PCU033985

North West Transport Options
Transport for New South Wales
PO Box K659
Haymarket
New South Wales 1240

Department of Planning
Received
23 MAY 2012
Scanning Room

21 May 2012

To Whom It May Concern,

RE: NORTH WEST TRANSPORT OPTIONS SUBMISSION

In response to the invitation for public comment, please find attached Sydney Business Park and Marsden Park Development's submission to the North West Transport Options discussion paper.

We also concurrently submit on the North West Rail Link Environmental Impact Statement and the NSW Long Term Master Plan Discussion Paper.

Introduction

Marsden Park Developments is the developer of the Sydney Business Park which will form the basis of the largest employment precinct in North West Sydney. Marsden Park Developments is developing 256 hectares of land identified for commercial, industrial and bulky goods employment purposes. Marsden Park Developments and has created an iconic vision for the site translated through the Sydney Business Park entity.

The site already has major tenants committed to the site including IKEA and Bunnings and work has commenced on the first stages of development. This is the start of a rare opportunity for a single large developer to deliver a major master planned employment precinct for Sydney. Please see www.sydneybusinesspark.com.au for more information.

We can confirm that neither Marsden Park Developments nor Sydney Business Park has any political affiliations and neither has made any donations to political parties.

The Transport Planning Opportunity

Current planning in the North West Growth Centre provides a unique opportunity for the integration of transport and land use planning to ensure that Sydney's housing and growth requirements can be provided without prohibitive infrastructure costs.

With precincts such as Area 20, Riverstone, Alex Avenue, Schofields, Colebee, Marsden Park, Marsden Park Industrial and Schofields all currently rezoned or being planned it is imperative to consider the function of the transport network and the interaction between the transport modes. We feel that there currently exists the ability to plan links in the rail network that would:

- Provide rail to the largest employment centre in the North West;
- Connect the Northern and Richmond lines;
- Have the potential to close the loop for the city rail network, improving efficiency of movements on the rail network;
- Connect business hubs in Penrith, St Marys, Dunheved, Marsden Park, Rouse Hill, Norwest, Macquarie University, North Ryde, North Sydney & Sydney Central Business District;
- Enable the stabling of trains near employment areas rather than residential
- Reduce the mode split to car, delaying or negating the need for costly road upgrades to South Street, Richmond Road, M4 and M7;
- Improve the commercial return on the Richmond line upgrades; and
- Increase the rail access to the future community of over 65,000 homes and 550 hectares of future employment land.

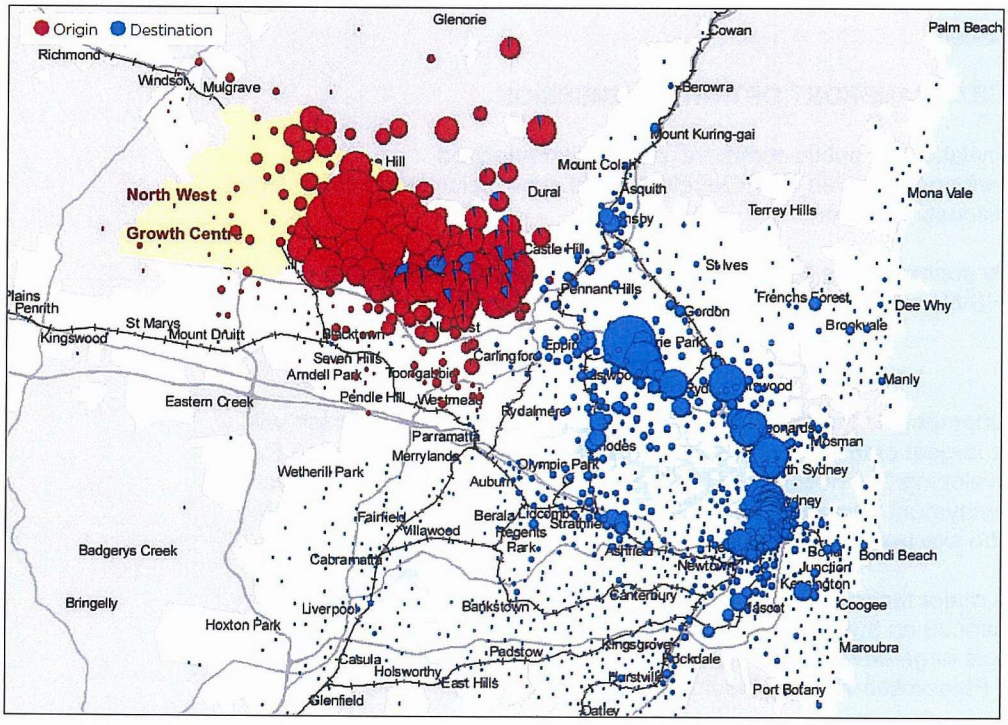

Figure 1. *Core Customer Demand Analysis*
Source: North West Rail Link Industry Briefing

As evidenced by the North West Rail Link's own studies above, the current proposed rail link clearly stops short of meeting the future demand of the North West Growth Centre by finishing at Cudgegong Road.

The current planning status of the North West Growth Centre presents the opportunity to plan and incorporate transport options for the future growth of Sydney's population in this area in a sustainable and efficient manner. The North West Growth Centres structure plan has matured and it may be appropriate to review the outcomes to date.

Independent Option Assessment

Marsden Park Developments appointed Hyder Consulting, GTA Consultants and High Range Analytics to independently assess the Options A & B, looking at key considerations including:

- Alignment and corridor requirements;
- Track arrangement;
- Station locations;
- Earthworks and Civil Structures;
- Stabling;
- Signalling and Communications;
- Environmental Approvals;
- Demographic & Travel Studies; and
- Transport Modelling.

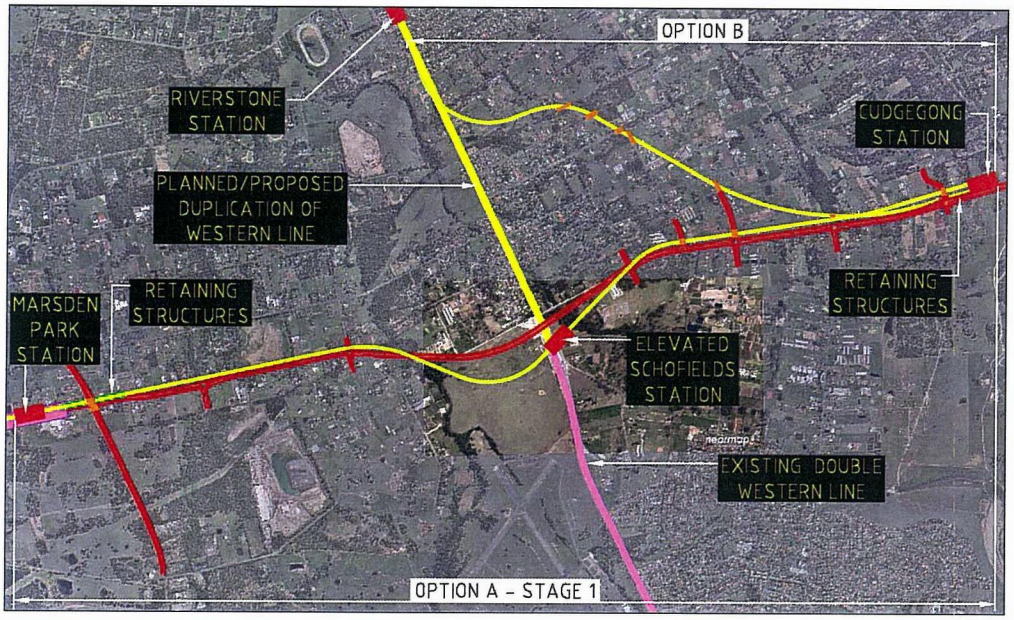

Figure 2. *Overview of the Options*
Source: Hyder Consulting

The above figure shows the rail alignment plans for the two options. Full details of the horizontal and vertical alignments of both options are provided within the Hyder report. In preparing these layouts Hyder's objectives were to:

- Minimise the impact on existing roads;
- Integrate with the master planning for the North West Growth Centre;
- Minimise the land acquisition;
- Maximise the use of existing Government land holdings; and
- Minimise the construction costs.

Key Findings

Transport Corridor Width

Hyder have revised the alignment for the entire length of Option A & B, and have concluded that the rail corridor is required to be between 30 and 50 metres wide. They note this varies dependent on the rail position whether in cut, on grade, embankment or sky train.

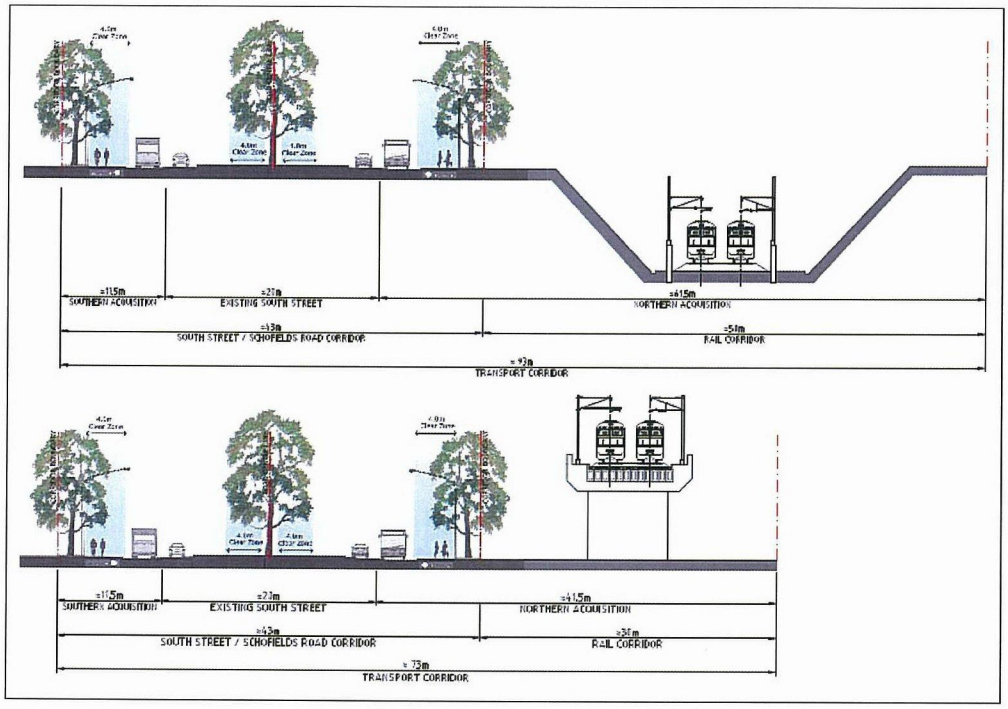

Figure 3. *Indicative Transport Corridor Cross Section*
Source: Hyder Consulting

When shared with the proposed 43m Schofields Road corridor this equates to a 73 to 93 metre wide Transport Corridor. See drawing 002-AA004938-P1 for details.

Intersection with South Street & Richmond Road

Hyder have reviewed the future grade separated intersection at Richmond Road and South Street and have concluded that the best position for the Marsden Park Railway Station is within the future Marsden Park Town Centre with a tunnelled entry to the station under Richmond Road. See plan OPA-1-006-AA004938–P1 for details.

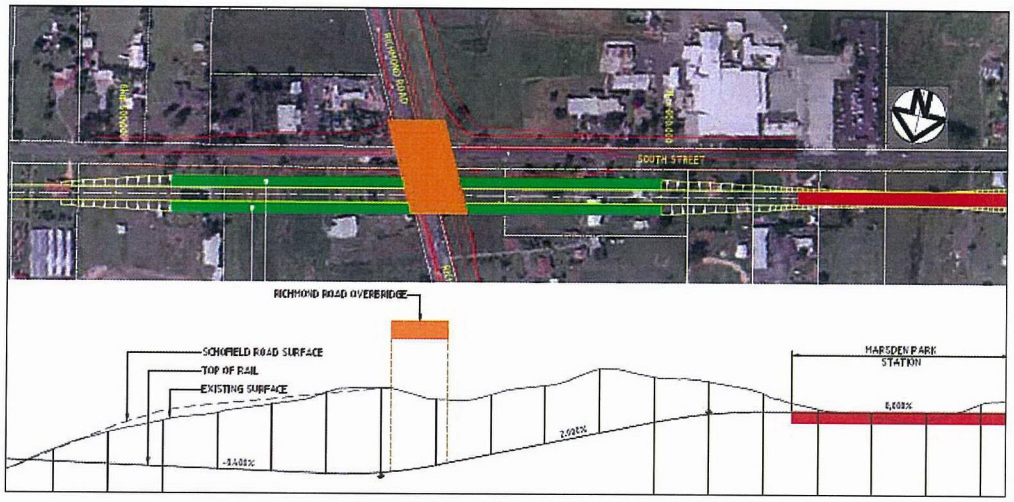

Figure 4. *Proposed Transport Corridor Alignment and indicative Cross Section Source: Hyder Consulting*

Please note in the above plan that north is to the bottom of the page.

The Marsden Park train station is positioned at the Marsden Park Town Centre between the 550 hectare Marsden Park Employment Lands and the 10,000 dwellings at the Marsden Park Residential area.

Stabling Yards

Marsden Park Developments submit for consideration the relocation of the stabling yards from Tallawong in the residential area of Rouse Hill, the Ponds and Kellyville Ridge. It is suggested that this facility would be better located in a 35,000 sqm area on the western side of the Marsden Park Industrial Precinct within the General Industrial (IN1) area.

Extension of Transport Corridor to Penrith Line and M4

In consideration of the Option A extension to Marsden Park, we have also investigated the longer term opportunity to extend the rail along the Roads & Maritime Services proposed corridor known as the Werrington Arterial. We see this is a substantial opportunity for the NSW Government to connect Western Sydney with direct rail transport to white collar jobs.

Key benefits of the continued Transport Corridor are:

- The rail network meets with the existing disused railway at Dunheved and into St Marys. This will connect the Penrith, Richmond and North West Rail lines;
- The road network will connect the M4, Great Western Highway, South Street/Schofields Road, which will become an alternate link between Sydney's West and North West; and
- The majority of this Transport Corridor is already within the Governments ownership.

See below summary sheets and attached plans named Option A Stage 2 for details.

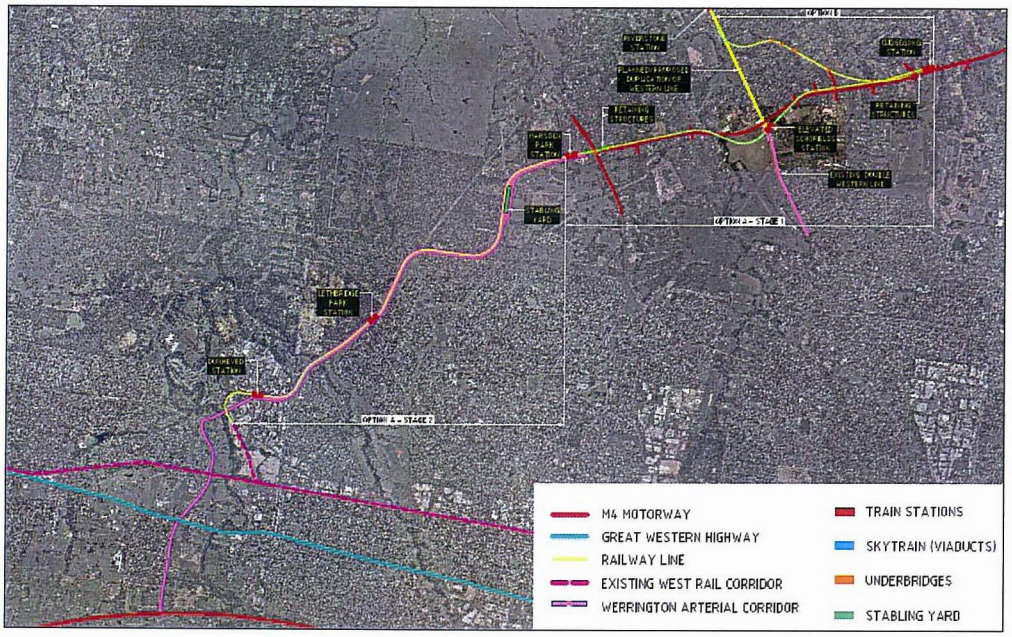

Figure 5. *Werrington Arterial & Option A Rail Extension to St Marys*
Source: Hyder Consulting

The network map below shows the opportunity that linking the North West Rail Line with the Richmond and Penrith Lines. This closes the loop and provides connections for Western Sydney commuters to travel to the business parks and employment areas of North West Sydney.

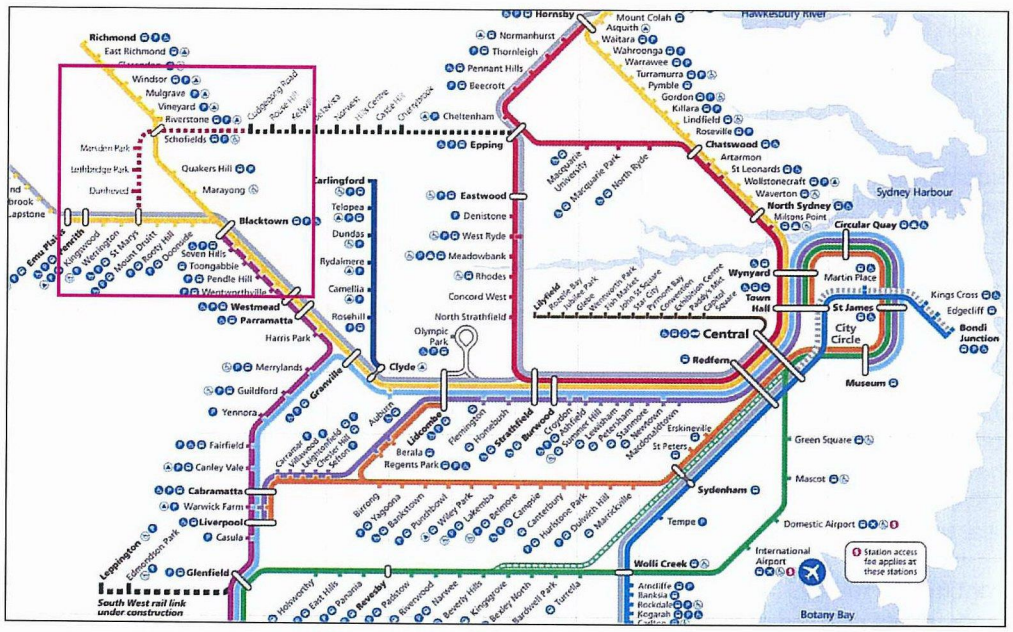

Figure 6. *Proposed City Rail Network Map, Closing the North West Rail Loop*
Source: City Rail and APP Corporation

These additional links provide considerable benefit to the road and rail network – please see submission for details.

Comparison of Options

Hyder have rated each of the options against the various criteria and rated the options as follows.

Key Criteria	Objective	Option A		Option B
		Stage 1	Stage 1 & 2	
Community Benefits	Improved accessibility to transport in general	3	4	2
	Reduced Community Severance	3	4	2
Economic Prosperity	Improved accessibility to markets for goods and services	3	4	1
Environmental Sustainability	Reduced energy use	3	4	1
	Reduced greenhouse emissions	3	4	1
	Improved response to climate change adaption	3	4	2
Integration of Transport and Land Use	Reduced Private vehicle use	3	4	1
	Improved access to activity centres	2	4	1
	Fit with relevant local area objectives or plans	3	4	0
Efficiency, Coordination and Reliability	Reduced journey times	3	4	0
	Increased journey reliability	2	4	1
	Improved response to transport disruptions	3	4	2
Safety and Health and Wellbeing	Reduced Injuries and fatalities	3	4	3
	Improved air quality	3	4	3
Final Score		**40**	**56**	**20**

Figure 7. *Option Criteria Assessment & Ranking*
Source: Hyder Consulting

Option A Recommended

Following the assessment, Hyder Consultants engineering analysis recommended that:

- *Option A (Stages 1 and 2) is the preferred alignment for the North West Rail Extension as is has the greater potential for increasing the growth of local area development;*
- *The key benefits from the project include:*
  - *Early provision of high-quality public transport in growth areas in Sydney's North west;*
  - *Rail line would bring significant improvement to transport choices. Strong connection between western NWGC precincts to key destinations to the east (including Parramatta, Black Town and Sydney CBD) and the West (including Penrith);*
  - *Enhanced community access to high-order employment, education and community facilities;*
  - *Reduced household transport costs;*
  - *Reduced road congestion in North West Growth Centre region;*
  - *Enhanced mobility for disadvantaged social groups;*
  - *Reduced vehicle usage leading to lower carbon emissions and air pollution;*
  - *Integrated land use and transport planning contributing to environmentally sustainable development;*
  - *Reduced travel constraints between employment and residential areas; and*
  - *Direct and indirect employment opportunities during delivery of the project.*

GTA Consultants & High Range Analytics modelling analysis recommend that:

- *The quantitative appraisal of patronage potential of the options indicated a substantial difference between Option A and Option B, with Option A showing the greatest potential. The fact that Option A shows more incremental patronage potential than Option B should be no surprise: it would extend the coverage of the rail network in the study area, providing an additional station. Whereas Option B would only connect two stations that would exist in any case; and*
- *The qualitative and quantitative appraisals identify the preferred option on patronage potential grounds as Option A and its extension Option A with western extension to St Marys.*

Submission

Marsden Park Developments submit that:

- Option A is selected as the preferred alignment;
- A shared Transport Corridor is developed that aligns with South Street & Schofields Road and that it is as refined as possible;
- The same zoning principles that applied to Schofields be used in zoning the land for the Transport Corridor (and this is incorporated in the Marsden Park Residential Precinct exhibition in the middle of this year); and
- That the extension of the Transport Corridor along the Warrington Arterial is explored by the Government with a view to connecting the rail to St Marys and the road to the M4.

Conclusion

This submission seeks to provide Transport for New South Wales with an independent, considered review of the two options. We believe that setting aside this Transport Corridor now will provide the opportunity for the future development of the North West.

We acknowledge that this submission is only a first step, but it is hoped that this will provide the catalyst for further studies and planning on this opportunity.

Sydney Business Park and Marsden Park Developments look forward to working with the Government to deliver the best planning and infrastructure delivery outcomes for this area. We trust that this submission assists the Transport for NSW, the Department of Planning, Roads & Maritime Services and Infrastructure Agencies to further consider the options for rail and road to the North West Growth Centre and beyond.

Should you have any queries regarding our submission, please do not hesitate to contact me on 0413 442 096 or owen.walsh@sydneybusinesspark.com.au.

Yours sincerely
SYDNEY BUSINESS PARK

OWEN WALSH
Development Director

Enc: Hyder North West Rail Extension Option Assessment dated 21 May 2012
Sydney City Rail Network Plan with Option A (Stage 1 & 2)

Cc:		
	Kevin Conolly MP	Member for Riverstone
	Robert Black	Department of Planning (Land Release)
	David Fitzgibbon	Department of Planning (Marsden Park)
	Bruce Coleman	Department of Planning (MP Industrial & Schofields)
	Infrastructure Director	Department of Planning (Major Projects NWRL EIS)
	Tom Gellibrand	Transport for NSW (North West Rail)
	Graham Nelmes	Transport for NSW (North West Rail)
	Team	Transport for NSW (NSW Transport Master Plan)
	Georgie Wheadon	Transport for NSW (NSW Transport Master Plan)
	Chris Shannon	Blacktown City Council (Strategic & Precinct Planning)

NORTH WEST RAIL LINK EXTENSION
OPTION ASSESSMENT

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SYDNEY BUSINESS PARK

NORTH WEST RAIL LINK EXTENSION

Option Assessment for the North West Rail Link Extension

Author	Sanjeev Hanumaiah	
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Approver	Graeme Robinson	
Report No	F001-AA004938-AAR-01	
Date	21 May 2012	

This report has been prepared for Sydney Business Park in accordance with the terms and conditions of appointment for North West Rail Link Extension dated 12 April 2012. Hyder Consulting Pty Ltd (ABN 76 104 485 289) cannot accept any responsibility for any use of or reliance on the contents of this report by any third party.

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EXECUTIVE SUMMARY

This report has been prepared to support a submission by Sydney Business Park to the NSW Government. Hyder Consulting have been engaged by APP to undertake a study into preferred route(s) for an extension to the North West Rail Link, servicing the North West Growth Centre. This report outlines major considerations associated with extending the North West Rail Link along these routes.

Two potential rail route options have been developed through this analysis. Corridor alignments for the potential options have been selected to ensure a high-quality railway that will serve North West Growth Centre in the long-term.

The routes considered are:

- **Option A Cudgegong Road to St Marys**
  - (Stage 1) Cudgegong to Marsden Park
  - (Stage 2) Marsden Park to St Marys Station
- **Option B Cudgegong to Riverstone Station**

An options assessment process was then carried out on the two rail routes against the following benefits criteria:

- Community benefits
- Economic prosperity
- Environmental sustainability
- Integration of transport and land use
- Efficiency, Coordination and Reliability
- Safety Health and Well Being

Following the assessment processes, Option A (Stage1 and 2) have been identified as the preferable alignments for an extension.

This Option achieves the following benefits:

- Early provision of high-quality public transport in growth areas in Sydney's north west;
- Rail line would bring significant improvement to transport choices. Strong connection between western North West Growth Centre precincts to key destinations to the east (including Parramatta, Blacktown and Sydney CBD) and the West (including Penrith);
- Enhanced community access to high-order employment, education and community facilities;
- Reduced household transport costs;
- Reduced road congestion in North West Growth Centre region;
- Enhanced mobility for disadvantaged social groups;
- Reduced vehicle usage leading to lower carbon emissions and air pollution;

- Integrated land use and transport planning contributing to environmentally sustainable development;
- Reduced travel constraints between employment and residential areas;
- Direct and indirect employment opportunities during delivery of the project

Option A (Stage 1 & 2) delivers a comprehensive solution which enhances the railway networks proposed by the North West Rail Link, as well as serving the growth areas within the North West region.

Given the lead time required to implement a major railway infrastructure project and the pressure for urban growth in the region, it is essential that the land for the project be identified and reserved early. This will ensure the preferred alignment option is secured and future urban growth area planning makes optimal use of this future asset.

1 INTRODUCTION

1.1 Project Background

The North West Growth Centre (NWGC) is located approximately 35km North West of the Sydney CBD and about 15km North West of Parramatta. It represents the remaining lands available for significant urban development in this sector of the Sydney Basin, further development beyond these borders is constrained by the Hawkesbury-Nepean River floodplain to the north and west, and the hilly, vegetated lands to the east and north east.

The main elements of the proposed transport infrastructure for the NWGC include the duplication of the Richmond rail line, North West Rail Link and the provision of a road hierarchy based to a large extent on the upgrading of the existing road network.

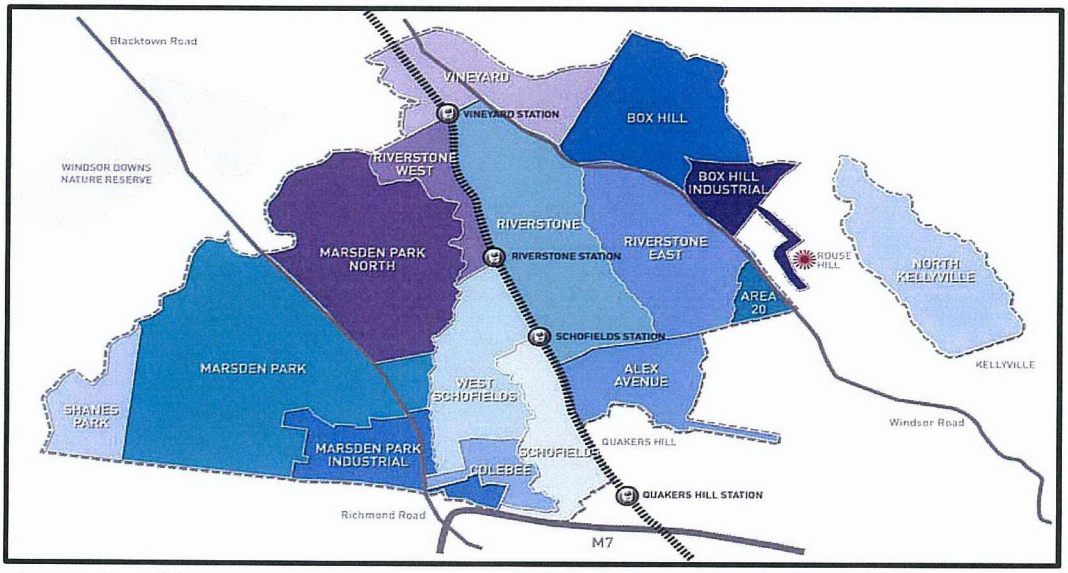


Figure 1: North West growth Centre

Marsden Park

The Marsden park industrial precinct is approximately 40 km from the Sydney CDB, spans 550 hectares and has been rezoned from rural land to allow for a variety of employment and residential uses. The Marsden Park Industrial precinct will become the Sydney's largest master planned, fully integrated commercial, industrial and residential community.

The Marsden Park Industrial Precinct will allow for a variety of uses, including:

- 15000 new dwellings;
- 70 hectares of commercial land;
- 40 hectares of bulky goods retailing;
- 206 hectares of industrial land; and
- 63 hectares of conservation land and open space

Marsden Park Industrial Precinct will provide new jobs for people in the adjoining suburbs of Shalvey, Bidwell and Hassall Grove as well as future residents in new suburbs in the North West Growth Centre

Schofield Road and Richmond Road Upgrade

In additon to the proposed developments at Marsden park, an upgrade of Schofields Road is being actively considered. The Schofields Road, when extended to Richmond Road, would be a major east-west connection between Windsor road and Richmond Road, providing a transit boulevard to meet the future transport needs of the North West Growth Centre. It would also service the new Schofields Railway Station and the adjacent Town Centre.

Schofield Road is currently a two lane rural road linking Windsor Road at Rouse Hill to Railway Terrace at Schofields. It forms a T-Junction with Railway Terrace at its western end. It is proposed that Schofields Road cross the Blacktown-Richmond rail Line via an overpass and continue via South Street to link up to Richmond Road at Marsden Park. Further connection has also been planned to the M4.

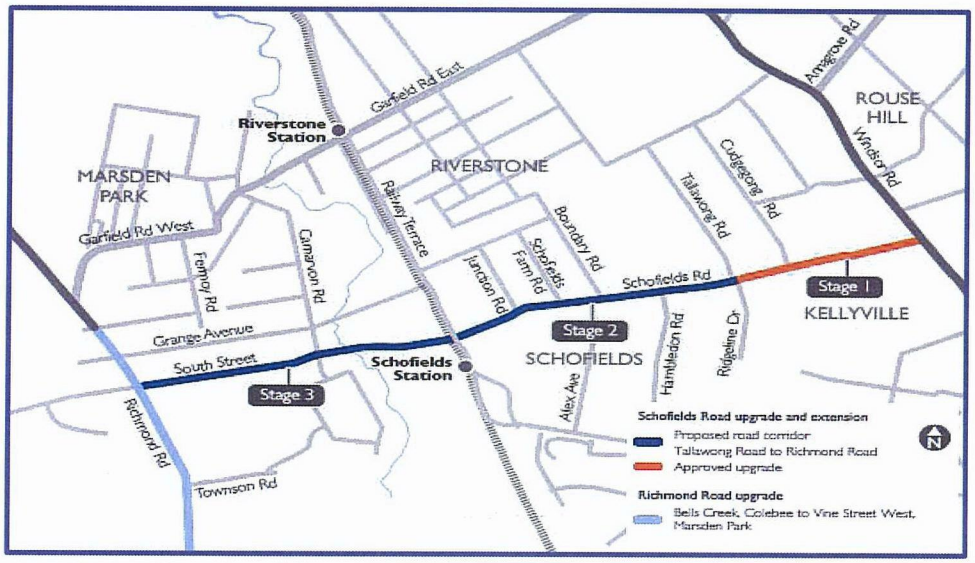


Figure 2: North West Growth Centre

The Road upgrade will include:

- An upgrade from a two lane to a four lane divided road with a wide central median for future widening to six lanes if required in the future.
- Provision of a tree lined transit Boulevard, in a typically 43m corridor.
- Ten New signalised intersections, including Railway Terrace and Richmond Road.
- Schofields Road extended from Railway Terrace through South Street to Richmond Road.
- Underpass crossing of the Richmond rail line
- Five Bridges located at Second Ponds Creek, First Ponds Creek, a tributary east of Railway Terrace, Eastern Creek and Bells Creeks.
- Improved flood immunity.

Richmond Road provides a key north-south link through the North West Growth Centre. Richmond Road is the main road connection to the regional road system for the released precincts of Marsden Park Industrial, Marsden Park, Marsden Park North, Schofields West, Schofields and Colebee in the North West Growth Centre.

The Road upgrade will include:

- The upgrade of Richmond Road from a two lane road to a four lane divided road with landscaped central median;
- A wide median from 350 metres north of Bells Creek bridge to just north of Grange Avenue, to cater for a possible future upgrade to a six lane road;
- New intersections with traffic lights at Townson Road, South Street and access to the Colebee Precinct;
- An off road shared user path on the western side of the road, with provision for a future shared user path on the eastern side.
- Altered arrangement at Grange Avenue intersection to restrict traffic movements to left in/left out.
- Indented bus bays and stops at Townson Road and South Street, with bus priority at intersections.
- Designated turning lanes and pedestrian/bicycle crossing provisions at traffic lights.
- Closure of Hollinsworth Road intersection (when new access is provided at Townson Road).

Current NWRL Project Scope

The North West Rail Link (NWRL) is currently scoped for a 23km integrated to the rest of the transport network and surrounding land uses. Starting from Epping station on the Main North Line and terminating at the new station, Cudgegong Road Station. The eight proposed stations on this line are: Cherrybrook, Castle Hill, Hills Centre, Norwest, Bella Vista, Kellyville, Rouse Hill and Cudgegong Road. It is anticipated that work will begin in 2017 with completion in 2024.

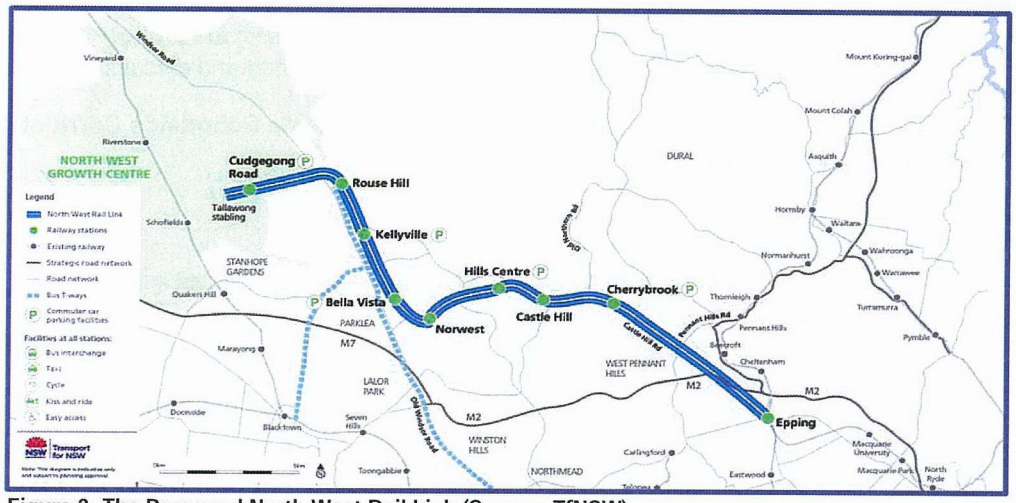


Figure 3: The Proposed North West Rail Link (Source: TfNSW)

Proposed North West Rail Link extension

Transport for NSW (TfNSW) is currently seeking to select a preferred corridor for the potential extension of the North West Rail Link. The two potential transport corridors identified west of Cudgegong road to support future growth in the North West Growth Centre are;

- Option A(Stage 1)-Cudgegong Road to Marsden Park via Schofields station (Approximately 7.35 km);
- Option B-Cudgegong to Riverstone Station (Approximately 4.65 km).

