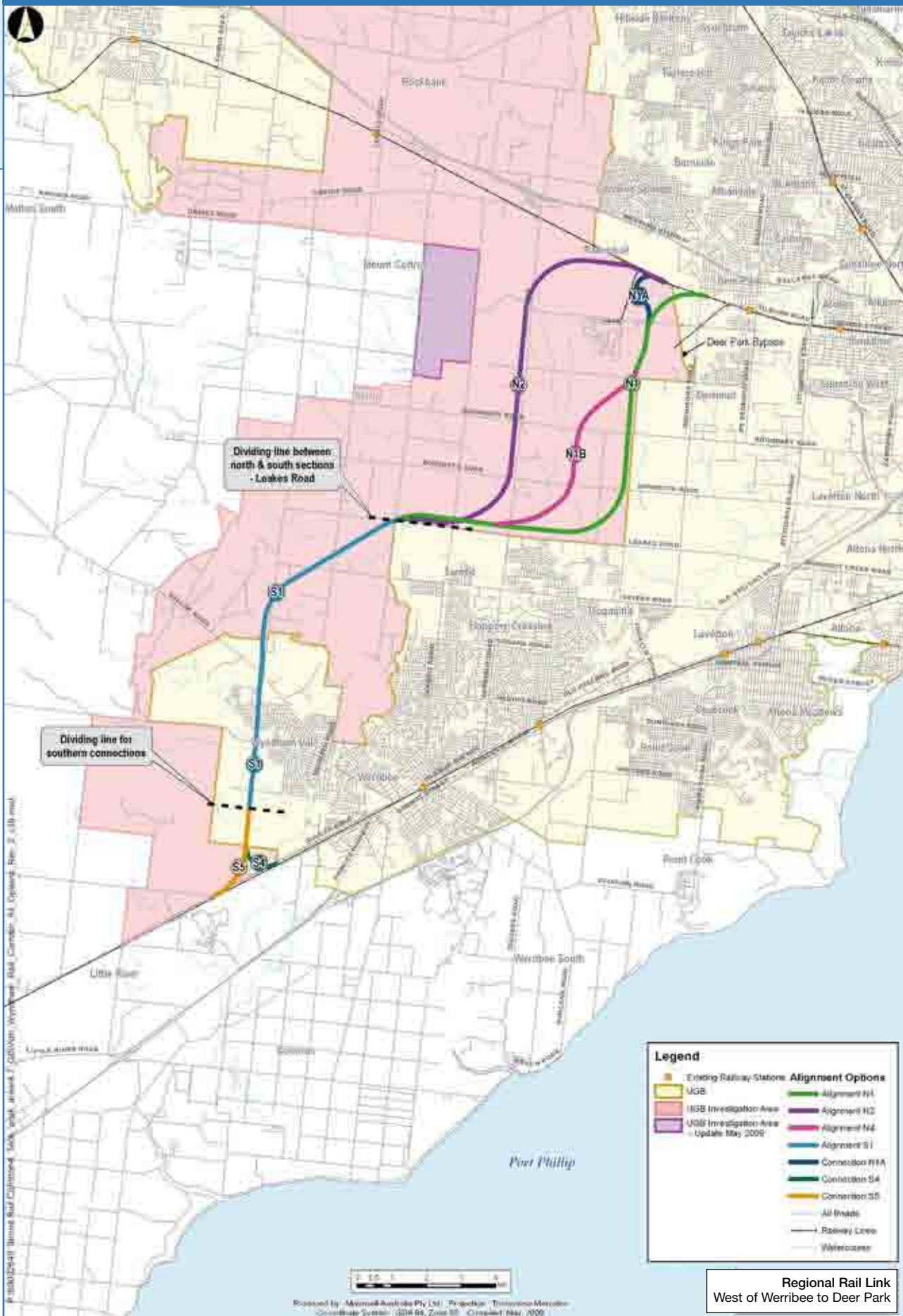


FIGURE 8: MAP OF THE CONCEPT ALIGNMENTS



## 6.0 PHASE 2: SPECIALIST INVESTIGATIONS

Following finalisation of the concept alignments, consultants were engaged in various specialist areas to undertake assessment on the concept alignments as shown in Figure 7. Each consultant was provided with the planning objectives and assessment criteria against which they assessed each of the concept alignments. This was completed using the assessment evaluation criteria key shown below in Table 8.

TABLE 8: ASSESSMENT EVALUATION RATING KEY

Meets objective very well	
Meets objective well	
Meets objective moderately well	
Meets objective poorly	
Meets objective very poorly	
Other	DNS – Did Not Study
	YTD – Yet to be Determined
	N/A – Not Applicable

The specialist findings and the tabulated assessment using the evaluation criteria is presented below.

### 6.1 ENGINEERING DESIGN

Preliminary engineering assessment on each of the study options N1 to S5 determined that the northern alignment options N1 and N1B each failed to meet the functional requirements for maximum line speed and travel times for regional passenger services. Importantly options N1 and N1B failed to integrate with the existing and future Ballarat Rail Corridor in the vicinity of Robinsons Road at Deer Park. However, refinements of these alignment options were prepared in case further investigation would be required. Alignment option N2 met the functional requirements for line speed. It was also recognised that for the northern alignment options N1 and N1B to meet the functional requirements, realignment would extend outside of the project study area in each case.

TABLE 9: ENGINEERING ASSESSMENT

Assessment Criteria	Option N1	Option N1A	Option N1B	Option N2	Option S1	Option S4	Option S5
Ensure engineering standards for gradients, curves, all clearances, maintenance access, crest walls, embankments and retaining walls		DNS					
Ensure that engineering standards for drainage are applied		DNS					
Ensure that drainage of the tracks have been considered in the design		DNS					
Ensure that rail/road grade separation is incorporated		DNS					
Ensure footprint of the design doesn't exceed the 75m study area boundary along the entire corridor		DNS					

## 6.2 TRANSPORT PLANNING

For the transport planning and land use planning assessment a rail section cannot be assessed in isolation, therefore combinations of alignment concepts were formed to create a complete rail corridor. For practical reasons, such as the feasibility and ability to compare options, the combinations were limited to a range of four combined options that represented plausible transport and land use scenarios. The combination options were limited by the alignment selection, number of stations and the land use potential.

All of the proposed northern rail alignments (N1, N1B, N2) were expected to provide major benefits to passenger capacity and service reliability for both metro trains on the Werribee line as well as V/Line services on the Geelong line. Journey times for residents living in the northern parts of Wyndham City Council were also expected to be significantly lower whilst journey times for passengers using Geelong express trains (known as Flagship services) did not change.

Stations must be located close to existing and proposed activity centres with convenient access to road and bus networks. For alignments N1 and N1B at Rose Grange, a station would be within convenient distance of the proposed activity centre, to optimise train and bus transport access. Alignment N2 was considered less suitable as the station would not link well with the proposed Rose Grange activity centre. Alignment N1 is closer than N2 to existing industrial areas for an intermodal freight terminal. N2 was rated lowest as it was considered to be too far away from industrial areas.

For the road network, all proposed rail alignments would reduce road traffic throughout Wyndham City Council (especially southern areas). A regional reduction in demand on major arterial roads and freeways would also be experienced. For all alignments, grade separations of the proposed rail line would need to be built at arterial road crossings where significant traffic volumes were observed. Some of these could be deferred until the surrounding land is developed.

Alignment N2 was expected to require a lower number of grade separations in the initial construction stage as well as long term due to its location further away from existing developed land uses, compared to the other alignments. For the bus network, hubs would be located at the major activity centres and their associated stations for all alignments, providing good connectivity for both facilities. The exception was at Rose Grange for alignment N2, mentioned above. Overall, the Transport Planning Assessment recommended either alignment N1 or N1B.

TABLE 10: TRANSPORT PLANNING ASSESSMENT

Assessment Criteria	Combined Option 1 (Residential, N1B, S1, S4, S5)	Combined Option 2 (Industrial, N1, S1, S4, S5)	Combined Option 3 (Hybrid, N2, S1, S4, S5)
Passenger capacity – Werribee Line			
Passenger capacity – Geelong Line			
Geelong express travel time			
Geelong to Werribee line connectivity			
Total travel time from Wyndham Vale/Tarneit areas			
Service reliability, suburban and regional lines			
Accessibility to local rail service			
Public transport mode share			
Stabling and maintenance			
Personal safety of passengers			
Enabler for intermodal freight terminal			
Impact on present arterial road connectivity			
Impact on future arterial road connectivity			
Directness			

Assessment Criteria	Combined Option 1 (Residential, N1B, S1, S4, S5)	Combined Option 2 (Industrial, N1, S1, S4, S5)	Combined Option 3 (Hybrid, N2, S1, S4, S5)
Road congestion reduction on existing arterials			
Congestion reduction at existing station car parks			
Bus route coverage			
Bus network connectivity			
Bus integration with rail stations			
Bus integration with land uses			
Bus route directness			
Efficiency of bike network			
Efficiency of walking network			
Integration with land use scenario (Residential)			
Integration with land use scenario (Hybrid)			
Integration with land use scenario (Industrial)			

### 6.3 LAND USE PLANNING

As discussed above, the land use planning and transport planning assessments were based on feasible combinations of route options, station locations and land use scenarios in order to practically cover the assessment.

Option N1 provided the greatest consistency with relevant land use planning policies, strategies and plans. In terms of integration with the existing activity centres, Alignment N1 and N1B are preferred as they maximised the connection with Rose Grange. The N2 Alignment would compromise the proposed future role of Rose Grange in the activity centres hierarchy and prevent the development of a Major Activity Centre. N1 would also maximise future urban growth opportunities providing flexible options for both future residential or industrial land uses. Alignments N1B and N2 would preclude an Intermodal Freight Terminal and potentially restrict industrial growth.

In terms of land uses conflicts and severances the N1 and N1B alignment options minimised the potential impacts to key industry, business and residential land uses. N2 is less preferred as it cuts through the Boral Quarry in Ravenhall, compromising the significance of the extractive industry resource, which is given higher priority in state planning compared to residential and business uses.

Overall, the Land Use Assessment recommended alignment option N1; especially in conjunction with a hybrid land use combining both industrial and residential expansion.

The consultants assessed the land use planning against:

- > the existing Urban Growth Boundary, refer to Table 11; and
- > future land use scenarios for residential, industrial and a combined approach to future land develop around the UGB investigation areas, refer to Table 12

The assessment against the existing Urban Growth Boundary shows a poor ability across all alignment options to meet the assessment criteria; particularly in integrating stations with Activity Centres and hence maximising development opportunities.

Refer to Table 11 for the assessment.

