Appendix J: Transport Impact Assessment

Byford Rail Extension

Byford Station, Transport Impact Assessment

MetCONNX August 2023

Urbsol

Document Control

Document No: BRE-BSTIA-JAP004-RP-A

Rev No.	Author	Reviewer		Approved for Issue		
		Name	Signature	Name	Signature	Date
A	J Petsos	N Matthew		N Matthew		4/07/2023
B	J Petsos	N Matthew		N Matthew		2/08/2023

Document history

Rev No.	Nature of Change
A	First Issue
B	Various revisions following PTA review

Change log

Urbsol

Table of Contents

Urbsol

Urbsol

Index of Tables

Index of Figures

Urbsol

Summary

Introduction

MetCONNX is responsible for the design, procurement, manufacture, construction, installation and commissioning of rail infrastructure and ancillary works to support an electrified operational passenger rail between Armadale and Byford, as part of the Byford Rail Extension (BRE) Design and Construction Project. A key component of these works is the delivery of two new train stations, namely the Armadale Station and the Byford Station.

This report has been prepared in accordance with the *Transport Impact Assessment Guidelines, Volume 4 – Individual Developments* (WAPC, August 2016). Given the scale of redevelopment proposed, the requirements of a Transport Impact Assessment are addressed in this report.

This report builds upon previous planning phase investigations for the BRE project, both undertaken by WSP, including the *Future Year Traffic Impact Analysis, Byford* (WSP, February 2022) and the *Byford Station Access Strategy* (WSP, January 2021). It also references traffic volume related information from Cardno's *Transport Impact Assessment, TIA-LSP Lot 1 Abernethy Road, Byford* (Cardno, October 2021).

Existing Situation

Land uses in Byford have changed considerably in the last 15 years, with rapid growth in residential, retail, commercial and civic uses as more households choose to live in Perth's south-eastern corridor. Whilst the station is to be located in a current greenfield, surrounding land uses include the following:

- The eastern side of the rail line hosts a range of transitional main street retail, commercial and civic uses such as a post office, a pharmacy, banks, a vet clinic, RSL, cafes, smaller speciality stores and a medium-sized supermarket.
- The western side of the rail line hosts two major supermarkets with associated speciality retailers, fast food, and a petrol station. Two schools (Byford Secondary College and Salvado Catholic College) are also located on this side of the railway.
- Residential development surrounds the future station area, with large vacant landholdings immediately to the east of the future station. Whilst development historically followed South Western Highway (SWH), the majority of new residential land releases occur on the western side of the railway tracks.

The following representative peak hour periods were chosen for the traffic assessment as they are expected to represent the combined network/station peak periods:

- AM peak: 8:00-9:00
- PM peak: 15:00-16:00

Network Modifications

Road Network

The network modifications/additions to be constructed as part of the project include:

- The construction of Sansimeon Boulevard, north of Abernethy Road to form the northern leg of the roundabout at Abernethy Road/Gordin Way.
- The existing Sansimeon Boulevard will be extended south and deviate to the east to intersect the new north-south section of Sansimeon Boulevard.
- A roundabout will be constructed at the intersection of the two Sansimeon Boulevard links.
- From that roundabout, Evans Way will extend to the north and connect into Padra Turn/Evans Way to form a four way intersection. This section of Evans Way will provide access to Byford Station via Access Road A.
- From the same roundabout, Clara Street will be constructed to the east across the rail line and connect into George Street. This section of Clara Street will have a secondary access to the station (left in/out only) via Plaza Road.

Pedestrian and Cyclist Networks

The new train station provides an opportunity to realise a second pedestrian link across the rail via the provision of Clara Street, connecting the east and west side of the Byford Town Centre. It also includes a new at-grade rail crossing at Clara Street West.

Footpaths along Evans Way, Clara Street and Sansimeon Boulevard will further improve the pedestrian permeability around the Town Centre, connect with the surrounding path networks and with the retail/commercial area to the south and colleges south of Abernethy Road.

The new Principal Shared Path (PSP) along the west side of the rail line will create an important cycling linkage in the Byford cycle network. The PSP will connect to Armadale in the north, and to Abernethy Road in the south.

A grade-separated crossing at Larsen Road and an at-grade crossing at Clara Street West will improve the east-west connectivity across the rail line.

Public Transport Network

The public transport network is essentially based upon roads that facilitate the existing bus services, but extended to provide access to/from the station via Sansimeon Boulevard, Evans Way and Clara Street. It is anticipated there will be implementation of new Transperth bus routes to service the new growth areas to the west of Byford Station, subject to future planning by Transperth.

Traffic Generation

Traffic generated at Byford station was estimated by factoring up existing traffic at Armadale Station in accordance with relative private vehicle generated patronage numbers. Beyond 2026, changes in station traffic was estimated by factoring PnR and KnR traffic by the estimated change in patronage using these modes. In the context for this TIA, the operational assessment of the access point and key surrounding intersections was undertaken for the critical peaks, which included the network peak in the AM period, and the coinciding network and station peak in the PM period. The trips generated by the station during these periods was estimated to be:

- 2026 AM peak - **52 PnR trips**, and **90 inbound and 90 outbound KnR trips**
- 2026 PM peak - **88 PnR trips**, and **153 inbound and 153 outbound KnR trips**
- 2036 AM peak - **73 PnR trips**, and **60 inbound and 60 outbound KnR trips**
- 2036 PM peak - **124 PnR trips**, and **103 inbound and 103 outbound KnR trips**

Traffic distribution was undertaken in consultation with SSJ to ensure that station related private vehicles reflected likely development of the surrounding areas.

Traffic Assessment

An operational assessment of the station access point was undertaken for the following scenarios:

- 2026 AM and PM peak
- 2036 AM and PM peak

An operational assessment of key intersections was undertaken for the following scenarios:

- 2022 AM and PM peak, (where existing) without station generated traffic
- 2026 AM and PM peak, without and with station generated traffic
- 2036 AM and PM peak, with station generated traffic

For the 2026 assessment, the traffic volumes used in the SIDRA analysis account for the estimated traffic on the respective roadway links, including 50% development of the Byford Town Centre Structure Plan area, nominal additional through traffic, and traffic generated at the station.

The assessment indicates that the access point is expected operate satisfactorily during the AM and PM peak traffic periods for 2026 and beyond, with low degrees of saturation, minimal delays and minimal queueing.

This assessment also indicates that all intersections assessed are expected operate well during the AM and PM peak traffic periods. The difference in operational performance between the 2026 base case and 2026 project case that includes the station traffic, appears to be insignificant and would barely be noticeable to drivers. The operational performance of new intersections also appears to be satisfactory, with low degrees of saturation, minimal delays and minimal queueing.

The assessment indicates that in 2036, the key intersections are generally expected to operate satisfactorily with acceptable degrees of saturation, minimal delays and minimal queueing. The only area where it appears there may be operational issues is for southbound traffic on Sansimeon

Boulevard to turn onto Abernethy Road (PM peak). This is a result of high traffic demands on Abernethy Road, and not due to station generated traffic.

Comparing previous investigations undertaken, there appears is a level of uncertainty and conflicting information with respect to traffic growth on Abernethy Road.

Beyond this project, it is recommended that SSJ consider more focussed modelling of the wider area be undertaken, so that broader network and consolidated land use assumptions are considered, ensuring that the Byford Station and surrounding development is included. This will enable a better understanding of the future needs for Abernethy Road. Should the traffic demands grow in line with forecasts used for this assessment, the delays could be reduced significantly if an additional short lane is provided on the north and south approaches to separate left turning traffic from through/right turning traffic. i.e. two lanes on the approaches to the roundabout.

Conclusions

Key conclusions of the transport assessment are provided below:

- there are some significant enhancements and opportunities created with the development, including the new PSP along the west side of the rail line linking Armadale in the north and Abernethy Road in the south. A second pedestrian link across the rail, connecting the east and west side of the Byford Town Centre will also be provided, as well as additional footpaths along Evans Way, Clara Street and Sansimeon Boulevard that will further improve the pedestrian permeability around the Town Centre.

- Consideration has been given to areas where potential difficulty in crossing roads or undesirable conflict has been identified, and appropriate treatments incorporated into the design.

- The project includes the creation of a new at-grade level rail crossing. This is not ideal from a safety perspective, however it is recognised that the crossing will close only sporadically for the Bunbury train line.

- The extension of Evans Way north to the existing intersection at Evans Way/Padra Turn was seen to potentially create some undesirable safety implications if all movements were permitted at the closely spaced intersections at Access Road A, Padra Turn and Ninka Lane. A number of potential options were developed to improve safety and discussed with SSJ. However SSJ indicated a strong desire to maintain full movements at each location to minimise any negative impact upon the local community and maximise accessibility. As a result, the design progressed to maintain full connectivity and movements, but has raised pavement through the intersection of Evans Way/Padra Turn to achieve safe vehicular speeds through the area. It should be recognised that this was not the preferred outcome for Urbsol or MetCONNX. However SSJ has indicated its acceptance of risk associated with this final design outcome.

- For bus traffic key road access routes to/from Armadale Station is similar to the private vehicle network. In the vicinity of the station, new road construction of Sansimeon Boulevard and Evans Way will provide access to the broader road network.

- Traffic generated at Byford station was estimated by factoring up existing traffic at Armadale Station in accordance with relative private vehicle generated patronage numbers, sourced from the *Byford Station Access Strategy* (WSP, January 2021). Beyond 2026, changes in station traffic was estimated by factoring PnR and KnR traffic by the estimated change in patronage using these modes.

- The operational assessment undertaken indicated that all intersections assessed are expected operate well during the 2026 AM and PM peak traffic periods. There is a marginal difference in performance comparing the 2022 and 2026 base case scenarios. This is despite the fact that the assessment assumed that the station related traffic is 100% additional/new traffic on the network, and there will be no mode shift away from private vehicle usage as a result of the station development.

- As bus traffic is combined with general traffic at the access point and key intersections assessed, the bus operations are also expected to be satisfactory with will minimal delays and queueing.

- The assessment indicates that in 2036, the key intersections are generally expected to operate satisfactorily with acceptable degrees of saturation, minimal delays and minimal queueing. The only area where it appears there may be operational issues is for southbound traffic on Sansimeon Boulevard to turn onto Abernethy Road (PM peak). This is a result of high traffic demands on Abernethy Road, and not due to station generated traffic. Beyond this project, it is recommended that SSJ consider more focussed modelling of the wider area be undertaken, so that broader network and consolidated land use assumptions are considered. This will enable a better understanding of the future needs for Abernethy Road

As a result of the assessment undertaken and with regard to the objectives of the TIA, it can be concluded that the proposed station redevelopment:

- and its associated proposals provides for safe and efficient access for all modes to the site

- is well-integrated with surrounding land uses

- does not adversely impact on the surrounding land uses

- does not adversely impact on the surrounding transport networks or its users

1 Introduction

MetCONNX is responsible for the design, procurement, manufacture, construction, installation and commissioning of rail infrastructure and ancillary works to support an electrified operational passenger rail between Armadale and Byford, as part of the Byford Rail Extension (BRE) Design and Construction Project. A key component of these works is the delivery of two new train stations, namely the Armadale Station and the Byford Station.

Urbsol has been commissioned by MetCONNX on behalf of the Public Transport Authority (PTA) to prepare Transport Impact Assessments (TIA's) in support of the Development Application (DA) for the each of the stations.

The subject of this report is Byford Station. This new station, approximately 7 kilometres south of the existing Armadale Station, will include state-of-the-art, up-to-standard facilities such as Park N Ride (PnR), Kiss N Ride (KnR), a new bus interchange as well as a cyclist/pedestrian path network connecting to and from the station complex. The latest development plans for the design are attached to this report in Appendix A.

This report has been prepared in accordance with the *Transport Impact Assessment Guidelines, Volume 4 – Individual Developments* (WAPC, August 2016). Given the scale of redevelopment proposed, the requirements of a Transport Impact Assessment are addressed in this report. The TIA has been structured in accordance with that reference document for ease of assessment. Accordingly, the objectives of this TIA are to demonstrate that the development will:

- Provide safe and efficient access for all modes to the individual site
- Be well-integrated with surrounding land uses
- Not adversely impact on the surrounding land uses
- Not adversely impact on the surrounding transport networks and the users of those networks

A copy of the Transport Impact Assessment Checklist has been included in Appendix B.

This report builds upon previous planning phase investigations for the BRE project, both undertaken by WSP, including the *Future Year Traffic Impact Analysis, Byford* (WSP, February 2022) and the *Byford Station Access Strategy* (WSP, January 2021). It also references traffic volume related information from Cardno's *Transport Impact Assessment, TIA-LSP Lot 1 Abernethy Road, Byford* (Cardno, October 2021).

2 Existing Situation

2.1 Location

Byford is in the south-eastern corridor of the Perth Metropolitan region within the Shire of Serpentine Jarrahdale (SSJ). Byford is located in the northern portion of the Shire with the Byford Town Centre positioned 7km south of Armadale and 35km south-east of the Perth CBD, via Thomas Road and Kwinana Freeway.

Land uses are typically residential, with growing commercial and retail activity. The area's recent rural-residential and equine history is still visible, and an important part of the place. To the east is the Darling Scarp and State Forest which provide nearby nature tourism and recreational experiences. According to the Australian Bureau of Statistics Byford had a population of 3,335 people in 2001. In 2016 the ABS estimated population for the Byford District Structure Plan area was 18,123 people, representing an increase of over 440%. Statistics for 2022 indicate continued growth to 22,520 people. This growth has put pressure on existing services, facilities, and infrastructure.

Figure 1 Location plan

Urbsol

2.2 Land Uses

Land uses in Byford have changed considerably in the last 15 years, with rapid growth in residential, retail, commercial and civic uses as more households choose to live in Perth's south-eastern corridor.

- The eastern side of the rail line hosts a range of transitional main street retail, commercial and civic uses such as a post office, a pharmacy, banks, a vet clinic, RSL, cafes, smaller speciality stores and a medium-sized supermarket.
- The western side of the rail line hosts two major supermarkets with associated speciality retailers, fast food, and a petrol station. Two schools (Byford Secondary College and Salvado Catholic College) are also located on this side of the railway.
- Residential development surrounds the future station area, with large vacant landholdings immediately to the east of the future station. Whilst development historically followed South Western Highway (SWH), the majority of new residential land releases occur on the western side of the railway tracks.

Byford Station will offer a permanent, high quality public transport connection to Armadale, other Inner Armadale activity centres, Perth CBD and beyond. This change will inevitably encourage new growth and development.

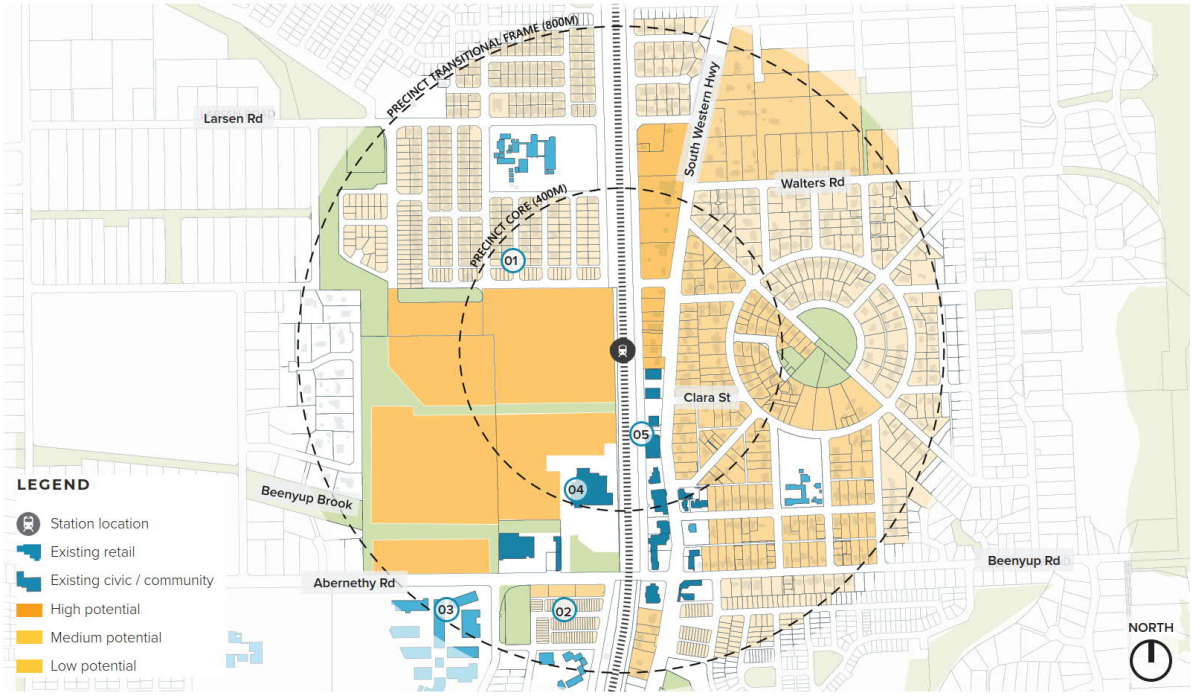


Figure 2 Land uses

Urbsol

2.3 Road Network

Referring to Figure 3 and Figure 4, the key road links surrounding the future Byford Station consist of the following:

- Abernethy Road: initially a single carriageway but upgraded to dual carriageway between Gordin Way and SWH, 60 km/h posted speed limit and generally classified as a "Local Distributor" within the MRWA Road Hierarchy (and a small segment of "Regional Distributor" status between Soldiers Road and SWH). Transitions into Beenyup Road on the east side of SWH, of which it also forms as a major four-way signal. It carries around 12,000 veh/day, both west of SWH and west of Gordin Way.

- South Western Highway (SWH): generally a dual carriageway road, with a 60 km/h posted speed limit and classified as a "Primary Distributor" within the MRWA Road Hierarchy. It forms the north-south regional route between Perth and Bunbury via Armadale as State Route 20. It carries around 15,000 veh/day around this part of the network.

- Gordin Way: a minor road that extends south from the existing roundabout at Abernethy Road. It is a single carriageway road, with a 50 km/h posted speed limit and classified as an "Access Road" within the MRWA Road Hierarchy. The very short Sansimeon Boulevard on the north side of Abernethy Road currently serves as the main access point to the Woolworths shopping centre car park. Both Gordin Way and the Woolworths access road (Sansimeon Boulevard) carry just over 2,000 veh/day.

- George Street: a north-south minor road parallel to the existing railway line. It is a single carriageway road, with a 50 km/h posted speed limit and classified as an "Access Road" within the MRWA Road Hierarchy. It connects to Abernethy Road as a priority T-intersection with most traffic movements allowable (except for the southbound being a left-out only). It currently functions as a low-speed link through the existing Byford Town Centre, associated with small-scale commercial and therefore car parking activity. It carries around 3,000 veh/day.

- Pitman Way: Similar to George Street, but forms as the connection between the Byford Town Centre and SWH, of which is configured as a priority T-intersection. Also carries at least 3,000 veh/day today.

Figure 3 Key road links around the future Byford Station, on aerial map view

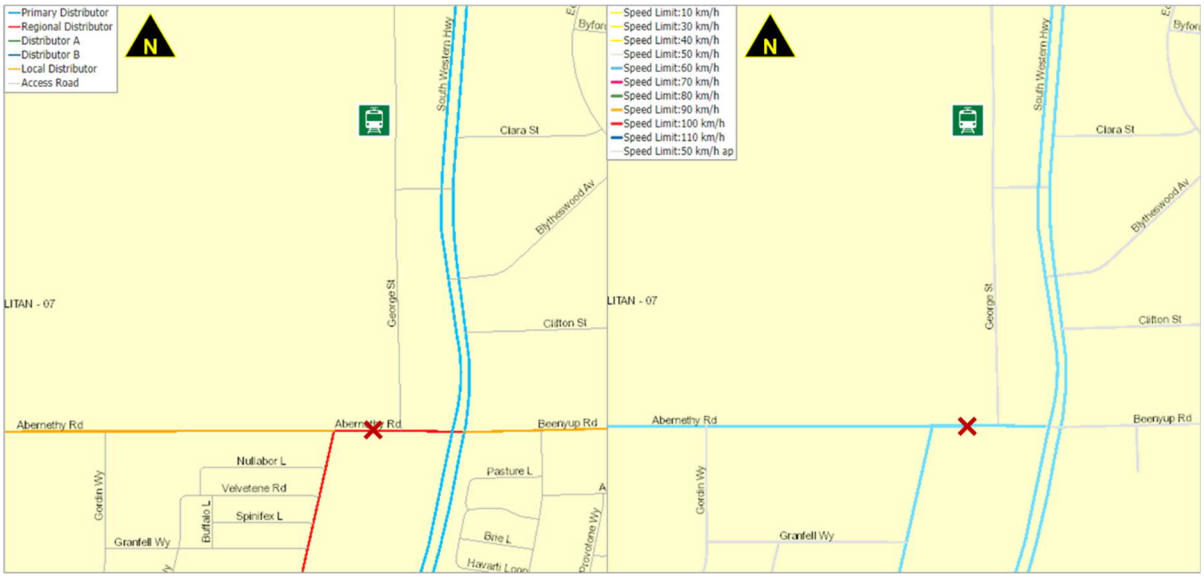


Figure 4 Key road links around the future Byford Station, showing Main Roads Road Hierarchy classifications and posted speed limits (MRWA, Road Information Mapping)

Urbsol

In terms of the MRWA Road Hierarchy:

- Primary Distributor
    - Provide for major regional and inter-regional traffic movement and carry large volumes of generally fast-moving traffic. Some are strategic freight routes and all are State Roads. They are managed by Main Roads WA.
- Regional Distributor
    - Roads that are not Primary Distributors, but which link significant destinations and are designed for efficient movement of people and goods within and beyond regional areas.
- Local Distributor
    - Roads that carry traffic within a cell and link Distributor A/B or Primary Distributors at the boundary, to access roads. The route of Local Distributors should discourage through traffic so that the cell formed by the grid of higher order distributor roads only carries traffic belong to or serving the area. Local Distributors should accommodate buses but discourage trucks.
- Access Road
    - Provide access to abutting properties with safety aspects having priority over the vehicle movement function. In urban areas, these roads are bicycle and pedestrian friendly, with aesthetics and amenity also important.

It should be noted that the roads listed in this particular area are under the responsibility of both the Western Australian Planning Commission (WAPC) and SSJ, except for SWH being a Primary Distributor (which is managed by Main Roads WA).

2.4 Parking and Access

This section is not applicable in terms of the existing situation, as the current Byford Station located around 400 metres south of Abernethy Road is a remnant of an old train system that had been rebuilt in the late 1990s and does not consist of any Transperth-related services. The station is still part of the regional Transwa Perth-Bunbury Australind Line but serves very few passenger numbers today.

2.5 Traffic Flows

2.5.1 Traffic Surveys

Traffic surveys were undertaken at key locations in the vicinity of the proposed station, in order to gain an appreciation of existing traffic demands, as well as the demand profiles throughout the day to ensure suitable periods are assessed in this traffic assessment. Figure 5 shows the traffic survey locations undertaken June 2022 by Surveytech.

Figure 5 Traffic survey locations (with ID numbers in red)

Table 1 summarises the traffic survey locations and their associated individual peak hour periods; also refer to Figure 3 for the site numbers highlighted in red. Figure 6 shows the hourly volume profile for all the surveyed sites that takes account into all traffic movements.

ID	Site Name	AM Peak Hour	PM Peak Hour
1	Abernethy Road/Gordin Way/San Simeon Boulevard	8:00-9:00	14:45-15:45
2	Abernethy Road/George Street	8:15-9:15	15:00-16:00
3	SWH/Abernethy Road/Beenyup Road	8:00-9:00	15:00-16:00
4	SWH/Pitman Way	8:00-9:00	15:45-16:45
5	George Street/Pitman Way	11:30-12:30	15:00-16:00

Table 1 Existing survey peak hour times for all individual sites

Urbsol

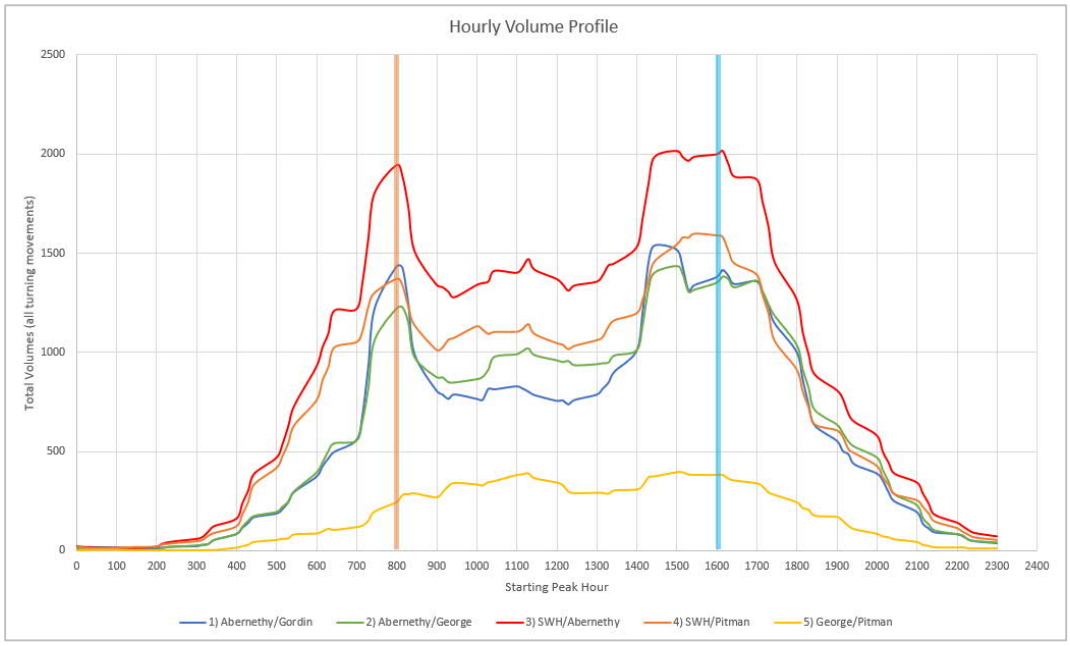


Figure 6 Hourly volume profile for all sites

As this part of the network does not yet contain a proper railway station, there is fairly little variability in the peak hour periods across the sites in question, at least when compared to the existing Armadale Station to the north. The only discernible observation is the intra-peaking pattern on George Street/Pitman Way, given its nature in serving commercial traffic. It should be emphasised, however, that these peak hours are typically determined by summing all turning movements in each site.

In comparison to the Byford Rail Extension's *SIDRA Base Model Calibration and Validation Report* undertaken previously by WSP (commissioned by PTA, Rev F, November 2021), the peak hour periods observed in 2021 across a wider study area surrounding the future Byford Station (covering six selected sites bounded by Thomas Road, SWH, Abernethy Road and Plaistowe Boulevard) ranged from 8:00 to 9:00 for the AM peak, and likewise ranging from 15:30 to 17:30 for the PM peak[1], are not that different to the recent 2022 surveys covered in this report.

The term 'peaking' can depend on the perspective of accounting every single movement, or the through movements along the main distributor, or the in- and outbound movements associated with the car parks. Thus, the objective of determining a pair of representative peak hour periods can be ambiguous depending on those aforementioned perspectives.

In the context for this TIA, it is most critical to assess the combined network/station peak rather than simply considering the station peak or network peak.

- AM Peak - at the existing Armadale Station, the morning network peak is typically between 8:15 and 9:15am, while the station peak is an hour earlier, between 7:15 and 8:15am. Based on the data from Table 1, the existing network peak in Byford typically occurs 8:00 and 9:00am. In line with the peaking pattern at Armadale Station, the station peak is expected to occur earlier than the network peak. The traffic generated by the station is not expected to be sufficient enough to alter the AM peak hour.

[1] The WSP peak hours along the Abernethy Road network (analysed between SWH and Gordin Way) was found to be 8-9 and 16:30-17:30 in the AM and PM peaks respectively.

Urbsol

- During the afternoon, the network peak around Byford is typically between 3.00 and 4:00pm. It is possible that the station related traffic peak coincides with the network peak.

As such the following representative peak hour periods were chosen for the assessment as they are expected to represent the combined network/station peak periods:

- AM peak: 8:00-9:00
- PM peak: 15:00-16:00

2.5.2 Network Traffic Flows

Figure 7 and Figure 8 summarise the peak hour period network traffic volumes across the five sites.

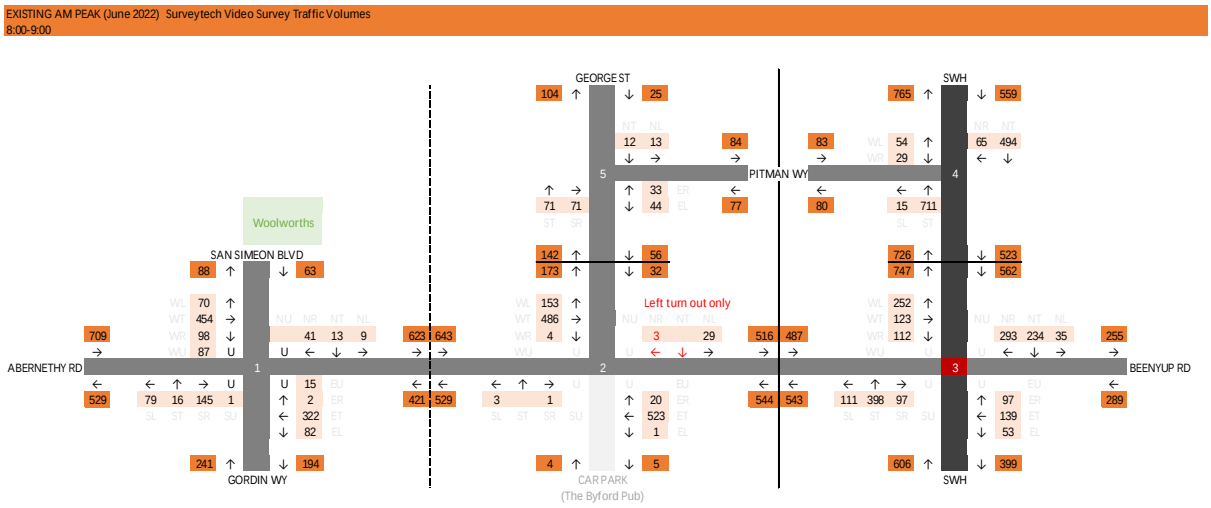


Figure 7 2022 AM peak hour network traffic flows

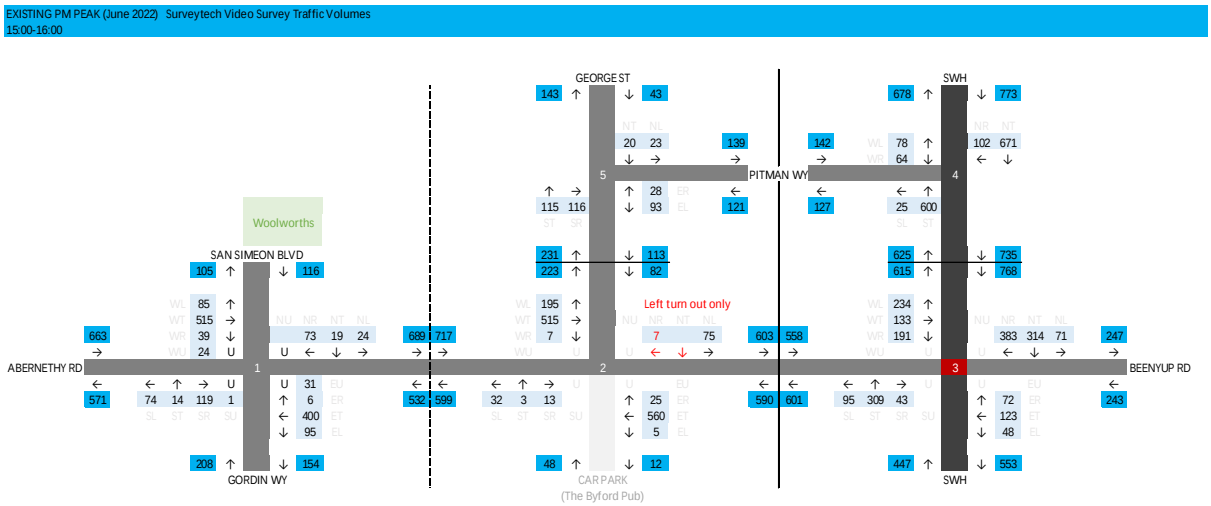


Figure 8 2022 PM peak hour network traffic flows

Urbsol

2.6 Pedestrian and Cyclist Access

The pedestrian network traversing within and around the existing Byford Town Centre is still developing and undergoing upgrades as the area is growing, so path quality is still variable depending on location and is still fragmented when viewed on a larger network perspective. On the eastern side of the railway line (the original Byford Town Centre), George Street consists of many on-street parking as well as a number of accesses to small-scale commercial outlets, with some paved paths suitable for everyday pedestrian traffic but not so for higher-speed cycling. This type of setup is somewhat similar along SWH, but with no on-street parking present and a notable pelican crossing located just south of SWH/Pitman Way. Figure 9 shows the general state of existing paths along George Street and SWH.

