Movement & Place Consulting

Croskell (Employment) PSP – Integrated Transport Assessment

Final Report

31 January 2025

Document Revision History

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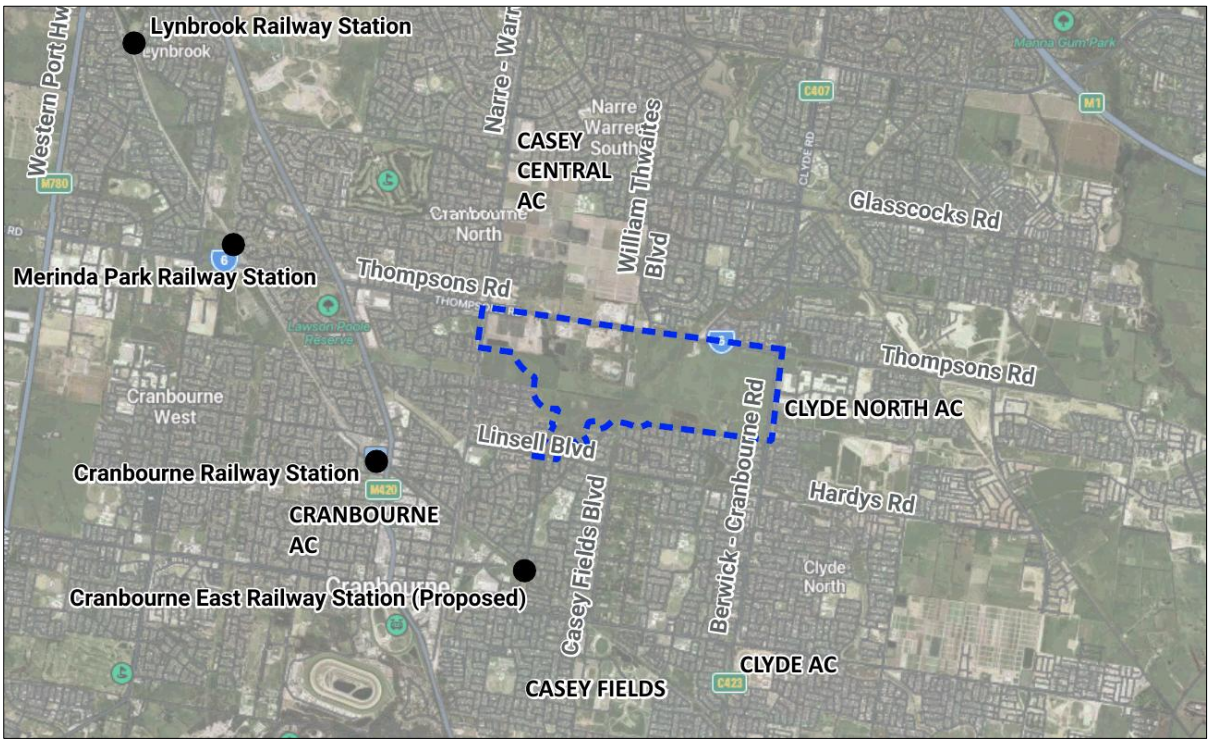
Executive summary

This report, prepared for the Victorian Planning Authority, provides an integrated transport assessment for the proposed development of the Croskell (Employment) precinct in the City of Casey.

As well as assessing current transport conditions and quantifying the traffic demands associated with the envisaged land uses, this report considers various measures that, if incorporated, would reduce the reliance on private vehicles and reduce traffic congestion. The suggestions cover actions to encourage much greater use of walking, bicycles, micro-mobility and public transport while managing traffic capacity and parking provision.

Site Context

The Croskell (Employment) precinct is in the City of Casey. It sits immediately south of Thompsons Road between Narre Warren-Cranbourne Road and Berwick-Cranbourne Road and is approximately 3.3km by 0.9km in size.



The precinct is designated for a mix of primarily business, industrial and commercial activity in the northern two-thirds of the site, with some residential development (mainly adjacent to recently completed residential areas to the south). There is a significant east-west utilities easement that will provide a buffer between the industrial and commercial activities and residential uses.

When fully developed, the precinct will contain a mix of employment and residential land. There will be 937 dwellings with an estimated population of 2,905, mostly south of the utility easement.

Existing Conditions

The precinct presently contains remnant, largely unused former farmland, an intensive smallholding, concrete plant and a few other land uses fronting Thompsons Road. There is little, if any, significant traffic generated by the land uses, and there are no public road accesses into the precinct.

The precinct is mostly surrounded by residential neighbourhoods along the southern, western, and northern precinct boundaries. Employment land will be provided along the eastern boundary, as well as a yet to be constructed service business precinct located along Thompsons Road (west of William Thwaites Boulevard).

The surrounding primary State arterial road network carries significant and growing traffic volumes, with greater traffic intensity to the north and north-west. Thompsons Road is an important freight route and forms part of the Principal Freight Network (PFN). Recent and planned road improvements continue in tandem with growth. Road crashes are quite frequent, with particular concentrations on Thompsons Road and Narre Warren–Cranbourne Road.

Public transport in the area is limited to bus services, mostly quite low frequency. There are no railway stations within walking distance; Cranbourne, Merinda Park and the future Cranbourne East stations are 2-3km away, while Narre Warren and Berwick stations are about 6km away to the north.

Several Principal Bicycle Network (PBN) links are planned nearby, typically along public infrastructure easements such as the Melbourne Water pipe track and electricity Transmission Line easement. There are several Strategic Cycling Corridor (SCC) links that are provided along Narre Warren – Cranbourne Road, Berwick – Cranbourne Road, and Linsell Boulevard.

Issues, constraints and opportunities

Transport issues and constraints on the development and future function of the Croskell (Employment) precinct include:

- the busy high-speed primary State arterial roads adjacent to the precinct,
- limited bus services, and
- the generally low density of surrounding development that engenders high car dependency.

These factors reduce access opportunities for people who are less likely to drive or own a car. These people are overrepresented amongst the following vulnerable demographic groups:

- youths under 18-years old
- elderly aged adults
- people with a disability
- lower socio-economic individuals or families, and
- newly arrived migrants.

There are opportunities to integrate active transport links within site with those in surrounding areas, and to extend and improve the bus services through Croskell and onwards. The redevelopment of the precinct will open-up opportunities to provide new north-south and east-west connection across multiple modes.

The commercial, business and industrial activities in Croskell will increase local jobs, thus reducing the need for locals to travel to more distant workplaces. However, supporting auxiliary land uses will need to be established to make Croskell a more complete 'place' for workers and residents alike.

Traffic demand and implications

Using traffic generation assumptions typical of comparable areas in Melbourne, the precinct could generate about 58,400 vehicles per average weekday once fully developed. Most travel demand will be generated to and from places north and north-west of the precinct, adding significantly to the already high and fast-growing traffic volumes on these roads.

Strong measures will be needed to reduce the need for car use, by ensuring there are a wide range of high-quality alternative transport options for people to choose from. A range of interventions that can improve public and active transport options have been identified. Some land use interventions have also been identified for future consideration in subsequent planning works to create places that are more attractive and accessible for visitors.

Integrated Transport Assessment insights

This report considers the degree to which VPA's draft PSP benefits/encourages travelling by each transport mode. Key transport insights related to the proposed VPA plans include:

- Footpaths and bicycle riding infrastructure are generally well provided
- Canopy tree planting will beautify the public realm and mitigate urban heat island effects, making environments more pleasant for pedestrians
- Footpaths and connector streets meet directly with safe signalised crossing points. Bus stops have also been co-located with safe pedestrian crossing, reducing walking distances
- Local road network permeability is improved by direct north-south and east-west connector streets through Croskell. Streetscape treatments reduce unnecessary through-traffic.

Future areas of consideration to improve transport options include:

- Reducing traffic congestion by encouraging active and public transport uptake
- Providing wider footpaths and regular safe crossing opportunities in commercial, retail and mixed-use areas (where higher pedestrian volumes are anticipated)
- Providing raised threshold treatments at all intersections will improve pedestrian priority and safety for all road users by slightly slowing vehicle movements
- Providing safe bicycle riding paths (dedicated and SUP) that connect the SCC with key destinations within the precinct
- Providing bus priority infrastructure along congested segments of the road network (particularly along PPTN indicated segments)
- Facilitating future bus network reforms routing services through the Croskell (Employment) precinct, by configuring internal streets and intersections for reliable and safe bus operations, thus enabling services to drop travellers close to dense land uses and providing efficient access to both local and regional (surrounding activity centres and train stations) destinations.

Alignment with PSP 2.0 Guidelines

The extent to which the PSP aligns with VPAs PSP 2.0 Guidelines, and the transport-relevant **Features** and **Targets** it sets out has been considered. Key areas of alignment between the draft Croskell (Employment) PSP plans and the PSP 2.0 Guidelines are outlined below:

- Safe streets and public spaces are being supported by pedestrian and bicycle riding infrastructure, in alignment with Feature 4. Footpaths and bicycle lanes are buffered from roadways, more safe road crossing opportunities are being provided, and canopy coverage seeks to beautify public spaces
- Priority pathways for each transport mode (to create balanced movement and place networks) have been identified on precinct plans. This includes dedicated bicycle lanes on all arterial and connector streets and the identification of bus capable roads
- Improved walkability and safe bicycle riding pathways have been implemented, in accordance with Feature 6. This includes the provision of footpaths on all streets, direct and continuous bicycle riding lanes, and roadway designs to improve safety on all connector streets and arterial roads
- Intensity of land use development along corridors will encourage public transport use, in alignment with Feature 7. This was achieved through the clustering of higher-order land uses along proposed bus capable PPTN corridors, and the decision to make all precinct connector streets bus capable
- There was a specific need to protect sensitive land uses against freight traffic, as indicated within a sub-feature under Feature 8. This has been achieved by ensuring that residential developments are buffered away from major freight corridors and PFN routes (such as Thompsons Road)
- All residential and employment areas have access to active and public transport options, and local community services and goods, in alignment with Feature 9. This was achieved through the clustering of higher-order land uses along arterial and connector streets, that will serve as bus capable roads (some highlighted as PPTN corridors)
- The design of the public realm mitigates climate change impacts, in alignment with Feature 11. This will be achieved through canopy trees along all local and connector streets.

There were areas of further consideration which may be required in future to ensure alignment with some **Features** of the VPA PSP 2.0 Guidelines. These include:

- Increase the provision of safe road crossing opportunities along arterial roads and connector streets, and consider implementing raised crossings at unsignalised crossing points. This should enhance walkability and safe bicycle riding in line with Feature 6
- Consider bus service frequency increases particularly along the PPTN corridors. This should encourage more people to consider public transport as a viable option when traveling to and from the precinct in line with Feature 7
- Review the location and carefully plan out the development of commercial and retail zones located next to primary State arterial roads, given the need to buffer sensitive land uses away

from Principal Freight Network corridors. Improving this outcome will ensure alignment with Feature 8

- Consider how future built form engage with the public realm and provide passive surveillance along streets. This should enable support safe public spaces in line with Feature 11.

There were mixed outcomes in terms of alignment with transport relevant **Targets** set within the VPA PSP 2.0 Guidelines too. Alignment outcomes are summarised below:

- *The arterial road should provide a 1.6km road grid with safe and efficient connections (Target 5)*

  The mid-precinct N-S road (aligned with Casey Fields Boulevard) is identified as a connector street within the Croskell (Employment) PSP – a departure from the desired regular 1.6km arterial road spacing.