TABLE 11: LAND USE PLANNING ASSESSMENT: EXISTING UGB

Assessment Criteria	Option N1	Option N1A	Option N1B	Option N2	Option S1	Option S4	Option S5
Consistency with State and Local Planning Policy Frameworks	Yellow	Yellow	Yellow	Yellow	Blue	Blue	Blue
Consistency with other relevant land use policies	Light Blue	Light Blue	Light Blue	Light Blue	Blue	Light Blue	Light Blue
Ability for stations to be integrated with activity centres	Yellow	Yellow	Yellow	Yellow	Blue	Light Blue	Light Blue
Capacity to support interim land uses at station sites	Yellow	Yellow	Yellow	Yellow	Blue	Light Blue	Light Blue
Ensuring transport interchanges and car parks can be integrated with activity centres	Yellow	Yellow	Yellow	Yellow	Blue	Light Blue	Light Blue
Minimises potential conflicts with adjoining land uses	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue
Maximises potential benefits for development of land in vicinity	Yellow	Yellow	Yellow	Yellow	Blue	Light Blue	Light Blue
Potential for fragmenting future urban land within the UGB	Light Blue	Light Blue	Light Blue	Light Blue	Yellow	Light Blue	Light Blue

TABLE 12: LAND USE PLANNING ASSESSMENT: FUTURE LAND USE SCENARIOS

Assessment Criteria	Combined Option 1 (Residential, N1B, S1, S4, S5)	Combined Option 2 (Industrial, N1, S1, S4, S5)	Combined Option 3 (Hybrid, N2, S1, S4, S5)	Combined Option 4 (Hybrid, N1, S1, S4, S5)
Consistency with State and Local Planning Policy Frameworks	Yellow	Light Blue	Yellow	Light Blue
Consistency with other relevant land use policies	Light Blue	Light Blue	Light Blue	Dark Blue
Ability for stations to be integrated with activity centres	Dark Blue	Dark Blue	Light Blue	Dark Blue
Capacity to support interim land uses at station sites	Light Blue	Light Blue	Light Blue	Light Blue
Ensuring transport interchanges and car parks can be integrated with activity centres	Dark Blue	Dark Blue	Dark Blue	Dark Blue
Minimises potential conflicts with adjoining land uses	Light Blue	Medium Blue	Yellow	Medium Blue
Maximises potential benefits for development of land in vicinity	Dark Blue	Dark Blue	Light Blue	Dark Blue
Potential for fragmenting future urban land within the UGB	Light Blue	Medium Blue	Yellow	Medium Blue

## 6.4 FLORA AND FAUNA

The presence of Plains Grassland, a Commonwealth and State listed threatened ecological community, has been identified as the most significant ecological issue for the Regional Rail Link – West of Werribee to Deer Park alignment, although the project has sought to avoid the most significant areas in the Melton/Wyndham region found around Mount Cottrell and west of Wyndham Vale. It was also identified that several species classified as threatened at State and Commonwealth level have potential to be impacted by the proposed alignment.

A desktop assessment was undertaken prior to the alignment selection workshop. A field assessment relied on data supplied by the Growth Areas Authority and Department of Sustainability and Environment as part of their project to map native flora and fauna in Melbourne’s growth areas. This data was supplied after the workshop; however it did not have an effect on the assessment from the workshop as it was known that areas of native vegetation would be encountered regardless of the ‘northern’ alignment option chosen.

Of all the alignments, the impact on the Plains Grassland community is greatest for N2. However, the existing land use approved for the Boral Quarry means that much of the grassland traversed by N2 has already been approved for development and the net impact of N2 could therefore be less than any of the N1 options. The project involves a minor area of the remaining extent of Plains Grassland and it was noted offsetting of any native vegetation removed as part of the project is possible for all alignment options.

TABLE 13: FLORA AND FAUNA ASSESSMENT

Assessment Criteria	Option N1	Option N1A	Option N1B	Option N2	Option S1	Option S4	Option S5
Minimise impacts on significant EVC’s (ha)	Yet To be Determined Runs through Ravenhall grasslands	YTD May run through reserve at Boral quarry site	YTD	YTD Boral quarry site likely to be a good offset location	YTD	YTD	YTD
Impacts on flora and fauna species listed under FFG Act and EPBC Act	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Impacts on Ramsar wetlands or National Park estates	Yes Ravenhall grasslands	No	No	No	No	No	No
Ability to meet net gain requirements under <i>Native Vegetation Management Framework</i>	Yes Area Yet To be Determined	Yes YTD	Yes YTD	Yes YTD	Yes YTD	Yes YTD	Yes YTD

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## 6.5 HYDROLOGY

The measure of potential impacts on river health, riparian zones, surface water quality and stream flows is closely related to the number of watercourses that are being crossed, hence less optimal scores result from more waterway crossings. However, it is recognised that all options require a number of waterway crossings to get from Deer Park to West of Werribee.

Of the northern alignments, N1B was the preferred alignment as it crossed the least number of waterways and had the lowest Aggregate Potential Impacts on Waterway and Floodplain Function Score. Alignment Option N1A has fewer waterway crossings however it provides an alternative connection to the existing Ballarat railway for alignment options N1 and N1B. N2 and N1 both crossed one more waterway of ecological value, thereby increasing their impacts.

The S1 alignment intersected a proposed Melbourne Water retarding basin on Davis Creek which created further engineering considerations for safety. The major risk in terms of impacts on flooding lies where S4 runs along the northern side of the existing Melbourne-Geelong Rail over Lollypop Creek. Advice from Melbourne Water is that the existing rail line, even following upgrading as part of the Regional Fast Rail project, is overtopped by the 100-year ARI event for a length of approximately 500 m in the Browns Rd/McGrath Rd area. This area is subject to major inundation both upstream and downstream and it is important any future works consider the existing flooding issues of the Princes Freeway, Western Treatment Plant and other affected properties both upstream and downstream. The Regional Rail Link – West of Werribee to Deer Park will need to be designed such that flood storage and conveyance are not affected in the flooded area (approx 2km of the alignment), as an increase in flood levels would not be acceptable. While some level of flooding is common to all options on the southern alignments; engineering solutions are capable of mitigating these risks.

TABLE 14: HYDROLOGICAL ASSESSMENT

Assessment Criteria	Option N1	Option N1A	Option N1B	Option N2	Option S1	Option S4	Option S5
Number of crossings of waterways of ecological value	6 crossings	1 crossing	2 crossings	6 crossings	7 crossings	2 crossings	2 crossings
Minimise potential impacts on river health values, riparian zones, surface water quality and stream flows	Score of 71	Score of 12	Score of 19	Score of 62	Score of 70	Score of 23	Score of 29
Capacity of design to ensure that where adjacent land is subject to inundation that existing flood levels are not increased.							
Capacity of design to ensure that adjoining land not subject to flooding remains flood free, where appropriate							

## 6.6 GEOTECHNICAL

The geological conditions are consistent across the entire length of the proposed alignment options. The exception is the Werribee River crossing, where there is limited information available and will require further investigation. In general, the subsurface profile comprises an upper layer of residual highly reactive clay soils with frequent gravel to boulder sized basalt corestones/floaters overlying highly weathered to slightly weathered, vesicular to non-vesicular basalt volcanic rock. The average thickness of the overlying soils is expected to be approximately 1.5m, and can range to over 3m in depth. The basalt floaters range up to 1m diameter in size. Minimal groundwater data is currently available, with no evidence of groundwater in excavations up to 2.5m depth.

Although no geotechnical issues were yet identified as ‘show-stoppers’, areas of higher geotechnical risk and therefore requiring further investigation were found at:

- > Wyndham Vale/Manor Lakes cutting on alignment S1;
- > Werribee River Crossing on alignment S1, the Derrimut Road crossing (cut) on alignment N1 and N1B; and
- > the Deer Park Bypass crossing (cut) on alignment N1.

TABLE 15: GEOTECHNICAL ASSESSMENT

Assessment Criteria	Option N1	Option N1A	Option N1B	Option N2	Option S1	Option S4	Option S5
Minimal cut required	Yellow	Blue	Yellow	Yellow	Yellow	Yellow	Light Blue
Minimal fill required	Yellow	Blue	Yellow	Blue	Light Blue	Blue	Light Blue
Avoids expansive soils	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow
Avoid alluvial sediments	Blue	Blue	Blue	Blue	Yellow	Blue	Blue

## 6.7 CULTURAL HERITAGE

N1A, S4 and S5 do not cross any areas of cultural heritage sensitivity, cultural heritage places, registered historical places nor any local council places. N1 alignment passes through approximately 2.9km of sensitive areas, N1B and S1 passes through approximately 1km and N2 through 400m.

N1, N1B, N2 and S1 all impact on one registered Aboriginal place. N1A, S4 and S5 do not cross any registered historical places or impact on any local council places. Alignment N1 would impact on two historical places and one delisted place, N2 on one historical place and one delisted place, and S1 on one delisted place. Alignment N1B would impact on one local council place and N2 on two local council places. It was noted that cultural heritage issues could be managed through a Cultural Heritage Management Plan once a preferred alignment has been selected.

TABLE 16: CULTURAL HERITAGE ASSESSMENT

Assessment Criteria	Option N1	Option N1A	Option N1B	Option N2	Option S1	Option S4	Option S5
Areas of protected Aboriginal sensitivity	Dohertys Ck (2.5km) and Skeleton Ck (400m)	None	Skeleton Ck (1km)	Dry Ck (400m)	Werribee River (600m), Lollypop Ck (400m)	Rail reserve (2km – mostly disturbed)	Rail reserve (2km – mostly disturbed)
Aboriginal sites on alignment	1 surface scatter	None	1 surface scatter	2 surface scatters	1 surface scatter	None	None
Aboriginal sites within 500m corridor	3 surface scatters	None	1 surface scatter	4 surface scatters	3 surface scatters	None	1 surface scatter
Heritage Victoria sites on alignment	2 dry stone walls, 1 delisted wall	None	None	1 delisted dry stone wall	1 delisted dry stone wall	None	None
Heritage Victoria sites within 500m corridor	1 delisted dry stone wall	None	3 buildings	2 delisted stone walls, 3 delisted sites	2 delisted stone walls, 1 sheep wash	Werribee Racecourse station	2 delisted sites
Local HO sites on alignment	None	None	1 house ruin	2 buildings	None	None	None
Local HO sites within 500m corridor	None	None	3 buildings	None	1 building	Werribee Racecourse	None

## 6.8 SOCIAL IMPACT

All proposed rail corridors and station locations would provide for an overall improvement in connectivity. However, N2 and S1 have the greatest potential impact on the dislocation or severance of communities and activities – N2 because it is on the edge of the proposed urban area and would isolate existing/future community facilities and; and S1 because it would potentially sever existing community links that have already been established across the proposed rail corridor. All alignments provide for improved access to goods, services, employment, health and education. However, N2 would divide the Rose Grange Activity Centre into two. This would mean that higher order goods and services associated with Major Activity Centres would not develop in the northern section of the study area, and that residents would have to travel further to access these. All alignments will require the acquisition of land; N2 rates lower than the other options as it will require the acquisition of land that is of significance to the

whole of the state – Boral Quarry. All Alignments are likely to have a fairly equal impact on the surrounding community during the construction and operation phase, except for S5 where there is minimal housing. Alignments S4, S5 and N1 do not impact on known local heritage and recreation places. Alignment S1 may impact on linear parkland along Lollypop Creek and Alignment N1B and N2 both impact on local heritage sites.

TABLE 17: SOCIAL IMPACT ASSESSMENT

Criteria	N1	N1A	N1B	N2	S1	S4	S5
Impact of severance effects upon road, public transport, walking and cycling networks to community facilities and properties, retail precincts and access to properties		DNS					
Impact on local social networks, community patterns and linkages.		DNS					
Proximity to activity nodes and employment centres		DNS					
Impact on access to regional health and education facilities		DNS					
Impact on employment opportunities and access improvements to areas of employment		DNS					
Number of properties by type affected by acquisition (agricultural, residential, commercial, public space)		DNS					
Land holdings by type that stand to benefit from proximity to a station		DNS					
Impact resulting from the construction, operation and maintenance of the rail route on residents, important community facilities and open space, in terms of – noise, dust and fumes, visual intrusion, light, aesthetics, vibration and landscaping.		DNS					
Impact of the route on sites of European and Aboriginal Cultural Heritage and the public’s enjoyment of these spaces.		DNS					
Impact of the route on open space (including linear open space networks) and environmental sites valued for their biodiversity and enjoyment by the community		DNS					
Impact on the use and development of recreational facilities		DNS					

## 6.9 ECONOMIC IMPACT

Preliminary advice and analysis on the transport economic impacts of the project was provided by the Department of Transport rather than a specialist consultant. Based on the net present values of economic benefits over a fifty year evaluation period, the hybrid option of N1 against N2 under both the residential development and hybrid development scenarios, the former was proven to be of more benefit.