The potential of a western extension of Option A is also discussed in this report, a westward extension from Marsden Park to St Marys.

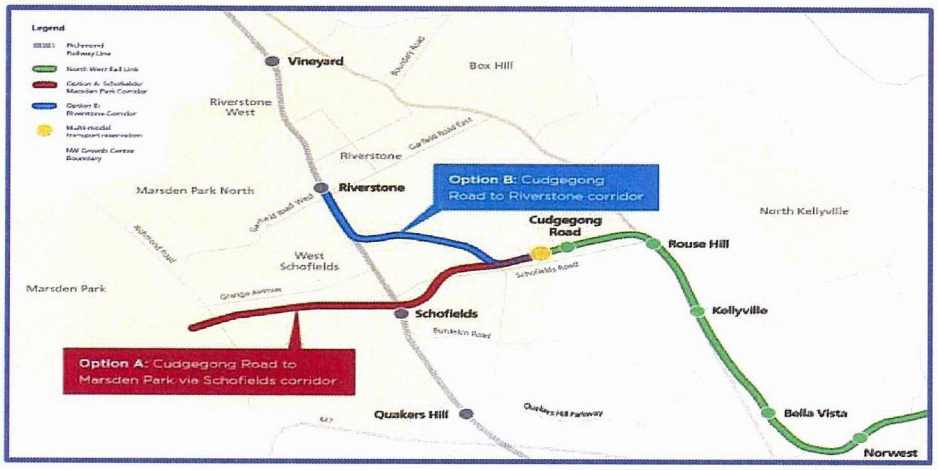


Figure 4: North West Rail Link extension

1.2 Objective of Options Assessment

The objective of the Options Assessment is to assess strategically the overall need and potential for developing/extending the proposed NWRL rail line to the west area of the NWGC and provide recommendations for project implementation of the most suitable development option in terms of rail alignment, technical standards and organisation.

The outline plan for the NWRL extension provides an indicative routing of the rail corridor and forms the basis for identifying possible rail alignments to connect the proposed NWRL and West Area of the NWGC. Two alignment options have been identified and discussed in this report.

Option A (Stage 1): Cudgegong Road to Marsden Park via Schofields Corridor, approximately 7.35km.

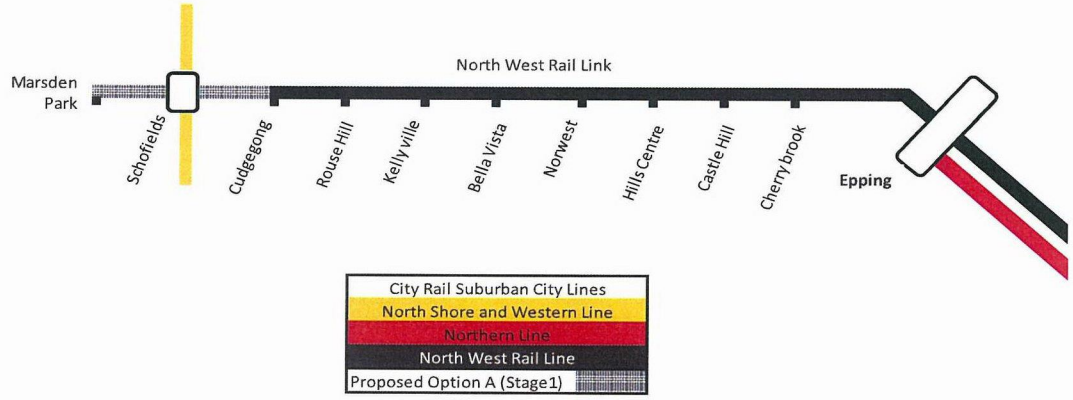


Figure 5: Option A (Stage 1) - Cudgegong Road station to Marsden Park station via Schofields Station

Option A (Stage 2): Marsden Park Station to St Marys Station (Western Line), Approximately 16.0km

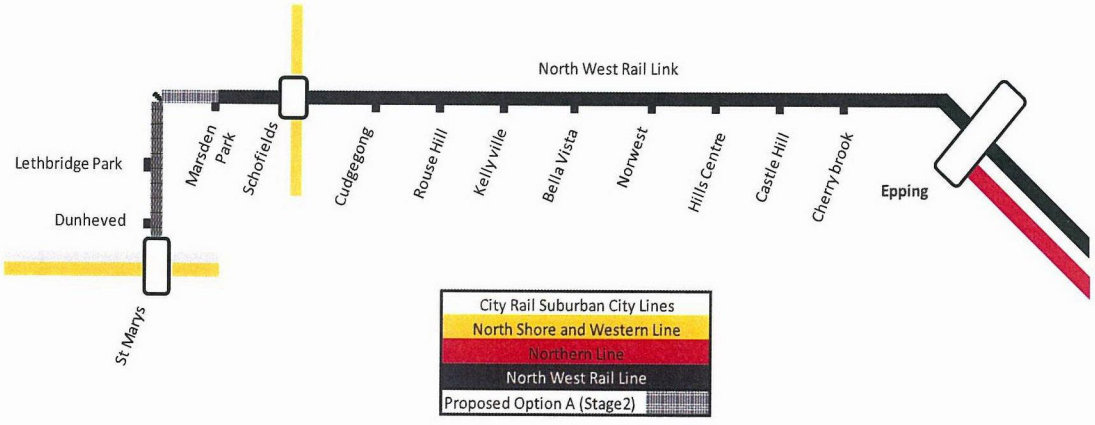


Figure 6: Option A (Stage 2) – Marsden Park station to St Marys Station (Western Line)

Option B: Cudgegong Road to Riverstone Corridor (Approximately 4.65km)

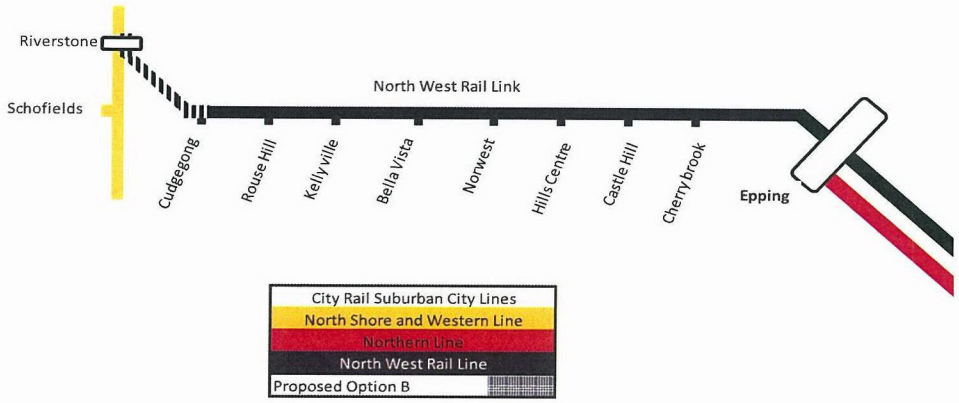


Figure 7: Option B-Cudgegong Road station to Riverstone Station

The objectives of this NWRL extension proposal are to:

- Provide a strong connection between western NWGC precincts to key destinations to the east (including Parramatta and Sydney CBD) and the West (including Penrith);
- Provide strong connections between three of the main Town Centres within the NWGC area- Marsden Park, Schofields and Rouse Hills;
- Provide capacity to complement land release strategies in the North West Growth Centre;
- Support rail based public transport;
- Improve public Safety;
- Provide value for money.

2 OUTLINE OF OPTIONS

2.1 Option A(Stage1)- Cudgegong Road to Marsden Park via Schofields Corridor

Project Corridor

It is proposed that Option A (Stage 1) corridor will take the following route:

- Commences at the end of NWRL (Cudgegong Road) and heads west;
- Crosses Ponds creek, moves west along the northern side of Schofield Road passing Boundary, Schofields Farm and Junction Roads;
- Crosses Schofield Road and Junction Road heading south west towards the new Schofields Railway Station. Crosses the New Schofields Railway station approximately 300m east of Richmond Railway Line and then continues towards the site of future Schofield's town centre;
- Crosses Schofields road again approximately 500m east of Carnarvon Road and continues alongside the planned western extension of Schofields Road, passing Veron Road and over Eastern Creek and Carnarvon Road;
- Continues west alongside South Street crosses Richmond Road and heads towards Marsden Park.

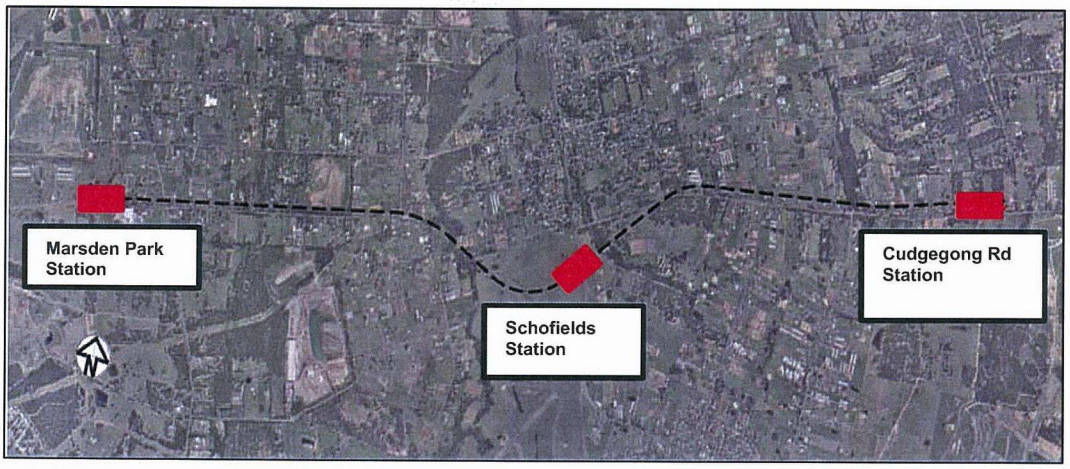


Figure 8: Option A (Stage 1) Cudgegong Rd to Marsden Park via Schofields Station

Integrated Road/Rail Corridor adjacent to proposed South Street/Schofields Road

Schofields Street is proposed to be upgraded into a four lane, dual carriage road that extends westwards from Railway Terrace to connect with South Street, creating an important 8km long link between Richmond and Windsor road.

Proposed Option A Stage 1 rail corridor is integrated with road corridor to achieve the best possible outcome to compliment the overall transport strategy.

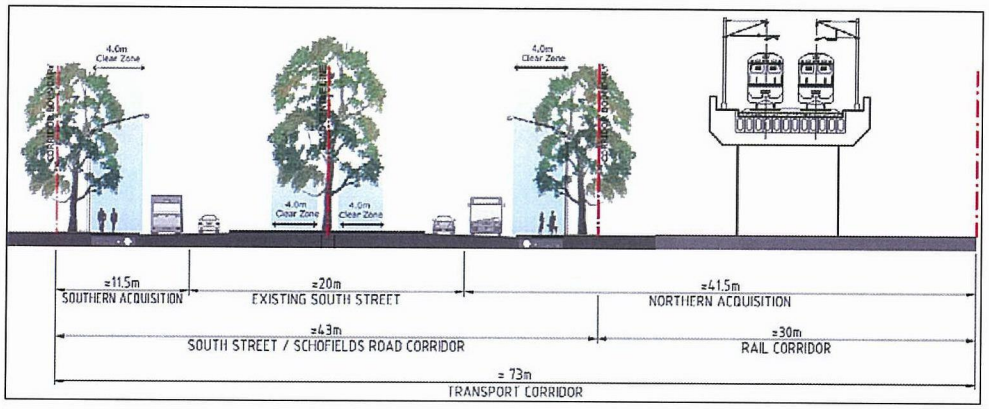


Figure 9: Typical Rail Corridor Cross Section on Viaduct adjacent to proposed South Street/Schofields Road

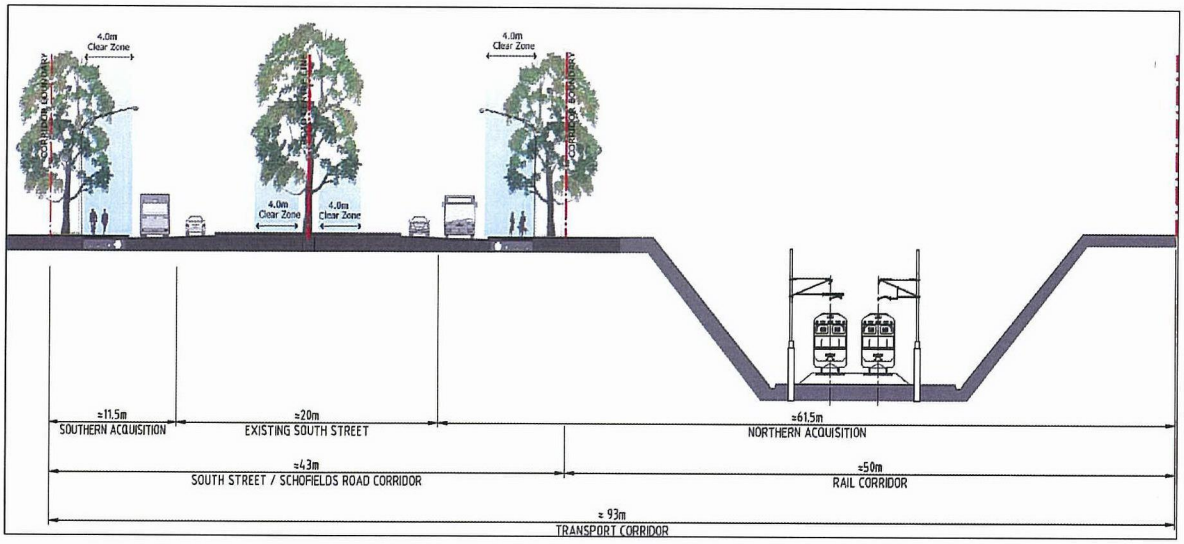


Figure 10: Typical Rail Corridor Cross Section in cutting adjacent to proposed South Street/Schofields Road

The rail corridor will generally be 40-50m wide, but wider at locations where bridges, stations, car parking, train stabling and other facilities are required.

Track Arrangement

This Alignment will incorporate two tracks from Cudgegong Road to Marsden Station. Preliminary concept Plan and Longitudinal sections were developed and are included in Appendix B.

Stations

Proposed new stations are Schofields Station (NWRL-Extension Line) and Marsden Park Station.

Schofields Station (NWRL-Extension Line) will be located north side of the existing Schofields station. The station will require a grade separation between Richmond Line and proposed NWRL extension line to create different levels for rail/rail interchange.

Marsden Park station will be located South East of the intersection of Richmond Road and South Street.

Depending on future urban growth in the surrounding areas, additional stations can be opened in the future. Station names to be confirmed later in the project's development.

Earthworks and Civil Structures

Bridges will be built to grade separate the rail extension from existing or likely future arterial roads. Cudgegong Road to Marsden Park is a combination of elevated concrete bridge sections, embankments, cuttings and viaducts. Table 1 summarises the civil structures and earthworks.

Section	Civil Structures	Earthworks
0.000km to 0.700km		Open Cut (Approx. 800m)
0.375km	Tallawong Road Overbridge	
1.50km to 2.450km		Open Cut (Approx. 900m)
1.875km	Boundary Road Overbridge	
2.225km	Schofield Farm Road Overbridge	
2.500km-5.400km	Viaduct-Sky Train (approx.2.9km)	
3.350km	Schofields Station	
5.500km-5.650km		Open Cut (Approx. 200m)
6.775km	Richmond Road Overbridge	
6.650km to 6.850km	Cut and Cover tunnel (Approx. 200m)	450m Open Cut- Dive structure
7.250km	Marsden Park Station and Stabling facility	

Table 1: Summary of Earthworks and Civil Structures

Stabling

Stabling and Depot facilities for trains proposed to be located 1.5km south west of Marsden Park Stations, adjacent to South Street instead of Tallawong Road (NWRL proposal) as the impact on the community at this location is minimal as it is a non-residential area.

The same stabling configuration as that proposed for the North West Rail Link has been applied at this location. The stabling facilities can accommodate 16 eight car trains with provisions for future expansion to 24 eight car sets.

By locating the stabling facilities for the majority of trains required to operate on the NWRL towards the end of the line, the need for extended sections of out-of-service or empty running is eliminated.

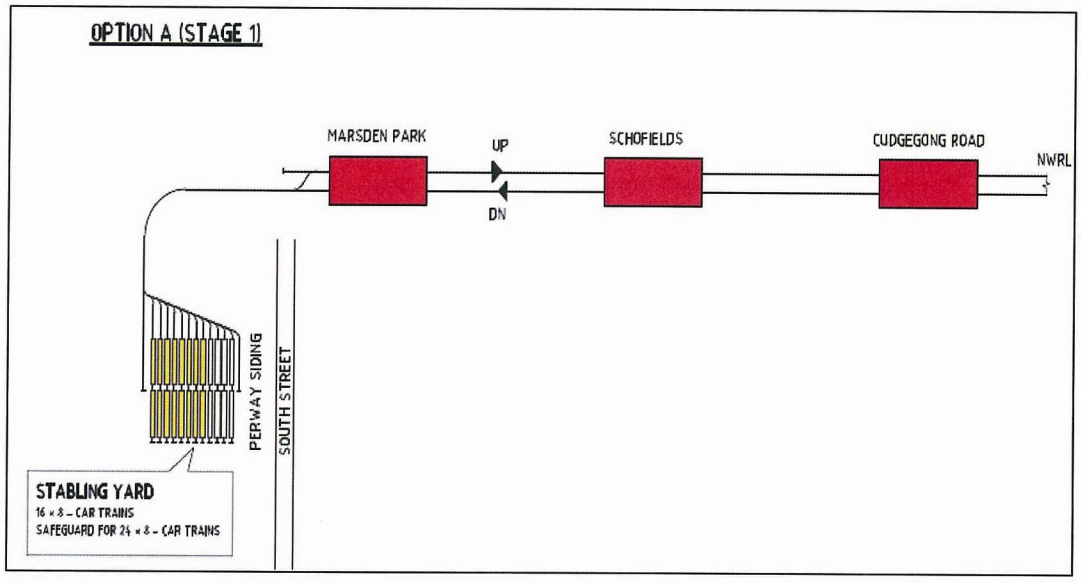


Figure 11: Stabling facility Option A Stage 1

Signalling and communication systems

Signalling system will need to be designed depending on the Operation service requirement and communication system as a minimum would require electronic ticketing system, CCTV, Supervisory control and data acquisition systems (SCADA), passenger information system, emergency help points, digital voice announcement system etc.

Electrical and Mechanical systems

High Voltage supply would be required for traction substation and station substation depending on the power study and 11kv power supply to the station to feed the lighting, air-condition, lift, escalators etc.

Traction voltage will be 1500v dc same as the existing network to the extended options and would require substation to feed the OHW.

2.2 Option A (Stage 2) - Marsden Park to St Mary's Station (Western Railway Line) via Lethbridge Park and Dunheved Station.

Project Corridor

It is proposed that Option A (Stage 2) corridor will take the following route:

- Commence from Marsden Park proposed station heading west on the North Side of South Street for approximately 800m;
- Crosses South Street and run parallel to South Street until the end of the street.
- Curves to the south east and continues north side of Sedgman Crescent for approximately 800m then curves south west towards Forester Road crossing Palmyra Avenue.
- Corridor continues north of Forester Road towards St Marys Leagues Stadium and turns west along Christie Street to join the existing rail corridor near Dunheved Golf Club.

The project rail corridor will generally be 40-50m wide, but wider at locations where deep cuttings/embankments, stations, car parking, train stabling and other facilities are required.

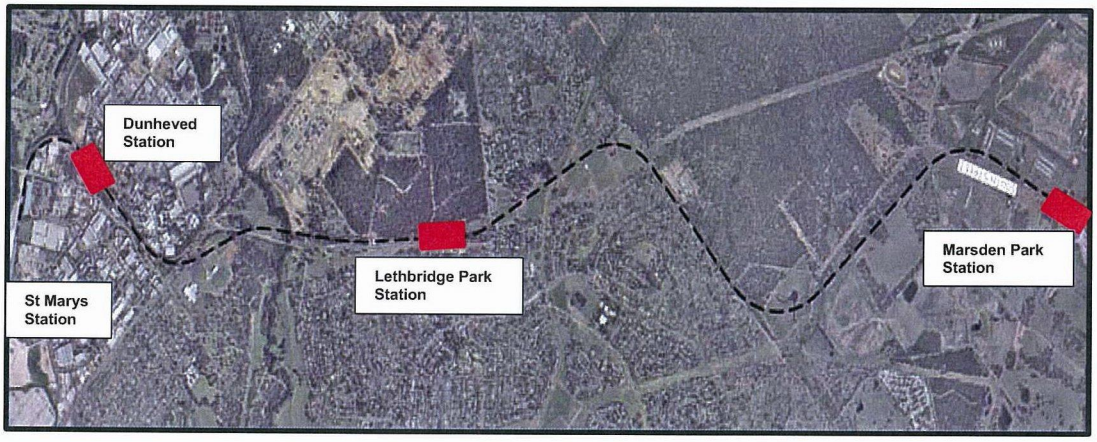


Figure 12: Option A (Stage 2) Marsden park to St Marys Corridor

Track Arrangement

This Alignment will incorporate two tracks from Cudgegong to St Marys Station on the Western Railway Line. Preliminary concept plan and longitudinal sections were developed and are included in Appendix C.

Stations

Proposed new stations are Lethbridge Park and Dunheved Station.

Lethbridge Park will be located south west at the intersection of Forrester Road and Palmyra Avenue.

Dunheved Station will be located 200m west of Forester Road and north of Christie Street.

Depending on future urban growth in the surrounding areas, additional stations can be opened in the future.

Earthworks and Civil Structures

Bridges will be built to grade separate the Rail Extension from existing or likely future arterial roads. Marsden Park to St Marys is a combination of elevated bridge structures, embankments, cuttings and viaducts. Table **2** lists summarises civil structures and earthworks.

Section	Civil Structures	Earthworks
7.350km-8.500km		Open Cut (Approx.1.15km)
8.225km	South Street Overbridge	
8.500km to 10.650		At grade(shallow cut to fill) (Approx. 2.150km)
10.650km-11.150km		Open Cut (Approx. 500m)
11.150km-12.050km		Embankment (Approx. 900m)
12.050km to13.750km		Open Cut (Approx. 1.70km)
12.800km	Lethbridge Park Station	Open Cut
13.750km to 14.950km	Viaduct-Sky Train (Approx. 1.2km)	
14.950km to 16.350km		Shallow Embankment (Approx.1.4km)
16.350km to 16.600km		Shallow Cut (Approx.250m)
16.375km	Christie Street Overbridge	

Table 2: Summary of Earthworks and Civil Structures

Stabling

Stabling and Depot facilities for trains can be located 1.5km south west of Marsden Park Stations, adjacent to South Street. The impact on the community at this location is minimal as it is a non-residential area.

The same stabling configuration as that proposed for the North West Rail Link extension in Stage 1 to Marsden Park has been applied at this location. The stabling facilities can accommodate 16 eight car trains with provisions for future expansion to 24 eight car sets.

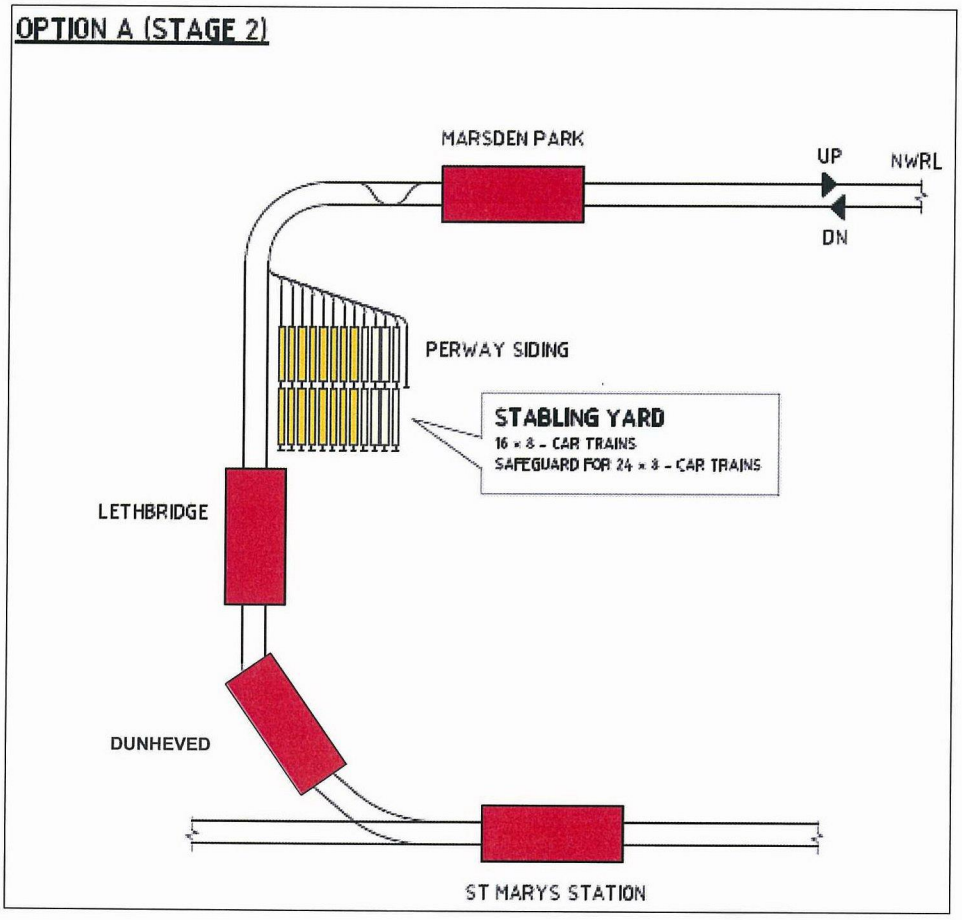


Figure 13: Stabling Facility Option A Stage 2

Signalling and communication systems

Signalling system will need to be designed depending on the Operation service requirement and communication system as a minimum would require electronic ticketing system, CCTV, Supervisory control and data acquisition systems (SCADA), passenger information system, emergency help points, digital voice announcement system etc.

Electrical and Mechanical systems

High Voltage supply would be required for traction substation and station substation depending on the power study and 11kv power supply to the station to feed the lighting, air-condition, lift, escalators etc.

Traction voltage will be 1500v dc same as the existing network to the extended options and would require substation to feed the OHW.

2.3 Option B- Cudgegong Road to Riverstone Corridor

Project Corridor

It is proposed that Option B corridor will take the following route:

- Cudgegong road to Riverstone corridor, first crossing Ponds Creek immediately west of the planned stabling facility for the North West Rail Link.
- The Corridor heads North West passing Boundary Street, Schofields Farm Road, St Albans Road, Westminister Street and Kensington Park Road.
- The Corridor then curves in a westerly direction before heading North West and meeting the Richmond Line and Railway Terrace corridor near Riverstone Road, approximately 800metres south of Riverstone Station.

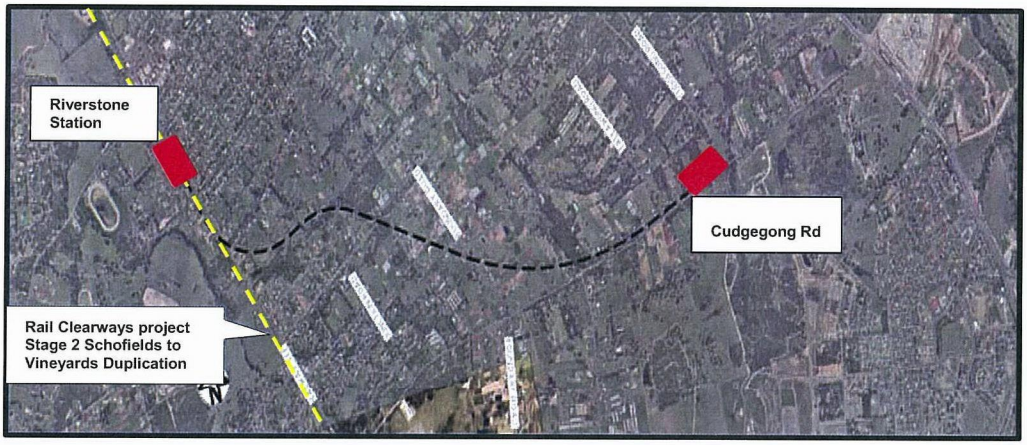


Figure 14: Option B Cudgegong Road to Riverstone Station

Track Arrangement

This Alignment will incorporate two tracks from Cudgegong to Riverstone Station on the Western Line. Preliminary concept plan and longitudinal sections were developed and are included in Appendix D.

Schofields to Riverstone on the Western Line is currently a single bi-directional track. Under Stage 2 of the Transport NSW Clearways Programme, a duplication of the line from new Schofields Station to Vineyards is planned including an upgrade to Riverstone Station.

Stations

No new stations are proposed for this scheme but modification/extension to Riverstone Station would be required.

Earthworks and Civil Structures

Bridges will be built to grade separate the rail extension from existing or likely future arterial roads. The line between Cudgegong Road to Riverstone is marked by a combination of elevated bridge structures, embankments, cuttings and viaducts. Table 3 lists summarises the civil structures and earthworks.

Section	Civil Structures	Earthworks
0.000km-0.700km		Open Cut (Approx.700m)
0.400km	Tallawong Road Overbridge	
0.700km-1.550km		Embankment (Approx. 850m)
1.175km	Hambledon Road Underbridge	
1.550km-3.800km		Open cut (Approx. 2.25km)
2.025km	Boundary Road Overbridge	
2.725km	Schofields Farm Road Overbridge	
2.825km	Saint Albans Road Overbridge	
3.025km	Westminster Street Overbridge	
3.225km	Kensington Park Road	
3.800km-4.400km	Viaduct-Sky Train (Approx. 600m)	
4.400km to 4.640km		Embankment (Approx.240m)

Table 3 Summary of civil structures and earthworks

Stabling

No new stabling facility location is being investigated in this option as there is very limited opportunity along the proposed corridor. Utilising the same Tallawong Stabling Facility (NWRL) location is proposed for this option.

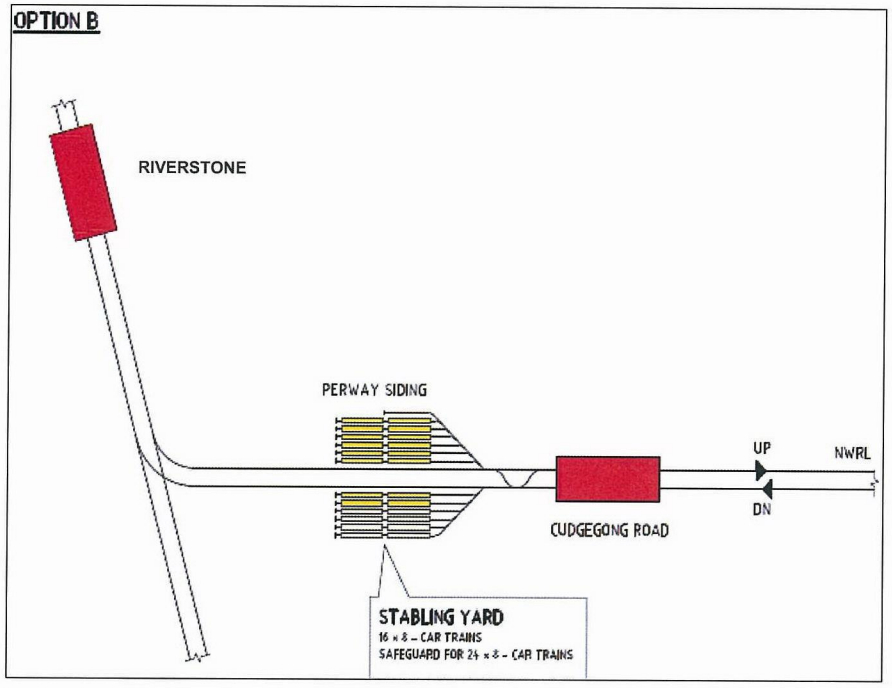


Figure 15: Stabling Facility Option B

Signalling and communication systems

Signalling system will need to be designed depending on the operation service requirement and communication system as a minimum would require electronic ticketing system, CCTV, supervisory control and data acquisition systems (SCADA), passenger information system, emergency help points, digital voice announcement system etc.

Electrical and Mechanical systems

High Voltage supply would be required for traction substation and station substation depending on the power study. 11kv power supply to the station to feed the lighting, air-condition, lift, escalators etc.

Traction voltage will be 1500v dc same as the existing network to the extended options and would require substation to feed the OHW.

Both proposed options will have new 1500v DC OHW systems for the main lines and crossovers. Any overbridges in the rail line will require OHW supports and bonding for electrolysis purposes.

2.4 Environmental Approval Process

Approvals may be required under the following environmental and heritage legislation prior to construction of the NWRL extension.

Environmental Planning and Assessment Act

Planning and development in NSW is carried out under the Environmental Planning and Assessment Act 1979 (EP&A Act) and Environmental Planning and Assessment Regulation 2000. This is achieved through assessment of development against environmental planning instruments.

Two planning instruments: the State Environmental Planning Policy (Sydney Regional Growth Centre) 2006 and the EP&A (Growth Centres) Regulation 2006, have been created under this Act. These set provisions for the development of the North West Growth Centre (NWGC) and South West Growth Centre (SWGC). The majority of both NWRL extension Options is contained with the NWGC area. Accordingly, development of either Option must be consistent with requirements under these planning instruments.

- **Option A Stage 2**

The Sydney Regional Environmental Plan No.30 – St Marys (SREP 30) is a statutory environmental planning instrument also prepared under the EP& A Act. The extent of SREP 30 is outlined in the image below. The site is zoned for a mixture of conservation, urban, employment, open space and related purposes. Each zone has a set of objectives and permissible uses.

Part of the Option A Stage 2 alignment including the future *'Lethbridge Park'* Station are located on the northern side of Forrester Road, Lethbridge Park. This area is within SREP 30 and adjacent to the regional 'Wianamatta Park'. Future development in this area must be in accordance with the requirements under SREP 30.

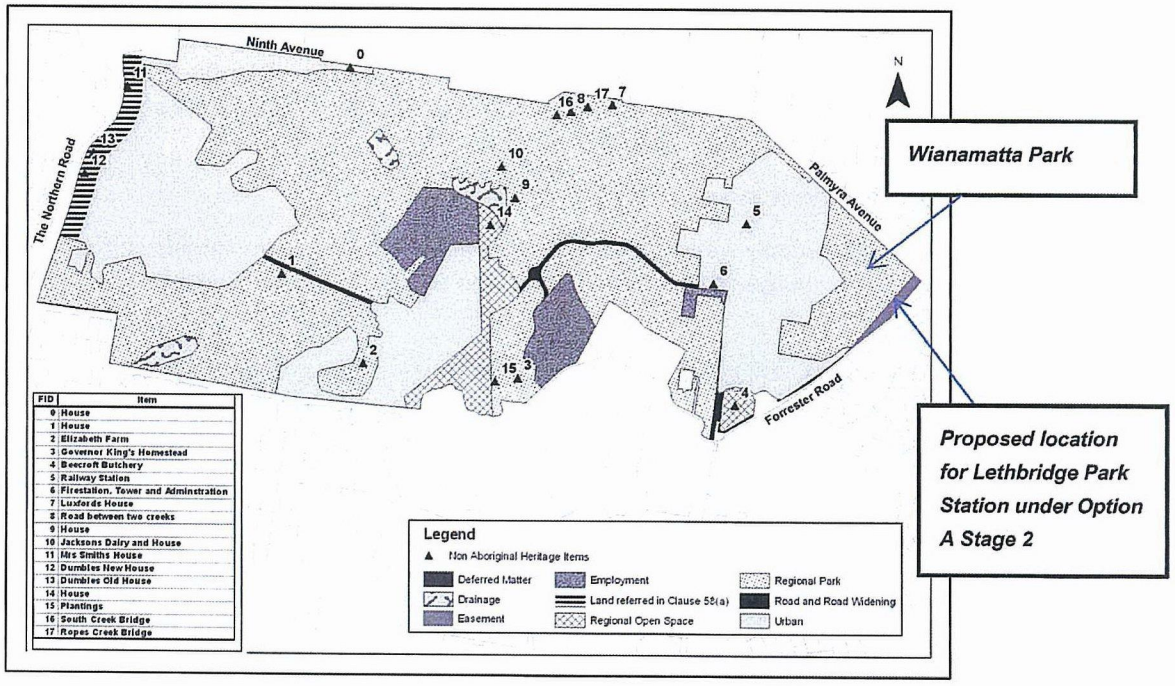


Figure 16: Sydney Regional Environmental Plan No 30 – St Marys zoning.

