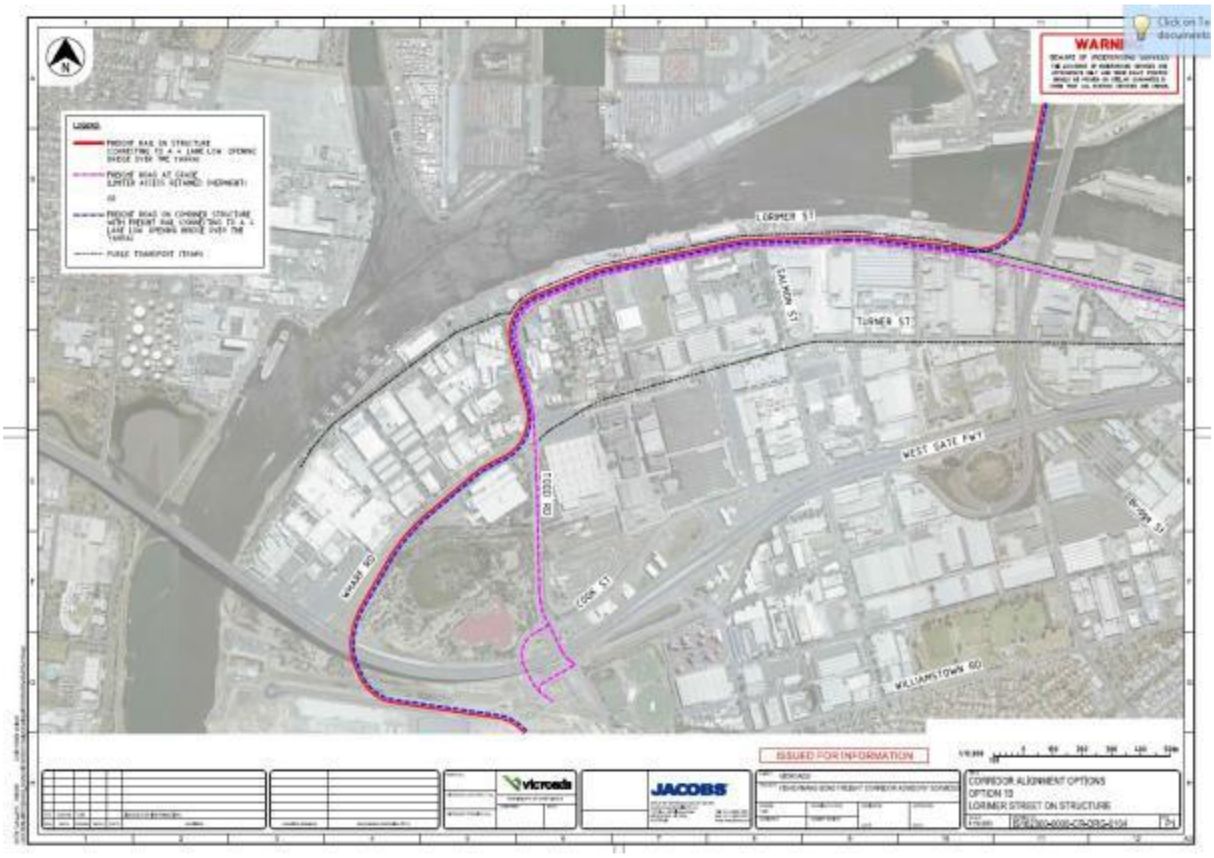
	Freight Road	Freight Rail	Public Transport
Strategic Corridor Option 1A – Lorimer St at Grade	Limited road access retained via Lorimer St.	At grade on Lorimer St (with grade separations as needed) connecting to shallow tunnel under or low bridge over the Yarra	Tram on Turner St
Strategic Corridor Option 1B – Lorimer St on Structure	On structure with rail with structure up to 4 lanes wide– connecting to four lane low opening bridge.	On structure on Lorimer St – low opening 4 lane bridge over the Yarra	Tram on Turner St Tram on Lorimer St
Strategic Corridor Option 2 – Turner St on Structure	On structure with rail with structure up to 4 lanes wide – connecting to four lane higher bridge.	On structure on Turner St – higher 4 lane bridge crossing the Yarra	Tram on Turner St Tram on Lorimer St
Strategic Corridor Option 3 – M1 Corridor on Structure	On structure with rail - structure up to 4 lanes wide. Connecting to 4 lane higher Bridge.	On structure following the M1 corridor– high bridge crossing the Yarra	Tram on Turner St Tram on Lorimer St
Strategic Corridor Option 4 – Separated Corridors	On structure along the M1 Corridor connecting to low opening four lane bridge – road built first	On structure along the Lorimer corridor connecting to low opening four lane bridge over the Yarra connecting with road link.	Tram on Turner St

Source: Study team

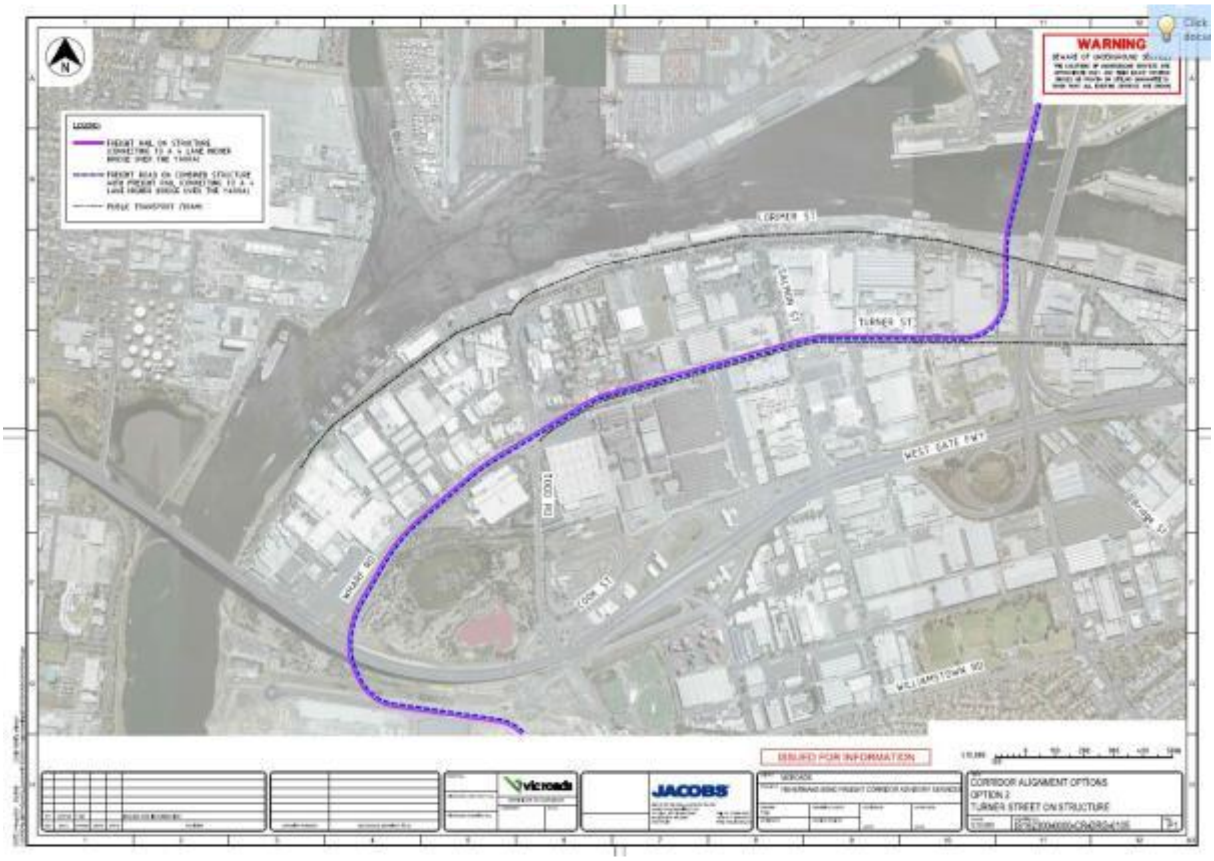
STRATEGIC CORRIDOR OPTION 1 A – Lorimer St at grade (base case)



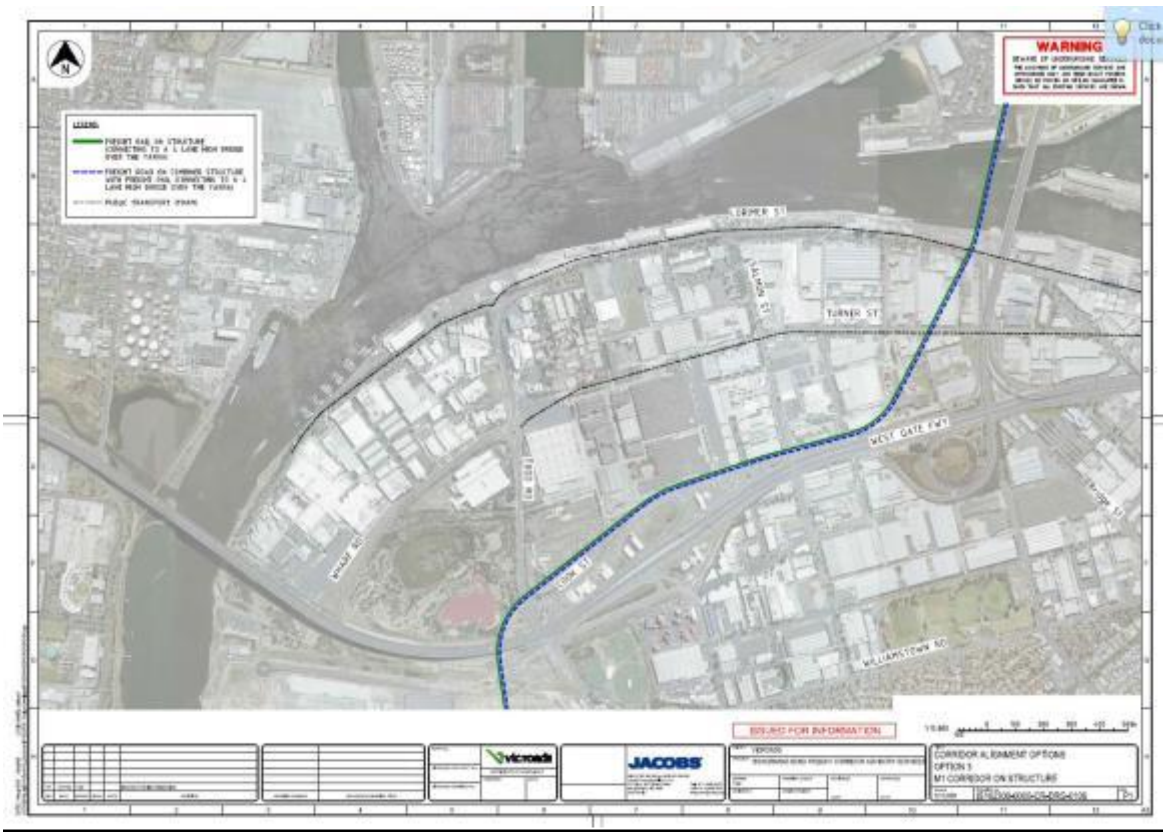
STRATEGIC CORRIDOR OPTION 1B – Lorimer St on Structure