The benefits have been estimated based on:

- > the projected land uses around stations;
- > potential rail patronage; and
- > the associated trip generation.

It should be noted, the preliminary analysis does not consider freight benefits or the fact that both industrial land and mixed use activity centres will serve as trip attractors.

The difference required to access the nearest station by car in the base and project cases becomes a benefit for existing rail users switching station in the project case. New users under the project scenario result in less vehicle kilometres and associated avoided externalities and resource costs corrections. The difference in travel times benefits N2 should Truganina station proceed under the residential scenario. N2 has the effect of diluting Rose Grange South, in which case it is reduced to a neighbourhood activity centre.

TABLE 18: ECONOMIC IMPACT ASSESSMENT

Assessment Criteria	Option N1	Option N1A	Option N1B	Option N2	Option S1	Option S4	Option S5
Travel time savings/costs for PT users in Wyndham and Melton growth areas		DNS					
V/Line (Geelong) passengers		DNS					
Werribee rail line passengers		DNS					
Rail freight		DNS				N/A	
Travel time and vehicle operating cost savings for road users (as a result of reduced traffic on road corridors parallel to Werribee/Melton rail lines)		DNS					N/A
Contribution to a reduction in congestion on arterial roads	YTD	YTD	YTD	YTD	YTD	YTD	YTD

## 6.10 CONTAMINATION AND HYDROGEOLOGICAL

All options feature a level of potentially contaminated sites in their vicinity but it was not considered a significant level to jeopardise the project. The potential for acid sulphate soil was extremely low across all alignment options. N1 was the least preferred alignment as it intercepted Woods Road – Leakes Road with potentially shallow groundwater (less than 4 m), however the railway is not in a cutting in this vicinity. Potentially shallow groundwater was also identified along S4 in the vicinity of the Readymix quarry, although again the impacts are likely to be reduced as the railway will not be in a cutting at this point. Interaction with surface water and perched groundwater bodies is likely to occur where the alignments cross surface waters and the corresponding perched alluvial aquifers (such as the Werribee river system and other surface streams). The only protected water supply close to the rail alignments is the Werribee delta water supply protection area east of S5.

Overall, no major land contamination or hydrogeological issues were identified that would severely restrict construction of the proposed project.

TABLE 19: CONTAMINATION AND HYDROGEOLOGICAL ASSESSMENT

Assessment Criteria	Option N1	Option N1A	Option N1B	Option N2	Option S1	Option S4	Option S5
Impacts by significant contamination (sites identified on EPA Priority Sites Register)	EPA site within alignment. 5 sites near alignment	DNS	One site near alignment	One site near alignment	No sites near alignment	One site near alignment	No sites near alignment
Potential impacts by waste acid sulphate or potential acid sulphate soils	Low acid sulphate soil probability	DNS	Low acid sulphate soil probability	Low acid sulphate soil probability	Low acid sulphate soil probability	Low acid sulphate soil probability	Low acid sulphate soil probability
The presence of near-surface groundwater	Within 4m of surface	DNS	Between 10-50m from surface	Between 10-50m from surface	Between 10-50m from surface	Between 10-50m from surface	Within 4m of surface
Review of historic aerial photos for likely previous land uses	SW cnr of Boral site, salvage yard	DNS	Low potential of past contam activities	Low potential of past contam activities	Low potential of past contam activities	Low potential of past contam activities	Low potential of past contam activities

## 6.11 NOISE AND VIBRATION

All of the northern alignments have similar noise and vibration impacts. For the southern alignments, S4 has a greater noise impact because it travels through West Werribee, which is more highly populated than Little River.

Preliminary investigations from site measurements indicate vibration impacts are minimal for all alignment options.

TABLE 20: NOISE AND VIBRATION ASSESSMENT

Assessment Criteria	Option N1	Option N1A	Option N1B	Option N2	Option S1	Option S4	Option S5
Minimise noise impacts on amenity and wellbeing							
Day noise level below Leq 15 hour target of 65 dB(A)							
Night noise level below Leq 9 hour target of 60 dB(A)							
Maximum noise level below Lmax target of 80 dB(A)							
Groundborne vibration velocity below curve 4 of AS 670.2							

## 6.12 PHYSICAL SERVICES

Alignments N1, N1B and N2 all intercept major services, in particular the APA Gasnet Brooklyn to Ballarat Gas transmission line running parallel to the south of Middle Road. All three alignments are also impacted to a lesser extent by the Visionsteam “Nextgen” Optical fibre route. The N1 crosses the Cowies Hill 1150mm MS main owned by Melbourne Water twice. Melbourne Water also has strategic concept plans to build the St Albans to Werribee 1150mm main line and Visionstream optical fibre conduit running parallel to Middle Road impacts N1, N1B and N2 alignments.

The N2 option alignment is constrained by the encroachment into the proposed corridor by a high voltage transmission pylon. This option is further constrained by the potential impact of crossing the Boral railway siding west of Christies Road. The N2 alignment also has an additional Gasnet HP gas transmission crossing point west of Hopkins Road and a Vision Stream fibre optic crossing east of Hopkins Road.

Alignment S1 intersects the 600mm City West Water reticulation water main running under the proposed centre-line of the rail corridor and the water supply infrastructure south of Ballan Road, just to the west of the alignment. This conflict is over 700m in

length and could incur a significant cost if relocated. Constraints where multiple utilities cross the alignment at Manor Lakes Boulevard, Eppalock Drive and Ballan Road, can be minimised through design.

Alignments S4 and S5 are not heavily constrained by existing utilities in their current configuration.

Overall, measures during detailed design and construction stages of the project will serve to minimise the impacts of the project on existing services and impacts of the services on the construction of the project.

TABLE 21: PHYSICAL SERVICES ASSESSMENT

Assessment Criteria	Option N1	Option N1A	Option N1B	Option N2	Option S1	Option S4	Option S5
Impact on gas, water, sewerage, fibre optic and other utilities	Crosses Cowies Hill 1150mm Main twice			Gas assets and HV mast within study area	Constrained through Armstrong Rd corridor		

## 7.0 PHASE 2: ALIGNMENT SELECTION

The findings from the specialist investigations on the concept alignments were collated and presented at an Alignment Selection Workshop. At the workshop four of the specialist areas of investigation were identified as the significant factors in determining the preferred alignment option. The engineering investigations deemed a number of concept alignments incapable of meeting the operational plan; however a refinement of alignment option N1, known as N1 – HAL02, was presented to solve these issues.

Additional investigation by the specialists into the impacts of N1 – HAL02 determined unacceptable social and engineering impacts from the project. A further refinement of the option to best meet the project assessment criteria produced N1 – HAL02A. The specialist investigations identified that provided appropriate mitigation measures are in place, the impacts from N1 – HAL02A are considered acceptable to the development of the project.

### 7.1 SELECTION WORKSHOP

The Alignment Selection Specialist Workshop for the Regional Rail Link – West of Werribee to Deer Park was held in February 2009 with the aim of:

- > Presenting the specialist assessments of the project alignment options; and
- > Identifying any specific information/analysis required to select a preferred alignment option.

The radius of the curve of N1A was deemed too acute to enable a train to meet the minimum design speed and was therefore eliminated prior to the workshop. As such a minimal level of investigation of this option was undertaken. The specialist assessment findings were collated and summarised against the project objectives. Table 20 provides a summary of the results.

**TABLE 22: COLLATION OF ALL SPECIALIST INVESTIGATIONS UP TO THE ALIGNMENT SELECTION WORKSHOP AGAINST THE PROJECT OBJECTIVES**

Assessment Criteria	Option N1	Option N1A	Option N1B	Option N2	Option S1	Option S4	Option S5
To ensure suitable track geometry and drainage for the transit corridor		DNS					
To minimise the footprint of engineered cut/fill batters		DNS					
To maximise the operating efficiency of the transit corridor		DNS					
To ensure compatibility with State and local land use and development policies		DNS					
To ensure the integration of land use, development and transport		DNS					
To minimise impacts on biodiversity and environmental integrity	YTD	YTD	YTD	YTD	YTD	YTD	YTD
To protect waterway and floodplain function							
To minimise impact on existing floodplains and areas subject to inundation							
To minimise route options traversing unfavourable ground conditions							
To avoid or minimise impacts on Aboriginal and non-Aboriginal cultural heritage places							
To minimise the dislocation or severance and to maximise opportunities for improved connectivity		DNS					
To maximise access to goods, services and employment		DNS					
To minimise the negative impacts to people and property of acquiring land		DNS					
To protect and enhance amenity and wellbeing of nearby sensitive land uses		DNS					

Assessment Criteria	Option N1	Option N1A	Option N1B	Option N2	Option S1	Option S4	Option S5
To protect and enhance enjoyment of local heritage and recreation places		DNS					
To improve transport economic efficiency for passengers and freight customers		DNS					
To enable wider economic benefits		DNS					N/A
To avoid or minimise known significantly contaminated sites		DNS					
To identify areas of near-surface regional groundwater		DNS					
To minimise noise and vibration impacts on amenity and well-being							
To minimise potential conflicts with physical services							

Four of the specialist areas of investigation were identified as the significant factors in determining the preferred alignment option. The four key areas of specialist investigation were:

- > Engineering design;
- > Transport planning;
- > Land use planning; and
- > Social impact.

Of the four key areas N1 has greater potential benefits than N2. In particular, alignment option N2 was found to reduce the potential size of activity centres and the benefit of integrating land use and transport in relation to the likely expansion of the Urban Growth Boundary. When comparing N2 against N1 the opportunities for access to facilities and employment are reduced, especially those based around existing and future Activity Centres.

Impacts identified from the other specialist areas of investigation were generally common across all the alignments; they do not offer a significant point of difference between the alignment options. However, an approach to minimise the impacts will be developed which will be undertaken as part of this project. Provided appropriate mitigation measures are in place, the impacts are not considered detrimental to the development of the project.

Further engineering investigations undertaken prior to the workshop and presented at the workshop were aimed at meeting the operational plan to provide a desired train speed of 160 kilometres per hour, which meant that alignment options N1 and N1B were not feasible in their configuration at that time. Therefore a refinement of

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alignment option of N1 to N1 – HAL02 was developed outside of the study area of the earlier alignment options to achieve desirable speeds. Option N1 – HAL02 leaves the Melbourne-Ballarat Railway east of Robinsons Road, Deer Park whereas N1 leaves the existing railway west of Robinsons Road. The refined alignment option then travels south-west through Ravenhall and Truganina to rejoin Option N1 at Derrimut Road, Tarneit. The design update to create N1 – HAL02 also pushed the location of alignment option S1 further west between Davis Road, Tarneit and Ballan Road, Wyndham Vale.

The workshop reached the following conclusions:

- > Specialist investigations would be undertaken on N1- HAL02; and
- > The viability of N1 – HAL02 as the preferred option would be determined by the ability of the option to satisfy the four key areas of specialist investigation.