Threatened Species Conservation Act

The NSW Threatened Species Conservation Act 1995 (TSC Act) provides for the listing and protection of threatened plant and animal species, populations and ecological communities in NSW. Activities, that are likely to have adverse impacts upon NSW threatened species will require assessment under the TSC Act before the activity can commence.

In December 2007, Biodiversity Certification of the Sydney Growth Centres (including the North West Growth Centre) commenced under section 126G of the TSC Act. The Certification process ensures that protection of native vegetation and consideration of significant biodiversity issues takes place well in advance of the commencement of major Projects.

In July 2008, Certification for the Sydney Growth Centre was validated by the Threatened Species Conservation Amendment (Special Provisions) Act 2008.

The following image identifies the extent of Biodiversity Certification across the NWGC area:

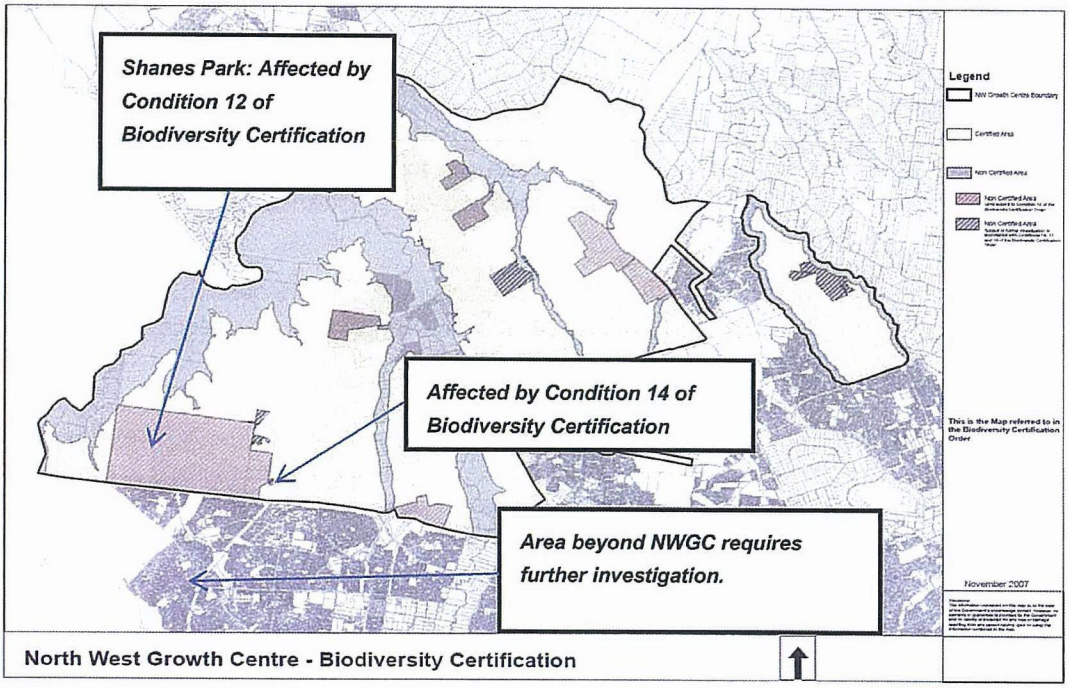


Figure 17 Extent of NWGS Biodiversity Certification as found in the NSW Government Gazette, December 2007

- Areas highlighted in yellow are regarded as 'certified' under the NWGC Biodiversity Certification. Within these areas, there is no requirement for a Threatened Species assessment during Development Applications or when undertaking local and regional infrastructure works.
- Areas which are hatched red are regarded as 'non-certified' and are subject to Condition 12 of the Biodiversity Certification. This condition states that: '*Notwithstanding any other conditions of biodiversity certification, in the lands marked by a red hatching on the biodiversity certification maps existing native vegetation must not be cleared unless it is in accordance with a plan of management or unless such clearance has*

been agreed to by the DECC' (Government Gazette of the State of NSW, Friday 14 December 2007).

- There is no change to the approval process in areas which have not been certified. Threatened species assessments may still be required before development applications can be assessed within non-certified lands.

It appears that, due to Biodiversity Certification of the region, the majority of areas considered for the NWRL extension will not require a Threatened Species assessment.

➢ **Option A Stage 2**

NWRL extension Option A Stage 2 consists of a track alignment which ends at St.Marys station, running adjacent to Shanes Park. Shanes Park has not been included in the Biodiversity Certification of the NWGC under the TSC Act. Additionally, Condition 14 of the NWGC Biodiversity Certification advises *"During or before the preparation of the relevant precinct plan(s) under the Growth Centres Development Code, a further detailed assessment must be undertaken of the areas adjoining or proximate to the Shanes Park Air Services Australia site marked in blue hatching on the biodiversity certification maps"* (Government Gazette of the State of NSW, Number 181, Friday 14 December 2007).

Development of the North West Rail Link extension Option A Stage 2, in proximity to east and south boundaries of Shanes Park, may require some amount of clearing from the stabling yard west of Marsden Park Station to chainage 11.000km.

Following this, it is unlikely that construction of extension Option A Stage 2 can proceed near Shanes Park without a management plan in place or further assessment/approval from the DECC or relevant authority.

Additionally, where Option A Stage 2 runs beyond the southern boundary of the NWGC certification area into a currently 'non-certified area', provisions under the TSC Act may apply.

***Environmental Protection and Biodiversity Conservation* Act**

Under the Environmental Protection and Biodiversity Conservation Act, approval is required from the Commonwealth Environment Minister for actions that are likely to have 'a significant impact' on the environment, whether the action is taken on Commonwealth land or not. Under the EPBC Act, an action includes a project, undertaking, development or activity.

In 2011, the NSW Government undertook a Strategic Assessment of the NSW Growth Centres. This study looked at the implications of Biodiversity Certification under the EPBC Act. Similar to that granted under the TSC Act, Biodiversity Certification under the EPBC Act enables development of the Sydney Growth Centres to proceed hand in hand with protection of the sensitive environment of NSW.

On 20 December 2011, the Commonwealth Environment Minister endorsed the Sydney Growth Centres Strategic Assessment Program. On 28 February 2012, the Commonwealth Environment Minister approved all actions associated with development of the Sydney Growth Centres as described in the Program Report.

EPBC Biodiversity Certification ensures that site by site assessment ordinarily required under the Act for a project of 'significant impact' is no longer required. This is provided that project actions with certified areas are consistent with the endorsed Program.

➢ **Option A Stage 2**

The scope of Biodiversity Certification for the NWGC under the EPBC Act mirrors that granted by the TSC Act. Shanes Park is not certified under EPBC Biodiversity Certification.

As previously discussed, development of the North West Rail Link extension Option A Stage 2, in proximity to east and south boundaries of Shanes Park, may require some amount of clearing from the stabling yard west of Marsden Park Station to chainage 11.000km.

Following this, it is unlikely that construction of extension Option A Stage 2 can proceed near Shanes Park without a management plan in place or further assessment/approval from the relevant authority.

Additionally, where Option A Stage 2 runs beyond the southern boundary of the NWGC certification area into a currently 'non-certified area', provisions under the EPBC Act may apply.

Heritage Act

Approvals must be gained from the Heritage Council when making changes to a heritage place listed on the NSW State Heritage Register or covered by an interim heritage order.

The following is a summary table outlining which legislative instruments may be triggered by the two extension options.

Legislative Trigger	Option A (Stage 1)	Option A (Stage 2)	Option B
Environmental Planning and Assessment Act	Will apply. In particular through: • SEPP (Sydney Growth Centres) 2006. • EP&A (Growth Centres) Regulation 2006	Will apply. In particular through: • SEPP (Sydney Growth Centres) 2006. • EP&A (Growth Centres) Regulation 2006 • SREP No.30 St Marys.	Will apply. In particular through: • SEPP (Sydney Growth Centres) 2006. • EP&A (Growth Centres) Regulation 2006
Threatened Species Conservation Act	Will not apply	May apply where extension runs beyond southern boundary of NWGC. A management plan or approval from DECC may be required to commence works in proximity to Shanes Park.	Will not apply
EPBC Act	Will not apply	May apply where extension runs beyond southern boundary of NWGC. A management plan or approval from DECC may be required to commence works in proximity to Shanes Park.	Will not apply
Heritage Act	Likely to apply	Likely to apply	Likely to apply

Table 4 Legislative instruments that may be triggered by construction of NWRL extension

3 PATRONAGE POTENTIAL OF OPTION A AND OPTION B

GTA Consultants have prepared a patronage potential of Option A and B. The following tasks were investigated as part of the feasibility study:

- Accessibility relationship between proposed options and other rail corridor
- Transport network and land use relationship with the two options, providing a qualitative review of the potential travel markets.
- Expected demand and estimated patronage for each option

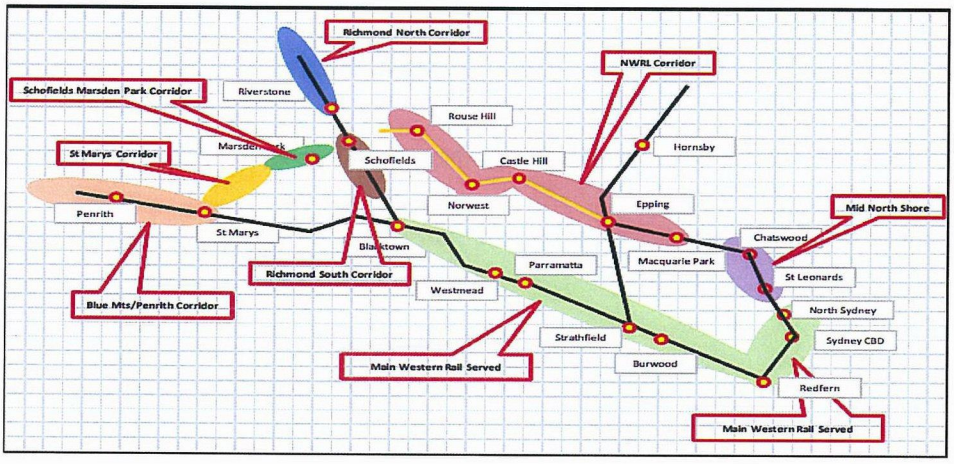


Figure 18: Schematics of rail links and rail served employment corridors

3.1 Summary of findings

Accessibility

GTA found that Option A (Stage 1 & 2) would provide direct connection between Marsden Park Schofields corridor (western NWGC) and North West Rail Link and indirect connections to other corridors interchanging at Schofields, Blacktown and St Marys (Stage 2).

It was found that Option B would provide direct connection between Riverstone and North West Rail Link and also provide indirect connection to other corridors interchanging at Blacktown.

For movements between the North West Growth Centre and other areas, Option B would require travellers to access rail system at Riverstone by other mode, such as bus or kiss and ride. GTA found this to be less attractive than either direct or indirect connections that would be established with Option A.

Employment and Population Forecast

The North West Subregion is the fastest growing sub region in Sydney and also plays an important role in accommodating Sydney's growing population.

Comparison of the population growth forecast for the study areas are indicated below

- Schofields Marsden Park corridor is expected to grow from 2,500 to 31,000 (+28,500) with a cumulative growth factor of 12.1.

- Richmond north corridor is expected to grow from 11,300 to 29,700 (+18,400) with a cumulative growth factor of 2.6.

Using this information, GTA found that Option A to be the more favourable extension alternative as population in Marsden Park Corridor will surpass that of the North Richmond Corridor over this period.

The North West Subregion in the recent years has experienced substantial growth in Jobs. Employment in the key centres of the North West is forecast to more than double by 2036.

Comparison of the employment growth forecast for the study areas are indicated below

- Schofields Marsden Park Corridor is expected to grow to 6,900 jobs from a base of 800 in 2006. The cumulative growth factor would be just under 10.
- Richmond North Corridor is expected to experience an increase of 8,900 jobs, from a base in 2006 of 12,800. The cumulative growth factor would be 1.7.

The Key corridors of NWRL: Schofields, Marsden Park and Richmond North Corridor are all expected to see substantial increases in population and employment.

- NWRL +75,000 residents and +40,000 jobs
- Schofield Marsden Park +31,000 residents and +7000 jobs (could be another +12,000)
- Richmond North +18,500 residents and +9,000 jobs

GTA found that these changes will generate a large increase in trip production and attraction in the sub-region, at an average trip rate of 3.64 per person per weekday, the new residents of just Schofields Marsden Park Corridor and Richmond North Corridor will generate some 180,000 additional trips per day.

Travel Patterns

A corridor identified in this study within the North West Growth Centre would have train use trip rates of:

- 36/200 per person for travel to the CBD
- 15.5/200 per person for travel to NWRL including Norwest
- 1/100 per person for less prospective travel
- These would be factored up by 20% to account for proximity to rail
- Indirect connections for travel to the CBD would reduce demand by 2.8%
- Indirect connections for travel to the NWRL would reduce demand by 3.1%
- Modal interchange would reduce demand by around 10% for the Schofields Marsden Park Corridor to NWRL Corridor segment in Option B.

Patronage Potential

The quantitative appraisal of patronage potential of the options indicated a substantial difference between Option A and Option B, with Option A showing the greatest Potential. Option A would extend the rail network coverage with additional stations along the route, while Option B only connect to existing stations although useful would not cover additional markets.

The qualitative and quantitative appraisals identify the preferred option on patronage potential grounds as Option A (Stage 1 and Stage 2);

The complete Patronage assessment report is provided in Appendix E.

4 IMPACT OF EXTENDING THE NWRL

An extension to the NWRL is not without drawbacks. This section observes the various impacts construction of the extension may have on the environment, community and surrounding infrastructure.

4.1 Community and Noise Impact

The NWRL extension will have substantial noise and community impact. The following have been identified for each of the three options

Impact Type	Option A (Stage 1)	Option A (Stage 2)	Option B
Property Acquisition*	Roughly 2.5km^2 of land to be acquired with this route, on existing corridor.	Roughly 4km^2 of land to be acquired with this route. Much of which is existing corridor.	Roughly 2km^2 of land to be acquired with this route. This area is zone as residential lands.
Noise Impact**	Construction and operational noise impact to residents between: • Junction Road and Railway Terrance, Schofields • Railway Terrace and Grange Avenue, Schofields	Construction and operational noise impact to residents between: • Captain Cook Drive, Willmot • Forrester Road, Lethbridge Park	Route appears to avoid high density residential areas. Potential operational and construction impact between: • Brighton Road and Cranbourne Street Riverstone
Temporary Construction*** Impact	Potential increase in construction traffic on Railway Parade/ Railway Terrace may affect nearby residents. Other impacts appear minimal.	Additional land may be required, located on Commonwealth Heritage and Protected land sites. Potential impact on native vegetation at these sites	Potential increase in construction traffic Cranbourne street and Railway Terrace may affect residents. Other impacts appear minimal.

Table 5 NWRL extension community and noise impact

*Disruption caused by property acquisition: A number of properties will be affected by the rail alignment, grade separations, New Railway Stations, car parking and train stabling facilities

**Noise Impact: There may be noise impacts to existing or future communities based on the location, design, construction and use of the proposed route.

***Temporary Construction Impact: The major components for railway construction include track formation, ballast, sleepers, rail tracks, stations and stabling, these will create temporary

negative impacts such as increased dust, light, fumes and construction-related traffic. These impacts can be mitigated through comprehensive construction management plan.

4.2 Aboriginal and European Heritage Impact

There are a number Aboriginal and European heritage sites within the North West region of NSW.

A desktop search on the Australian Heritage Information Management System reveals a number of Aboriginal places in proximity to all two NWRL extension options, the most being associated with Option A Stage 2. A thorough review of all heritage sites or places of significance that may be affected by the construction of the chosen option should be progressed as part of the Project development.

4.3 Infrastructure Easements

A range of power lines, together with other infrastructure services, exist in the area where the three rail extension options are sited. Key power easements affect parts of Marsden Park, Riverstone and North Riverstone. This infrastructure may be impacted by construction of the extension.

A high voltage power line runs adjacent to the location of the future *'Lethbridge Park'* station in Option A (Stage 2).

4.4 Impact on Existing Waterways

The main waterways potentially affected by the extension Options are sited along the length of Eastern Creek, Ponds Creek, Marsden Creek, Bells Creek and Little Creek. The following table outlines the extent of the impact.

Option A (Stage 1)	Option A (Stage 2)	Option B
First Ponds Creek	Marsden Creek	First Ponds Creek
Eastern Creek	Little Creek	
Bells Creek		

Table 6 Summary of waterways affected by construction of NWRL extension

Each Option alignment is elevated to run over these creeks where required. Additionally, each Option has been designed to run above the existing ground level. This mitigates any significant flood risk to the track. It is, however, recommended that a corridor flooding assessment be undertaken prior to the commencement of detailed design of the selected option.

The proposed NWRL extension has the potential to impact on water quality during both the construction and operation phases of the Project. As such, the potential for erosion and sedimentation from cuttings, embankments and scouring downstream of culverts as well as polluted runoff due to oils, greases and gross litter will need to be controlled in accordance with all statutory and environment protection requirements. Minimum environmental management

requirements would need to include appropriate erosion and sediment control measures. Water quality treatment measures will also need to be incorporated into the detailed drainage design.

5 NWRL EXTENSION BENEFITS ASSESSMENT

5.1 Assessment Matrix

The following have been identified as criteria for evaluating the benefits of the NWRL extension options against each other.

- Community benefits
- Economic prosperity
- Environmental sustainability
- Integration of transport and land use
- Efficiency, Coordination and Reliability
- Safety Health and Well Being

An evaluation matrix has been put together to undertake the assessment. A scoring system has been adopted for this matrix:

Rating	Description
4	Excellent
3	Good
2	Acceptable
1	Poor
0	Very Poor

The findings from the matrix assessment are documented on the following four pages.

	Objective	Option A (Stage 1)	Option A (Stage 2)	Option B
Community Benefits	Improved accessibility to transport in general	Strong connection between western North West Growth Centre precincts to key destinations to the East of Sydney Areas serviced by the Railway-Marsden Park North, Marsden Park, Marsden Park Industrial, Colebee, Schofields etc.	Strong connection to key destinations to the east (including Parramatta, Black Town and Sydney CBD) and the West (including Penrith) Areas Serviced By the Railway- Marsden Park North, Marsden Park, Marsden Park Industrial, Colebee, Schofields, Shalvey, Lethbridge Park, Ropes Crossing, North St Marys, Willmot etc.	Strong connection between Eastern North West Growth Centre precincts to key destinations to the East of Sydney. Areas Serviced By the Railway- Riverstone, Marsden Park North
	Score	3	4	2
	Reduced Community Severance	Linking community either side of North West Growth centre Grade separated Road/Rail Reduce Congestion along Grange Ave, Schofields Rd, Garfield Road, Richmond Road	Linking community to major developing business centres. Grade separated Road/Rail Reduce Congestion along Grange Ave, Schofields Rd, Garfield Road, Richmond Road, M4, Western Highway and M7/M2.	Garfield Road and Schofield Road have some influence on community severance, exacerbated by traffic levels. Grade separated Road/Rail
	Score	3	4	2
Economic Prosperity	Improved accessibility to markets for goods and services	Rail line would open up the area through direct links to central Sydney, Rousehill, Marsden Park, Schofields etc. employment and market opportunities	Rail line would open up the area through direct links to central Sydney, Parramatta, Blacktown, Rousehill, Penrith etc. employment and market opportunities	Rail line would open up the area through direct links to central Sydney, Rousehill etc. employment and market opportunities

	Objective	Option A (Stage 1)	Option A (Stage 2)	Option B
	Score	3	4	1
Environmental Sustainability	Reduced energy use	2 New Stations in the route giving more accessibility to wider community	3 New Stations in the route giving more accessibility to wider community	No new station in the route, limited opportunity compared to Option A
	Score	3	4	1
	Reduced greenhouse emissions	2 New Stations in the route giving more accessibility to wider community, net emissions would be reduced due to the greater emissions efficiency of rail transport.	3 New Stations in the route giving more accessibility to wider community, net emissions would be reduced due to the greater emissions efficiency of rail transport.	No new station in the route, limited accessibility to community compared to Option A.
	Score	3	4	1
	Improved response to climate change adaption	Areas serviced by the Railway-Marsden Park North, Marsden Park, Marsden Park Industrial, Colebee, Schofields etc. Rail line could be effectively flood-proofed, it would help keep transport moving during storm events	Areas Serviced By the Railway- Marsden Park North, Marsden Park, Marsden Park Industrial, Colebee, Schofields, Shalvey, Lethbridge Park, Ropes Crossing, and Willmot etc. Rail line could be effectively flood-proofed, it would help keep transport moving during storm events	Areas Serviced By the Railway- Riverstone, Marsden Park North Rail line could be effectively flood-proofed, it would help keep transport moving during storm events
	Score	3	4	2

	Objective	Option A (Stage 1)	Option A (Stage 2)	Option B
Integration of Transport and Land Use	Reduced Private vehicle use	Areas serviced by the Railway-Marsden Park North, Marsden Park, Marsden Park Industrial, Colebee, Schofields etc. reducing private car use in these areas	Areas Serviced By the Railway- Marsden Park North, Marsden Park, Marsden Park Industrial, Colebee, Schofields, Shalvey, Lethbridge Park, Ropes Crossing, Willmot etc. reducing private car use in these areas.	Areas Serviced By the Railway- Riverstone, Marsden Park North reducing private car use in these areas.
	Score	3	4	1
	improved access to activity centres	Rail Line would offer reduced travel times between western part of North West Growth Centre to many key destinations to east and CBD	Rail Line would offer reduced travel times between areas along the route and many key destinations including CBD, Parramatta, Blacktown, Penrith, Rosehill etc.	Rail Line would offer reduced travel times only to the eastern part of North West Growth Centre to many key destinations including CBD
	Score	2	4	1
	Fit with relevant local area objectives or plans	Allows future connection to the Western Line (Penrith).	Compliments RTA road improvement plan in the North West Region. Schofields Rd/South Street extension to Werrington Arterial	Limited Options of expansion
	Score	3	4	0
Efficiency, Coordination and Reliability	Reduced Journey times	Western Part of North West Growth Centre only will benefit from the Railway	Rail Line would offer reduced travel times to all areas along the route to many key destinations including CBD, Parramatta, Blacktown, Penrith, Rosehill etc.	No significant benefit from the Railway compared to Option A
	Score	3	4	0

	Objective	Option A (Stage 1)	Option A (Stage 2)	Option B
	Increased journey reliability	Rail line would offer more reliable and consistent travel times than road-based transport. Reduce Congestion along Grange Ave, Schofields Rd, Garfield Road, Richmond Road	Rail line would offer more reliable and consistent travel times than road-based transport. Reduce Congestion along Grange Ave, Schofields Rd, Garfield Road, Richmond Road, Great Western Highway and M7/M2	Rail line would offer more reliable and consistent travel times than road-based transport but only some benefit for Garfield Road and Schofield Road in reducing congestion
	Score	2	4	1
	Improved response to transport disruptions	Rail line would provide an alternative to road transport during peak hours, major events, storm events etc.	Rail line would provide an alternative to road transport during peak hours, major events, storm events etc.	Rail line would provide an alternative to road transport during peak hours, major events, storm events etc.
	Score	3	4	2
Safety and Health and Well being	Reduced Injuries and fatalities	Transport accidents would be reduced overall through transfer of trips from road to rail.	Transport accidents would be reduced overall through transfer of trips from road to rail.	Transport accidents would be reduced overall through transfer of trips from road to rail.
	Scores	3	4	3
	Improved air quality	Mode shift to rail results in lower emissions overall although effect on air quality may not be significant	Mode shift to rail results in lower emissions overall although effect on air quality will be significant	Mode shift to rail results in lower emissions overall although effect on air quality may not be significant
	Scores	3	4	3
	Final Score	**40**	**56**	**20**

6 RECOMMENDATIONS

Two potential rail route alignment options were mapped and then assessed through a comparison of their benefits.

Option A (Stages 1 and 2) are the preferred alignments for the NWRL extension.

The key benefits from this Option include:

- Early provision of high-quality public transport in growth areas in Sydney's North west;
- Rail line would bring significant improvement to transport choices. Strong connection between western NWGC precincts to key destinations to the east (including Parramatta, Black Town and Sydney CBD) and the West (including Penrith)
- Enhanced community access to high-order employment, education and community facilities;
- Reduced household transport costs;
- Reduced road congestion in North West Growth Centre region;
- Enhanced mobility for disadvantaged social groups;
- Reduced vehicle usage leading to lower carbon emissions and air pollution;
- Integrated land use and transport planning contributing to environmentally sustainable development;
- Reduced travel constraints between employment and residential areas;
- Direct and indirect employment opportunities during delivery of the project

The NSW Government has good reason to explore the benefits that rail infrastructure could bring to both the mobility and accessibility of the City, medical facilities, educational institutions, major sports and entertainment. Even more critically, rail infrastructure can provide the economic regeneration support that permanent public transport infrastructure can bring to local growth areas.

6.1 Way Forward

To progress the findings of this study to implementation, further actions will be required:

- Conduct more detailed patronage analysis. Surveys of community travel patterns and preferences and benchmarking against other similar rail lines could be used to validate the modelling results.
- Obtain more detailed survey and geotechnical information to develop the rail design concept in greater detail.
- Confirm a preferred route and put measures in place as quickly as possible to protect it and enable planning of associated land use development to proceed.
- Calculate the project benefits to enable a cost-benefit analysis to be completed.
- Continue to engage the community and stakeholders.

7 REFERENCES

Transport for NSW (2011) North West Rail Link Project Definition Report

Transport for NSW (2011) North West Rail Link Submission to Infrastructure Australia

North West Transport Options (2012) Planning North West Sydney's future public transport needs

AECOM (2011) Area 20 Exhibition Technical Advice-Rail Transport

Transport Road and Maritime Services (2011) Schofields Road Upgrade

Transport Road and Maritime Services (2012) Richmond Road Upgrade

Websites

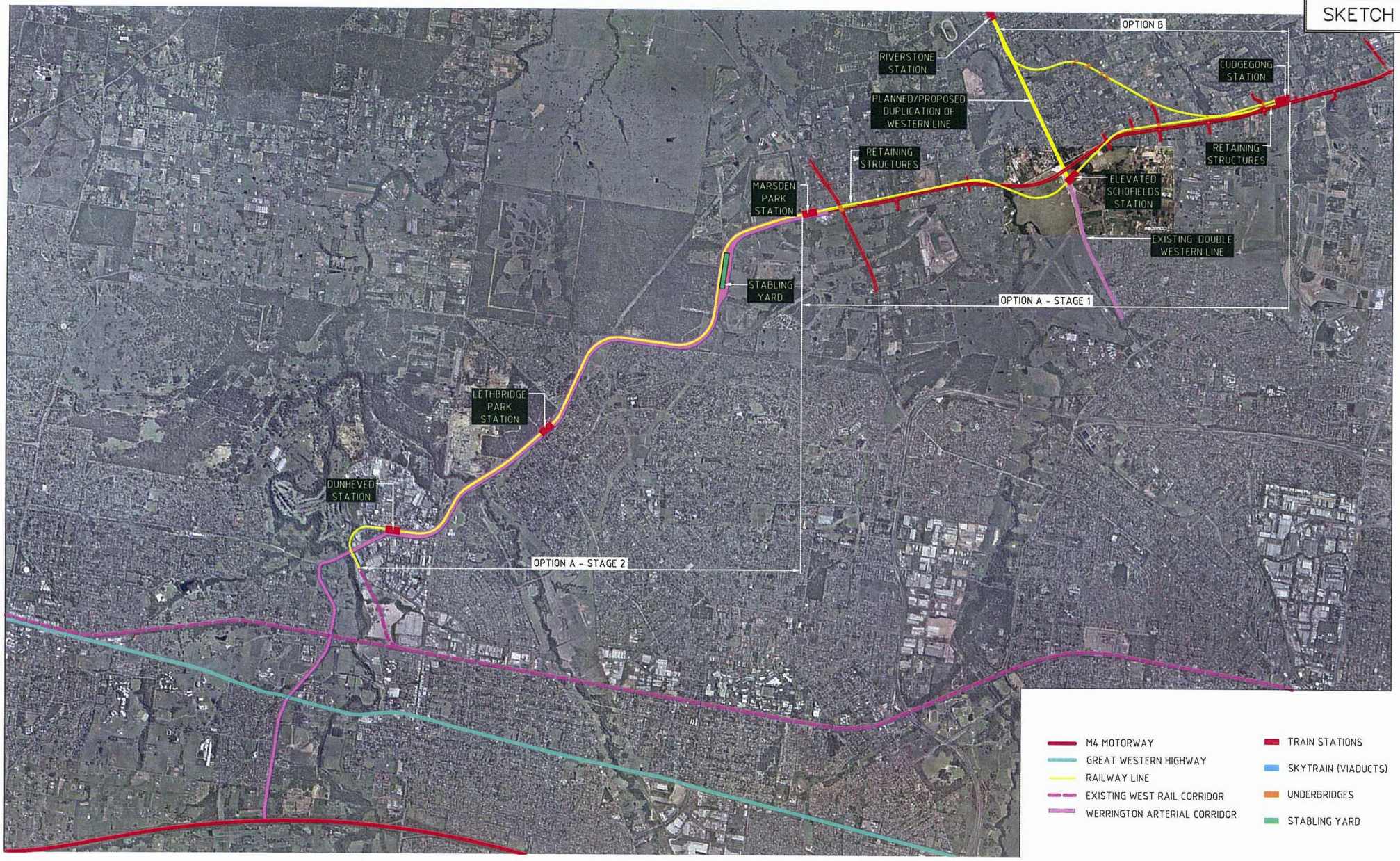
www.growthcentres.nsw.gov.au/strategicassessment-94.html

www.gcc.nsw.gov.au/biocert-63.html

Appendix A

North West Rail Link Extension-Locality Plan

SKETCH



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Grid		Approved KT	

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Project: NORTH WEST RAIL LINK

Title: NORTH WEST RAIL LINK EXTENSION
LOCALITY PLAN
OP-A (STAGE 1 & 2) & OP-B

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Appendix B

GA sketch and Long Section for Option A Stage 1

SKETCH

TRAIN STATIONS
SKYTRAIN (VIADUCTS)
UNDERBRIDGES
RETAINING STRUCTURES
SCHOFIELDS ROAD/RICHMOND ROAD
RAILWAY LINE

PLAN
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Project: NORTH WEST RAIL LINK

Title: NORTH WEST RAIL LINK EXTENSION
COVER SHEET
OPTION A - STAGE 1

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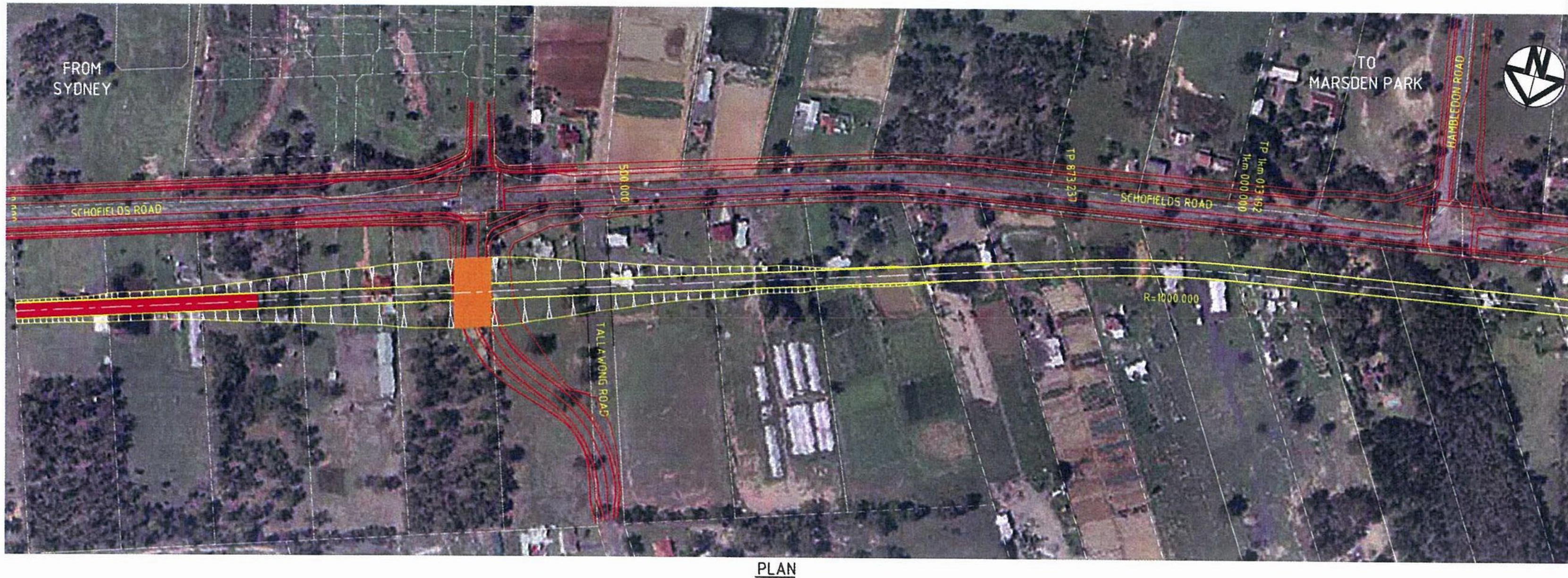

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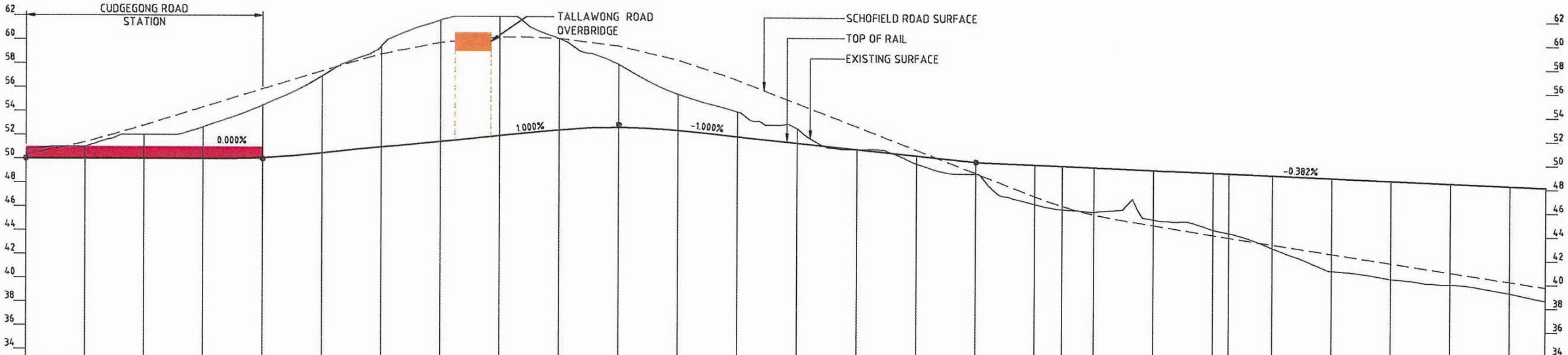