  However, this is consistent with the existing boulevard cross sections of William Thwaites Boulevard (north) and Casey Fields Boulevard (south) to which it will connect. The PSP supports this corridor as a vital local connection between Casey Fields precinct and the business, commercial and residential land uses within Croskell and north of Thompsons Road.

- *Off-road bicycle paths should be provided on all connector streets and arterial roads (Target 6)*

  The proposed are in alignment as off-road road-adjacent links have been provided along all required roads, and off-road pathways seeks to connect SCCs

- *Footpaths are to be provided on both side of all road reservations (Target 7)*

  The proposed plans align with this target

- *Pedestrian and cyclist crossing are to be provided every 400m-800m where appropriate along arterial roads and other accessibility barriers (Target 8)*

  The proposed plans generally align with this target, acknowledging opportunities to increase the frequency of crossing opportunities along Thompsons Road and along connector streets

- *95% of dwellings should be located within 400m walking distance to a future bus route or bus capable road (Target 9)*

  The proposed plans are generally in alignment, except small pockets of low density residential along the precinct's southern boundary. There are opportunities to increase service frequencies on surrounding bus capable roads, as many bus users are willing to walk greater distance if services are highly frequent.

Concluding remarks

Overall, the proposed plans meet the majority of requirements found within the VPA guiding documents, and address transport infrastructure needs across all transport modes.

A range of additional actions have been identified to meet the vision for Croskell's development and growth. These include improvements to active and public transport networks, and detailed consideration of how land use intensity and built form can be better integrated to increase the number of people with genuine transport choices, ensure access for all and reduce traffic congestion on the surrounding road network.

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1 Introduction

1.1 Scope

Movement & Place Consulting was engaged by the Victorian Planning Authority (VPA) to undertake a traffic and transport review to confirm the transport networks required to support the Croskell (Employment) precinct Structure Plan (PSP). This report is the Integrated Transport Assessment which outlines the following insights with regards to the precinct plans provided by the VPA on 21 June 2023 and a revised set on 26 June 2024:

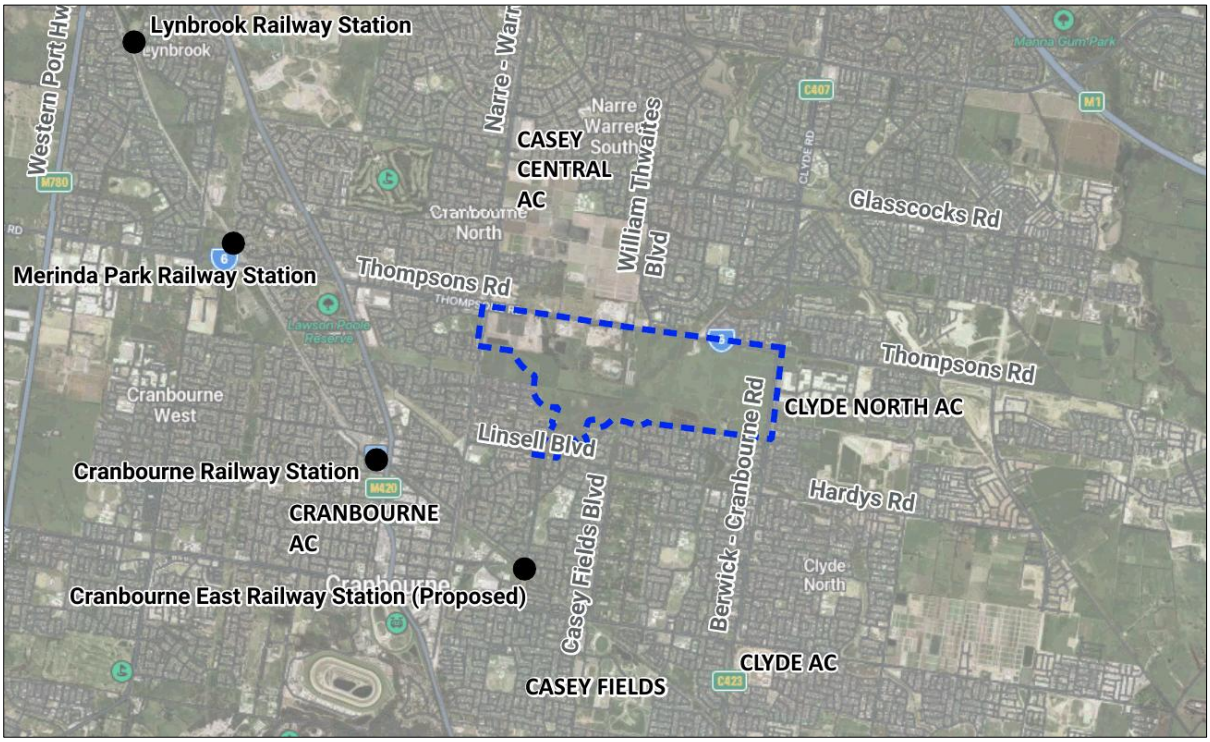
- Active and public transport network requirements
- Road typology and cross section recommendations suitable for the forecast daily traffic volumes
- Integration and prioritisation of mode-specific transport infrastructure.

1.2 Site context

The Croskell (Employment) precinct (Croskell) is located in the centre of the City of Casey. It is mostly surrounded by established low-density residential neighbourhoods, with proposed industrial and business precincts located to the precinct's east and north (along Thompsons Road west of William Thwaites Boulevard). It is located around seven kilometres south-west of the Dandenong National Employment and Innovation Cluster.

Croskell will be a regionally significant commercial precinct for the south-eastern outer suburban region, that could provide more than 6,600 jobs. It located within 1.5km of the Cranbourne railway line and 5km of the Monash Freeway as illustrated in Figure 1 below.

Figure 1: Regional Context

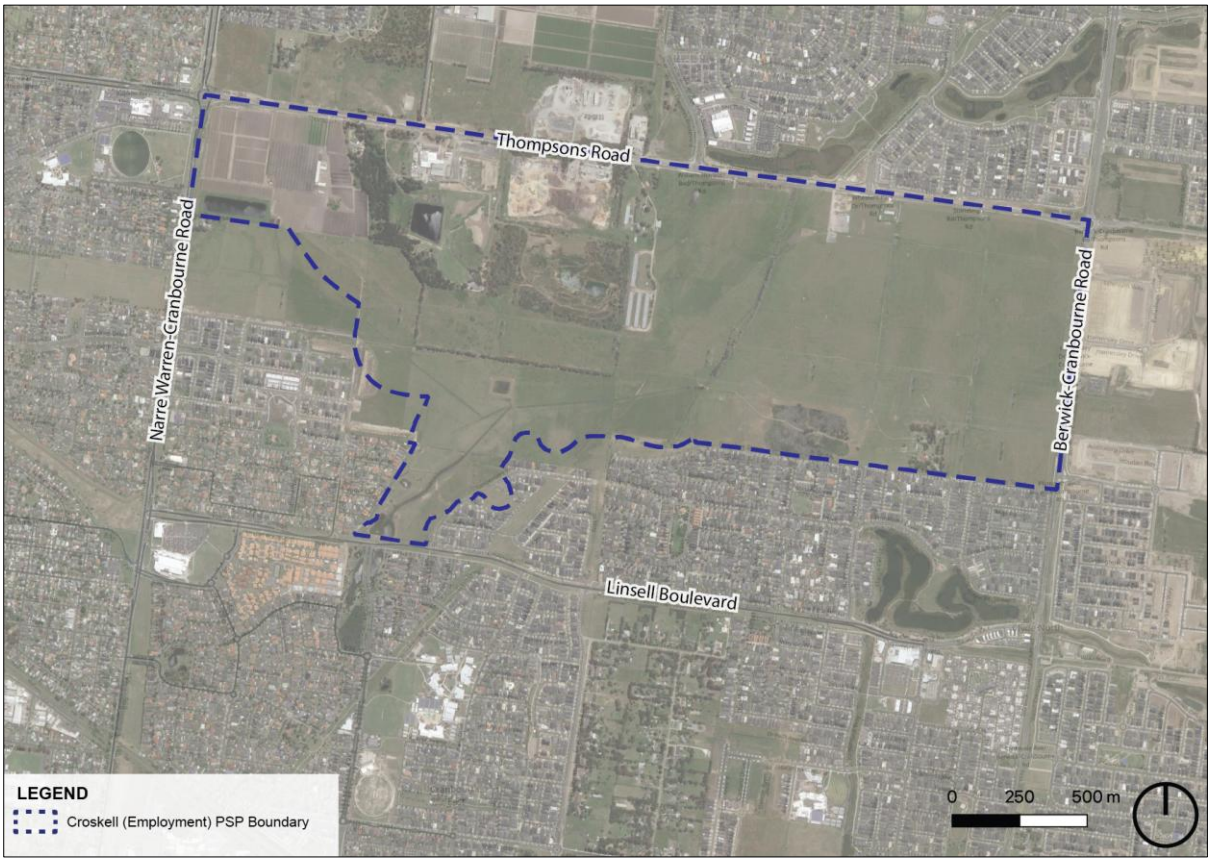


Source: Vicmaps aerial imagery, VPA with M&PC analysis

The Croskell (Employment) precinct Structure Plan (PSP) envisages a mix of housing types, community facilities, drainage infrastructure, roads, shared pedestrian and bike paths, and open space that builds on the character of the surrounding area.

The precinct is surrounded by established schools and shopping centres, a hospital, and a police station. In a greenfield context, Croskell represents a relatively small infill precinct, of which includes a significant utility easement that could inhibit north-south movements as shown in Figure 2 below.

Figure 2: Study Area



Source: Vicmaps aerial imagery, VPA with M&PC analysis

1.3 Ultimate design year – Land use scenario

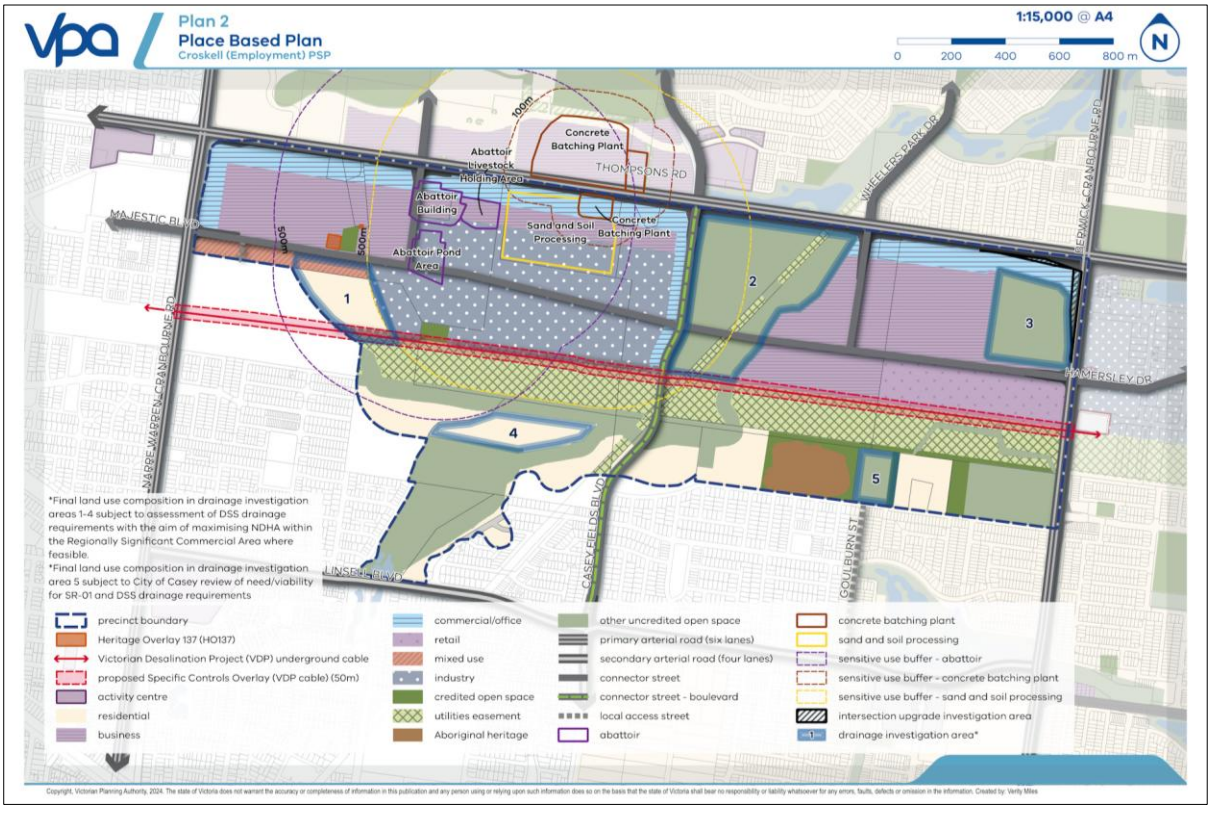
By 2051, Croskell is expected to support 6,651 jobs. There are six land use types that are envisioned for the site. Table 1 shows these land use types as well as the potential Net Developable Area (NDA) for each land use.