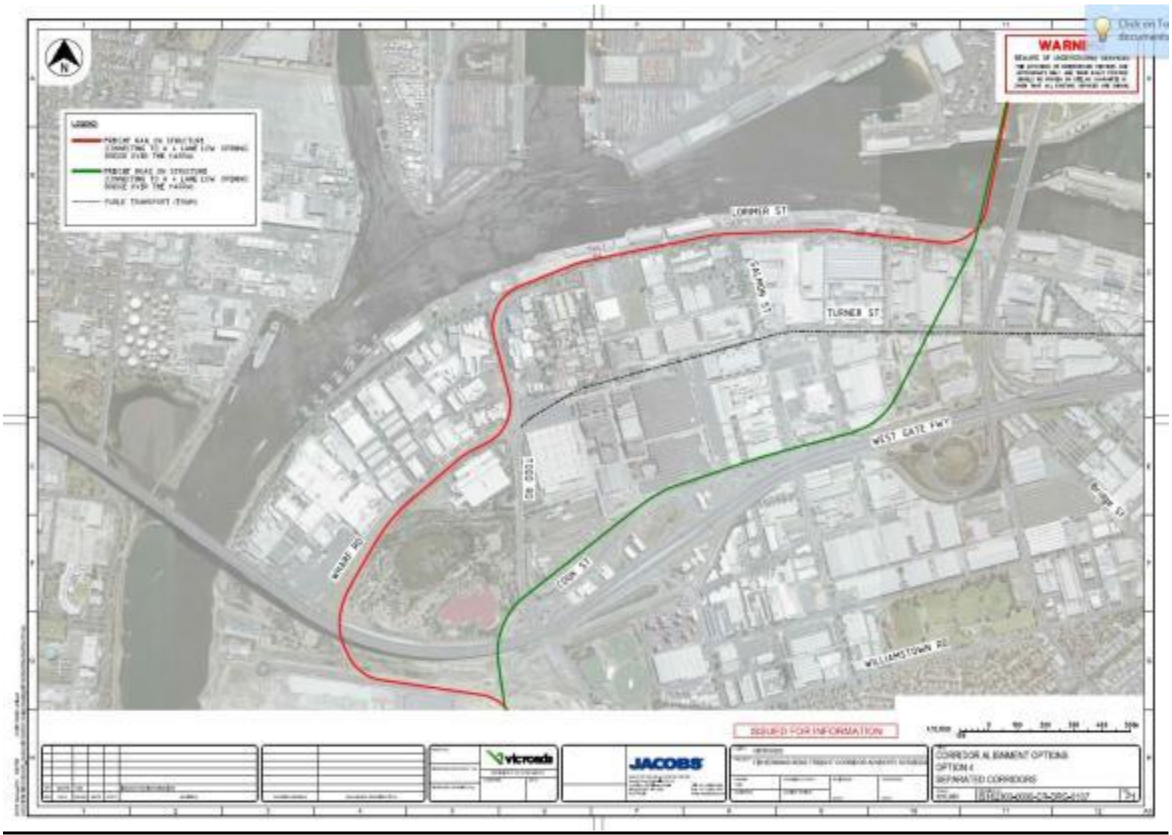
STRATEGIC CORRIDOR OPTION 2 – Turner St on Structure



STRATEGIC OPTION 3 – M1 Corridor on Structure



STRATEGIC OPTION 4 – Separated Road and Rail Corridors on Structure



6. Concept Corridor Designs to be Assessed and Costed

6.1 Finalising Concept Design Options

Five strategic corridor options were endorsed for further assessment and design as follows:

- Strategic Option 1A – Lorimer St road and rail at grade (the base case)
- Strategic Option 1B – Lorimer St road and rail on structure
- Strategic Option 2 – Turner St road and rail on structure
- Strategic Option 3 – M1 corridor road and rail on structure
- Strategic Option 4 – Dual corridor – road on structure on Lorimer St, rail on structure M1 corridor.

Jacobs undertook further detailed review of this five corridor options, including considering some variations of alignments around each corridor to consider:

- Alternative paths a link could go along the corridor;
- Potential to provide access for road and rail on the same corridor on separated infrastructure – i.e. road at grade and rail on structure on the same corridor;
- Potential to deliver road and rail access via separate corridors – i.e. a road structure on one corridor and a rail structure on another corridor, and;
- How delivery of the corridors may be staged – i.e. potential to deliver a dedicated corridor for road with a rail corridor delivered later once volumes have grown at Webb Dock.

Following consideration of each Strategic Corridor Option against this consideration, a final package of eight alignments was identified to progress to concept design, urban design, planning and costing considerations. The final package includes:

Alignment Option 1A – Lorimer St with road and rail operating at grade within existing corridors. Option includes two grade separated intersection with rail crossing the Yarra via a low opening bridge. Road would continue to use the existing road links via Wurundjeri Way. This is considered to be the Base Case

Alignment Option 1B – Lorimer St with rail operating on a two lane structure and Road continuing to use the existing road links via Wurundjeri Way. Option includes rail crossing the Yarra via a low opening bridge. A new tram service could be incorporated operating under the new structure.

Alignment Option 1C – Lorimer St with road and road and rail operating on a four lane structure above Lorimer St connecting across the Yarra on a low four lane opening bridge. Whilst the bridge would be delivered as four lanes, the full structure could be built as a two lane road structure that is expandable to four lanes to accommodate rail as and when needed.

Alignment Option 2 – Turner St with road and road and rail operating on a four lane structure above Turner St connecting across the Yarra on a higher four lane bridge rising to a similar height to Bolte Bridge. Whilst the bridge would be delivered as four lanes, the full structure could be built as a two lane road structure that is expandable to four lanes to accommodate rail as and when needed.

Alignment Option 3A – M1 North – All M1 alignments have in common a connection to a high Yarra crossing (no opening requirement) and take a path to avoid crossing over the AusNet transmission facility. This route requires acquisition of a fair parcel of land as the route crosses Turner St. The route would then proceed on structure over Salmon St along Cook St. The nth M1 alignment would then follow a path around the northern side of Westgate Park, connecting with the existing rail corridor on the western side of the park to enter the port.

Alignment Option 3B – M1 Centre – An on structure alignment that follows Cook St and enter the port area near the current truck access point on the north side of the freeway. Given the need to get under the M1, the connection would need to drop as it approaches port land and would require a realignment of Todd Rd to the east in order to maintain adequate clearance on this link.

Alignment Option 3C – M1 South – An alignment has been identified that would cross the M1 and enter Webb Dock on the southern side of the freeway. Options would require acquisition of a new corridor on the southern side of the M1.

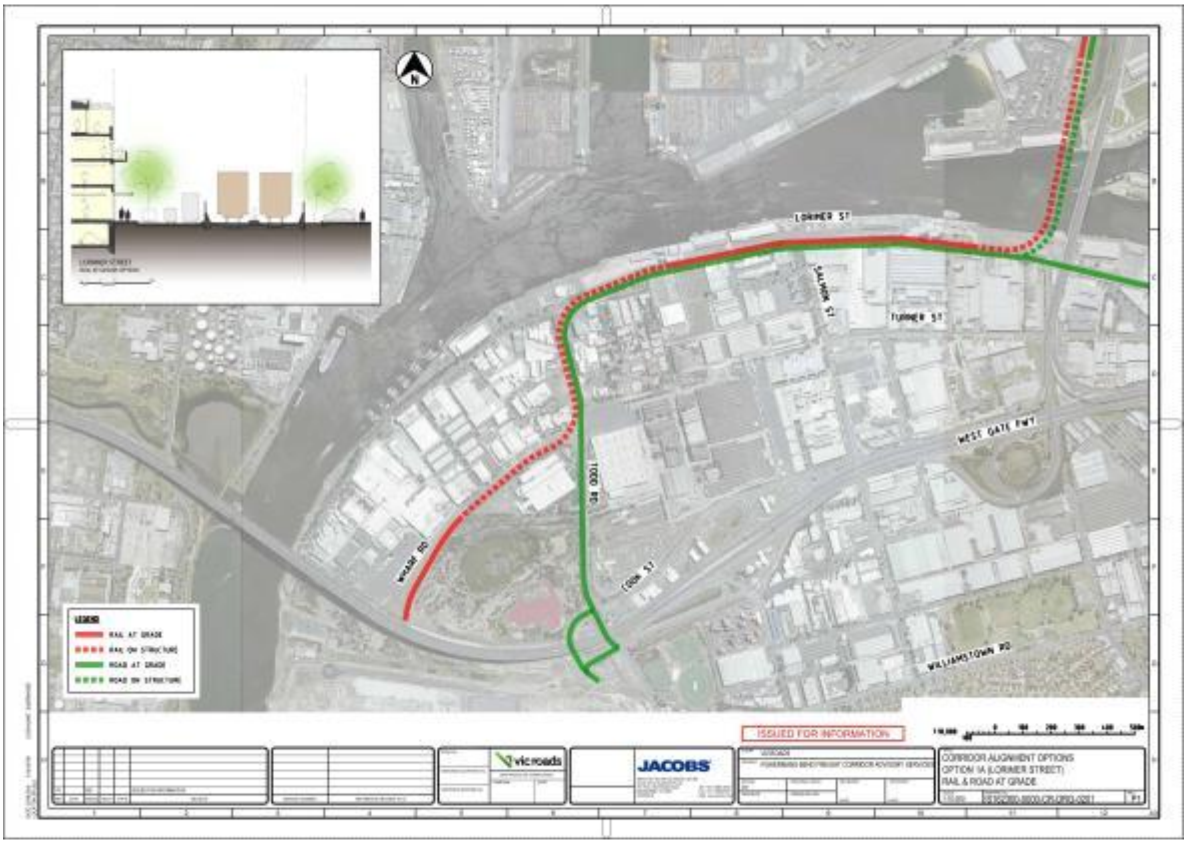
Alignment Option 4 – Separated Corridor - Given the requirement to protect corridors for road and rail, an option is to provide access through two corridors rather than one. This option includes delivery of a road connection on structure along the M1 connecting to a low opening 4 lane bridge that has the capacity to carry rail. There could also be development later of a separate two lane structure for rail along Lorimer St. Depending on progress of other factors, under this option either both, or maybe only one of the corridors might ultimately be developed.

Concept design and initial assessment of each of these alignments is set out in more detail below at 6.2.