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0km 100.000	50.000	52.000
0km 150.000	50.000	52.657
0km 200.000	50.050	54.487
0km 250.000	50.500	56.947
0km 300.000	51.000	59.483
0km 350.000	51.500	61.676
0km 400.000	52.000	62.000
0km 450.000	52.500	60.169
0km 500.000	52.750	58.023
0km 550.000	52.500	55.559
0km 600.000	52.000	54.102
0km 650.000	51.500	52.719
0km 700.000	51.000	51.000
0km 750.000	50.500	49.811
0km 800.000	50.000	49.000
0km 850.000	49.809	46.488
0km 900.000	49.618	45.875
0km 950.000	49.426	45.276
1km 000.000	49.235	44.435
1km 050.000	49.044	42.908
1km 100.000	48.853	41.047
1km 150.000	48.662	40.425
1km 200.000	48.471	39.992
1km 250.000	48.279	39.255

LONGITUDINAL SECTION
SCALES - HORIZ. 1:2000 VERT. 1:200

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Client

Status: PRELIMINARY
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Height Datum	AHD	Checked SH
Grid		Approved KT

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Project: NORTH WEST RAIL LINK

Title: NORTH WEST RAIL LINK EXTENSION
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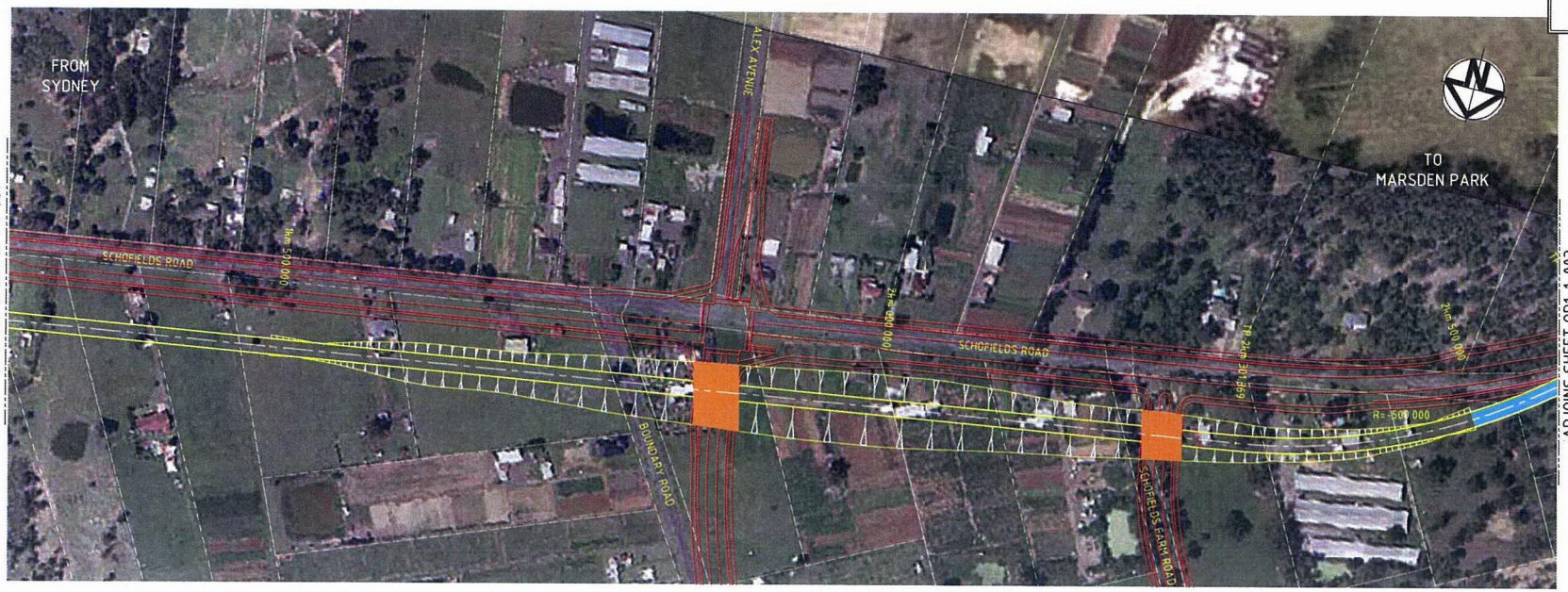

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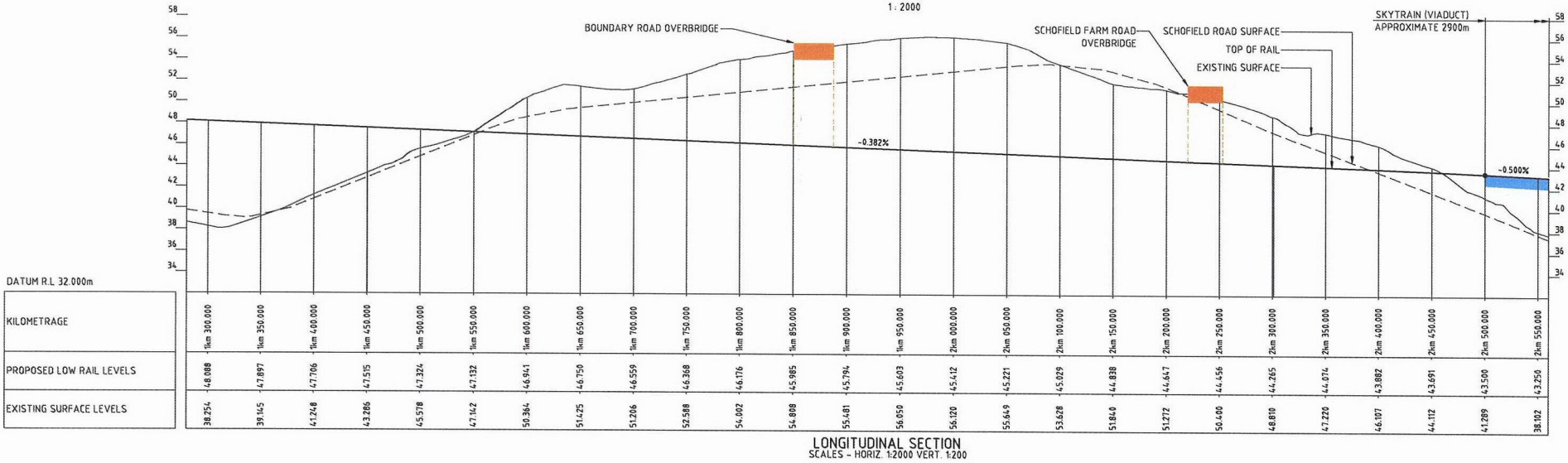

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PROPOSED LOW RAIL LEVELS	48.988	47.897	47.706	47.515	47.324	47.132	46.941	46.750	46.559	46.368	46.176	45.985	45.794	45.603	45.412	45.221	45.029	44.838	44.647	44.456	44.265	44.074	43.882	43.691	43.500	43.250
EXISTING SURFACE LEVELS	38.254	39.145	41.268	43.286	45.578	47.142	50.364	51.425	51.206	52.588	54.002	54.898	55.681	56.050	56.120	55.649	53.628	51.840	51.272	50.400	48.819	47.220	46.197	44.112	41.289	38.162

LONGITUDINAL SECTION
SCALES - HORIZ. 1:2000 VERT. 1:200

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Client

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Project: NORTH WEST RAIL LINK

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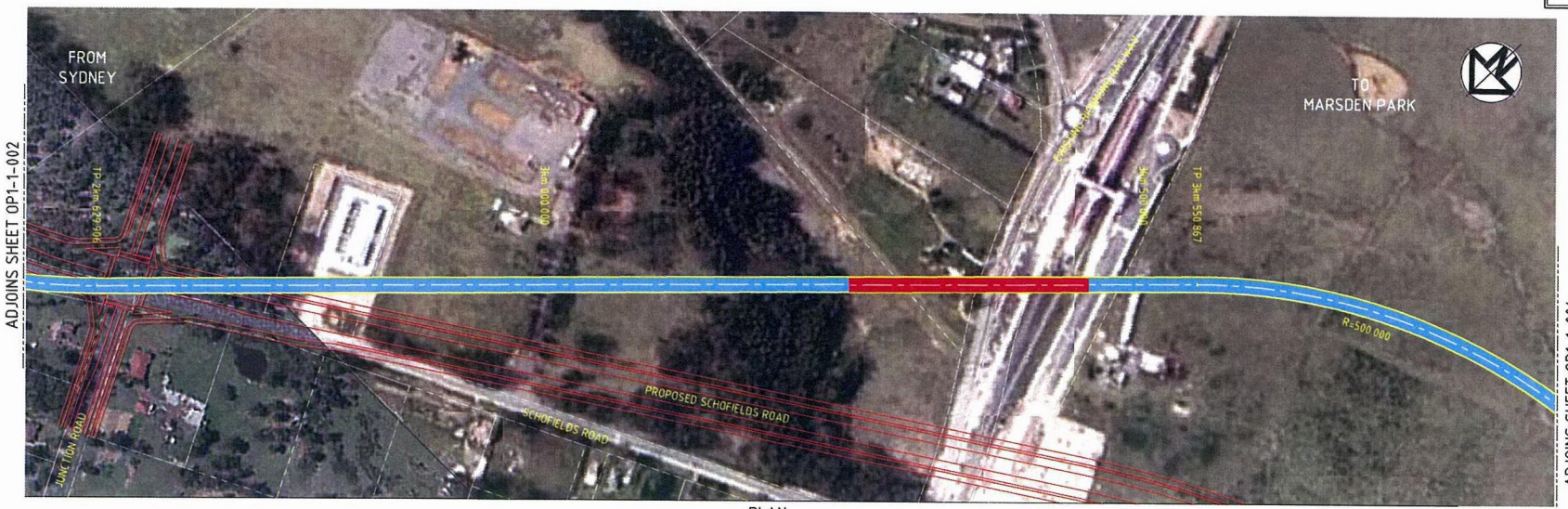

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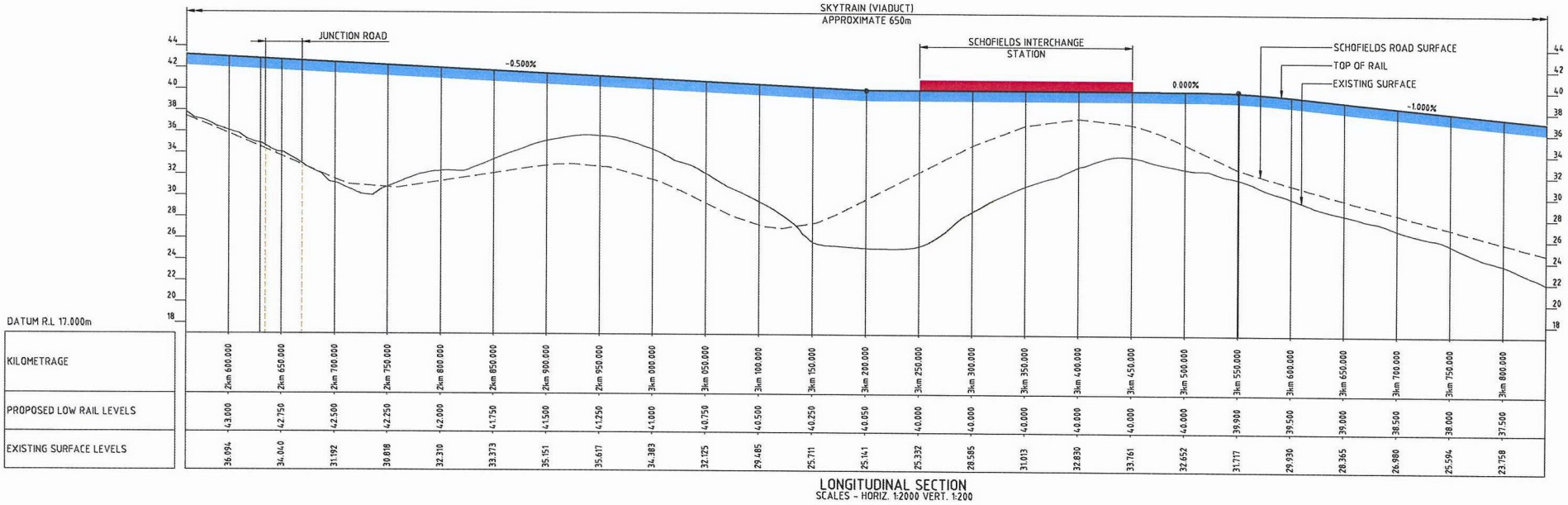

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Project: NORTH WEST RAIL LINK

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OPTION A - STAGE 1 \ SHEET 03

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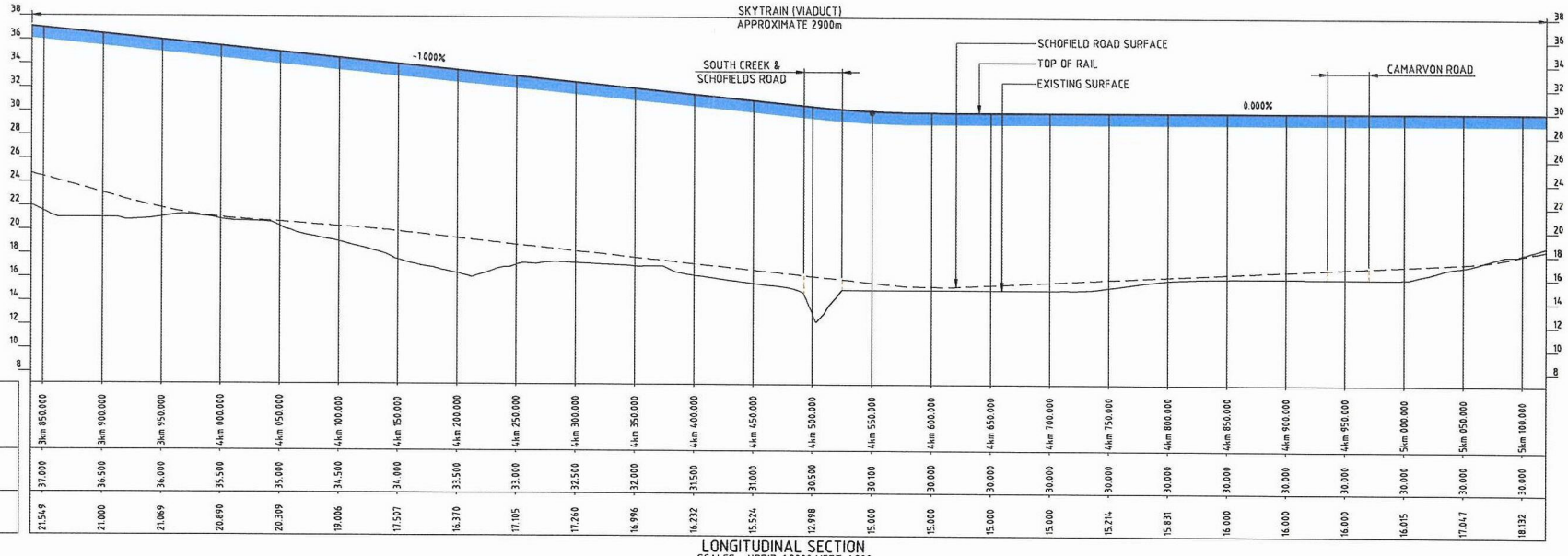

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PROPOSED LOW RAIL LEVELS	37.000	36.500	36.000	35.500	35.000	34.500	34.000	33.500	33.000	32.500	32.000	31.500	31.000	30.500	30.100	30.000	30.000	30.000	30.000	30.000	30.000	30.000	30.000	30.000	30.000	30.000
EXISTING SURFACE LEVELS	27.549	21.000	21.069	20.899	20.309	19.006	17.507	16.370	17.105	17.260	16.996	16.232	15.524	12.998	15.000	15.000	15.000	15.000	15.214	15.831	16.000	16.000	16.000	16.015	17.047	18.132

LONGITUDINAL SECTION
SCALES - HORIZ. 1:2000 VERT. 1:200

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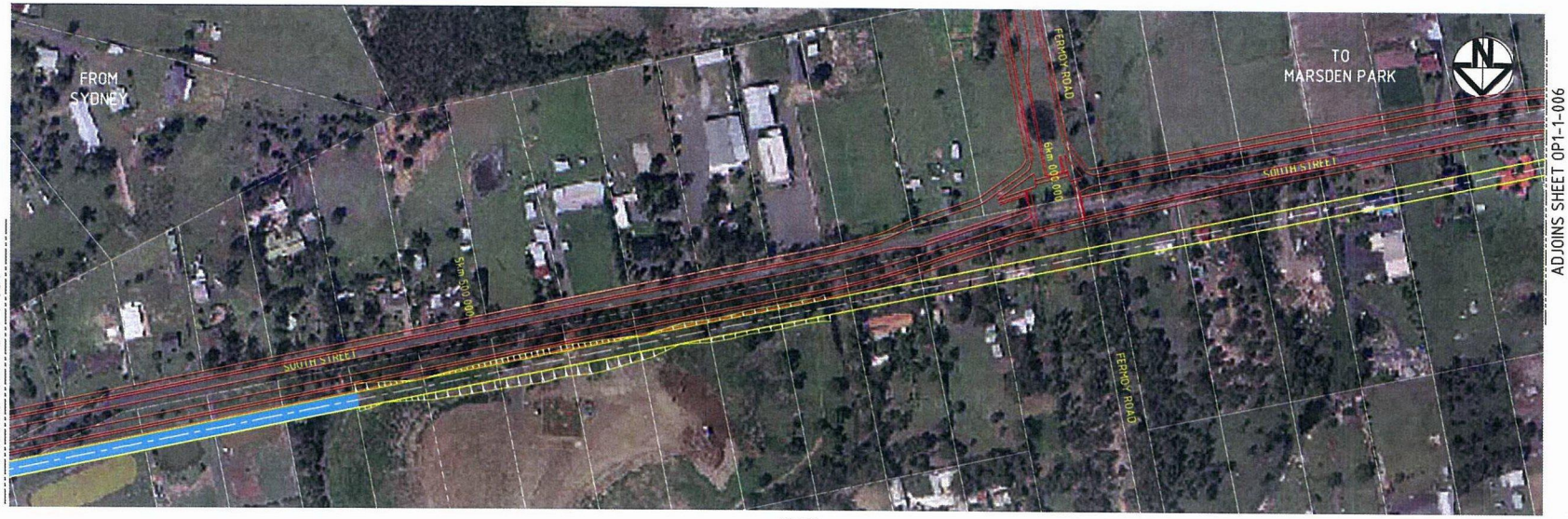

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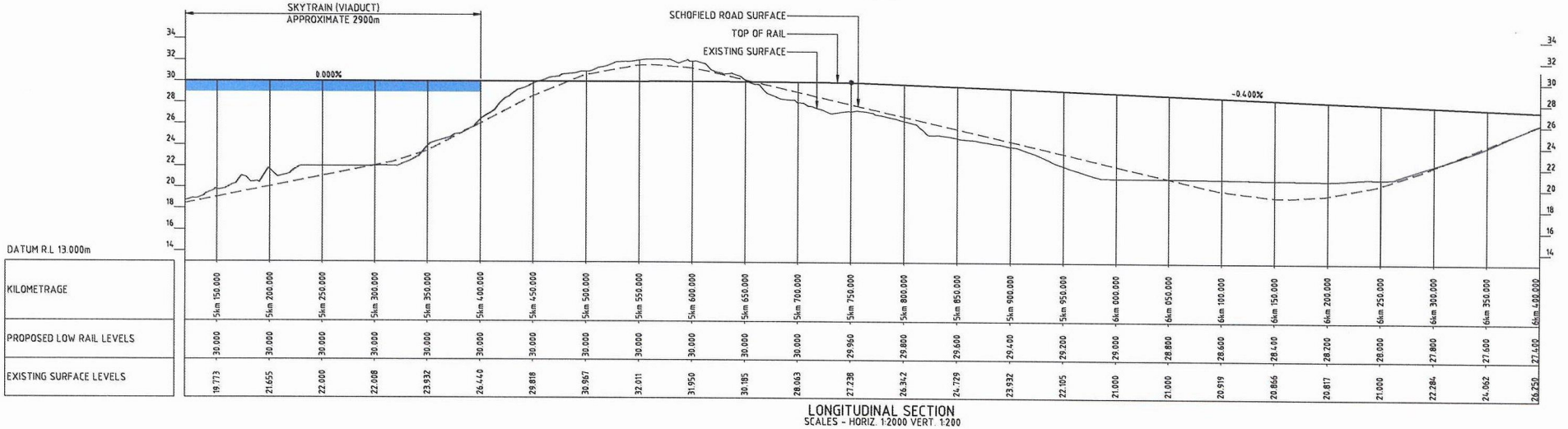

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PROPOSED LOW RAIL LEVELS	30.000	30.000	30.000	30.000	30.000	30.000	30.000	30.000	30.000	30.000	30.000	30.000	29.960	29.800	29.600	29.400	29.200	29.000	28.800	28.600	28.400	28.200	28.000	27.800	27.600	27.600
EXISTING SURFACE LEVELS	19.773	21.655	22.000	22.608	23.932	26.440	29.818	30.967	32.011	31.950	30.185	28.063	27.238	26.342	24.729	23.932	22.105	21.000	21.000	20.919	20.856	20.817	21.000	22.284	24.062	26.250

LONGITUDINAL SECTION
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Client

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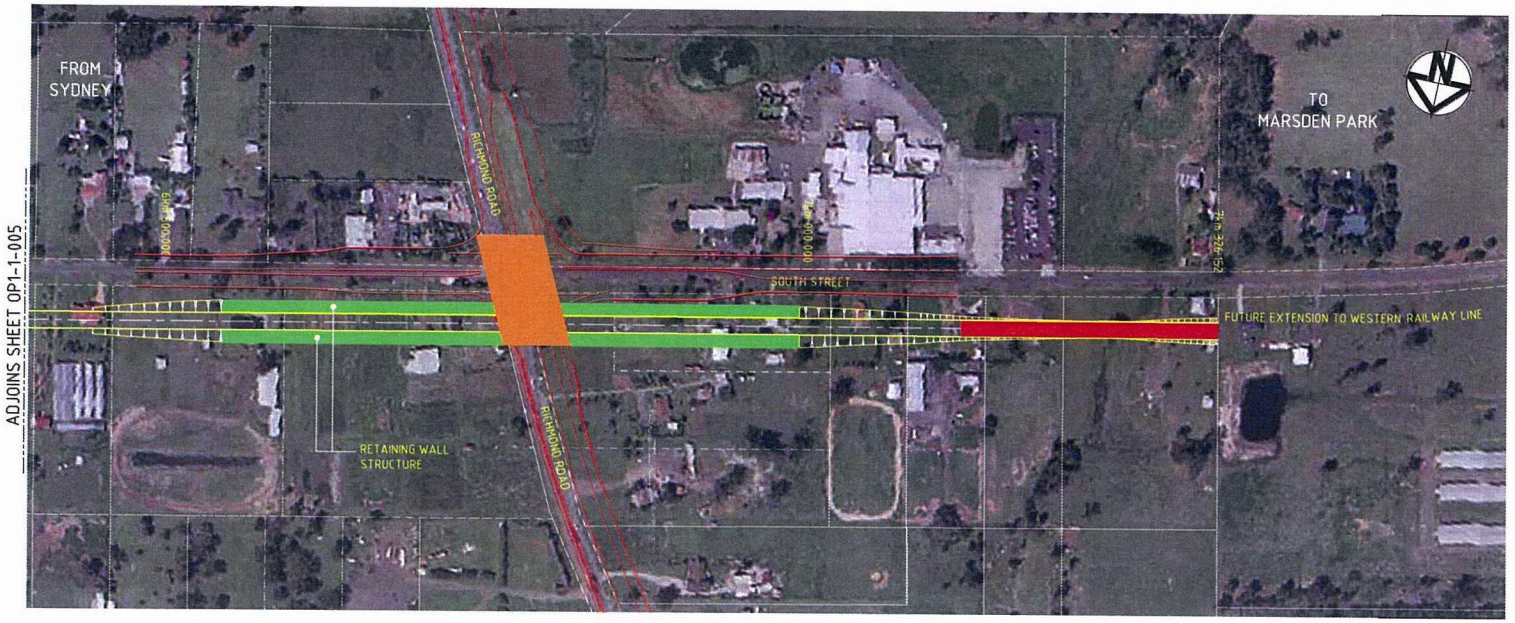

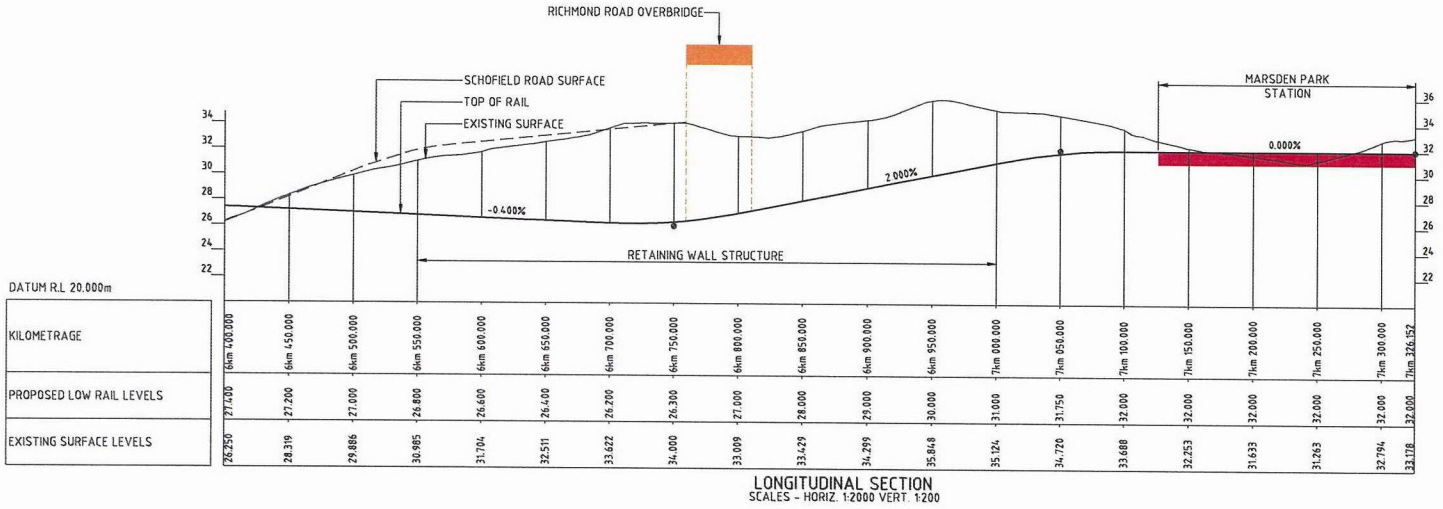

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Status: PRELIMINARY
NOT FOR CONSTRUCTION

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Project: NORTH WEST RAIL LINK

Title: NORTH WEST RAIL LINK EXTENSION
PLAN & LONGITUDINAL SECTION
OPTION A - STAGE 1 \ SHEET 06

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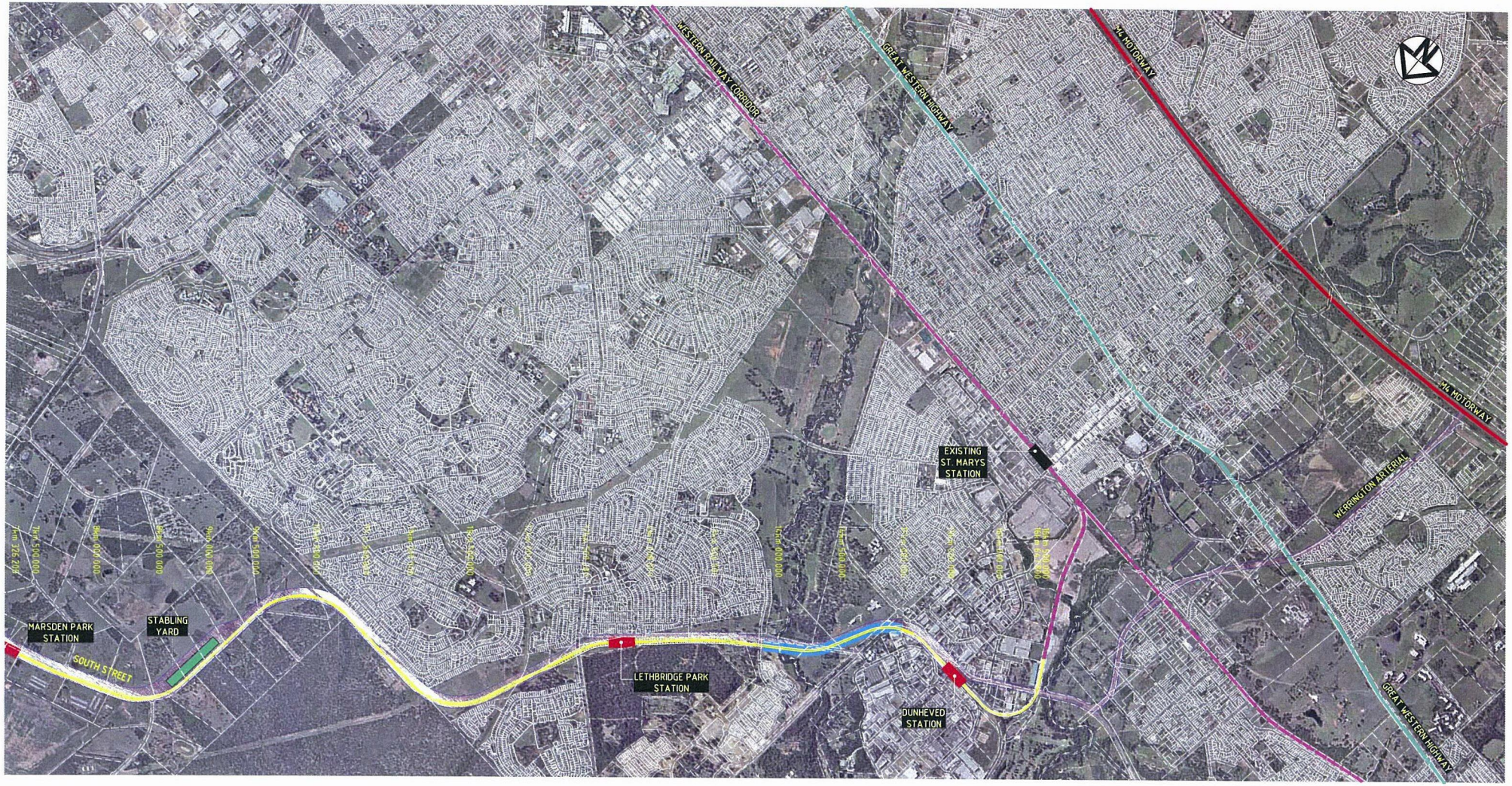
Appendix C

GA sketch and Long Section for Option A Stage 2

SKETCH



M4 MOTORWAY
GREAT WESTERN HIGHWAY
RAILWAY LINE
EXISTING WEST RAIL CORRIDOR
WERRINGTON ARTERIAL CORRIDOR

TRAIN STATIONS
EXISTING TRAIN STATION
SKYTRAIN (VIADUCTS)
UNDERBRIDGES
STABLING YARD

PLAN
1 : 15000

Issue	Description	Date
P1	FOR INFORMATION	11.05.12

0 300 600 900 1200 1500m
1 : 15000

Client

Status: PRELIMINARY
NOT FOR CONSTRUCTION

Scales	1:2000	Current Issue Signatures
		Drawn MZ
Original Size	A1	Designed VN
Height Datum	AHD	Checked SH
Grid		Approved KT
Filename:	OPA-2-000-aa004938-nsk-00.dwg	

Project: NORTH WEST RAIL LINK

Title: NORTH WEST RAIL LINK EXTENSION
COVER SHEET
OPTION A - STAGE 2

HYDER CONSULTING PTY LTD
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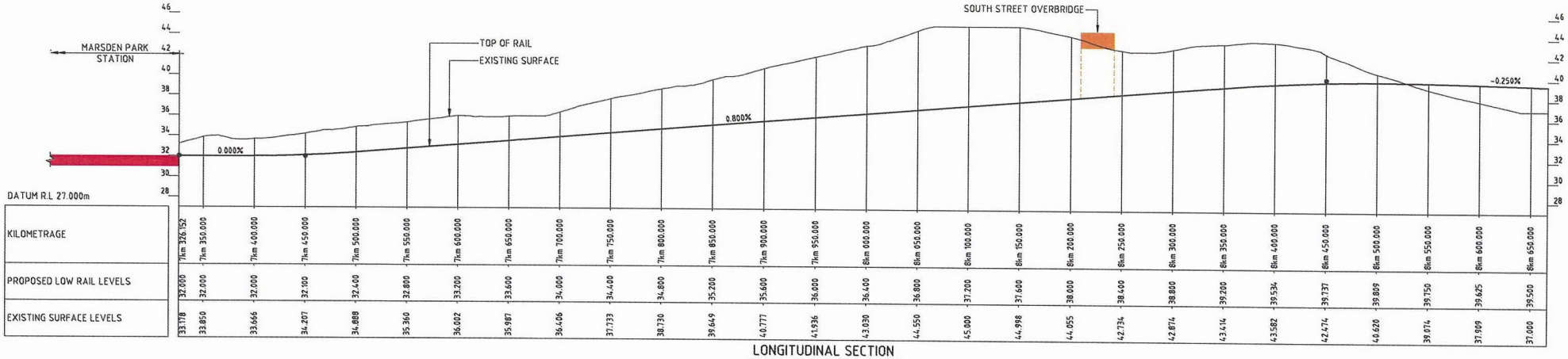
Drawing No.	Project No.	Issue
OPA-2-000-	AA004938	P1

Date Plotted: 21 May 2012 - 01:05PM File Name: F:\AA004938\E-CAD\B-Sketches\OPA-2-000-aa004938-nsk-00.dwg V1

SKETCH

PLAN
1 : 2000



LONGITUDINAL SECTION
SCALES - HORIZ. 1:2000 VERT. 1:200

Issue	Description	Date
P1	FOR INFORMATION	11.05.12

100mm on Original

0 50 100 150 200m
1 : 2000

Client

Status: PRELIMINARY
NOT FOR CONSTRUCTION

		Current Issue Signatures
Scales	1:2000	Drawn HZ
Original Size	A1	Designed VN
Height Datum	AHD	Checked SH
Grid		Approved KT
Filename:	OPA-2-001-aa004938-nsk-00.dwg	

Project: NORTH WEST RAIL LINK

Title: NORTH WEST RAIL LINK EXTENSION
PLAN & LONGITUDINAL SECTION
OPTION A - STAGE 2 \ SHEET 01

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Drawing No.	Project No.	Issue
OPA-2-001-	AA004938	P1

Date Plotted: 21 May 2012 - 01:05PM File Name: F:\AA004938\E-CAD\B-Sketches\OPA-2-001-aa004938-nsk-00.dwg V1