Table 1: Proposed land use composition in Croskell

Land Use	Net Developable Area
Business	59.21 ha
Office	24.86 ha
Industrial	45.67 ha
Mixed Use	4.74 ha
Retail	11.92 ha
Residential	30.39 ha (937 dwellings)

The spatial distribution of land use scenario is illustrated in Figure 3 below.

Figure 3: Proposed Land Uses – Place Based Plan (Croskell (Employment) PSP Plan 2)



Source: VPA

1.4 Report structure

This report has been prepared to showcase the insights of our transport assessment and suggests future infrastructure requirements to facilitate the development of Croskell. The report is structured as follows:

- Chapter 1 – Introduction
- Chapter 2 – Background
- Chapter 3 – Issues, Constraints and Opportunities
- Chapter 4 – Proposed Infrastructure Plans
- Chapter 5 – Traffic Demand Forecasting
- Chapter 6 – Transport modal assessment
- Chapter 7 – PSP Guidelines alignment assessment
- Chapter 8 – Summary Conclusions

2 Background

2.1 Policy document insights

The Integrated Transport Assessment is guided by the principles and requirements of local and state policies. Insights from a review of policy and other relevant documents are outlined in Table 2 below.

Table 2: Document review insights

Document	Key considerations
StreetsAhead – Integrated Transport Strategy (City of Casey)	• Proactively manage transport network planning in response to growth • Concentrate jobs, high density residential and mixed-use development in key activity centres with good accessibility by all transport modes • Utilise existing transport infrastructure and resources • Improve public transport access to reduce congestion and provide travel reliability for all • Create a continuous walking and cycling network that connects residential areas to shops and services. Ensure path design maximises safety and comfort • Provide reliable travel times for freight • Establish priority for different modes (bus lanes and bicycle lanes) to utilise roadways most efficiently
Industrial Development Policy (City of Casey)	• Encourage the orderly development of industry zones with consideration of the objectives of the precinct and nearby neighbourhoods • Ensure new industrial buildings make a positive contribution to the streetscape, particularly where visible along primary state and secondary arterial roads • Ensure road layout maintains satisfactory and safe traffic movements, and is properly integrated with surrounding roadways and land uses
Activity Centres Strategy (City of Casey)	• Locate higher density housing in activity centres, with high access to both public transport and open space • Design transport infrastructure to promote and prioritise active transport trips in activity centres • Provide car parking to satisfy user needs, without detriment to local amenity
Housing Strategy (City of Casey)	• Increase housing diversity and density close to public transport, shops and other services. Narre-Warren-Cranbourne Road (north of Thompsons Road) was highlighted for substantial growth • Encourage mixed land uses in key activity centres • Discourage intensive housing in areas remote from public transport • Strategically locate housing growth to ensure cost-effective infrastructure delivery
Precinct Structure Planning Guidelines: New Communities in Victoria (VPA)	• Enable access to employment and services via a short walk to reduce greenhouse gas emissions, social isolation, and household affordability costs • Precincts that are set to support economic development opportunities should be located in areas adjacent to, or in close proximity to arterial roads, public transport and freight networks • Protect existing and future priority freight routes (Thompsons Road) from conflication land uses

Document	Key considerations
	• Locate and design mixed-use residential and employment areas to ensure residents and employees have access to public and active transport, local community and retail services, and open space • Ensure safe, direct and pleasant use of pedestrian and cycle routes and public transport connections • Off-road bicycle paths should be provided on all connector streets and arterial roads, connecting with the Principal Bicycle Network and Strategic Cycling Corridors where possible • Pedestrian and cyclist crossings provided every 400-800m
Growth Corridor Plans – Managing Melbourne's Growth (VPA)	• Locate business/commercial precincts and high-density residential housing, adjacent to town centres and along PPTN routes. Consider placing activity centres at the intersection of a PPTN corridor and local bus routes. However, avoid placing activity centres along primary State arterial roads • The PPTN network should run between major town centres, major employment areas and train stations (between Cranbourne to Pakenham line stations). PPTN transport operations should be supported by land uses that can generate demand for public transport trips • Assign preferred routes for each transport mode to ensure future operations and management can be undertaken most efficiently • Strategically locate industrial land, as it is impossible to retro-fit land if constrained by sensitive land uses (residential) • As a significant freight corridor, Thompsons Road will need to be buffered by non-residential land uses. Carefully consider the appropriateness of employment land types (heavy industry, light industry, commercial) within proximity to physical constraints (such as primary State arterial roads and transmission easements)
Plan Melbourne 2017-2050 (State Government)	• Provide high-quality public transport access to job-rich areas. An efficient and simplified network can increase the willingness for people to use public transport • The PPTN outlines the routes where high-quality public transport services are or will be provided. Increased diversity and density of developments is encouraged on the PPTN, particularly at interchanges, activity centres and where principal public transport routes intersect • Roads that service more intense land use will prioritise walking, cycling and public transport • Priority should be given to pedestrian movements in neighbourhood centres. Continuous, high-quality walking routes need to be developed and streets need safe, pleasant and attractive walking routes. This approach will be particularly important in neighbourhood centres • Create safer, bicycle-friendly environments will encourage groups currently under-represented— including women, families and school-age children— to consider cycling • Ensure a more consistent and informed approach to land- use planning in freight precincts and corridors to protect residents from unacceptable amenity impacts
Housing Strategy (State Government)	• New homes should be built in areas close to jobs, transport and community services • Delivery of jobs, schools, hospitals, public transport, roads and social housing must be closely linked to the release of lots and the construction of homes

Document	Key considerations
Transport Integration ACT (2010) (State Government)	• Use an integrated approach to address land use and transport issues. An integrated approach shifts from a single mode focus to consider a unified transport and land use system • Consider broader social, economic and environmental implications in their decision-making processes
20-minute neighbourhood (State Government)	• Provide safe, accessible and well connected infrastructure for pedestrians and bicycle riders to encourage active transport uptake • Offer high-quality public realms and open spaces • Facilitate access to high-quality public transport srvices, that supports access for people to jobs and higher-order services • Deliver housing/population at densities that make local services and transport viable

Several consistent themes are generally observed across all documents. The main theme is the need to enhance active and public transport choices. Each document provides a variety of land use and transport initiatives to improve and diversify transport options and access to services. One of which includes higher amenity and safer active transport links that are well connected to key destinations. The public transport network should be highly accessible, efficient, and reliable. These transport initiatives should be tied in with strategically planned land use development, to ensure that transport infrastructure can effectively connect people to the places they need to go.

2.2 Existing conditions

The investigation of existing conditions provided a basis to develop network improvements for Croskell. The key insights of our desktop review are provided in the following sections.

2.2.1 Pedestrian network

The precinct is still in the early stages of development, so urban form is sparse and pedestrian facilities still developing. At present, the only footpaths in the precinct's vicinity are along the surrounding primary State arterial roads. They are appropriately buffered from traffic lanes in parts but are generally low in amenity. There is a general lack of safe crossing facilities across the roads surrounding the precinct, and limited canopy cover.

There are a few shared-user paths (SUP) that are provided along the precinct boundary. These are located along the east side Narre Warren - Cranbourne Road, east side of Berwick – Cranbourne Road, and south side of Linsell Boulevard. Footpaths are also provided on the north side of Linsell Boulevard, and along Thompsons Road in line with development to the north and to bus stops on both sides of the roadway.

2.2.2 Bicycle network

Several proposed Principal Bicycle Network (PBN) corridors intersect directly through the Croskell (Employment) precinct, including:

- Thompsons Road
- Narre-Warren Cranbourne Road
- Berwick-Cranbourne Road
- Diagonal Melbourne Water pipe track (between Berwick and Cranbourne).

The Strategic Cycling Corridor (SCC) is present along Narre Warren – Cranbourne Road, Berwick - Cranbourne Road, and Linsell Boulevard. These corridors will be important linkage to support bicycle riding access to and from the PSP.

There are existing SUPs on the east side Narre Warren - Cranbourne Road, the east side of Berwick – Cranbourne Road, and the south of Linsell Boulevard.

2.2.3 Public transport network

There are seven bus routes that operate on the periphery of the precinct (plus a night bus service on weekend evenings). Bus Routes 799 & 881 operate along the precinct's northern boundary, formed by Thompsons Road, and provide access to Merinda Park Station. Route 888 runs along Berwick-Cranbourne Road, providing access to Berwick Station.

Bus Routes 798, 841, 847 & 899 operate close to the precinct edge. Most routes are reasonably direct between nearby major activity centres, schools and train stations (Cranbourne, Fountain Gate-Narre Warren, and Berwick), and provide early morning and late evening services. Night-bus Route 981 uses Narre Warre-Cranbourne Road, but no stops are currently provided next to the Croskell (Employment) precinct. The existing public transport network is illustrated in Figure 4 and Figure 5 overleaf.