6.2 Alignment Options Concept Design and Initial Assessment

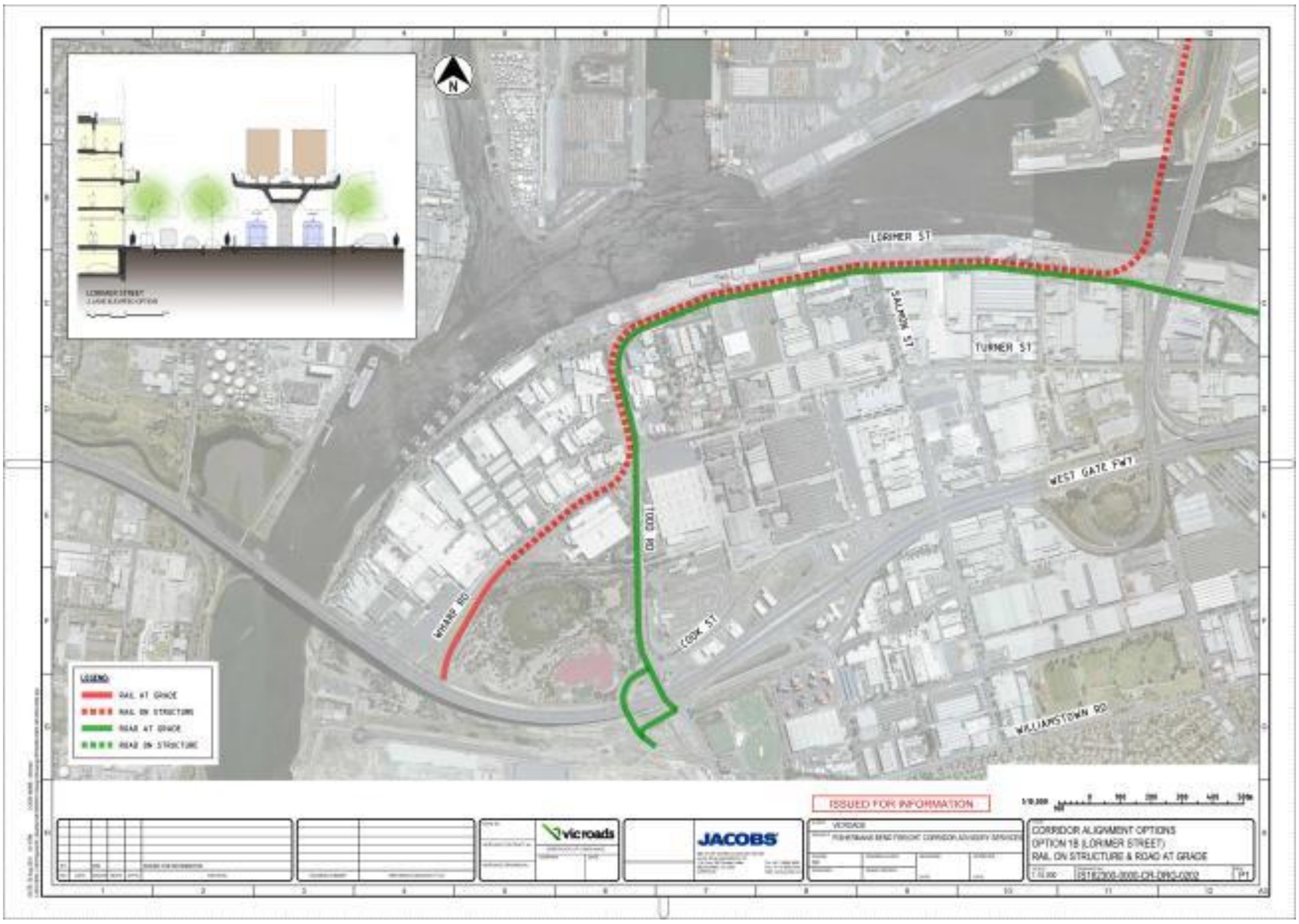
6.2.1 Alignment Option 1A – Lorimer St road and rail at grade

Base case option that would require narrowing of Lorimer St to fit two train lines within the existing road corridor. Key likely benefits include lower costs relatively to alternatives on structure, no need for land acquisition and utilisation of an existing known freight route. Key dis-benefit of this option is that road freight will remains operating at grade on Lorimer St which impacts the urban realm and is not as efficient for port trucks as a direct, dedicated link. Option would also reduce options for PT and active links taking up the existing rail corridor. Alignment would connect to a low opening bridge given the space available – an opening requirement would restrict full capacity of the link from port perspective. Full cross section drawings for each option are shown at Appendix B



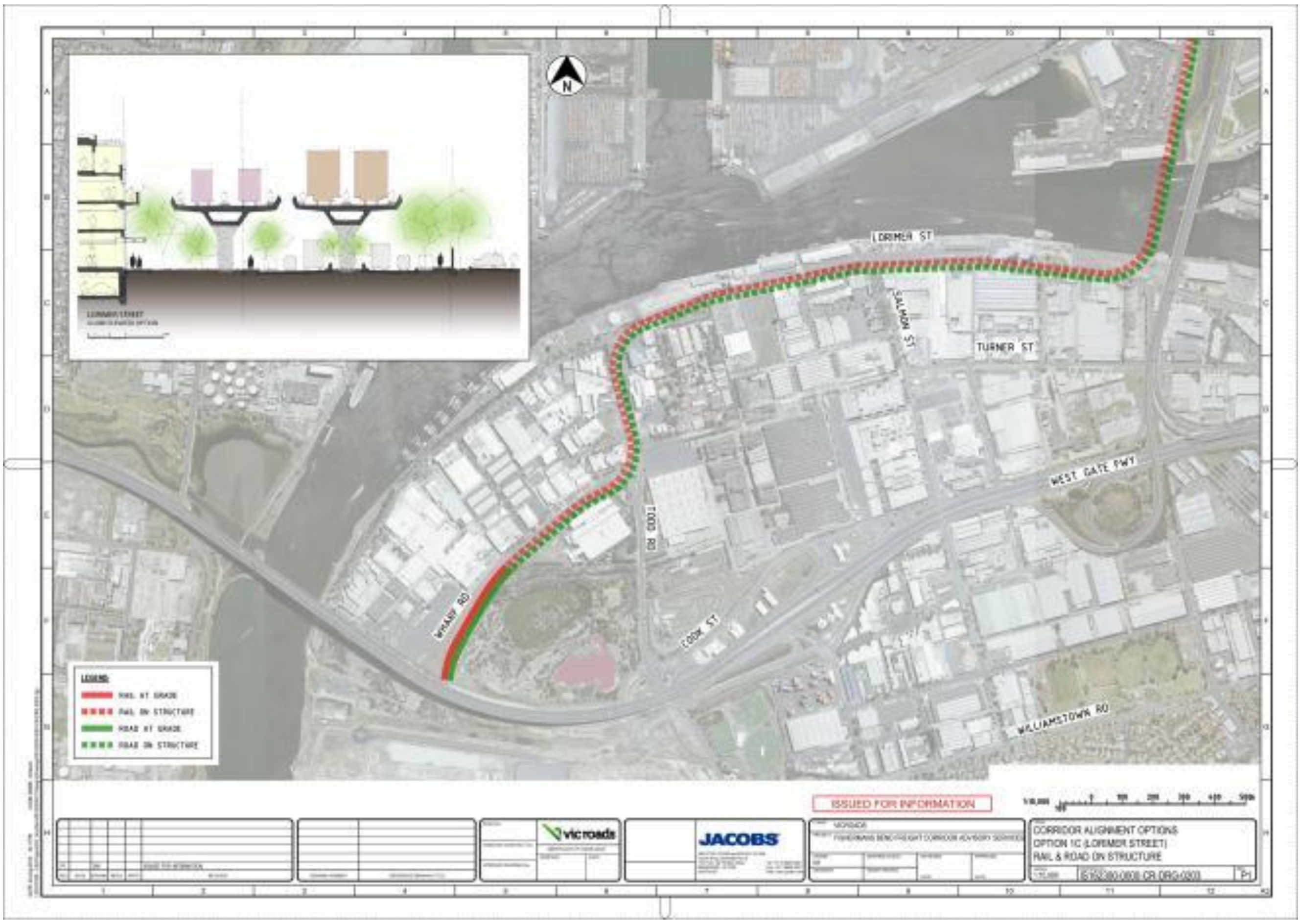
6.2.2 Alignment Option 1B – Lorimer St rail on structure and road at grade

Fits within the existing road corridor, however, the road would need to be narrowed, reducing capacity. Key benefits include no need for land acquisition and utilisation of an existing, workable alignment. Space available to operate a tram underneath the two lane rail structure and/or place a bike path. Key dis-benefit of this option is that road freight remains operating at grade on Lorimer St which impacts the urban realm and is not as efficient for port trucks as a direct, dedicated link. . Option would connect to a low opening bridge given the space available which would restrict full capacity of the link from port perspective.



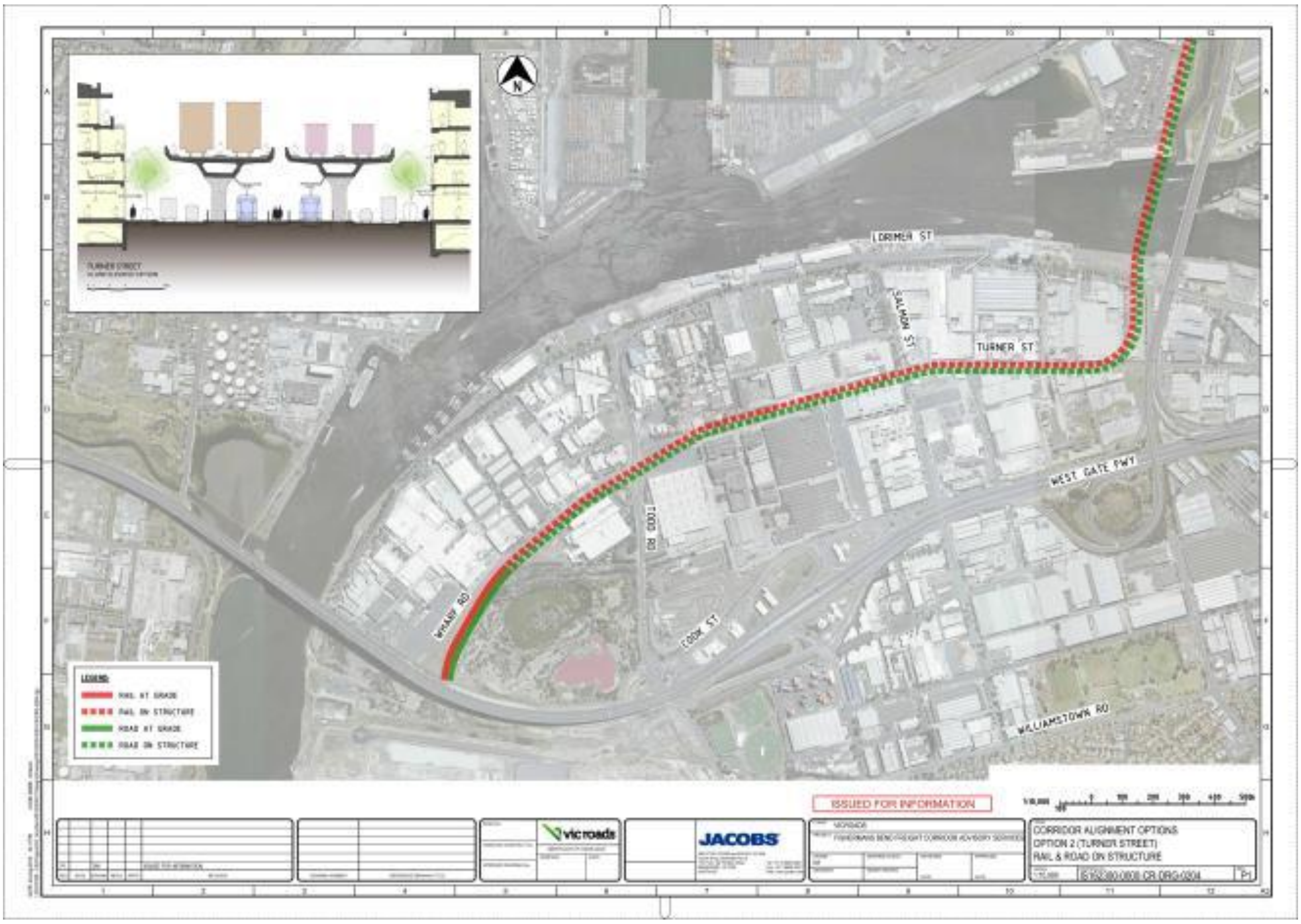
6.2.3 Alignment Option 1C – Lorimer St rail and road on structure