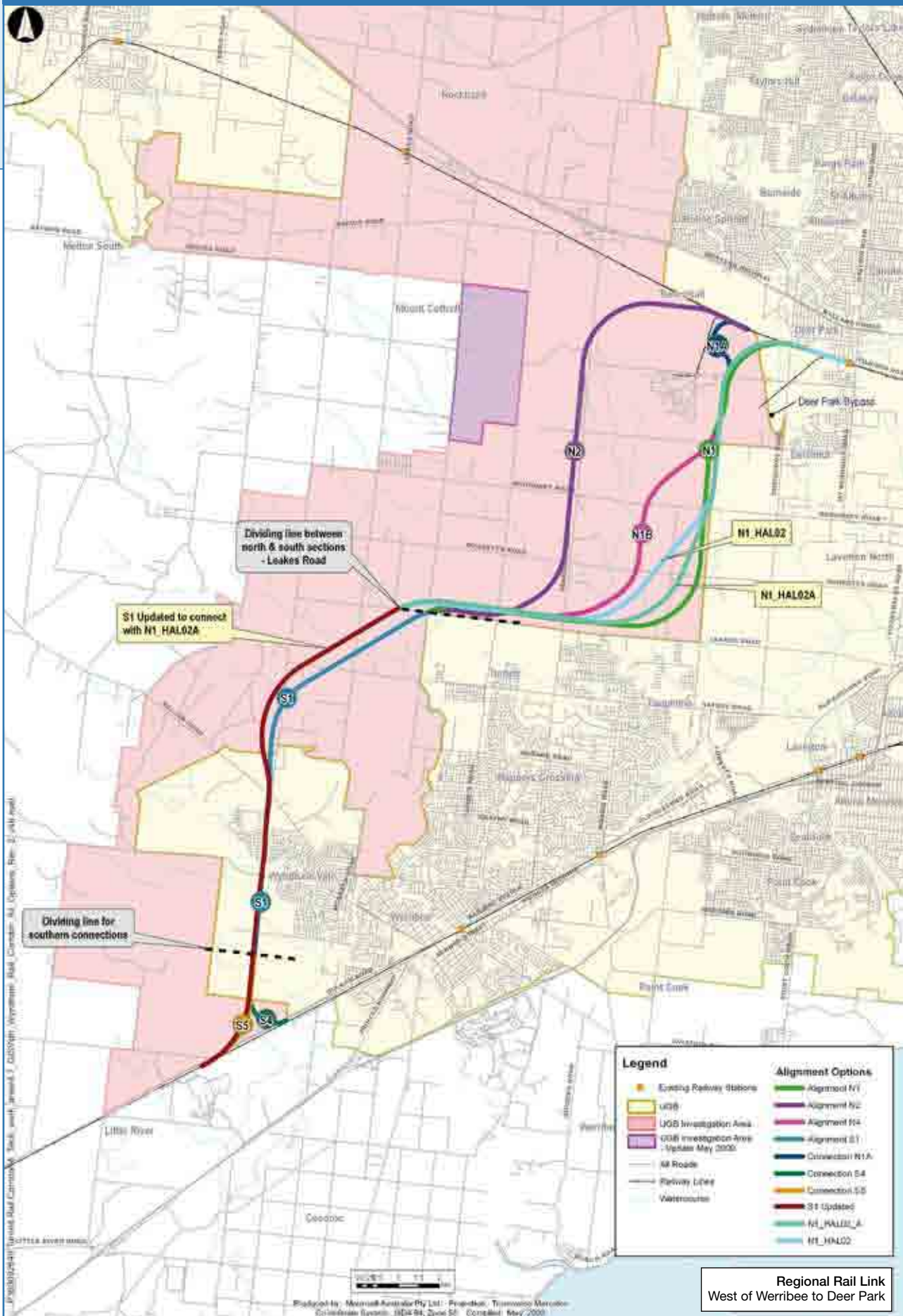
## 7.2 REFINEMENT OF THE ALIGNMENT

The specialist investigations for transport planning, land use planning and social impacts for option N1 – HAL02 identified:

- > Poor integration of the station and the proposed activity centre at Rose Grange as the station platforms would likely be located on the western side of Derrimut Road away from expansion of the proposed activity centre on the eastern side of Derrimut Road;
- > Significant social and community impacts from the acquisition of approximately 30 residential dwellings under construction in the Central Park residential estate at Deer Park; and
- > The potential impact on a section of the Boral Quarry close to the corner of Middle and Christies Roads, Ravenhall.

In achieving the project objectives to minimise the potential impacts of the transit corridor on existing properties, it was recognised that the alignment option N1 – HAL02 unacceptably impacted residential lots in Central Park West and extractive industry operations on the Boral Quarry site and so alignment option N1 – HAL02 was refined into N1 – HAL02A to avoid these impacts. Both N1 – HAL02 and N1 – HAL02A are shown overleaf.

FIGURE 9: MAP OF ALIGNMENT OPTIONS INCLUDING N1 – HAL02 AND N1 – HAL02A



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The refined option N1 – HAL02A leaves the existing Ballarat railway west of Robinsons Road (like alignment option N1), thereby eliminating potential land acquisition impacts on dwellings in the Central Park West Estate in Deer Park. The alignment option then parallels the Christies Road Reservation to eliminate potential acquisition impacts on the Boral Quarry site. The N1 – HAL02A alignment also ensures that the proposed station in Tarneit at Rose Grange could be located to the east side of Derrimut Road adjacent to proposed activity centre.

Evaluation of the alignment against the proposed rail standards has determined that the refined Option N1 – HAL02A could achieve a maximum line speed of 160km/h according to proposed design standards.

From a transport planning perspective, N1 – HAL02A rated as a joint-preferred alignment, along with N1, N1B and N1HAL02, with no effect on Geelong Flagship service journey times.

N1 – HAL02A provides the greatest consistency with the land use objectives to develop more housing and jobs. There is provision for an intermodal freight terminal inside the existing Urban Growth Boundary and zoned industrial areas. N1 – HAL02A integrates well with existing activity and proposed activity centres and maximises the opportunities at Rose Grange Activity Centre. Future urban growth opportunities are maximised through the opportunity to develop future residential or industrial land uses. Other options limit this potential, particularly alignments N1B and N2 which preclude an Intermodal Freight Terminal and potentially industrial growth.

There is little difference between the options N1, N1 – HAL02A and N1B from a social planning perspective. This is particularly evident compared to alignment option N1 – HAL02 which required the acquisition of over 30 residential properties in the Central Park West Estate in Deer Park.

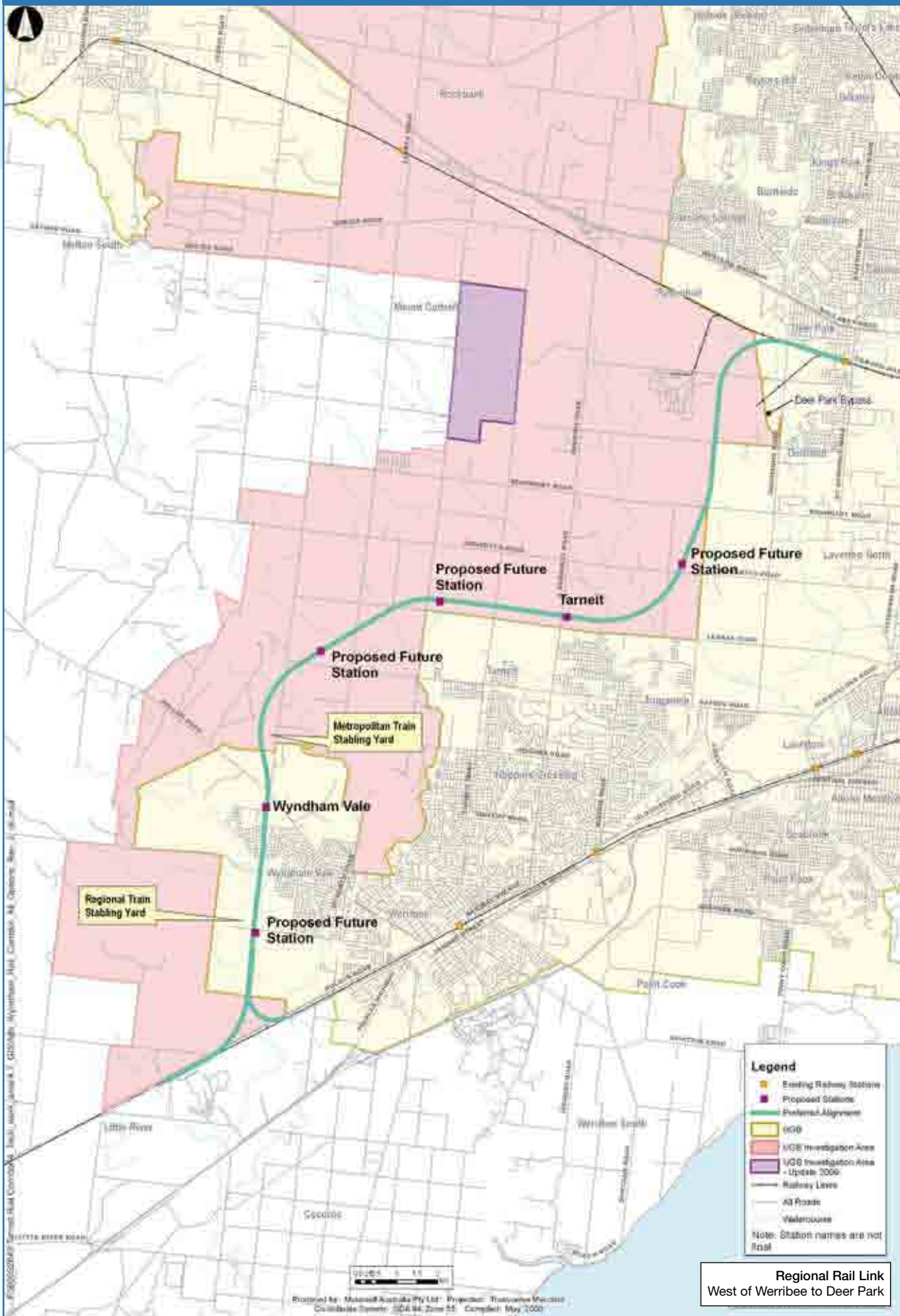
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N1 – HAL02A is equal to the other options in its ability to provide for improved access to goods, services, employment, health and education across the study area. N1 – HAL02A has similar land acquisition requirements as the other options, but during the construction and operational phase N1 – HAL02A is likely to have reduced off-site impacts on the surrounding community compared to N1, N1B and N2. N1 – HAL02A will have a residual impact on the pony club site located to the south-east of Dohertys and Woods Road in Truganina although the current use of this site is unlikely to continue once urban development extends past the site. However, in the short term, mitigation of impacts will need to be managed through the detailed design phase in order to provide for its continued use as a pony club.

Physical service constraints are similar to the N1 and N1 – HAL02 alignments from the Ballarat Rail Corridor to Middle Road. The preferred alignment does not impact the Boral Quarry operation to the north-west of the Christies Road/Middle Road intersection. The alignment is directly impacted by two oblique crossings of the Melbourne Water 1150mm Cowies Hill water main in Truganina.

Option N1 – HAL02A leaves the Melbourne-Ballarat Railway west of Robinsons Road, Deer Park and travels south in the vicinity of Riding Boundary Road to parallel Christies Road before turning southwest a short distance north of Boundary Road, Truganina. The option rejoins Option N1 at Derrimut Road, Tarneit. Refer to Figure 10 for the map of N1 – HAL02A.