Figure 9 Pedestrian and cyclist accessibility along George St (top) and SWH (bottom) (Google)

Figure 10 shows the general state of existing paths along Abernethy Road. As this western part of the railway line is more recent than the former eastern part, the pedestrian network here is fresher in quality and should tie in with the future Byford Station as the land use and the surrounding roads develop in the near future. These paved paths are generally setup for pedestrians and low-speed cycling and is lesser in quality when compared to fully marked and dedicated principal shared paths (PSPs).

Urbsol

Figure 10 General street environment along Abernethy Road (Wormall Civil & Google Maps)

Figure 11 visually shows the extent of bike path provision surrounding the future Byford Station. As the general Byford area is still developing, it can be seen that the pedestrian/cycling network is still very fragmented and incomplete and is expected to change in the near future as the station and nearby developments are built out.

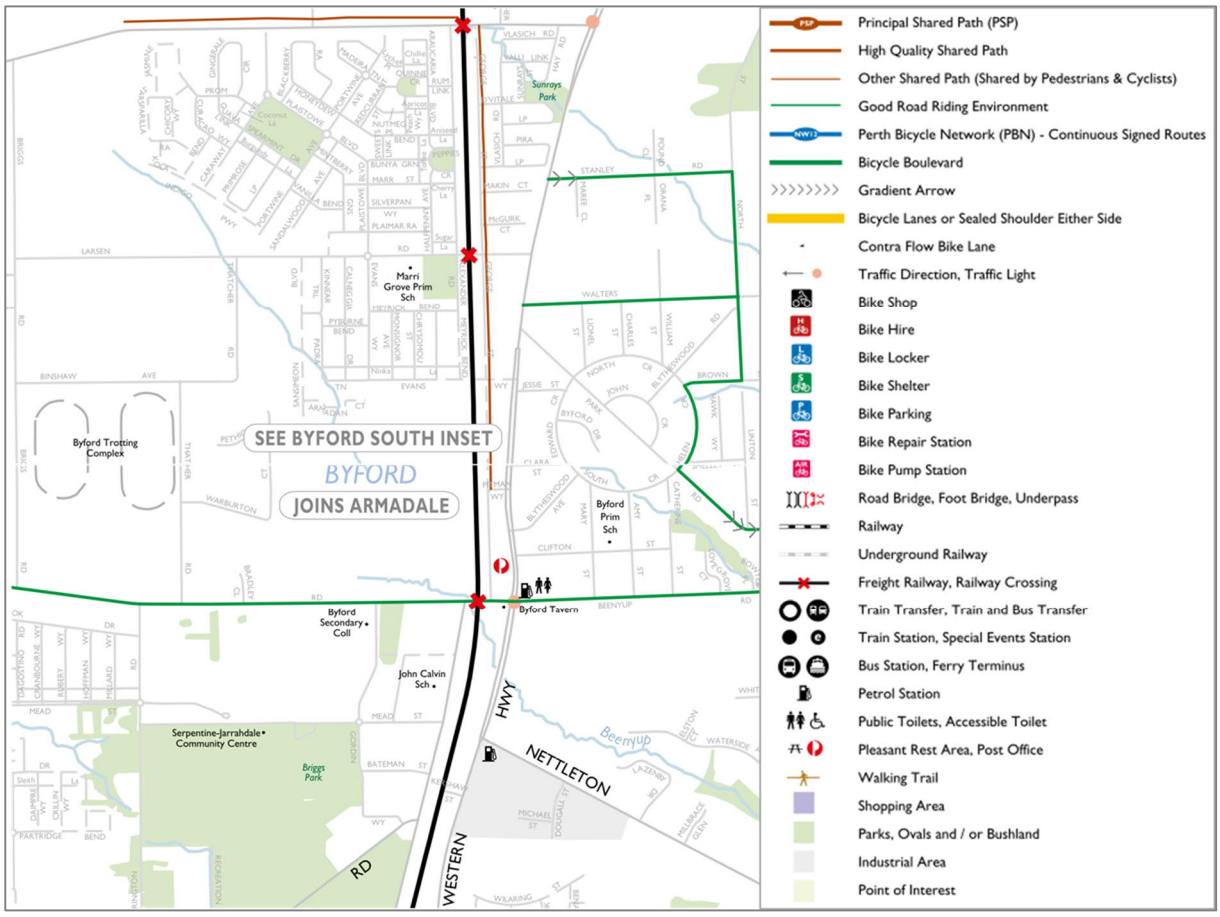


Figure 11 Comprehensive bike map surrounding Byford Station (DoT)

2.7 Public Transport Provisions

Figure 12 shows the location of the future Byford Station in relation to the Armadale railway line, located within Transperth's Zone 4 fare system as well as approximately being 42 kilometres from Perth railway station. According to METRONET, a train journey travel time to and from Perth railway station of approximately 42 minutes is expected to and from Perth Station, based on the C stopping pattern (express service between Cannington and Claisebrook, stopping at Oats Street). Trains to Armadale currently run as low as five-minute headways during peak periods (approximately 10 trains per hour).

Urbsol

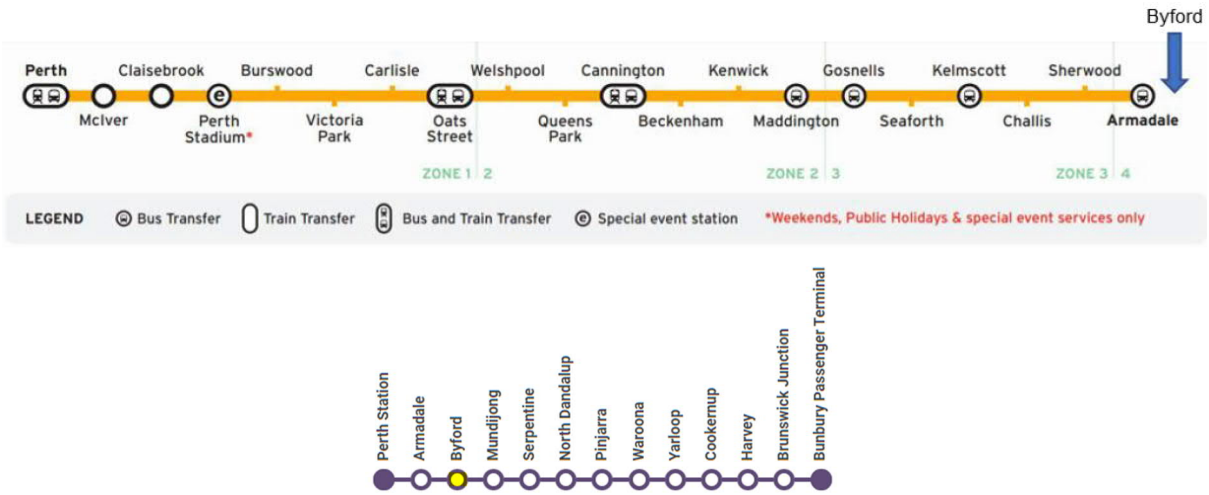


Figure 12 Byford Station location in relation to the Armadale and Australind Lines (PTA/TransWA)

Byford Station is expected to support as well as complement the role of Armadale Station, being a major transit hub between rail and buses. It is also a stopping point along the regional Australind Line (Perth-Bunbury, operated by TransWA).

Figure 13 shows the current Transperth bus routes operating around the future Byford Station. There are currently 4 bus routes in total, all heading via SWH and into Armadale Station.

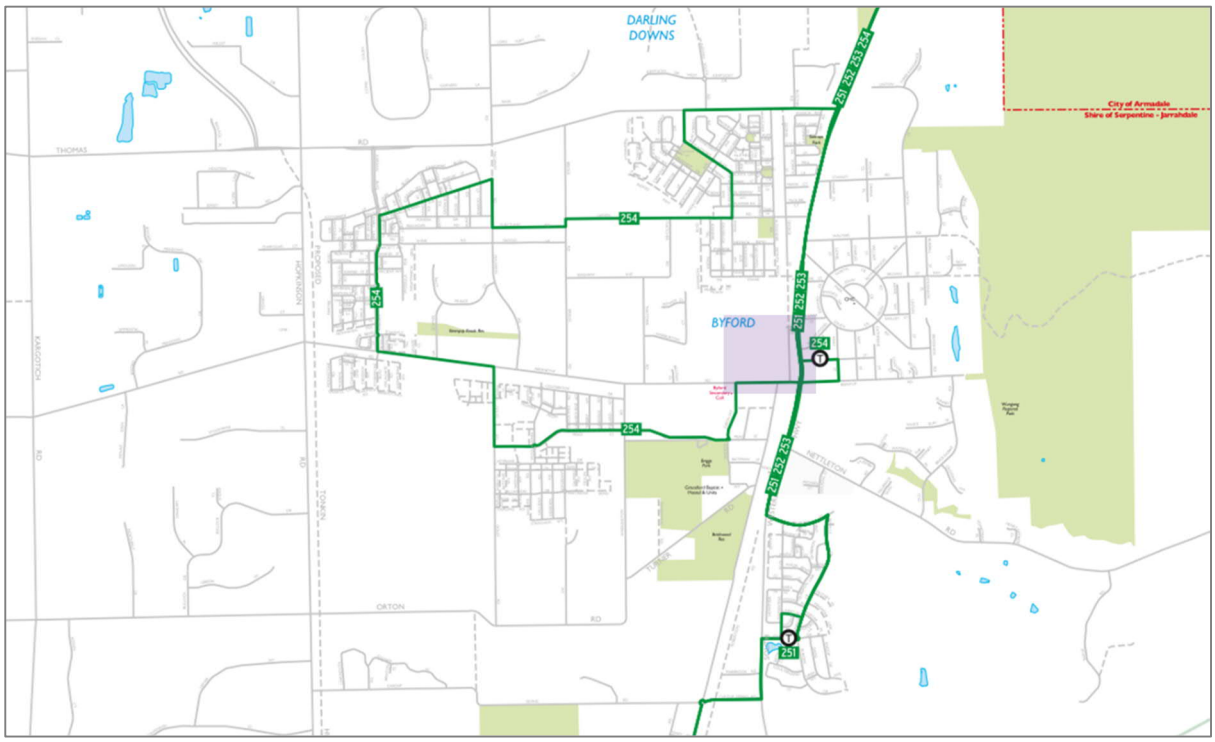


Figure 13 Bus routes to and from the future Byford Station precinct (with TIA area in purple)

Urbsol

2.8 Crash Data

Figure 14 shows the crash data summary obtained from Main Roads' Reporting Centre, focusing on the road links surrounding the future Byford Station. This crash data covers a period of five years, between the start of 2017 and end of 2021.

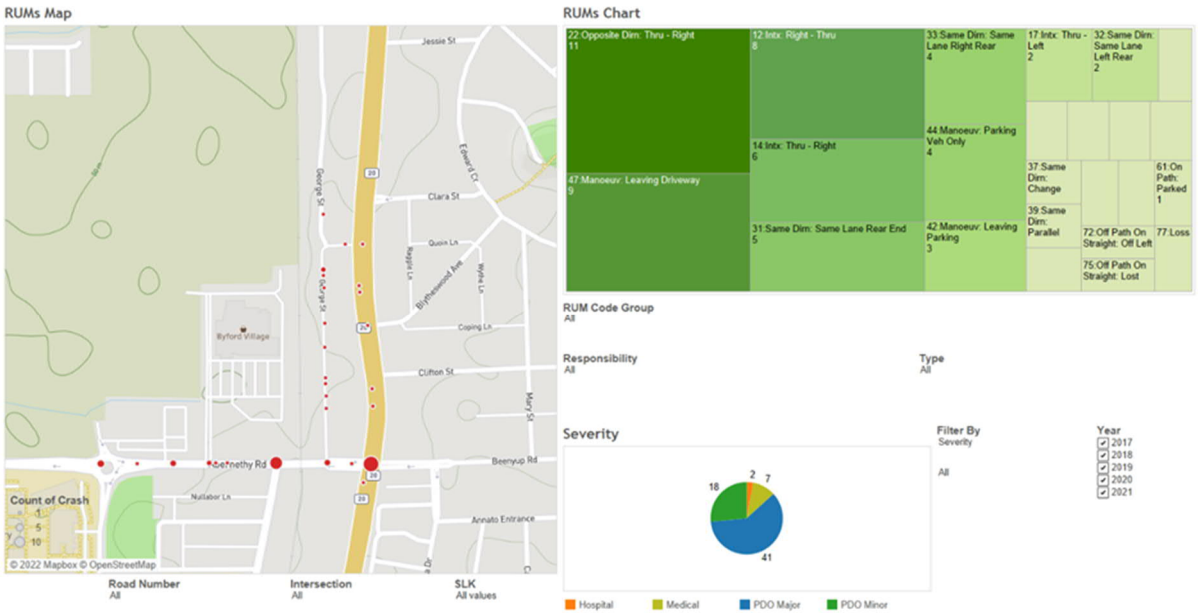


Figure 14 Crash data summary

There have been about 68 crashes for these defined road links, with the vast majority being on Abernethy Road, notably on the intersections with SWH and Soldiers Road. Out of the total amount and in terms of Severity, 41 were classified as "PDO Major", 18 as "PDO Minor", 7 as "Medical" and 2 as "Hospital". None of these crashes were classified as fatal.

The figure also shows a RUMs chart that indicates the type of crash: many of these were found to be either related to parking manoeuvres or turning movements at intersections. It should be noted that the latter form of crashes is often associated with turning movements involving filtering right turns on signalised sites (e.g. SWH/Abernethy Road), or turns on unsignalised/priority sites (e.g. Abernethy Road/Soldiers Road, which was a T-intersection with no median, until the Abernethy Road widening in 2018 that had put in a median). No clear crash patterns were evident from the analysis.

3 Development Proposal

MetCONNX is responsible for the design, procurement, manufacture, construction, installation and commissioning of rail infrastructure and ancillary works to support an electrified operational passenger rail between Armadale and Byford, as part of the Byford Rail Extension (BRE) Design and Construction Project. A key component of these works is the delivery of two new train stations, namely the Armadale Station and the Byford Station.

The development of Byford Station includes the provision of new Park N Ride, Kiss N Ride and bus interchange facilities, as well new road and cyclist/pedestrian network connections. The latest development plans are attached to this report in Appendix A. An overall schematic of the station at opening is shown in Figure 15. That figure indicates key transport related facilities proposed at opening, and future parking provisions and land development areas. That same area is shown in context with the broader structure in Figure 16.

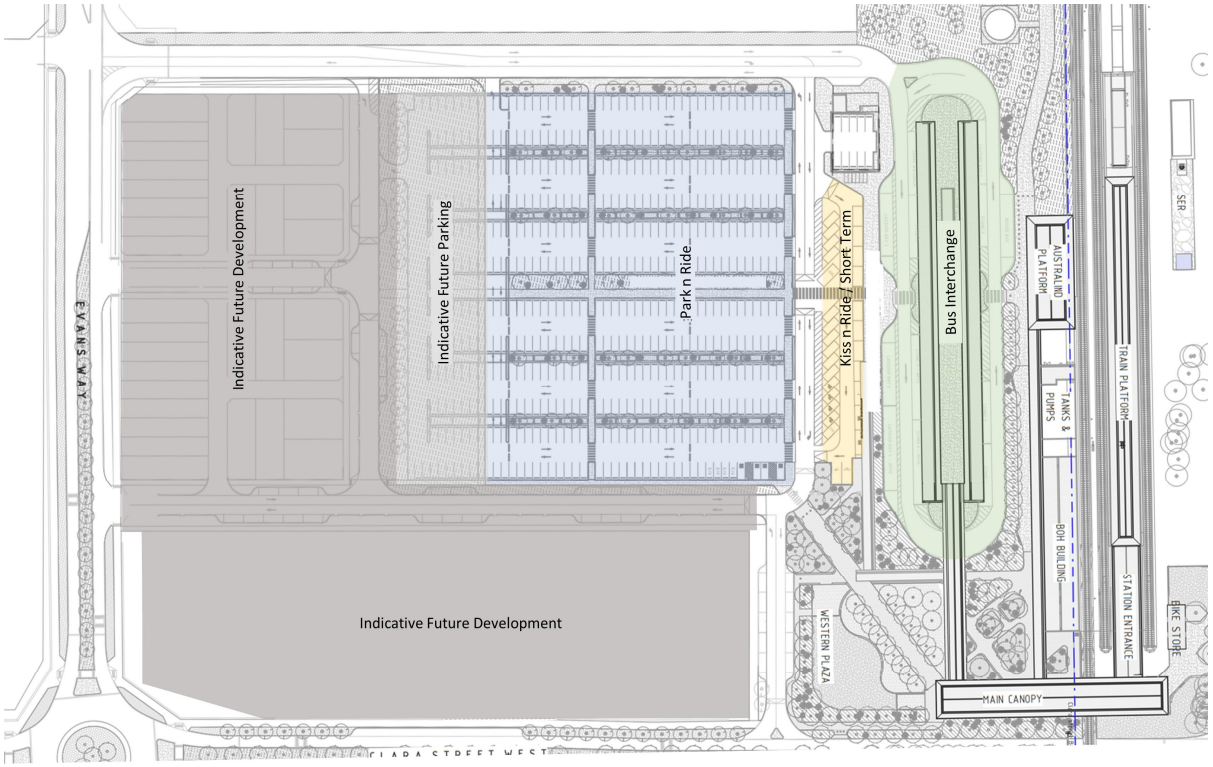


Figure 15 Proposed station layout

Key road links to be constructed as part of the project include:

- Sansimeon Boulevard-Evans Way link between Abernethy Road and Padra Turn/Evans Way
- extension of Sansimeon Boulevard into Clara Street across to George Street
- Plaza Road that provides left/out connectivity at Clara Street

The future road, and other networks, are discussed in detail in the following section.

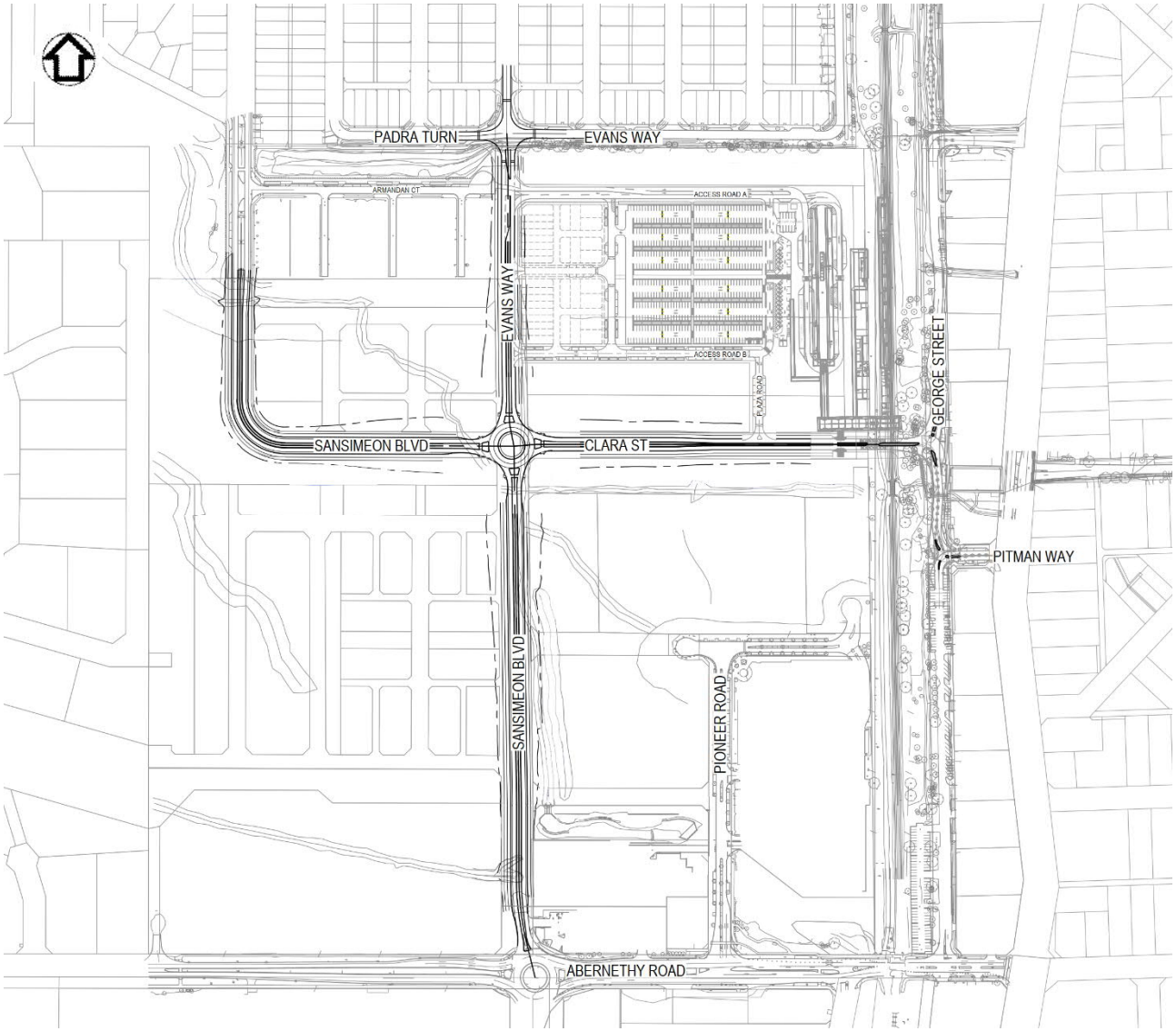


Figure 16 Proposed station in context with the developing surrounding network

Urbsol

4 Changes to Surrounding Transport Networks

This section of the report discusses proposed modifications to the various transport networks and draws upon MetCONNX's *Byford Station Final Place Plan* (MetCONNX, October 2022).

4.1 Road Network

The key road access routes to/from Byford Station for private vehicles are outlined in Figure 17. These will provide access to the PnR and KnR facilities. The links to be constructed as part of the project to support this access include:

- The construction of Sansimeon Boulevard, north of Abernethy Road to form the northern leg of the roundabout at Abernethy Road/Gordin Way.
- The existing Sansimeon Boulevard will be extended south and deviate to the east to intersect the new north-south section of Sansimeon Boulevard.
- A roundabout will be constructed at the intersection of the two Sansimeon Boulevard links.
- From that roundabout, Evans Way will extend to the north and connect into Padra Turn/Evans Way to form a four way intersection. This section of Evans Way will provide access to Byford Station via Access Road A.
- From the same roundabout, Clara Street will be constructed to the east across the rail line and connect into George Street. This section of Clara Street will have a secondary access to the station (left in/out only) via Plaza Road.

The majority of the suburban development in Byford is happening on the west side of the rail. Most patrons are expected to come from these areas and gain access to the station via Sansimeon Boulevard. Linking Sansimeon Boulevard with a connection to Abernethy Road, will not only create station access, but will also support further development of the western Town Centre.

Clara Street West will create a new internal cross-rail connection between the east and west side of the town centre. This new street will deliberately be designed as a slow-speed environment, to emphasise its town centre character and prevent it becoming a thoroughfare or vehicular short cut. The level rail crossing will be present at the eastern end of this new section of road.

While Larsen Road to the north will be disconnected at the railway, the new grade-separated crossing at Thomas Road will improve the east-west accessibility in the arterial network.

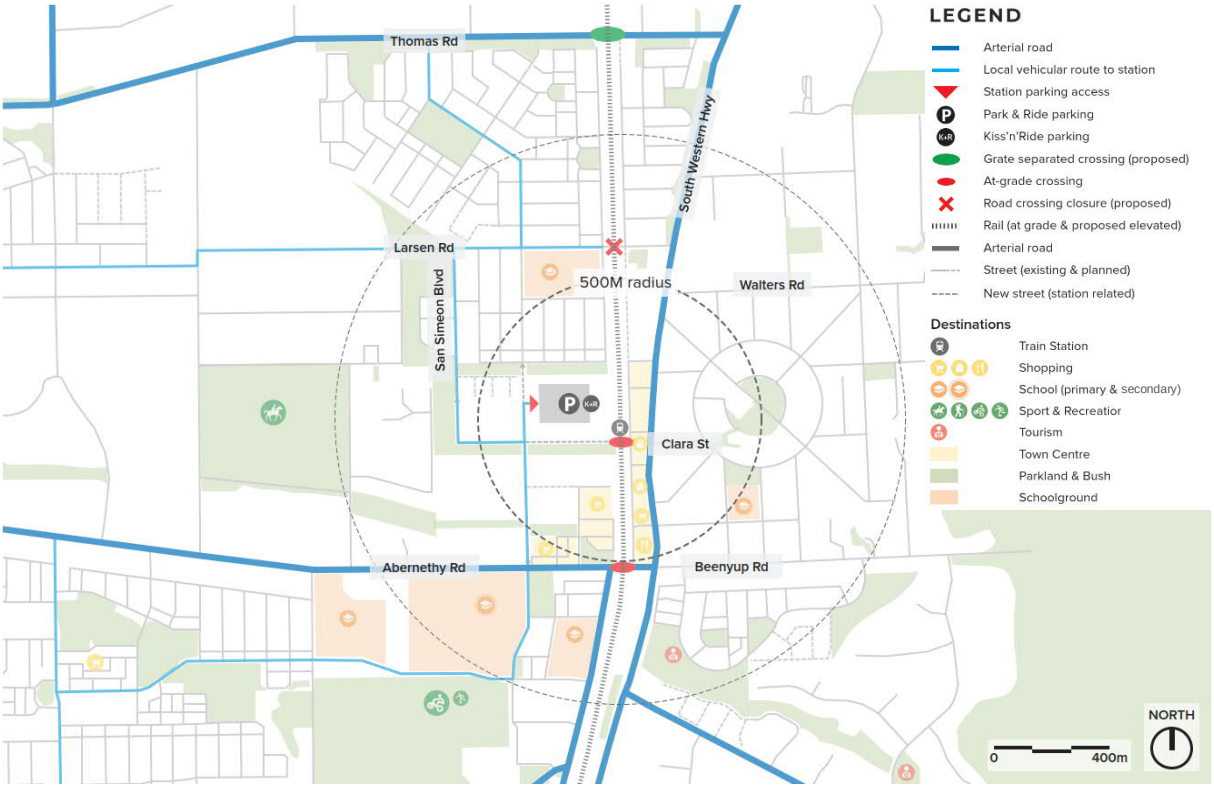


Figure 17 Byford Station – road network (MetCONNX)

4.2 Intersection Layouts/Controls

This section discusses the key intersections and access points directly related to the station operations, and provides discussion and justification on those that are considered appropriate for operational assessment as part of this TIA. The original intent was to assess the following sites:

- George Street/Pitman Way priority intersection
- George Street/Clara Street priority intersection
- Sansimeon Boulevard/Evans Way/Clara Street roundabout
- Abernethy Road/Gordin Way/Sansimeon Boulevard roundabout

With respect to the intersection at George Street/Pitman Way, whilst a number of layouts have been considered, the preference for this location is to modify the existing priority so that the Pitman Way-George Street northern leg is the priority route. This is likely to suit future traffic volumes and reinforce the desired route between the station and the Town Centre. The proposed intersection layout is shown in Figure 18.

Given the proximity of the George Street and SWH intersections on Pitman Way, the SWH intersection was also included in the operational assessment.

Urbsol

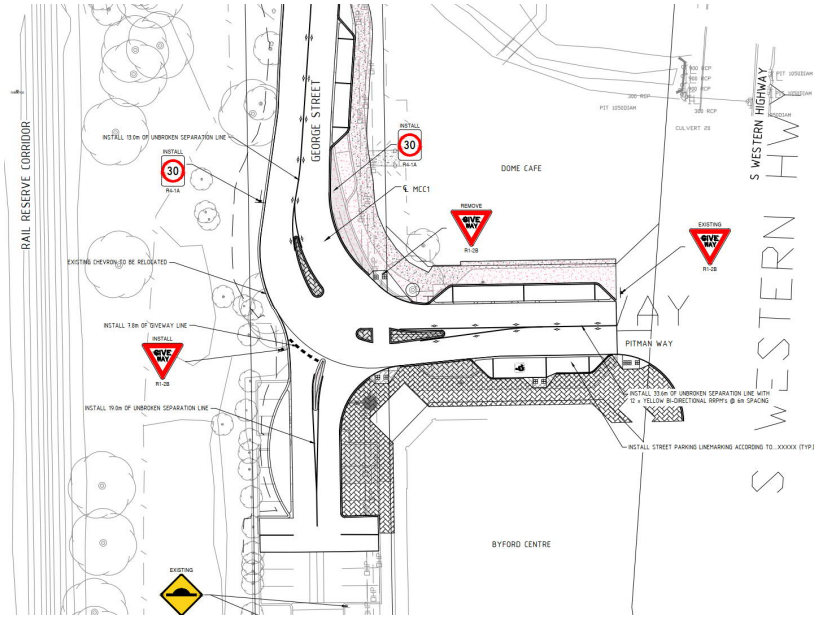


Figure 18 George St/Pitman Way Intersection

The proposed intersection of George Street/Clara Street is similar to George Street/Pitman Way, with the George Street (south)-Clara Street link the priority route, with George Street (north) the terminating leg at the intersection. The concept layout is shown in Figure 19. This is likely to best suit the traffic through the intersection and reinforce the desired route between the station and the Town Centre.

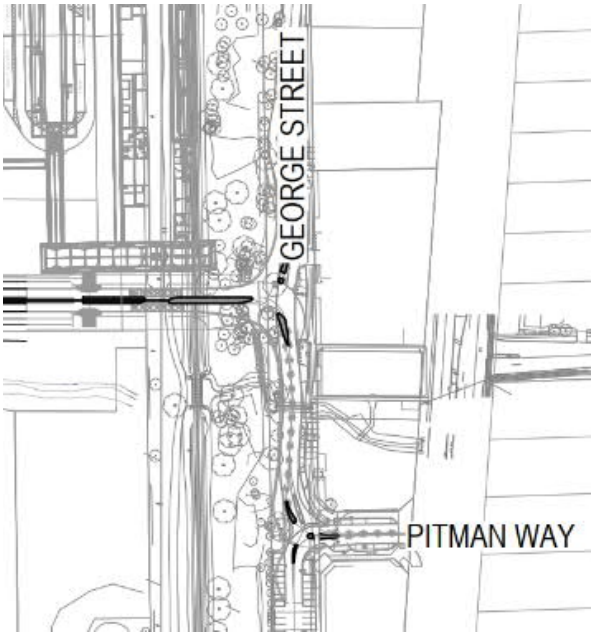


Figure 19 George St/Clara St Intersection

Urbsol

The intersection at Sansimeon Boulevard/Evans Way/Clara Street is proposed to be roundabout controlled. This intersection forms a key distribution point between directions servicing the local structure and therefore a roundabout is considered to be a suitable control mechanism, which will provide the desired operational and safety outcomes. Approach islands on all legs are proposed that will accommodate crossing provisions for non-motorised traffic. The concept layout is shown in Figure 20.