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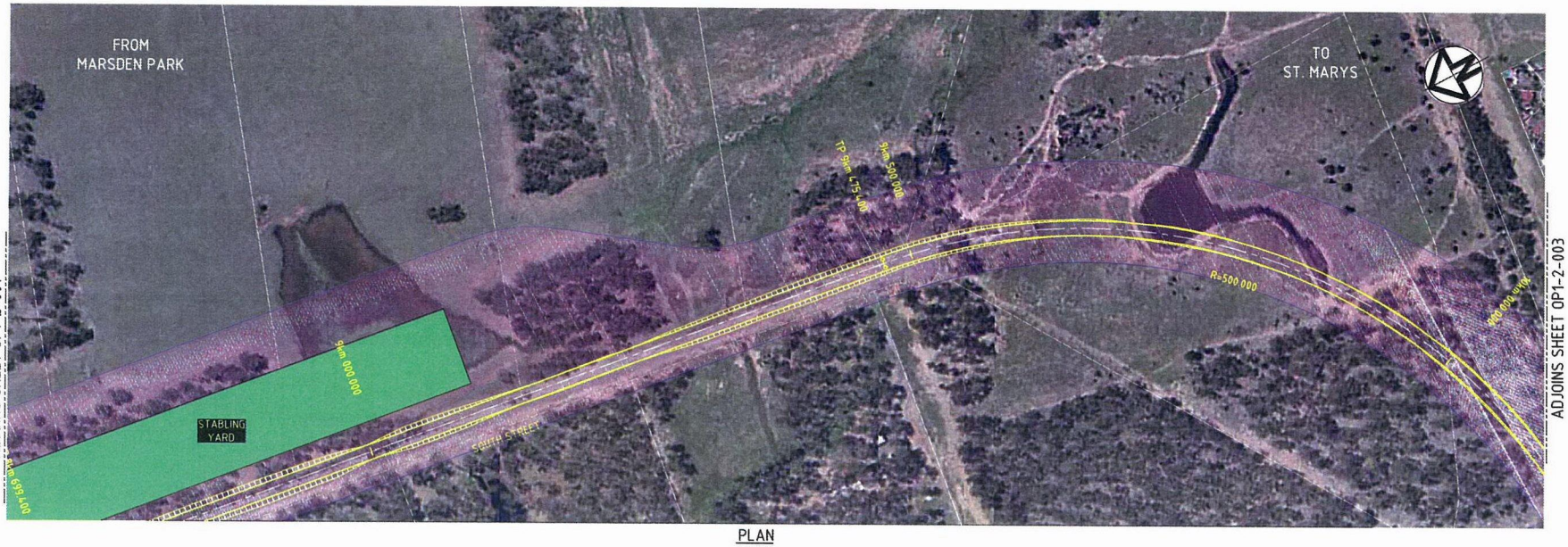

PLAN
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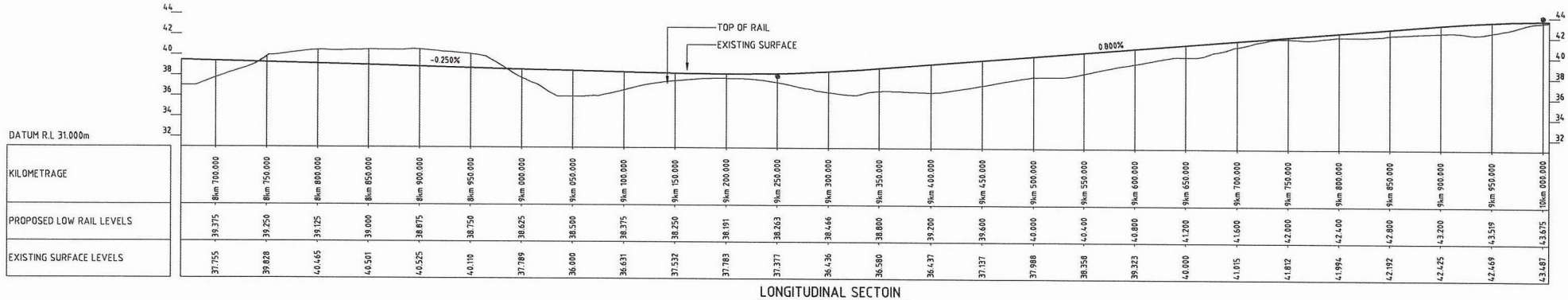

LONGITUDINAL SECTOIN
SCALES - HORIZ. 1:2000 VERT. 1:200

Issue	Description	Date
P1	FOR INFORMATION	11.05.12

100mm on Original

0 50 100 150 200m
1 : 2000

Client

Status: PRELIMINARY
NOT FOR CONSTRUCTION

Scales	1:2000	Current Issue Signatures
		Drawn HZ
Original Size	A1	Designed VN
Height Datum	AHD	Checked SH
Grid		Approved KT

Filename: OPA-2-002-aa004938-nsk-00.dwg

Project: NORTH WEST RAIL LINK

Title: NORTH WEST RAIL LINK EXTENSION
PLAN & LONGITUDINAL SECTION
OPTION A - STAGE 2 \ SHEET 02

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Drawing No.	Project No.	Issue
OPA-2-002-	AA004938	P1

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PLAN
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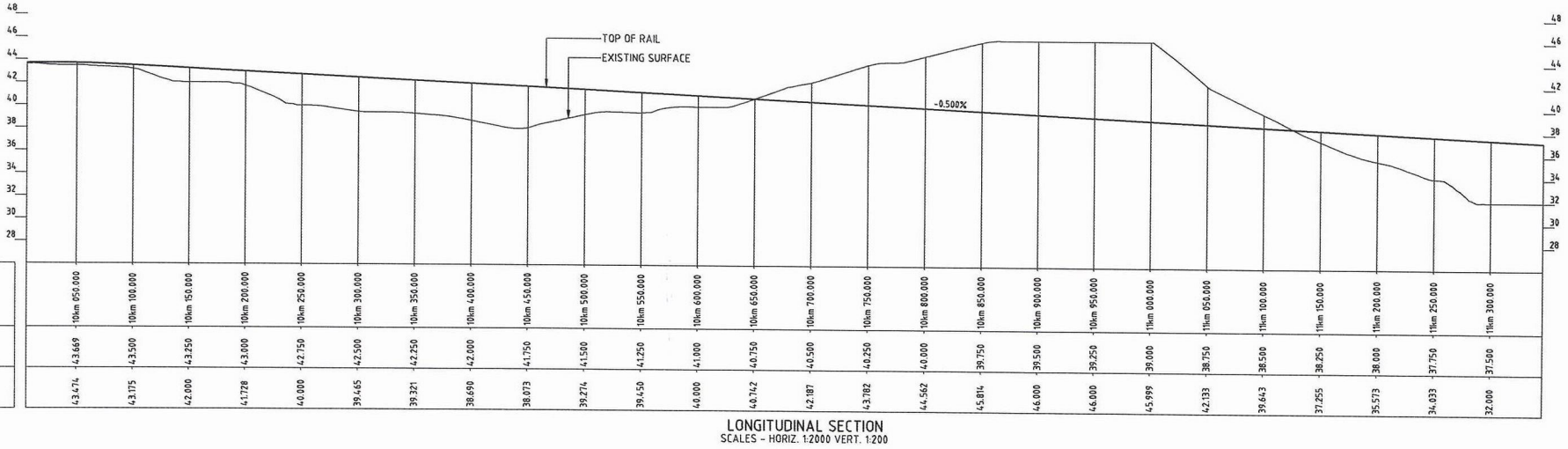

DATUM R.L 26.000m

KILOMETRAGE	PROPOSED LOW RAIL LEVELS	EXISTING SURFACE LEVELS
10km 650.000	43.669	43.474
10km 100.000	43.500	43.175
10km 150.000	43.250	42.000
10km 200.000	43.000	41.728
10km 250.000	42.750	40.000
10km 300.000	42.500	39.485
10km 350.000	42.250	39.321
10km 400.000	42.000	38.690
10km 450.000	41.750	38.073
10km 500.000	41.500	39.274
10km 550.000	41.250	39.450
10km 600.000	41.000	40.000
10km 650.000	40.750	40.742
10km 700.000	40.500	42.187
10km 750.000	40.250	43.782
10km 800.000	40.000	44.562
10km 850.000	39.750	45.814
10km 900.000	39.500	46.000
10km 950.000	39.250	46.000
11km 000.000	39.000	45.999
11km 050.000	38.750	42.133
11km 100.000	38.500	39.643
11km 150.000	38.250	37.255
11km 200.000	38.000	35.573
11km 250.000	37.750	34.033
11km 300.000	37.500	32.000

LONGITUDINAL SECTION
SCALES - HORIZ. 1:2000 VERT. 1:200

Issue	Description	Date
P1	FOR INFORMATION	11.05.12

100mm on Original

0 50 100 150 200m
1 : 2000

Client

Status: PRELIMINARY
NOT FOR CONSTRUCTION

Scales	1:2000	Current Issue Signatures
		Drawn MZ
Original Size	A1	Designed VN
Height Datum	AHD	Checked SH
Grid		Approved KT

Filename: OPA-2-003-aa004938-nsk-00.dwg

Project: NORTH WEST RAIL LINK

Title: NORTH WEST RAIL LINK EXTENSION
PLAN & LONGITUDINAL SECTION
OPTION A - STAGE 2 \ SHEET 03

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Drawing No.	Project No.	Issue
OPA-2-003-	AA004938	P1

Date Plotted: 21 May 2012 - 01:06PM File Name: F:\AA004938\E-CAD\B-Sketches\OPA-2-003-aa004938-nsk-00.dwg V1

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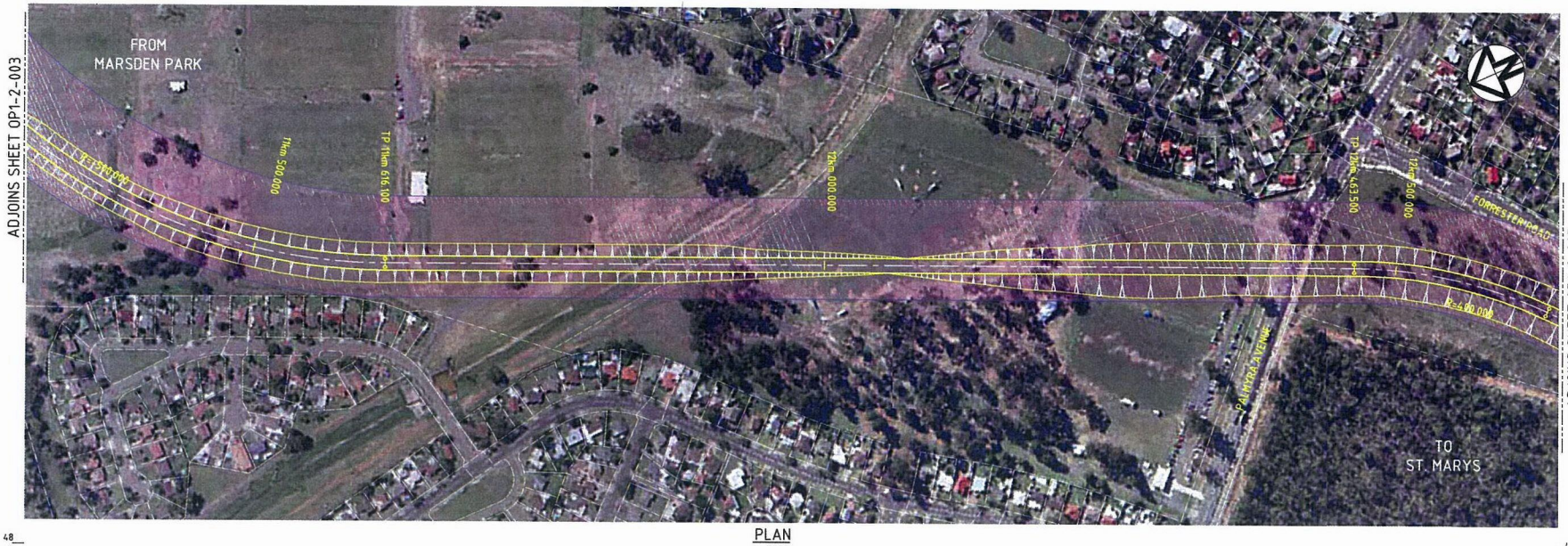
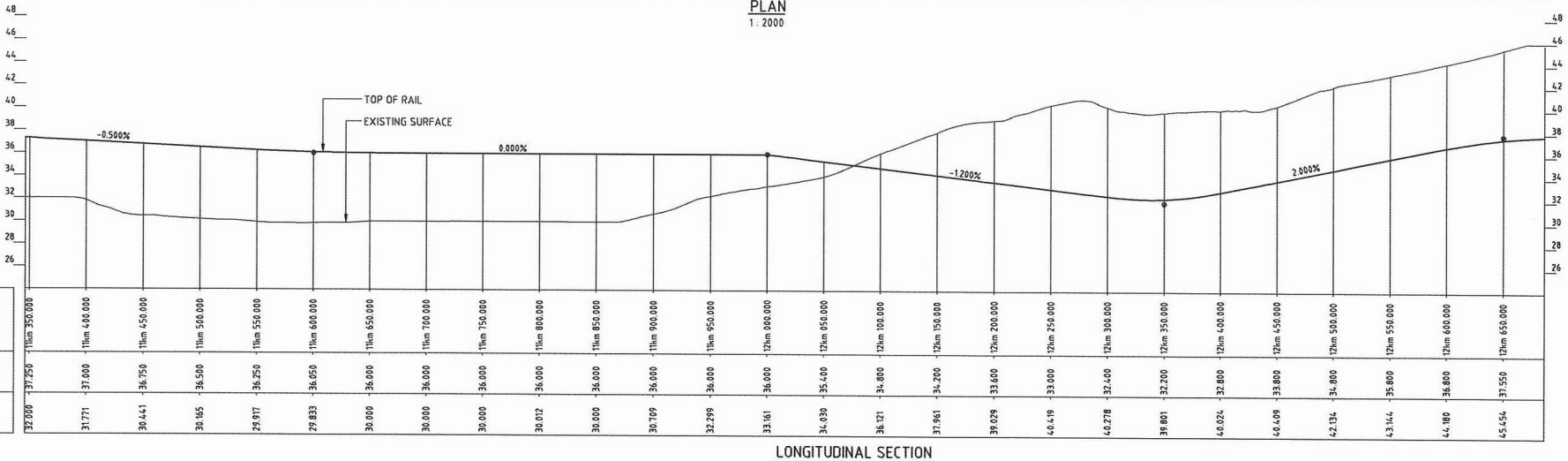


PLAN
1 : 2000



DATUM R.L 24.000m

KILOMETRAGE	PROPOSED LOW RAIL LEVELS	EXISTING SURFACE LEVELS
11km 350.000	37.250	32.000
11km 400.000	37.000	31.771
11km 450.000	36.750	30.441
11km 500.000	36.500	30.165
11km 550.000	36.250	29.917
11km 600.000	36.050	29.833
11km 650.000	36.000	30.000
11km 700.000	36.000	30.000
11km 750.000	36.000	30.000
11km 800.000	36.000	30.012
11km 850.000	36.000	30.000
11km 900.000	36.000	30.709
11km 950.000	36.000	32.299
12km 000.000	36.000	33.161
12km 050.000	35.400	34.038
12km 100.000	34.800	36.121
12km 150.000	34.200	37.961
12km 200.000	33.600	39.029
12km 250.000	33.000	40.419
12km 300.000	32.400	40.278
12km 350.000	32.200	39.801
12km 400.000	32.800	40.024
12km 450.000	33.800	40.409
12km 500.000	34.800	42.134
12km 550.000	35.800	43.144
12km 600.000	36.800	44.180
12km 650.000	37.550	45.454

LONGITUDINAL SECTION
SCALES - HORIZ. 1:2000 VERT. 1:200

Issue	Description	Date
P1	FOR INFORMATION	11.05.12

100mm on Original

0 50 100 150 200m
1 : 2000

Client

Status: PRELIMINARY
NOT FOR CONSTRUCTION

Scales	1:2000	Current Issue Signatures
		Drawn HZ
Original Size	A1	Designed VN
Height Datum	AHD	Checked SH
Grid		Approved KT
Filename:	OPA-2-004-aa004938-nsk-00.dwg	

Project: NORTH WEST RAIL LINK

Title: NORTH WEST RAIL LINK EXTENSION
PLAN & LONGITUDINAL SECTION
OPTION A - STAGE 2 \ SHEET 04

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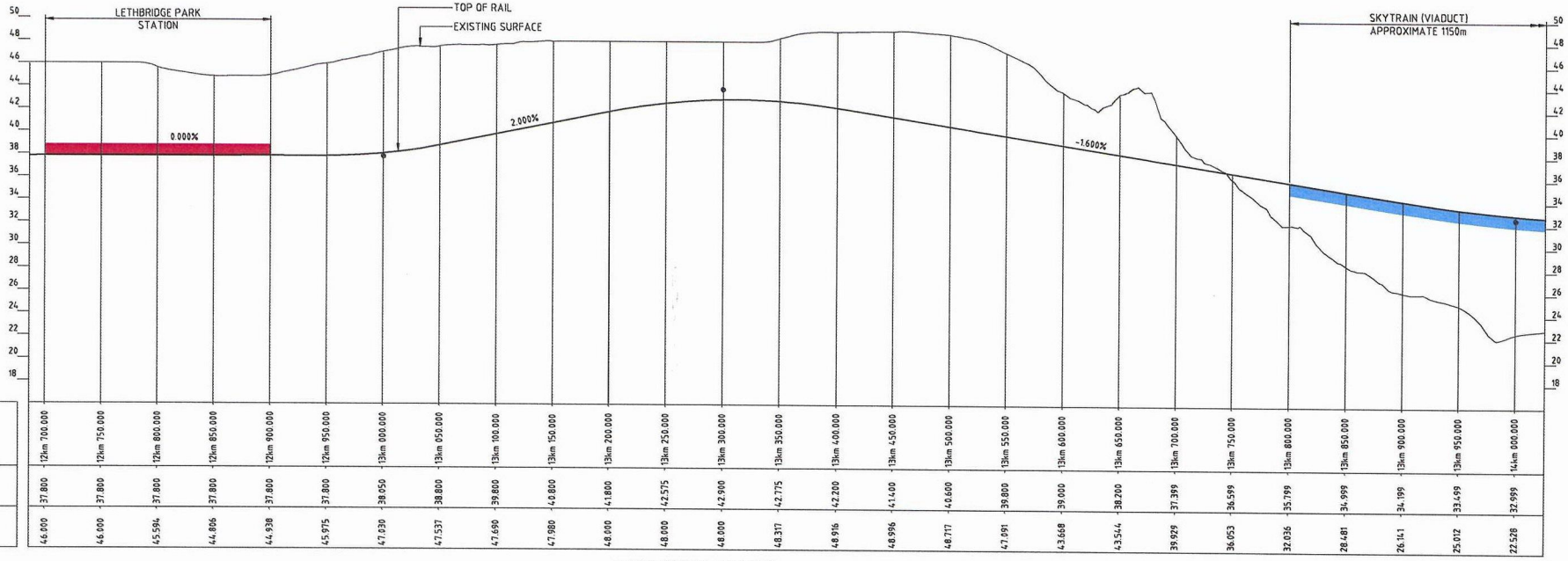
OPA-2-004-	AA004938	P1

Date Plotted: 21 May 2012 - 01:06PM File Name: F:\AA004938\E-CAD\B-Sketches\OPA-2-004-aa004938-nsk-00.dwg V1

SKETCH

PLAN
1 : 2000



DATUM R.L 16.000m

KILOMETRAGE	PROPOSED LOW RAIL LEVELS	EXISTING SURFACE LEVELS
12km 700.000	37.800	46.000
12km 750.000	37.800	46.000
12km 800.000	37.800	45.594
12km 850.000	37.800	44.806
12km 900.000	37.800	44.938
12km 950.000	37.800	45.975
13km 000.000	38.050	47.930
13km 050.000	38.800	47.537
13km 100.000	39.800	47.690
13km 150.000	40.800	47.980
13km 200.000	41.800	48.000
13km 250.000	42.575	48.000
13km 300.000	42.900	48.000
13km 350.000	42.775	48.317
13km 400.000	42.200	48.916
13km 450.000	41.400	48.996
13km 500.000	40.600	48.717
13km 550.000	39.800	47.091
13km 600.000	39.000	43.668
13km 650.000	38.200	43.544
13km 700.000	37.399	39.929
13km 750.000	36.599	36.053
13km 800.000	35.799	32.036
13km 850.000	34.999	28.481
13km 900.000	34.199	26.141
13km 956.000	33.499	25.012
14km 000.000	32.999	22.528

LONGITUDINAL SECTION
SCALES - HORIZ. 1:2000 VERT. 1:200

Issue	Description	Date
P1	FOR INFORMATION	11.05.12

100mm on Original

0 50 100 150 200m
1 : 2000

Client

Status: PRELIMINARY
NOT FOR CONSTRUCTION

Scales	1:2000	Current Issue Signatures
		Drawn MZ
Original Size	A1	Designed VN
Height Datum	AHD	Checked SH
Grid		Approved KT

Filename: OPA-2-005-aa004938-nsk-00.dwg

Project: NORTH WEST RAIL LINK

Title: NORTH WEST RAIL LINK EXTENSION
PLAN & LONGITUDINAL SECTION
OPTION A - STAGE 2 \ SHEET 05

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Drawing No.	Project No.	Issue
OPA-2-005-	AA004938	P1

Date Plotted: 21 May 2012 - 01:06PM File Name: F:\AA004938\E-CAD\B-Sketches\OPA-2-005-aa004938-nsk-00.dwg V1

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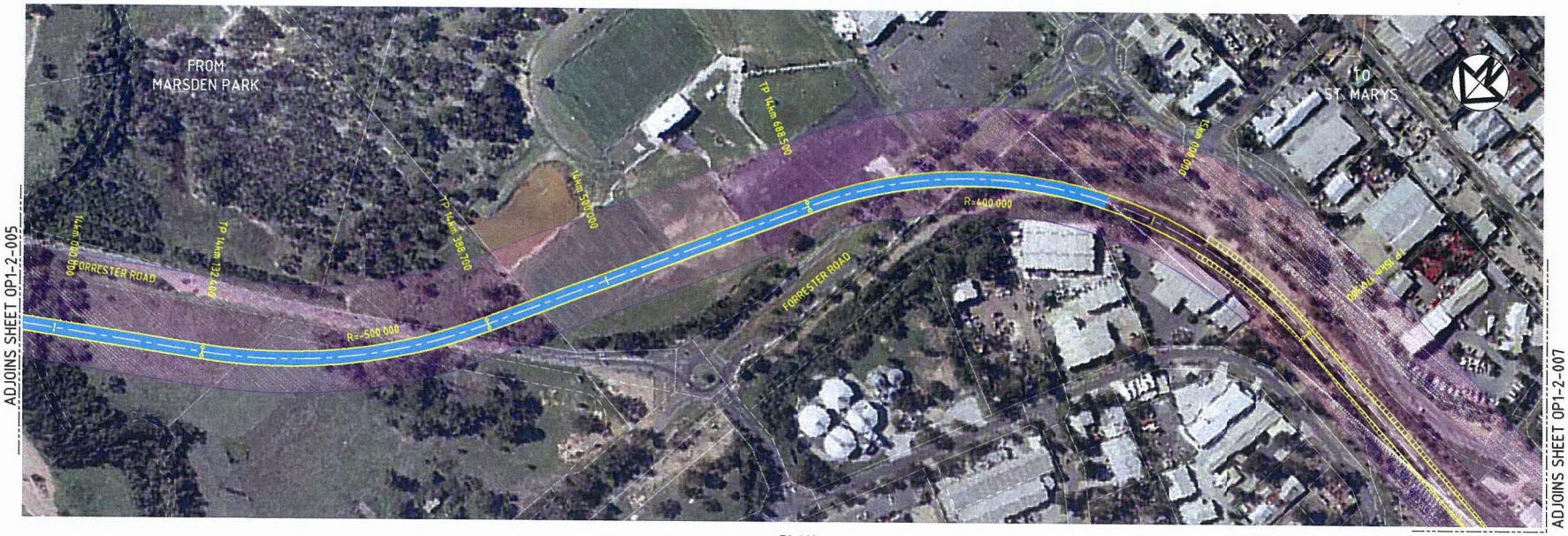
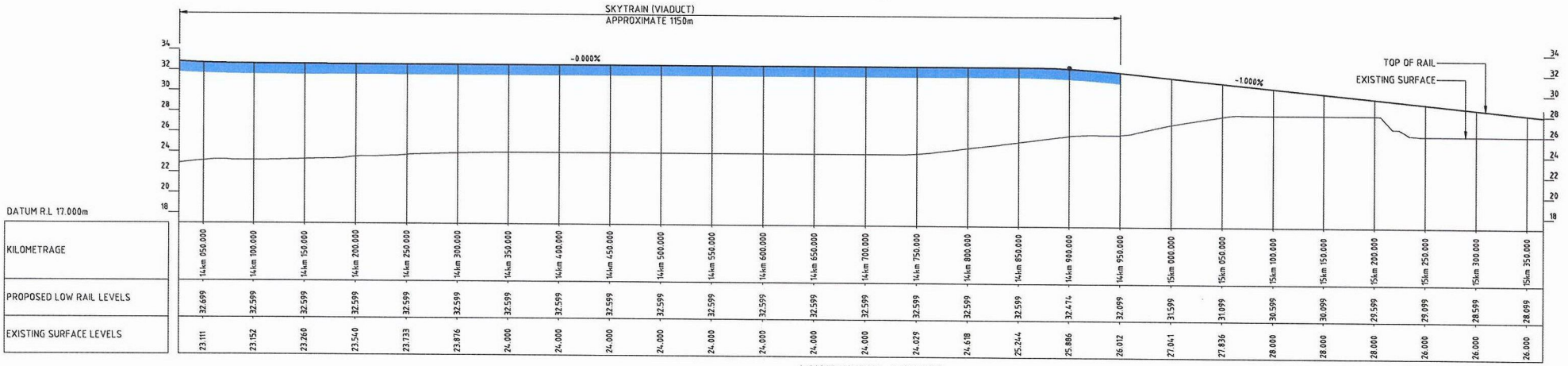


PLAN
1 : 2000



DATUM R.L 17.000m

KILOMETRAGE	PROPOSED LOW RAIL LEVELS	EXISTING SURFACE LEVELS
14km 050.000	32.699	23.111
14km 100.000	32.599	23.152
14km 150.000	32.599	23.260
14km 200.000	32.599	23.540
14km 250.000	32.599	23.733
14km 300.000	32.599	23.876
14km 350.000	32.599	24.000
14km 400.000	32.599	24.000
14km 450.000	32.599	24.000
14km 500.000	32.599	24.000
14km 550.000	32.599	24.000
14km 600.000	32.599	24.000
14km 650.000	32.599	24.000
14km 700.000	32.599	24.000
14km 750.000	32.599	24.029
14km 800.000	32.599	24.618
14km 850.000	32.599	25.244
14km 900.000	32.474	25.886
14km 950.000	32.099	26.012
15km 000.000	31.599	27.041
15km 050.000	31.099	27.836
15km 100.000	30.599	28.000
15km 150.000	30.099	28.000
15km 200.000	29.599	28.000
15km 250.000	29.099	26.000
15km 300.000	28.599	26.000
15km 350.000	28.099	26.000

LONGITUDINAL SECTION
SCALES - HORIZ. 1:2000 VERT. 1:200

Issue	Description	Date
P1	FOR INFORMATION	11.05.12

100mm on Original

0 50 100 150 200m
1 : 2000

Client

Status: PRELIMINARY
NOT FOR CONSTRUCTION

Scales	1:2000	Current Issue Signatures
		Drawn HZ
Original Size	A1	Designed VN
Height Datum	AHD	Checked SH
Grid		Approved KT

Filename: OPA-2-006-aa004938-nsk-00.dwg

Project: NORTH WEST RAIL LINK

Title: NORTH WEST RAIL LINK EXTENSION
PLAN & LONGITUDINAL SECTION
OPTION A - STAGE 2 \ SHEET 06

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OPA-2-006-	AA004938	P1

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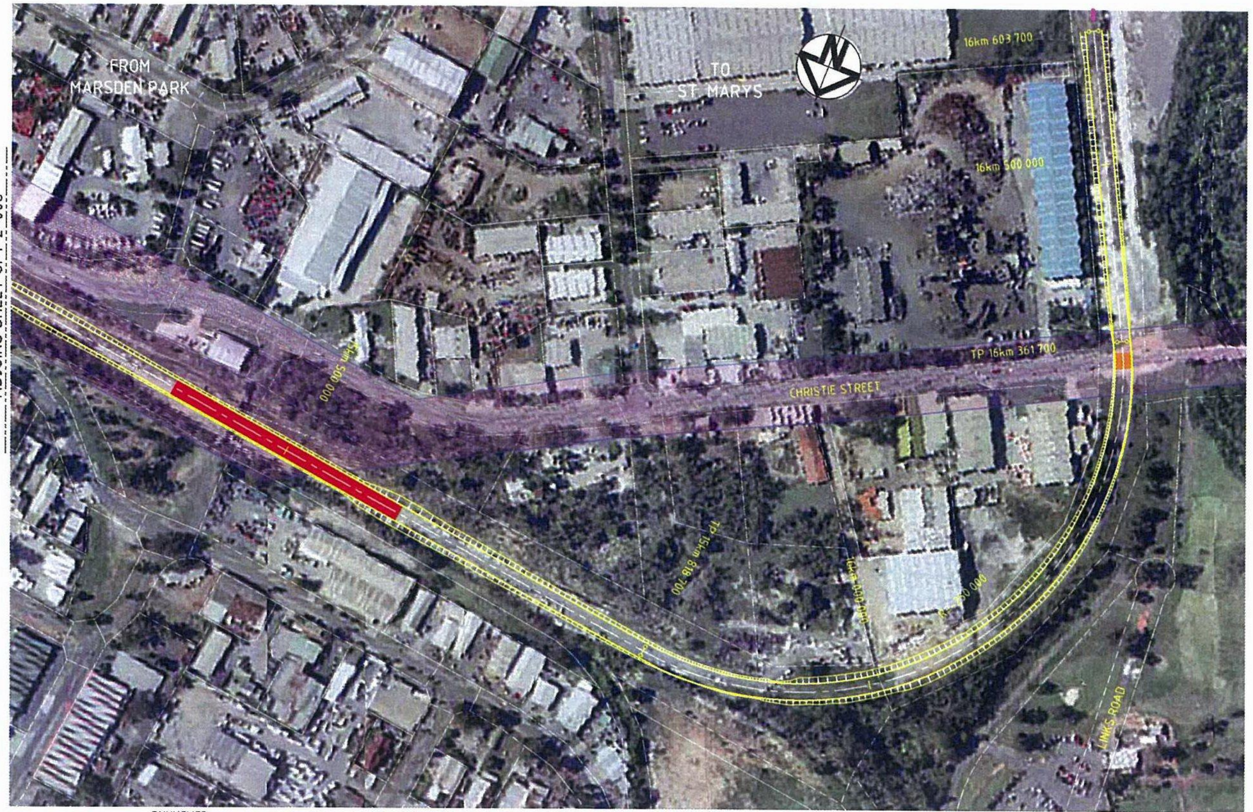
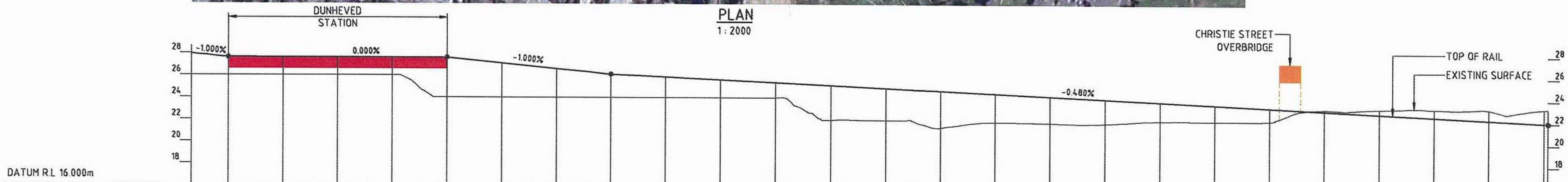


PLAN
1 : 2000



KILOMETRAGE	15km 400.000	15km 450.000	15km 500.000	15km 550.000	15km 600.000	15km 650.000	15km 700.000	15km 750.000
PROPOSED LOW RAIL LEVELS	27.599	27.599	27.599	27.599	27.599	27.099	26.599	26.099
EXISTING SURFACE LEVELS	26.000	26.000	26.000	26.000	24.000	24.000	24.000	24.000

KILOMETRAGE	15km 800.000	15km 850.000	15km 900.000	15km 950.000	16km 000.000	16km 050.000	16km 100.000	16km 150.000
PROPOSED LOW RAIL LEVELS	25.859	25.619	25.379	25.139	24.899	24.659	24.419	24.178
EXISTING SURFACE LEVELS	24.000	24.000	24.000	22.000	22.000	21.303	21.849	21.773

KILOMETRAGE	16km 200.000	16km 250.000	16km 300.000	16km 350.000	16km 400.000	16km 450.000	16km 500.000	16km 550.000	16km 600.000 16km 603.712
PROPOSED LOW RAIL LEVELS	23.938	23.698	23.458	23.218	22.978	22.738	22.498	22.258	22.018 22.000
EXISTING SURFACE LEVELS	21.744	21.996	22.000	22.000	23.123	23.174	23.206	23.195	23.271 23.287

LONGITUDINAL SECTION
SCALES - HORIZ. 1:2000 VERT. 1:200

Issue	Description	Date
P1	FOR INFORMATION	11.05.12

0 50 100 150 200m
1 : 2000

100mm on Original

Client

Status: **PRELIMINARY**
NOT FOR CONSTRUCTION

Scales	1:2000	Current Issue Signatures
		Drawn MZ
Original Size	A1	Designed VN
Height Datum	AHD	Checked SH
Grid		Approved KT
Filename:	OPA-2-007-aa004938-nsk-00.dwg	

Project: NORTH WEST RAIL LINK

Title: NORTH WEST RAIL LINK EXTENSION
PLAN & LONGITUDINAL SECTION
OPTION A - STAGE 2 \ SHEET 07

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Drawing No.	Project No.	Issue
OPA-2-007-	AA004938	P1