FIGURE 10: MAP OF N1 – HAL02A



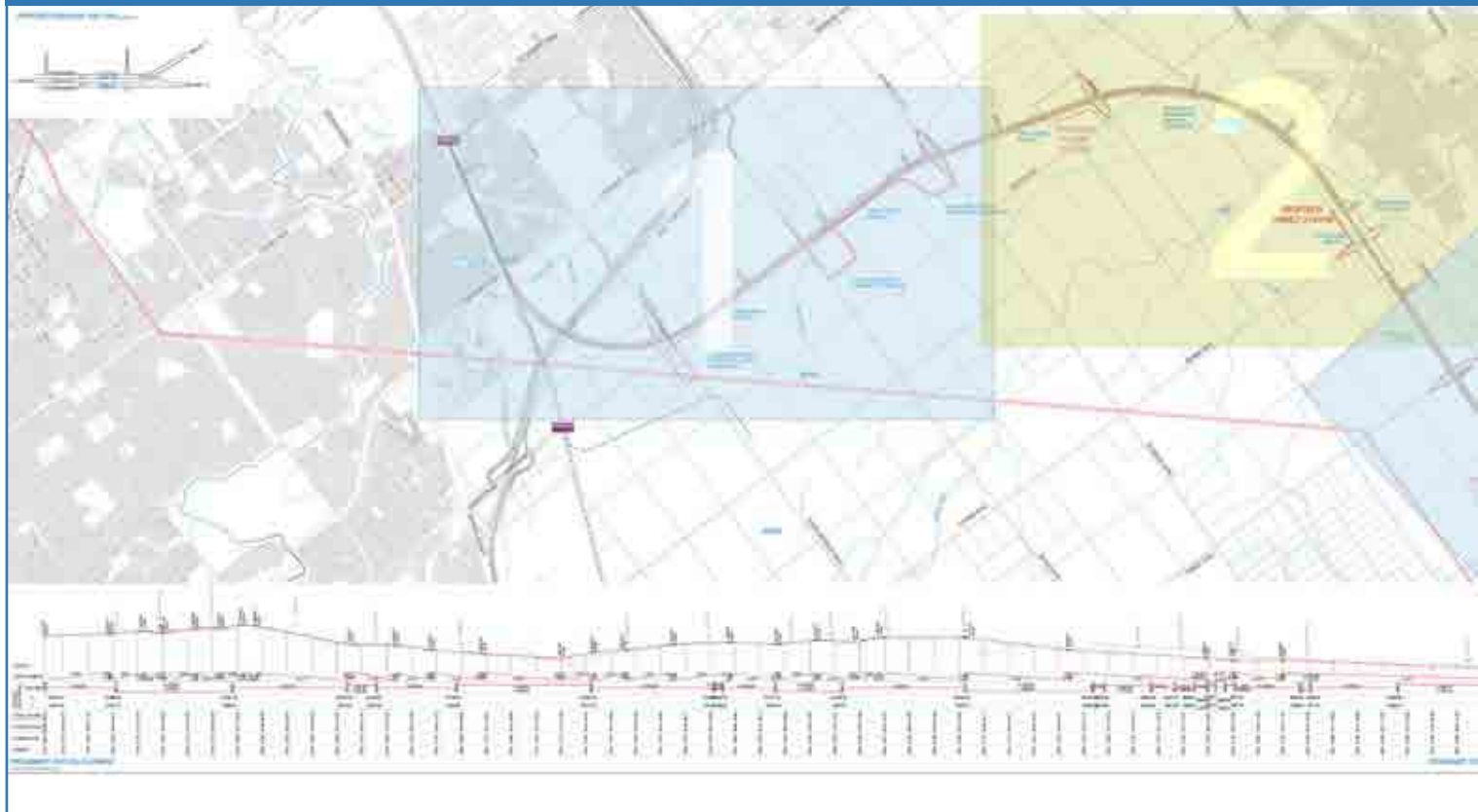
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## 7.3 RECOMMENDED ALIGNMENT OPTION

With the advice and input of the Project Reference Group, the Department of Transport's preferred alignment option is N1 – HAL02A as this option has the greatest potential to meet the overall project objective “to reserve land for a high quality transit corridor servicing Melbourne's and Victoria's west”.