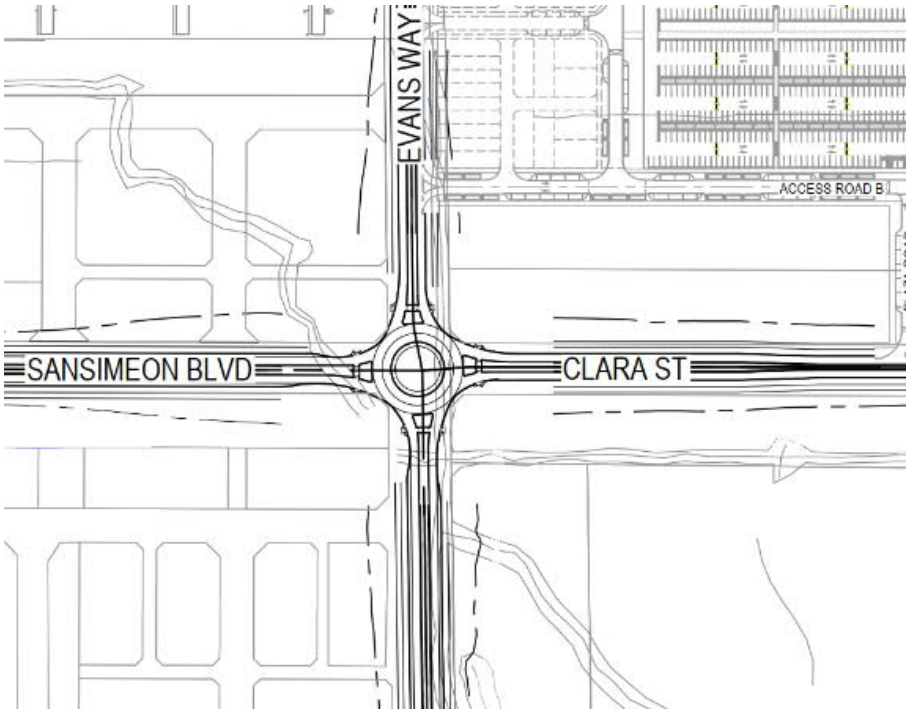


Figure 20 Sansimeon Blvd/Evans Way/Clara St Intersection

The original intent for the Evans Way link (extending north of the roundabout at Sansimeon Boulevard/Clara Street) was to terminate at the station entrance road (Access Road A). However SSJ requested that northern link to be extended further to connect into the existing intersection at Evans Way/Padra Turn. This modification is shown in Figure 21. As a result, at a traffic engineering scope discussion at the project outset, the scope was therefore extended to include an operational assessment of the Evans Way/Access Road A intersection.

This generated some investigation into the safest and most efficient layouts, given the proximity of the Access Road A and Padra Turn intersections on Evans Way (approximately 40m), and the Ninka Lane access points just over 30m further north. It was considered that there may be some undesirable safety implications if all movements were permitted at all intersections/sites. As a result, a number of potential scenarios were developed and discussed with SSJ. These options included various permutations/combinations of roundabout/priority control at the Evans Way/Access Road A intersection along with potential restrictions to movements at Padra Turn/Evans Way and in/out of Ninka Lane.

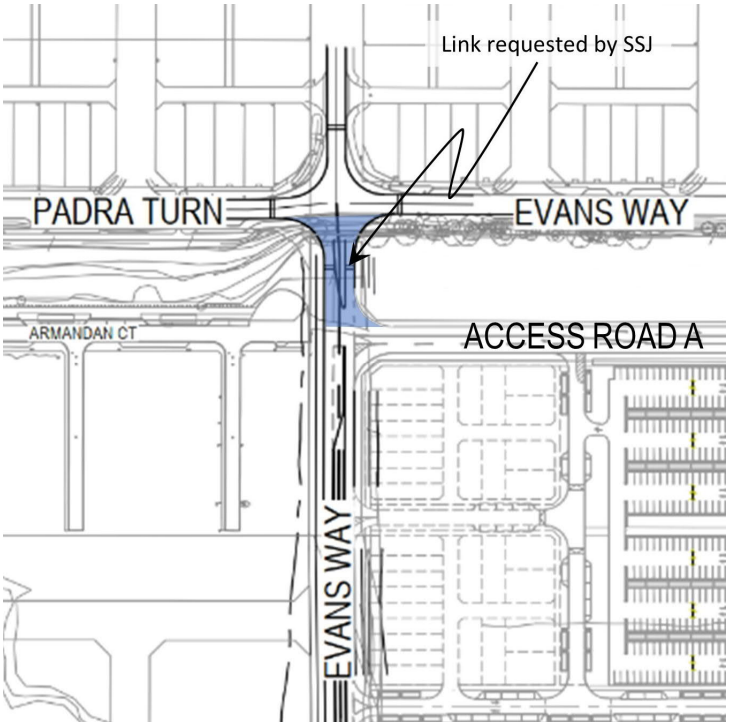


Figure 21 Evans Way-Padra Turn Connection

SSJ indicated a strong desire to maintain full movements at each location to minimise any negative impact upon the local community and maximise accessibility. As a result, the design progressed to maintain full connectivity and movements, but has raised pavement through the intersection of Evans Way/Padra Turn to achieve safe vehicular speeds through the intersection and minimise any negative safety implications. It should be recognised that this was not the preferred outcome for Urbsol or MetCONNX. It is also understood that there have been concerns raised from a design perspective and during the road safety audit. However SSJ has indicated its acceptance of risk associated with this final design outcome (in DA4 Meeting #2 on 29 June 2023, and in the Alliance Scope Clarification Meeting on 10 July 2023).

As agreed at the initial traffic engineering scope discussion, no operational assessment was considered necessary along Abernethy Road, as the section between SWH and Sansimeon Boulevard/Gordin Way was assessed as a network by WSP in the *Future Year Traffic Impact Analysis, Armadale* (WSP, March 2022). That assessment was undertaken for the year 2036. However because the project scope includes the development of the Sansimeon Boulevard northern leg of that roundabout, an opening year 2026 assessment has been undertaken for the intersection. The conceptual layout of the northern leg is shown in Figure 22.

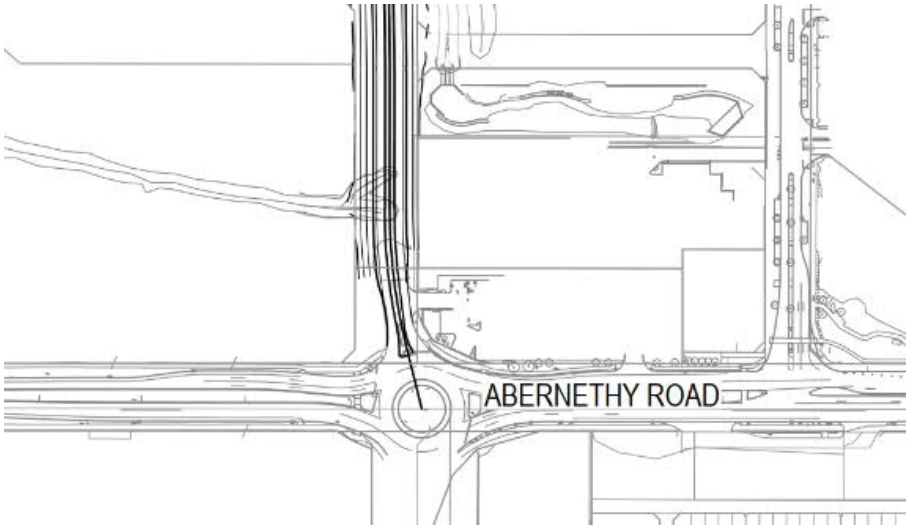


Figure 22 Abernethy Rd/Gordin Way/Sansimeon Blvd Roundabout

A connection between the Clara Street and the south east corner of the station is proposed to be provided (Plaza Access), with a left in/out only provisions on Clara Street. This is provided more for connectivity for the plaza/open space area, and not expected to be heavily utilised (certainly not encouraged) by station related traffic. For the operational assessment, it was considered desirable to undertake a worst case assessment for the Evans Way/Access Road A intersection by assuming all station related traffic uses Access Road A rather than Plaza Access. As a result of this, and the low levels of traffic likely on Clara Street, an operational assessment for this intersection was not considered necessary.

As the future land parcels around the station are developed, and adjacent roads are also constructed, their operation should be considered as part of traffic impact assessment undertaken for those developments. As the likely development type is not certain and traffic generation cannot be accurately predicted, they have not been specifically assessed as part of this TIA. As required for Development Application purposes, this TIA is focussed on the current development, which includes the Byford Station.

Based on the above discussion, the intersections assessed as part of this TIA includes the following sites, which are also shown in Figure 23:

- George Street/Pitman Way priority intersection
- SWH/Pitman Way priority intersection
- George Street/Clara Street priority intersection
- Sansimeon Boulevard/Evans Way/Clara Street roundabout
- Evans Way/Access Road A priority intersection
- Abernethy Road/Gordin Way/Sansimeon Boulevard roundabout

Figure 23 Intersections assessed in this TIA

The operations of the proposed access arrangement have been documented in Sections 9 and 10 of this report.

Urbsol

4.3 Pedestrian and Cyclist Networks

The new train station provides an opportunity to realise a second pedestrian link across the rail via the provision of Clara Street, connecting the east and west side of the Byford Town Centre. It also includes a new at-grade rail crossing at Clara Street West. Whilst not ideal from a safety perspective, the crossing will close only sporadically for the Bunbury train line.

A new Welcome Place marks the new connection between the eastern and western town centre. The plaza will have ample travellers moving through, and attractive for both youth and parents with young children. All contributing to the activation and safety of the plaza and town centre.

Additional footpaths along Evans Way, Clara Street and Sansimeon Boulevard will further improve the pedestrian permeability around the Town Centre, connect with the surrounding path networks and with the retail/commercial area to the south and colleges south of Abernethy Road.

Refer to Figure 24 for a schematic of the pedestrian network. The "New footpath (station related)" and "New Street (station related)" are those to be provided as part of the project. These new footpaths (station related) include the east side of Sansimeon Boulevard (south) and Evans Road, both sides of Clara Street and the south side of Sansimeon Boulevard (west).

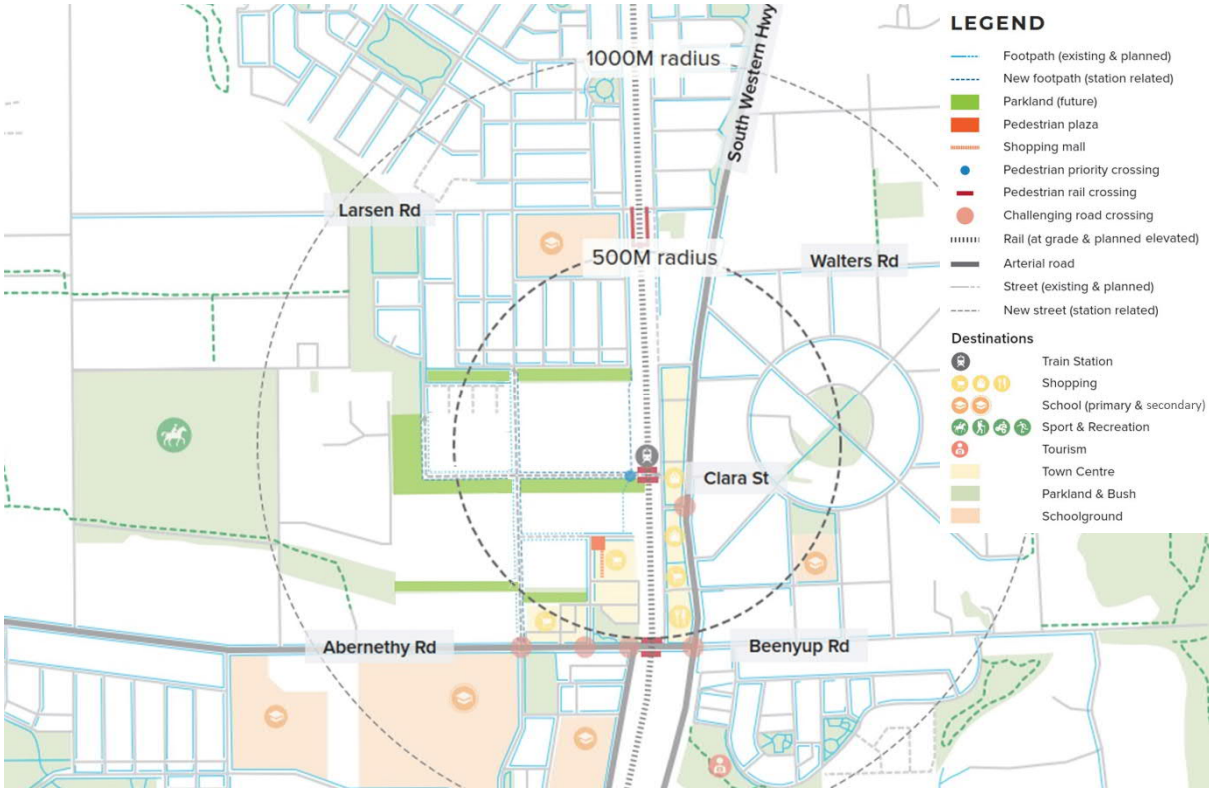


Figure 24 Byford Station – pedestrian network (MetCONNX)

The new Principal Shared Path (PSP) along the west side of the rail line will create an important cycling linkage in the Byford cycle network. The PSP will connect to Armadale in the north, and to Abernethy Road in the south. The SSJ will realise a PSP from Abernethy Road to Mundijong in the south.

Urbsol

The PSP will be key to creating safe cycle connections to important local destinations such as the Town Centre, and the Byford Secondary College south of Abernethy Road.

A grade-separated crossing at Larsen Road and an at-grade crossing at Clara Street West will improve the east-west connectivity across the rail line.

Secure bike storage will be provided adjacent to the station entrance and main canopy near the plaza.

Refer to Figure 25 for a schematic of the cyclist network. With respect to the provisions as part of this project, it indicates local cycle routes on Sansimeon Boulevard and Clara Street.

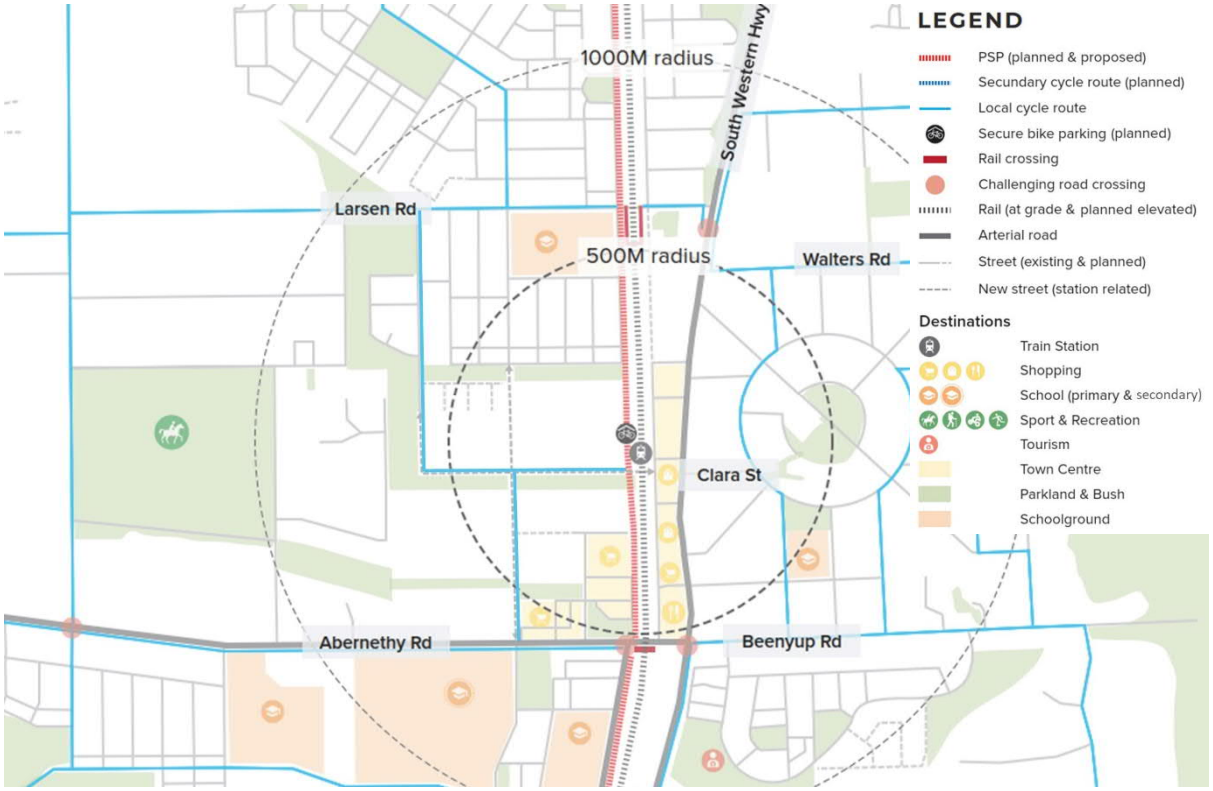


Figure 25 Byford Station – cyclist network (MetCONNX)

Urbsol

4.4 Public Transport Networks

Figure 26 provides a schematic of the roads that are likely to facilitate the future public transport network. It is essentially based upon roads that facilitate the existing bus services, but provides an indication of the additional new/existing roads that mat be required to service the Byford Station.

In addition, it is anticipated there will be implementation of new Transperth bus routes to service the new growth areas to the west of Byford Station. The future services and routes are discussed in Section 8.1.2.

It is important to note that confirmation of future bus routes is still subject to future Transperth/PTA planning.

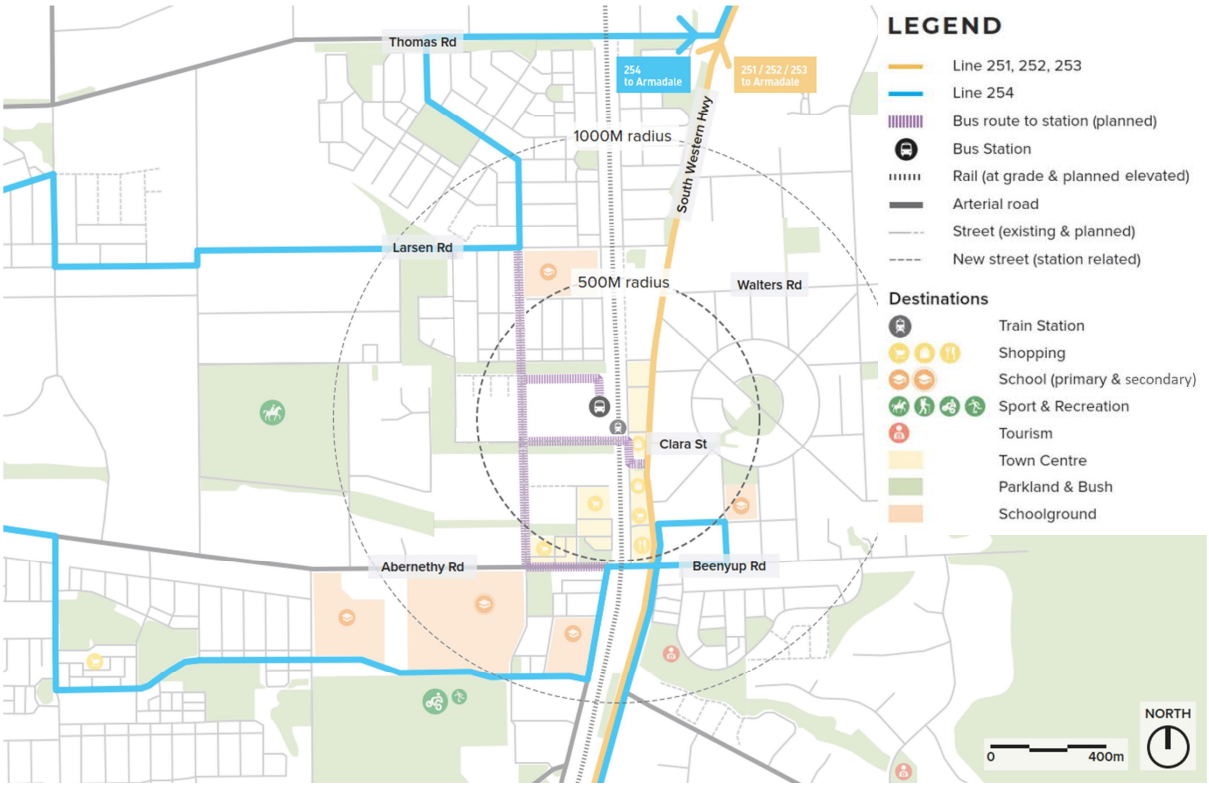


Figure 26 Byford Station – public transport network (MetCONNX)

Please refer to Figure 27 for a summary of travel paths for the various modes through the redeveloped Armadale Station site.

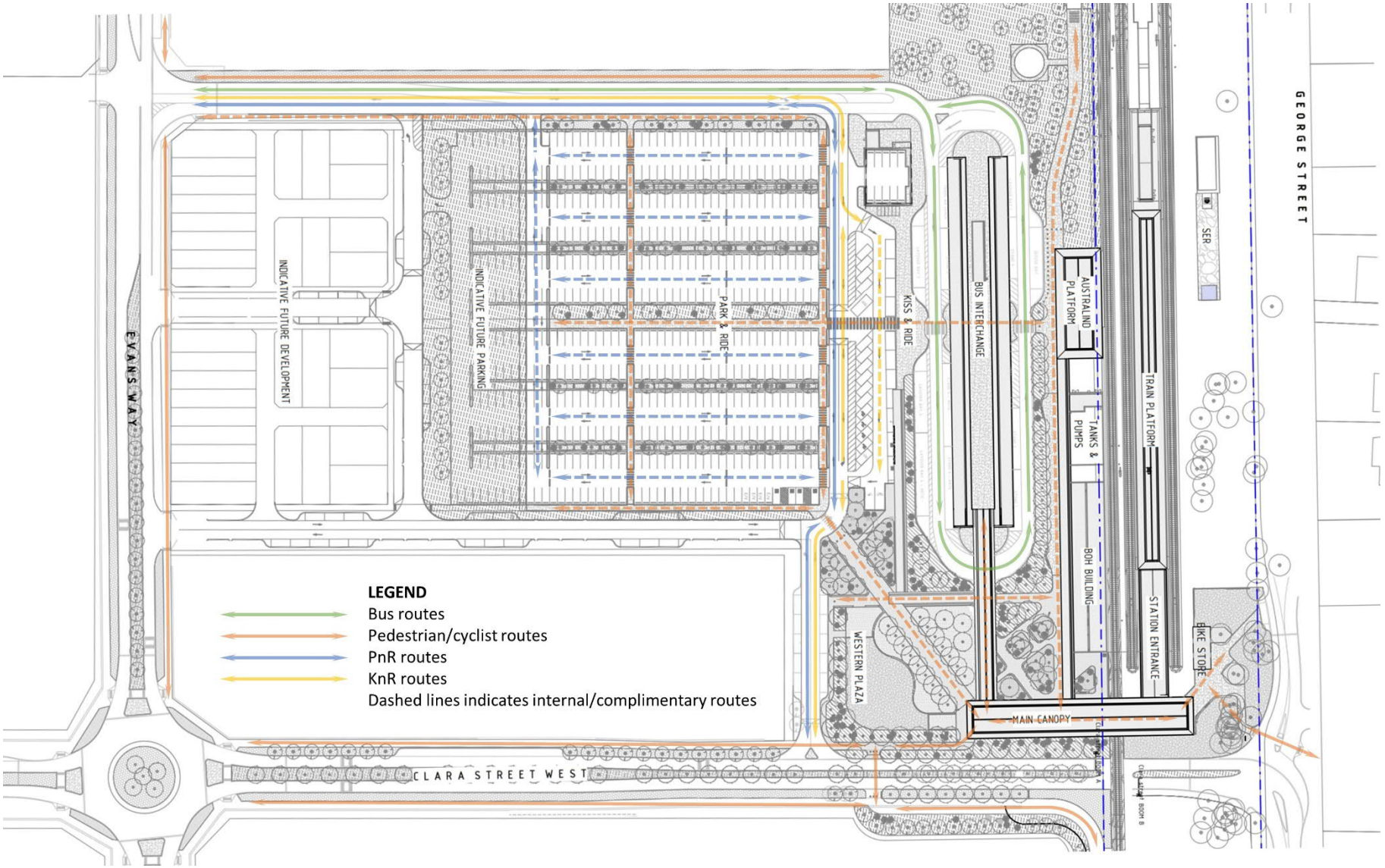


Figure 27 Byford Station – transport journey and accessibility plan (MetCONNX)

5 Integration with Surrounding Area

As stated in the *Transport Impact Assessment Guidelines, Volume 4 – Individual Developments* (WAPC, August 2016), the intent of this section is to identify how well the proposed development integrates with the surrounding land uses with respect to transport links and accessibility.

5.1 Surrounding Attractors/Generators

5.1.1 District Level Destinations

Figure 28 shows an overview of the existing destinations and activities on a district level around the Byford Station precinct at the district level. In the large part, these consist of shopping, and recreation areas, and civic and educational facilities.

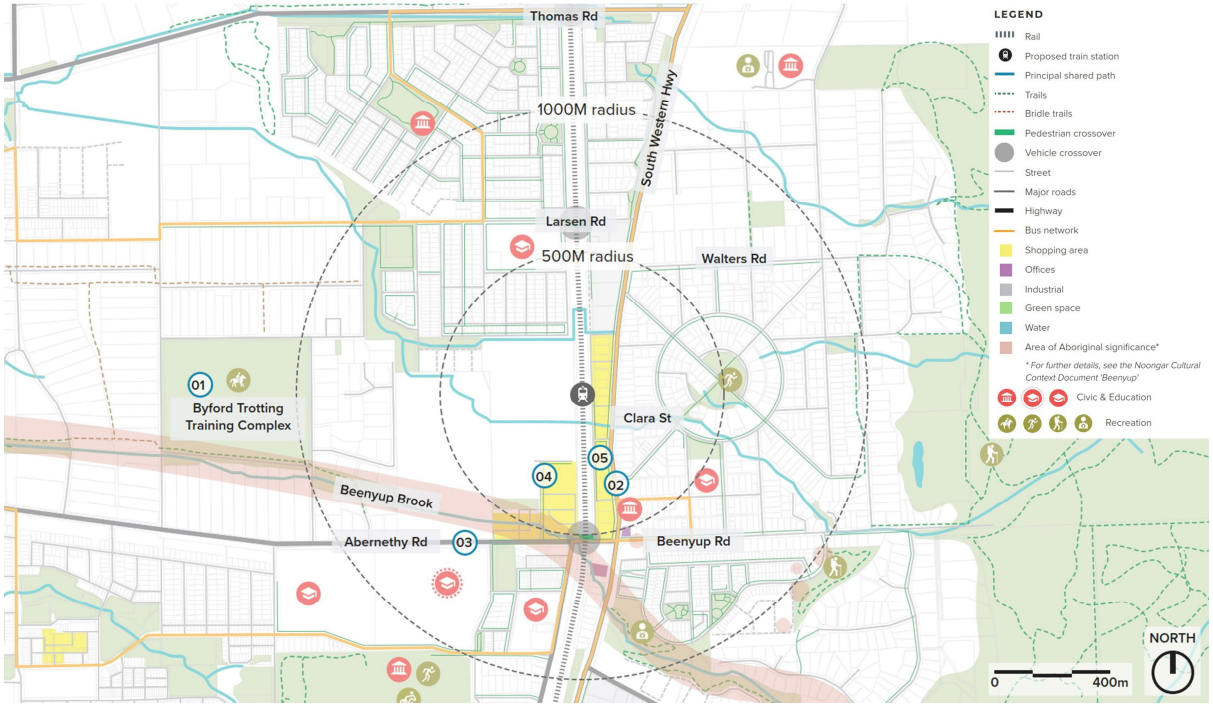


Figure 28 Byford Station – district level destinations (MetCONNX)

5.1.2 Local Activities

Figure 29 shows an overview of the local activities across the Byford Town Centre as surveyed in 2020. Civic, commercial and hospitality activities are mostly clustered on the eastern side of the railway line, in a zone around SWH. A new cluster is developing on the western side, where the new Town Centre is coming to fruition. Car parking between the buildings support the town centre activities.

Stronger connections across the rail line, through the introduction of a new station environment, will help to encourage the connectivity between the eastern and western part of the town centre, supporting pedestrian flows and street activation.

Urbsol

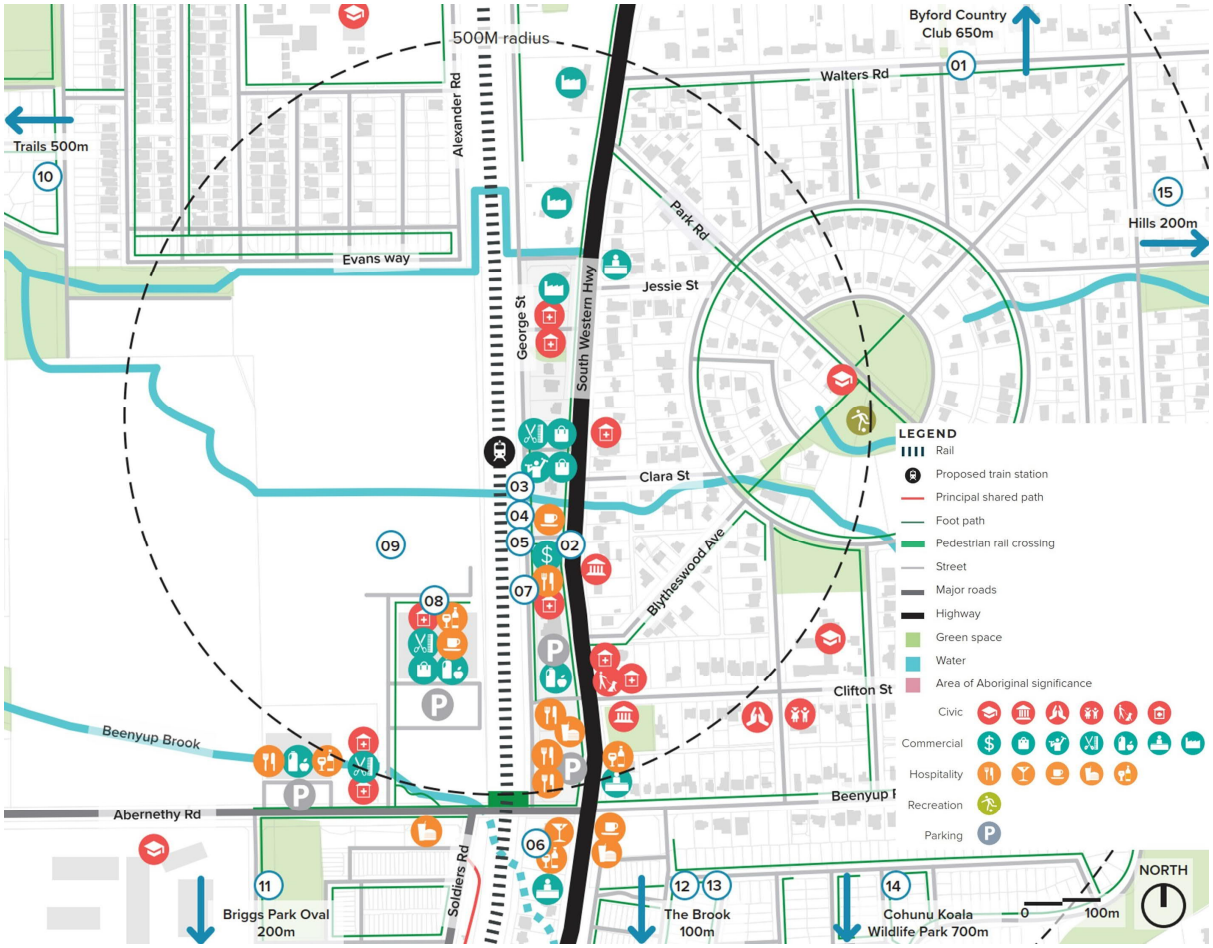


Figure 29 Byford Station – local level destinations (MetCONNX)

5.2 Proposed Changes to Surrounding Land Uses

Land uses in Byford have changed considerably in the last 15 years, with rapid growth in residential, retail, commercial and civic uses as more households choose to live in Perth's south-eastern corridor.

- The eastern side of the rail line hosts a range of transitional main street retail, commercial and civic uses such as a post office, a pharmacy, banks, a vet clinic, RSL, cafes, smaller speciality stores and a medium-sized supermarket.
- The western side of the rail line hosts two major supermarkets with associated speciality retailers, fast food, and a petrol station. Two schools (Byford Secondary College and Salvado Catholic College) are also located on this side of the railway tracks.
- Residential development surrounds the future station area, with large vacant landholdings immediately to the east of the future station. Whilst development historically followed South West Highway, the majority of new residential land releases occur on the western side of the railway tracks.

Byford Station will offer a permanent, high quality public transport connection to Armadale, other Inner Armadale activity centres, Perth CBD and beyond. This change will inevitably encourage new growth and development.