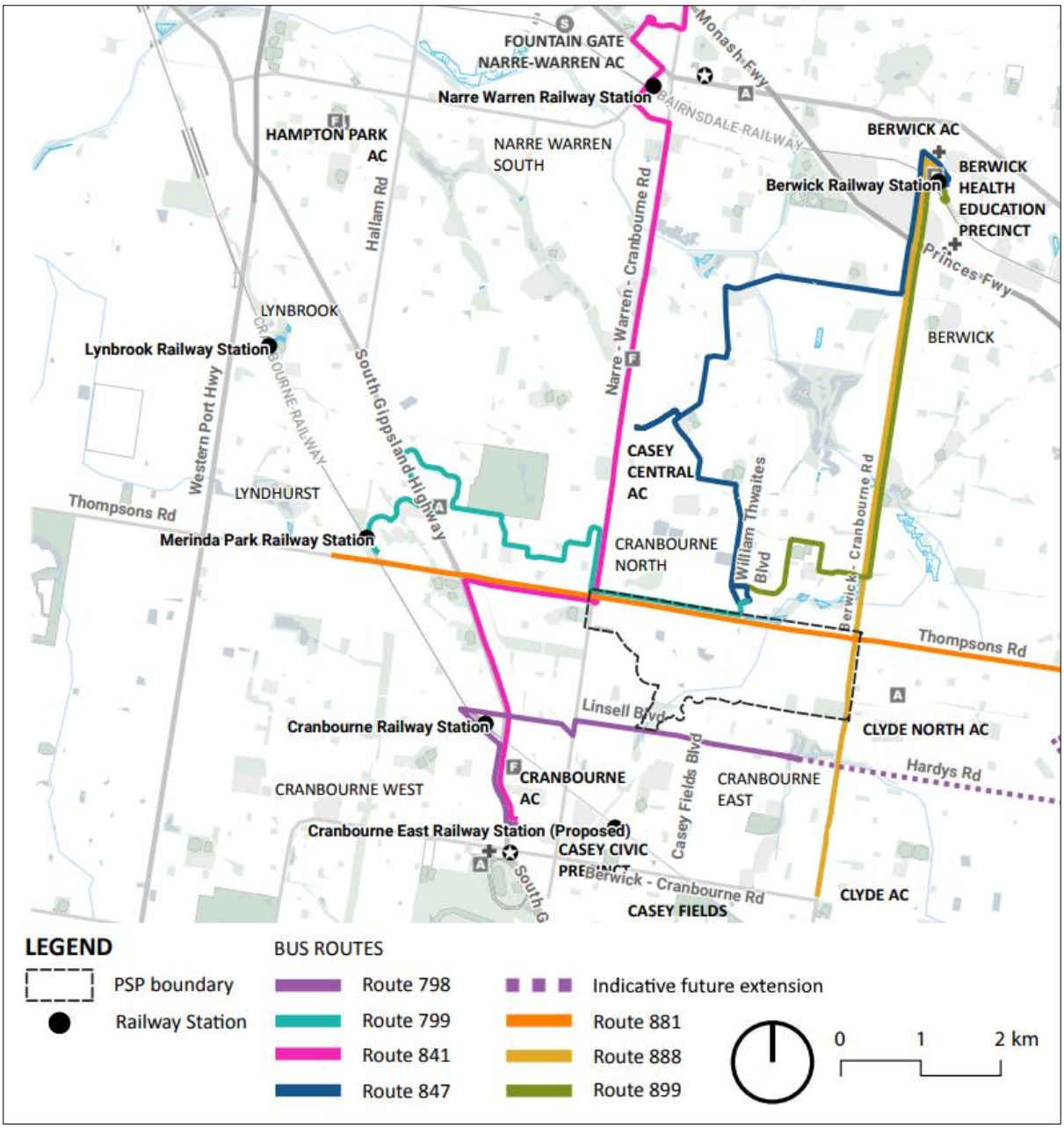
Bus service headways are typically consistent between days on each route. Typical daytime headways are outlined in Table 3 below.

Table 3: Typical day-time bus route headways (minutes) in each direction

Bus Route	Weekday	Saturday	Sunday
798	~ 20	~ 20	~ 20
799	~ 40	~ 40	~ 40
841	~ 40	~ 40	~ 60
847	~ 40	~ 60	~ 60
881	~ 40	~ 40	~ 40
888	~ 60	~ 60	~ 60
899	~ 40	~ 40	~ 40
981 (night)	-	~ 60 (early morning)	~ 60 (early morning)

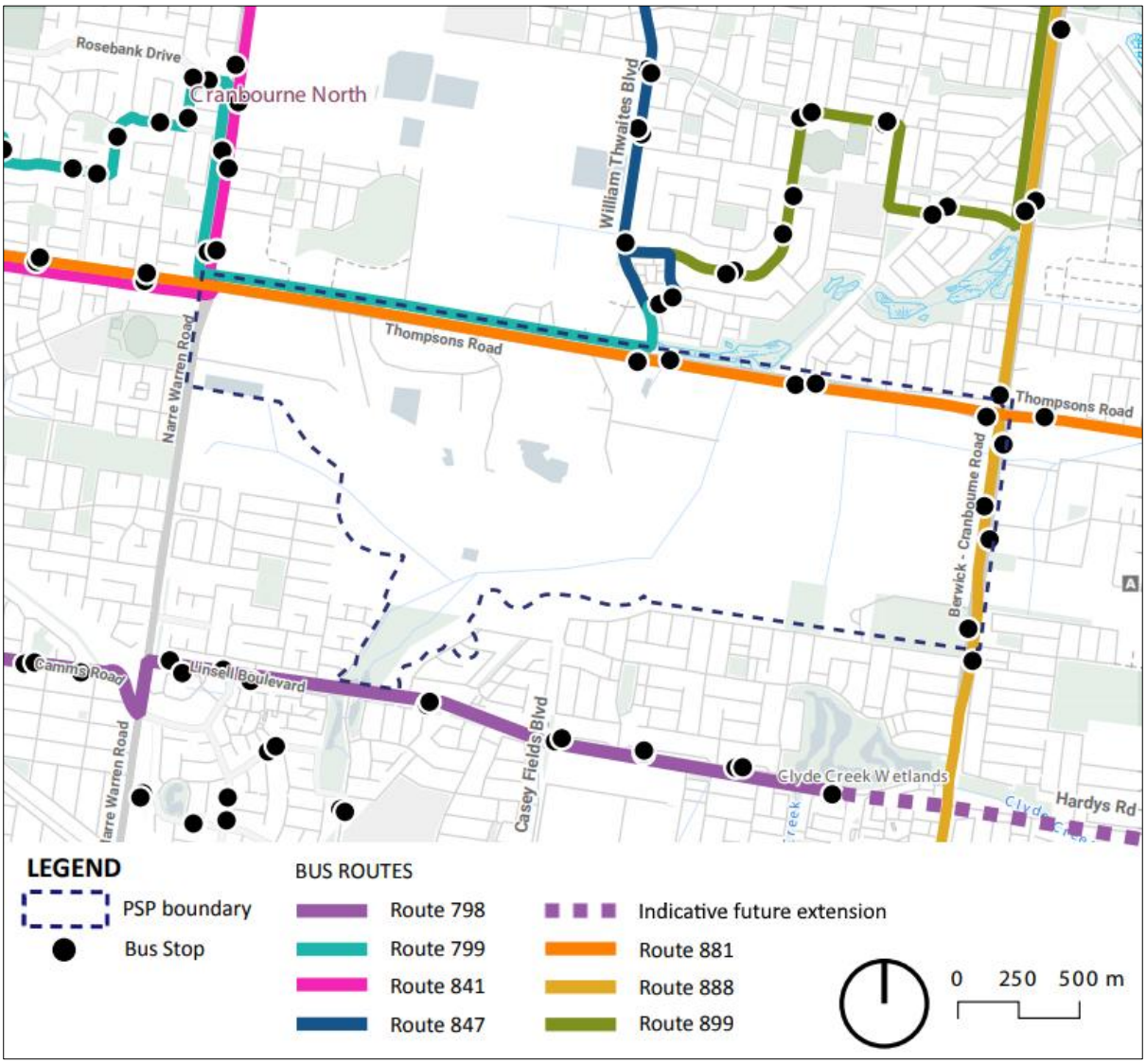
Source: PTV (2023)

Figure 4: Existing public transport regional map



Source: M&PC analysis of PTV data (2024)

Figure 5: Existing public transport around the precinct



Source: M&PC analysis of PTV data (2024)

The Principal Public Transport Network (PPTN) Area overlaps the north-western corner of the precinct, at the Narre Warren-Cranbourne Road and Thompsons Road intersection.

The importance of providing high-quality bus services early in greenfield development was demonstrated in Selandra Rise, the neighbourhood directly south of Croskell. A 2021 RMIT study of the area found that providing public transport services early in the development phase (3 years after the first residents moved in) resulted in higher levels of ongoing bus use (and lower transport costs overall). There were also significant net social, economic, and environmental benefits that outweighed the costs of provision.[1]

There are no railway stations within walking distance of the Croskell (Employment) precinct. The closest and most directly accessible stations are located along two train lines, as follows:

- Cranbourne Line (closest):
    - Merinda Park – 2.6km west of the site along Thompsons Road

[1] RMIT (2021). 'Early delivery of equitable and healthy transport options in new suburbs - Final report'

  - Cranbourne Station – 2.6km south-west of the site along Narre-Warren Cranbourne Road and Camms Road
  - Cranbourne East Station (proposed) – 2km south of the site along Broad Oak Drive.
- Pakenham Line (more remote):
  - Narre-Warren Station – 5.9km north of the site along Narre-Warren Cranbourne Road
  - Berwick Station – 6.3km north of the site along Berwick Cranbourne Road.

On each line, Metro train services run at about 20-minute headways seven days a week, with morning and afternoon peak headways of 10-12 minutes on weekdays.

On weekdays, a V/Line service arrives at Berwick Station from Traralgon in the morning (drop-off only), and a return service to Traralgon leaves Berwick in the afternoon (pick-up only).

Bus movements on Thompsons Road are likely to increase in future as the road is the only location that can support east west public transport movements across a longer distance.

2.2.4 Road network

The Croskell (Employment) precinct is bordered by three primary State arterial roads (Thompsons Road, Narre-Warren Cranbourne Road, and Berwick-Cranbourne Road). These roads are part of a larger grid of primary State arterial roads that provide regional access to major activity centres, such as Fountain Gate, Narre Warren, Berwick and Cranbourne. They are also used to access the freeway and highway network. Key connector streets within proximity to Croskell include Linsell Boulevard, Casey Fields Boulevard and William Thwaites Boulevard. Provision is made to extend Linsell Boulevard west from Narre Warren-Cranbourne Road to the South Gippsland Highway in future.

Thompsons Road and Berwick-Cranbourne Road are divided carriageways with multiple lanes and 80km/h speed limits. Narre Warren-Cranbourne Road is slightly narrower in width with 70km/h speed limits, serving established areas surrounding Cranbourne Activity Centre.