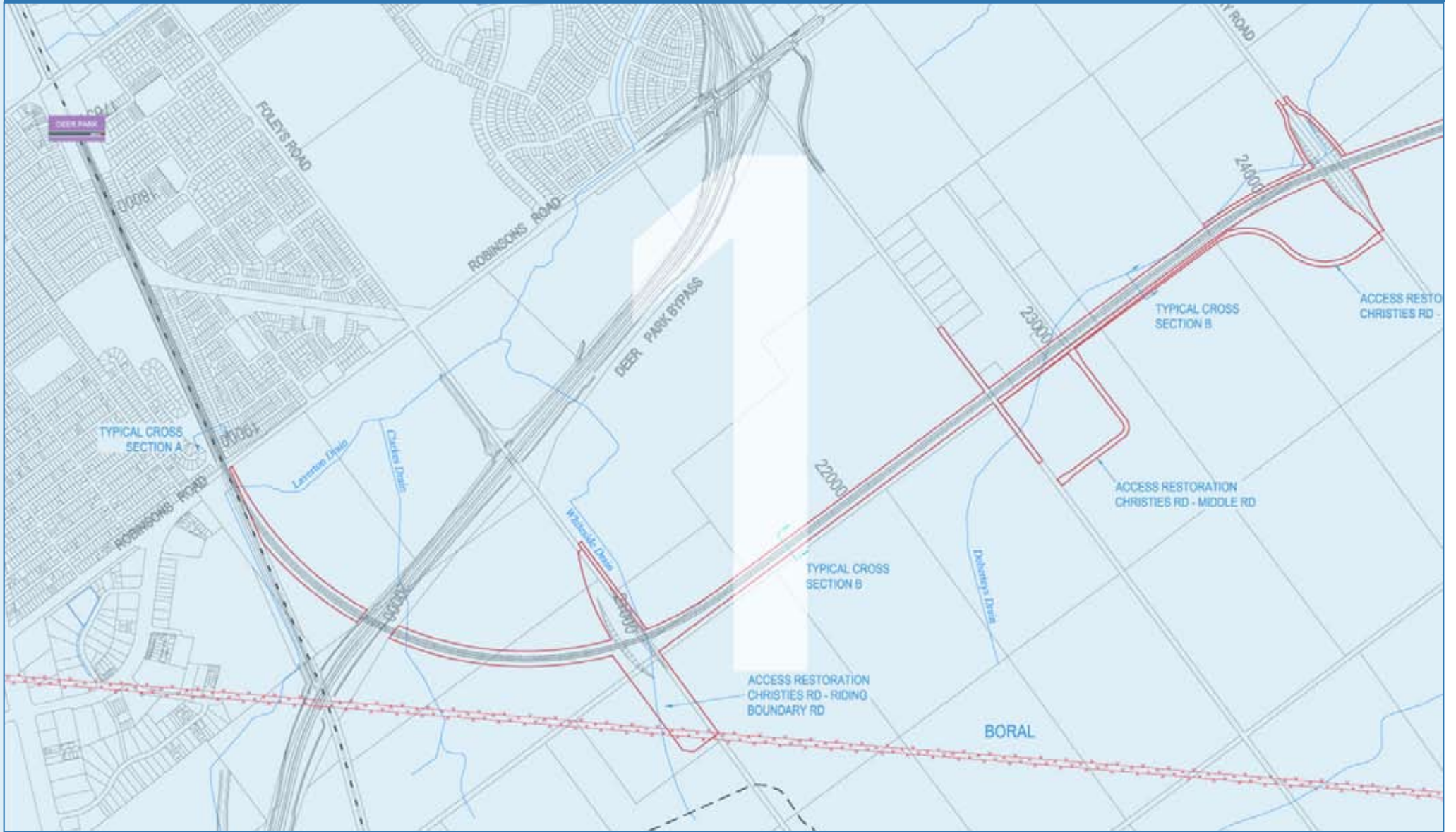
# APPENDIX B

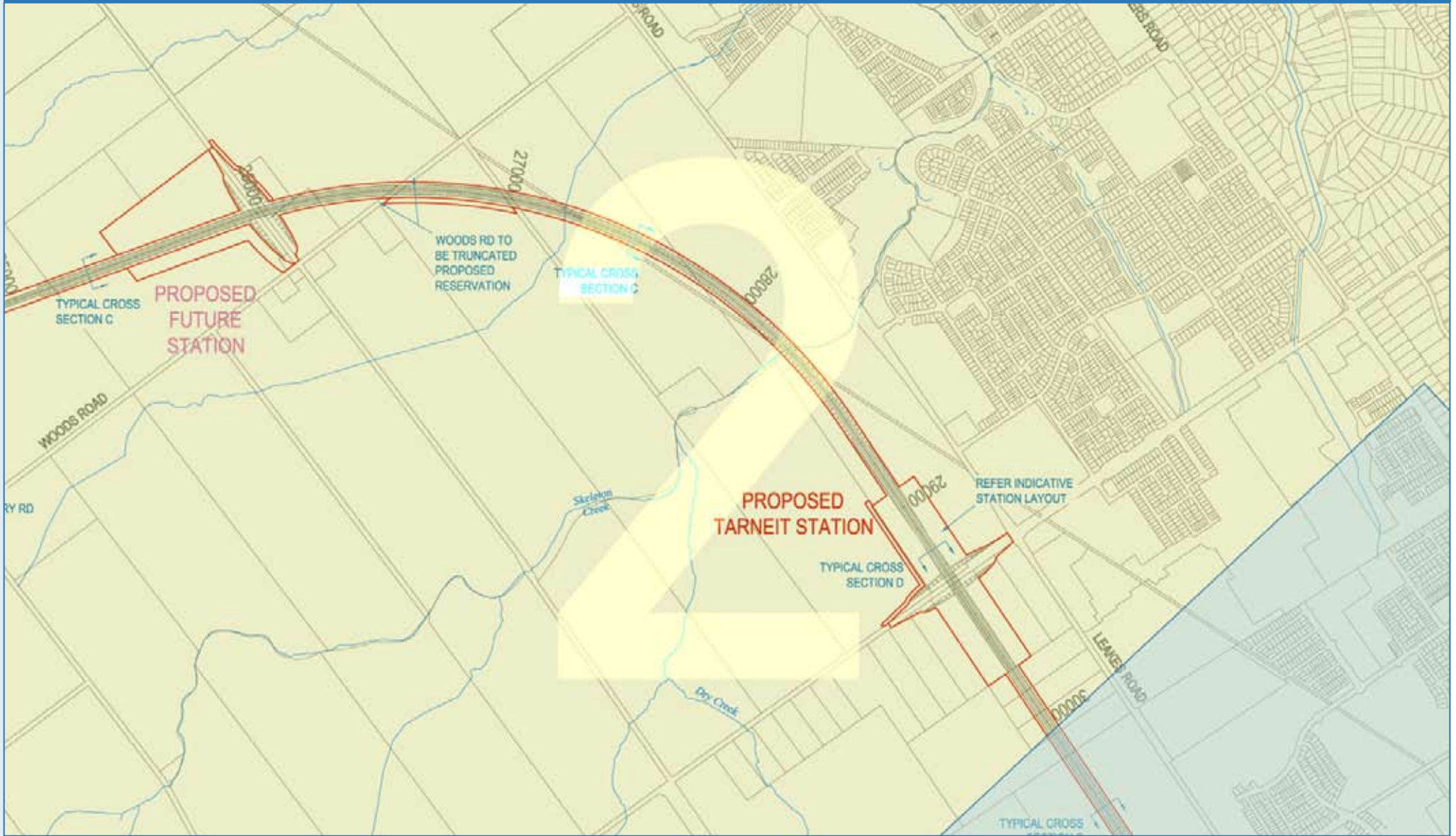
FIGURE 11: PLAN OF REGIONAL RAIL LINK – WEST OF WERRIBEE TO DEER PARK





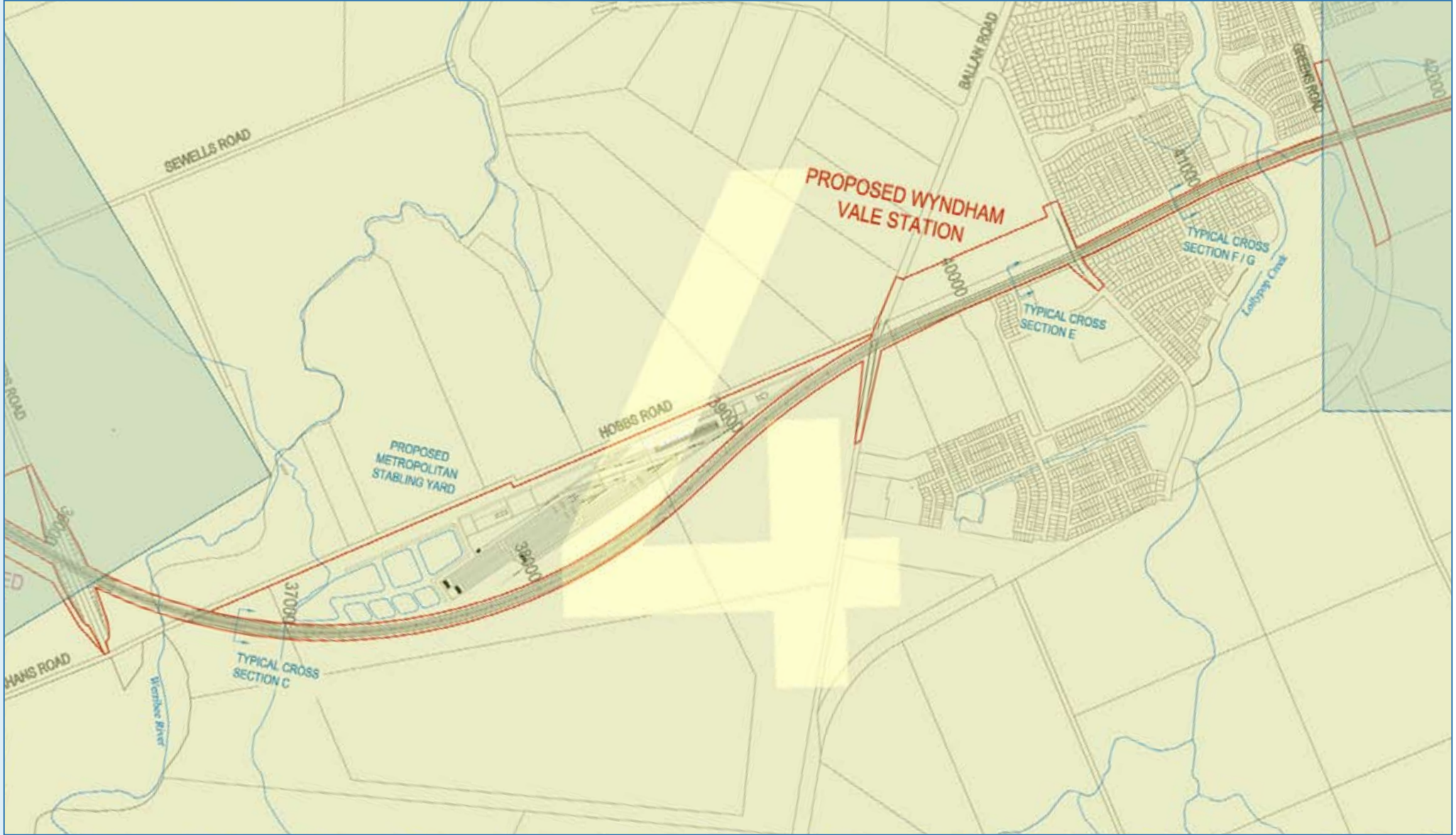
# PLAN 1





# PLAN 3

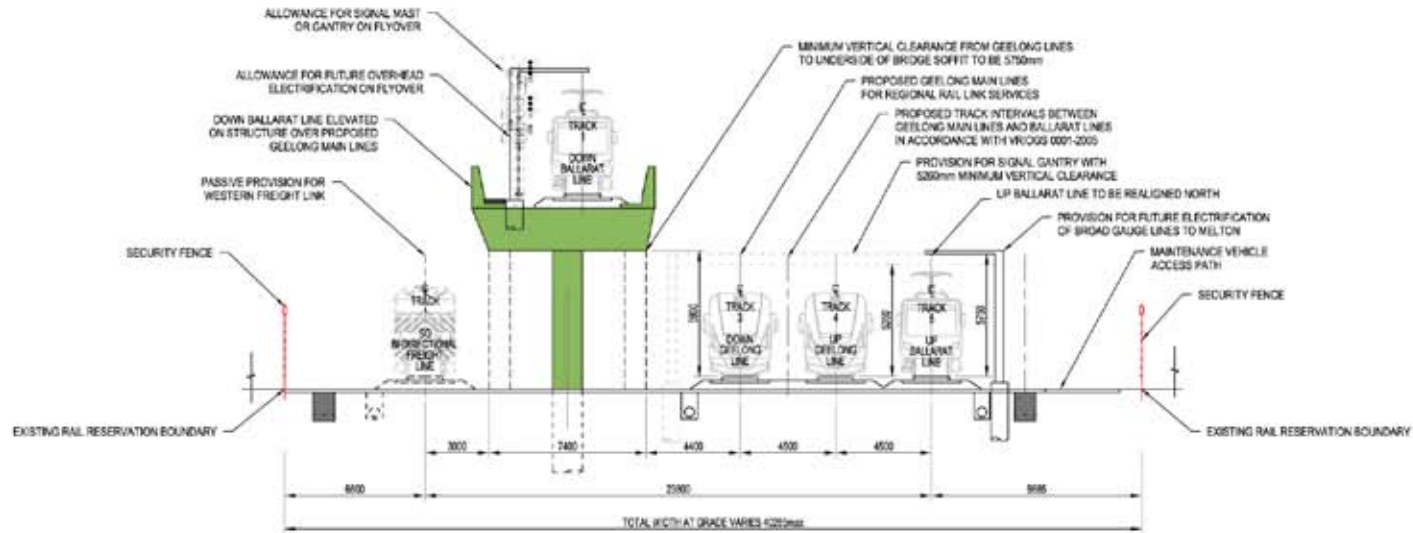




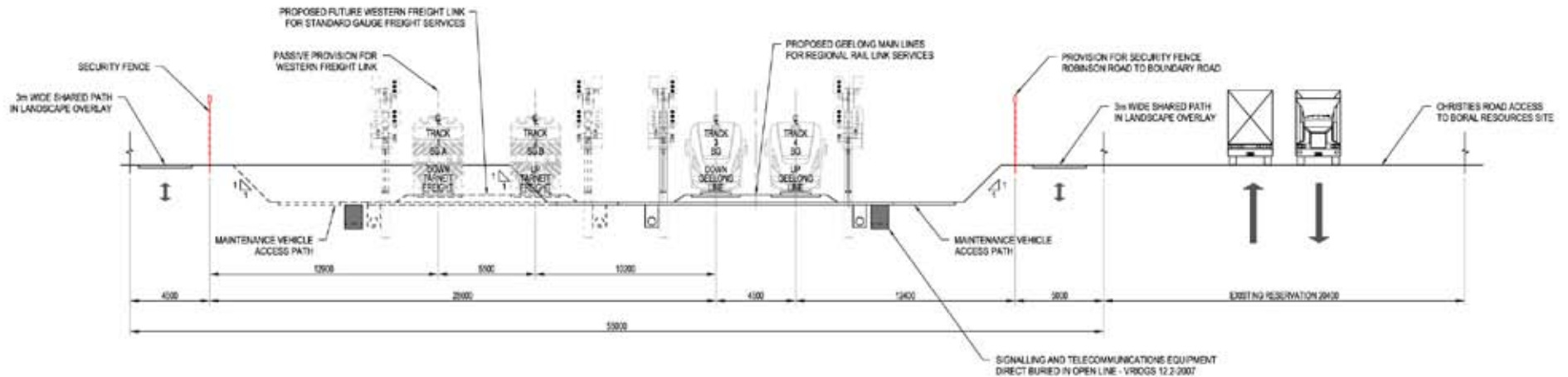
PLAN 5



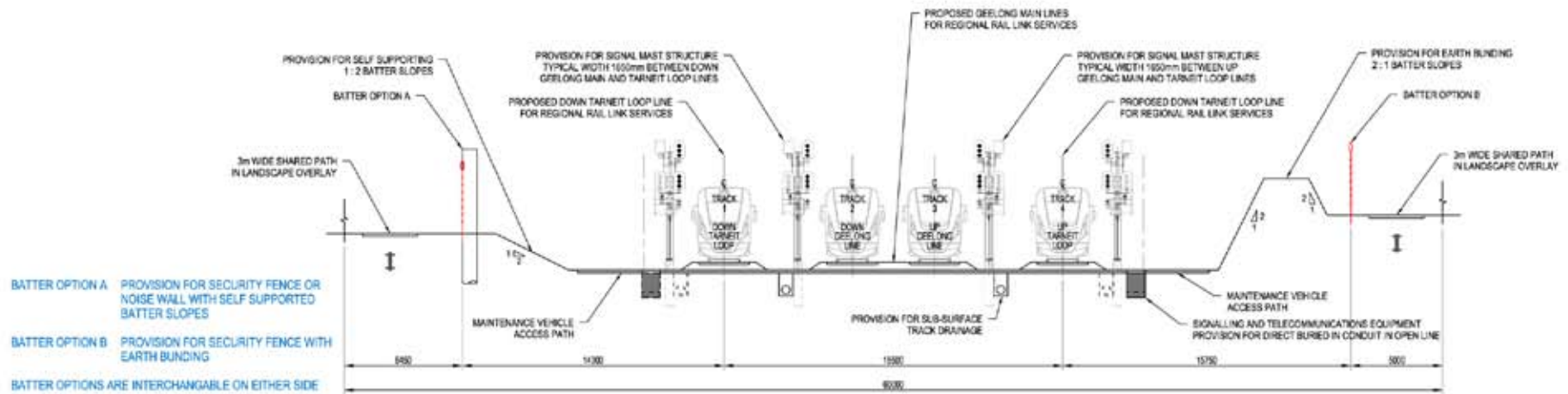
**TYPICAL SECTION A – DEER PARK JUNCTION UP SIDE OF ROBINSONS ROAD 5 TRACK CORRIDOR WITH GRADE SEPARATION OF DOWN BALLARAT LINE AND PASSIVE PROVISION FOR WESTERN FREIGHT LINK THROUGH DEER PARK**



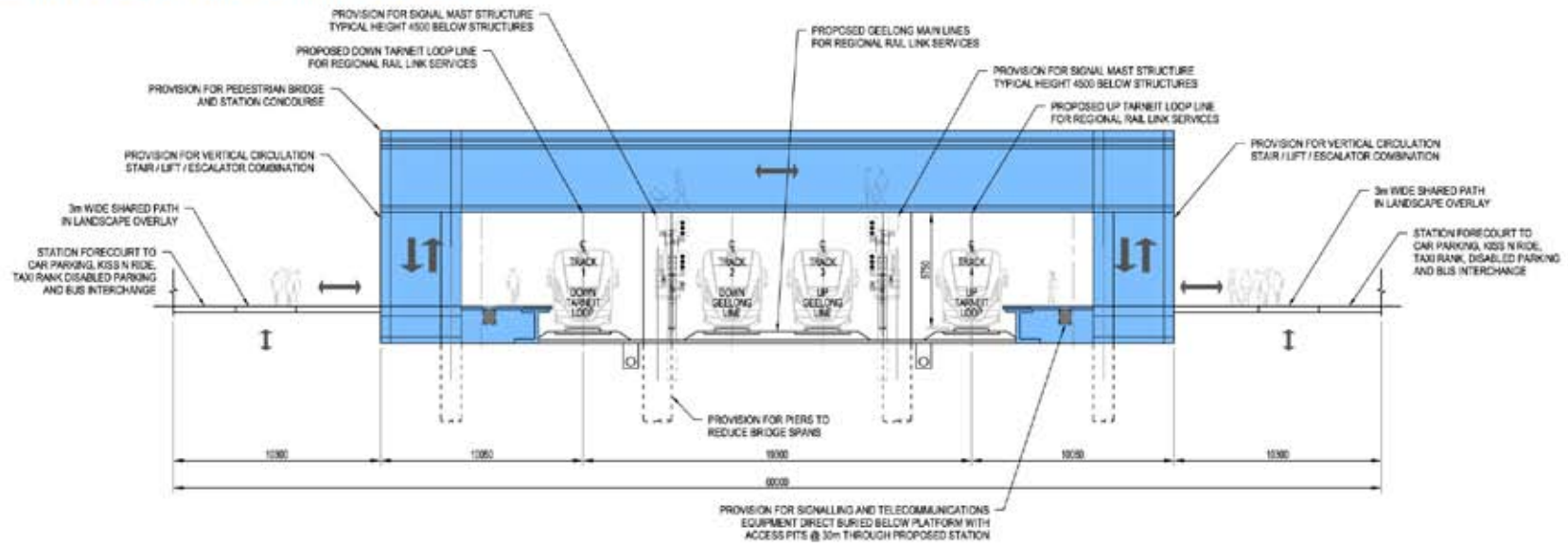
**TYPICAL SECTION B – RIDING BOUNDARY ROAD TO BOUNDARY ROAD 4 TRACK CORRIDOR WITH 2 X BIG TRACKS FOR GEELONG MAIN LINES AND PASSIVE PROVISION OF 2 X SG TRACKS FOR WESTERN FREIGHT LINK**