Urbsol

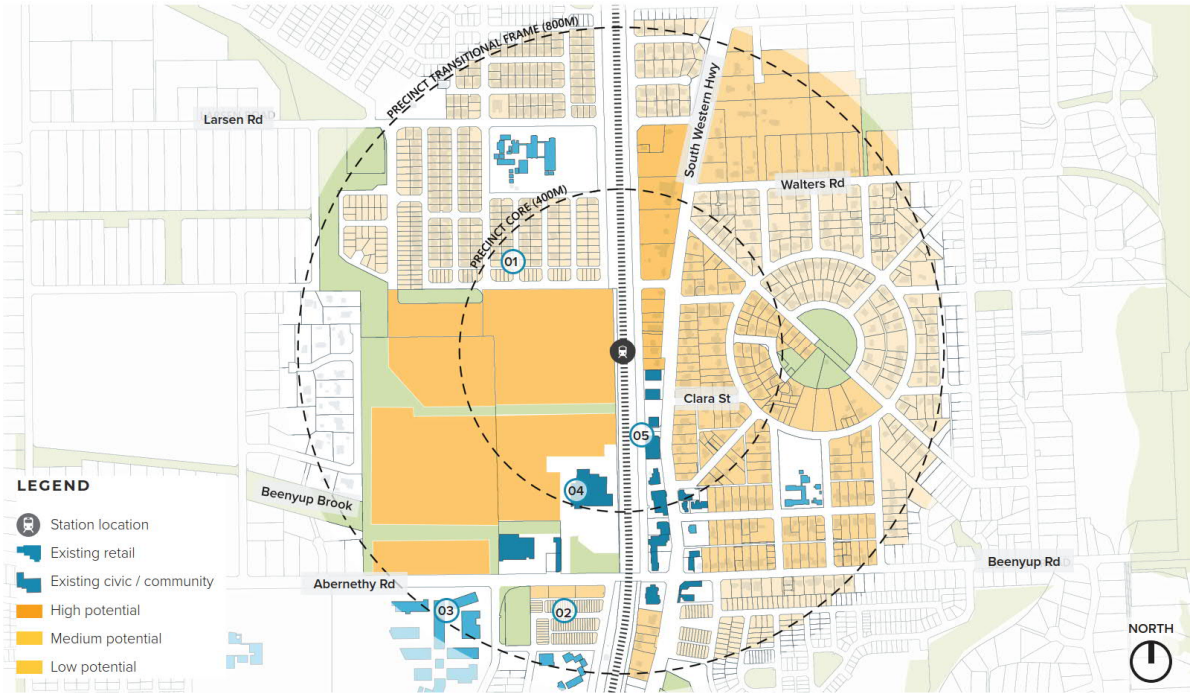


Figure 30 Land uses

Currently, Byford centre lacks strategic employment offerings beyond those directly related to population driven retail, of which is it largely dependent. The centre is categorised as a District Centre in the State Planning Policy 4.2, which encourages a greater level of commercial and civic development focussed on:

- District level office development
- Local professional services
- A wider range of retail offerings such as a discount department store.

There are immediate opportunities for new community and health related uses that the Shire is pursuing to the south of Clara Street West, which will further activate the station precinct.

5.3 Desire Lines between Station and Surrounds

For a summary of key journey routes and accessibility through and around the station for the various travel modes, please refer to Figure 27 and the following sections which cover the various travel modes.

5.3.1 Vehicular Traffic

Key road access routes to/from Armadale Station for private vehicles were discussed in Section 4.1. On a regional level these are similar to the existing situation, however in the vicinity of the station, new road construction of Sansimeon Boulevard, Evans Way and Clara Street (which all converge at a four way roundabout) will provide access to the surrounding areas in all directions. Whilst Clara Street will

provide a possible vehicular connection to the Town Centre via George Street, this route will certainly not be encouraged for vehicular use, as their preferred access routes are via Sansimeon Boulevard and to access Larsen Road and Thomas Road to the north and Abernethy Road and beyond to the south. This supports the expected level of development, both locally within the Byford Town Centre Structure Plan area and beyond, the majority of which is expected to occur to the west of the station precinct.

5.3.2 Pedestrians and Cyclists

High standard pedestrian and cyclist facilities are critically important for the promotion of the use of these transport modes, and to support the expected mode share targets. Whilst these mode share targets are discussed in detail in Section 8.1,it is worth noting here that the combined walking and cycling mode shares are expected to increase from 12% in 2026 (opening) to 37% in 2041.

The key pedestrian and cyclist access routes to/from Byford Station were discussed in Section 4.3. The new PSP along the west side of the rail line will create an important cycling linkage in the network. It will connect to Armadale in the north, and to Abernethy Road in the south.

The PSP will be key to create safe cycle connections to important local destinations such as the Town Centre, and the Byford Secondary College south of Abernethy Road.

The new train station provides an opportunity for a second pedestrian link across the rail, connecting the east and west side of the Byford Town Centre.

Additional footpaths along Evans Way, Clara Street and Sansimeon Boulevard, and linkages to George Street will further improve the pedestrian permeability around the Town Centre, connect with the surrounding path networks and with the retail/commercial area to the south and colleges south of Abernethy Road.

A grade-separated crossing at Larsen Road and an at-grade crossing at Clara Street West will improve the east-west connectivity across the rail line.

The proposed networks will provide opportunity for accessibility to the station for pedestrians and cyclists with an expectation to accommodate the future targets for these transport modes. They will also improve permeability through the precinct and better connections between residents and the town centre and its attractions.

5.3.3 Public Transport

For bus traffic, key road access routes to/from Byford Station were discussed in Section 4.4 and is also similar to the private vehicle network. In the vicinity of the station, new road construction of Sansimeon Boulevard and Evans Way will provide access to the broader road network, to Larsen Road and Thomas Road to the north and Abernethy Road and Mead Street to the south. These linkages will provide access to the regional road network in SWH, and the additional majority of development expected to the west of the station precinct.

The desire lines for all modes are expected to be accommodated by the planned new components of the various networks and their connections to the wider area and surrounding attractions.

6 Committed Developments and Other Transport Proposals

This section discusses forecast growth in the Serpentine-Jarrahdale region, primarily with respect to population and dwellings, as they will be the key drivers of growth in activity at the Byford Station. The discussion covers a number of sources, and whilst there appear to be some inconsistencies between the various sources, this is likely to reflective of different types of modelling, differences in assumptions, and forecasting occurring at different times with varying base data. And whilst the forecasting outputs may differ, they all point towards significant growth in the region.

6.1 Byford Station Access Strategy

The *Byford Station Access Strategy* (WSP, January 2021) indicates that the SSJ is expected to experience significant growth over the next two decades with a current population of 34,523 (in 2020) and a forecasted population of 68,335 in 2036 (at the time this document was prepared). Under the State's South-East Metro Sub-Regional Framework (complementary to Perth & Peel @ 3.5 Million) Byford is identified as an emerging District Centre.

According to .id (Informed Decisions) a significant amount of growth forecasted for the SSJ will occur in Byford. Based on data sourced at the time of preparing the access strategy, it was estimated that Byford would experience a 168% growth in dwellings in 2041 from 2016. The land surrounding the future Byford Station was expected to take on a significant portion of this growth and experience significant land use changes over the next decade.

The Byford District Structure Plan and Byford Town Centre Structure Plan, both shown in Figure 31,are the Shire's structure plans in place to guide the forecasted growth and land use development and intensification for Byford.

The Byford District Structure Plan and Byford Town Centre Structure Plan will naturally evolve the access to Byford Station. With the development of both structure plans, access to Byford Station in 2036 will be achieved to the north, east, south and west.

The *Byford Station Access Strategy* (WSP, January 2021), outlined METRONET's forecasted dwelling and population numbers respectively, within the Byford Station precinct for 2020, 2026 (opening year), 2031 and 2041. These are included in Table 2. Over those two decades, the number of dwellings in the Byford Station catchment area was forecasted to grow by 174%, with a simultaneous growth in population.

	EXISTING (2020)	2026 (OPENING)	2031	2041
Dwellings	1,421	1,932 (+36%)	2,401 (+69%)	3,890 (+174%)
Population	4,263	5,796 (+36%)	7,203 (+70%)	11,670 (+174%)

Table 2 MLUFS forecasted dwelling numbers within station precinct (1km radius)

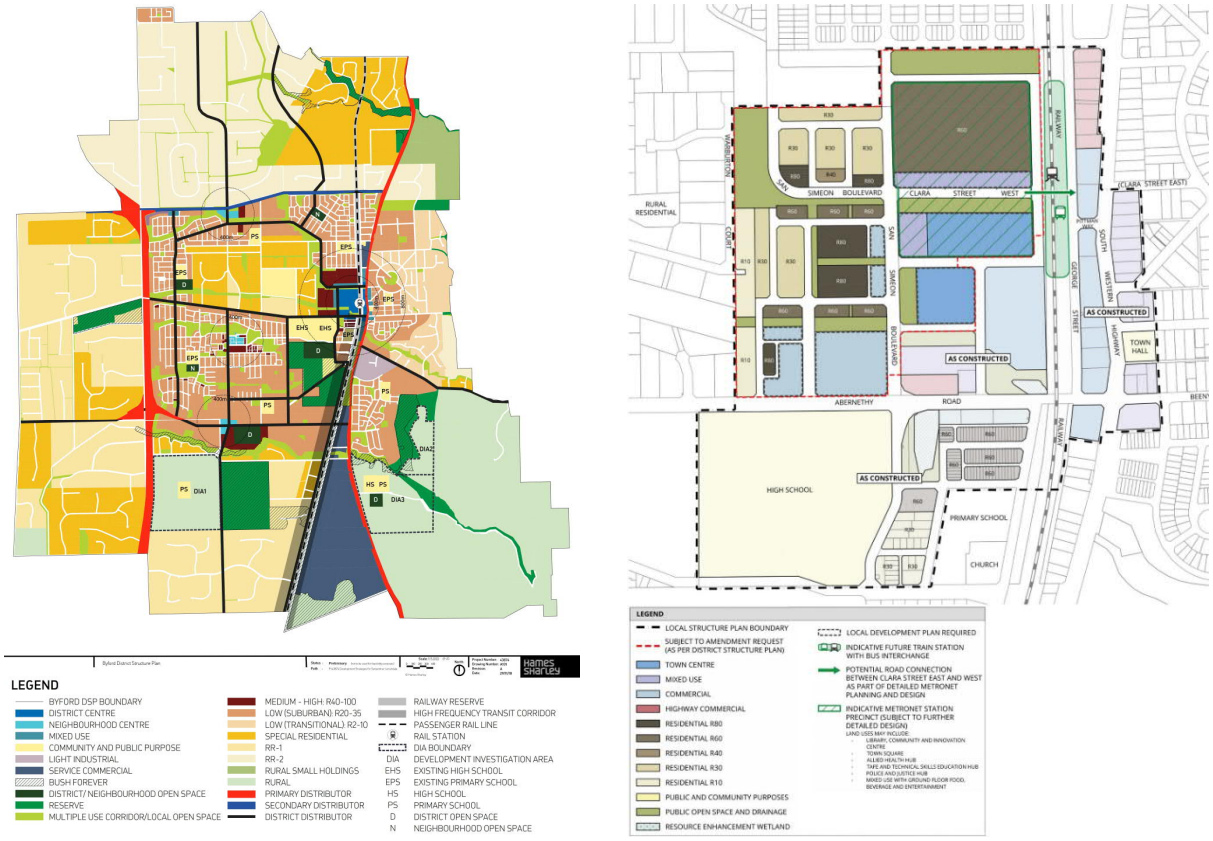


Figure 31 Byford District Structure Plan and Byford Town Centre Structure Plan

In addition to the growth forecasted for the immediate station precinct, Arup's *Byford Rail Extension (BRE) STEM Results* report (Arup, August 2020), which were also included in WSPs *Byford Station Access Strategy* (WSP, January 2021), presents population and employment MLUFS outputs for the Byford Project Area. That area is defined by Armadale Road in the north, Tonkin Highway to the west, Albany Highway and SWH to the east and Mundijong Road in the south. Building upon the forecasted dwelling and population numbers for the Byford Station Precinct, Table 3 presents the MLUFS population, dwellings and employment forecasts for the Byford Project Area which includes the area surrounding Byford Station.

YEAR	POPULATION	DWELLINGS	EMPLOYMENT
2016	32,758	12,714	8,764
2021	46,677	17,866	13,785
2031	74,912	27,337	19,062
2041	94,939	36,344	22,365

Table 3 Byford Project Area population and employment forecasts (WSP 2021)

Urbsol

6.2 Recent .id Data

Table 4 and Table 6 show the number of forecasted dwellings and population respectively for 2021 to 2036 obtained more recently from .id (Informed Decisions). These tables are supported by Figure 32 and Figure 33 which illustrates number of forecasted additional dwellings/population in percentage terms for the period 2021 to 2036. On average, yearly growth is forecast around 7%, adding around 800 new dwellings per year for the SSJ. These high levels of growth will continue to be a significant theme throughout the SSJ, which presents a unique opportunity to provided key infrastructure to support sustainable transport use. Whilst the most significant growth is forecast for the Mundijong area, significant growth is also forecast for Byford, which is predicted to grow in number of dwellings by 79% in the period 2021 to 2036. The population is expected to grow by a similar percentage.

					Change (2021 to 2036)	
	2021	2026	2031	2036	Number	%
Byford	6,512	9,149	10,828	11,685	+5,173	+79.4
Cardup	635	644	650	658	+23	+3.6
Darling Downs	1,075	1,180	1,247	1,256	+181	+16.8
Hopeland – Keysbrook	158	167	177	187	+29	+18.3
Jarrahdale	862	868	876	897	+35	+4.1
Mundijong	966	1,941	4,055	7,108	+6,142	+635.7
Oakford - Oldbury	267	274	283	292	+25	+9.4
Serpentine	750	776	805	838	+88	+11.7
Total	**11,225**	**14,999**	**18,921**	**22,921**	**+11,696**	**+104.2**

Table 4 SSJ dwelling forecasts (Source: .ID)

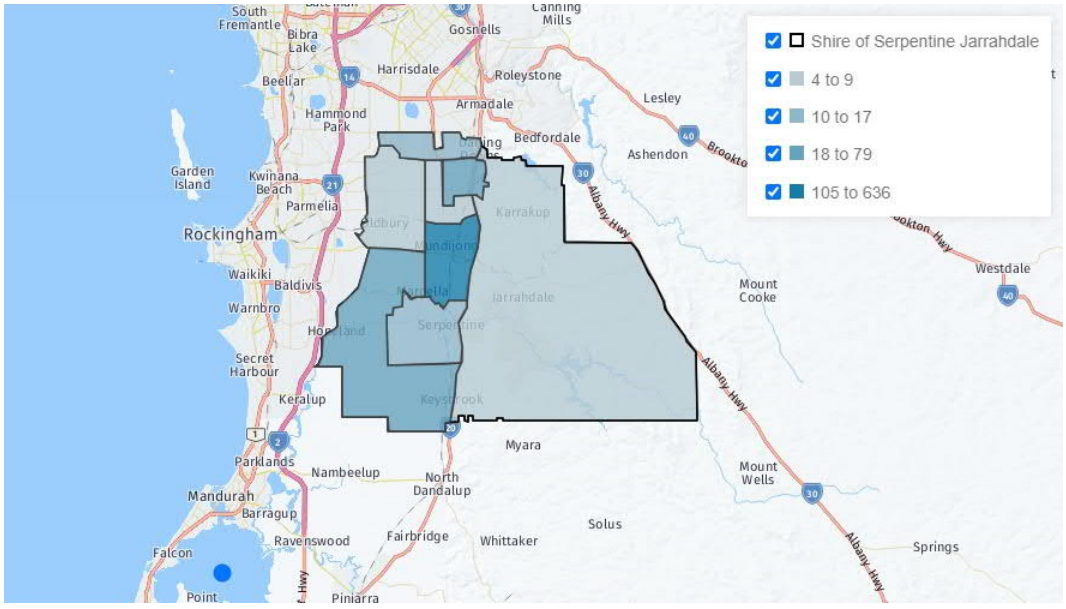


Figure 32 SSJ dwellings forecast map (2016 to 2036) - % change (Source: .ID)

Urbsol

					Change (2021 to 2036)	
	2021	2026	2031	2036	Number	%
Byford	19,538	27,028	31,759	33,896	+14,358	+73.5
Cardup	2,043	2,006	2,002	1,997	-45	-2.2
Darling Downs	3,320	3,558	3,732	3,720	+400	+12.1
Hopeland – Keysbrook	521	510	529	548	+27	+5.1
Jarrahdale	2168	2145	2133	2165	-3	-0.1
Mundijong	2,710	5,336	11,211	19,750	+17,040	+628.8
Oakford - Oldbury	730	733	741	764	+34	+4.7
Serpentine	2,324	2,373	2,420	2,508	+185	+7.9
Total	**33,354**	**43,689**	**54,527**	**65,348**	**+31,996**	**+95.9%**

Table 5 SSJ population forecasts (Source: .ID)

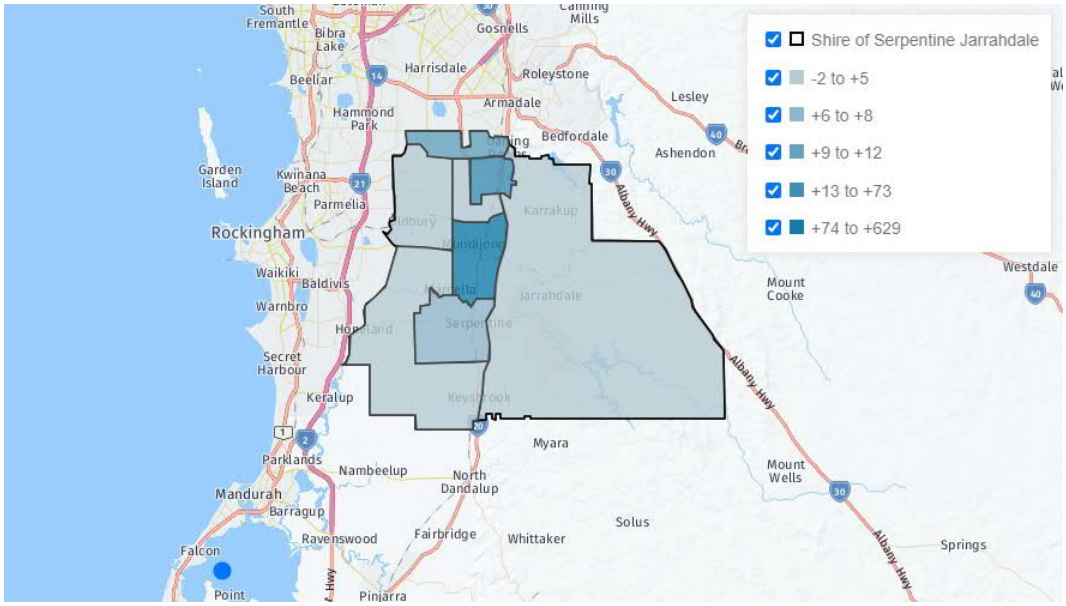


Figure 33 SSJ population forecast map (2016 to 2036) - % change (Source: .ID)

Whilst it is difficult to directly compare the dwelling and population forecasts from the various sources, it appears that the more recent .id forecasts are not as bullish as the data that used in WSP's *Byford Station Access Strategy (January 2021)* and in the Department of Transport's Strategic Transport Evaluation Model (STEM) in determining the total patronage for the future scenarios. The forecasted patronage growth for Byford Station from the opening year of the BRE is shown below in Table 6.

Urbsol

	2026 (Opening)	2031 (from 2026)	2041 (from 2026)
Forecasted Boardings	-	+31%	+68%

Table 6 Average Existing & Forecasted Daily Passenger Boardings

In broad terms, trip generation for the assessment of traffic impacts relating to Byford Station has been based on proportioning of existing station related traffic (at a similar facility i.e. Armadale Station) in accordance with relative station patronage, and applying growth based on the data in Table 6. This is detailed in the following sections. Using this more bullish data source would provide a more conservative assessment of the impacts of the proposed Byford Station.

7 Analysis of Transport Networks – General Advice

7.1 Assessment Years

Two time horizons have been adopted for the assessment of the Byford Station. These include 2026 and 2036.

The year 2026 has been adopted as the opening year. The base traffic volumes for the assessment of this time horizon include the 2022 surveyed traffic counts, allowing for a level of growth where required, based on information WSP provided in its future year traffic assessment. For new/proposed roads, traffic volumes have been developed in consideration of information contained in Cardno's *Transport Impact Assessment, TIA-LSP Lot 1 Abernethy Road, Byford* (Cardno, October 2021).

A 2036 assessment has also been undertaken to address the longer term considerations required in the Transport Assessment Guidelines for Development. Similarly to the 2026 assessment, traffic volumes for this assessment year were developed in consideration of volume projections in the documents previously mentioned.

7.2 Time Periods for Assessment

In the context for this TIA, it is most critical to consider the combined network/station peak rather than the station peak. As such the following representative peak hour periods were chosen:

- AM peak: 8:00-9:00
- PM peak: 15:00-16:00

The logic behind each of those time periods was discussed in detail in Section 2.5.

8 Development Generation & Distribution

8.1 Traffic Generation

8.1.1 Private Vehicles

To estimate private vehicle traffic generated by the proposed Byford Station, including PnR and KnR trips, the broad process detailed in the dot points below was adopted: The sources and details of the information used in the process are detailed in the discussion that follows.

1. 2022 trip generation at the existing Armadale Station was determined from surveys.
2. The 2022 trips generated at Armadale Station were factored up in accordance with projected patronage growth to 2026 (opening year for Byford Station).
3. The total private vehicle trips were broken down into PnR and KnR trips based on projected mode share splits.
4. For 2036, total private trips generated were estimated by factoring up in accordance with projected patronage growth. Similarly to 2026, the total private vehicle trips were broken down into PnR and KnR trips based on projected mode share splits.

In order to establish total trip generation for the existing Armadale Station, traffic surveys were undertaken by Surveytech in June 2022. The surveys covered all station access points over an entire 24 hour period, so that trip generation could be determined for the station peaks and network peak periods.

For the purpose of this assessment it was assumed that any surveyed outbound trip in the AM peak was for KnR purposes and also entailed an inbound trip, with the balance relating to PnR purposes. Similarly for any inbound trip during the PM peak, it was assumed to be a KnR trip which also entailed an outbound trip.

A summary of existing private vehicle trip generation at Armadale Station is included in Table 7.

	PnR			KnR			Total		
	In	Out	Total	In	Out	Total	In	Out	Total
AM Network Peak (8:15-9:15)	26		*26*	34	34	*68*	60	34	*94*
AM Station Peak (7:15-8:15)	52		*52*	76	76	*152*	128	76	*204*
PM Network Peak (16:15-17:15)		50	*50*	52	52	*104*	52	102	*154*
PM Station Peak (15:30-16:30)		34	*34*	68	68	*136*	68	102	*170*

Table 7 Existing (2022) trip generation at Armadale Station

The *Byford Station Access Strategy* (WSP, January 2021) established future target mode share based on stakeholder feedback provided for a number of scenarios that were considered for Byford Station. Mode share for the opening year (2026) and the targets for the preferred scenario (for 2041) are shown in Figure 34.

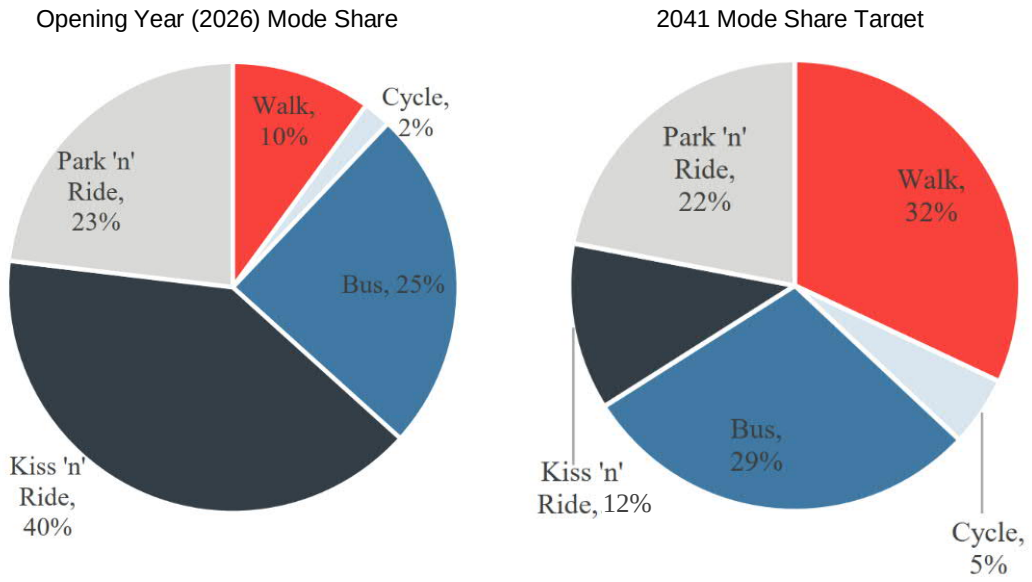


Figure 34 Mode Share Targets (WSP)

The 2041 target mode share was determined based on stakeholder feedback provided for the three mode share scenarios for Byford Station. Based on stakeholder feedback the High Walking & Cycling Scenario was determined as the preferred scenario.

This scenario was chosen as it most effectively responds to the evolving nature of Byford as a Town Centre, which can realistically achieve a high walking and cycling mode share over time. This scenario supports the existing planning framework and responds to staged development of the Byford Town Centre Structure Plan and Byford District Structure Plan.

The future target mode share and its transition from the 2026 mode share reflects Byford Stations transition from a station which is primarily accessed via private vehicle to a Bus-Rail Interchange station typology.

The 2022 trips at Armadale Station were firstly factored up to 2026 (opening year) trip estimates, based on estimated patronage growth between those two time horizons (approximately 3.4%). For the AM peak, total inbound trips were then factored up in accordance with relative private vehicle patronage between Armadale and Byford for that year, which are approximately 2.3 times higher at Byford. Those inbound trips were then proportioned between PnR and KnR purposes, and outbound KnR trips were assumed to be equal to the inbound KnR trips. For the PM peak, the same process was adopted, however the total estimated outbound trips were proportioned between PnR and KnR purposes. This differentiation was required as there are very little outbound PnR trips expected during the AM peak and very few inbound PnR trips are expected during the PM peak.

The 2026 trip generation estimates are summarised in Table 8.

	PnR			KnR			Total		
	In	Out	Total	In	Out	Total	In	Out	Total
AM Network Peak (8:15-9:15)	52	0	*52*	90	90	*180*	142	90	*232*
AM Station Peak (7:15-8:15)	111	0	*111*	193	193	*385*	304	193	*497*
PM Network Peak (16:15-17:15)	0	88	*88*	153	153	*306*	153	241	*394*
PM Station Peak (15:30-16:30)	0	88	*88*	153	153	*306*	153	241	*394*

Table 8 2026 trip generation estimates at Byford Station

For 2036 projections, the estimated 2026 trips were factored in accordance with the estimated change in patronage to 2036. This was undertaken separately for PnR and KnR trip purposes to reflect the estimated change in mode share from Figure 34. The resulting 2036 trip generation estimates are summarised in Table 9.

	PnR			KnR			Total		
	In	Out	Total	In	Out	Total	In	Out	Total
AM Network Peak (8:15-9:15)	73	0	*73*	60	60	*120*	133	60	*193*
AM Station Peak (7:15-8:15)	156	0	*156*	129	129	*258*	285	129	*414*
PM Network Peak (16:15-17:15)	0	124	*124*	103	103	*206*	103	227	*330*
PM Station Peak (15:30-16:30)	0	124	*124*	103	103	*206*	103	227	*330*

Table 9 2036 trip generation estimates at Byford Station

To summarise, the following statements outline the additional private vehicle traffic assumed in the traffic assessment, which is based on the network peak in the AM period, and the coinciding network and station peak in the PM period:

- In the 2026 AM peak, **52 PnR trips** are expected, along with **90 inbound and 90 outbound KnR trips**
- In the 2026 PM peak, **88 PnR trips** are expected, along with **153 inbound and 153 outbound KnR trips**
- In the 2036 AM peak, **73 PnR trips** are expected, along with **60 inbound and 60 outbound KnR trips**
- In the 2036 PM peak, **124 PnR trips** are expected, along with **103 inbound and 103 outbound KnR trips**

8.1.2 Buses

Future bus routes and frequencies (based on current planning) for Byford Station were provided by PTA. These indicate that in total, approximately 112 inbound and 115 outbound buses could be expected upon station opening in 2026. The services are essentially based upon roads that facilitate the existing bus services, but extended to new/existing roads that mat be required to service the Byford Station. In addition, it is anticipated there will be implementation of new Transperth bus routes to service the new growth areas to the west of Byford Station.

It has been assumed that these services will increase by approximately 63% for 2036, in alignment with the estimated train boardings associated with the bus mode share. For the purposes of the traffic assessment, and to provide a conservative assessment, it has been assumed that approximately 20% of services run in each of the AM and PM peak traffic periods, with approximately 60% to/from the south of Access Road A and 40% to/from the north.

It is important to note that confirmation of future bus routes is still subject to future Transperth/PTA planning.

8.2 Traffic Distribution

In a meeting at the project outset (held on 14 July 2022), SSJ requested that Urbsol consult relevant officers for input and agreement on the traffic distribution for station related private vehicles, so that it reflected likely development of the surrounding areas. The resulting private vehicle trip distribution for 2026 AM and PM peaks, and the 2036 AM and PM peaks, are shown in Figure 35 to Figure 38.