Significant land acquisition along full east – west length of Lorimer St required to fit four lanes of structure – potentially unrealistic. Key benefit is that operationally it provides dedicated road and rail connection, removing road from travelling at grade. However, option still requires a low opening bridge given the space available. Opening function would restrict full capacity of the link from port perspective, but does provide dedicated access for all modes. Impacts in terms of blocking natural light to buildings on the south side of Lorimer St.



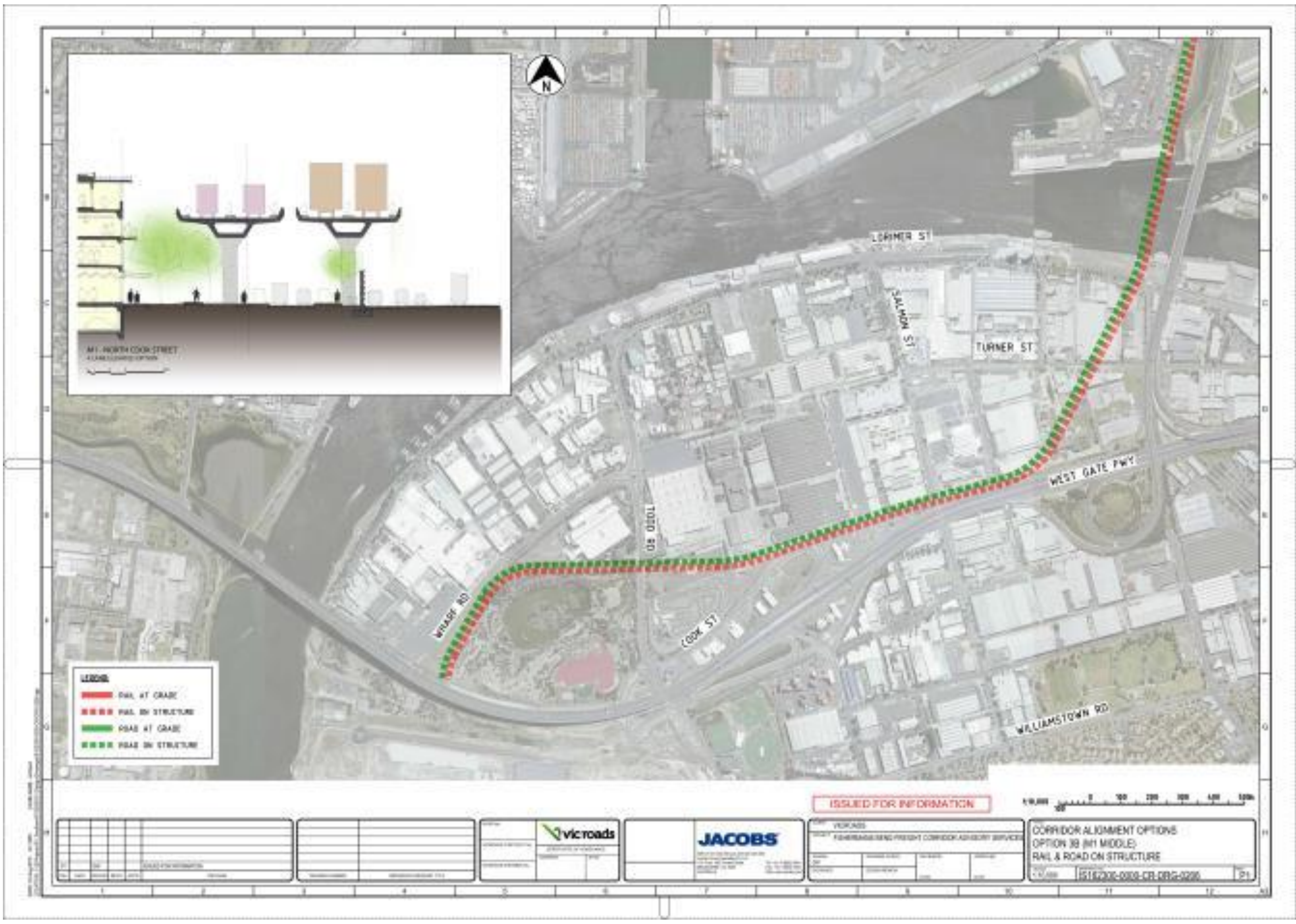
6.2.4 Alignment Option 2

Route would have a significant impact on the look and layout of a future Turner St that has been extended and expanded as the central spine of the Employment Zone. Whilst would be good from a port operations perspective with a higher bridge and direct link to existing rail corridor, Jacobs considers any Turner St route is likely to be unrealistic from a urban renewal and development perspective. Clearly highest impacts on transport network connectivity within the area. A tram could be built under any structure, but structures would overwhelm the road space below.



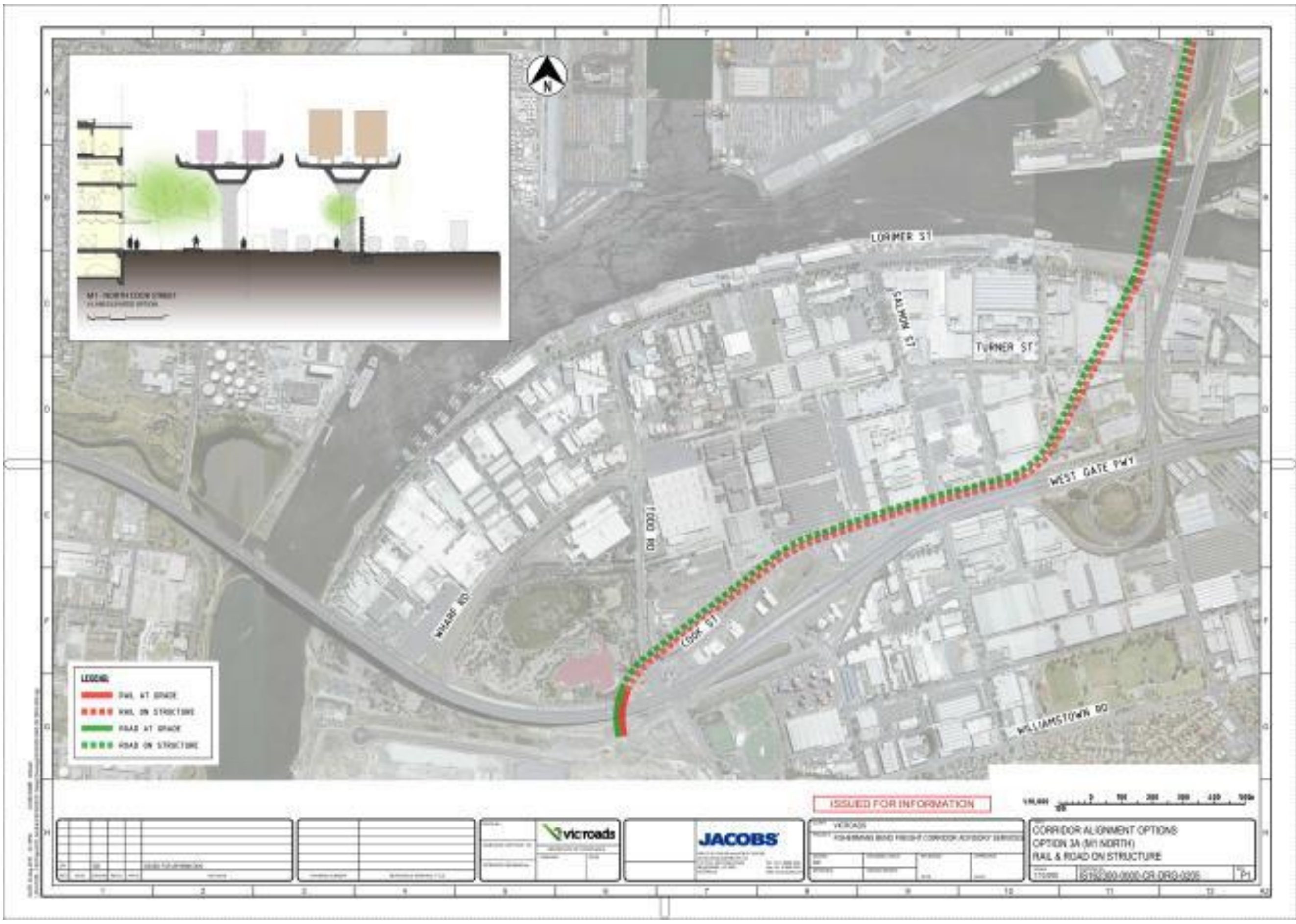
6.2.5 Alignment Option 3A

All M1 routes that allow for rail would have an impact on land as they head south. The full cost of this is difficult to fully assess, however, could be significant, but potentially manageable in the context of realignment of land across the employment area. Option would also impact southern side of land parcels along Cook St and the northern side of Westgate Park. The existing go-cart and rifle facilities would also be impacted. M1 options are considered optimal from an urban space perspective given they run along space on the southern side of any buildings (limited natural light impact) next to the freeway.