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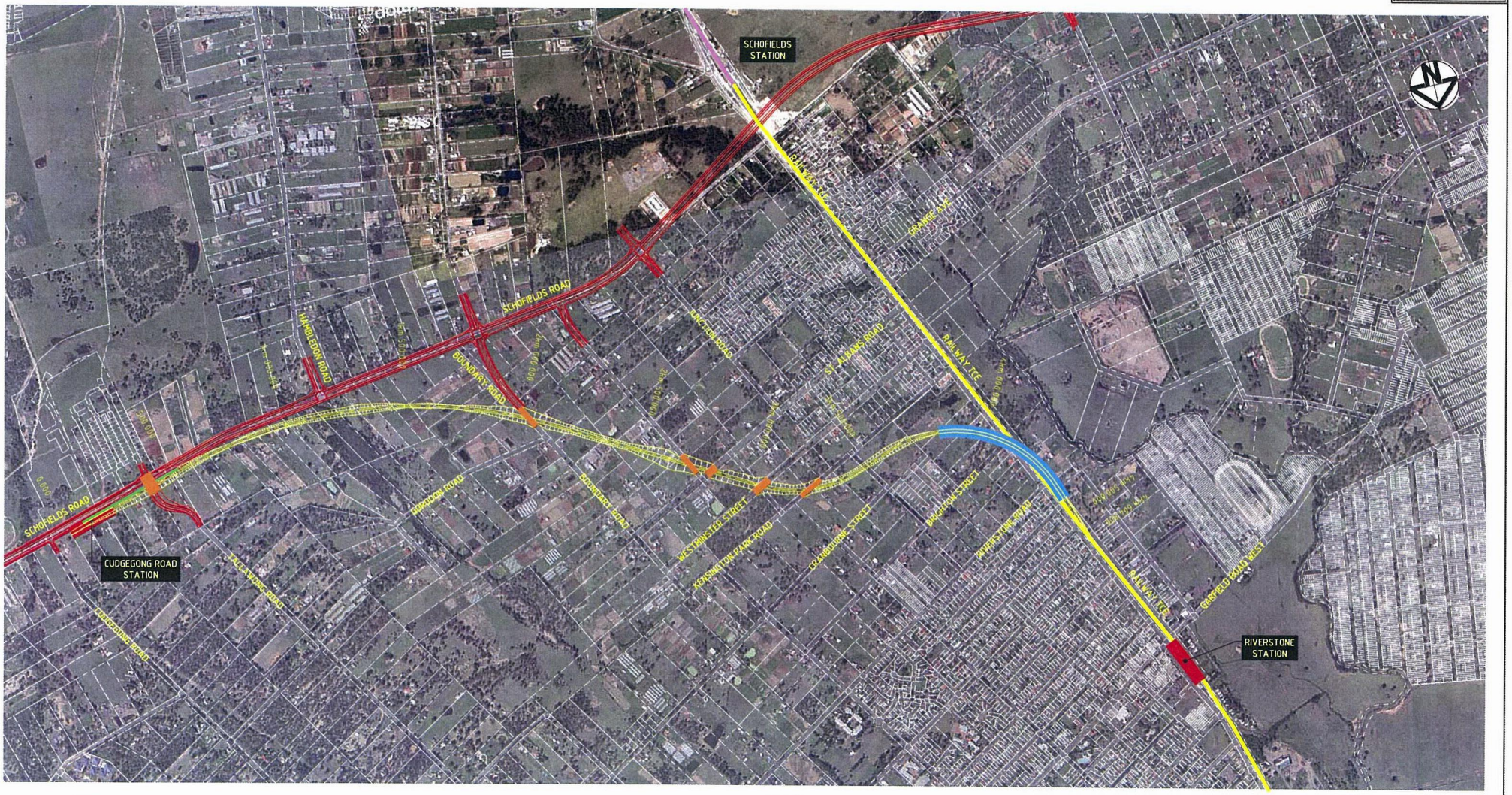
Appendix D

GA sketch and Long Section for Option B

SKETCH



PLAN
1 : 8000

- TRAIN STATIONS
- SKYTRAIN (VIADUCTS)
- OVERBRIDGES
- RETAINING STRUCTURES
- SCHOFIELDS ROAD
- RAILWAY LINE
- EXISTING DOUBLE TRACK - WESTERN RAILWAY LINE
- PLANNED/PROPOSED DUPLICATION OF WESTERN RAILWAY LINE

Issue	Description	Date
P1	FOR INFORMATION	11.05.12

100mm on Original

0 200 400 600 800 1000m
1 : 10000

Client

Status: PRELIMINARY
NOT FOR CONSTRUCTION

Scales	1:8000	Current Issue Signatures	
		Drawn MZ	
Original Size	A1	Designed VN	
Height Datum	AHD	Checked SH	
Grid		Approved KT	

Filename: OPB-000-aa004938-nsk-00.dwg

Project: NORTH WEST RAIL LINK

Title: NORTH WEST RAIL LINK EXTENSION
COVER SHEET
OPTION B

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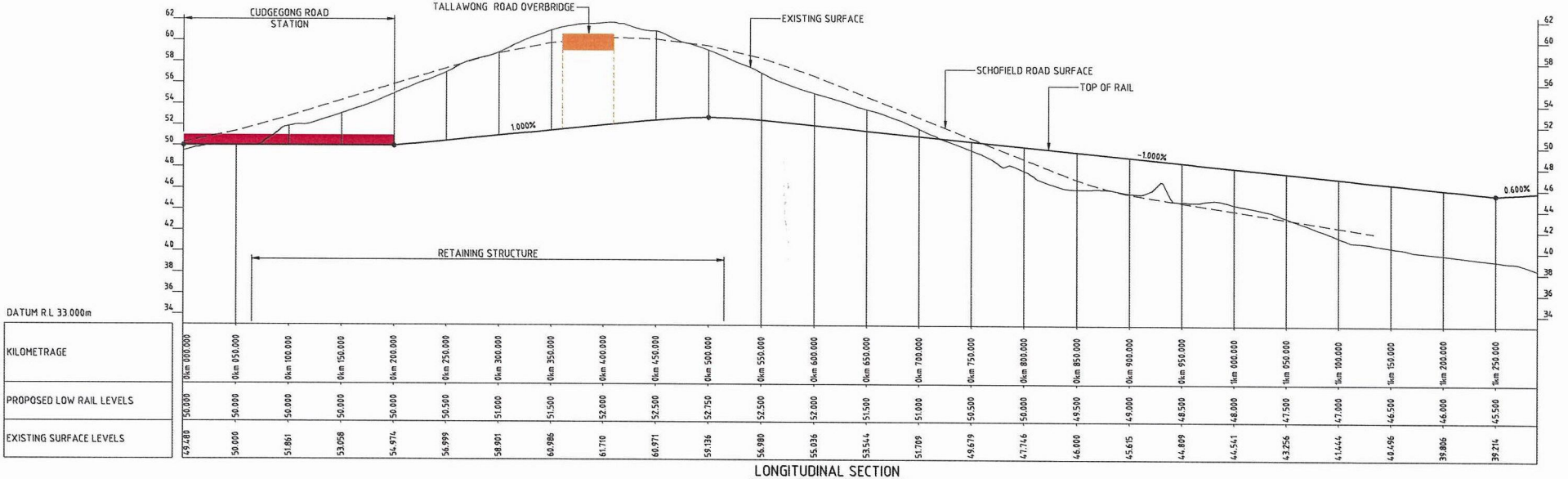
Drawing No.	Project No.	Issue
OPB-000	AA004938	P1

Date Plotted: 21 May 2012 - 01:07PM File Name: F:\AA004938\E-CAD\B-Sketches\OPB-000-aa004938-nsk-00.dwg V1

SKETCH

PLAN
1 : 2000



LONGITUDINAL SECTION
SCALES – HORIZ. 1:2000 VERT. 1:200

Issue	Description	Date
P1	FOR INFORMATION	11.05.12

100mm on Original

0 50 100 150 200m
1 : 2000

Client

Status: PRELIMINARY
NOT FOR CONSTRUCTION

Scales	1:2000	Current Issue Signatures
		Drawn HZ
Original Size	A1	Designed VN
Height Datum	AHD	Checked SH
Grid		Approved KT
Filename:	OPB-001-aa004938-nsk-00.dwg	

Project: NORTH WEST RAIL LINK

Title: NORTH WEST RAIL LINK EXTENSION
PLAN & LONGITUDINAL SECTION
OPTION B - SHEET 01

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Drawing No.	Project No.	Issue
OPB-001	AA004938	P1

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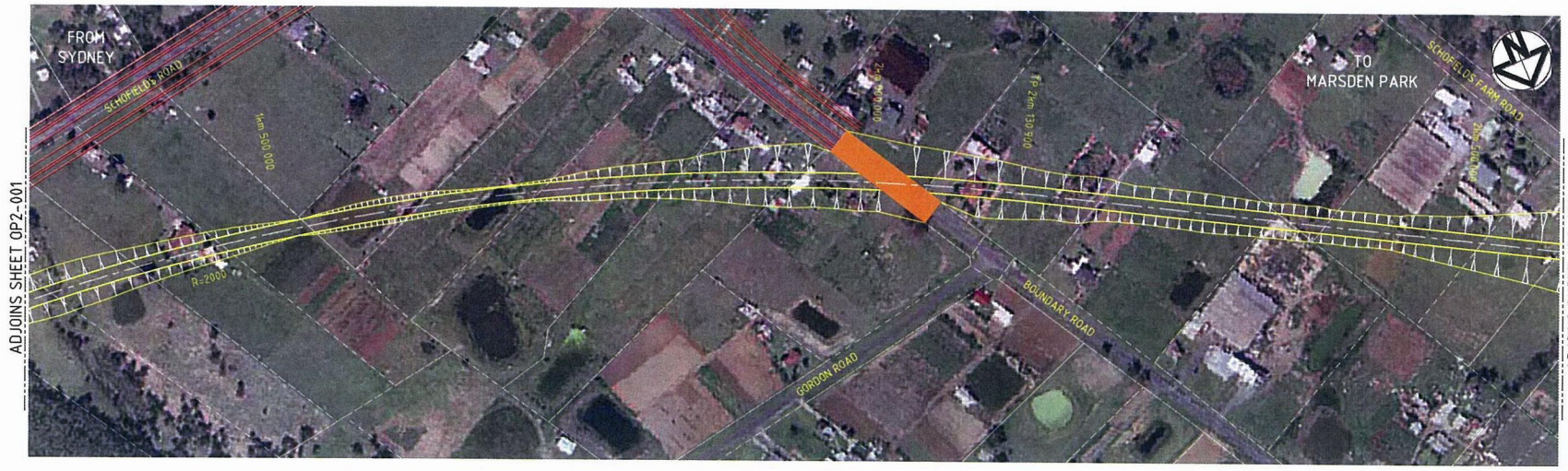

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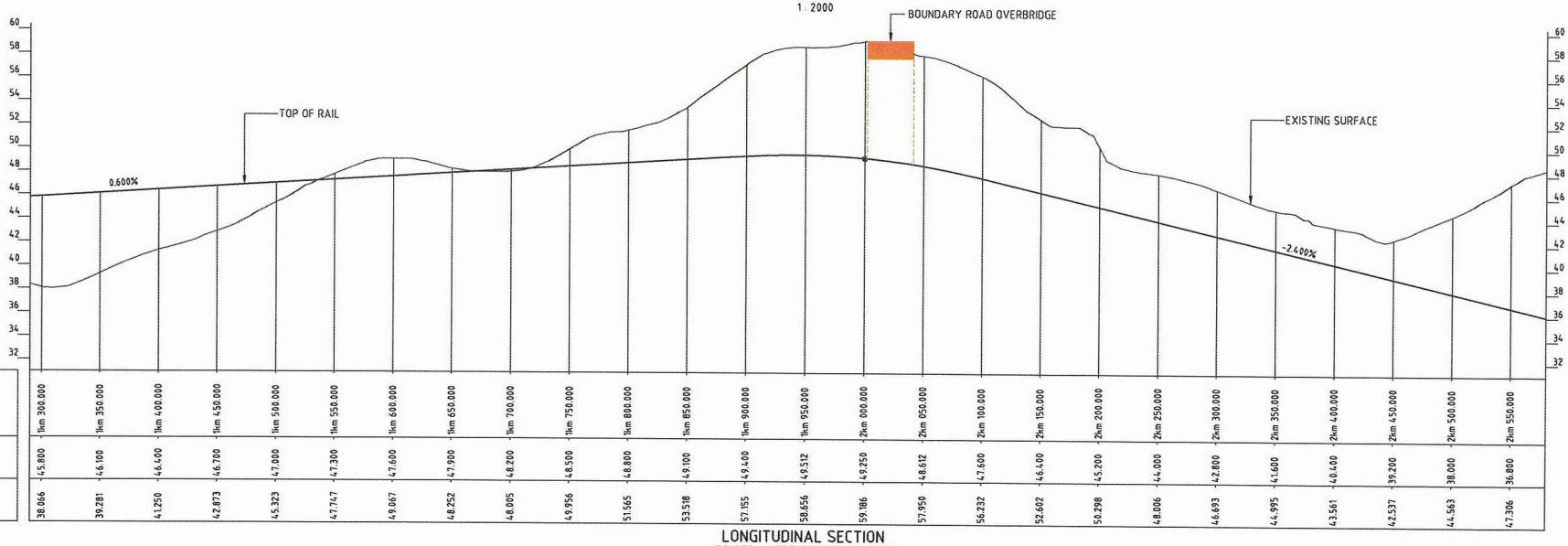

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PROPOSED LOW RAIL LEVELS	45.800	46.100	46.400	46.700	47.000	47.300	47.600	47.900	48.200	48.500	48.800	49.100	49.400	49.512	49.250	48.612	47.600	46.400	45.200	44.000	42.800	41.600	40.400	39.200	38.000	36.800
EXISTING SURFACE LEVELS	38.066	39.281	41.250	42.873	45.323	47.747	49.067	48.252	48.005	49.956	51.565	53.518	57.155	58.656	59.186	57.950	56.232	52.602	50.298	48.006	46.693	44.995	43.561	42.537	44.563	47.306

LONGITUDINAL SECTION
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Project: NORTH WEST RAIL LINK

Title: NORTH WEST RAIL LINK EXTENSION
PLAN & LONGITUDINAL SECTION
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OPB-002	AA004938	P1

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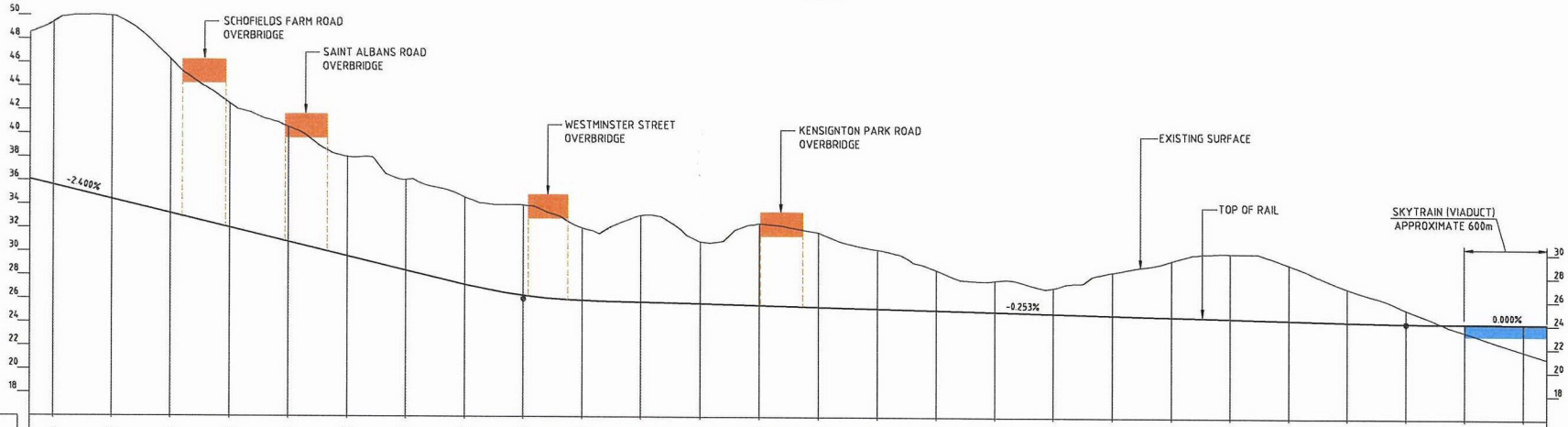

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2km 700.000	33.200	46.287
2km 750.000	32.000	42.536
2km 800.000	30.800	40.559
2km 850.000	29.600	38.000
2km 900.000	28.400	36.098
2km 950.000	27.200	34.633
3km 000.000	26.268	33.962
3km 050.000	25.873	32.033
3km 100.000	25.747	33.095
3km 150.000	25.620	30.905
3km 200.000	25.493	32.444
3km 250.000	25.367	31.692
3km 300.000	25.240	30.252
3km 350.000	25.113	28.512
3km 400.000	24.987	27.644
3km 450.000	24.860	27.054
3km 500.000	24.733	28.388
3km 550.000	24.607	29.369
3km 600.000	24.480	30.000
3km 650.000	24.353	29.067
3km 700.000	24.227	27.072
3km 750.000	24.100	25.300
3km 800.000	24.100	23.397
3km 850.000	24.100	21.762

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Project: NORTH WEST RAIL LINK

Title: NORTH WEST RAIL LINK EXTENSION
PLAN & LONGITUDINAL SECTION
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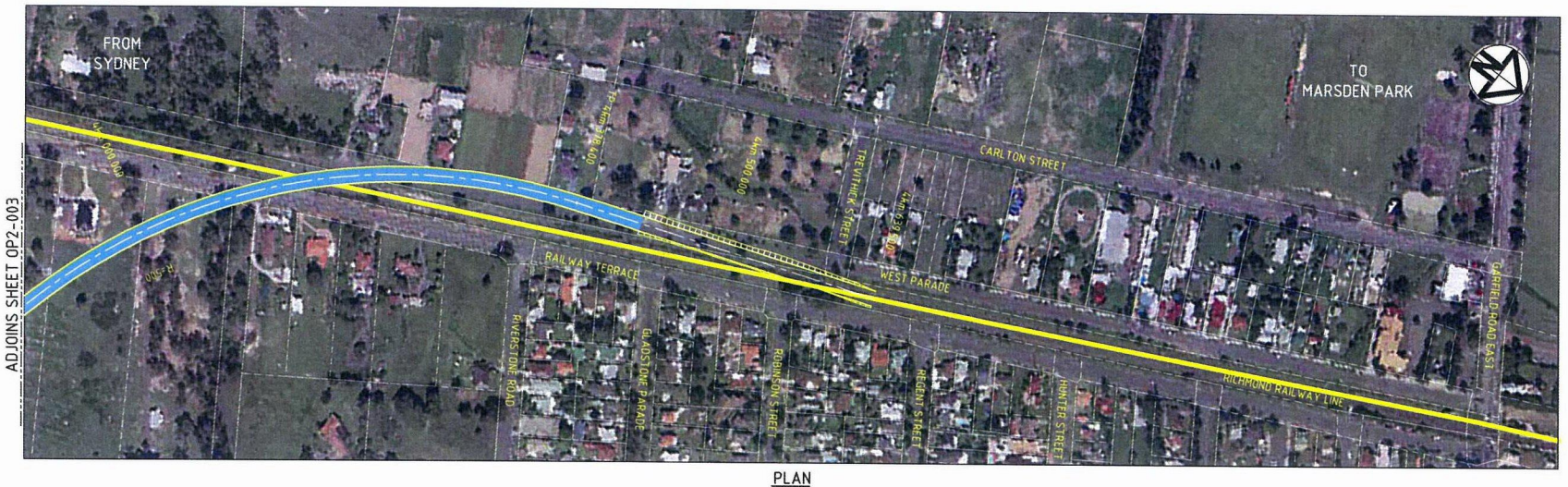

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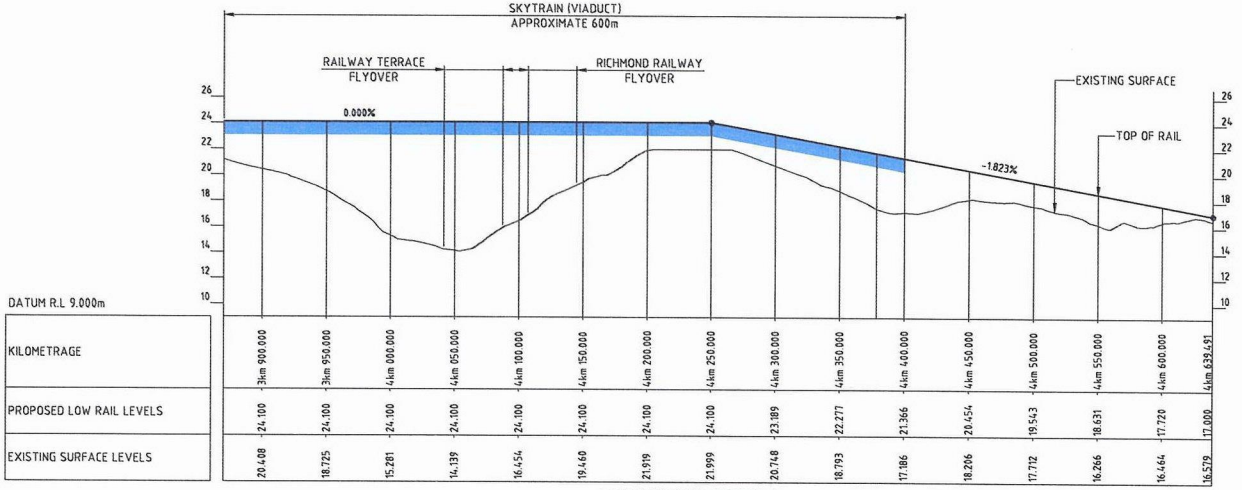

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Status: PRELIMINARY
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Project: NORTH WEST RAIL LINK

Title: NORTH WEST RAIL LINK EXTENSION
PLAN & LONGITUDINAL SECTION
OPTION B - SHEET 04

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Appendix E

North West Options-Patronage Potential of Option A and Option B

North West Options –patronage potential of Options A and B

Prepared for Marsden Park Developments Pty Ltd and
GTA Consultants Pty Ltd

HIGH RANGE ANALYTICS PTY LTD

May 17, 2012

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Table of Contents

North West Options – Comparison of Patronage Potential of Options A and B

Prepared for GTA Consultants Pty Ltd

1.0 Introduction

Transport for NSW (TfNSW) is currently seeking to select a preferred corridor for the potential extension of the North West Rail Link corridor. As part of this process TfNSW is seeking submissions from the public and stakeholders on two potential options. This report was commissioned by one of the stakeholders, Marsden Park Developments Pty Ltd, to consider the relative patronage implications of the two options.

The options, selection process and submission process are described in Northwest Transport Options – Discussion Paper, March 2012, produced by TfNSW.

The options under consideration are:

- Option A – Cudgegong Road to Marsden Park via Schofields corridor
- Option B – Cudgegong Road to Riverstone corridor

At present the North West Rail link is planned to connect Epping with Rouse Hill, via Norwest, and would terminate at a station located near Cudgegong Road west of Rouse Hill town centre, along Schofields Road. The current planning phase is seeking to identify whether a corridor should be preserved from Cudgegong Road along the alignment of either Option A or B. The discussion paper states that the no specific mode has been selected for the corridor, and that this is a matter for consideration in the development of the Long Term Transport Masterplan.

The following tasks were undertaken and are described in this report:

- The two options are defined, including considering their relationship with other elements of the transport network and land use in Chapter 2. This also provides a qualitative review of potential travel markets in the sub-region and how each option would relate to these markets.
- Chapter 3 summarises the process used to compile a set of land use forecasts for the immediate sub-region using Bureau of Transport Statistics small area land use forecasts.
- Chapter 4 draws together information about travel characteristics and expected demands from various sources, to provide parameters with which to estimate likely patronage.
- An estimate of patronage potential of each option is provided in Chapter 5.
- Chapter 6 draws conclusions from the work.

This work is undertaken at a strategic level to gain an understanding of the comparative patronage potential of the two options and the key factors that underpin these relativities.

2.0 Option Definition

2.1 General

This chapter defines the options and provides a summary of the sub-regional context in terms of land use and transport. It also identifies potential travel markets and provides a qualitative review of these markets relevant to each option.

2.2 Option definition

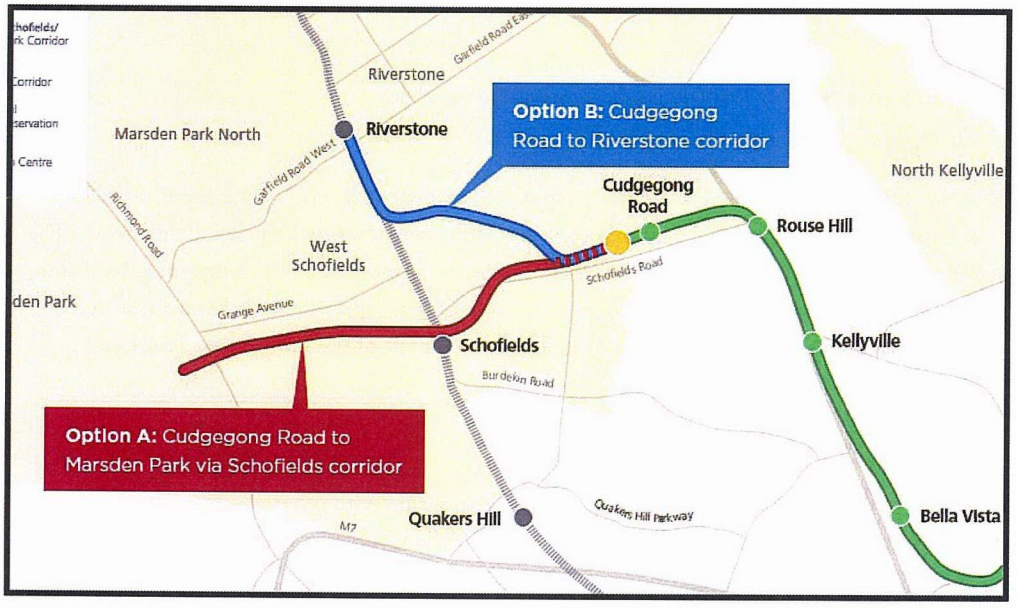
The options are described in Northwest Transport Options – Discussion Paper, March 2012, produced by TfNSW.

The options under consideration are:

- Option A – Cudgegong Road to Marsden Park via Schofields corridor
- Option B – Cudgegong Road to Riverstone corridor

The following schematic of the options is copied from the Discussion Paper.

Figure 2-1: Option alignments (pg 5 Northwest Transport Options – Discussion Paper)



North West Rail Link is currently planned to terminate at Cudgegong Road. NWRL is a state government commitment and is expected to proceed, subject to final planning and funding. According to the Discussion Paper, the corridor option selected from the two under consideration, if it were approved, would form an extension of the North West Rail Link corridor. Upon approval the selected option's corridor would be preserved using a state environment planning policy (SEPP), although the corridor might not be acquired for some time and would only be acquired when needed.

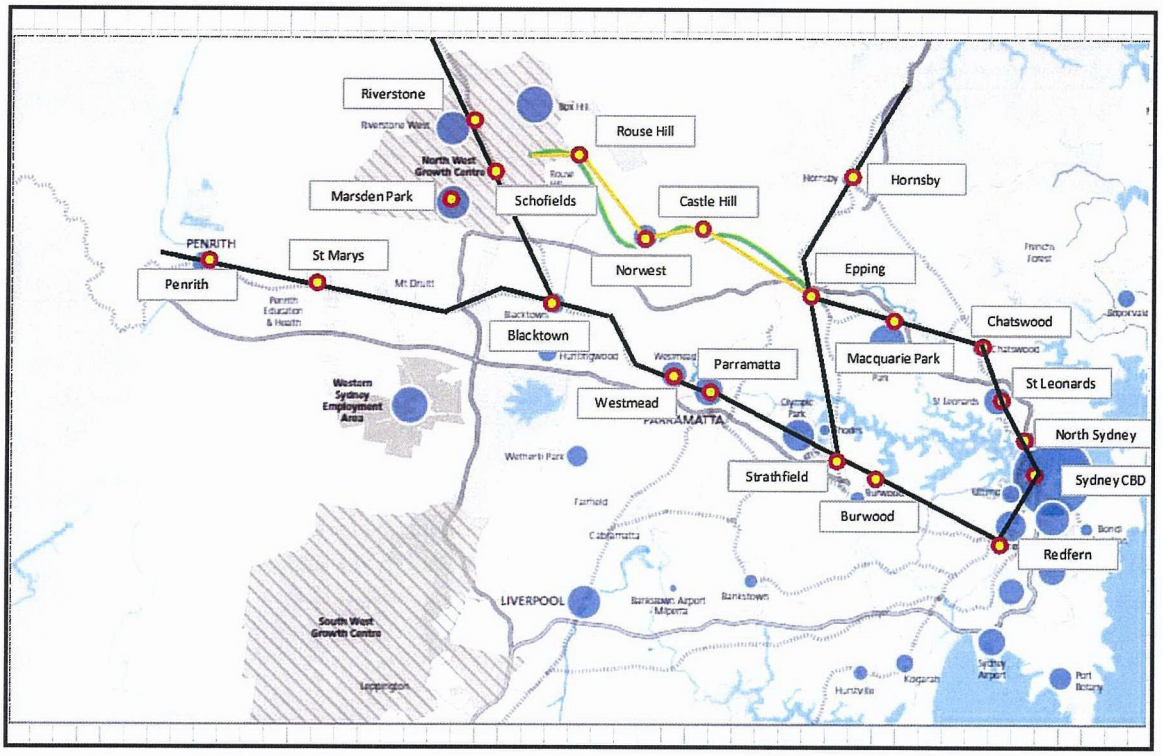
No mode has been selected by TfNSW at this stage and, hence, there is some uncertainty as to what type of service might be offered to travellers, in terms of speed, capacity, coverage etc; For the purposes of this analysis it is assumed that the mode would be rail and this would be well integrated with the North West Rail Link and with the Richmond Line. By good integration we mean:

- Common tickets, and
- At the Richmond Line interchange station (Option A – Schofields and Option B - Riverstone) this means minimal travel distance between platforms, facilitating movement with good quality design, and adequate design and
- Consideration is given to minimising wait times for passengers changing services, either via higher frequency or through some form of timetable co-ordination.

The potential of a western extension to Option A is also canvassed in this report. A westward extension would go via Lethbridge Park, Dunheved and St Marys.

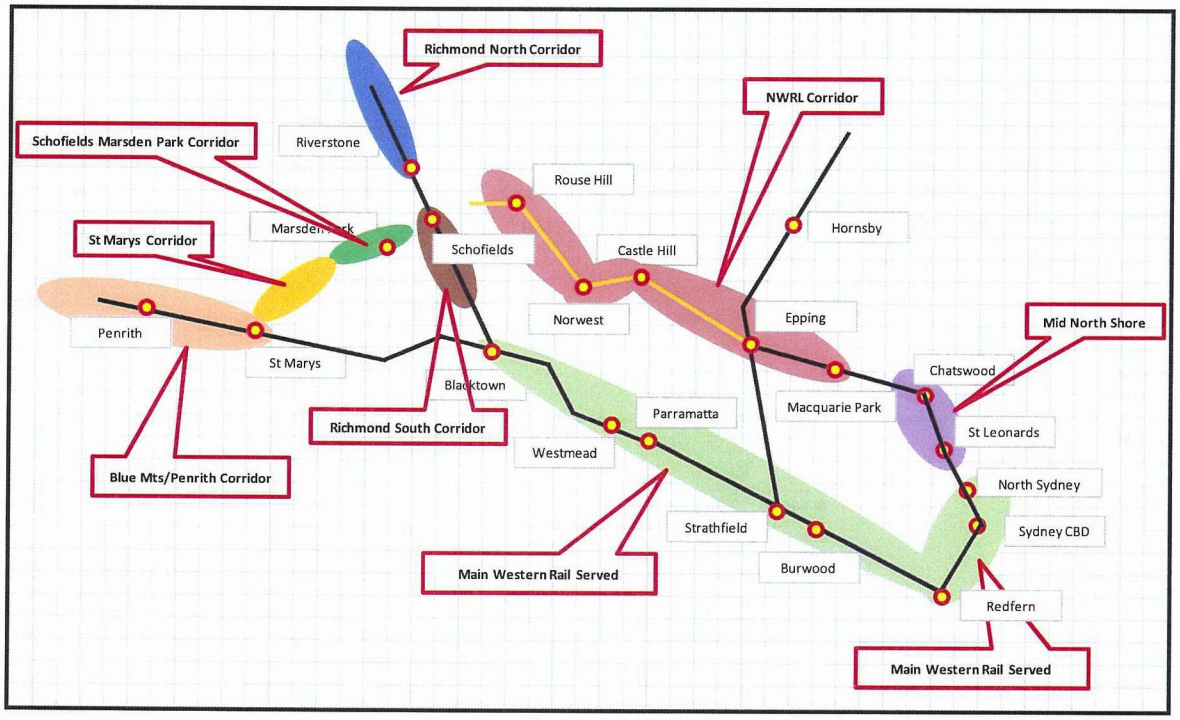
The broader strategic context of the options is show in the following schematic.

Figure 2-2: Schematic of strategic context



The following schematic abstracts the key rail links from the above regional context and adds rail-served employment corridors that directly relate to the options in terms of prospective rail-served markets.

Figure 2-3: Schematic of rail links and rail-served employment corridors

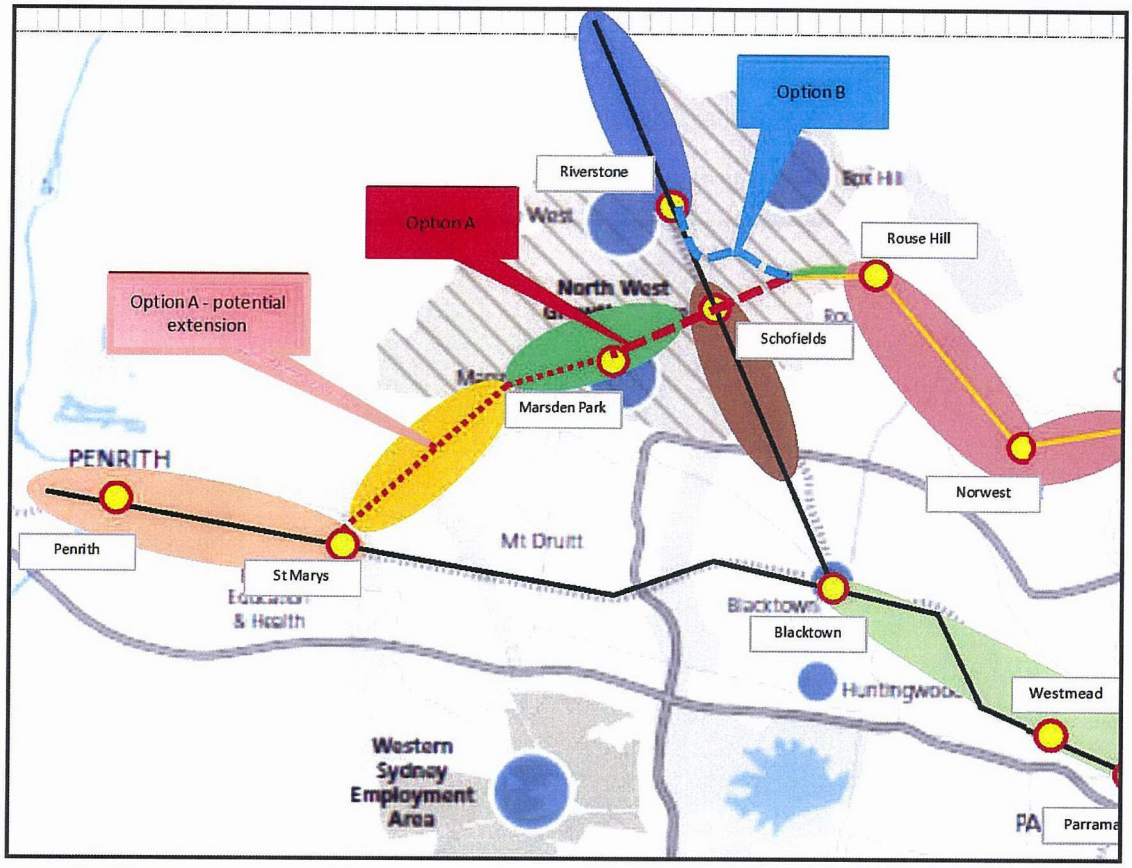


Note: refer to Appendix A for a list of travel zones in each of these corridors

The aggregation of rail served areas into corridors is specific to this project. They bring together sections of the various rail corridor based on their relationship to accessibility that would be provided by the corridor options.

The following schematic focuses on the local context of the options, showing how they would provide connections between different corridors. The schematic also identifies a potential western extension of Option A. Whilst this extension is mentioned in the Discussion Paper, it is not directly the subject of the current exhibition process, it would, however, form a potentially useful link in the rail network.