Figure 35 Estimated 2026 AM Peak trip generation and distribution

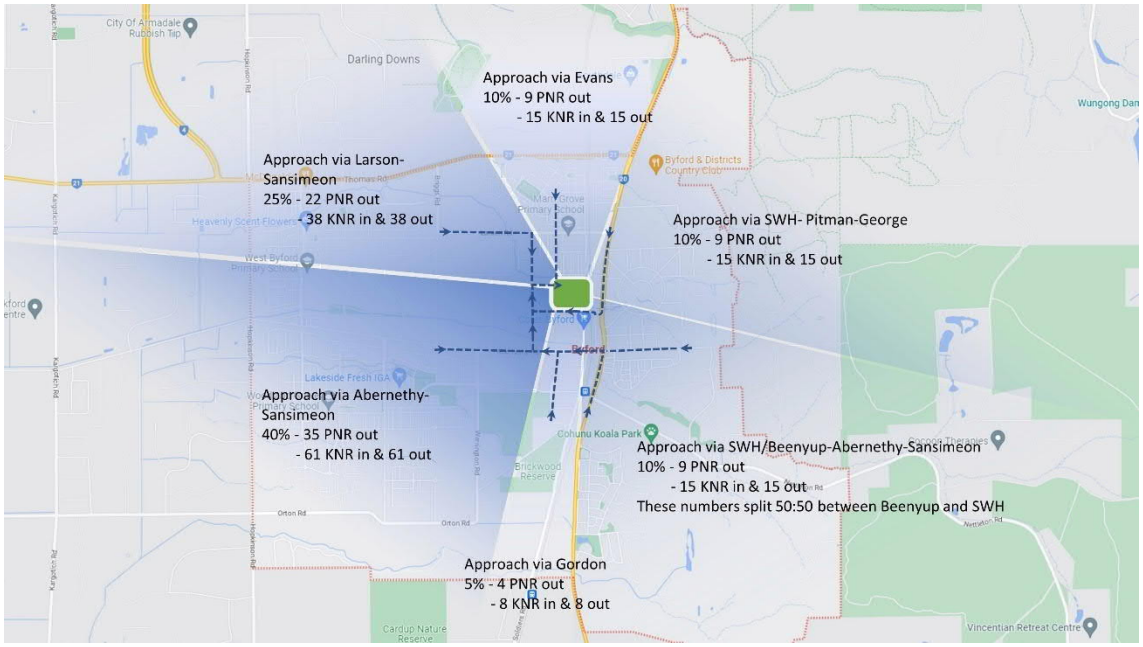


Figure 36 Estimated 2026 PM Peak trip generation and distribution

Urbsol

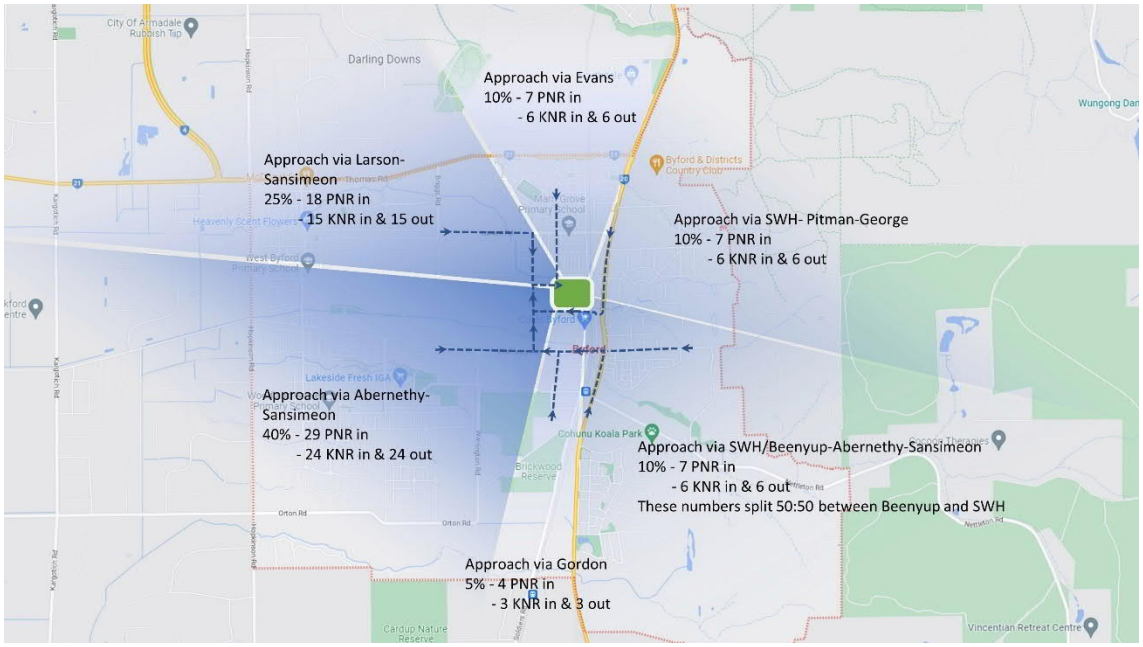


Figure 37 Estimated 2036 AM Peak trip generation and distribution

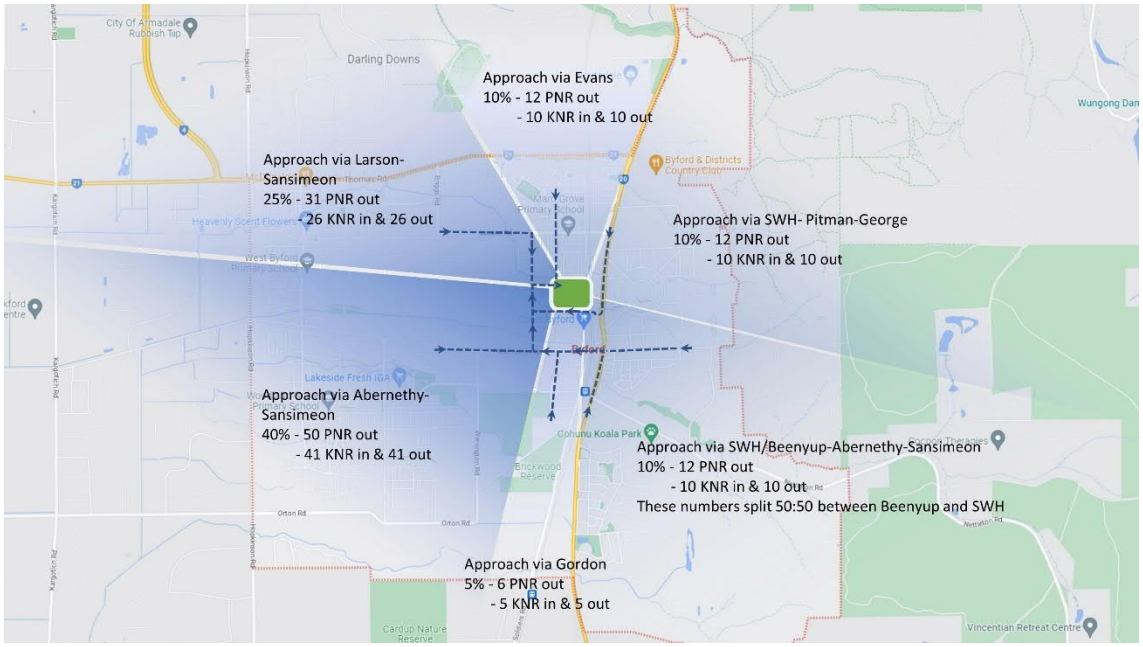


Figure 38 Estimated 2036 PM Peak trip generation and distribution

Urbsol

9 Base and With Development Traffic Flows

In a meeting at the project outset (held on 14 July 2022), the approach to the traffic assessment was outlined and agreed, which included focussing any operational assessment on key intersections on the adjacent road network at which the station operations are likely to contribute significant volumes. As per the discussion in Section 4.2, the intersections assessed as part of this TIA includes the following sites:

- George Street/Pitman Way priority intersection
- SWH/Pitman Way priority intersection
- George Street/Clara Street priority intersection
- Sansimeon Boulevard/Evans Way/Clara Street roundabout
- Evans Way/Access Road A priority intersection
- Abernethy Road/Gordin Way/Sansimeon Boulevard roundabout

9.1 Base Flows

Because of the amount of new road construction as part of the Byford Station development, significant effort was required to establish base peak period traffic flows at the intersections to be assessed. The discussion below attempts to provide a summary of the process, sources of data and assumptions made to develop the base case flows.

There are two key components of the estimated base case traffic flows:

- Estimated growth at existing intersections
- Byford Structure Plan related traffic

In terms of the growth estimates for existing intersections, the intersections of Abernethy Road/Gordin Way, SWH/Pitman Way, and George Street/Pitman Way are examined. The projections for these intersections are derived utilising the Main Roads' URP/RPB method, which is the same method that WSP used in its *Future Year Traffic Impact Analysis, Byford* (WSP, February 2022). This entailed the following steps for these locations:

- Establish daily traffic growth on each intersection approach between 2021 and 2026 from Main Roads ROM24 (Regional Operations Traffic Model).
- Apply peak hour factors to the daily growth in accordance with existing peak hour factors obtained from the traffic surveys.
- Proportion the peak period growth on each approach in accordance with existing turning volume proportions.
- Add the estimated peak hour traffic growth (between 2021 and 2026) to the surveyed 2022 turning volumes.

It should be noted that ROM24 does not include Gordin Way in the network. As a result, growth was summed on the parallel Soldiers Road and Warrington Road, and treating the three north-south roads as a screenline, one third of the total daily growth was assumed for Gordon Road.

Also note that the project includes the provision of Sansimeon Boulevard, extending north from the roundabout at Abernethy Road/Gordin Way. As a result, this method did not provide estimated traffic volumes in/out of that leg. The traffic projections had to be supplemented by volumes estimated for the Byford Town Centre Structure Plan, which forms the second part of the base case traffic flows.

The method for estimating volumes at new and modified intersections was primarily predicated on Cardno's *Transport Impact Assessment, TIA-LSP Lot 1 Abernethy Road, Byford* (Cardno, October 2021). That report provided estimated two way daily volumes on the local road network attributed to the development of the local structure. These are shown in Figure 39.

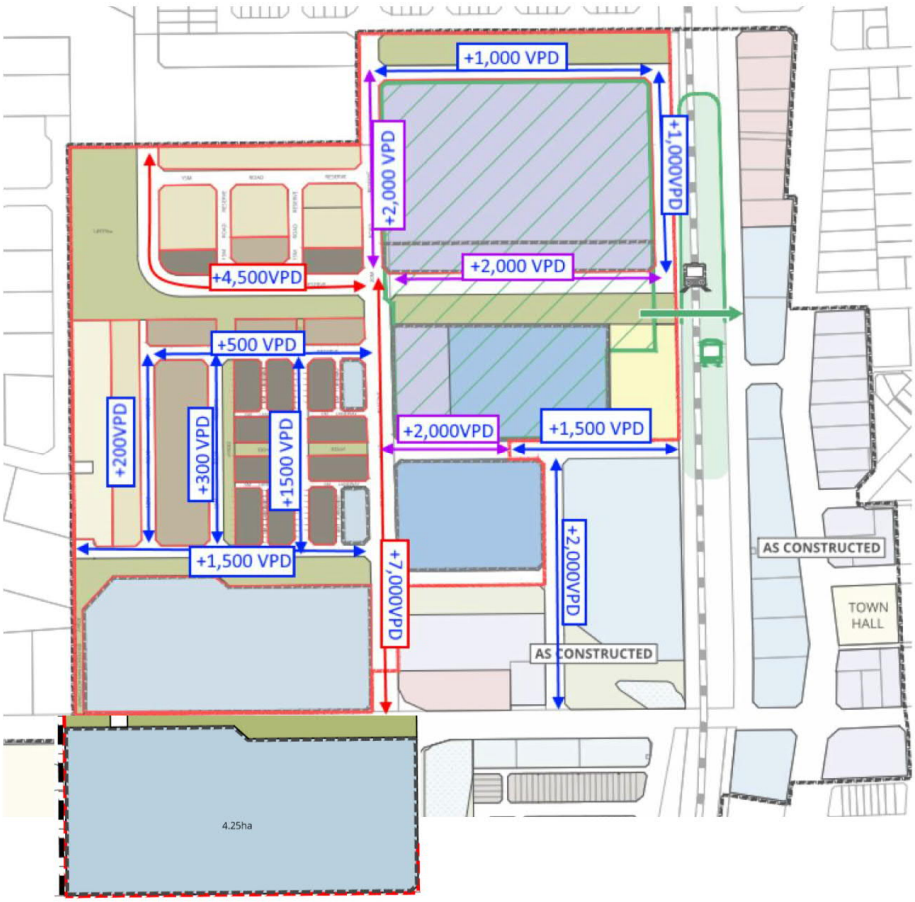


Figure 39 Estimated development traffic volumes on local structure roads (Cardno)

This analysis takes into account three intersections of Evans Way/Sansimeon Boulevard, Evans Way/Access Road A, and Clara Street/George Street.

To convert daily development related traffic into peak hour figures, a conservative peak hour factor of 10% was assumed. Once daily figures were converted into peak hour numbers, and a 50:50 directional split was assumed on all roads, which seemed fairly reasonable upon review of peak period traffic volume estimates by Cardno. Turning volumes on each approach to an intersection were proportioned as per the total daily traffic volumes expected on the exiting legs from that intersection.

Urbsol

The only deviation from that approach was the Sansimeon Boulevard northern approach to Abernethy Road/Gordin Way (which is essentially a n access driveway for Wool worths at the moment), where approaching and exiting traffic was proportioned 40% to/from Abernethy Road east and west, and 20% to/from Gordin Way. Also note that as ROM24 is a strategic model, and U-turns at this intersection are typically a result of local access issues, no growth was applied to exiting U-turn volumes at this intersection. Existing U-turn volumes were carried through into the future scenarios.

Where there were mismatches in volumes between closely spaced intersections, or where little entering/exiting flows between intersections was expected, a furnessing tool was used to ascertain the best fit turning volumes for these intersections.

What could not be ascertained from the various sources of data, was the possibility or magnitude of traffic that may be generated 'through' the area due to new routes being established i.e. not locally generated to/from the local structure. Specifically, an additional 100 vehicles per hour for the Sansimeon Boulevard-Abernethy Road route (each way) and an additional 50 vehicles per hour for the Evans Way – Pitman Way route (each way) have been factored in.

The 2026 (opening year) base case traffic flows without Byford Station are shown in Figure 40 and Figure 41. Please note these don't include existing U-turn volumes at the Abernethy Road/Sansimeon Boulevard/Gordin Way roundabout.

9.2 "With Development" Flows

9.2.1 2026 Flows

Section 8.1 provided details on the expected trip generation and distribution for Byford Station. Using the traffic generation and projections in that section, traffic generated by the station in 2026 is expected to be:

- 52 PnR trips, and 90 inbound and 90 outbound KnR trips during the AM network peak
- 88 PnR trips, and 153 inbound and 153 outbound KnR trips during the PM station/network peak

Based on that information, Figure 42 and Figure 43 provide a summary of the 2026 (opening year) traffic flows with Byford Station. Please note these don't include existing U-turn volumes at the Abernethy Road/Sansimeon Boulevard/Gordin Way roundabout.

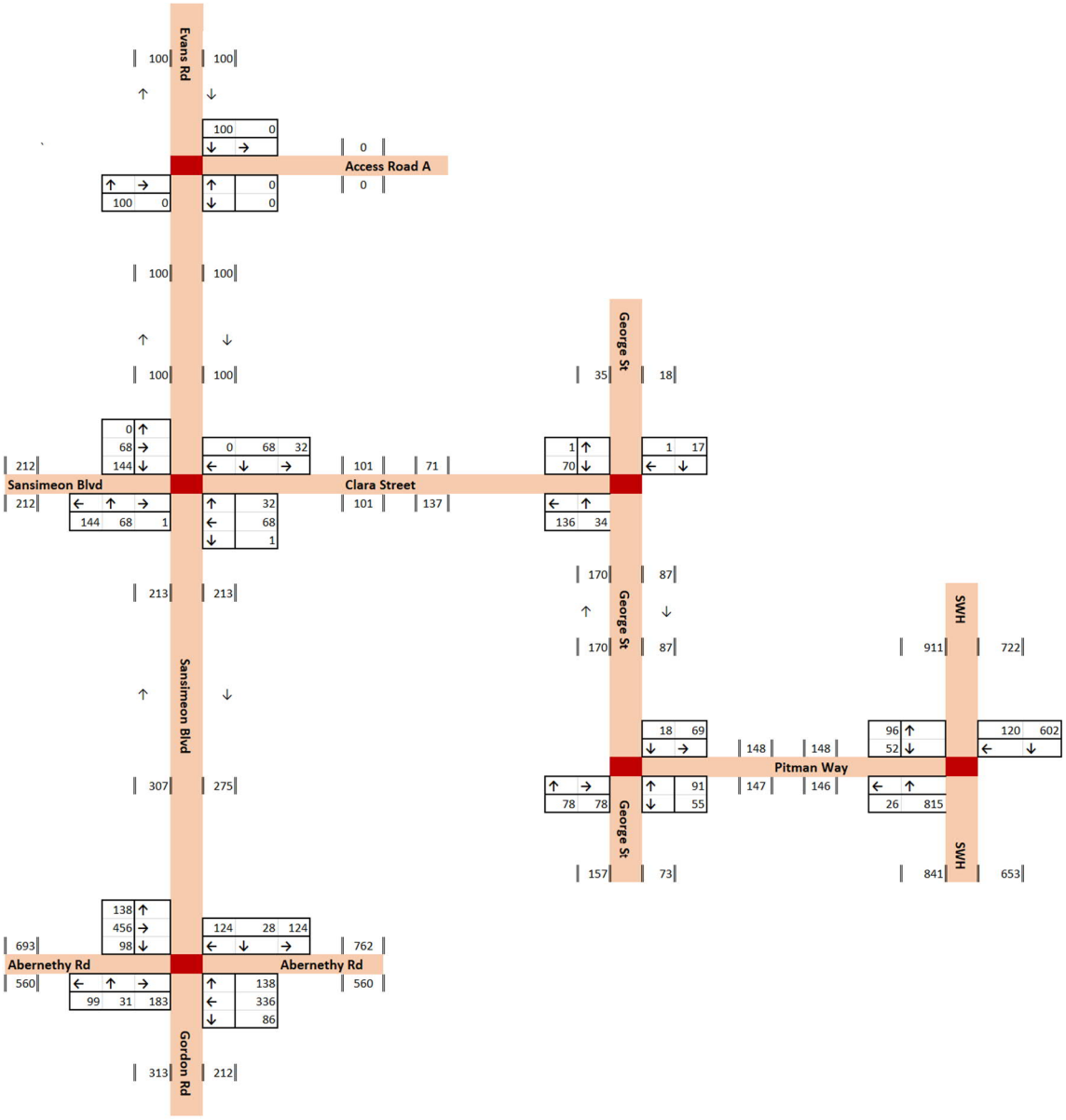


Figure 40 2026 AM base case peak hour network traffic flows

Urbsol

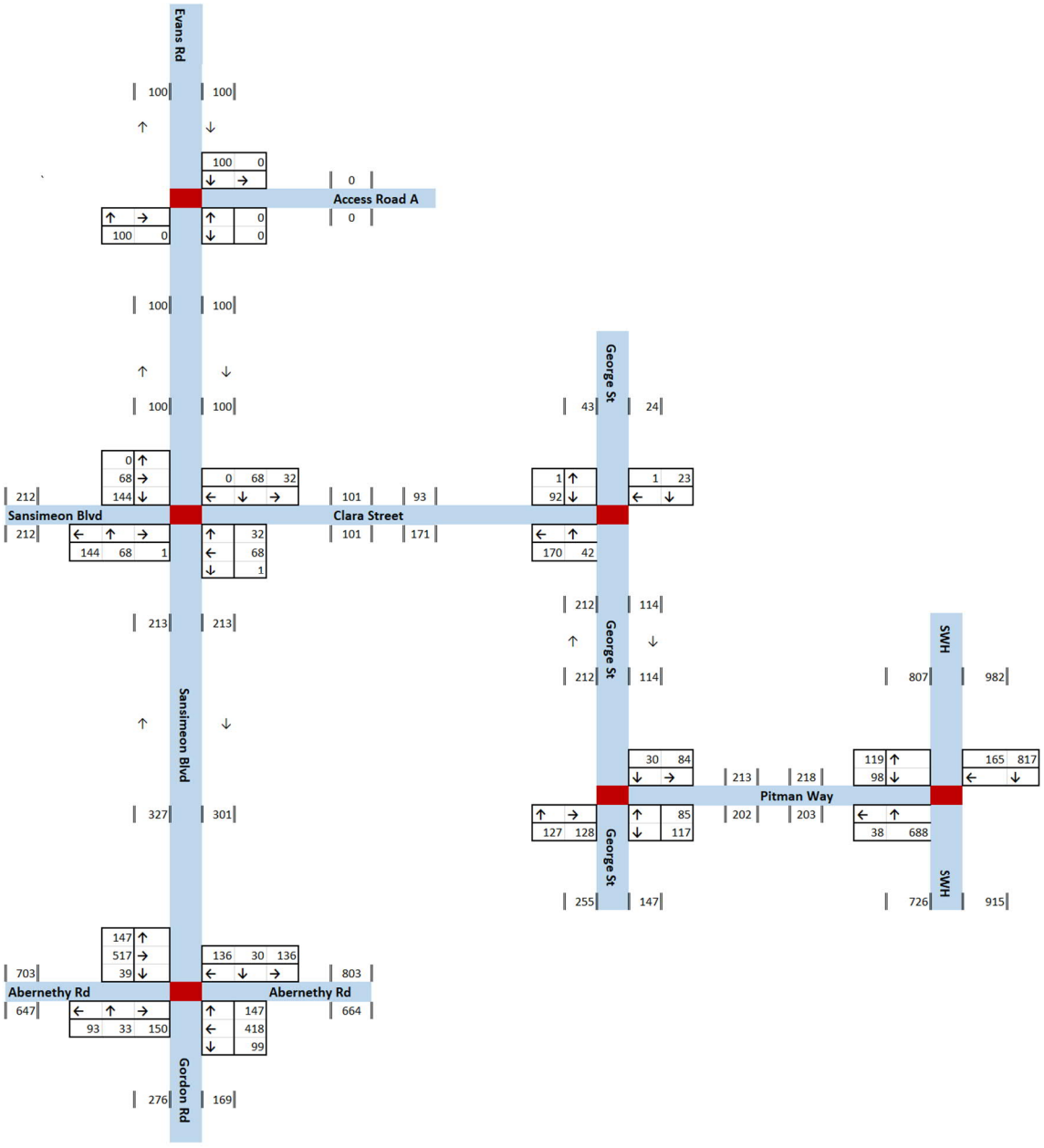


Figure 41 2026 PM base case peak hour network traffic flows

Urbsol

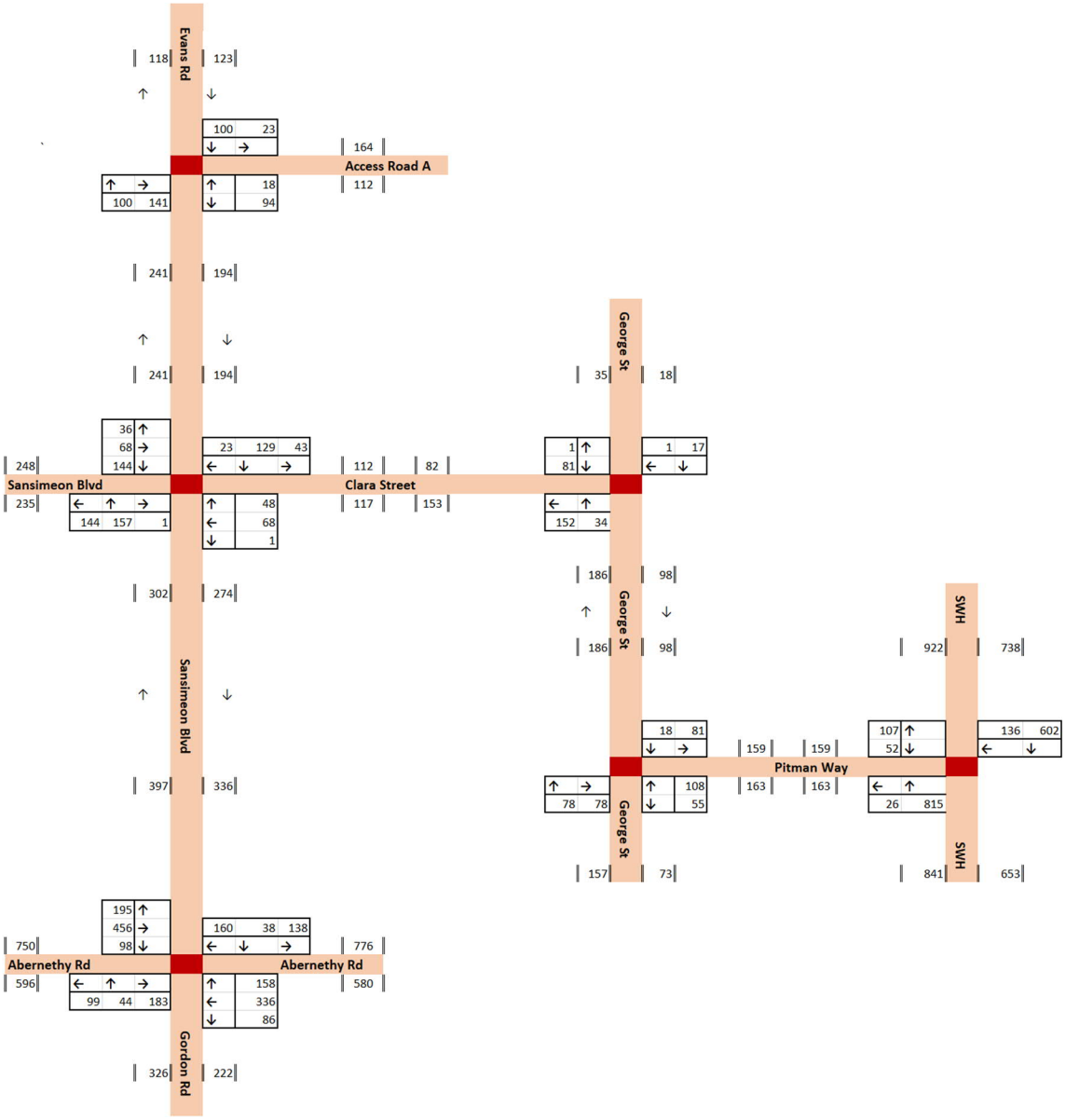


Figure 42 2026 AM peak hour network traffic flows with Byford Station

Urbsol

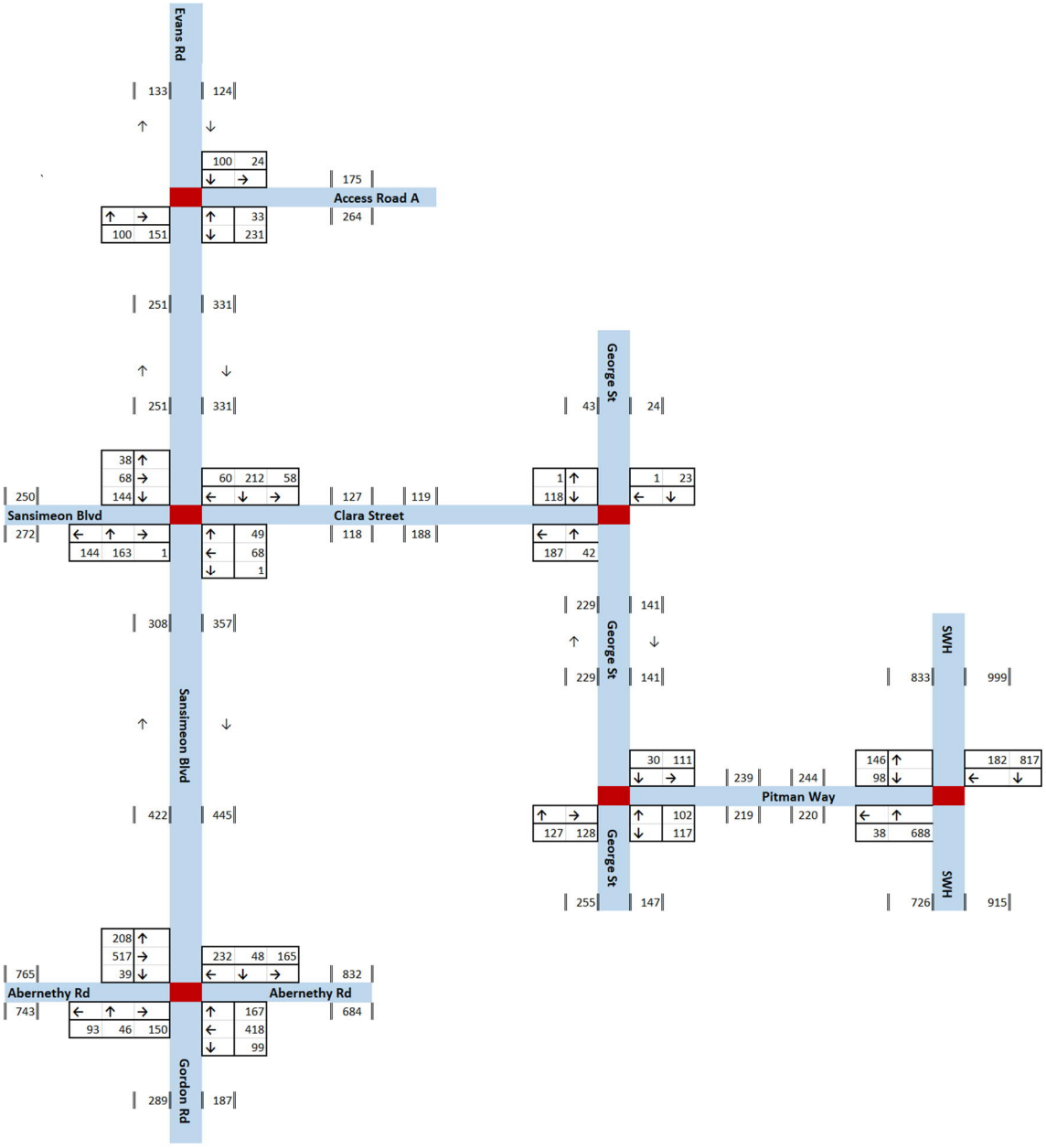


Figure 43 2026 PM peak hour network traffic flows with Byford Station

Urbsol

9.2.2 2036 Flows

Section 8.1 provided details on the expected trip generation and distribution for Byford Station. Using the traffic generation and projections in that section, traffic generated by the station in 2036 is expected to be:

- 73 PnR trips, and 60 inbound and 60 outbound KnR trips during the AM network peak
- 124 PnR trips, and 103 inbound and 103 outbound KnR trips during the PM station/network peak

Baseline 2036 traffic flows were estimated using the same methodology as the 2026 assessment, however 100% development of the local structure was assumed to have occurred by that time. Traffic generated to/from the station was then superimposed on the base traffic. The resultant 2036 AM and PM peak traffic projections are shown in Figure 44 and Figure 45. Please note these don't include existing U-turn volumes at the Abernethy Road/Sansimeon Boulevard/Gordin Way roundabout.

In comparison to the projected volumes WSP and Cardno developed in their respective assessments of the Abernethy Road/Sansimeon Boulevard/Gordin Way roundabout, the 2036 volumes developed as part of this assessment are typically much higher. The WSP assessment appears to have barely any growth on Abernethy Road or Sansimeon Boulevard, which appears to be a result of the little change in volumes in ROM24, which in turn doesn't appear to account for the development of the Byford Town Centre Structure Plan that was assessed by Cardno. It is also noted that U-turns have been omitted from their assessment. The Cardno assessment appears to have no to little growth on Gordin Way, and U-turns have also been removed from any assessment.