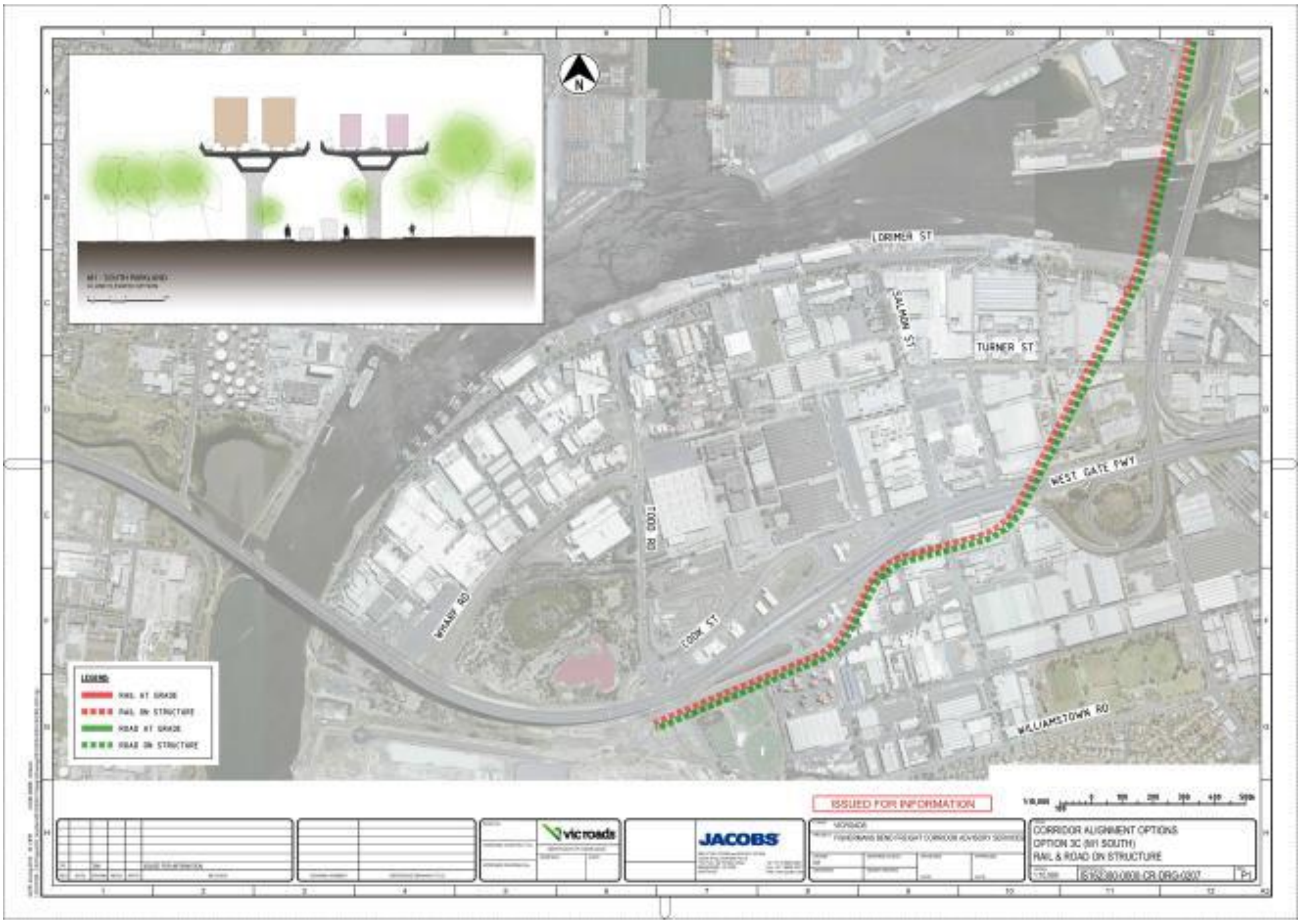
6.2.6 Alignment Option 3B

All M1 routes that allow for rail would have an impact on land as they head south. Option would also impact southern side of land parcels along Cook St. Key disadvantage of this option is a need to realign Todd Rd to create new intersection with Cook St. Good for port operations in that it connects to a higher bridge not restricted by opening and provides dedicated access for all modes.



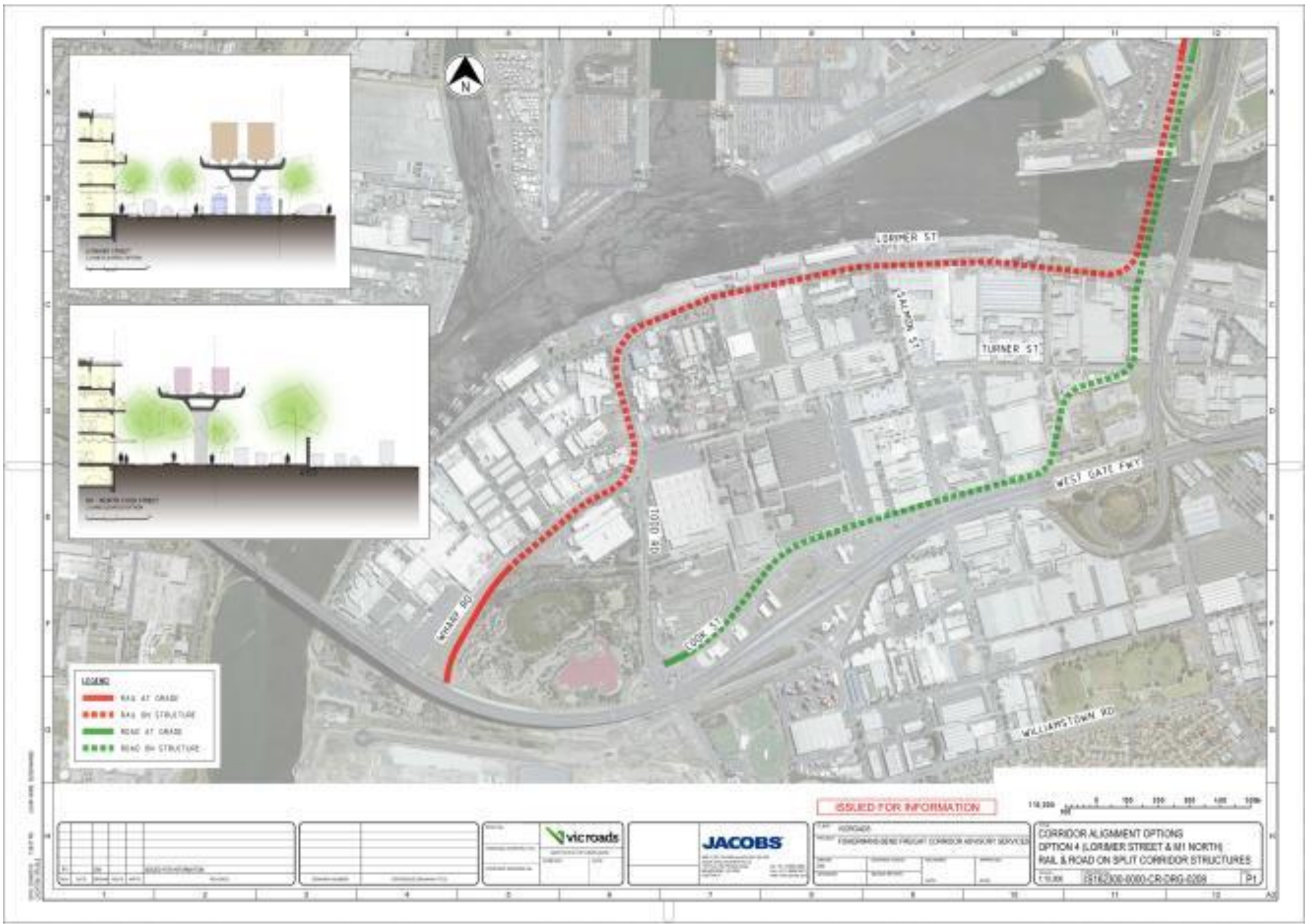
6.2.7 Alignment Option 3C

All M1 routes that allow for rail would have an impact on land as they head south. Highest cost option due to longer length, structure over the M1 and land acquisition on the south of the M1. Whilst there is a clear impact on land, could potentially be managed as area is redeveloped.



6.2.8 Alignment Option 4

Given the area needed to accommodate 4 lanes of structure, an option was developed to split road and rail between two corridors. Key disadvantages are urban impacts are created on two corridors and need for a low bridge given rail on Lorimer St. Key advantages are ability to build a shorter road route which saves some construction cost, reduces some acquisition and allows for road to connect to Cook St before Todd Rd. In the case Option 1B was pursued as first option, this shorter road could be protected as the road route for if or when trucks using Lorimer St became unacceptable. Future strengthening of Bolte Bridge would be another alternative to avoid future need for this road.



8. Multi Criteria Assessment of Options

8.1 Overview

This section outlines the results of a multi criteria assessment (MCA) workshop held on 29 August 2016 at the Department with representatives of DEDJTR, VicRoads, Public Transport Victoria (PTV), and Jacobs.
Each shortlisted option was assessed against key criteria shown below in **Table 8.1**.

Table 8.1 : MCA workshop criteria and description of basis of assessment

	Basis of Assessment
Cost	Jacobs will be preparing a high level costing for each option being considered. It has been assumed that options involving four lanes on structure would be built in two, two lane stages. The Yarra crossings would always be initially built to meet ultimate capacity
Construction and deliverability risk	Jacobs will provide a high-level assessment of the relative construction risk of each option taking into account the complexity and likelihood of critical issues emerging.
Landside port supply chain efficiency	Jacobs assessment of the impacts of each option for port operations – would any of the options be better or worse for supporting the future development and capacity of the port? Key factors differentiating options are ability to separate port trucks from general traffic, impact of an opening bridge on route capacity and impact of any high grade connection on fuel consumption.
Ease of connection to webb dock	Jacobs will provide a high-level assessment of how easily and efficiently each option will be able to connect into Webb Dock including impact on other roads, and any complexity with needing to pass over or under other structures and ability to transition smoothly to accommodate options for future development of rail terminal capacity within the port.
Impact of connection to broader network	All options need to connect road and rail freight movements from Webb Dock to the Swanson/Appleton precinct. Jacobs will provide a high –level impact assessment of all the options including road remaining on arterial network and rail and road on a low opening bridge or a higher bridge.
Fishermans bend transport network connectivity impacts	Planning is underway considering enhanced transport connections for Fishermans Bend for public trans and active modes. There will also be a need to retain a flexible and workable network for road access. Jacobs provided the workshop a high-level comment of the impact of each option on connectivity within Fishermans Bend for all modes or transport (walking, cycling, public transport, and private car networks).
Land acquisition impact	Jacobs will provide a high-level assessment of the potential area needed to be acquired under each option. A very indicative cost of the land acquisition, assuming it is developed for mix use purposes, will be provided to allow comparison between options.
Environmental impacts	Group qualitative discussion on the relative environmental impact (noise, emissions) on the corridor area affected by each option informed by Jacobs assessment and urban design cross sections of each option.
Visual and amenity impacts	Group qualitative discussion on relative visual and amenity impact on the corridor area affected by each option informed by Jacobs assessment and urban design cross sections of each option.
Support for Fishermans Bend renewal	High-level Jacobs qualitative assessment of the likely impact (positive, negative, neutral) on the renewal and development of the area passed by each corridor option.