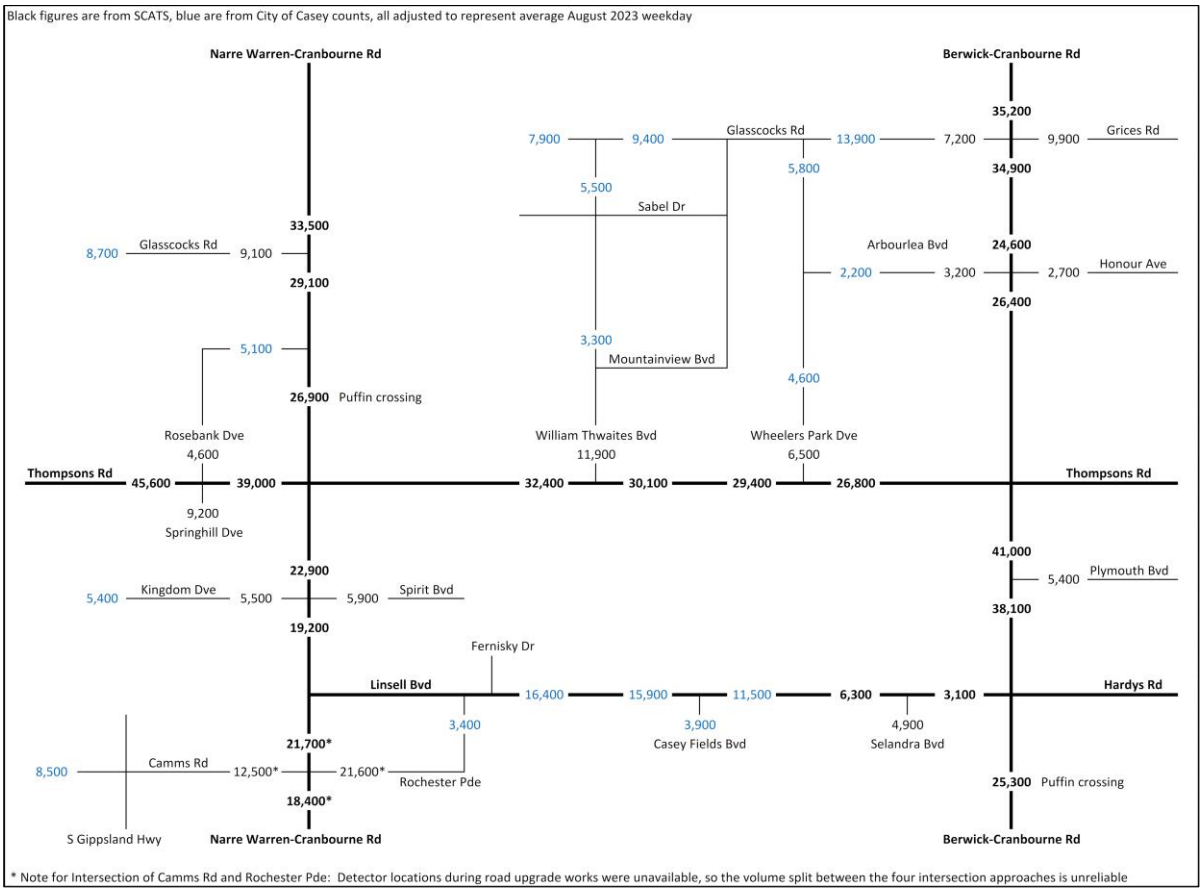
Thompsons Road is a significant freight corridor, that will ultimately connect the Dandenong South and future Officer South/Cardinia Road industrial areas. It is therefore indicated as part of the PFN, where future land use and transport planning will need to ensure that freight movements are considered and prioritised. Signalised intersection upgrades are planned for the Thompsons Road/Berwick-Cranbourne Road intersection to improve the efficiency of vehicle movements.

Connector and local streets are often single lane, lower-speed environments, providing access to low intensity residential areas and neighbourhood centres. Signalised traffic intersections are strategically placed at key neighbourhood vehicle entry points along primary State arterial roads to improve road safety for all road users.

2.2.5 Traffic volumes

Figure 6 summarises estimated August 2023 weekday traffic volumes on key roads in the Croskell vicinity, from SCATS counts at selected signalised intersections, supplemented by City of Casey traffic counts elsewhere. The City of Casey counts were adjusted to August 2023 average weekday levels using seasonal adjustment and growth factors to compare them with the SCATS data.

Figure 6: Estimated August 2023 average weekday traffic volumes



Source: M&PC analysis of SCATS and City of Casey traffic counts

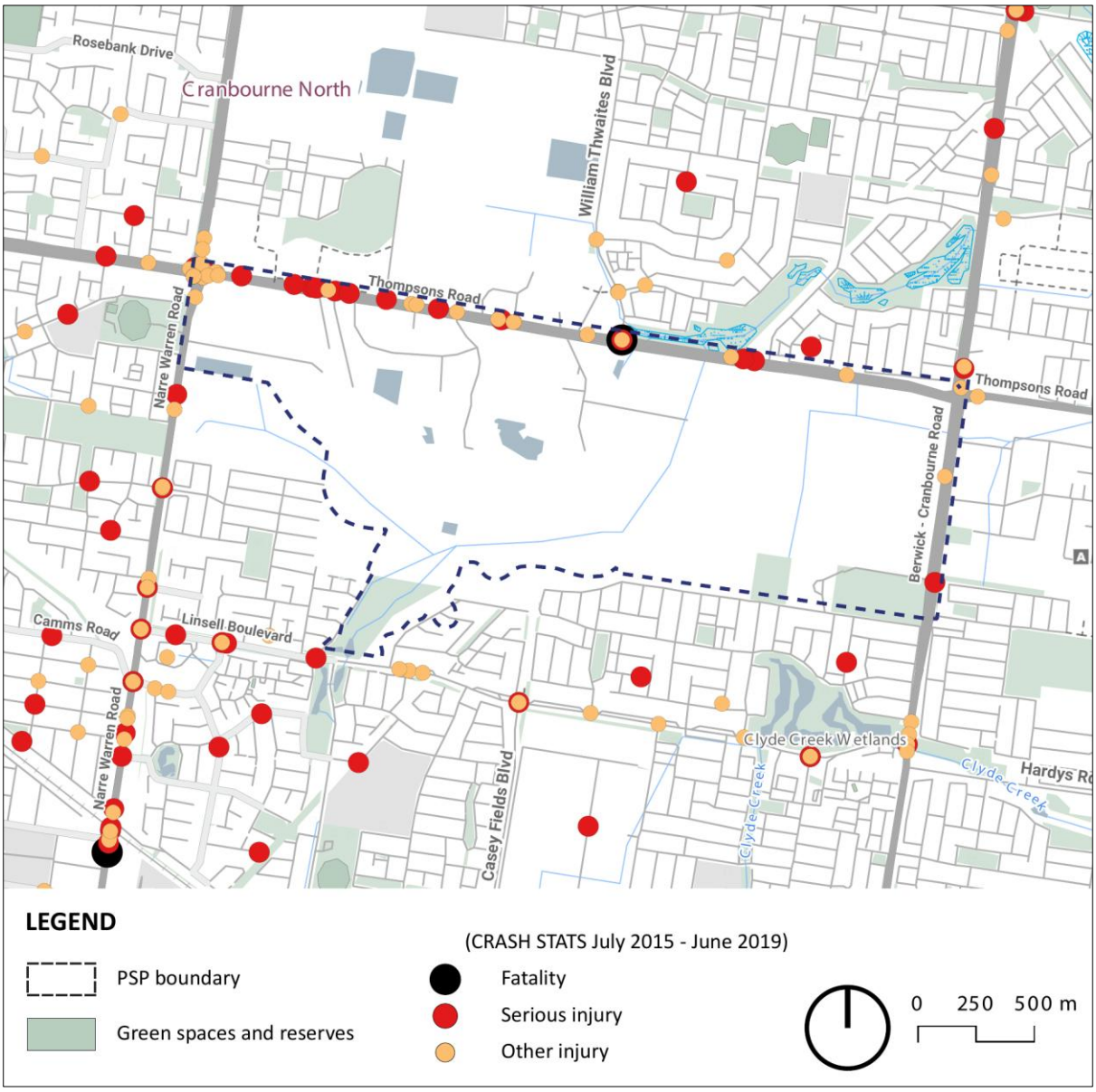
Thompsons Road typically carries about 25,000 vehicles a day across Berwick-Cranbourne Road, increasing to 38,000 west of Narre Warren-Cranbourne Road. Linsell Boulevard, south of the precinct, carries about 5,000 vehicles a day west of Berwick-Cranbourne Road, increasing to over 15,000 where it meets Narre Warren-Cranbourne Road.

Berwick-Cranbourne Road carries about 24,000 vehicles a day south of Linsell Boulevard, increasing to over 40,000 north of Grices Road. Narre Warren-Cranbourne Road carries somewhat less than this, ranging from 17,000 vehicles a day south of Camms Road to just over 30,000 north of Glasscocks Road.

2.2.6 Road safety

Recorded crashes on the surrounding road network in the four years preceding COVID-19 are shown in Figure 7 below.

Figure 7: Road crash statistics between July 2015 and June 2019



Source: VicRoads

On the primary State arterial roads and connector streets bordering the precinct, 98 crashes were recorded between July 2015 and June 2019. Of these, 33 were serious injury crashes, and one was a fatal crash (at the intersection of Thompsons Road and William Thwaites Boulevard). Four of the crashes involved vulnerable road users (pedestrians or bicycle riders); two involved serious injuries and two 'other injuries'.

There were notable concentrations of crashes on the western part of Thompsons Road, and along Narre Warren-Cranbourne Road south of the precinct.

A breakdown of the number of crashes and persons involved is provided in Table 4 overleaf.

Table 4: Crash statistics in the Croskell (Employment) PSP precinct (2015-2019)

Severity	Fiscal Year				Total
	2015-16	2016-17	2017-18	2018-19	
Number of crashes					
Fatal crashes	1	0	0	0	1
Serious injury crashes	4	11	10	8	33
Other injury crashes	18	13	16	17	64
Total	**23**	**24**	**26**	**25**	**98**
Number of persons involved					
Fatalities	1	0	0	0	1
Serious injuries	4	18	13	8	43
Other injuries	27	23	28	28	106
No injuries	39	18	32	47	136
Total	**71**	**59**	**73**	**83**	**286**

Source: VicRoads

2.2.7 Car ownership rates

The City of Casey has higher car ownership than Greater Melbourne as a whole. Car ownership rates are particularly high in suburbs next to the Croskell (Employment) precinct, in the 'Cranbourne North – East' and 'Cranbourne East – North' SA2s as shown in Table 5 below.

Table 5: Household car ownership as a percentage of total households in 2021

	Cars per household				
	0	1	2	3	4 or more
Cranbourne North - East	1%	25%	52%	15%	7%
Cranbourne East - North	2%	30%	48%	14%	6%
City of Casey	3%	28%	45%	16%	9%
Greater Melbourne	9%	37%	37%	11%	6%

Source: ABS (2021)

Car ownership is also related to household income. 8% of lower-income households (weekly income $650 or less) have no cars in Cranbourne North – East and 12% in Cranbourne East – North. Less than 1% of households with a weekly income of $2,000 or more have no cars.

Multiple car ownership is high; 74% of households in Cranbourne North – East have two or more cars, compared with 60% in the City of Casey and 54% in Greater Melbourne as a whole.

2.2.8 Mode share & journey to work catchment

ABS (2021) journey to work data was analysed at SA2 level for 'Cranbourne North – East' and 'Cranbourne East – North'. Out of the total 12,345 work trips, most residents travelled to the:

- City of Casey (3,750 people – 30%)
- City of Greater Dandenong (2,461 people – 20%)

Transport mode shares to the most common work destinations are outlined in Table 6 below.

Table 6: Journey to Work mode shares of nearby residents in 2021

Destination of travel to work (LGA)	Transport mode			
	Motor vehicle	Public transport	Active transport	Other mode
City of Casey	92%	4%	3%	1%
City of Greater Dandenong	96%	3%	-	1%
City of Kingston	97%	3%	-	-
City of Frankston	96%	4%	-	-
City of Monash	92%	8%	-	-
City of Knox	96%	2%	-	1%
City of Melbourne	47%	53%	-	1%
TOTAL	**92%**	**6%**	**1%**	**1%**

Source: ABS (2021). Figures exclude working from home

The overall transport mode share was dominated by motor vehicles (92%). Public and active transport modes had much smaller mode shares (6% and 1% respectively).

Amongst the work destinations with the highest trip volumes, the City of Melbourne had a high public transport mode share (53%). All other destinations had much higher motor vehicle mode shares of well over 90%.

Outside the areas shown, public transport mode shares were significantly higher to inner-city LGAs (such as Maribyrnong, Yarra and Port Phillip). However, the number of trips was low in each case (all were under 100 trips).

Residents in the Croskell vicinity overwhelmingly use private vehicles to access their places of work, and active and public transport provisions do not meet their needs (particularly compared to other parts of Greater Melbourne). Public transport is used more for journeys to work at destinations that are accessible by Cranbourne/Pakenham train services.