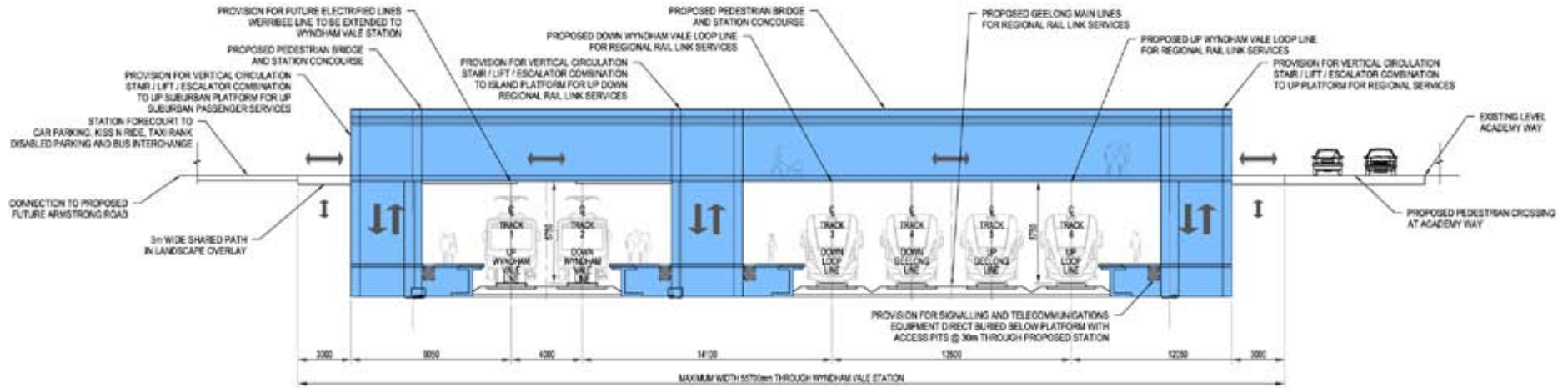
## TYPICAL SECTION C – 4 TRACK CONFIGURATION WITH GEELONG MAIN AND TARNEIT LOOP LINES IN CUTTING UP SIDE DOWN SIDE OF TARNEIT STATION



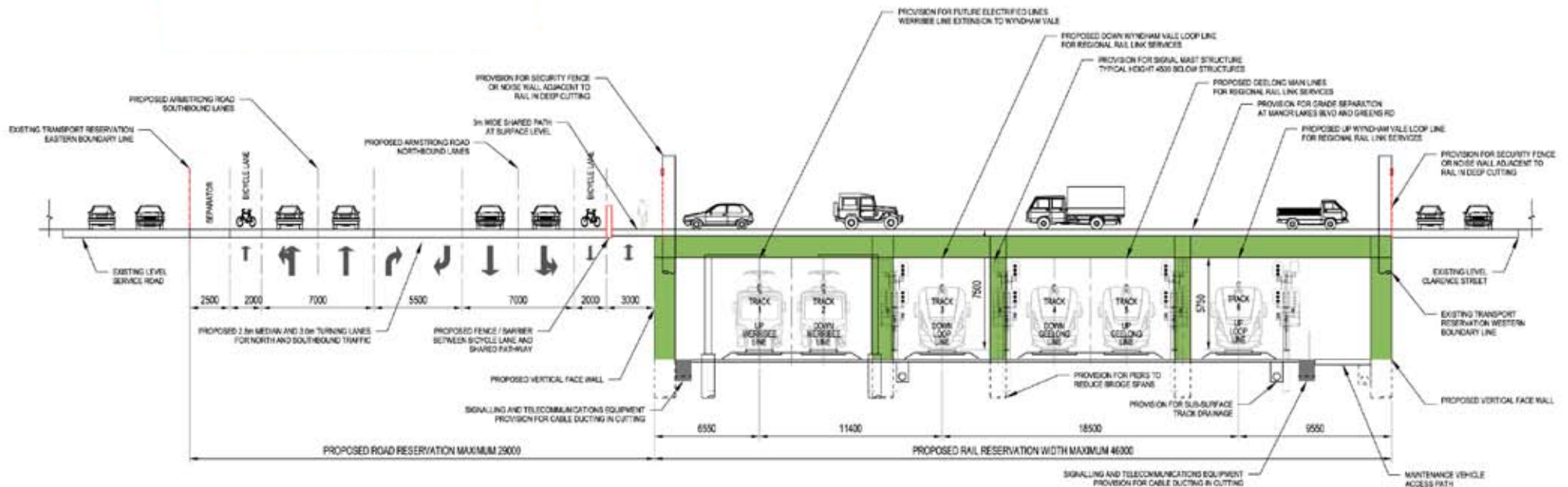
## TYPICAL SECTION D – 4 TRACK CONFIGURATION IN CUTTING WITH SINGLE FACE PLATFORMS AT TARNEIT STATION



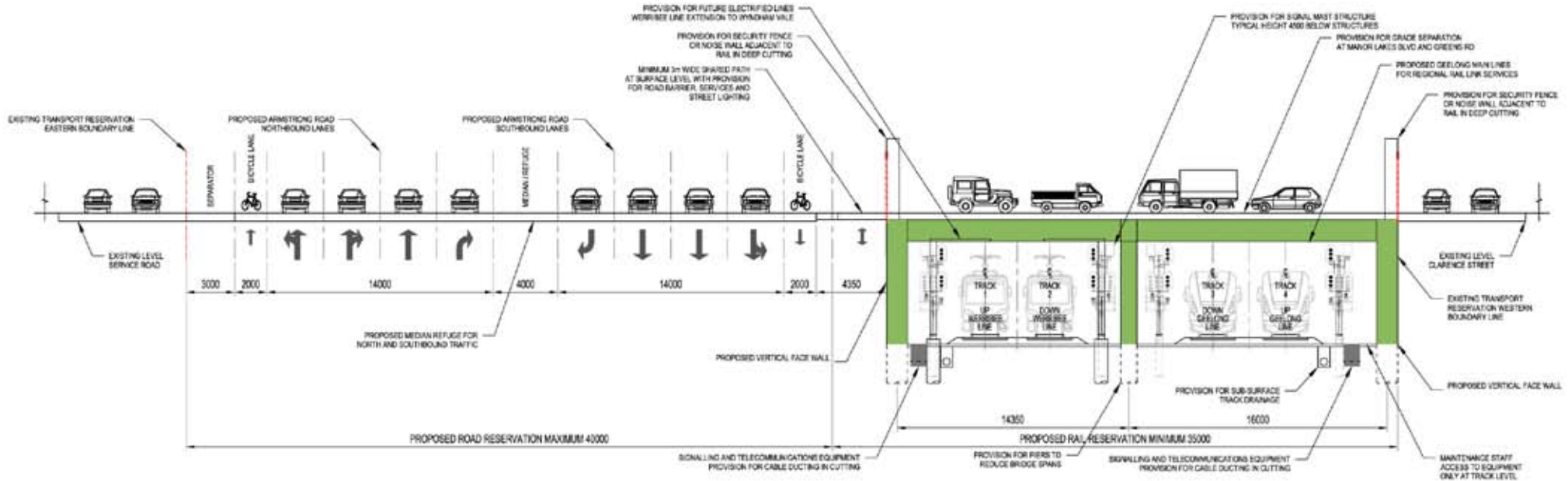
# TYPICAL SECTION E – 6 TRACK CONFIGURATION AT WYNDHAM VALE STATION WITH SINGLE FACE AND ISLAND PLATFORMS WITH DEEP CUTTING



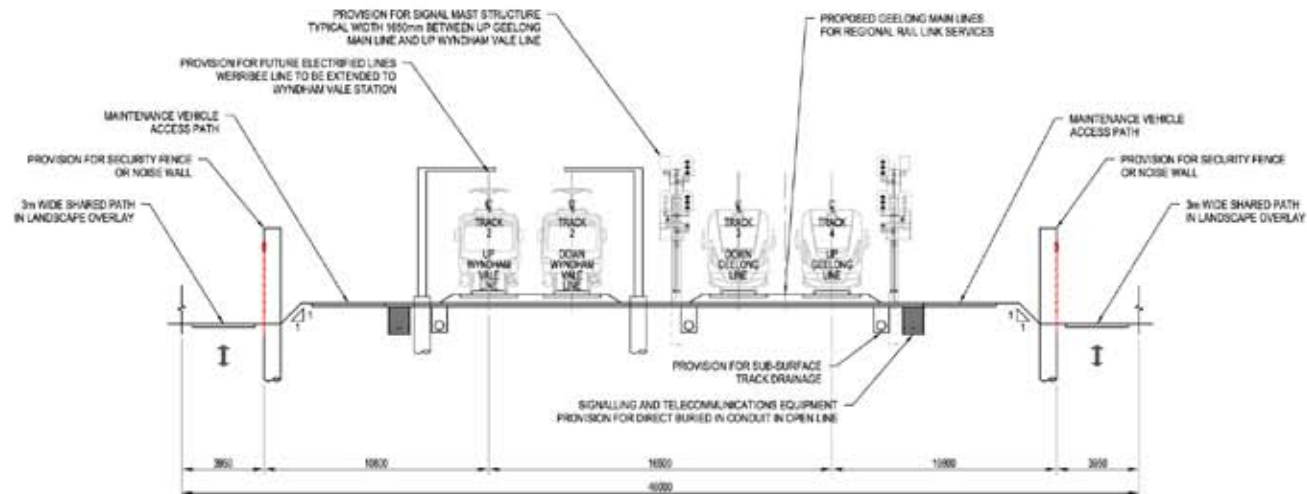
# TYPICAL SECTION F – OPTION 1 6 TRACK CONFIGURATION IN DEEP CUTTING MANOR LAKES BLVD TO GREENS ROAD