8.2 Results overview

The results of the MCA workshop for all options are shown below in Figure 8.1. All options were scored on a 3 scale rating scheme indicating its relative performance for each criteria compared to the other options.

The results indicated three broad bands of results - The Alignment Option 3 (M1 corridor) variations scored the highest, with Option 3A performing the best out of all the options assessed. The Lorimer St Alignments were rated second whilst the poorest performing alignments were Option 2 (Turner St) and Option 4 (Dual Corridor).

Figure 8.1 : MCA workshop results

		OPTION 1A Road and Rail (with grd seps) Lorimer St At Grade	OPTION 1B Rail on Structure (2 lanes) and Road at grade Lorimer St	OPTION 1C Road and Rail Lorimer St on structure (4 lanes)	OPTION 2 Road and Rail Turner St corridor on structure (4 lanes)	OPTIONS 3A Road and Rail M1 corridor (Nth) on structure 4 lanes)	OPTION 3B Road and Rail M1 corridor (Middle) on structure (4 lanes)	OPTION 3C Road and Rail M1 corridor (Sth) on structure (4 lanes)	OPTION 4 Road on Structure (2 lanes) M1 and Rail on Structure (2 lanes) Lorimer
Cost and Deliverability	COST	3	2	1	1	1	1	1	1
	CONSTRUCTION AND DELIVERABILITY RISK	3	3	2	2	1	1	1	2
Port Efficiency	LANDSIDE PORT SUPPLY CHAIN EFFICIENCY	1	1	2	2	3	3	3	2
	EASE OF CONNECTION TO WEBB DOCK	3	3	3	3	3	2	3	3
Network, Urban Development and Amenity Impacts	IMPACT OF CONNECTION TO BROADER NETWORK (YARRA CROSSING)	1	1	2	3	3	3	3	2
	TRANSPORT NETWORK DEVELOPMENT IMPACTS (TRAFFIC, WALKING, CYCLING, PUBLIC TRANSPORT)	1	1	3	3	3	2	3	3
	LAND ACQUISITION IMPACT	3	3	1	2	1	1	1	1
	ENVIRONMENTAL IMPACTS (NOISE, EMISSIONS)	1	1	2	1	3	3	3	2
	VISUAL AND AMENITY IMPACTS	3	3	2	1	2	3	2	2
	SUPPORT FOR FISHERMANS BEND RENEWAL (ENCOURAGE ACTIVATION OF EMPLOYMENT LAND)	2	2	3	1	3	3	2	1
	OVERALL SCORE	21	20	21	19	**23**	**22**	**22**	19

	Red Light = Higher cost, higher impact or lower benefit relative to other options	**1**
	Amber Light = Medium cost, impact or benefit relative to other options	**2**
	Green Light = Lower cost, lower impact or higher benefit relative to other options	**3**

8.3 Detailed option assessments

8.3.1 Alignment Option 1A – Lorimer Street at-grade road and rail link with grade separations

		OPTION 1A Road and Rail (with grd seps) Lorimer St At Grade
Cost and Deliverability	COST	3
	CONSTRUCTION AND DELIVERABILITY RISK	3
Port Efficiency	LANDSIDE PORT SUPPLY CHAIN EFFICIENCY	1
	EASE OF CONNECTION TO WEBB DOCK	3
Network, Urban Development and Amenity Impacts	IMPACT OF CONNECTION TO BROADER NETWORK (YARRA CROSSING)	1
	TRANSPORT NETWORK DEVELOPMENT IMPACTS (TRAFFIC, WALKING, CYCLING, PUBLIC TRANSPORT)	1
	LAND ACQUISITION IMPACT	3
	ENVIRONMENTAL IMPACTS (NOISE, EMISSIONS)	1
	VISUAL AND AMENITY IMPACTS	3
	SUPPORT FOR FISHERMANS BEND RENEWAL (ENCOURAGE ACTIVATION OF EMPLOYMENT LAND)	2
OVERALL SCORE		**21**

This option ranked the second tier of options.

It scored favourably on cost and constructability (due to use of the existing rail alignment), delivery risk (option is easiest to construct), connectivity to Webb Dock, land acquisition requirements (no land acquisition), and on visual and amenity impacts (the assumption being that Lorimer Street is expected to continue to be an area of industrial land use given the long term leasing of the Port of Melbourne). Whilst largely at grade, the option does include some elevated structure to ensure there are no level crossings required.

This option also scored lower relative to alternatives on landside port efficiency and network connection due to the need for a low opening bridge and retention of the current circuitous road route between docks via Docklands. It also scored poorly on likely impacts to public transport, walking, cycling, and motor vehicle traffic, and on noise and emissions given the ongoing presence of diesel trains and trucks at grade through the precinct.

8.3.2 Alignment Option 1B: Lorimer Street at grade road and rail link on structure

		OPTION 1B Rail on Structure (2 lanes) and Road at grade Lorimer St
Cost and Deliverability	COST	2
	CONSTRUCTION AND DELIVERABILITY RISK	3
Port Efficiency	LANDSIDE PORT SUPPLY CHAIN EFFICIENCY	1
	EASE OF CONNECTION TO WEBB DOCK	3
Network, Urban Development and Amenity Impacts	IMPACT OF CONNECTION TO BROADER NETWORK (YARRA CROSSING)	1
	TRANSPORT NETWORK DEVELOPMENT IMPACTS (TRAFFIC, WALKING, CYCLING, PUBLIC TRANSPORT)	1
	LAND ACQUISITION IMPACT	3
	ENVIRONMENTAL IMPACTS (NOISE, EMISSIONS)	1
	VISUAL AND AMENITY IMPACTS	3
	SUPPORT FOR FISHERMANS BEND RENEWAL (ENCOURAGE ACTIVATION OF EMPLOYMENT LAND)	2
OVERALL SCORE		**20**

This option ranked the second tier of options.

It scored the same across all categories as Option 1A except on cost which it scored mid-range (due to the higher cost of the rail structure compared to at grade rail).

Whilst enjoying the benefits of being an existing route with no need for land allocation, the option was scored down on the basis that trucks would continue operating at grade through the area and through Docklands into the long term. One advantage of Option 1B over 1A was the potential to site active or public transport links underneath the new rail structure. However, it is noted that given the small area available for two rail lines (shown below), as per option 1A, Lorimer St would likely need to be narrowed to accommodate the new rail structure, reducing capacity for other modes.

A key constraint of this option, also like Opiton1A, is the retention of truck movements through the area and docklands at grade into the long term.

8.3.3 Alignment Option 1C: Lorimer Street road and rail link on structure

		OPTION 1C Road and Rail Lorimer St on structure (4 lanes)
Cost and Deliverability	COST	1
	CONSTRUCTION AND DELIVERABILITY RISK	2
Port Efficiency	LANDSIDE PORT SUPPLY CHAIN EFFICIENCY	2
	EASE OF CONNECTION TO WEBB DOCK	3
Network, Urban Development and Amenity Impacts	IMPACT OF CONNECTION TO BROADER NETWORK (YARRA CROSSING)	2
	TRANSPORT NETWORK DEVELOPMENT IMPACTS (TRAFFIC, WALKING, CYCLING, PUBLIC TRANSPORT)	3
	LAND ACQUISITION IMPACT	1
	ENVIRONMENTAL IMPACTS (NOISE, EMISSIONS)	2
	VISUAL AND AMENITY IMPACTS	2
	SUPPORT FOR FISHERMANS BEND RENEWAL (ENCOURAGE ACTIVATION OF EMPLOYMENT LAND)	3
OVERALL SCORE		**21**

This option scored the same overall as Option 1A; and was in the middle rank of all the options.

It scored poorly on cost of construction and land acquisition, which is shown below (due to the costs of the structure and additional land requirements needed to accommodate construction of four lanes of structure). This option performed mid-range for constructability, landside port supply chain efficiency (raising trucks off street level is a positive intervention to lower truck externalities in the area), broader network connections (option would still require a low opening bridge), environmental impacts, and visual impacts.

Where this option scored favourably was in its relative strength in limiting impacts on other transport modes and in support for the precinct urban renewal goals given it provides a fully separated route for road and rail above ground level.

8.3.4 Alignment Option 2: Turner Street road and rail link on structure

Cost and Deliverability	COST
	CONSTRUCTION AND DELIVERABILITY RISK
Port Efficiency	LANDSIDE PORT SUPPLY CHAIN EFFICIENCY
	EASE OF CONNECTION TO WEBB DOCK
Network, Urban Development and Amenity Impacts	IMPACT OF CONNECTION TO BROADER NETWORK (YARRA CROSSING)
	TRANSPORT NETWORK DEVELOPMENT IMPACTS (TRAFFIC, WALKING, CYCLING, PUBLIC TRANSPORT)
	LAND ACQUISITION IMPACT
	ENVIRONMENTAL IMPACTS (NOISE, EMISSIONS)
	VISUAL AND AMENITY IMPACTS
	SUPPORT FOR FISHERMANS BEND RENEWAL (ENCOURAGE ACTIVATION OF EMPLOYMENT LAND)
	OVERALL SCORE

This option scored equal lowest with Option 4.

The key reasons for this result were high cost relative to Option 1A and 1B, significant environmental impacts (noise, emissions), significant visual and amenity impacts, and low support for Fishermans Bend renewal goals. Turner Street is expected to be a key employment and civic precinct in the Fishermans Bend renewal scheme and this option would most likely significantly diminish amenity in the area, potentially hampering renewal potential relative to other options. This option would also have a land acquisition impact (shown below) where the route would turn into Turner St, noting Jacobs assumed the State would need to resolve any acquisitions needed along Turner St more generally to develop this as a new through route.

This option scores mid-range on construction and deliverability risk, landside port supply chain efficiency and land acquisition impact. It scored favourably on connection to Webb Dock given its easy alignment with the existing rail corridor, and crossing the Yarra via a high, non-opening bridge.