2.3 Nearby transport infrastructure upgrades

Infrastructure upgrades have accompanied growth in the vicinity of Croskell, and more are planned. Recent and planned initiatives include:

- Thompsons Road (recently completed): Duplication (to at least 2 lanes in each direction) between Frankston-Dandenong Road and Berwick-Cranbourne Road; intersection signalisation; new pedestrian/bicycle shared-path (10.7km long); level crossing removal near Merinda Park Station
- Glasscocks Road (recently completed): Connection to South Gippsland Highway including bus priority and shared user paths
- Narre Warren-Cranbourne Road (recently completed): Providing one extra through traffic lane in each direction between Thompsons Road and South Gippsland Highway; new pedestrian and bicycle paths
- Thompsons Road/Berwick-Cranbourne Road intersection (planned): signalisation; improved active and public transport infrastructure
- Cranbourne train line (recently completed): Track duplication between Dandenong and Cranbourne; level crossing removals at several locations; and a new station building at Merinda Park Station
- Cranbourne train line extension (planned): Extension to a new station at Cranbourne East on the west side of Broad Oak Drive
- Bus network improvements: Route 863 extension (now operates from Endeavour Hills to Cranbourne West); Route 895 re-alignment (travels through the Casey Business Park).

3 Issues, Constraints and Opportunities

The assessment of background documents, data sources and existing conditions leads to a high-level outline of key issues, constraints, and opportunities, as discussed below.

3.1 Issues

Several transport issues that present challenges to the development and future function of the Croskell (Employment) precinct. These include the following:

- High rates of car use in the outer suburbs
- Bus services in the City of Casey do not carry a significant proportion of overall travel demand
- Very few safe and prioritised pedestrian crossing points across surrounding primary State arterial roads
- Incomplete bicycle riding networks with a lack of safe and prioritised crossings across primary State arterial roads.

3.2 Constraints

Constraints influencing the development of the precinct and its transport connections include the following:

- High traffic volumes on Thompsons Road, Berwick-Cranbourne Road and Narre Warren-Cranbourne Road as the sole arterial road routes (considerate of primary and secondary routes) in the area. Thompsons Road is also identified as a PFN route which may restrict transport infrastructure and land use development types that hinder freight movements
- Distance to train stations: the nearest train stations (existing and planned) are beyond regular walking distance; the demand for car parking is high because most people drive to the stations
- Easements and controls for the Victorian desalination plant cable and high voltage electricity transmission towers constrain north-south movement corridors connecting the precinct to the south
- An urban floodway zone runs directly through the middle of the precinct
- Various potentially contaminated land parcels (currently subject to investigation).

3.3 Opportunities

Key opportunities exist to integrate transport and land use outcomes in the precinct. These include:

- Providing more jobs and services in the City of Casey to attract local people and businesses
- Enhancing north-south connections between Cranbourne East and Cranbourne North
- Integrating pedestrian and bicycle riding links with key surrounding land uses, including schools, town centres and train stations
- Strategically locating freight trip generating land uses with good access to nearby freight corridors
- Co-ordinating development and supporting transport in stages to ensure each parcel has access to necessary transport infrastructure and services from the outset

4 Proposed Infrastructure Plans

The integrated transport assessment aims to provide constructive advice on the VPA's existing plans for the Precinct. These existing plans include:

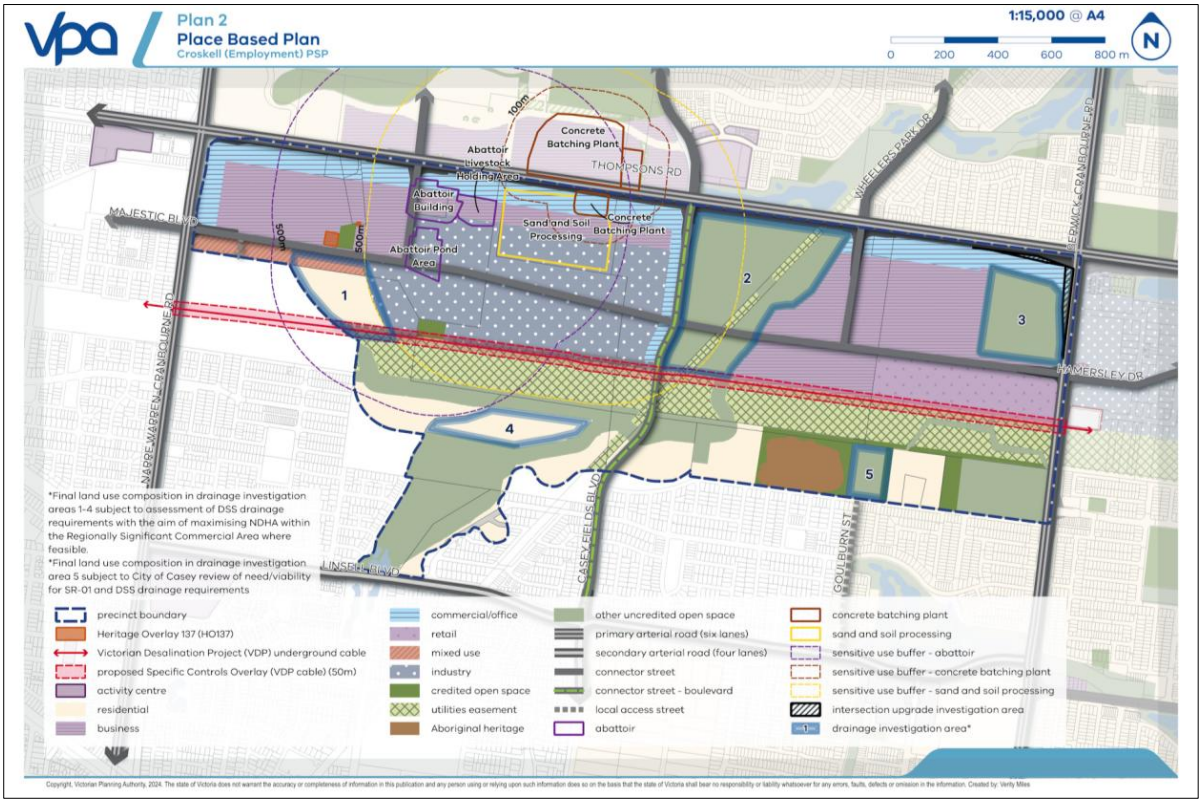
- Place Based Plan
- Movement Network and Public Transport plan
- Precinct Infrastructure Plan
- Road cross sections (three different types).

Proposed infrastructure treatments for each of the plans above are discussed in the following sections.

4.1 Place Based Plan

The VPA has proposed a number of land uses for the Croskell (Employment) precinct. The PSP plan set, as provided to the consultant at the time of this report, is illustrated in Figure 8 below.

Figure 8: Draft Place Based Plan



Source: VPA

A large proportion of Croskell is allocated for business and retail land uses. Commercial and office land uses are consolidated along Thompsons Road and the precinct's central north-south connector street. The mid-section of Croskell is zoned for industrial land uses. Residential land uses are provided along the southern edges of the precinct, as an extension of the predominately residential built-form south of Croskell. Small pockets of open space are spread out across the precinct. A small mixed-use zone is located along the western segment of the proposed east-west connector street.

The allocation of residential land uses along Croskell's southern boundary is a logical extension of existing residential areas. The consolidation of commercial and office land uses (which have higher trip attraction rates by area) along Thompsons Road suggests aspirations to replicate transit-oriented corridor development.

The mid-precinct location of industrial land uses suggests aspirations to conceal this style of built form away from primary State arterial road corridors. The internal precinct road network and primary State arterial road intersections will need to ensure the ability to accommodate heavy freight vehicle movements. There will also be a need to discourage freight vehicles from entering residential areas along Casey Fields Boulevard and Linsell Boulevard.

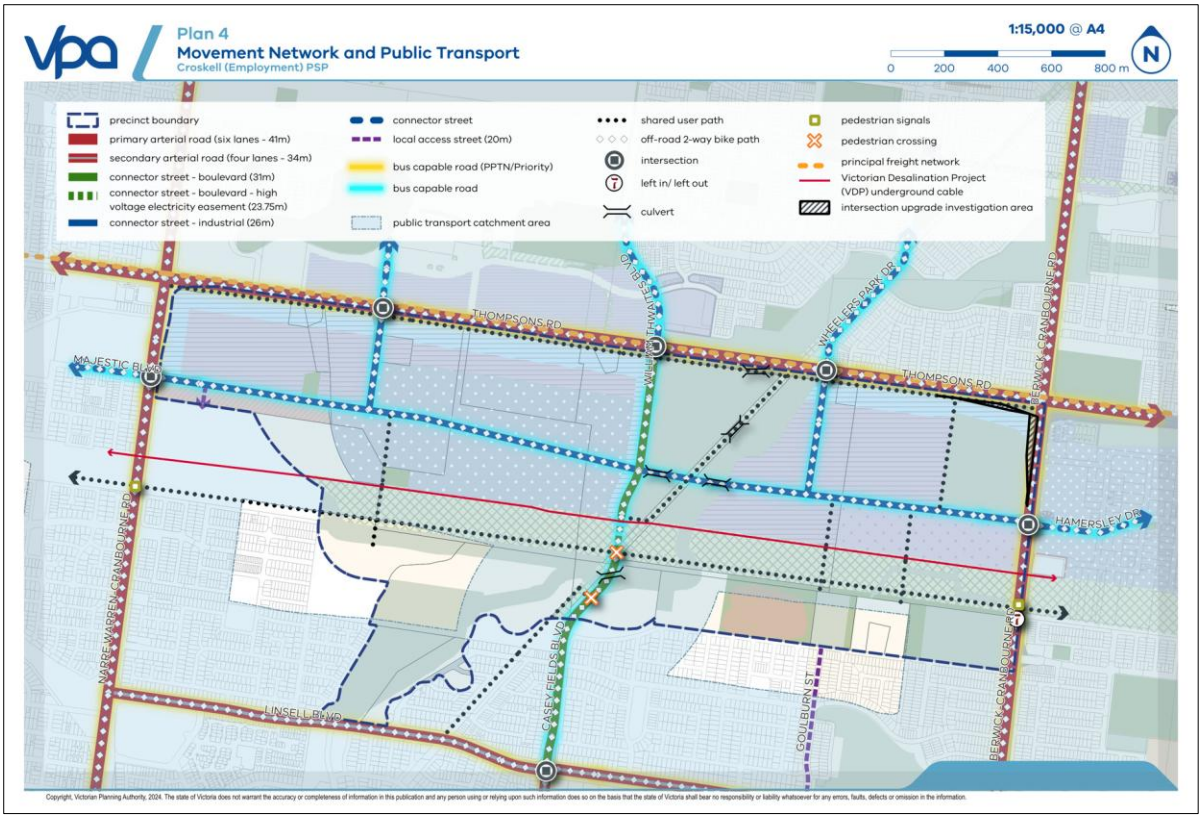
The minimal development within the urban floodway zone is appropriate. The allocation of open space within this zone provides additional opportunities to create a suburban ecological/green corridor. These open spaces are positioned where they can safely and directly be accessed via the municipal wide proposed bicycle riding corridor.

The mid-precinct location of a mixed-use precinct places future land uses further away from existing public transport corridors. Access to these land uses is likely to be made by private vehicle.

4.2 Movement Network and Public Transport plan

The VPA has proposed transport infrastructure and access arrangements for the Croskell (Employment) precinct. These are illustrated in Figure 9 below.