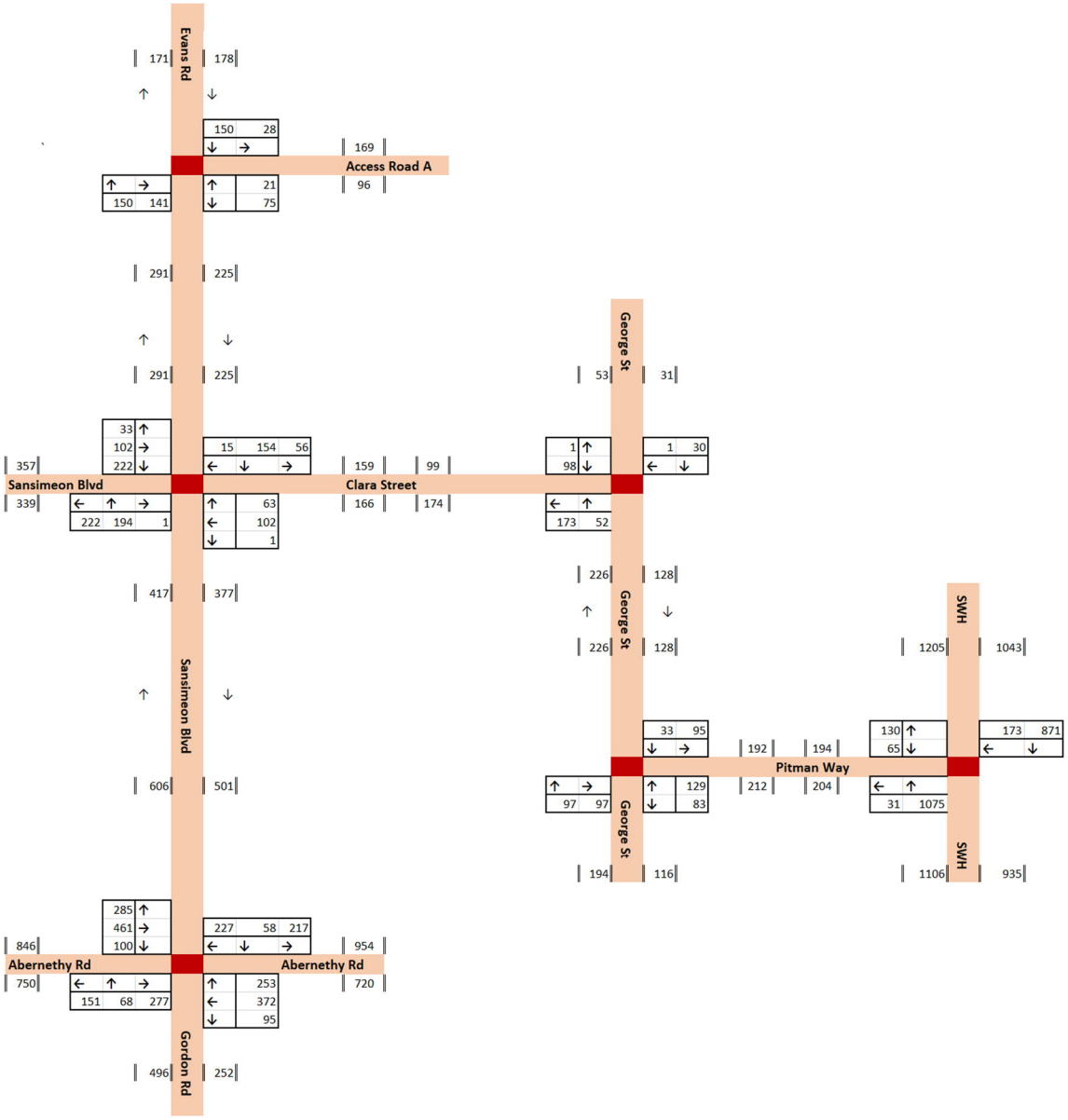


Figure 44 2036 AM peak hour network traffic flows with Byford Station

Urbsol

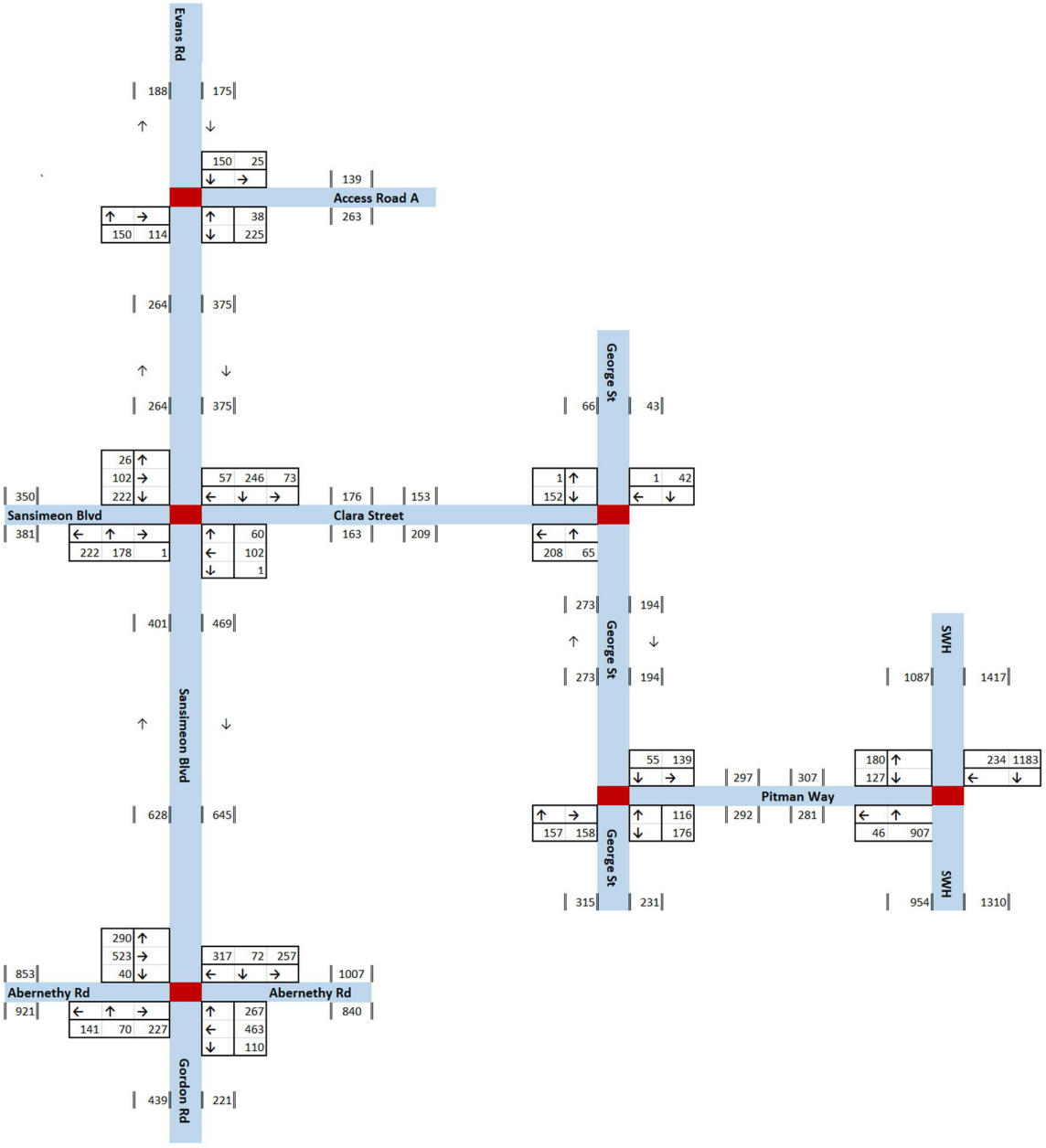


Figure 45 2036 PM peak hour network traffic flows with Byford Station

Urbsol

10 Analysis of Development Accesses

As per the discussion in Section 4.2, the intersections and access points assessed as part of this TIA includes the following sites:

- George Street/Pitman Way priority intersection
- SWH/Pitman Way priority intersection
- George Street/Clara Street priority intersection
- Sansimeon Boulevard/Evans Way/Clara Street roundabout
- Evans Way/Access Road A priority intersection
- Abernethy Road/Gordin Way/Sansimeon Boulevard roundabout

The Evans Way/Access Road A intersection is the critical access point that requires an operational assessment. Details for this intersection are included in this section. For all other intersections, the details of the operational assessment is included in Section 12.

The operational assessment of the Evans Way/Access Road A intersection was undertaken using SIDRA, and was undertaken for the following scenarios:

1. 2026 AM and PM peak, representing an opening year assessment
2. 2036 AM and PM peak, representing an opening year + 10 year assessment

10.1 Access Assessment

For the 2026 assessment, the traffic volumes used in the SIDRA analysis account for the estimated traffic on Evans Way, including 50% development of the Byford Town Centre Structure Plan area, nominal additional through traffic, and traffic generated at the station.

The results of the SIDRA analysis for the Evans Way/Access Road A intersection are summarised in Table 10. This assessment indicates that the access point assessed is expected operate satisfactorily during the AM and PM peak traffic periods. The assessment indicates that in 2026, the proposed access point is expected to operate satisfactorily with low degrees of saturation, minimal delays and minimal queueing. This is particularly important for bus traffic as buses are combined with general traffic at this location. Therefore bus operations are also expected to be efficient with will minimal delays and queueing.

For the 2036 assessment, the traffic volumes used in the SIDRA analysis account for the estimated traffic on Evans Way, including 100% development of the Byford Town Centre Structure Plan area, nominal additional through traffic, and traffic generated at the station. The results of the 2036 SIDRA analysis for the Evans Way/Access Road A intersection are also included in Table 10.

The assessment indicates that in 2036, similar to the 2026 assessment, the proposed access point is expected to operate satisfactorily with low degrees of saturation, minimal delays and minimal queueing.

		2026 AM Peak				2036 AM Peak			
Approach	**Movement**	**DOS**	**Ave Delay (s)**	**Queue (m)**	**LOS**	**DOS**	**Ave Delay (s)**	**Queue (m)**	**LOS**
Evans Way - South	T	0.15	0	6	A	0.19	0	7	A
	R	0.15	5.3	6	A	0.19	5.9	7	A
	Approach	*0.15*	*3.1*	*6*	*NA*	*0.19*	*2.9*	*7*	*NA*
Access Road A - East	L	0.07	4.9	2	A	0.06	5.1	2	A
	R	0.02	6.1	1	A	0.03	6.8	1	A
	Approach	*0.07*	*5.1*	*2*	*A*	*0.06*	*5.5*	*2*	*A*
Evans Way - North	L	0.07	4.6	0	A	0.1	4.6	0	A
	T	0.07	0	0	A	0.1	0	0	A
	Approach	*0.07*	*0.9*	*0*	*NA*	*0.1*	*0.7*	*0*	*NA*
Intersection		***0.15***	***3***	***6***	***NA***	***0.19***	***2.6***	***7***	***NA***
		2026 PM Peak				**2036 PM Peak**			
Approach	**Movement**	**DOS**	**Ave Delay (s)**	**Queue (m)**	**LOS**	**DOS**	**Ave Delay (s)**	**Queue (m)**	**LOS**
Evans Way - South	T	0.16	0	6	A	0.17	0	6	A
	R	0.16	5.3	6	A	0.17	5.9	6	A
	Approach	*0.16*	*3.2*	*6*	*NA*	*0.17*	*2.6*	*6*	*NA*
Access Road A - East	L	0.17	5	6	A	0.17	5.2	6	A
	R	0.04	6.2	1	A	0.05	6.6	1	A
	Approach	*0.17*	*5.1*	*6*	*A*	*0.17*	*5.4*	*6*	*A*
Evans Way - North	L	0.07	4.6	0	A	0.1	4.6	0	A
	T	0.07	0	0	A	0.1	0	0	A
	Approach	*0.07*	*0.9*	*0*	*NA*	*0.1*	*0.7*	*0*	*NA*
Intersection		***0.17***	***3.6***	***6***	***NA***	***0.17***	***3.2***	***6***	***NA***

Table 10 Summary of Evans Way/Access Road A performance

11 Impact on Surrounding Roads

11.1 Abernethy Road

In terms of potential changes in traffic volumes on existing roads in the immediate vicinity of the station, the biggest change is expected on Abernethy Road west of Sansimeon Boulevard/Gordin Way. The 2026 traffic projections at this location developed as part of this TIA appear higher than the 2036 projections estimated by WSP in its *Future Year Traffic Impact Analysis, Byford* (WSP, February 2022) and the *Byford Station Access Strategy* (WSP, January 2021). That document indicates practically no growth in traffic between now and 2036, which appears to be a result of the little change in volumes in ROM24, which in turn doesn't appear to account for the development of the Byford Town Centre Structure Plan that was assessed by Cardno in its *Transport Impact Assessment, TIA-LSP Lot 1 Abernethy Road, Byford* (Cardno, October 2021).

From the volume determination undertaken for this exercise, it is expected that 2026 traffic volumes may increase from an estimated base of 693vph eastbound, to approximately 750vph in the AM peak (both excluding 87 U-turns from the west). During the PM peak, the change expected is from a base of 703vph to 765vph (both excluding 24 U-turns from the west). Whilst the change due to the station is not particularly significant, it appears that the total volumes may be approaching the capacity of the roadway in that section, particularly when U-turning vehicles are accounted for. Through this area, with little interruption to traffic in the area (major access to Salvado Catholic College and Byford Secondary College occurs via the side roads), it is more likely that the operations of the intersections in the vicinity will dictate the overall operations of Abernethy Road. The assessment of the intersection of Abernethy Road/Sansimeon Boulevard/Gordin Way, based on the turning volumes developed as part of this project, is detailed in the following section.

With respect to additional capacity in the road network, through discussion with SSJ, it understood that upgrades to Thomas Road and Orton Road are expected to accommodate east-west traffic into the future (rather than Abernethy Road), as they will have connectivity with Tonkin Highway once extended. This has been considered in an investigation undertaken by Arup for Main Roads in its *Tonkin Highway Extension Proposed Modelling Report (Arup, November 2021)*. Whilst that investigation has modelled a wide area of the network, it covers Abernethy Road across to SWH. It is recognised that Byford Station and its planned surrounding roads are not the focus of that investigation, however it doesn't seem to have reflected the provision of Sansimeon Boulevard, and it isn't clear what land uses have been allowed for, although the exercise has used Main Roads ROM24 as a key input.

Regardless, a number of the scenarios modelled for 2029 and 2036 indicate similar order of magnitude in traffic projections as estimated in the current TIA investigations.

Beyond this project, it is recommended that SSJ consider more focussed modelling of the wider area be undertaken, probably consistent with the work undertaken by Arup, using ROM24 as a base. This would ensure that broader network and consolidated land use assumptions are reflected, including the Byford Station and surrounding development, to gain a better understanding of the future needs for Abernethy Road.

11.2 Other Areas

Into the longer term, mode share targets indicate that fewer patrons (compared to 2026) are expected to use private vehicles to access/leave the station. There should therefore be a corresponding reduction in private vehicle trip generation at the station from 2026 levels. However by that time, there may be additional development in the Town Centre area, which may still mean there could be an increase in

volumes on Abernethy Road. Hence the importance of appropriate investigations to understand the future requirements.

Closer to SWH, in terms of the potential impact that station traffic may have at the SWH/Abernethy Road intersection and its approaches, the estimated trip generation and agreed traffic distribution results in an additional 28 movements through the intersection during the AM peak and 44 movements during the PM peak. These represent changes of 1.4% and 2.2% of current day volumes, even if it assumed that there is no reduction in private vehicle usage through this intersection when the Byford Station is in operation. This change is insignificant and within day to day levels of fluctuations.

On a more localised level, there doesn't appear to be any sections of roadway where capacity is likely to be an issue. In the immediate vicinity of the station, the conservative estimates of adding nominal levels of through traffic to be included in the assessment (which cannot be accurately determined without more strategic level modelling) are more significant than the station generated traffic. Regardless, the volumes still appear to be within the function and capacity of the roads.

12 Impact on Intersections

As per the discussion in Section 4.2, and previously agreed, the intersections assessed as part of this TIA includes the following sites:

- George Street/Pitman Way priority intersection
- SWH/Pitman Way priority intersection
- George Street/Clara Street priority intersection
- Sansimeon Boulevard/Evans Way/Clara Street roundabout
- Abernethy Road/Gordin Way/Sansimeon Boulevard roundabout

The operational assessment of each of those intersections was undertaken using SIDRA, and was undertaken for the following scenarios:

1. 2026 AM and PM peak, without station generated traffic
2. 2026 AM and PM peak, with station generated traffic
3. 2036 AM and PM peak, representing an opening year + 10 year assessment

For existing intersections, Scenarios 1 and 2 will allow a direct comparison of the layout modified (as part of the project), with and without station traffic, to demonstrate the expected impact of the project.

For new intersections, it will allow a demonstration of the expected operational characteristics.

12.1 2026 (Opening Year) Assessment

For the 2026 assessment, the traffic volumes used in the SIDRA analysis account for the estimated traffic on the respective roadway links, including 50% development of the Byford Town Centre Structure Plan area, nominal additional through traffic, and traffic generated at the station where required.

The results of the SIDRA analysis for the assessed intersections are included in Table 11 (AM peak) and Table 12 (PM peak). These tables include the results for the 2022 base case, 2026 base case (without station traffic) and 2026 (with station traffic). This allows a comparison of existing conditions and a demonstration of the impact of station traffic. Note that the intersection of SWH/Pitman Way has been assessed as two networked intersections to account for the dual stage right turn out from Pitman Way, which is the preferred method using SIDRA.

This assessment indicates that all intersections assessed are expected operate well during the AM and PM peak traffic periods. There is a marginal difference in performance comparing the 2022 and 2026 base case scenarios. And the difference in operational performance between the 2026 base case and 2026 project case that includes the station traffic, appears to be insignificant and would barely be noticeable to drivers.

The operational performance of new intersections also appears to be satisfactory, with low degrees of saturation, minimal delays and minimal queueing.

As buses are combined with general traffic at these intersections, their operations are also expected to be efficient with will satisfactory delays and queueing.

12.2 2036 Assessment

For the 2036 assessment, the traffic volumes used in the SIDRA analysis account for the estimated traffic on respective roadway links, including 100% development of the Byford Town Centre Structure Plan area, nominal additional through traffic, and traffic generated at the station.

The results of the SIDRA analysis for the assessed intersections are summarised in Table 13 (AM and peaks).

The assessment indicates that in 2036, the key intersections are generally expected to operate satisfactorily with acceptable degrees of saturation, minimal delays and minimal queueing. The only area where it appears there may be operational issues is for southbound traffic on Sansimeon Boulevard to turn onto Abernethy Road (PM peak). This is a result of high traffic demands on Abernethy Road, and not due to station generated traffic.

As detailed in Section 11.1, there is a level of uncertainty and conflicting information with respect to traffic growth on Abernethy Road. Should the traffic demands grow in line with forecasts used for this assessment, the delays could be reduced significantly if an additional short lane is provided on the north and south approaches to separate left turning traffic from through/right turning traffic. i.e. two lanes on the approaches to the roundabout.

As previously recommended, beyond this project, it is recommended that SSJ consider more focussed modelling of the wider area be undertaken, so that broader network and consolidated land use assumptions are considered, ensuring that the Byford Station and surrounding development is included. This will enable a better understanding of the future needs for Abernethy Road.

			2022 AM Peak				2026 AM Peak (without station traffic)				2026 AM Peak (with station traffic)			
Location	**Approach Name**	**Movement**	**DOS**	**Ave Delay (s)**	**Queue (m)**	**LOS**	**DOS**	**Ave Delay (s)**	**Queue (m)**	**LOS**	**DOS**	**Ave Delay (s)**	**Queue (m)**	**LOS**
Abernethy Rd -Gordin Way	Gordin Way - South	L	0.28	4.9	11	A	0.42	6.8	20	A	0.46	7.6	23	A
		T	0.28	4.5	11	A	0.42	6.5	20	A	0.46	7.3	23	A
		R	0.28	9.9	11	A	0.42	11.8	20	B	0.46	12.6	23	B
		U	0.28	11.6	11	B	0.42	13.4	20	B	0.46	14.2	23	B
		Approach	*0.28*	*7.9*	*11*	*A*	*0.42*	*9.7*	*20*	*A*	*0.46*	*10.4*	*23*	*B*
	Abernethy Rd - East	L	0.13	5.1	5	A	0.19	5.8	7	A	0.21	6.1	8	A
		T	0.2	4.8	8	A	0.3	5.5	13	A	0.32	5.8	15	A
		R	0.2	10	8	A	0.3	10.6	13	B	0.32	10.9	15	B
		U	0.2	12.3	8	B	0.3	12.8	13	B	0.32	13.1	15	B
		Approach	*0.2*	*5.2*	*8*	*A*	*0.3*	*7*	*13*	*A*	*0.32*	*7.4*	*15*	*A*
	Sansimeon Blvd - North	L	0.09	5.1	3	A	0.41	6.6	17	A	0.51	7.6	24	A
		T	0.09	4.9	3	A	0.41	6.5	17	A	0.51	7.5	24	A
		R	0.09	10	3	B	0.41	11.7	17	B	0.51	12.6	24	B
		U	0.09	12	3	B	0.41	13.4	17	B	0.51	14.3	24	B
		Approach	*0.09*	*8.3*	*3*	*A*	*0.41*	*8.9*	*17*	*A*	*0.51*	*10*	*24*	*B*
	Abernethy Rd - West	L	0.27	4.6	14	A	0.35	5.7	20	A	0.38	6	22	A
		T	0.27	4.7	14	A	0.35	5.8	20	A	0.38	6.2	22	A
		R	0.27	10.1	13	B	0.35	11.4	18	B	0.38	11.7	21	B
		U	0.27	12.4	13	B	0.35	13.7	18	B	0.38	14	21	B
		Approach	*0.27*	*6.3*	*14*	*A*	*0.35*	*7.4*	*20*	*A*	*0.38*	*7.6*	*22*	*A*
	Intersection		***0.28***	***6.3***	***14***	***A***	***0.42***	***7.9***	***20***	***A***	***0.51***	***8.4***	***24***	***A***
Sansimeon Blvd - Clara St	Sansimeon Blvd - South	L	NA	NA	NA	NA	0.18	3.8	9	A	0.27	4.1	13	A
		T	NA	NA	NA	NA	0.18	3.8	9	A	0.27	4.1	13	A
		R	NA	NA	NA	NA	0.18	7.7	9	A	0.27	8	13	A
		Approach	*NA*	*NA*	*NA*	*NA*	*0.18*	*3.8*	*9*	*A*	*0.27*	*4.1*	*13*	*A*
	Clara St - East	L	NA	NA	NA	NA	0.10	5.4	3	A	0.13	6	4	A
		T	NA	NA	NA	NA	0.10	5.6	3	A	0.13	6.2	4	A
		R	NA	NA	NA	NA	0.10	9.6	3	A	0.13	10.2	4	B
		Approach	*NA*	*NA*	*NA*	*NA*	*0.10*	*6.9*	*3*	*A*	*0.13*	*7.8*	*4*	*A*
	Evans Way - North	L	NA	NA	NA	NA	0.10	4.4	4	A	0.20	4.5	9	A
		T	NA	NA	NA	NA	0.10	4.4	4	A	0.20	4.5	9	A
		R	NA	NA	NA	NA	0.10	8.3	4	A	0.20	8.4	9	A
		Approach	*NA*	*NA*	*NA*	*NA*	*0.10*	*4.4*	*4*	*A*	*0.20*	*5*	*9*	*A*
	Sansimeon Blvd - West	L	NA	NA	NA	NA	0.18	4.8	8	A	0.24	5.6	11	A
		T	NA	NA	NA	NA	0.18	5	8	A	0.24	5.8	11	A
		R	NA	NA	NA	NA	0.18	9	8	A	0.24	9.8	11	A
		Approach	*NA*	*NA*	*NA*	*NA*	*0.18*	*7.7*	*8*	*A*	*0.24*	*8.1*	*11*	*A*
	Intersection		***NA***	***NA***	***NA***	***NA***	***0.18***	***5.7***	***9***	***A***	***0.27***	***6***	***13***	***A***

Table 11 2022 and 2026 base and project case intersection performance summary – AM Peak

Note: Queue reported is 95th percentile queue length

			2022 AM Peak				2026 AM Peak (without station traffic)				2026 AM Peak (with station traffic)			
Location	**Approach Name**	**Movement**	**DOS**	**Ave Delay (s)**	**Queue (m)**	**LOS**	**DOS**	**Ave Delay (s)**	**Queue (m)**	**LOS**	**DOS**	**Ave Delay (s)**	**Queue (m)**	**LOS**
SWH - Pitman Way Stage 1	SWH - South	L	0.20	5.6	0	A	0.24	5.6	0	A	0.24	5.6	0	A
		T	0.20	0.1	0	A	0.24	0.1	0	A	0.24	0.1	0	A
		Approach	*0.20*	*0.2*	*0*	*NA*	*0.24*	*0.2*	*0*	*NA*	*0.24*	*0.2*	*0*	*NA*
	Median - East	T	0.09	4.4	2	A	0.21	6	6	A	0.24	6.2	7	A
		Approach	*0.09*	*4.4*	*2*	*A*	*0.21*	*6*	*6*	*A*	*0.24*	*6.2*	*7*	*A*
	Pitman Way - West	L	0.05	5.2	2	A	0.10	5.6	3	A	0.11	5.6	3	A
		T	0.05	6.5	1	A	0.11	8.5	3	A	0.11	8.7	3	A
		Approach	*0.05*	*5.6*	*2*	*A*	*0.11*	*6.6*	*3*	*A*	*0.11*	*6.6*	*3*	*A*
	Intersection		***0.20***	***1***	***2***	***NA***	***0.24***	***1.7***	***6***	***NA***	***0.24***	***1.8***	***7***	***NA***
SWH - Pitman Way Stage 2	SWH - North	T	0.15	0	0	A	0.18	0	0	A	0.18	0	0	A
		R	0.04	5.7	0	A	0.07	5.7	0	A	0.09	5.7	0	A
		Approach	*0.15*	*0.7*	*0*	*NA*	*0.18*	*1*	*0*	*NA*	*0.18*	*1.1*	*0*	*NA*
	Median - West	R	0.05	5.3	1	A	0.10	6.6	3	A	0.10	6.6	3	A
		Approach	*0.05*	*5.3*	*1*	*A*	*0.10*	*6.6*	*3*	*A*	*0.10*	*6.6*	*3*	*A*
	Intersection		***0.15***	***0.9***	***1***	***NA***	***0.18***	***1.4***	***3***	***NA***	***0.18***	***1.5***	***3***	***NA***
George St - Pitman Way	George St - South	T	0.08	0	3	A	0.15	3.9	4	A	0.15	4	4	A
		R	0.08	4.8	3	A	0.15	5.6	4	A	0.15	5.7	4	A
		Approach	*0.08*	*2.4*	*3*	*NA*	*0.15*	*4.7*	*4*	*A*	*0.15*	*4.9*	*4*	*A*
	Pitman Way - East	L	0.05	3.9	1	A	0.08	3.9	0	A	0.09	3.9	0	A
		R	0.05	4.2	1	A	0.08	3.9	0	A	0.09	3.9	0	A
		Approach	*0.05*	*4*	*1*	*NA*	*0.08*	*3.9*	*0*	*NA*	*0.09*	*3.9*	*0*	*NA*
	George St - North	L	0.02	4.8	1	A	0.06	4.6	2	A	0.07	4.6	2	A
		T	0.02	4.1	1	A	0.06	3.1	2	A	0.07	3.6	2	A
		Approach	*0.02*	*4.4*	*1*	*A*	*0.06*	*4.3*	*2*	*NA*	*0.07*	*4.4*	*2*	*NA*
	Intersection		***0.08***	***3.1***	***3***	***NA***	***0.15***	***4.3***	***4***	***NA***	***0.15***	***4.4***	***4***	***NA***
George St - Clara St	George St - South	L	NA	NA	NA	NA	0.10	5	0	A	0.11	5	0	A
		T	NA	NA	NA	NA	0.10	3.7	0	A	0.11	3.7	0	A
		Approach	*NA*	*NA*	*NA*	*NA*	*0.10*	*4.7*	*0*	*NA*	*0.11*	*4.7*	*0*	*NA*
	George Street - North	T	NA	NA	NA	NA	0.01	3.6	0	A	0.01	3.6	0	A
		R	NA	NA	NA	NA	0.01	6.6	0	A	0.01	6.8	0	A
		Approach	*NA*	*NA*	*NA*	*NA*	*0.01*	*3.8*	*0*	*A*	*0.01*	*3.8*	*0*	*A*
	Clara Street - West	L	NA	NA	NA	NA	0.04	5.6	0	A	0.05	5.6	0	A
		R	NA	NA	NA	NA	0.04	5.6	0	A	0.05	5.6	0	A
		Approach	*NA*	*NA*	*NA*	*NA*	*0.04*	*5.6*	*0*	*NA*	*0.05*	*5.6*	*0*	*NA*
	Intersection		***NA***	***NA***	***NA***	***NA***	***0.10***	***4.9***	***0***	***NA***	***0.11***	***4.9***	***0***	***NA***

Table 12 2022 and 2026 base and project case intersection performance summary – AM Peak (continued)

Note: Queue reported is 95th percentile queue length

			2022 AM Peak				2026 AM Peak (without station traffic)				2026 AM Peak (with station traffic)			
Location	**Approach Name**	**Movement**	**DOS**	**Ave Delay (s)**	**Queue (m)**	**LOS**	**DOS**	**Ave Delay (s)**	**Queue (m)**	**LOS**	**DOS**	**Ave Delay (s)**	**Queue (m)**	**LOS**
Abernethy Rd -Gordin Way	Gordin Way - South	L	0.25	5.1	10	A	0.38	6.6	17	A	0.45	8.3	22	A
		T	0.25	4.9	10	A	0.38	6.5	17	A	0.45	8.2	22	A
		R	0.25	10.1	10	B	0.38	11.7	17	B	0.45	13.4	22	B
		U	0.25	11.8	10	B	0.38	13.3	17	B	0.45	14.9	22	B
		Approach	*0.25*	*8.0*	*10*	*A*	*0.38*	*9.3*	*17*	*A*	*0.45*	*10.9*	*22*	*B*
	Abernethy Rd - East	L	0.15	4.7	6	A	0.22	5.1	9	A	0.25	5.9	10	A
		T	0.24	4.5	10	A	0.34	5.0	16	A	0.39	5.7	20	A
		R	0.24	9.6	10	A	0.34	10.2	16	B	0.39	10.8	20	B
		U	0.24	12.1	10	B	0.34	12.6	16	B	0.39	13.3	20	B
		Approach	*0.24*	*5.0*	*10*	*A*	*0.34*	*6.4*	*16*	*A*	*0.39*	*7.2*	*20*	*A*
	Sansimeon Blvd - North	L	0.15	5.0	5	A	0.43	6.5	18	A	0.64	8.9	37	A
		T	0.15	4.9	5	A	0.43	6.3	18	A	0.64	8.7	37	A
		R	0.15	10.0	5	B	0.43	11.5	18	B	0.64	13.9	37	B
		U	0.15	11.9	5	B	0.43	13.2	18	B	0.64	15.6	37	B
		Approach	*0.15*	*8.2*	*5*	*A*	*0.43*	*8.7*	*18*	*A*	*0.64*	*11.5*	*37*	*B*
	Abernethy Rd - West	L	0.25	4.5	12	A	0.32	5.7	18	A	0.36	5.9	20	A
		T	0.25	4.6	12	A	0.32	5.8	18	A	0.36	6.2	20	A
		R	0.25	10.0	12	B	0.32	11.4	16	B	0.36	11.7	19	B
		U	0.25	12.3	12	B	0.32	13.6	16	B	0.36	13.9	19	B
		Approach	*0.25*	*5.2*	*12*	*A*	*0.32*	*6.4*	*18*	*A*	*0.36*	*6.6*	*20*	*A*
	Intersection		***0.25***	***5.8***	***12***	***A***	***0.43***	***7.2***	***18***	***A***	***0.64***	***8.3***	***37***	***A***
Sansimeon Blvd - Clara St	Sansimeon Blvd - South	L	NA	NA	NA	NA	0.18	3.8	9	A	0.29	4.4	14	A
		T	NA	NA	NA	NA	0.18	3.8	9	A	0.29	4.4	14	A
		R	NA	NA	NA	NA	0.18	7.7	9	A	0.29	8.3	14	A
		Approach	*NA*	*NA*	*NA*	*NA*	*0.18*	*3.8*	*9*	*A*	*0.29*	*4.4*	*14*	*A*
	Clara St - East	L	NA	NA	NA	NA	0.1	5.4	3	A	0.14	6.8	5	A
		T	NA	NA	NA	NA	0.1	5.6	3	A	0.14	7.0	5	A
		R	NA	NA	NA	NA	0.1	9.6	3	A	0.14	11.0	5	B
		Approach	*NA*	*NA*	*NA*	*NA*	*0.1*	*6.9*	*3*	*A*	*0.14*	*8.7*	*5*	*A*
	Evans Way - North	L	NA	NA	NA	NA	0.1	4.4	4	A	0.33	4.7	16	A
		T	NA	NA	NA	NA	0.1	4.4	4	A	0.33	4.7	16	A
		R	NA	NA	NA	NA	0.1	8.3	4	A	0.33	8.6	16	A
		Approach	*NA*	*NA*	*NA*	*NA*	*0.1*	*4.4*	*4*	*A*	*0.33*	*5.4*	*16*	*A*
	Sansimeon Blvd - West	L	NA	NA	NA	NA	0.18	4.8	8	A	0.25	5.6	11	A
		T	NA	NA	NA	NA	0.18	5.0	8	A	0.25	5.8	11	A
		R	NA	NA	NA	NA	0.18	9.0	8	A	0.25	9.8	11	A
		Approach	*NA*	*NA*	*NA*	*NA*	*0.18*	*7.7*	*8*	*A*	*0.25*	*8.1*	*11*	*A*
	Intersection		***NA***	***NA***	***NA***	***NA***	***0.18***	***5.7***	***9***	***A***	***0.33***	***6.2***	***16***	***A***

Table 12 2022 and 2026 base and project case intersection performance summary – PM Peak