8.3.5 Alignment Option 3A: Road and Rail M1 corridor (Nth) on (structure 4 lanes)

		OPTIONS 3A Road and Rail M1 corridor (Nth) on structure 4 lanes)
Cost and Deliverability	COST	1
	CONSTRUCTION AND DELIVERABILITY RISK	1
Port Efficiency	LANDSIDE PORT SUPPLY CHAIN EFFICIENCY	3
	EASE OF CONNECTION TO WEBB DOCK	3
Network, Urban Development and Amenity Impacts	IMPACT OF CONNECTION TO BROADER NETWORK (YARRA CROSSING)	3
	TRANSPORT NETWORK DEVELOPMENT IMPACTS (TRAFFIC, WALKING, CYCLING, PUBLIC TRANSPORT)	3
	LAND ACQUISITION IMPACT	1
	ENVIRONMENTAL IMPACTS (NOISE, EMISSIONS)	3
	VISUAL AND AMENITY IMPACTS	2
	SUPPORT FOR FISHERMANS BEND RENEWAL (ENCOURAGE ACTIVATION OF EMPLOYMENT LAND)	3
OVERALL SCORE		**23**

Option 3A scored the highest out of all options presented in the multi-criteria analysis but only by a narrow margin relative to Options 3B and 3C.

This option lost points due to high construction cost relative to less expensive options and on construction/deliverability risk (due to the need for significant infrastructure provision and reworking interface with the M1 corridor). It also scored poorly on relative land acquisition requirements (shown below this option would likely to require relatively more acquisition than most other options). It scored mid-range on only one criteria; visual and amenity impacts (largely due to potential land take required along the edge of Westgate Park). In all other criteria this option scored favourably.

The M1 options 3A, 3B, 3C all allow for construction of a non-opening bridge (which is preferable in terms of port capacity and efficiency when compared to an opening bridge). The amenity and environmental benefits of locating the structure along the M1 were also deemed to be higher relative to Turner St and Lorimer St options and also provide better support for Fishermans Bend renewal goals.

8.3.6 Alignment Option 3B: Road and Rail M1 corridor (Middle) on (structure 4 lanes)

Cost and Deliverability	COST
	CONSTRUCTION AND DELIVERABILITY RISK
Port Efficiency	LANDSIDE PORT SUPPLY CHAIN EFFICIENCY
	EASE OF CONNECTION TO WEBB DOCK
Network, Urban Development and Amenity Impacts	IMPACT OF CONNECTION TO BROADER NETWORK (YARRA CROSSING)
	TRANSPORT NETWORK DEVELOPMENT IMPACTS (TRAFFIC, WALKING, CYCLING, PUBLIC TRANSPORT)
	LAND ACQUISITION IMPACT
	ENVIRONMENTAL IMPACTS (NOISE, EMISSIONS)
	VISUAL AND AMENITY IMPACTS
	SUPPORT FOR FISHERMANS BEND RENEWAL (ENCOURAGE ACTIVATION OF EMPLOYMENT LAND)
OVERALL SCORE	

This Option placed equal second in the MCA alongside Option 3C.

This option scored poorly on cost relative to less expensive options and on construction/deliverability risk (due to the need for significant infrastructure provision and reworking interface with the M1 corridor). It also scored poorly on relative land acquisition requirements shown below.

This option scored mid-range in two criteria; ease of connection to Webb Dock and in transport network development impacts – lower that Options 3A and 3C. These lower scores were due to the requirement to realign Todd road to cross under the new freight structures as it comes down to grade and enters port land. This entry to port land where there are the existing road access point was also marked down due to its potential to reduced road access capacity. Options 3A and 3C did not touch the capacity of the existing road access arrangements.

For all other criteria this option scored favourably. Of note this option scored better relative to option 3Ae for visual and amenity impacts due to the option not touching Westgate Park.

8.3.7 Alignment Option 3C: Road and Rail M1 corridor (South) on (structure 4 lanes)

		OPTION 3C Road and Rail M1 corridor (Sth) on structure (4 lanes)
Cost and Deliverability	COST	1
	CONSTRUCTION AND DELIVERABILITY RISK	1
Port Efficiency	LANDSIDE PORT SUPPLY CHAIN EFFICIENCY	3
	EASE OF CONNECTION TO WEBB DOCK	3
Network, Urban Development and Amenity Impacts	IMPACT OF CONNECTION TO BROADER NETWORK (YARRA CROSSING)	3
	TRANSPORT NETWORK DEVELOPMENT IMPACTS (TRAFFIC, WALKING, CYCLING, PUBLIC TRANSPORT)	3
	LAND ACQUISITION IMPACT	1
	ENVIRONMENTAL IMPACTS (NOISE, EMISSIONS)	3
	VISUAL AND AMENITY IMPACTS	2
	SUPPORT FOR FISHERMANS BEND RENEWAL (ENCOURAGE ACTIVATION OF EMPLOYMENT LAND)	2
	OVERALL SCORE	**22**

This Option placed equal second in the MCA alongside Option 3B.

There were four points of difference across the criteria. Ease of connection to Webb Dock, transport network development impacts, visual and amenity impacts, and support for Fishermans Bend Renewal. Land acquisition impact is shown below.

Ease of connection to Webb Dock and transport network development impacts were scored more favourably in Option 3C because it was more favourable relative to Option 3B as this route does not need new works north of the Westgate Bridge. However, 3C was scored less favourably for visual and amenity impacts and support for Fishermans Bend renewal relative to Option 3B due its positioning of structure south of the M1 potentially casting shadows and impacting residential areas planned for south of the freeway.

8.3.8 Alignment Option 4: Road on structure (2 lanes) M1 and Rail on structure (2 lanes) along Lorimer Street

		OPTION 4 Road on Structure (2 lanes) M1 and Rail on Structure (2 lanes) Lorimer
Cost and Deliverability	COST	1
	CONSTRUCTION AND DELIVERABILITY RISK	2
Port Efficiency	LANDSIDE PORT SUPPLY CHAIN EFFICIENCY	2
	EASE OF CONNECTION TO WEBB DOCK	3
Network, Urban Development and Amenity Impacts	IMPACT OF CONNECTION TO BROADER NETWORK (YARRA CROSSING)	2
	TRANSPORT NETWORK DEVELOPMENT IMPACTS (TRAFFIC, WALKING, CYCLING, PUBLIC TRANSPORT)	3
	LAND ACQUISITION IMPACT	1
	ENVIRONMENTAL IMPACTS (NOISE, EMISSIONS)	2
	VISUAL AND AMENITY IMPACTS	2
	SUPPORT FOR FISHERMANS BEND RENEWAL (ENCOURAGE ACTIVATION OF EMPLOYMENT LAND)	1
OVERALL SCORE		**19**

This Option placed equal last in the MCA alongside Option 2.

This option scored poorly on cost (due to the need for two separate structures), land acquisition impact (related to the required dual set of structures), and its likely poor outcome for support for Fishermans Bend renewal relative to other options. As well as the cost and complexity of building two structures, the potential for these structures to give a view of ‘surrounding’ the precinct was a significant concern.

Mid-range scores were noted for constructability (road on a separate structure would enable tighter curves to be achieved than combined with rail), landside port supply chain efficiency and connection to broader network (an opening bridge would be required in this option which is sub-optimal), environmental impacts as well as visual and amenity impacts (relative to the worst performing options this option is better, however splitting the freight routes means that impacts may be spread to more parts of the precinct rather than kept in a tight corridor).

This option scored favourably on ease of connection to Webb Dock (like all other options except Option 3B this option does not require complicated works at the dock interface), and for transport network development impacts (it moving all freight off existing road space to allow more space for other modes).

9. Conclusions and Recommendations

9.1 Summarising the outcomes of the MCA process

The results of the MCA were grouped into three broad levels – the M1 alignment options all generally rated the strongest due to their ability to accommodate a road and rail corridor separated from other road users without the need to acquire large parcels of land from businesses likely to remain in the area. The assessment also identified the relative lessor impact on the renewal of the area of putting an upgrade link near the freeway rather than through other less built up locations. Whilst Lorimer St has advantages as the site of the existing freight route, to accommodate both a road and rail corridor either requires road to continue operating at grade or large acquisition of land from businesses on the south side of the road. The fact an M1 route could connect to a higher river crossing, removing the need for a low opening structure potentially blocking free movement in and out of Victoria Dock, was a further advantage of these alignment relative to Lorimer St.

The MCA process also identified that either of Alignment Options 2 (Turner St) or 4 (dual corridor) were the least preferred primarily due to their impact on the future development and renewal of the employment precinct. Option 2 was considered to have an unacceptable impact Turner St is planned to be the central corridor of the employment precinct and would be overwhelmed by two, two lane structures, whilst delivery of Option 4 would have an impact on two separate corridors and largely surround the Employment Precinct – this was also considered to be unacceptable.

The three Alignment Option 3 variations were further considered to identify a final preferred long term freight corridor to Webb Dock.

9.2 The preferred long term solution

Following the MCA process, Jacobs and the Department further assessed the relative merit of the three Alignment Option 3 variations. The following key points were noted:

- Whilst Alignment Option 3A (M1 Nth) scored the highest through the MCA process, it was identified that the most significant obstacle for this route, the potential for undue impact on Westgate Park, distracted from its score only once under the 'visual and amenity impact' criteria. By comparison Options 3B and 3C were scored down twice due to their primary obstacle factors.

- In the case of 3B, the need to realign the road network at Todd Road and then how this road would connect in under the Westgate bridge, impacting the existing road based connections, led lower relative scores under the 'transport network impacts' and 'ease of connection to Webb Dock' criteria.

- Likewise, Alignment Option 3C was scored down twice relative to other Option 3 due the need to cross the freeway and pass through land identified for mixed use and residential redevelopment. This fact led to lower scores for the 'visual and amenity' criteria and the 'support for Fishermans bend renewal' criteria.

When these key differences were assessed in isolation, it was agreed that the potential for impact on Westgate Park (possible land loss and overshadowing) were a far more significant issue than the MCA process was able to highlight. Likewise for Option 3C, Jacobs and the Department identified that given the renewal of the area impacted by Option 3C is likely to not occur for some years into the future, any impacts of Option 3C could likely be well managed and incorporated into successful urban design for renewal of the area.

The relative scoring of Option 3B, which required realignment of Todd Road and impacted road entrances to the port, was considered to be fair.

Need to be clear that the current base case works and this should be identified on aster plans/planning docs as a freight corridor until such time that rail and road congestion in the area is such that the long term 3C option is triggered. Therefore it is proposed to have 2 lines on a map- current and long term….

Based on the above, the final preferred solution to be recommended to the Fishermans Bend Renewal Taskforce to be shown in the updated long term masterplan for the area will be Option 3C as well as the current Lorimer corridor. It is noted that at this stage, the purpose of identifying Option 3C is to support its protection as a possible route for upgraded road and rail links to the port should they be needed. Other developments may emerge in coming years that may result in Government reviewing and reconsidering this position.