Figure 9: Draft Movement Network and Public Transport Plan



Source: VPA

Croskell is bordered by three primary State arterial roads that will ultimately provide six lanes for traffic. Linsell Boulevard has been planned as an ultimate 4 lane arterial road. The existing length of Casey Fields Boulevard south of Linsell Boulevard has been planned as a Connector Street, and

potential future Council arterial road. The precinct's central north-south connector street will adopt a boulevard treatment, to align with the streetscape designs of connecting streets (William Thwaites Boulevard and Casey Fields Boulevard). Connector streets with an industrial zone appropriate streetscape treatment will be applied across all other precinct connector streets. These are proposed to link up with connector streets that extend northward from Thompsons Road, eastward from Berwick-Cranbourne Road, and westward from Narre Warren-Cranbourne Road.

All intersections where primary State arterial roads and connector streets meet will undergo intersection projects. The direct grid-like road network will ensure directness of travel and improve wayfinding through the precinct.

Bus capable roads are indicated along all primary State arterial roads and connector streets. Narre Warren-Cranbourne Road, Berwick-Cranbourne Road, Linsell Boulevard, and Thompsons Road (west of Narre Warren-Cranbourne Road) are indicated as part of the Principal Public Transport Network (PPTN). It is anticipated that these routes will operate a higher frequency of bus services given that PPTN links are chosen due to their strategic importance in facilitating public transport movement.

The proposed internal street network will provide SUPs to support bike riding connectivity. This includes SUPs that run east-west along the utility easement to connect the SCCs along Narre Warren-Cranbourne Road and Berwick-Cranbourne Road. An additional SUP will run diagonally through the precinct, as an extension of a direct continuous green corridor that runs diagonally between Beaconsfield and Cranbourne. These paths will directly connect with public open spaces, activity centres and community facilities that are located within and outside the precinct boundaries.

Off-road two-way bicycle paths will be provided along all precinct connector streets. This will provide future bicycle riders with safe and direct routes to ride along. Off-road bicycle paths are already provided along each of the precinct's neighbouring primary State arterial roads (though some are not shown in the plan above).

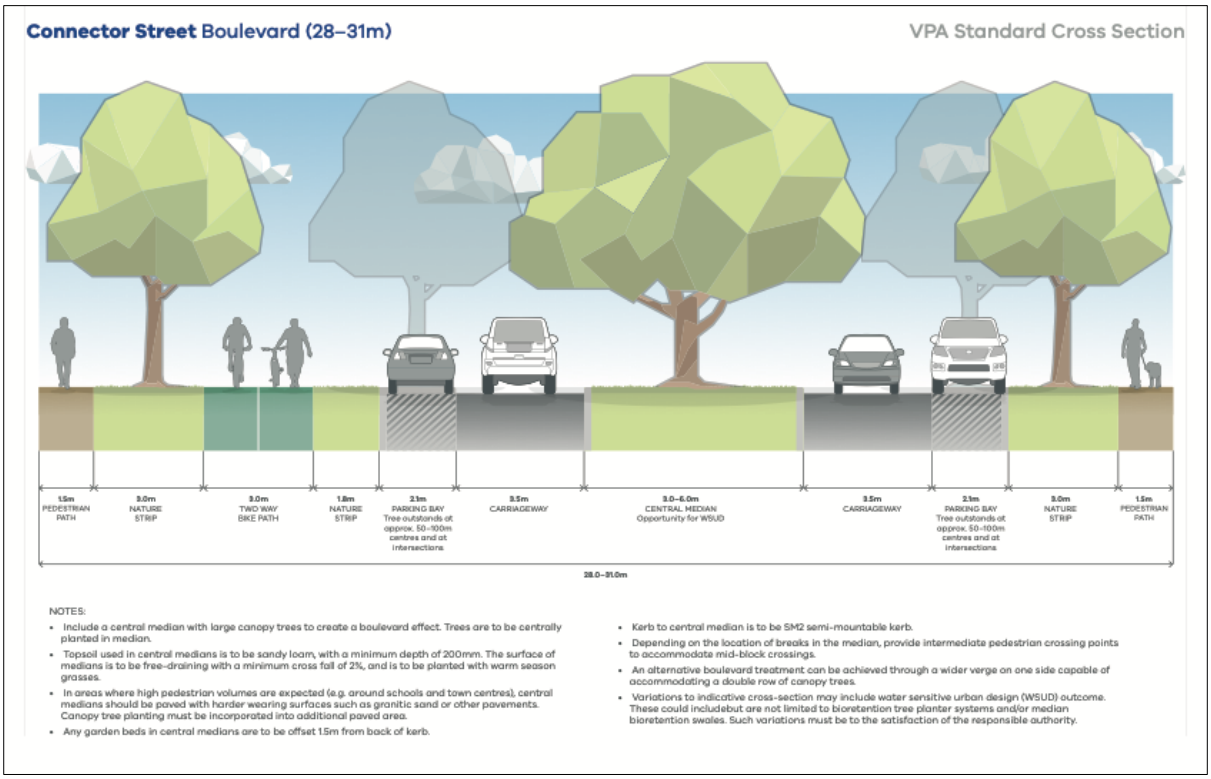
4.3 Road Cross Sections

Three cross sections are proposed to represent the allocation of transport infrastructure along the precinct's connector and local streets, both in a standard and industrial context. These are outlined in the sections below.

4.3.1 Connector Street (Boulevard)

A connector Street (boulevard) typically has high quality pedestrian environment, canopy trees (including within a broad median) and a single lane of traffic in each direction. A separated bicycle path provides a high-quality network for pedestrians (on a separate footpath) and bicycle riders, and some on-street parking provides for short stay parking as shown in Figure 10 below.

Figure 10: Typical Connector Street (Boulevard) midblock cross section



Source: VPA

This cross section is appropriate to be applied along connector streets that traverse through non-industrial land use precincts. The provision of one traffic lane (in each direction) discourages use of the street as a rat-run and will encourage lower safer driving speeds.

The dual-direction segregated bicycle path is appropriate given the nearby employment focus of development in Croskell, and the need to serve such locations in accordance with the Commonwealth Disability Discrimination Act and Gender Equality Act.

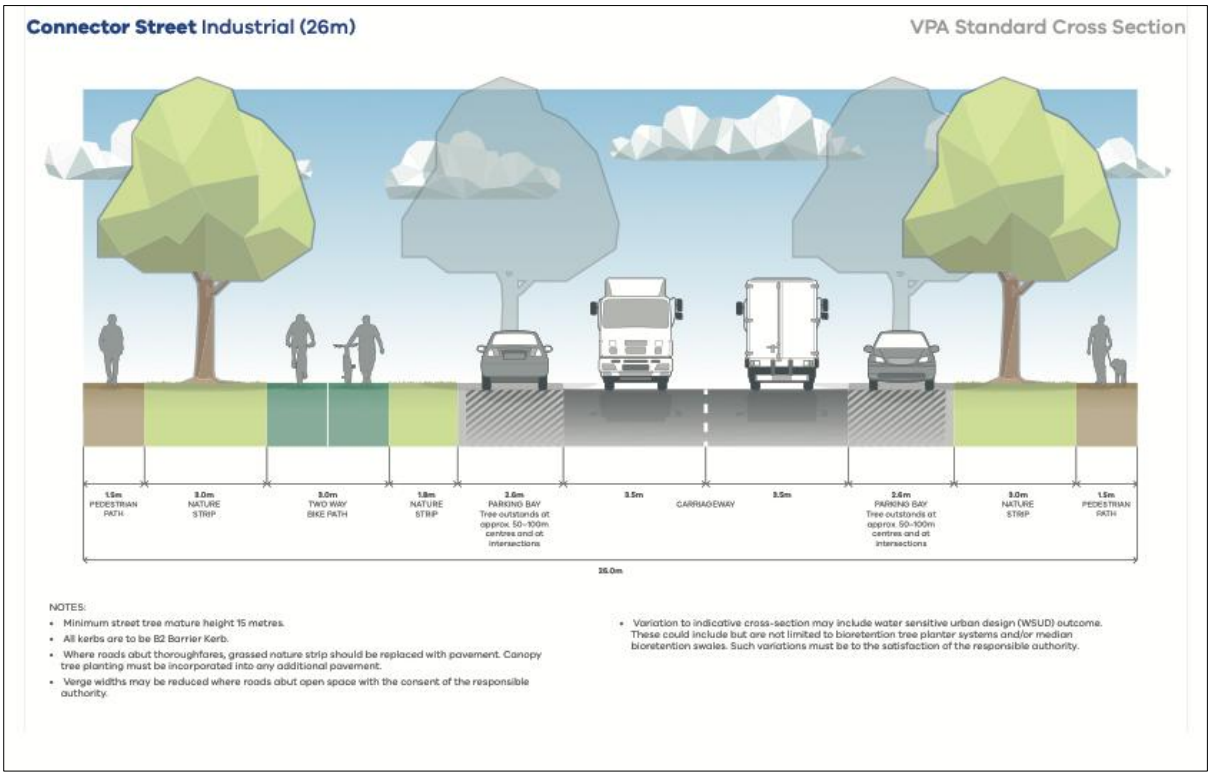
The wide median strip and canopy coverage will improve the amenity and pleasantness of the street, particularly by moderating weather conditions and reducing the urban heat island effect.

This cross section will be applied along the precinct's central north-south connector street and resembles the existing boulevard streetscape along William Thwaites Boulevard to the north, albeit featuring footpaths and a bike path rather than William Thwaites Boulevard's 2.5m shared use path.

4.3.2 Connector Street (Industrial)

A connector Street (industrial) typically has high quality pedestrian environment, canopy trees and a single lane of traffic in each direction, without being separated by a median. A separated bicycle path provides a high-quality network for pedestrians (on a separate footpath) and bicycle riders, and some on-street parking provides for short stay parking as shown in Figure 11 below.

Figure 11: Typical Connector Street (Industrial) midblock cross section



Source: VPA

This cross section is appropriate for industrial precincts. The wider roadway without a median strip, enables freight vehicles to make turning movements safely and effectively.

The dual-direction segregated bicycle path is required given the employment focus in the area, and the need to serve such locations in accordance with the Commonwealth Disability Discrimination Act and Gender Equality Act.