Note: Queue reported is 95th percentile queue length

			2022 AM Peak				2026 AM Peak (without station traffic)				2026 AM Peak (with station traffic)			
Location	**Approach Name**	**Movement**	**DOS**	**Ave Delay (s)**	**Queue (m)**	**LOS**	**DOS**	**Ave Delay (s)**	**Queue (m)**	**LOS**	**DOS**	**Ave Delay (s)**	**Queue (m)**	**LOS**
SWH - Pitman Way Stage 1	SWH - South	L	0.10	5.6	0	A	0.23	5.7	0	A	0.23	5.7	0	A
		T	0.10	0.0	0	A	0.23	0.1	0	A	0.23	0.1	0	A
		Approach	*0.10*	*0.5*	*0*	*NA*	*0.23*	*0.4*	*0*	*NA*	*0.23*	*0.4*	*0*	*NA*
	Median - East	T	0.10	2.4	3	A	0.27	6.0	8	A	0.30	6.2	9	A
		Approach	*0.10*	*2.4*	*3*	*A*	*0.27*	*6.0*	*8*	*A*	*0.30*	*6.2*	*9*	*A*
	Pitman Way - West	L	0.06	4.4	2	A	0.11	5.3	3	A	0.14	5.3	4	A
		T	0.07	4.2	2	A	0.22	8.1	5	A	0.22	8.3	5	A
		Approach	*0.07*	*4.3*	*2*	*A*	*0.22*	*6.6*	*5*	*A*	*0.22*	*6.5*	*5*	*A*
	Intersection		***0.10***	***1.8***	***3***	***NA***	***0.27***	***2.4***	***8***	***NA***	***0.30***	***2.6***	***9***	***NA***
SWH - Pitman Way Stage 2	SWH - North	T	0.20	0.1	0	A	0.24	0.1	0	A	0.24	0.1	0	A
		R	0.06	5.7	0	A	0.12	5.7	0	A	0.14	5.7	0	A
		Approach	*0.20*	*0.8*	*0*	*NA*	*0.24*	*1.0*	*0*	*NA*	*0.24*	*1.1*	*0*	*NA*
	Median - West	R	0.15	7.1	4	A	0.24	10.0	7	A	0.24	10.0	7	A
		Approach	*0.15*	*7.1*	*4*	*A*	*0.24*	*10.0*	*7*	*A*	*0.24*	*10.0*	*7*	*A*
	Intersection		**0.20**	**1.4**	**4**	**NA**	**0.24**	**1.8**	**7**	**NA**	**0.24**	**1.9**	**7**	**NA**
George St - Pitman Way	George St - South	T	0.13	0.0	5	A	0.25	4.1	8	A	0.26	4.2	8	A
		R	0.13	4.8	5	A	0.25	5.9	8	A	0.26	6.2	8	A
		Approach	*0.13*	*2.4*	*5*	*NA*	*0.25*	*5.0*	*8*	*A*	*0.26*	*5.2*	*8*	*A*
	Pitman Way - East	L	0.07	3.9	1	A	0.12	3.9	0	A	0.13	3.9	0	A
		R	0.07	4.7	1	A	0.12	3.9	0	A	0.13	3.9	0	A
		Approach	*0.07*	*4.0*	*1*	*NA*	*0.12*	*3.9*	*0*	*NA*	*0.13*	*3.9*	*0*	*NA*
	George St - North	L	0.04	4.9	1	A	0.08	4.6	3	A	0.10	4.6	3	A
		T	0.04	4.6	1	A	0.08	4.3	3	A	0.10	5.2	3	A
		Approach	*0.04*	*4.8*	*1*	*A*	*0.08*	*4.5*	*3*	*NA*	*0.10*	*4.7*	*3*	*NA*
	Intersection		***0.13***	***3.2***	***5***	***NA***	***0.25***	***4.5***	***8***	***NA***	***0.26***	***4.6***	***8***	***NA***
George St - Clara St	George St - South	L	NA	NA	NA	NA	0.12	5.0	0	A	0.13	5.0	0	A
		T	NA	NA	NA	NA	0.12	3.7	0	A	0.13	3.7	0	A
		Approach	*NA*	*NA*	*NA*	*NA*	*0.12*	*4.7*	*0*	*NA*	*0.13*	*4.7*	*0*	*NA*
	George Street - North	T	NA	NA	NA	NA	0.02	3.7	1	A	0.02	3.8	1	A
		R	NA	NA	NA	NA	0.02	7.0	1	A	0.02	7.2	1	A
		Approach	*NA*	*NA*	*NA*	*NA*	*0.02*	*3.8*	*1*	*A*	*0.02*	*3.9*	*1*	*A*
	Clara Street - West	L	NA	NA	NA	NA	0.06	5.6	0	A	0.07	5.6	0	A
		R	NA	NA	NA	NA	0.06	5.6	0	A	0.07	5.6	0	A
		Approach	*NA*	*NA*	*NA*	*NA*	*0.06*	*5.6*	*0*	*NA*	*0.07*	*5.6*	*0*	*NA*
	Intersection		***NA***	***NA***	***NA***	***NA***	***0.12***	***4.9***	***1***	***NA***	***0.13***	***4.9***	***1***	***NA***

Table 13 2022 and 2026 base and project case intersection performance summary – PM Peak (continued)

Note: Queue reported is 95th percentile queue length

			2036 AM Peak (with station traffic)				2036 PM Peak (with station traffic)			
Location	**Approach Name**	**Movement**	**DOS**	**Ave Delay (s)**	**Queue (m)**	**LOS**	**DOS**	**Ave Delay (s)**	**Queue (m)**	**LOS**
Abernethy Rd -Gordin Way	Gordin Way - South	L	0.83	20.1	81	C	0.83	24.0	81	C
		T	0.83	19.8	81	B	0.83	23.9	81	C
		R	0.83	25.1	81	C	0.83	29.1	81	C
		U	0.83	26.6	81	C	0.83	30.5	81	C
		Approach	*0.83*	*22.8*	*81*	*C*	*0.83*	*26.6*	*81*	*C*
	Abernethy Rd - East	L	0.28	6.9	12	A	0.34	6.7	16	A
		T	0.44	6.6	24	A	0.53	6.7	33	A
		R	0.44	11.7	24	B	0.53	11.8	33	B
		U	0.44	13.8	24	B	0.53	14.3	33	B
		Approach	*0.44*	*8.5*	*24*	*A*	*0.53*	*8.6*	*33*	*A*
	Sansimeon Blvd - North	L	0.86	18.7	77	B	1.03	60.3	251	E
		T	0.86	18.5	77	B	1.03	60.1	251	E
		R	0.86	23.7	77	C	1.03	65.4	251	E
		U	0.86	25.3	77	C	1.03	66.9	251	E
		Approach	*0.86*	*20.9*	*77*	*C*	*1.03*	*62.8*	*251*	*E*
	Abernethy Rd - West	L	0.53	8.6	41	A	0.49	7.8	33	A
		T	0.53	9.4	41	A	0.49	8.6	33	A
		R	0.53	15.4	37	B	0.49	14.5	31	B
		U	0.53	17.7	37	B	0.49	16.8	31	B
		Approach	*0.53*	*10.6*	*41*	*B*	*0.49*	*8.8*	*33*	*A*
	Intersection		***0.86***	***14.2***	***81***	***B***	***1.03***	***23.8***	***251***	***C***
Sansimeon Blvd - Clara St	Sansimeon Blvd - South	L	0.39	4.6	22	A	0.39	4.9	21	A
		T	0.39	4.5	22	A	0.39	4.9	21	A
		R	0.39	8.5	22	A	0.39	8.8	21	A
		Approach	*0.39*	*4.6*	*22*	*A*	*0.39*	*4.9*	*21*	*A*
	Clara St - East	L	0.20	6.7	7	A	0.22	7.8	9	A
		T	0.20	6.9	7	A	0.22	8.0	9	A
		R	0.20	10.9	7	B	0.22	12.0	9	B
		Approach	*0.20*	*8.5*	*7*	*A*	*0.22*	*9.5*	*9*	*A*
	Evans Way - North	L	0.25	5.4	12	A	0.42	5.8	23	A
		T	0.25	5.4	12	A	0.42	5.8	23	A
		R	0.25	9.3	12	A	0.42	9.7	23	A
		Approach	*0.25*	*5.6*	*12*	*A*	*0.42*	*6.4*	*23*	*A*
	Sansimeon Blvd - West	L	0.37	6.1	19	A	0.36	6.0	18	A
		T	0.37	6.3	19	A	0.36	6.2	18	A
		R	0.37	10.3	19	B	0.36	10.2	18	B
		Approach	*0.37*	*8.8*	*19*	*A*	*0.36*	*8.7*	*18*	*A*
	Intersection		***0.39***	***6.6***	***22***	***A***	***0.42***	***6.9***	***23***	***A***

Table 13 2036 project case intersection performance summary – AM and PM peaks

Note: Queue reported is 95th percentile queue length

			2036 AM Peak (with station traffic)				2036 PM Peak (with station traffic)			
Location	**Approach Name**	**Movement**	**DOS**	**Ave Delay (s)**	**Queue (m)**	**LOS**	**DOS**	**Ave Delay (s)**	**Queue (m)**	**LOS**
SWH - Pitman Way Stage 1	SWH - South	L	0.31	5.6	0	A	0.31	5.7	0	A
		T	0.31	0.1	0	A	0.31	0.1	0	A
		Approach	*0.31*	*0.3*	*0*	*NA*	*0.31*	*0.4*	*0*	*NA*
	Median - East	T	0.44	11.9	12	B	0.54	12.0	12	B
		Approach	*0.44*	*11.9*	*12*	*B*	*0.54*	*12.0*	*12*	*B*
	Pitman Way - West	L	0.15	6.5	5	A	0.19	6.1	6	A
		T	0.24	14.5	6	B	0.72	16.5	12	C
		Approach	*0.24*	*9.2*	*6*	*A*	*0.72*	*10.4*	*12*	*B*
	Intersection		***0.44***	***2.8***	***12***	***NA***	***0.72***	***4.3***	***12***	***NA***
SWH - Pitman Way Stage 2	SWH - North	T	0.26	0.1	0	A	0.35	0.1	0	A
		R	0.10	5.7	1	A	0.13	5.7	7	A
		Approach	*0.26*	*1.0*	*1*	*NA*	*0.35*	*1.0*	*7*	*NA*
	Median - West	R	0.19	11.8	5	B	0.63	30.2	12	D
		Approach	*0.19*	*11.8*	*5*	*B*	*0.63*	*30.2*	*12*	*D*
	Intersection		***0.26***	***1.6***	***5***	***NA***	***0.63***	***3.4***	***12***	***NA***
George St - Pitman Way	George St - South	T	0.20	4.2	6	A	0.34	4.6	12	A
		R	0.20	6.2	6	A	0.34	7.1	12	A
		Approach	*0.20*	*5.2*	*6*	*A*	*0.34*	*5.9*	*12*	*A*
	Pitman Way - East	L	0.12	3.9	0	A	0.17	3.9	0	A
		Approach	*0.12*	*3.9*	*0*	*NA*	*0.17*	*3.9*	*0*	*NA*
	George St - North	L	0.10	4.6	4	A	0.16	4.6	7	A
		T	0.10	4.9	4	A	0.16	7.5	7	A
		Approach	*0.10*	*4.6*	*4*	*NA*	*0.16*	*5.4*	*7*	*NA*
	Intersection		***0.20***	***4.5***	***6***	***NA***	***0.34***	***5.0***	***12***	***NA***
George St - Clara St	George St - South	L	0.13	5.0	0	A	0.16	5.0	0	A
		T	0.13	3.7	0	A	0.16	3.7	0	A
		Approach	*0.13*	*4.7*	*0*	*NA*	*0.16*	*4.7*	*0*	*NA*
	George Street - North	T	0.03	3.7	1	A	0.04	3.9	1	A
		R	0.03	7.1	1	A	0.04	7.8	1	A
		Approach	*0.03*	*3.8*	*1*	*A*	*0.04*	*4.0*	*1*	*A*
	Clara Street - West	L	0.06	5.6	0	A	0.09	5.6	0	A
		R	0.06	5.6	0	A	0.09	5.6	0	A
		Approach	*0.06*	*5.6*	*0*	*NA*	*0.09*	*5.6*	*0*	*NA*
	Intersection		***0.13***	***4.9***	***1***	***NA***	***0.16***	***4.9***	***1***	***NA***

Table 14 2036 project case intersection performance summary – AM and PM peaks (continued)

Note: Queue reported is 95th percentile queue length

13 Impact on Neighbouring Areas

It has been demonstrated that based on the assumed traffic generation and agreed traffic distribution, the station related traffic has limited impact at key intersections in the neighbouring area. It has also been demonstrated that the projected traffic volumes, including the station related traffic is within the capacity of the adjacent roadways. This is despite the fact that the assessment assumed that the station related traffic is 100% additional/new traffic on the network, and there will be no mode shift away from private vehicle usage as a result of the station development.

Based on the expected change in mode share beyond 2026, with increasing use of walking, cycling and public transport, it is possible that the station generated traffic may even decrease in future years.

With respect to noise and vibration no assessment has been undertaken as part of this transport assessment. However there is a separate noise and vibration report that is part of the overall package of technical documents that will be submitted as part of the DA.

14 Road Safety

14.1 General

It is worth noting that no clear crash patterns were evident in the recorded crashes on the nearby existing road network in the past five years. Furthermore, the additional traffic to/from the station is not likely to result in a significant increase in traffic volumes on the existing road network. Most of the additional traffic will be accommodated by new road construction, with turning traffic facilitated largely at key intersections that have, or will be, roundabout controlled. As a result, it is not expected that changes in traffic volumes due to the redevelopment of the station will contribute to any safety issues.

14.2 Evans Way/Access Road A

The original intent for the Evans Way link (extending north of the roundabout at Sansimeon Boulevard/Clara Street) was to terminate at the station entrance road (Access Road A). However SSJ requested that northern link to be extended further to connect into the existing intersection at Evans Way/Padra Turn.

This generated some investigation into the safest and most efficient layouts, given the proximity of the Access Road A and Padra Turn intersections on Evans Way (approximately 40m), and the Ninka Lane access points just over 30m further north. It was considered that there may be some undesirable safety implications if all movements were permitted at all intersections/sites. As a result, a number of potential scenarios were developed and discussed with SSJ. These options included various permutations/combinations of roundabout/priority control at the Evans Way/Access Road A intersection along with potential restrictions to movements at Padra Turn/Evans Way and in/out of Ninka Lane.

SSJ indicated a strong desire to maintain full movements at each location to minimise any negative impact upon the local community and maximise accessibility. As a result, the design progressed to maintain full connectivity and movements, but has raised pavement through the intersection of Evans Way/Padra Turn to achieve safe vehicular speeds through the intersection and minimise any negative safety implications. It should be recognised that this was not the preferred outcome for Urbsol or MetCONNX. It is also understood that there have been concerns raised from a design perspective and during the road safety audit. However SSJ has indicated its acceptance of risk associated with this final design outcome (in DA4 Meeting #2 on 29 June 2023, and in the Alliance Scope Clarification Meeting on 10 July 2023).

14.3 Level Rail Crossing

The project includes the creation of Clara Street, a new east-west link for pedestrians, cyclists and vehicles, connecting the east and west side of the Byford Town Centre. This link will provide opportunity for accessibility to the station for pedestrians and cyclists, and also improve permeability. It also includes the creation of a new at-grade level rail crossing. This is not ideal from a safety perspective, as the BRE project benefits from the removal of a number of at-grade crossings. However it is recognised that the crossing will close only sporadically for the Bunbury train line.

The level crossing will require all of the management tools to ensure that any compromise on safety is minimised, including flashing lights, boom gates, bells, warning signs, stop signage, pedestrian crossing gates, crosshatch exclusion zone, etc.

15 Public Transport Access

Public transport provisions have been covered in detail in the previous sections.

With respect to a development or redevelopment, the usual aim for this section of the TIA is to assess whether access from the development to the nearest bus stops and/or railway station is direct, safe and convenient. The public transport access is proposed via a shared access point at the northern end of the site (Access Road A) from Evans Way. This roadway will provide direct access into the bus interchange area and priority exit from the interchange area. The shared egress back on to the public road network means that buses will have some delay to exit onto Evans Way, however the assessment indicates that the access point is expected to operate efficiently and no additional or specific priority measures or alternative arrangements are considered necessary.

Also worth noting is the circulation of buses being accommodated within the site, therefore minimising any impact or conflict with other road users and pedestrians and cyclists.

16 Pedestrian and Cyclist Access/Amenity

Pedestrian and cyclist provisions and proposed changes to the pedestrian and cyclist networks have been discussed in sections 2.6, 4.3 and 5.3.2. This section represents a consolidation of information contained in the previous sections, as required in the WAPC TIA Guidelines. For ease of reference, pedestrian and cyclist discussions have been combined.

16.1 Existing Facilities

The pedestrian network traversing within and around the existing Byford Town Centre is still developing and undergoing upgrades as the area is growing, so path quality is still variable depending on location and is still fragmented when viewed on a larger network perspective. On the eastern side of the railway line (the original Byford Town Centre), George Street consists of many on-street parking as well as a number of accesses to small-scale commercial outlets, with some paved paths suitable for everyday pedestrian traffic but not so for higher-speed cycling. This type of setup is somewhat similar along SWH, but with no on-street parking and a notable pelican crossing located just south of SWH/Pitman Way.

Along Abernethy Road, the pedestrian network here is fresher in quality and should tie in with the future Byford Station as the land use and the surrounding roads develop in the near future. These paved paths are generally setup for pedestrians and low-speed cycling and is lesser in quality when compared to fully marked and dedicated principal shared paths (PSPs)

16.2 Future Facilities

The new train station provides an opportunity to realise a second pedestrian link across the rail via the provision of Clara Street, connecting the east and west side of the Byford Town Centre. It also includes a new at-grade rail crossing at Clara Street West. Whilst not ideal from a safety perspective, the crossing will close only sporadically for the Bunbury train line.

The new PSP along the west side of the rail line will create an important cycling linkage in the network. It will connect to Armadale in the north, and to Abernethy Road in the south. The PSP will be key to create safe cycle connections to important local destinations such as the Town Centre, and the Byford Secondary College south of Abernethy Road.

A new Welcome Place marks the new connection between the eastern and western town centre. The plaza will have ample travellers moving through, and attractive for both youth and parents with young children. All contributing to the activation and safety of the plaza and town centre.

Additional footpaths along Evans Way, Clara Street and Sansimeon Boulevard will further improve the pedestrian permeability around the Town Centre, connect with the surrounding path networks and with the retail/commercial area to the south and colleges south of Abernethy Road.

A grade-separated crossing at Larsen Road and an at-grade crossing at Clara Street West will improve the east-west connectivity across the rail line.

The proposed networks will provide opportunity for accessibility to the station for pedestrians and cyclists, and also improve permeability through the precinct and better connections between residents and the town centre and its attractions.

Secure bike storage will be provided adjacent to the station entrance and main canopy near the plaza.

Refer to Figure 46 and Figure 47 for schematics of the pedestrian and cyclist networks respectively.

In Figure 46, the “New footpath (station related)” and “New Street (station related)” are those to be provided as part of the project. These new footpaths (station related) include the east side of Sansimeon Boulevard (south) and Evans Road, both sides of Clara Street and the south side of Sansimeon Boulevard (west).

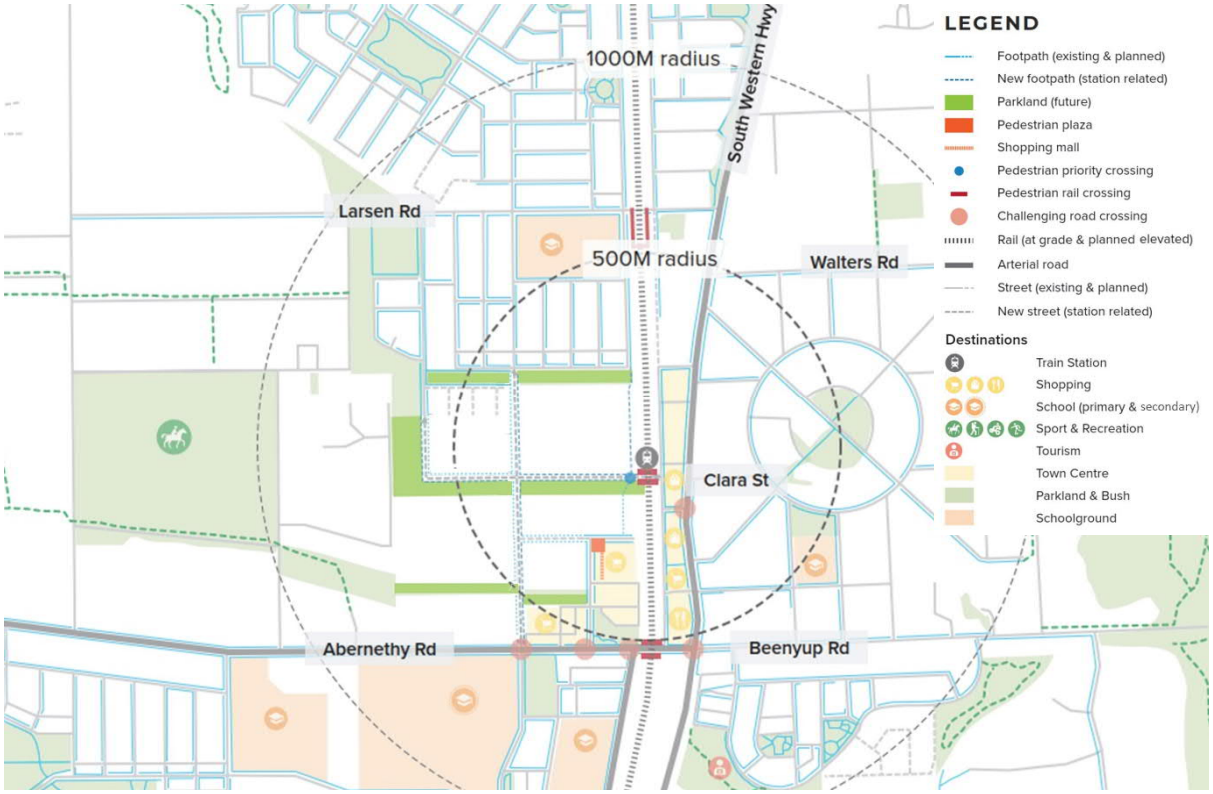


Figure 46 Armadale Station – pedestrian network (MetCONNX)

With respect to the provisions as part of this project, Figure 47, indicates local cycle routes on Sansimeon Boulevard and Clara Street.

Urbsol

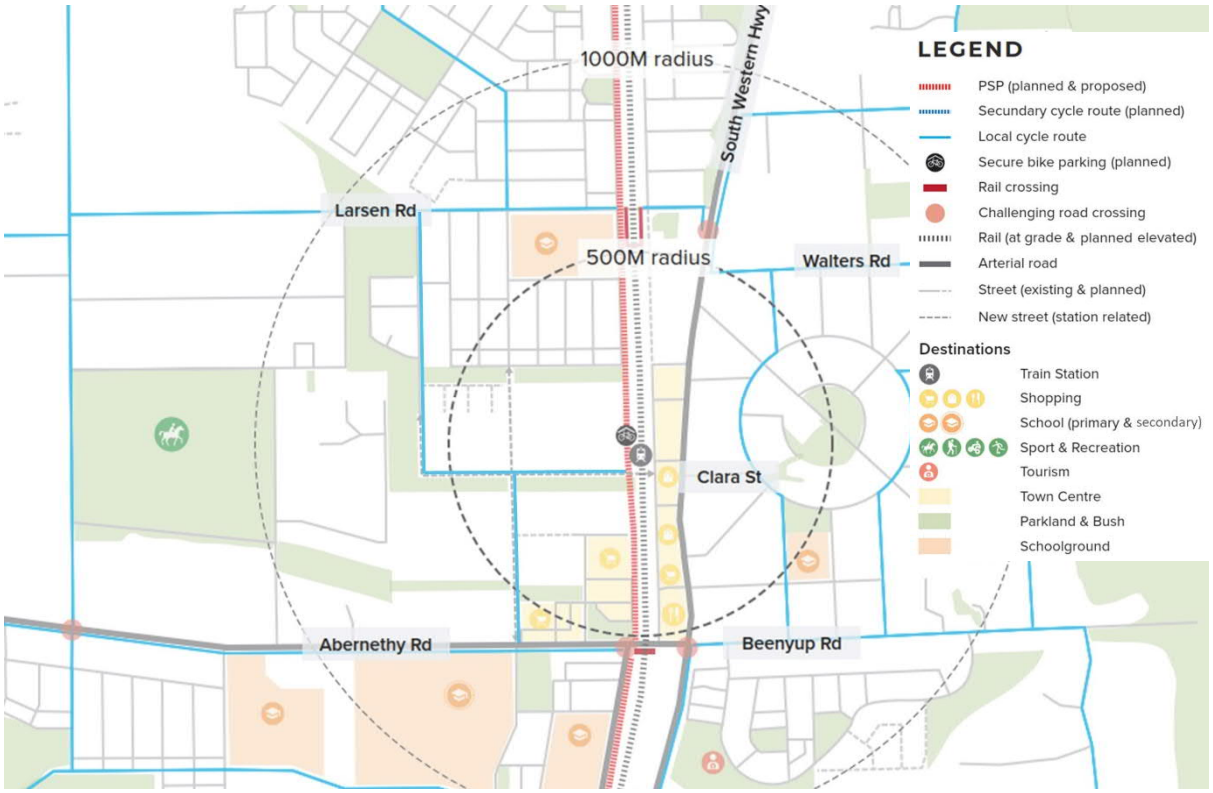


Figure 47 Armadale Station – cyclist network (MetCONNX)

Urbsol

17 Analysis of Pedestrian/Cycle Networks

Whilst there are some significant enhancements and opportunities created with respect to the pedestrian and cyclist networks, consideration has been given to areas where potential difficulty in crossing roads or undesirable conflict has been identified.

As previously mentioned, the project includes the creation of Clara Street, a new east-west link for pedestrians, cyclists and vehicles, connecting the east and west side of the Byford Town Centre. This link will provide opportunity for accessibility to the station for pedestrians and cyclists, and also improve permeability. It also includes the creation of a new at-grade level rail crossing. This is not ideal from a safety perspective, as the BRE project benefits from the removal of a number of at-grade crossings. However it is recognised that the crossing will close only sporadically for the Bunbury train line.

The level crossing will require all of the management tools to ensure that any compromise on safety is minimised, including flashing lights, boom gates, bells, warning signs, stop signage, pedestrian crossing gates, crosshatch exclusion zone, etc.

A number of potential points of conflict on the pedestrian/cycle network within the station precinct were identified as part of the expected pedestrian/cyclist desire lines, and appropriate treatments incorporated. Figure 48 shows the station area including the desire lines for pedestrian movements between the carpark area and bus interchange and train platform areas. Zebra crossings have been incorporated to cross parking circulation aisles to focus their movement into the central pathway that will guide them to/from the train platform. The location of the western north-south pedestrian linkages within the carpark takes account of the potential expansion of parking facilities to the west.

Between the carpark and rail platform the crossings will also pick up pedestrian traffic to/from the KnR facility and the bus interchange.

Crossings are also provided between the carpark and bus interchange to the plaza area that will connect with facilities to/from the Town Centre, using the rail crossing facilities previously discussed.

With respect to cyclists specifically, as cyclists enter the station from the north and south, there is an expectation that they would dismount to walkthrough the station area. From both directions, cyclists would be directed to the main station canopy that provides convenient access to the bike store.

To ensure safe and convenient connectivity with the paths on the surrounding local roads, appropriate facilities will be provided at the Evans Way/Access Road A intersection.

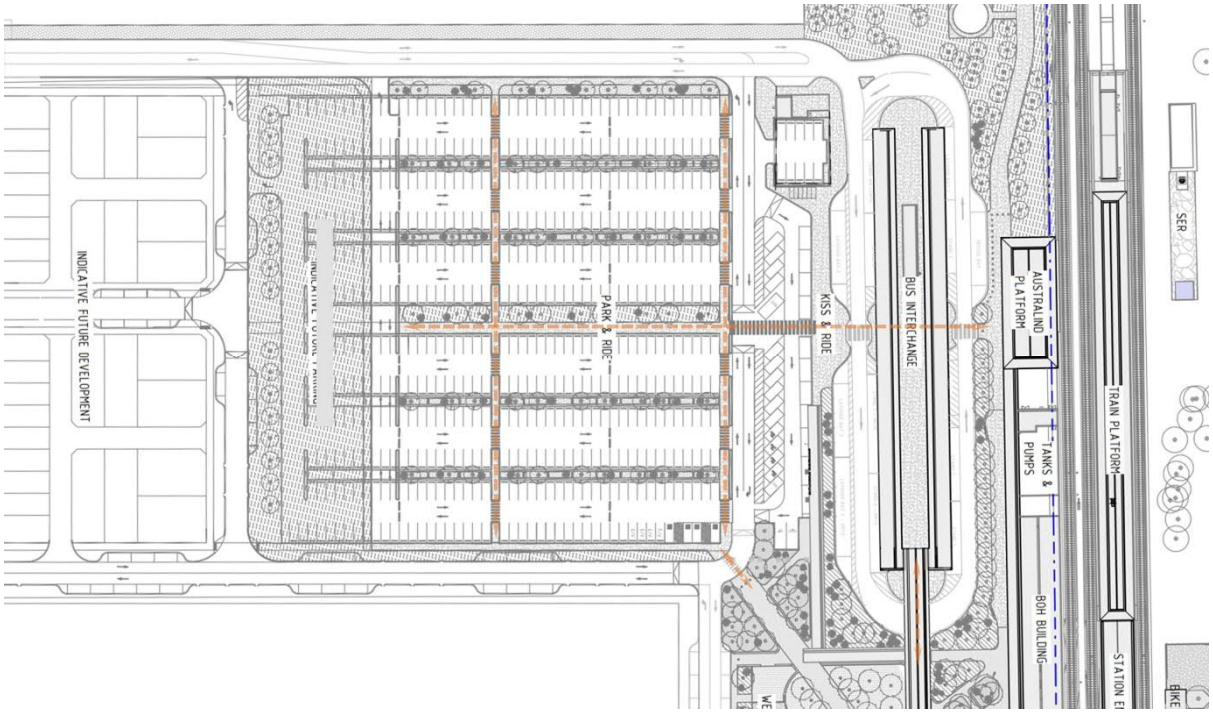


Figure 48 Pedestrian crossing facilities within the station

18 Safe Walk/Cycle to School

A safe walk/cycle to school assessment is required for residential developments or school developments to assess routes between residential areas and schools in an 800m vicinity, and to identify potential deficiencies to address. As a result, and because the station redevelopment is only likely to enhance facilities between nearby residential areas and schools, it is not considered necessary or applicable to undertake such an assessment for the station redevelopment.

19 Parking

The parking supply requirements have been specified by PTA based on previous modelling and estimation, and the design and proposed supply accommodates the requirements.

Considering the amount of inbound PnR traffic estimated during the AM network peak (52 vehicles), and the likelihood that around double that amount may enter during the earlier station peak (based on existing patterns at Armadale Station), the proposed supply of approximately of in excess of 400 bays is expected to comfortably accommodate the demand.

In the longer term, mode share targets indicate an increase in boardings from PnR trip arrivals. In 2036, the estimated inbound PnR traffic during the AM network peak is around 73 vehicles. With about double that amount expected during the earlier station peak, the proposed parking supply may still accommodate that demand, even though there is potential to increase the parking provisions.

20 Provision for Service Vehicles

On site loading, emergency access and rubbish collection will be provided for within the site in varying locations as described below and shown in Figure 49:

- 1 x loading bay has been provided at the southern end of the short term/KnR area. This allows loading and unloading to/from in more open areas that will not impact pedestrians through the area. Loading/unloading can also occur without obstruction to the KnR operations.
- 2 x emergency bays have been provided, one within the angled bay area in the short term/KnR area, and the other at the southern end of that same facility.
- 1x rubbish collection bay has been provided within the bus interchange area. This will operate in a simple one way environment in which refuse collection vehicles will enter the bay front in and exit front out.

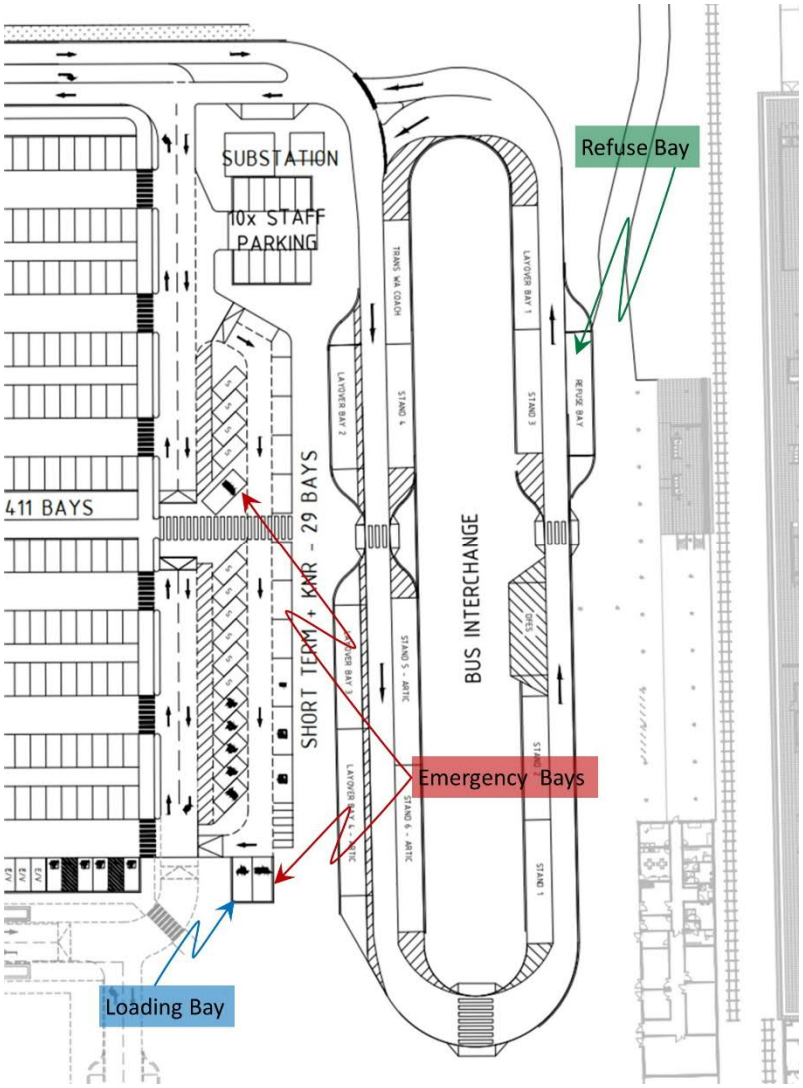


Figure 49 Provisions for service vehicles

Urbsol

21 Traffic Management Plan

A management plan is usually required at school sites, and other developments that generate significant activity on the frontage roads. In this instance, most of the activity is planned and facilitated for on site. This includes parking, KnR activity, taxi activity, bus activity, etc. As a result, any assessment of on-street activity of frontage roads is not considered necessary.