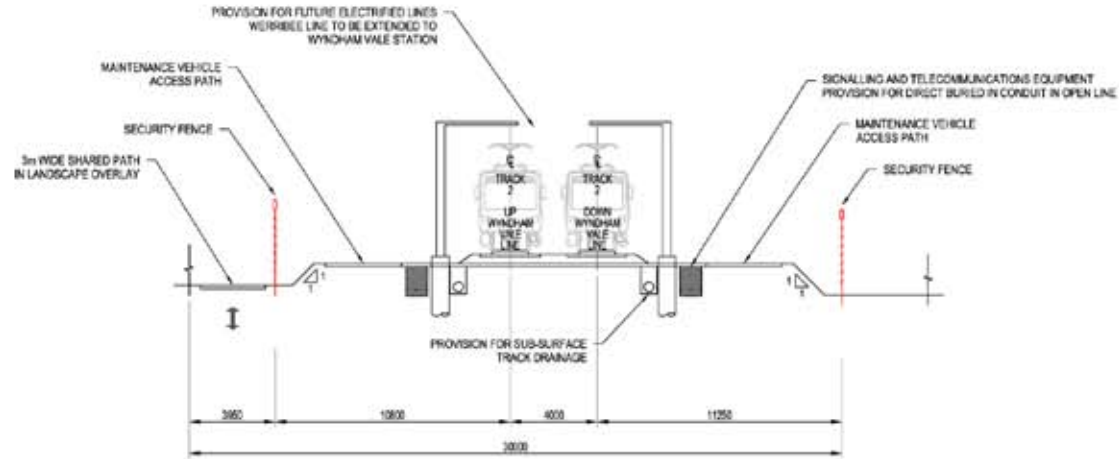
## TYPICAL SECTION G – OPTION 2 4 TRACK CONFIGURATION IN DEEP CUTTING MANOR LAKES BLVD TO GREENS ROAD



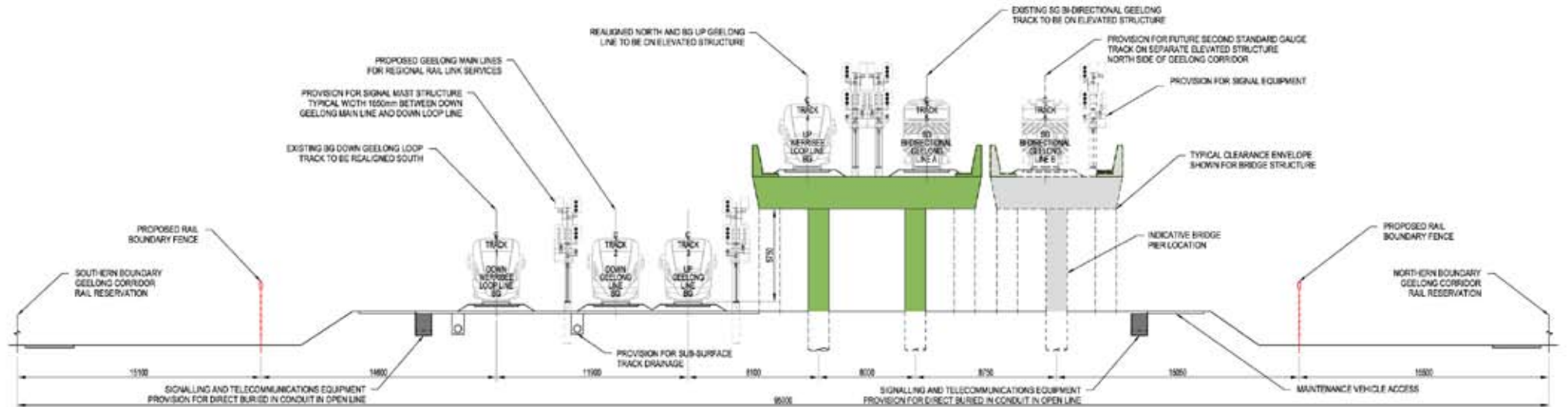
## TYPICAL SECTION H – 4 TRACK CONFIGURATION AT BLACK FOREST JUNCTION



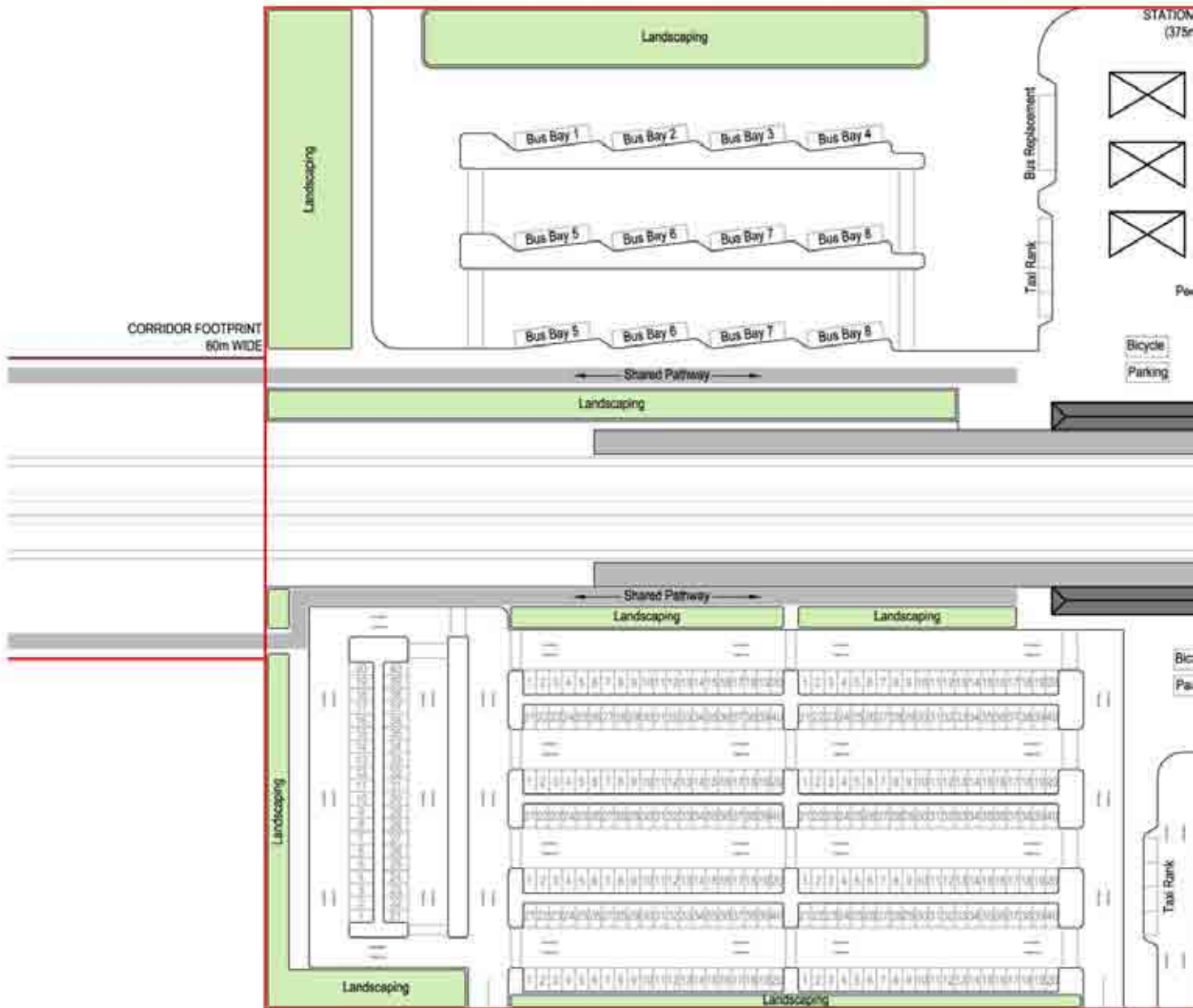
## TYPICAL SECTION J – 2 TRACK CONFIGURATION ON EMBANKMENT PROPOSED WERRIBEE LINE EXTENSION TO WYNDHAM VALE

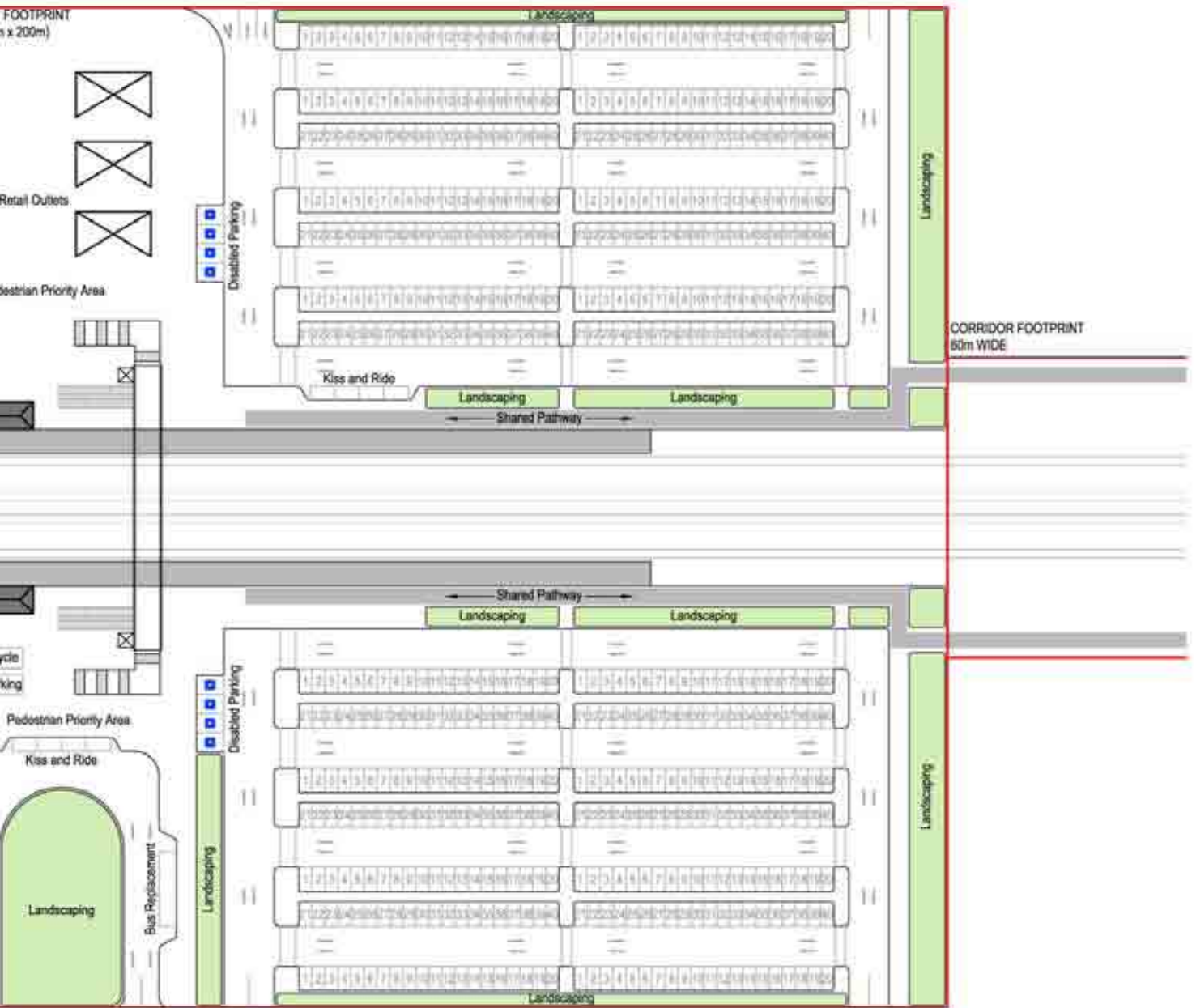


## TYPICAL SECTION K – GEELONG CORRIDOR 6 TRACKS ON EMBANKMENT, 2 X BG ELECTRIFIED, 2 X BG, 2X SG FREIGHT



# INDICATIVE STATION LAYOUT





ISBN 978-0-7311-8761-4

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121 Exhibition St, Melbourne Victoria 3000

Printed by OnDemand

323 Williamstown Road, Port Melbourne Victoria 3207

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