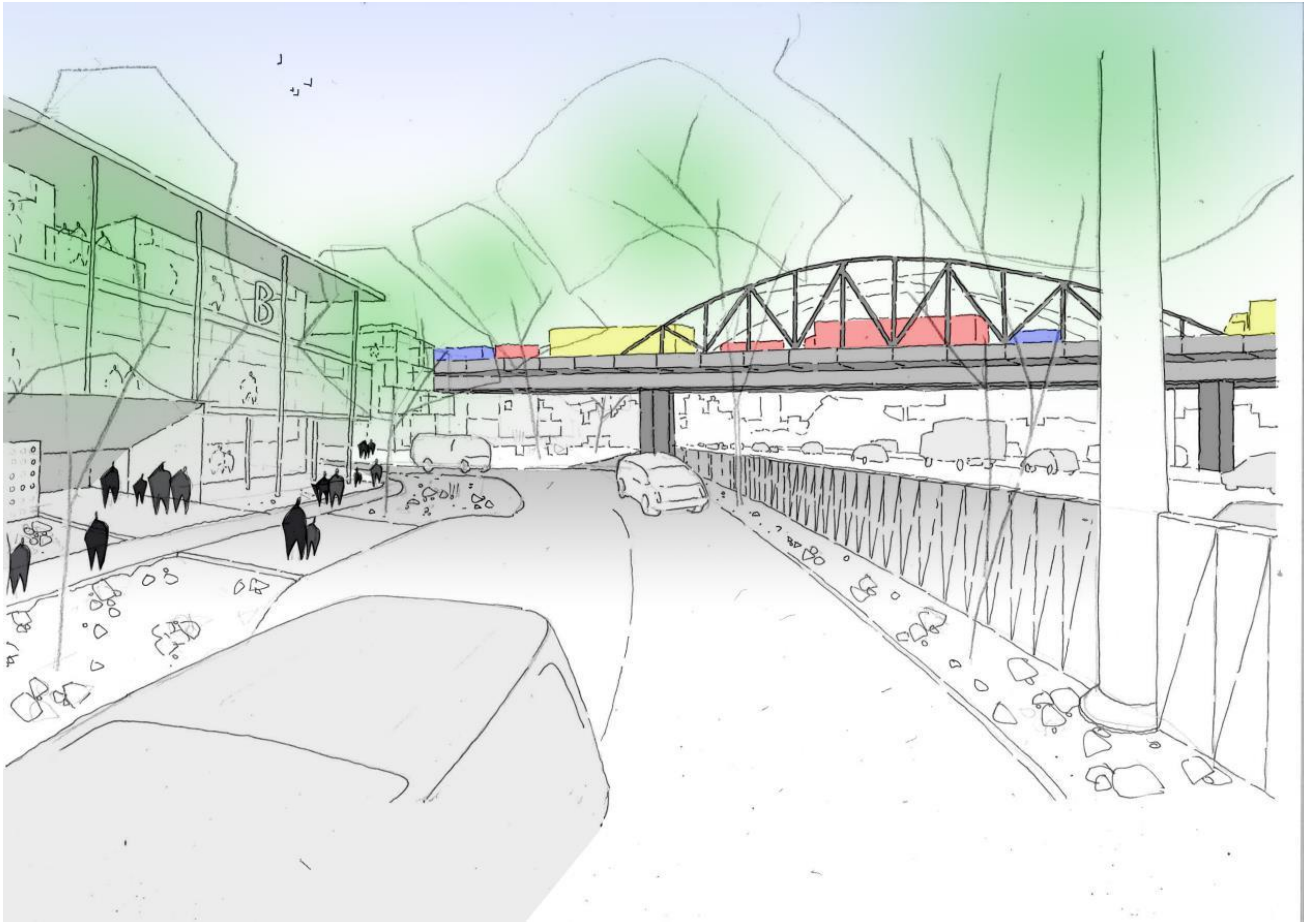
9.3 Communicating the Preferred Long Term Road and Rail Freight Corridor

Following agreement of the preferred long term road and rail freight corridor to Webb Dock as Alignment Option 3C, Jacobs progressed further urban design work to prepare a three dimensional view of Option 3C for inclusion, if needed, in any Fishermans Bend communications material. A location was selected immediately to the east of the Salmon St overpass looking east towards where Option 3C would cross over the freeway travelling to the southern side. Shown below at Figure 9.1 is the site selected at it appears in Google St view. Also shown is the initial work of the design team to site Option 3C at this location.

Figure 9.1 – Working image of 3D visualisation of Alignment Option 3C

Building on this image, the Jacobs team then prepared a full 3D visualisation of Option 3C as shown at Figure 9.2 on the following page.

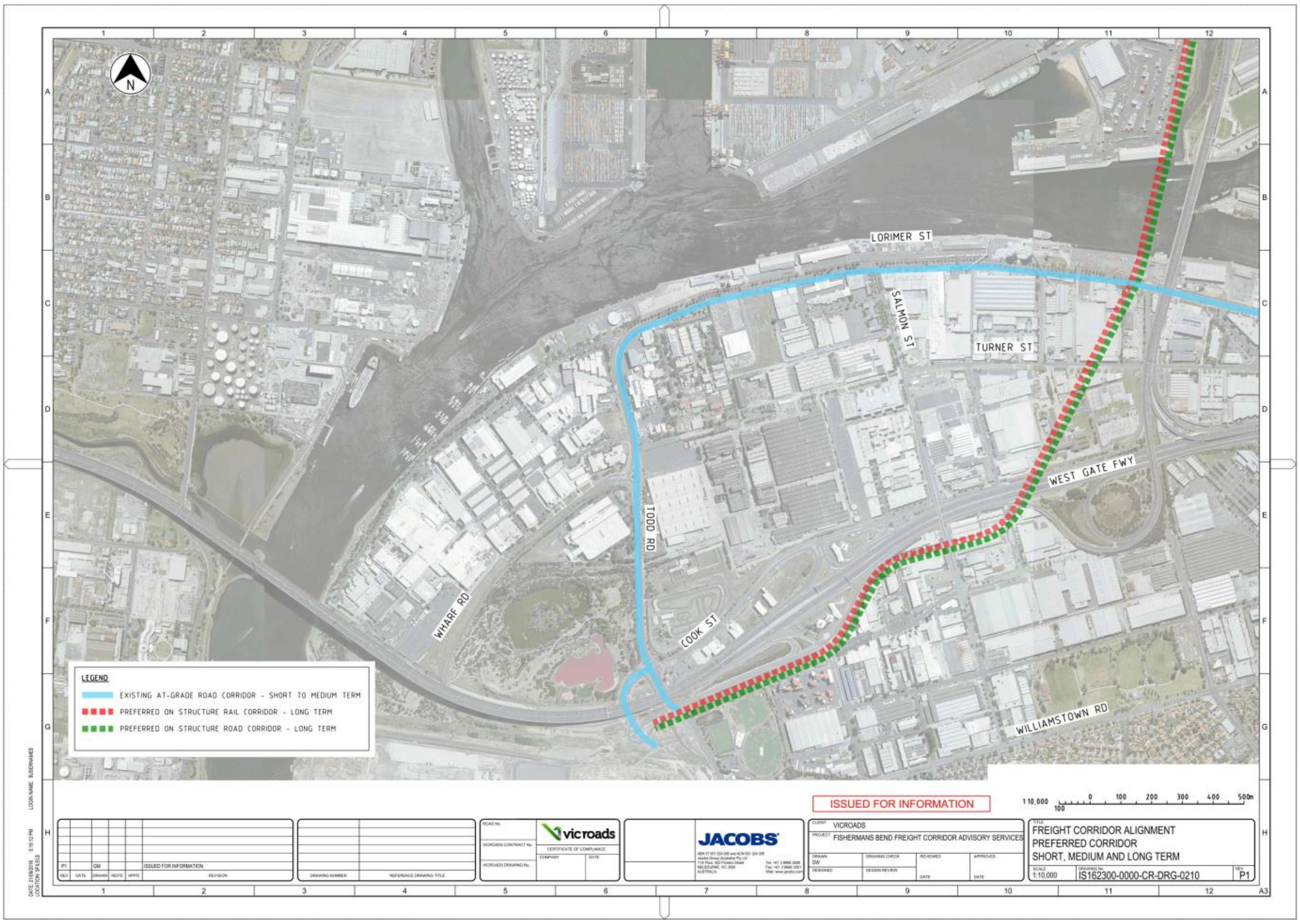
Figure 9.2 View of Recommended Option 3C - looking east on Cook St immediately east of Salmon St overpass



9.4 Conclusion

Whilst Lorimer St is likely to continue to provide for some time adequate connection capacity to Webb Dock for the movements that need this route, as trade grows and development of Fishermans Bend progresses, it is a real possibility that in the longer term additional road and rail connections that are properly separated from urban areas will be needed.

Jacobs work for the Department and with the project working group has confirmed that Option 3C should be identified and protected to support the development of Webb Dock during the upcoming 50 year lease term. Option 3C is shown below as the longer term preferred road and rail corridor, with Lorimer St continuing as the key route in the short to medium term. Whilst a range of factors may emerge in the longer term that identifies an alternative preferred route, for now it is vital that a route be identified and protected to ensure an effective road and rail corridor is available for development if and when it is needed.



Appendix A. - PRS train strip and reload analysis

Achievability of PRS train strip and reload within two hours is important to achieving the throughput volumes calculated for rail corridor operations, as the throughput capacity of each siding at Webb dock will be the overall capacity limiting component of the supply chain.

Benchmark times for reachstacker operations are shown in **Error! Reference source not found.**, which were derived from observations of typical reachstacker operators at North Dynon and North Quay Rail Terminal (Fremantle). Times at both locations were surprisingly similar.

Table A.1 : Reachstacker train loading and unloading benchmark times

Train loading and unloading times – to and from ground (based on timed observations at North Dynon and North Quay rail terminal with average operators) **Typical carry distance around 100 m**		
Container size	**20' containers**	**40' containers**
Unloading train (per container)	1 min 30 sec	1 min 45 sec
Loading train (per container)	1 min 45 sec	2 min 0 sec

The PRS train capacity is assumed at 84 TEU, with equal numbers of 20' and 40' containers. This means there would be 28 20' containers and 28 x 40'. The time required to undertake a complete train strip and reload would be:

Unload 28 x 20' = 28 x 1. 5 min = 42 min

Unload 28 x 40' = 28 x 1.75 min = 49 min

Load 28 x 20' = 28 x 1.75 = 49 min

Load 28 x 40' = 28 x 2.0 min = 56 min

Total = 196 min, or 3 hours 16 min

The maximum number of reachstackers that can efficiently work a train is generally agreed at one reachstacker per 100-120 m of train. PRS trains will have 42 wagons each around 13.1 m (the commonly used CFCLA CQPY two slot container flat is 13,053 mm coupler centre to coupler centre[1]), making to freight carrying train length around 546 m. Thus the maximum number of reachstackers that could be deployed efficiently is five per train. 196 min / 5 = 39.2 minutes.

If only two reachstackers were available, they would complete this task in 1 hour 38 mins, still within the two hour requirement.

Similarly, even if these times proved to be 50% too low, the task of 392 minutes could be performed in less than two hours by four reachstackers.

[1] http://www.cfcla.com.au/datasheet/CQPY_Wagon_Data_Sheet.pdf Accessed 3 August 2016