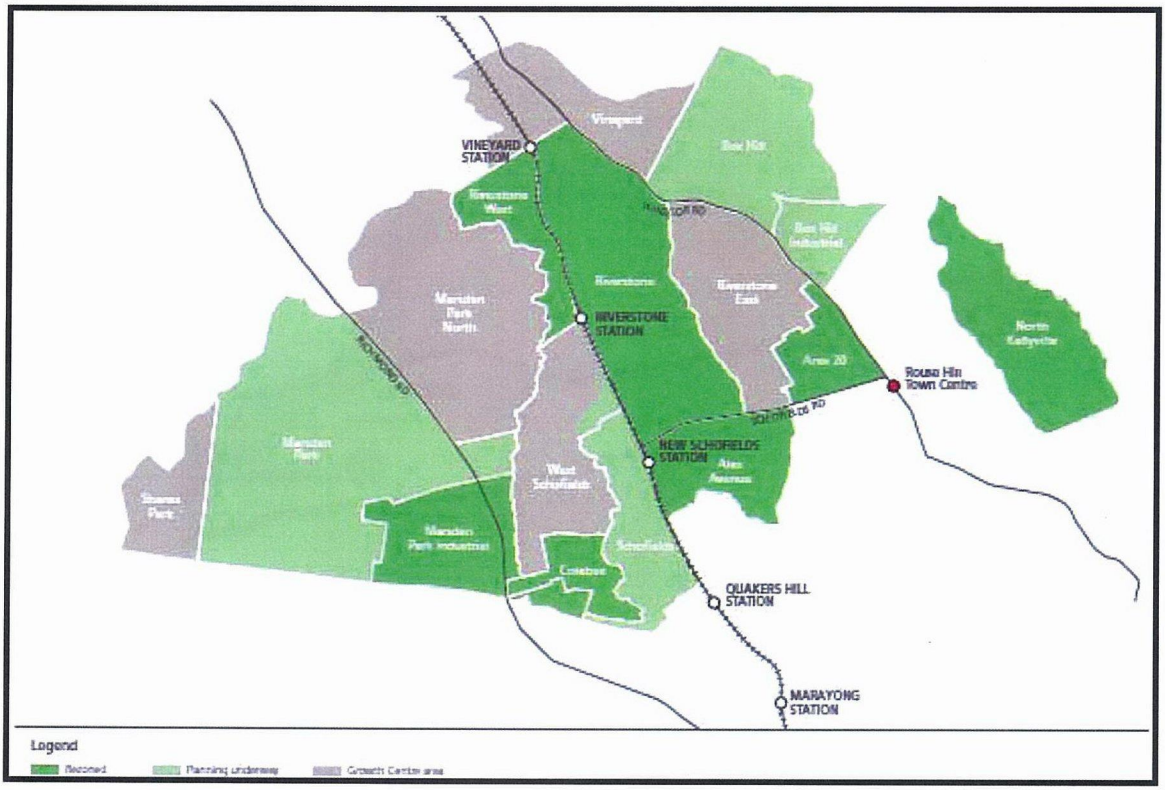
Figure 2-4: Schematic of options and connectivity for sub-regional context



2.3 Land use context

The North West Rail Link is designed to support a large proportion of the transport requirements of the developing North West Growth Centre. This growth centre is expected to accommodate some 200,000 new residents over the next 25 to 30 years and will require around 70,000 new dwellings. Development is being undertaken on a precinct basis and the following figure shows each of the precincts and its planning status.

Figure 2.5 – North West Growth Centre precinct planning status at March 2012

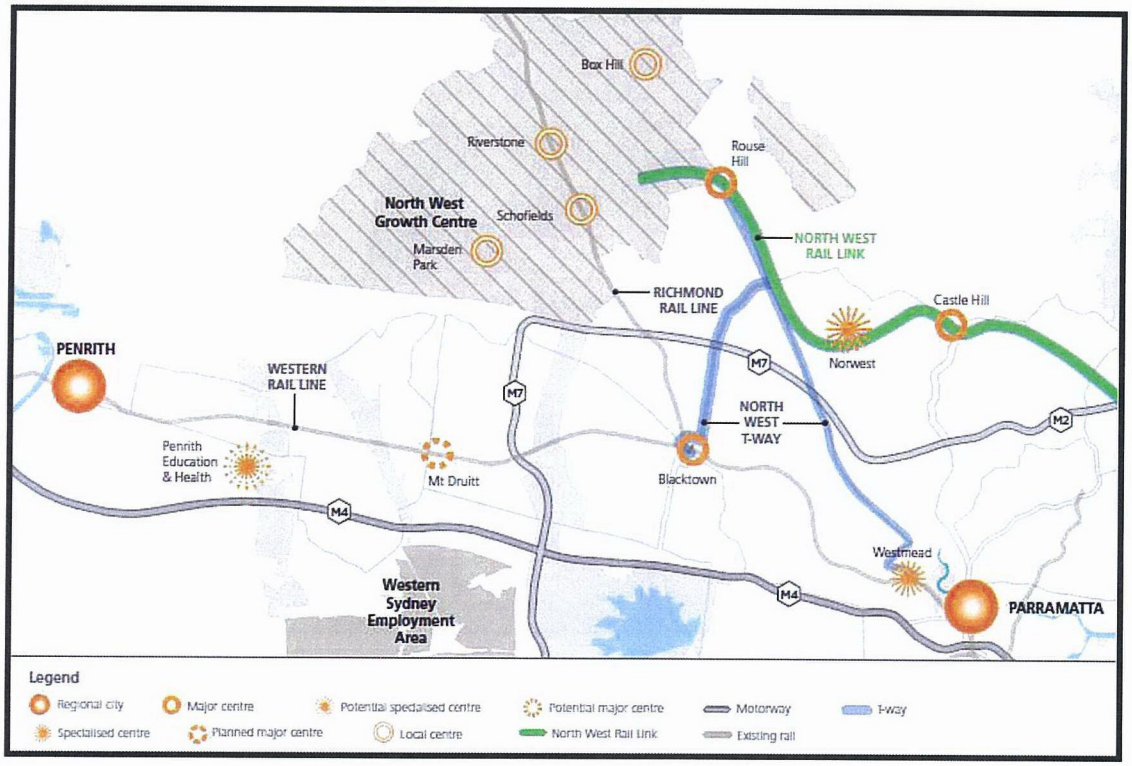


Source – Discussion Paper pg 12

2.4 Transport context

The future public transport context of the North West Growth Centre is shown in Figure 2.6 below, which identifies the main existing and future trunk transport facilities expected to be in place to support the increased land use and is from the Discussion Paper.

Figure 2.6 – Existing and planned public transport network

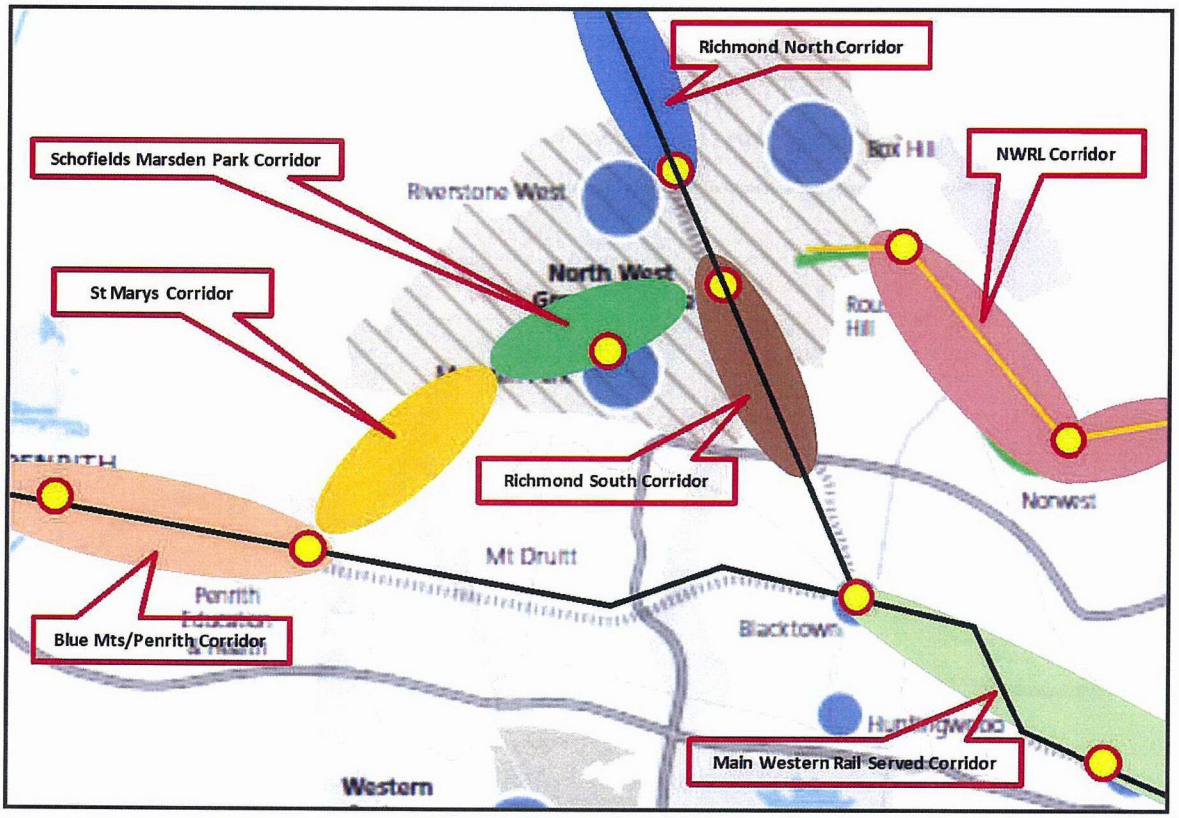


Source – Discussion Paper pg 9

2.5 Markets

Each of the corridor options under consideration would provide support for different sets of trips, based on their connectivity. This section identifies the core travel markets that would be supported by the options, if the options led to the extension of the NWRL (i.e., as a heavy rail link). The following schematic identifies the origin/destination areas of trips that have the potential to be supported by the options.

Figure 2-7: Schematic of potential origin-destination areas within the sub-region



Movements between each of these areas would be supported to a different extent by each of the options. In some cases movements would require service changes, in others they would require mode changes.

The potential for movements between each of the areas to be supported by each option is characterised in the following set of three tables. The entries in each table are defined as:

- *Direct* – the option would provide a direct connection between the two areas
- *Indirect* – the option would provide a connection between the two areas, however this connection may require a service change or it might be circuitous or both
- *Mode change* – the option would provide a connection but only with a mode change
- *No change* – the option would make little or no practical difference to travel between the two areas
- *NA* – not applicable

In the tables the area above the diagonal is blank as it is a mirror image of the assessment below the diagonal.

The purpose of this characterisation is twofold:

- Firstly, to provide a qualitative appraisal of the improved accessibility provided by each option between the selected areas, and
- Secondly, to identify prospective markets for which a quantitative assessment is required.

Table 2-1: Characterisation of the support for movements between selected areas for Option A

Movements between	Blue Mts/Penrith Corridor	St Marys Corridor	Schofields Marsden Park Corridor	Richmond North Corridor	NWRL Corridor	Main Western Rail Served Corridor	Richmond South Corridor
Blue Mts/Penrith Corridor	NA						
St Marys Corridor	NA	NA					
Schofields Marsden Park Corridor	Indirect	No change	NA				
Richmond North Corridor	No change	No change	Indirect	NA			
NWRL Corridor	Indirect	No change	Direct	Indirect	NA		
Main Western Rail Served Corridor	No change	No change	Indirect	No change	Indirect	NA	
Richmond South Corridor	No change	No change	Indirect	No change	Indirect	No change	NA

Table 2-2: Characterisation of the support for movements between selected areas for Option B

Movements between	Blue Mts/Penrith Corridor	St Marys Corridor	Schofields Marsden Park Corridor	Richmond North Corridor	NWRL Corridor	Main Western Rail Served Corridor	Richmond South Corridor
Blue Mts/Penrith Corridor	NA						
St Marys Corridor	NA	NA					
Schofields Marsden Park Corridor	No change	No change	NA				
Richmond North Corridor	No change	No change	No change	NA			
NWRL Corridor	Indirect	No change	Mode change	Direct	NA		
Main Western Rail Served Corridor	No change	No change	No change	No change	Indirect	NA	
Richmond South Corridor	No change	No change	No change	No change	Indirect	No change	NA

Table 2-3: Characterisation of the support for movements between selected areas for Option A with western extension to St Marys

Movements between	Blue Mts/Penrith Corridor	St Marys Corridor	Schofields Marsden Park Corridor	Richmond North Corridor	NWRL Corridor	Main Western Rail Served Corridor	Richmond South Corridor
Blue Mts/Penrith Corridor	NA						
St Marys Corridor	Indirect	NA					
Schofields Marsden Park Corridor	Indirect	Direct	NA				
Richmond North Corridor	Indirect	Indirect	Indirect	NA			
NWRL Corridor	Indirect	Direct	Direct	Indirect	NA		
Main Western Rail Served Corridor	No change	Indirect	Indirect	No change	Indirect	NA	
Richmond South Corridor	Indirect	Indirect	Indirect	No change	Indirect	No change	NA

These tables indicate that Option A with western extension to St Marys provides the greatest level of accessibility, in terms of serving the most direct and indirect markets.

Option A would provide a direct connection between the NWRL Corridor and the Schofields Marsden Park Corridor. Most other markets would require service changes at Schofields Station and an additional service change at Blacktown Station for movements between the:

- Blue Mountains Corridor and the Schofields Marsden Park Corridor and
- Blue Mountains Corridor and the NWRL Corridor.

Option B would provide a direct connection between the Richmond North Corridor and the NWRL Corridor, assuming trains on the NWRL corridor commenced at Richmond (or at least somewhere to the north of the bulk of the development). If they commenced at Riverstone, then this would be an indirect connection requiring a service change at Riverstone. Option B would also support indirect connections between NWRL Corridor and Main Western Rail Served Corridor via a service change at Riverstone and between NWRL Corridor and Richmond South; both of these would be more circuitous than Option A's support for this movement, due to the alignment of Option B, which heads north west from Cudgegong Road to Riverstone. The indirect connection between the NWRL Corridor and the Blue Mts/Penrith Corridor would require service changes at Riverstone and Blacktown.

For movements between Schofields Marsden Park Corridor and other areas, Option B would require travellers to access the rail system at Riverstone by some other mode, such as bus or kiss and ride. This is clearly less attractive than either direct connection or indirect connections that would be established in Option A.

3.0 Land Use – Population and Employment

3.1 General

This chapter describes the information sources and method used to compile a set of land use forecasts that reflect the latest Bureau of Transport Statistics small area forecasts.

3.2 Study area definitions

The previous chapter identified the areas that would be likely prospective areas of patronage for the two options. These areas are shown on Figure 2-3 above.

Having a workplace close to a station along the sections of rail corridor covered by this study's areas is highly prospective for rail patronage, especially if the home end of the trip is also close to a station.

Consequently, estimates of population and jobs are prepared for selected travel zones in each of the study's areas – these use selected travel zones that are well related to rail stations (they do not necessarily comprise all travel zones in the corridor. Appendix A summarises the travel zones used in this aggregation process. Zones not in the specified areas are treated as 'Rest of GMR'[1].

3.3 Forecasts of population and employment

The following three tables summarise the population forecasts for the study corridors. The corridors correspond with the qualitative assessment of improved accessibility undertaken in the previous chapter with the exception of the Mid North Shore Corridor (basically employment around Chatswood, Artarmon and St Leonards Stations), which was not identified separately in Chapter 2, as it formed part of NWRL Corridor.

Table 3-1: Forecast population for study corridors 2006 to 2036 – totals (ERP)

Study Area	2006	2011	2016	2021	2026	2031	2036
Blue Mountains Penrith Corridor	40,328	41,508	43,819	46,310	48,945	51,398	54,252
Main Western Rail Served Corridor	79,655	95,656	104,863	111,626	118,211	125,229	132,811
Mid North Shore	25,575	28,569	31,244	32,851	34,244	35,900	37,731
NWRL Corridor	53,979	65,388	90,460	103,850	114,878	121,962	128,763
Richmond Corridor North	11,363	11,787	12,849	16,174	21,368	26,935	29,754
Richmond Corridor South	25,474	26,768	29,449	33,111	36,726	38,860	41,266
Schofields Marsden Park Corridor	2,702	2,807	4,542	10,736	17,918	26,059	34,022
St Marys Corridor	26,431	26,818	27,297	27,494	28,760	29,385	30,179
Rest of GMR	4,948,697	5,231,428	5,505,791	5,797,277	6,095,350	6,398,229	6,698,360
Total GMR	5,214,203	5,530,728	5,850,314	6,179,883	6,516,312	6,853,956	7,187,137

Source: BTS Population Forecasts October 2009 release; aggregations by HRA using geographies in Appendix A

[1] GMR – greater metropolitan region

Table 3-2: Forecast population for study corridors 2006 to 2036 – cumulative increases from 2006 (ERP)

Study Area	2006	2011	2016	2021	2026	2031	2036
Blue Mountains Penrith Corridor	-	1,180	3,491	5,982	8,617	11,070	13,923
Main Western Rail Served Corridor	-	16,001	25,208	31,971	38,556	45,574	53,155
Mid North Shore	-	2,994	5,670	7,276	8,669	10,325	12,156
NWRL Corridor	-	11,409	36,481	49,871	60,899	67,983	74,784
Richmond Corridor North	-	425	1,487	4,811	10,006	15,572	18,391
Richmond Corridor South	-	1,294	3,975	7,637	11,252	13,385	15,792
Schofields Marsden Park Corridor	-	105	1,840	8,034	15,216	23,357	31,320
St Marys Corridor	-	388	866	1,519	2,240	2,954	3,748
Rest of GMR	-	282,731	557,094	848,580	1,146,654	1,449,533	1,749,664
Total GMR	-	316,525	636,111	965,680	1,302,109	1,639,753	1,972,934

Source: BTS Population Forecasts October 2009 release; aggregations by HRA using geographies in Appendix A, calculations by HRA

Table 3-3: Forecast population for study corridors 2006 to 2036 – cumulative growth factors from 2006 (ERP)

Study Area	2006	2011	2016	2021	2026	2031	2036
Blue Mountains Penrith Corridor	-	1.03	1.09	1.15	1.21	1.27	1.35
Main Western Rail Served Corridor	-	1.20	1.32	1.40	1.48	1.57	1.67
Mid North Shore	-	1.12	1.22	1.28	1.34	1.40	1.48
NWRL Corridor	-	1.21	1.68	1.92	2.13	2.26	2.39
Richmond Corridor North	-	1.04	1.13	1.42	1.88	2.37	2.62
Richmond Corridor South	-	1.05	1.16	1.30	1.44	1.53	1.62
Schofields Marsden Park Corridor	-	1.04	1.68	3.97	6.63	9.64	12.59
St Marys Corridor	-	1.01	1.03	1.06	1.08	1.11	1.14
Rest of GMR	-	1.06	1.11	1.17	1.23	1.29	1.35
Total GMR	-	1.06	1.12	1.19	1.25	1.31	1.38

Source: BTS Population Forecasts October 2009 release; aggregations by HRA using geographies in Appendix A, calculations by HRA

The above analysis indicates:

- Population growth for the GMR is expected to continue at relatively strong rates of about 1 per cent per annum for the next 25 years.
- The NWRL Corridor is expected to see substantial increase in population (+75,000) so that population in 2036 would be 2.6 times greater than in 2006. This is a substantial increase in expected population, given that large parts of the corridor developed some time ago, and could be considered to be mature.
- The Richmond North Corridor is expected to grow from 11,300 to 29,700 (+18,400), with a cumulative growth factor of 2.6.
- The Schofields Marsden Park Corridor is expected to grow from 2,700 to 34,000 (+31,320), with a cumulative growth factor of 12.6.

Of note is that the population of the Marsden Park Corridor will surpass that of the North Richmond Corridor over this period, by about 4,000 people.

The following three tables provide a similar analysis for employment forecasts (note that these are at the location of the workplace).

Table 3-4: Forecast employment for study corridors 2006 to 2036 - totals

Study Area	2006	2011	2016	2021	2026	2031	2036
Blue Mountains Penrith Corridor	27,884	29,913	32,332	35,809	37,950	40,242	42,910
Main Western Rail Served Corridor	376,692	395,074	421,822	449,917	468,048	484,298	498,845
Mid North Shore	49,803	50,738	52,820	55,975	57,257	58,607	60,429
NWRL Corridor	64,323	71,942	79,085	87,268	93,127	98,269	104,055
Richmond Corridor North	12,817	14,288	15,745	17,617	18,785	20,139	21,687
Richmond Corridor South	3,133	3,303	3,635	4,122	4,526	4,893	5,311
Schofields Marsden Park Corridor	780	1,414	1,834	3,118	5,474	7,554	7,683
St Marys Corridor	7,781	8,126	8,377	8,917	9,133	9,398	9,762
Rest of GMR	1,923,787	2,019,201	2,130,350	2,301,258	2,390,699	2,485,601	2,595,317
Total GMR	2,467,000	2,594,000	2,746,000	2,964,000	3,085,000	3,209,000	3,346,000

Source: BTS Employment Forecasts October 2009 release

Table 3-5: Forecast employment for study corridors 2006 to 2036 – cumulative increase from 2006

Study Area	2006	2011	2016	2021	2026	2031	2036
Blue Mountains Penrith Corridor	-	2,029	4,448	7,925	10,066	12,357	15,026
Main Western Rail Served Corridor	-	18,382	45,130	73,225	91,356	107,606	122,153
Mid North Shore	-	936	3,017	6,172	7,454	8,804	10,626
NWRL Corridor	-	7,618	14,762	22,944	28,804	33,946	39,731
Richmond Corridor North	-	1,472	2,928	4,800	5,968	7,322	8,871
Richmond Corridor South	-	170	502	989	1,393	1,760	2,178
Schofields Marsden Park Corridor	-	633	1,054	2,337	4,693	6,774	6,903
St Marys Corridor	-	345	596	1,136	1,352	1,617	1,981
Rest of GMR	-	95,415	206,563	377,471	466,912	561,814	671,531
Total GMR	-	127,000	279,000	497,000	618,000	742,000	879,000

Source: BTS Employment Forecasts October 2009 release; aggregations by HRA using geographies in Appendix A, calculations by HRA

Table 3-6: Forecast employment for study corridors 2006 to 2036 – cumulative growth factors from 2006

Study Area	2006	2011	2016	2021	2026	2031	2036
Blue Mountains Penrith Corridor	-	1.07	1.16	1.28	1.36	1.44	1.54
Main Western Rail Served Corridor	-	1.05	1.12	1.19	1.24	1.29	1.32
Mid North Shore	-	1.02	1.06	1.12	1.15	1.18	1.21
NWRL Corridor	-	1.12	1.23	1.36	1.45	1.53	1.62
Richmond Corridor North	-	1.11	1.23	1.37	1.47	1.57	1.69
Richmond Corridor South	-	1.05	1.16	1.32	1.44	1.56	1.70
Schofields Marsden Park Corridor	-	1.81	2.35	4.00	7.01	9.68	9.85
St Marys Corridor	-	1.04	1.08	1.15	1.17	1.21	1.25
Rest of GMR	-	1.05	1.11	1.20	1.24	1.29	1.35
Total GMR	-	1.05	1.11	1.20	1.25	1.30	1.36

Source: BTS Employment Forecasts October 2009 release; aggregations by HRA using geographies in Appendix A, calculations by HRA

The above tables indicate that:

- Employment is expected to grow at about the rate of population growth for the GMR as a whole over the forecast period.
- The NWRL Corridor is expected to experience the largest increase of jobs (+40,000) of the study's corridors, aside from the Main Western Rail Served Corridor, which includes the CBD and an employment base in 2006 of some 450,000 jobs (compared with the NWRL Corridor in 2006 of 64,500). The cumulative growth factor for the NWRL Corridor of 1.6.
- The Richmond North Corridor is expected to experience an increase of 8,900 jobs, from a base in 2006 of 12,800. The cumulative growth factor would be 1.7.
- The Schofields Marsden Park Corridor is expected to grow to 6,900 jobs from a base of 800 in 2006. The cumulative growth factor would be just under 10.

The estimate employment in the Schofields Marsden Park corridor of some 7,500 jobs in 2036 in the above forecasts is well below the estimates that form part of the current planning activities for the North West Growth Centre, of around 17,000 jobs (or employment capacity) in Marsden Park alone. This suggests that the BTS forecasts (in the above tables) understate likely transport demand and the importance of Marsden Park as a focus for transport facilities. For the purposes of the current analysis we will use the BTS estimates but will provide some comments in the relevant chapters below as to the impact of this.

For all options, the key corridors of NWRL, Schofields Marsden Park and Richmond North Corridor are all expected to see substantial increases in population and employment:

- NWRL +75,000 residents and +40,000 jobs
- Schofields Marsden Park +31,000 residents and +7,000 jobs (could be another +12,000)
- Richmond North +18,500 residents and +9,000 jobs

This will generate a large increase in trip production and attraction in the sub-region, at an average trip rate of 3.64 per person per weekday, the new residents of just Schofields Marsden Park Corridor and Richmond North Corridor will generate some 180,000 additional trips per day[2].

[2] This all mode average trip rate is from pg 14 of *2009/10 Household Travel Survey – Summary Report 2011 Release*, BTS. Note that there are other substantial population increases in the immediate sub-region, which will also generate large increases in trips, but these are away from the nominated corridors.

4.0 Travel Patterns

4.1 General

The approach to estimating patronage potential for each of the options seeks to identify the relativities of patronage for each option rather than the total patronage. It is based on areas of population and employment close to the rail corridors and their stations, as this is a core market with the highest prospect of actually using train, as well as high level estimates of rail demand.

4.2 Rail use estimates

The Discussion Paper identifies the following key transport task which will be generated by the North West Growth Centre and will be supported by rail by 2036:

- 40% of residents are expected to travel to the Sydney CBD by public transport
- 15% will travel to Macquarie Park, Chatswood, St Leonards and North Sydney.

Based on a projected additional population of 200,000 in the North West Growth Centre this translates approximately into trips via the following steps:

- 200,000 population would yield about 80%[3] in the 15 years+ classification, or about 160,000
- Applying the most recently published workforce participation rate for the Sydney North West major statistical region of 64.9%[4] implies approximately about 104,000 workers
- According to the 2006 census JTW about 14% of workers with workplaces in the Sydney Statistical Division did not travel to work on Census day or worked from home[5]
- In broad terms, it is expected that the additional population in the North West Growth Centre would see about 90,000 extra workers travel on any given weekday for the commute to work (or about 10 people in every 22)
- Of these, about 36,000 would travel to the CBD and about 13,500 would travel to Macquarie Park, Chatswood, St Leonards, and North Sydney

These trips will not be uniformly spread across the North West Growth Centre – higher rail trip rates will be expected near stations. Based on experience elsewhere in Sydney, commuter rail mode share falls as distance to train stations increase[6]. As the corridors identified in this study are well related to rail, the rates of commuter rail use for the Richmond North, Schofields Marsden Park and Richmond South Corridors have been adjusted up by 20%, when the Option under consideration would provide a rail connection.

In addition, direct connections will tend to have lower generalised costs, as the additional time associated with service change is avoided. The overall impact of this on demand varies with length of trip and trip purpose:

- For connections to the NWRL we have assumed that the average trip cost would be:

[3] Based on population forecasts by age for Blacktown North SLA prepared by BTS
[4] From Table 16, ABS 6291.0.55.001 Labour Force Australia, Detailed – Electronic Delivery March 2012
[5] Analysis of 2006 JTW Table 7 – proportion of mode number 9 for mode09 analysis
[6] Work using the 2001 JTW data set indicated that for travel zones within 2 km of the rail network rail mode share declined at a rate of 9E-05 times distance from an average mode share of 30% at the station, with average mode share dropping to: 25% 500m from the station; 19% 1,000m from the station; 14% 1,500 m from the station and 7% 2,000m from the station. Longworth, T, Wilson, C (2005) *An exploration of mode choice in Sydney using journey to work data*, ATRF, Sydney (download at http://www.patrec.org/web_docs/atrf/papers/2005/Longworth%20&%20Wilson%20%282005%29.pdf)

- 8 min access, 5 min wait time and 40 min in-vehicle time, 7 min egress time => 80 mins of generalised cost time[7]
- With a service change this would increase by a 5 minute service change => 90 mins of generalised costs time
- The impact on demand of this increase in generalised costs time is 12.5% - applying an elasticity of demand with respect to cost of -0.25, this suggests that an indirect service would have demand about 3.1% lower than a direct service

- For connections to the CBD we have assumed that the average trip cost would be:
  - 8 min access, 5 min wait time and 70 minute in-vehicle time, 7 minute egress time => 90 mins of generalised cost time
  - With a service change this would increase by a 5 minute service change => 100 mins of generalised costs time
  - The impact on demand of this increase in generalised costs time is 11% - applying an elasticity of demand with respect to cost of -0.25, this suggests that an indirect service would have demand about 2.8% lower than direct service

For prospective markets where an option would require a mode change, such as in Option B for trips to and from the Schofields Marsden Park Corridor, travellers would incur additional perceived costs. These higher perceived costs would reduce demand, through a similar mechanism as service changes (set out in the bullet points immediately above), but the impact would be greater. For Option B the segment of travel between Schofields Marsden Park Corridor and NWRL would require a mode change from the rail-access mode to rail at Riverstone – the additional costs associated with this would be:

- Interchange penalty – 15 mins
- Walk time – 4 mins
- Wait time – 7 mins
- Longer access time – 5 mins

When these are incorporated in the assumed average generalised cost for these journeys, the generalised cost time would increase from:

- 8 min access, 5 min wait time and 40 min in-vehicle time, 7 min egress time => 80 mins of generalised cost time, to
- 17 mins access, 12 mins wait, 40 mins in-vehicle time, 15 mins interchange penalty => 113 mins of generalise cost time

This represents an increase in perceived costs of 41 per cent. Applying an elasticity of -0.25 suggests that demands would reduce by 10% for this segment.

To account for the future attractiveness of rail travel to Norwest, the number of travellers using the NWRL to access Macquarie Park, Chatswood, St Leonards etc; of about 13,500 has been increased by an estimate of the numbers who would travel to Norwest by rail. For the employment zones that are well related to the proposed rail (TZ 2722, 2727 and 2729), the number of workers is forecast to reach 11,700 in 2036. We estimate about 35% of these would use rail; of which just under 20 percentage points would use rail from the North West Growth Centre. This would boost the high level estimate of 13,500 commuters up to 15,500.

[7] This applies penalty weights of 2 to access, wait time and egress components of the trip; the fare is not included

In addition to these key markets there are other, less prospective markets for rail travel, such as between Richmond South and NWRL and between NWRL and Blue Mts/Penrith. These have been dealt with by applying a trip rate of 0.01 rail trips per person for new resident in the relevant areas.

4.3 Rail trip rate summary

A corridor identified in this study within the North West Growth Centre would have train use trip rates of:

- 36/200 per person for travel to the CBD
- 15.5/200 per person for travel to NWRL including Norwest
- 1/100 per person for less prospective travel
- These would be factored up by 20% to account for proximity to rail
- Indirect connections for travel to the CBD would reduce demand by 2.8%
- Indirect connections for travel to the NWRL would reduce demand by 3.1%
- Modal interchange would reduce demand by around 10% for the Schofields Marsden Park Corridor to NWRL Corridor segment in Option B.

5.0 Patronage Potential

5.1 General

This chapter draws together the information analysed in previous chapters to estimate the relative use of the options. This is reported in terms of relative use indicators (RUI), which are essentially commuter journeys.

5.2 Option A

The following tables summarise the trip rates by train and the adjustment factors described in the previous chapter. These are applied to the incremental populations for the relevant areas identified in Chapter 2.

Table 5-1: Trip rates, adjustment factors and adjusted trip rates – Option A

Market		Trip rate	Adj for proximity	Indirect penalty	Adjusted trip rate
Richmond North	Schofields Marsden Park Corridor	0.01	1.2	0.969	0.01
NWRL	Schofields Marsden Park Corridor	0.08	1.2	1	0.09
Main Western Rail Corridor	Schofields Marsden Park Corridor	0.18	1.2	0.972	0.21
Richmond South	Schofields Marsden Park Corridor	0.01	1.2	0.969	0.01
Richmond North	NWRL	0.08	1.2	0.969	0.09
Main Western Rail Corridor	NWRL				
NWRL	Richmond South	0.01	1.2	0.969	0.01
NWRL	Blue Mts/Penrith	0.01	1.2	0.969	0.01

Table 5-2: Forecast incremental populations for specific markets – Option A

Market		Pop inc 2016	Pop inc 2021	Pop inc 2026	Pop inc 2031	Pop inc 2036
Richmond North	Schofields Marsden Park Corridor	1,840	8,034	15,216	23,357	31,320
NWRL	Schofields Marsden Park Corridor	1,840	8,034	15,216	23,357	31,320
Main Western Rail Corridor	Schofields Marsden Park Corridor	1,840	8,034	15,216	23,357	31,320
Richmond South	Schofields Marsden Park Corridor	1,840	8,034	15,216	23,357	31,320
Richmond North	NWRL	1,487	4,811	10,006	15,572	18,391
Main Western Rail Corridor	NWRL					
NWRL	Richmond South	3,975	7,637	11,252	13,385	15,792
NWRL	Blue Mts/Penrith	3,491	5,982	8,617	11,070	13,923

Table 5-3: Relative use indicators – Option A

Market		RUI 2016	RUI 2021	RUI 2026	RUI 2031	RUI 2036
Richmond North	Schofields Marsden Park Corridor	21	93	177	272	364
NWRL	Schofields Marsden Park Corridor	171	747	1,415	2,172	2,913
Main Western Rail Corridor	Schofields Marsden Park Corridor	386	1,687	3,195	4,904	6,576
Richmond South	Schofields Marsden Park Corridor	21	93	177	272	364
Richmond North	NWRL	134	434	902	1,403	1,657
Main Western Rail Corridor	NWRL					
NWRL	Richmond South	46	89	131	156	184
NWRL	Blue Mts/Penrith	41	70	100	129	162
Total		**821**	**3,213**	**6,098**	**9,307**	**12,220**

In the above analysis the potential to generate patronage from the Main Western Rail Corridor to NWRL Corridor has been excluded due to the circuitous route: it would generate some extra patronage, but this would be modest due to the advantages of alternative modes and would not differ greatly between Options A and B.

As noted in Chapter 3, the current land use projections for the study area indicate that some 12,000 extra jobs in Marsden Park are not included. This has the potential to boost patronage, especially outbound patronage, as Option A would result in a corridor of direct service between Marsden Park and Castle Hill/Epping, with substantial population and employment along the whole route, connecting activity centres at Epping, Castle Hill, Norwest, Rouse Hill and Marsden Park, as well as connecting with the broader rail network.

5.3 Option B

The following tables summarise the trip rates by train and the adjustment factors described in the previous chapter. These are applied to the incremental populations for the relevant areas identified in Chapter 2.

Table 5-4: Trip rates, adjustment factors and adjusted trip rates – Option B

Market		Trip rate	Adj for proximity	Indirect penalty	Adjusted trip rate
Richmond North	NWRL	0.08	1.2	1	0.09
Main Western Rail Corridor	NWRL				
NWRL	Richmond South	0.01	1.2	0.97	0.01
NWRL	Blue Mts/Penrith	0.01	1.2	0.97	0.01
NWRL	Schofields Marsden park Corridor	0.08	1.0	1.0	0.07

Table 5-5: Forecast incremental populations for specific markets – Option B

Market		Pop inc 2016	Pop inc 2021	Pop inc 2026	Pop inc 2031	Pop inc 2036
Richmond North	NWRL	1,487	4,811	1,006	15,572	18,391
Main Western Rail Corridor	NWRL					
NWRL	Richmond South	3,975	7,637	11,252	13,385	15,792
NWRL	Blue Mts/Penrith	3,491	5,982	8,617	11,070	13,923
NWRL	Schofields Marsden park Corridor	1,840	8,034	15,216	23,357	31,320

Table 5-6: Relative use indicators – Option B

Market		RUI 2016	RUI 2021	RUI 2026	RUI 2031	RUI 2036
Richmond North	NWRL	138	447	94	1,448	1,710
Main Western Rail Corridor	NWRL	-	-	-	-	-
NWRL	Richmond South	46	89	131	156	184
NWRL	Blue Mts/Penrith	41	70	100	129	162
NWRL	Schofields Marsden park Corridor	128	560	1,061	1,629	2,185
Total		353	1,166	1,386	3,362	4,240

In the above analysis the potential to generate patronage from the Main Western Rail Corridor to NWRL Corridor has been excluded due to the circuitous route: it would generate some extra patronage, but this would be modest due to the advantages of alternative modes and would not differ greatly between Options A and B.