Pedestrian and cyclist activity networks including on new and surrounding roads has already been discussed in detail in previous sections.

22 Conclusions

Urbsol was commissioned by MetCONNX on behalf of the Public Transport Authority (PTA) to prepare a TIA in support of the Development Application (DA) for the redevelopment of the Armadale Station, as part of the Byford Rail Extension (BRE) Design and Construction Project. This report was prepared in accordance with the *Transport Impact Assessment Guidelines, Volume 4 – Individual Developments* (WAPC, August 2016) and builds upon previous planning phase investigations for the BRE project.

The development of Byford Station includes the provision of new Park N Ride, Kiss N Ride and bus interchange facilities, as well new road and cyclist/pedestrian network connections. In terms of station access, the proposed station will primarily be access by Access Road A, via Evans Way.

Traffic generated at Byford station was estimated by factoring up existing traffic at Armadale Station in accordance with relative private vehicle generated patronage numbers. Beyond 2026, changes in station traffic was estimated by factoring PnR and KnR traffic by the estimated change in patronage using these modes. In the context for this TIA, the operational assessment of the access point and key surrounding intersections was undertaken for the critical peaks, which included the network peak in the AM period, and the coinciding network and station peak in the PM period. The trips generated by the station during these periods was estimated to be:

- 2026 AM peak - **52 PnR trips**, and **90 inbound and 90 outbound KnR trips**
- 2026 PM peak - **88 PnR trips**, and **153 inbound and 153 outbound KnR trips**
- 2036 AM peak - **73 PnR trips**, and **60 inbound and 60 outbound KnR trips**
- 2036 PM peak - **124 PnR trips**, and **103 inbound and 103 outbound KnR trips**

The operational assessment undertaken indicated that all intersections assessed are expected operate well during the AM and PM peak traffic periods. There is a marginal difference in performance comparing the 2022 and 2026 base case scenarios. And the difference in operational performance between the 2026 base case and 2026 project case that includes the station traffic, appears to be insignificant and would barely be noticeable to drivers.

The assessment indicates that in 2036, the key intersections are generally expected to operate satisfactorily with acceptable degrees of saturation, minimal delays and minimal queueing. The only area where it appears there may be operational issues is for southbound traffic on Sansimeon Boulevard to turn onto Abernethy Road (PM peak). This is a result of high traffic demands on Abernethy Road, and not due to station generated traffic.

Because there is a level of uncertainty and conflicting information with respect to traffic growth on Abernethy Road, beyond this project, it is recommended that SSJ consider more focussed modelling of the wider area be undertaken, so that broader network and consolidated land use assumptions are considered. This will enable a better understanding of the future needs for Abernethy Road.

The extension of Evans Way north to the existing intersection at Evans Way/Padra Turn was seen to potentially create some undesirable safety implications if all movements were permitted at the closely spaced intersections at Access Road A, Padra Turn and Ninka Lane. A number of potential options were developed to improve safety and discussed with SSJ. However SSJ indicated a strong desire to maintain full movements at each location to minimise any negative impact upon the local community and maximise accessibility. As a result, the design progressed to maintain full connectivity and movements, but has raised pavement through the intersection of Evans Way/Padra Turn to achieve safe vehicular speeds through the area. It should be recognised that this was not the preferred outcome

for Urbsol or MetCONNX. However SSJ has indicated its acceptance of risk associated with this final design outcome.

With respect to pedestrian/cyclist amenity, there are some significant enhancements and opportunities created with the development, including the new PSP along the west side of the rail line linking Armadale in the north and Abernethy Road in the south. A second pedestrian link across the rail, connecting the east and west side of the Byford Town Centre will also be provided, as well as additional footpaths along Evans Way, Clara Street and Sansimeon Boulevard that will further improve the pedestrian permeability around the Town Centre and the connectivity to the colleges south of Abernethy Road. Consideration has been given to areas where potential difficulty in crossing roads or undesirable conflict has been identified, and appropriate treatments incorporated into the design.

The project includes the creation of a new at-grade level rail crossing. This is not ideal from a safety perspective, as the BRE project benefits from the removal of a number of at-grade crossings. However it is recognised that the crossing will close only sporadically for the Bunbury train line.

For bus traffic key road access routes to/from Armadale Station is similar to the private vehicle network. In the vicinity of the station, new road construction of Sansimeon Boulevard and Evans Way will provide access to the broader road network, to Larsen Road and Thomas Road to the north and Abernethy Road and Mead Street to the south. These linkages will provide access to the regional road network in SWH, and the additional majority of development expected to the west of the station precinct.

As a result of the assessment undertaken and with regard to the objectives of the TIA, it can be concluded that the proposed station redevelopment:

- and its associated proposals provides for safe and efficient access for all modes to the site
- is well-integrated with surrounding land uses
- does not adversely impact on the surrounding land uses
- does not adversely impact on the surrounding transport networks or its users

Appendix A

Byford Station Development Plans (Extract)

BYFORD RAIL EXTENSION

BYFORD STATION & PRECINCT ARCHITECTURE

NOT FOR CONSTRUCTION PRINT IN COLOUR

DETAILED DESIGN

REV	DATE	AMENDMENT	DSN	DRN	CHK	APP
B.02	07-07-23	ISSUED FOR DA	P.Q	K.L	D.B	A.E
B.01	07-07-23	ISSUED FOR IDD - IDC	P.Q	K.L	D.B	A.E
A	18-10-22	ISSUED FOR RD	P.Q	K.L	D.B	A.E

ORIG SIZE A1

0 10 20 30 40 50 100mm

AT ORIGINAL PLOT SIZE

MetCONNX

Contractor No: R30-WWH-DWG-AR-325-00001 | Rev: B.02

REFERENCES

SCALE

DATUM

HORIZONTAL: PCG2020

VERTICAL: AHD71

DESIGNED	P.Quang
DRAWN	K.Low
CHECKED	D.Bate
APPROVED	A.Eyres
DATE	07-07-23

Government of Western Australia Public Transport Authority

BYFORD RAIL EXTENSION

BYFORD STATION
ARCHITECTURAL
COVER SHEET

PTA Drawing No: 11-A-109-AR0001 | Rev: B.02

CAD DRAWING PATHNAME Autodesk Docs://BRE BYFORD RAIL EXTENSION/R30-WWH-MDL-AR-325-00001.rvt

BYFORD STATION - ARCHITECTURE DA DRAWING LIST		
PTA DRAWING NUMBER	**METCONNX DRAWING NUMBER**	**DRAWING NAME**
11-A-109-AR0001	R30-WWH-DWG-AR-325-00001	COVER SHEET
	R30-WWH-DWG-AR-325-00002	DRAWING LIST
	R30-WWH-DWG-AR-325-00003	EXPLODED AXONOMETRIC
11-A-109-AR0003	R30-WWH-DWG-AR-325-10001	OVERALL PRECINCT PLAN
11-A-109-AR0004	R30-WWH-DWG-AR-325-10002	SITE PLAN - STATION BUILDING
11-A-109-AR0005	R30-WWH-DWG-AR-325-10003	SITE PLAN - CARPARK AND OTHER SERVICES
11-A-109-AR0010	R30-WWH-DWG-AR-325-20003	1-250 GENERAL ARRANGEMENT PLAN - ZONE 03
11-A-109-AR0011	R30-WWH-DWG-AR-325-20004	1-250 GENERAL ARRANGEMENT PLAN - ZONE 04
11-A-109-AR0016	R30-WWH-DWG-AR-325-20009	1-250 GENERAL ARRANGEMENT PLAN - ZONE 09
11-A-109-AR0017	R30-WWH-DWG-AR-325-20010	1-250 GENERAL ARRANGEMENT PLAN - ZONE 10
11-A-109-AR0085	R30-WWH-DWG-AR-325-22000	1-250 ROOF PLAN ZONE 03
11-A-109-AR0086	R30-WWH-DWG-AR-325-22001	1-250 ROOF PLAN ZONE 04
11-A-109-AR0087	R30-WWH-DWG-AR-325-22002	1-250 ROOF PLAN ZONE 09
11-A-109-AR0088	R30-WWH-DWG-AR-325-22003	1-250 ROOF PLAN ZONE 10
11-A-109-AR0139	R30-WWH-DWG-AR-325-30003	1-250 CEILING PLAN ZONE 03
11-A-109-AR0140	R30-WWH-DWG-AR-325-30004	1-250 CEILING PLAN ZONE 04
11-A-109-AR0145	R30-WWH-DWG-AR-325-30009	1-250 CEILING PLAN ZONE 09
11-A-109-AR0146	R30-WWH-DWG-AR-325-30010	1-250 CEILING PLAN ZONE 10
11-A-109-AR0214	R30-WWH-DWG-AR-325-40001	BUILDING ELEVATIONS SHEET 01
11-A-109-AR0215	R30-WWH-DWG-AR-325-40002	BUILDING ELEVATIONS SHEET 02
11-A-109-AR0216	R30-WWH-DWG-AR-325-40003	BUILDING ELEVATIONS SHEET 03
11-A-109-AR0239	R30-WWH-DWG-AR-325-50001	BUILDING SECTIONS SHEET 01
11-A-109-AR0240	R30-WWH-DWG-AR-325-50002	BUILDING SECTIONS SHEET 02
	R30-WWH-DWG-AR-325-00004	PERSPECTIVE
	R30-WWH-DWG-AR-325-00005	PERSPECTIVE
	R30-WWH-DWG-AR-325-00006	PERSPECTIVE
	R30-WWH-DWG-AR-325-00007	PERSPECTIVE
	R30-WWH-DWG-AR-325-00008	PERSPECTIVE
	R30-WWH-DWG-AR-325-00009	PERSPECTIVE
	R30-WWH-DWG-AR-325-00010	PERSPECTIVE

NOT FOR CONSTRUCTION PRINT IN COLOUR

DETAILED DESIGN

REV	DATE	AMENDMENT	DSN	DRN	CHK	APP
A.01	07-07-23	ISSUED FOR DA	P.Q	D.C	D.B	A.E

ORIG SIZE A1

0 10 20 30 40 50 100mm

AT ORIGINAL PLOT SIZE

MetCONNX

Contractor No: R30-WWH-DWG-AR-325-00002 | Rev: A.01

REFERENCES

SCALE

DATUM

HORIZONTAL: PCG2020

VERTICAL: AHD71

DESIGNED P.Quang

DRAWN K.Low

CHECKED D.Bate

APPROVED A.Eyres

DATE 07-07-23

Government of Western Australia Public Transport Authority

BYFORD RAIL EXTENSION

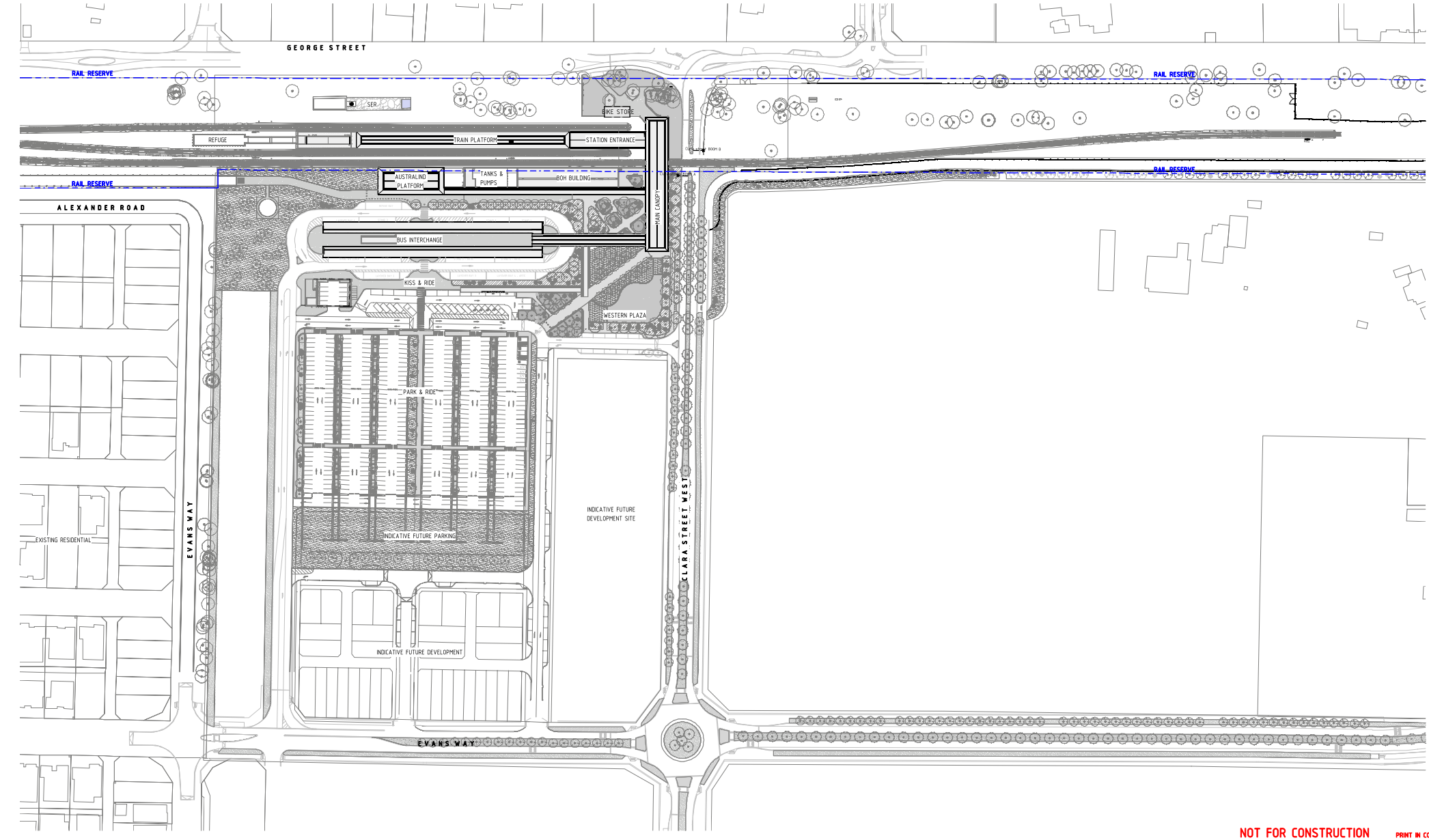
BYFORD STATION

ARCHITECTURAL

DRAWING LIST

PTA Drawing No: 00002 | Rev: A.01

CAD DRAWING PATHNAME Autodesk Docs://BRE BYFORD RAIL EXTENSION/R30-WWH-MDL-AR-325-00001.rvt



NOT FOR CONSTRUCTION PRINT IN COLOUR

DETAILED DESIGN

REV	DATE	AMENDMENT	DSN	DRN	CHK	APP
B.02	07-07-23	ISSUED FOR DA	P.Q	K.L	D.B	A.E
B.01	07-07-23	ISSUED FOR IDD - IDC	P.Q	A.C	D.B	A.E
A	18-10-22	ISSUED FOR RD	P.Q	A.C	D.B	A.E

ORIG SIZE A1 — 0 10 20 30 40 50 100mm AT ORIGINAL PLOT SIZE

MetCONNX

Contractor No: R30-WWH-DWG-AR-325-10001 | Rev: B.02

REFERENCES
XR11CI_Byf_Bus_20220601
XR11CI_Byf_Car_20220601
XR11CI_Byf_Ext_20220601
XR11CI_Byf_Cont_20220601

SCALE 1 : 1000

DATUM
HORIZONTAL: PCG2020
VERTICAL: AHD71

DESIGNED P.Quang
DRAWN A.Chapeikin
CHECKED D.Bate
APPROVED A.Eyres
DATE 07-07-23

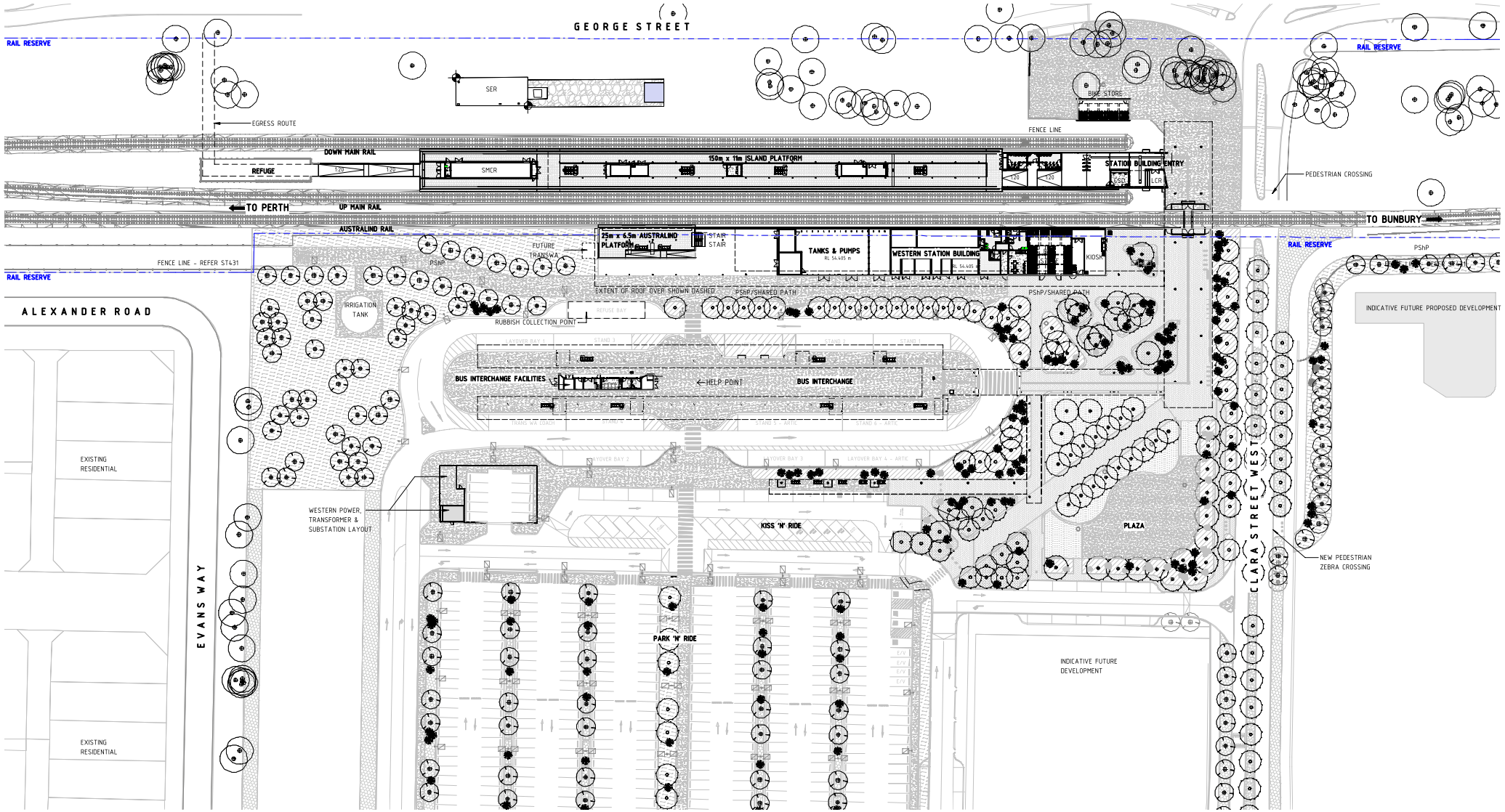
Government of Western Australia Public Transport Authority

BYFORD RAIL EXTENSION

BYFORD STATION
ARCHITECTURAL
OVERALL PRECINCT PLAN

PTA Drawing No: 11-A-109-AR0003 | Rev: B.02

CAD DRAWING PATHNAME Autodesk Docs://BRE BYFORD RAIL EXTENSION/R30-WWH-MDL-AR-325-00001.rvt



NOT FOR CONSTRUCTION PRINT IN COLOUR

DETAILED DESIGN

REV	DATE	AMENDMENT	DSN	DRN	CHK	APP
B.02	07-07-23	ISSUED FOR DA	P.Q	K.L	D.B	A.E
B.01	07-07-23	ISSUED FOR IDD - IDC	P.Q	A.C	D.B	A.E
A	18-10-22	ISSUED FOR RD	P.Q	A.C	D.B	A.E

ORIG SIZE A1 — 0 10 20 30 40 50 100mm AT ORIGINAL PLOT SIZE

MetCONNX

Contractor No: R30-WWH-DWG-AR-325-10002 | Rev: B.02

REFERENCES
XR11CI_Byf_Bus_20220601
XR11CI_Byf_Car_20220601
XR11CI_Byf_Ext_20220601
XR11CI_Byf_Cont_20220601

SCALE 1 : 500

DATUM
HORIZONTAL: PCG2020
VERTICAL: AHD71

DESIGNED	P.Quang
DRAWN	A.Chapeikin
CHECKED	D.Bate
APPROVED	A.Eyres
DATE	07-07-23

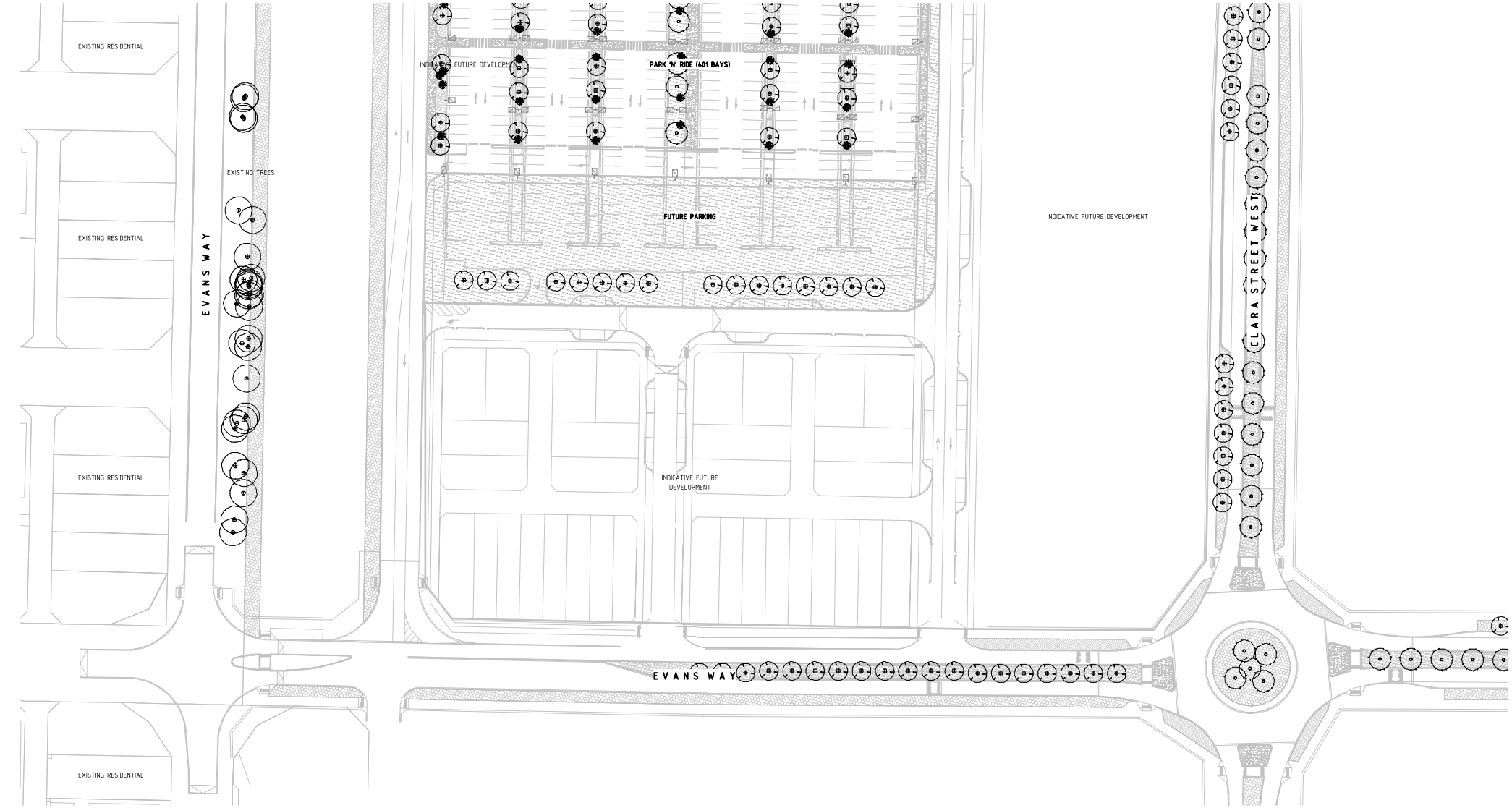
Government of Western Australia Public Transport Authority

BYFORD RAIL EXTENSION

BYFORD STATION
ARCHITECTURAL
SITE PLAN - STATION BUILDING

PTA Drawing No: 11-A-109-AR0004 | Rev: B.02

CAD DRAWING PATHNAME Autodesk Docs://BRE BYFORD RAIL EXTENSION/R30-WWH-MDL-AR-325-00001.rvt



NOT FOR CONSTRUCTION

PRINT IN COLOUR

DETAILED DESIGN

REV	DATE	AMENDMENT	DSN	DRN	CHK	APP
B.02	07-07-23	ISSUED FOR DA	P.Q	K.L	D.B	A.E
B.01	07-07-23	ISSUED FOR IDD - IDC	P.Q	A.C	D.B	A.E
A	18-10-22	ISSUED FOR RD	P.Q	A.C	D.B	A.E

ORIG SIZE A1

0 10 20 30 40 50 100mm

AT ORIGINAL PLOT SIZE

MetCONNX

Contractor No: R30-WWH-DWG-AR-325-10003 | Rev: B.02

REFERENCES

XR11CI_Byf_Bus_20220601
XR11CI_Byf_Car_20220601
XR11CI_Byf_Ext_20220601
XR11CI_Byf_Cont_20220601

SCALE 1 : 500

DATUM
HORIZONTAL: PCG2020
VERTICAL: AHD71

DESIGNED P.Quang
DRAWN A.Chapeikin
CHECKED D.Bate
APPROVED A.Eyres
DATE 07-07-23

Government of Western Australia Public Transport Authority

BYFORD RAIL EXTENSION

BYFORD STATION
ARCHITECTURAL
SITE PLAN - CARPARK AND OTHER SERVICES

PTA Drawing No: 11-A-109-AR0005 | Rev: B.02

CAD DRAWING PATHNAME Autodesk Docs://BRE BYFORD RAIL EXTENSION/R30-WWH-MDL-AR-325-00001.rvt

Appendix B

Transport Impact Assessment Checklist

Checklist for a transport impact assessment for individual development

- Tick the provided column for items for which information is provided.
- Enter N/A in the provided column if the item is not appropriate and enter reason in comment column.
- Provide brief comments on any relevant issues.
- Provide brief description of any proposed transport improvements, for example, new bus routes or signalisation of an existing intersection.

ITEM	PROVIDED	COMMENTS/PROPOSALS
Summary		
Introduction/Background		
name of applicant and consultant	Yes	Section 1
development location and context	Yes	Section 1, also Section 2
brief description of development proposal	Yes	Section 1, also Section 3, 4
key issues	Yes	Section 1
background information	Yes	Section 1
Existing situation		
existing site uses (if any)	Yes	Section 2.2
existing parking and demand (if appropriate)	Yes	Section 2.4. Also refer to Section 19.
existing access arrangements	Yes	Section 2.4
existing site traffic	Yes	Section 2.5
surrounding land uses	Yes	Section 2.1 and 2.2
surrounding road network	Yes	Section 2.3
traffic management on frontage roads	Yes	Section 2.3
traffic flows on surrounding roads (usually AM and PM peak hours)	Yes	Section 2.5
traffic flows at major intersections (usually AM and PM peak hours)	Yes	Section 2.5
operation of surrounding intersections	Yes	Section 2.5, Section 12 for detailed operations
existing pedestrian/cycle networks	Yes	Section 2.6
existing public transport services surrounding the development	Yes	Section 2.7
crash data	Yes	Section 2.8

ITEM	PROVIDED	COMMENTS/PROPOSALS
Development proposal		
regional context	Yes	Refer Section 2.1, 2.2, 5 and 6
proposed land uses	Yes	N/A
table of land uses and quantities	No	N/A
access arrangements	Yes	Section 5, also Section 4.2
parking provision	Yes	Section 2.4, 19
end of trip facilities	No	N/A
any specific issues	No	N/A
road network	Yes	Section 4.1
intersection layouts and controls	Yes	Section 4.2
pedestrian/cycle networks and crossing facilities	Yes	Section 4.3
public transport services	Yes	Section 4.4
Integration with surrounding area		
surrounding major attractors/ generators	Yes	Section 5.1
committed developments and transport proposals	Yes	Section 5.2, also Section 6
proposed changes to land uses within 1200 metres	Yes	Section 5.2
travel desire lines from development to these attractors/generators	Yes	Section 5.3
adequacy of existing transport networks	Yes	Section 5.3
deficiencies in existing transport networks	No	N/A
remedial measures to address deficiencies	No	N/A
Analysis of transport networks		
assessment years	Yes	Section 7.1
time periods	Yes	Section 7.2
development generated traffic	Yes	Section 8.1
distribution of generated traffic	Yes	Section 8.2
parking supply and demand	Yes	Section 19
base and 'with development' traffic flows	Yes	Section 2.5.2, 9.1, 9.2
analysis of development accesses	Yes	Section 10
impact on surrounding roads	Yes	Section 11
impact on intersections	Yes	Section 12

ITEM	PROVIDED	COMMENTS/PROPOSALS
Analysis of transport networks		
impact on neighbouring areas	Yes	Section 13
road safety	Yes	Section 14
public transport access	Yes	Section 15
pedestrian access/amenity	Yes	Section 16
cycle access/amenity	Yes	Section 16
analysis of pedestrian/cycle networks	Yes	Section 17
safe walk/cycle to school (for residential and school site developments only)	Yes	Section 18
traffic management plan (where appropriate)	Yes	Section 21
Conclusions	Yes	Section 22

Disclaimer and Copyright

This document and any attached files ("material") are the property of Urban Modelling Solutions (Urbsol). Any reproduction of the concepts, ideas, or content of the material is strictly prohibited without the prior consent of the owner/author.

Urbsol accepts no liability and implies no warranty or other assurance for reliance on the content of the material. Although all best efforts have been made Urbsol in no way guarantees the accuracy, completeness, timelessness or fitness for any particular purpose of the material. Any parties relying on this material do so at their own risk.

Data used in this work is largely provided by third parties and Urbsol can in no way attest for the accuracy or otherwise of this.

To the full extent permissible by law, Urbsol disclaims all responsibility and liability (including for negligence) for any damages or losses (including, without limitation, financial loss, damages for loss in business projects, loss of profits or savings or other consequential losses) arising in contract, tort or otherwise from any action or decision taken as a result of the use or inability to use the material. Information in the material is made available without warranty or responsibility on the part of Urbsol.

This material is not designed as providing a detailed action plan nor is it to be interpreted as proposing absolute solutions to likely traffic issues. Traffic analysis and modelling can provide an indication of likely outcomes but is not designed to replace professional judgment. This material is designed to aid and complement decision making.