The indicated relative use of this rail for this option is less than 40 per cent of Option A's in 2036.

As noted in Chapter 3, the current land use projections for the study area indicate that some 12,000 extra jobs in Marsden Park are not included. This has the potential to boost patronage, although Option B would result in a 3 or 4km long gap between the NWRL Corridor and Marsden Park. This gap would require a modal interchange for rail patrons and would be expected to substantially reduce incremental rail usage, when compared with a direct service that could be supported by Option A.

5.4 Option A with western extension to St Marys

The qualitative assessment of this extended option indicated that a number of additional segments would be served by the additional connectivity afforded by this option. However, while useful, most of these segments are modest, many relate to the St Marys corridor, which shows modest population growth of some 3,700 extra residents. The boost to patronage is not as straight forward to estimate for these extra segments, due to their small scale nature, the similarities of land use in some corridors and dispersed travel patterns.

Consequently, we increase estimates for Option A by 10% to derive the estimates of patronage shown in the table below.

Table 5-7: Relative use indicators for Option A western extended

Option	RUI 2016	RUI 2021	RUI 2026	RUI 2031	RUI 2036
Option A	821	3,213	6,096	9,307	12,220
Option A extended	903	3,534	6,706	10,238	13,442

A potential source of this additional patronage is the current movement by car in these geographic segments. The rail corridor would be of a similar length and directness to the road links, increasing the competitiveness of rail.

6.0 Conclusions

The main conclusions drawn from this work are:

- The scale of the proposed rail task to be dealt with in the morning peak by 2036 identified in the Discussion Paper is extremely ambitious. This will require good access to be provided by rail and suggests that one of the corridor options which is the subject of the current exhibition will be required and will be heavy rail.
- Following on from this requirement, options that cover more catchment area and appeal to the broadest number of segments should be preferred. From the qualitative appraisal presented in Chapter 2, Option A with western extension, clearly meets this requirement, by opening direct rail access to/from the North West Growth Centre from the west, as well as providing an extension of the NWRL corridor. Option A, by linking the Schofields Marsden Park Corridor directly with the NWRL Corridor, and indirectly linking with the Richmond North and Richmond South Corridors, as well as the Main Western Rail Served Corridor, brings a new market to rail.
- The quantitative appraisal of patronage potential of the options indicated a substantial difference between Option A and Option B, with Option A showing the greatest potential. The fact that Option A shows more incremental patronage potential than Option B should be no surprise: it would extend the coverage of the rail network in the study area, providing an additional station. Whereas Option B would only connect two stations that would exist in any case (Cudgegong Road and Riverstone Stations) – and while this link would be useful, it would not cover additional market. As noted previously the patronage analysis is at a strategic level and reflects the data inputs and assumptions, which are described in this report. Consequently the actual numbers should be treated with caution, although the relativities between the options are considered sound.
- The analysis indicates that the current employment forecasts produced by the state for Marsden Park do not fully reflect the future status of Marsden Park as a major employment node, by around 12,000 jobs in 2036. Updating of the small area forecasts, which is slated for 2012, would assist with transport planning activities in the sub-region.
- The qualitative and quantitative appraisals identify the preferred option on patronage potential grounds as Option A and its extension Option A with western extension to St Marys.

Appendix A – Study Geography

Travel Zone	Study Corridor
2150	St Marys Corridor
2149	St Marys Corridor
2152	St Marys Corridor
2159	St Marys Corridor
2157	St Marys Corridor
1851	St Marys Corridor
1850	St Marys Corridor
1855	St Marys Corridor
1858	St Marys Corridor
1861	St Marys Corridor
1853	Blue Mountains Penrith Corridor
1857	Blue Mountains Penrith Corridor
1852	Blue Mountains Penrith Corridor
1854	Blue Mountains Penrith Corridor
1856	Blue Mountains Penrith Corridor
1927	Blue Mountains Penrith Corridor
1930	Blue Mountains Penrith Corridor
1932	Blue Mountains Penrith Corridor
1925	Blue Mountains Penrith Corridor
1926	Blue Mountains Penrith Corridor
2008	Blue Mountains Penrith Corridor
2009	Blue Mountains Penrith Corridor
2005	Blue Mountains Penrith Corridor
2007	Blue Mountains Penrith Corridor
1997	Blue Mountains Penrith Corridor
1983	Blue Mountains Penrith Corridor
1992	Blue Mountains Penrith Corridor
1990	Blue Mountains Penrith Corridor
2278	Schofields Marsden Park Corridor
2267	Schofields Marsden Park Corridor
2227	Schofields Marsden Park Corridor
2223	Schofields Marsden Park Corridor
2226	Schofields Marsden Park Corridor
2273	Schofields Marsden Park Corridor
2233	Schofields Marsden Park Corridor
2274	Schofields Marsden Park Corridor
2277	Schofields Marsden Park Corridor
2216	Richmond Corridor North
2262	Richmond Corridor North
2211	Richmond Corridor North
2210	Richmond Corridor North

Travel Zone	Study Corridor
2261	Richmond Corridor North
2050	Richmond Corridor North
2054	Richmond Corridor North
2053	Richmond Corridor North
2040	Richmond Corridor North
2052	Richmond Corridor North
2037	Richmond Corridor North
2223	Richmond Corridor South
2227	Richmond Corridor South
2267	Richmond Corridor South
2271	Richmond Corridor South
2236	Richmond Corridor South
2272	Richmond Corridor South
2245	Richmond Corridor South
2246	Richmond Corridor South
2252	Richmond Corridor South
2254	Richmond Corridor South
2253	Richmond Corridor South
2259	Richmond Corridor South
2222	NWRL Corridor
2265	NWRL Corridor
2268	NWRL Corridor
2269	NWRL Corridor
2270	NWRL Corridor
2230	NWRL Corridor
2224	NWRL Corridor
2220	NWRL Corridor
2794	NWRL Corridor
2801	NWRL Corridor
2231	NWRL Corridor
2238	NWRL Corridor
2808	NWRL Corridor
2244	NWRL Corridor
2718	NWRL Corridor
2729	NWRL Corridor
2730	NWRL Corridor
2727	NWRL Corridor
2722	NWRL Corridor
2719	NWRL Corridor
2724	NWRL Corridor
2713	NWRL Corridor
2716	NWRL Corridor
2720	NWRL Corridor

Travel Zone	Study Corridor
2725	NWRL Corridor
2673	NWRL Corridor
2684	NWRL Corridor
2629	NWRL Corridor
2628	NWRL Corridor
2632	NWRL Corridor
2631	NWRL Corridor
1657	NWRL Corridor
1659	NWRL Corridor
2634	NWRL Corridor
2469	NWRL Corridor
2470	NWRL Corridor
2475	NWRL Corridor
2476	NWRL Corridor
2477	NWRL Corridor
2480	NWRL Corridor
2478	NWRL Corridor
2479	NWRL Corridor
2481	NWRL Corridor
2488	NWRL Corridor
2500	NWRL Corridor
2489	NWRL Corridor
2392	Mid North Shore
2387	Mid North Shore
2393	Mid North Shore
2398	Mid North Shore
2388	Mid North Shore
2400	Mid North Shore
2404	Mid North Shore
2411	Mid North Shore
2412	Mid North Shore
2334	Mid North Shore
2435	Mid North Shore
2090	Main Western Rail Served Corridor
2093	Main Western Rail Served Corridor
2101	Main Western Rail Served Corridor
2095	Main Western Rail Served Corridor
1693	Main Western Rail Served Corridor
1793	Main Western Rail Served Corridor
1697	Main Western Rail Served Corridor
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1703	Main Western Rail Served Corridor
1708	Main Western Rail Served Corridor

Travel Zone	Study Corridor
1710	Main Western Rail Served Corridor
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1711	Main Western Rail Served Corridor
1702	Main Western Rail Served Corridor
1715	Main Western Rail Served Corridor
1699	Main Western Rail Served Corridor
1628	Main Western Rail Served Corridor
1627	Main Western Rail Served Corridor
1633	Main Western Rail Served Corridor
1634	Main Western Rail Served Corridor
1636	Main Western Rail Served Corridor
1641	Main Western Rail Served Corridor
1517	Main Western Rail Served Corridor
1591	Main Western Rail Served Corridor
1559	Main Western Rail Served Corridor
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Travel Zone	Study Corridor
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141	Main Western Rail Served Corridor
142	Main Western Rail Served Corridor

Travel Zone	Study Corridor
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144	Main Western Rail Served Corridor
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166	Main Western Rail Served Corridor

Appendix F

Richmond Road Design

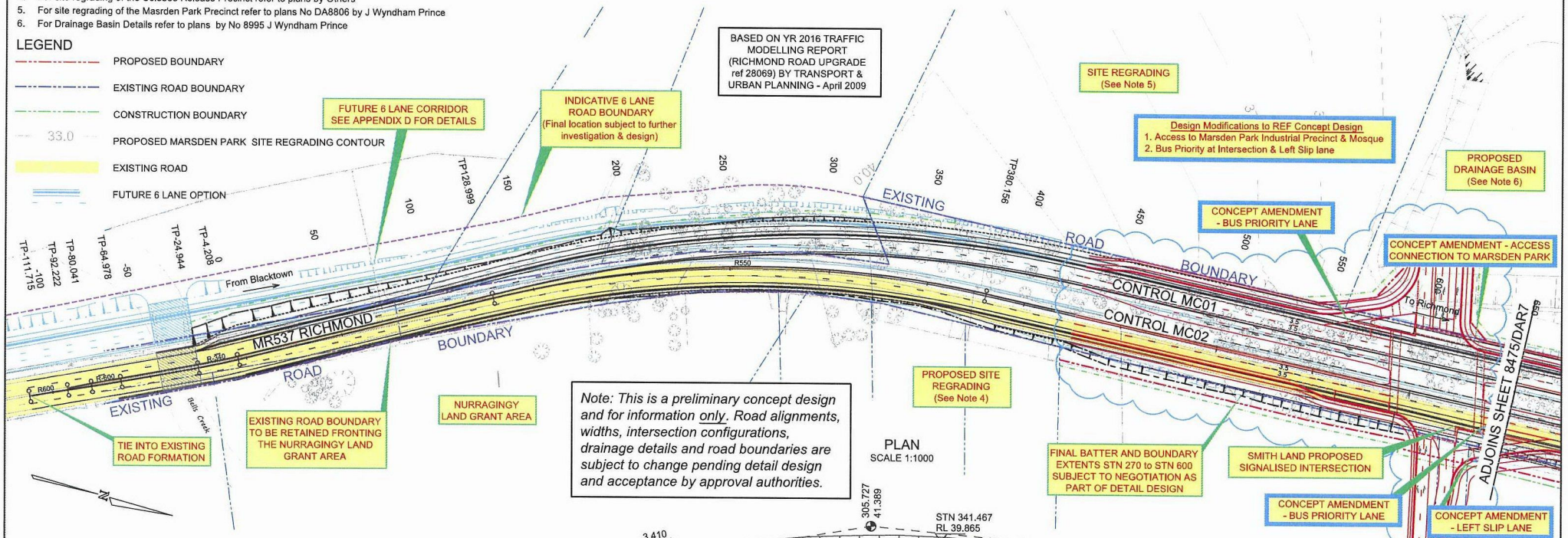
PRELIMINARY DRAWING ONLY NOT FOR CONSTRUCTION

NOTES

1. See sheet 8475/DAR2 for general notes.
2. All mountable kerbs to be painted reflective white.
3. All measurement are in metres unless otherwise shown.
4. For site regrading of the Colebee Release Precinct refer to plans by Others
5. For site regrading of the Masrden Park Precinct refer to plans No DA8806 by J Wyndham Prince
6. For Drainage Basin Details refer to plans by No 8995 J Wyndham Prince

LEGEND

- PROPOSED BOUNDARY
- EXISTING ROAD BOUNDARY
- CONSTRUCTION BOUNDARY
- 33.0 PROPOSED MARSDEN PARK SITE REGRADING CONTOUR
- EXISTING ROAD
- FUTURE 6 LANE OPTION



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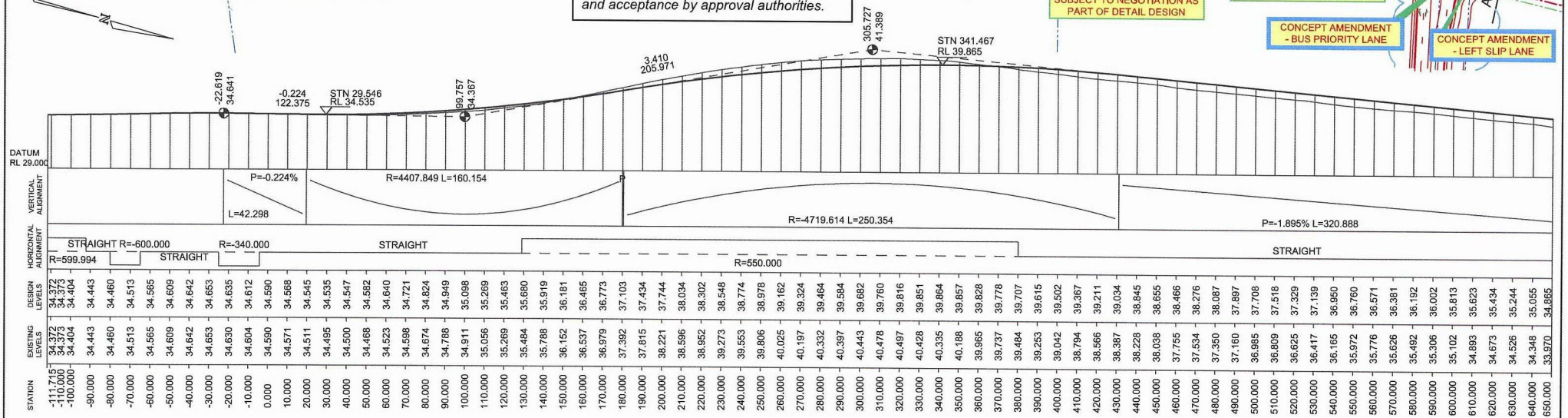
SCALE 1:1000



LONGITUDINAL SECTION - RICHMOND ROAD - (MC02)
SCALE 1:1000(H) 1:200(V)

PRELIMINARY DRAWING ONLY NOT FOR CONSTRUCTION

No.	Amendment Description	Initials	Date
J	RMS AMENDMENTS	BBB	02/03/12
I	LAND ACQUISITION AMENDED	BBB	26/09/11
H	ISSUED FOR ACCEPTANCE	SjW	11/03/11
G	ISSUED FOR REVIEW	SjW	14/01/11
F	ISSUED FOR REVIEW (SOUTHERN TIE IN REVISED)	BBB	01/12/10

A3 original | This sheet may be prepared using colour and may be incomplete if copied | Co-ordinate System: MGA Zone 56 | Height Datum: A.H.D.

SCALES
0 20 40 60 80 100
SCALE 1:1000m (A1 Sheet)
0 5 10 15 20
SCALE 1:200m (A1 Sheet)

PREPARED BY
J. WYNDHAM PRINCE
CONSULTING CIVIL INFRASTRUCTURE ENGINEERS & PROJECT MANAGERS

DESIGNED JK / SW
DRAWN JK / SW
REVIEWED PS / JH

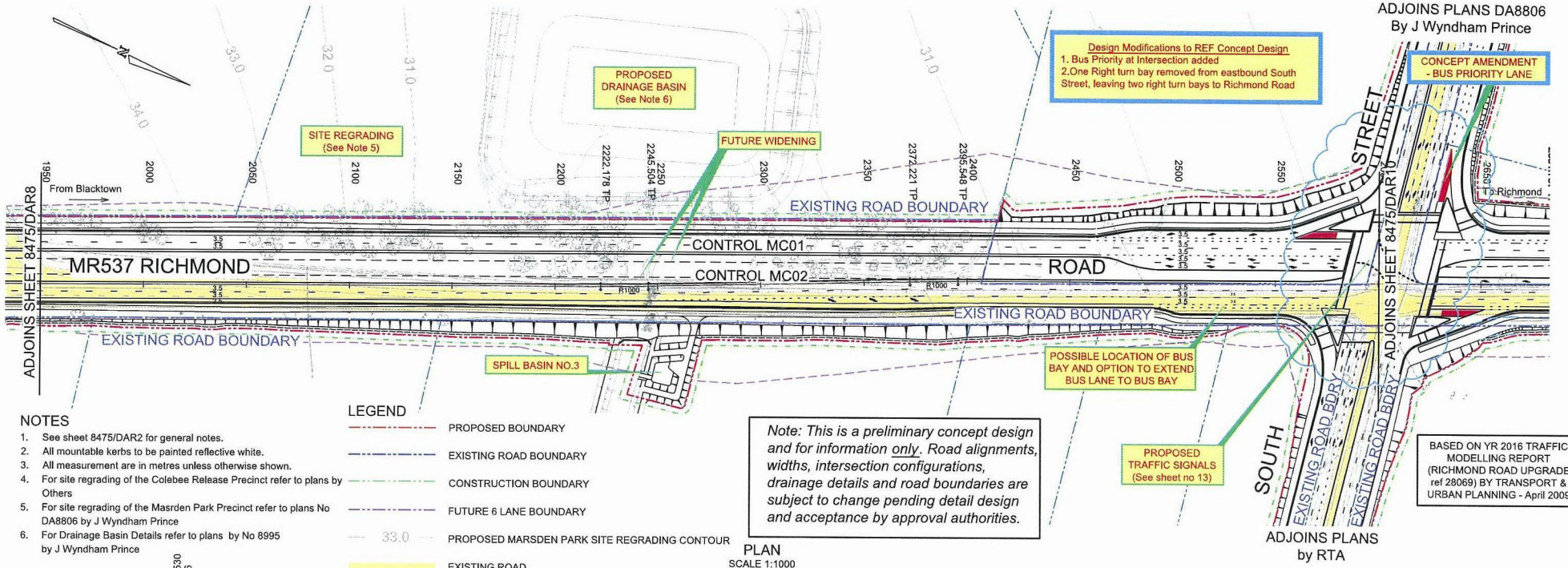
ROADS AND TRAFFIC AUTHORITY OF NSW

BLACKTOWN CITY COUNCIL
MR 537 RICHMOND ROAD
RECONSTRUCTION AND INTERSECTION WORKS BETWEEN BELLS CREEK AND GRANGE AVE, MARSDEN PARK
PLAN & LONGITUDINAL SECTION

FILE No.	DRAWING	PRINTED DATE	SHEET No.
8475DAR6	8475dar6.dwg	28/03/2012	6

REGISTRATION NUMBER
0537.040.CD.0011

PRELIMINARY DRAWING ONLY NOT FOR CONSTRUCTION



BASED ON YR 2016 TRAFFIC MODELLING REPORT (RICHMOND ROAD UPGRADE ref 28069) BY TRANSPORT & URBAN PLANNING - April 2009

NOTES

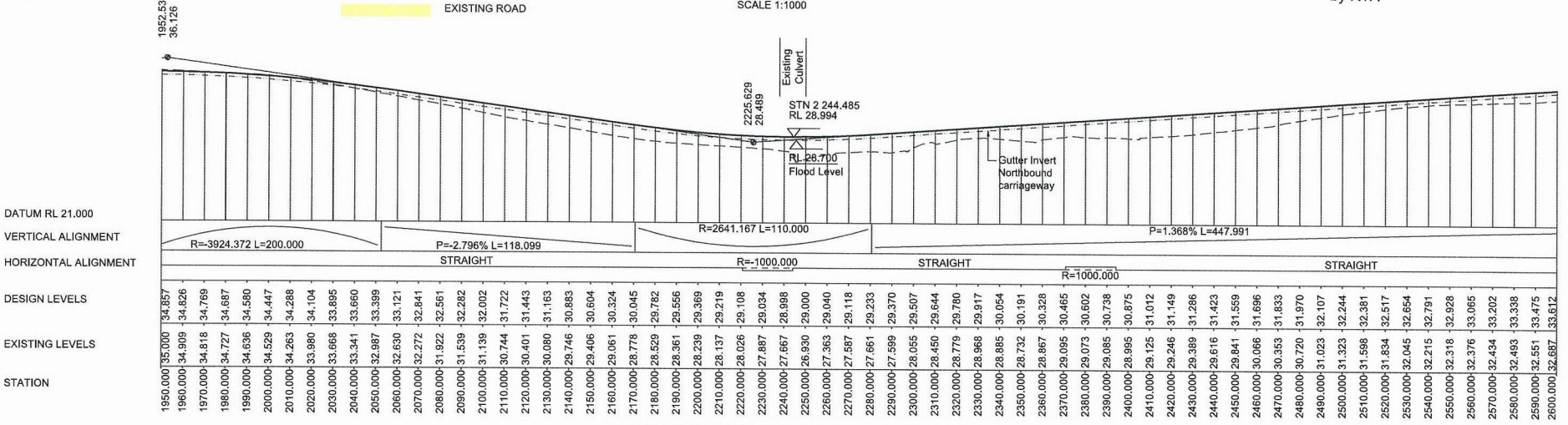
1. See sheet 8475/DAR2 for general notes.
2. All mountable kerbs to be painted reflective white.
3. All measurement are in metres unless otherwise shown.
4. For site regrading of the Colebee Release Precinct refer to plans by Others
5. For site regrading of the Masrden Park Precinct refer to plans No DA8806 by J Wyndham Prince
6. For Drainage Basin Details refer to plans by No 8995 by J Wyndham Prince

LEGEND

- PROPOSED BOUNDARY
- EXISTING ROAD BOUNDARY
- CONSTRUCTION BOUNDARY
- FUTURE 6 LANE BOUNDARY
- 33.0 PROPOSED MARSDEN PARK SITE REGRADING CONTOUR
- EXISTING ROAD

Note: This is a preliminary concept design and for information only. Road alignments, widths, intersection configurations, drainage details and road boundaries are subject to change pending detail design and acceptance by approval authorities.

PLAN
SCALE 1:1000



LONGITUDINAL SECTION - RICHMOND ROAD - (MC02)
SCALE 1:1000(H) 1:200(V)

PRELIMINARY DRAWING ONLY NOT FOR CONSTRUCTION

No.	Amendment Description	Initials	Date
H	ISSUED FOR ACCEPTANCE	SjW	11/03/11
G	ISSUED FOR REVIEW	SjW	14/01/11
F	ISSUED FOR REVIEW (SOUTHERN TIE IN REVISED)	BBB	01/12/10
E	ISSUED FOR REVIEW	SjW	09/09/10
D	ISSUED FOR REVIEW	SjW	12/08/10

A3 original | This sheet may be prepared using colour and may be incomplete if copied

SCALES
SCALE 1:1000m (A1 Sheet) 0 20 40 60 80 100
SCALE 1:200m (A1 Sheet) 0 5 10 15 20

Co-ordinate System: MGA Zone 56 | Height Datum: A.H.D.

PREPARED BY
J. WYNDHAM PRINCE
CONSULTING CIVIL INFRASTRUCTURE ENGINEERS & PROJECT MANAGERS

DESIGNED ..... JK / SW
DRAWN ..... JK / SW
REVIEWED ..... PS / JH

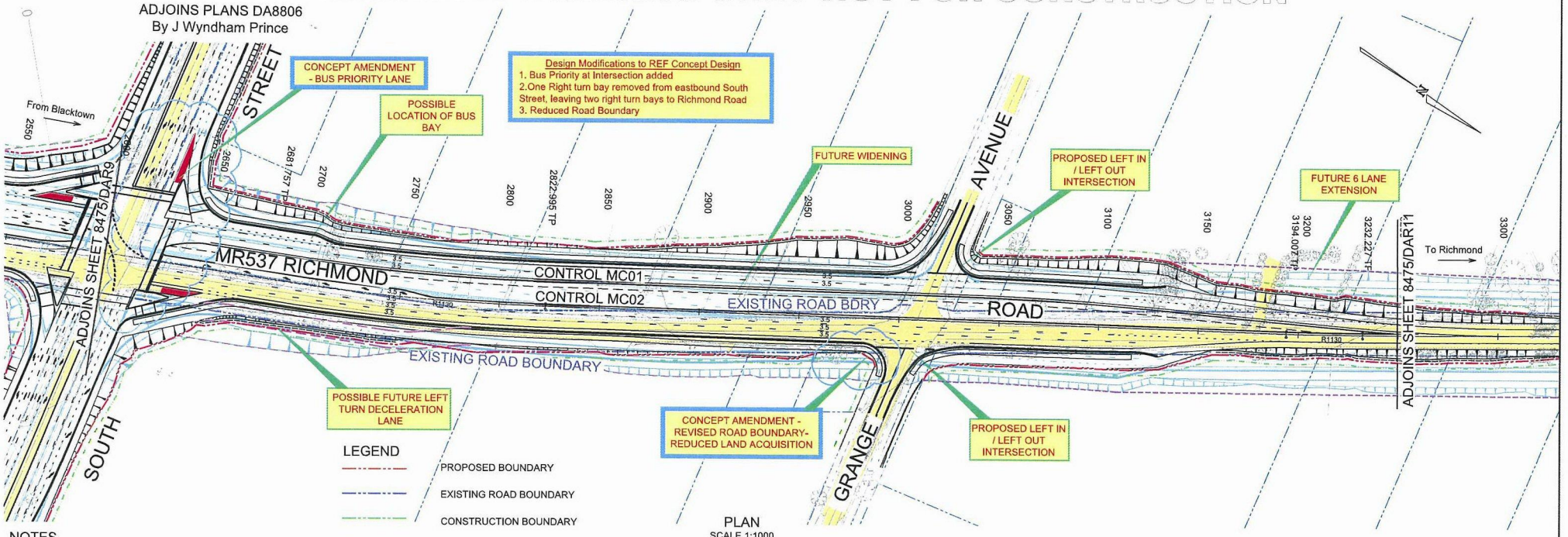
ROADS AND TRAFFIC AUTHORITY OF NSW

BLACKTOWN CITY COUNCIL
MR 537 RICHMOND ROAD
RECONSTRUCTION AND INTERSECTION WORKS BETWEEN BELLS CREEK AND GRANGE AVE, MARSDEN PARK
PLAN & LONGITUDINAL SECTION

FILE No.	DRAWING	PRINTED DATE	SHEET No.
8475DAR9	8475dar9.dwg	28/03/2012	9

REGISTRATION NUMBER
0537.040.CD.0011

PRELIMINARY DRAWING ONLY NOT FOR CONSTRUCTION



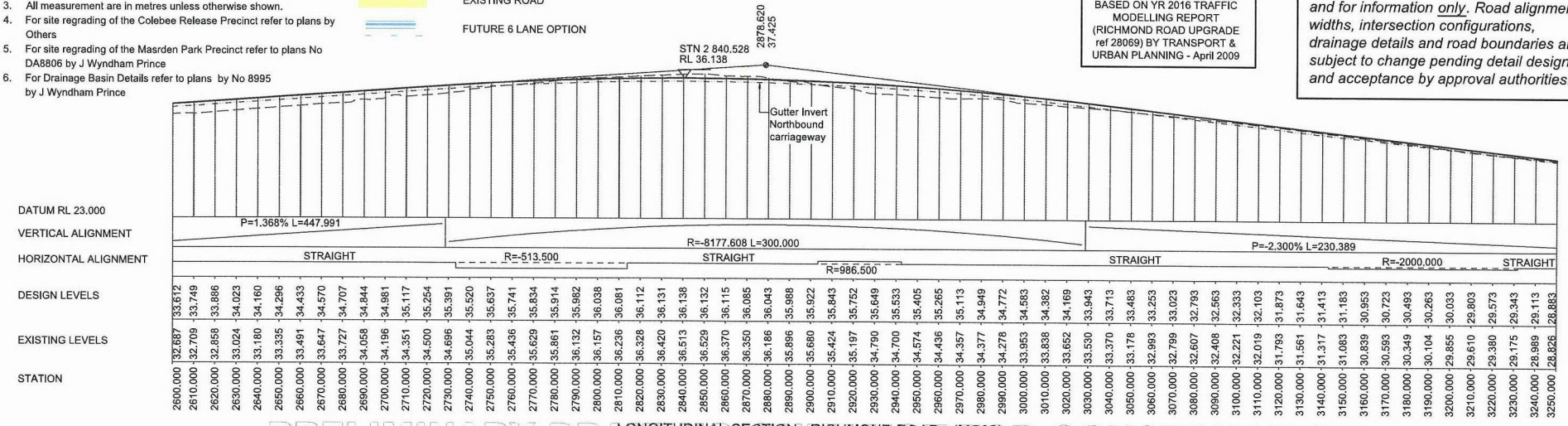
PLAN
SCALE 1:1000

NOTES

1. See sheet 8475/DAR2 for general notes.
2. All mountable kerbs to be painted reflective white.
3. All measurement are in metres unless otherwise shown.
4. For site regrading of the Colebee Release Precinct refer to plans by Others
5. For site regrading of the Masrden Park Precinct refer to plans No DA8806 by J Wyndham Prince
6. For Drainage Basin Details refer to plans by No 8995 by J Wyndham Prince

BASED ON YR 2016 TRAFFIC MODELLING REPORT (RICHMOND ROAD UPGRADE ref 28069) BY TRANSPORT & URBAN PLANNING - April 2009

Note: This is a preliminary concept design and for information only. Road alignments, widths, intersection configurations, drainage details and road boundaries are subject to change pending detail design and acceptance by approval authorities.



LONGITUDINAL SECTION - RICHMOND ROAD - (MC02)
SCALE 1:1000(H) 1:200(V)

PRELIMINARY DRAWING ONLY NOT FOR CONSTRUCTION

No.	Amendment Description	Initials	Date
I	RMS AMENDMENTS	BBB	02/03/12
H	ISSUED FOR ACCEPTANCE	SjW	11/03/11
G	ISSUED FOR REVIEW	SjW	14/01/11
F	ISSUED FOR REVIEW (SOUTHERN TIE IN REVISED)	BBB	01/12/10
E	ISSUED FOR REVIEW	SjW	09/09/10

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SCALES
SCALE 1:1000m (A1 Sheet) 0 20 40 60 80 100
SCALE 1:200m (A1 Sheet) 0 5 10 15 20

Co-ordinate System: MGA Zone 56 | Height Datum: A.H.D.

PREPARED BY
J. WYNDHAM PRINCE
CONSULTING CIVIL INFRASTRUCTURE ENGINEERS & PROJECT MANAGERS

DESIGNED JK / SW
DRAWN JK / SW
REVIEWED PS / JH

ROADS AND TRAFFIC AUTHORITY OF NSW

BLACKTOWN CITY COUNCIL
MR 537 RICHMOND ROAD
RECONSTRUCTION AND INTERSECTION WORKS BETWEEN BELLS CREEK AND GRANGE AVE, MARSDEN PARK
PLAN & LONGITUDINAL SECTION

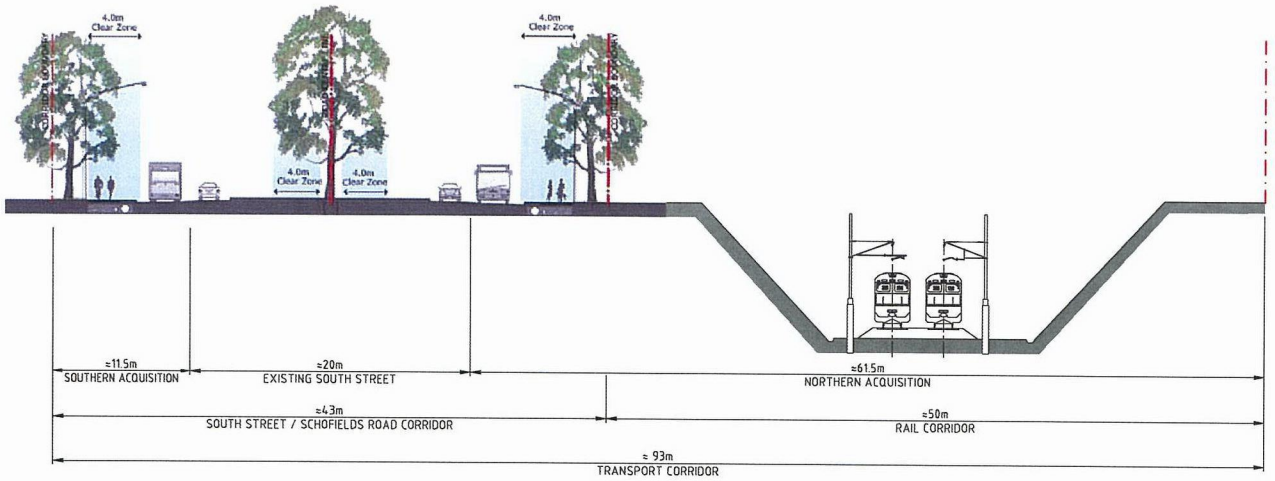
FILE No.	DRAWING	PRINTED DATE	SHEET No.
8475DAR10	8475dar10.dwg	28/03/2012	10

REGISTRATION NUMBER
0537.040.CD.0011

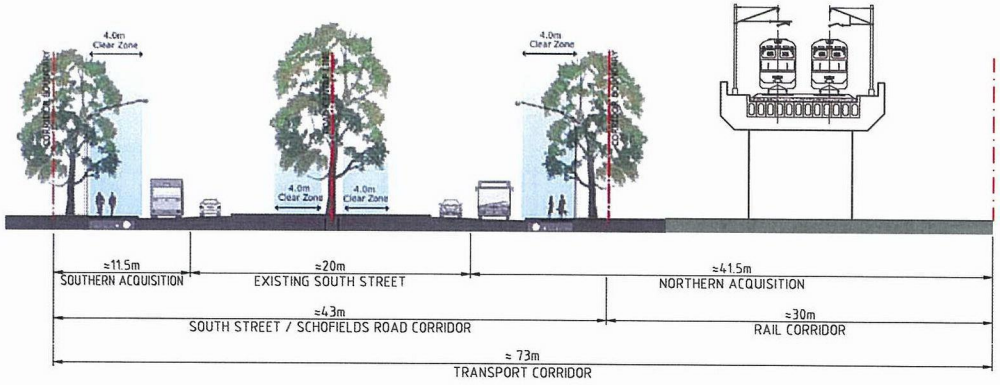
Appendix G

Integrated Road/Rail Corridor Sketch

SKETCH



INTEGRATED ROAD / RAIL (IN CUT) CORRIDOR
1 : 200



INTEGRATED ROAD / RAIL (VIADUCT) CORRIDOR
1 : 200

Issue	Description	Date
P1	FOR INFORMATION	11.05.12

Client

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1 : 200

Status: PRELIMINARY
NOT FOR CONSTRUCTION

		Current Issue Signatures
Scales	1:200	Drawn VH
Original Size	A1	Designed VN
Height Datum	AHD	Checked SH
Grid		Approved KT

Filename: 002-aa004938-nsk-00.dwg

Project: NORTH WEST RAIL LINK

Title: NORTH WEST RAIL LINK EXTENSION
TYPICAL CROSS SECTIONS

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Fax: +61 (0)2 8907 9001
www.hyderconsulting.com
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Drawing No.	Project No.	Issue
002	AA004938	P1

Date Plotted: 11 May 2012 - 11:24 AM File Name: F:\AA004938\E-CAD\B-Sketches\002-aa004938-nsk-00.dwg V1