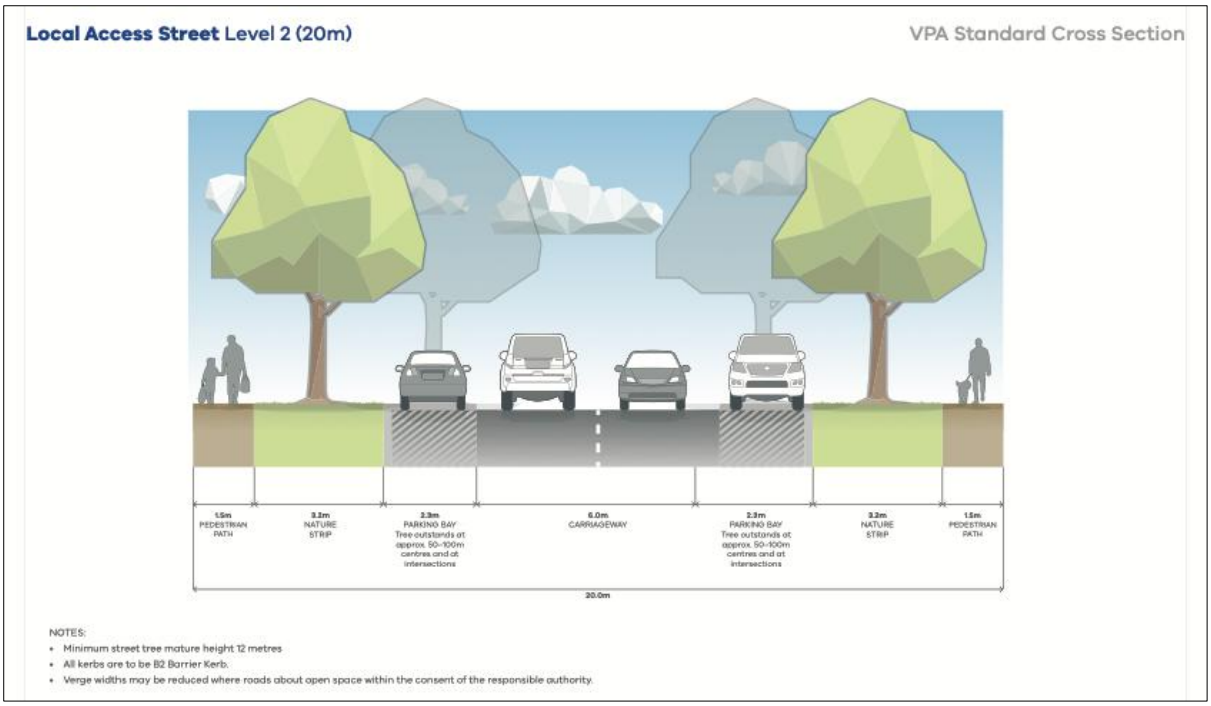
Tree canopy coverage will beautify the space and reduce urban heat island effects. The car parking can be provided at higher intensity (15m centres) allowing for 2 car parking spaces between each tree. This recognises that in the employment area, each development will need to provide on-site parking (including for visitors) and on-street visitor parking will not be required to any significant degree. This approach to streetscape amenity will also promote a high-quality character for the area. A relative lack of on-street car parking will also reduce the chance of over-provision which increases construction and maintenance costs.

This cross section treatment will be applied along all precinct connector streets (except the main N-S connector street).

4.3.3 Local Access Street (Level 2)

A Local Access Street (Level 2) typically has high quality pedestrian environment, canopy trees and a single lane of traffic in each direction (slightly narrower lanes are appropriate to encourage lower speeds). Some on-street parking is also provided as shown in Figure 12 below.

Figure 12: Typical Local Access Street (Level 2) midblock cross section



Source: VPA

This cross section is appropriate to be applied along local streets within non-industrial zones. The 3m wide traffic lane (6m in total) is narrower than those provided along connector streets, which encourages vehicles to slow down. The provision of canopy trees will beautify the streetscape, provide shelter for pedestrians, and reduce the urban heat island effects on the surrounding area.

The lack of a shared user path reflects the nature of land use expected in the area served by the dwellings, the type of vehicles typically using the street (smaller vehicles with higher visibility) and likely speed of traffic in the street.

Depending on the requirement for off-street parking, the distance between tree centres could be high or low, for example:

- If there is a zero maximum for off-street parking (i.e. no parking can be provided on site for each dwelling), there is less privatisation of the kerb for driveways, and more need for shared on-street parking. This would result in the need for 100m centres between street trees
- If standard off-street parking requirements exist (i.e. 1-3 car spaces per dwelling), there is maximum privatisation of the kerbside, less need for shared on-street parking and greatest need for tree canopy shade (to offset the additional hard surface, trapping heat on each property). This would result in a need to provide many more trees at much lower centres between street trees (absolute maximum of 50m), preferably under 10m centres with very limited on-street parking.

5 Traffic Demand Forecasting

The following section summarises key insights from the transport modelling component of the project.

5.1 Modelling approach

VPA requested a transport model to be developed which estimates:

- *"… daily (2-way) traffic volume forecasts for ultimate design year conditions along key internal PSP roads and surrounding/nearby arterial roads."*

For Croskell's ultimate land use scenario, a demand model was developed to estimate future vehicle travel demand for a design year of 2051. The model comprises vehicle trip generation, distribution and assignment steps in an approach summarised in Table 7 below.

Table 7: Modelling approach overview

Method	Description	Inputs
Trip generation	The number of vehicle trips generated to and from the Croskell study area is calculated for a variety of land use types	RMS trip generation rates Transport Impact Assessment Guidelines
Trip distribution	The trip origin and destination pairs are determined	ABS Journey to Work
Traffic assignment	Vehicle trips are loaded onto the road network based on the entry/exit point and the precinct destination zone A static assignment approach is used for the assignment stage	Google Maps navigational routing
Outputs	Estimated future vehicle trips to and from Croskell Daily vehicle trips on the proposed internal road network and immediate surrounding roads	

The adopted modelling approach does not estimate the potential external 'through' traffic. In order to provide some context to the forecast vehicle volumes created by the Croskell (Employment) precinct, the background traffic volumes were derived from strategic modelling outputs supplied by VPA for the *Officer South Employment PSP Transport Modelling Assessment*. To avoid double counting trips in/out of Croskell, the previously included Croskell trips were subtracted from the totals prior to combining with daily vehicle trips from our model.

5.2 Modelling output

The projected vehicle trips generated by the Croskell (Employment) precinct land uses are summarised in Table 8 below. These estimates use traffic generation rates considered representative of similar precincts elsewhere in Greater Melbourne. These figures may be regarded as an upper limiting estimate, as a greater take-up of public and active transport will lower these values.

The precinct could generate about 58,400 vehicle movements on an average weekday when fully developed. The land use generating the most vehicle traffic would be mixed use (16,800 vehicle movements), followed by retail (13,000), business (9,500) and residential (7,900).

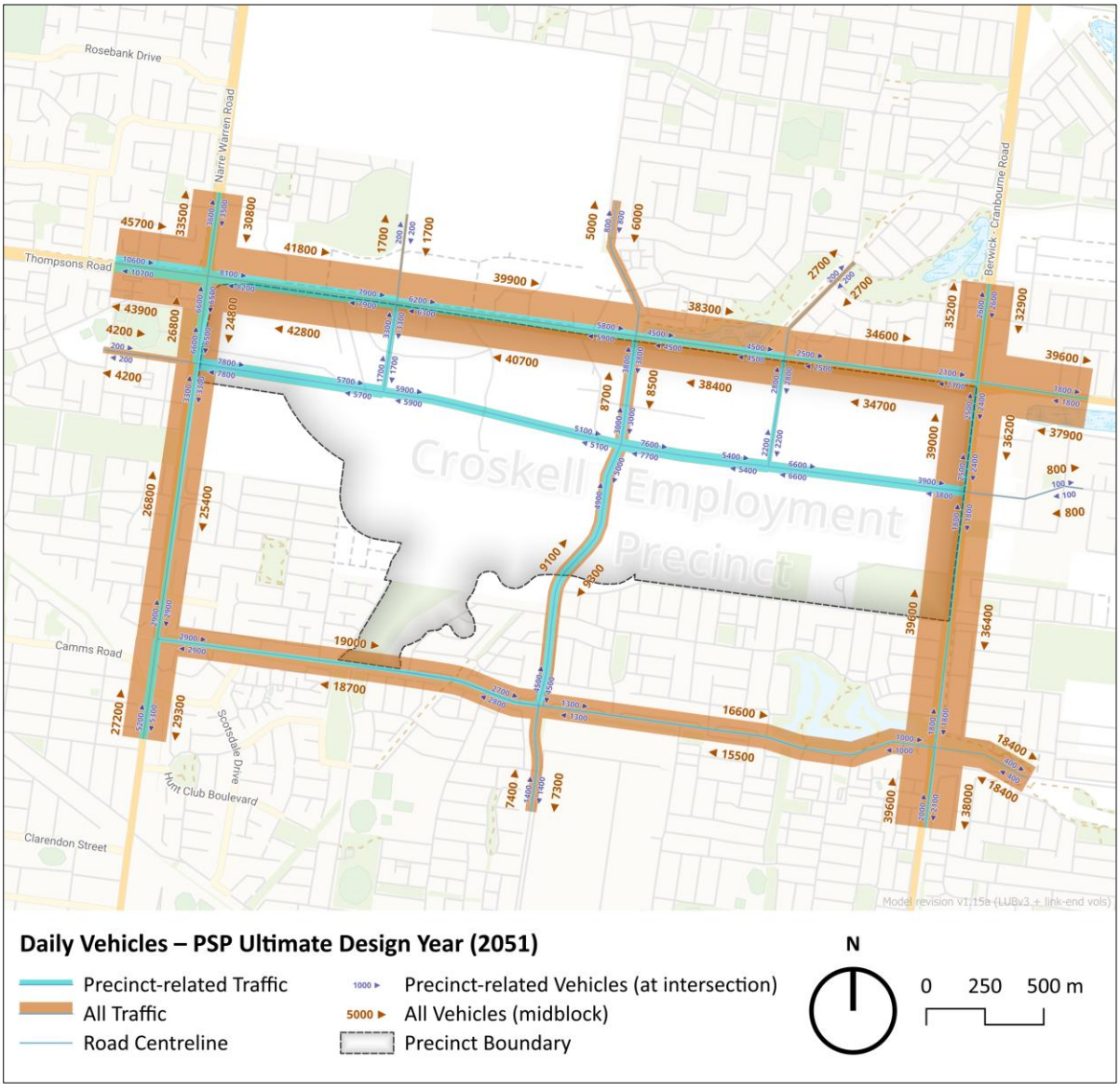
The potential distribution of this traffic (in blue) amongst the total traffic daily traffic the surrounding road network (in brown) is shown in Figure 13 below.

Table 8: Projected average weekday vehicle trips from Croskell land uses

Land use	Net developable area	Average weekday traffic (vehicles)		
		Production	Attraction	Total
Business	59.2 ha	4,800	4,700	9,500
Commercial	24.9 ha	2,000	2,000	4,000
Industrial	45.7 ha	3,700	3,600	7,300
Mixed use	11.9 ha	8,500	8,400	16,800
Retail	4.7 ha	6,500	6,500	13,000
Residential	937 dwellings	3,900	3,900	7,900
Total		**29,300**	**29,100**	**58,400**

Source: M&PC traffic modelling

Figure 13: Average weekday vehicle volumes within and adjoining Croskell



Source: M&PC traffic modelling

The majority of vehicle movements are expected to approach the precinct from the north-west (via the Narre Warren Road / Thompsons Road intersection), and access destinations in the north-western quarter of the precinct.

On Thompsons Road (east of Narre Warren Road) the modelling predicts daily two-way volumes will exceed 84,000 vehicles, implying a peak hour demand of around 8,400 vehicles per hour across six lanes – well above the estimated capacity of 6,000-7,200 vehicles per hour. Lower volumes are predicted on Berwick-Cranbourne Road (76,000/day across six lanes) and Narre Warren Road (52,000/day across four lanes) in road sections adjacent to Croskell (Employment) PSP.

It has been assumed that the commercial and office development along the south side of Thompsons Road will have access via a service road or similar arrangement there, reducing the traffic pressure on the internal precinct roads. Compared to the primary State arterial roads, the east-west access route through the precinct is expected to handle a relatively low volume of traffic (around 8,000 vehicles/direction/day in the busiest sections).

Similar daily vehicle volumes are anticipated on the precinct's central north-south connector street (extending Casey Fields Boulevard to William Thwaites Boulevard at Thompsons Road). This boulevard is expected to handle up to 9,200 vehicles/direction/day, although only 5,000 vehicles/direction/day of this will have a trip-end within the precinct – the remainder using the connector for access to/from areas immediately north and south of Croskell.

It should be noted that the Croskell traffic volumes were produced from an 'unconstrained' traffic assignment – travel routes don't consider the slower congested speeds caused by mixing with other primary State arterial road traffic.

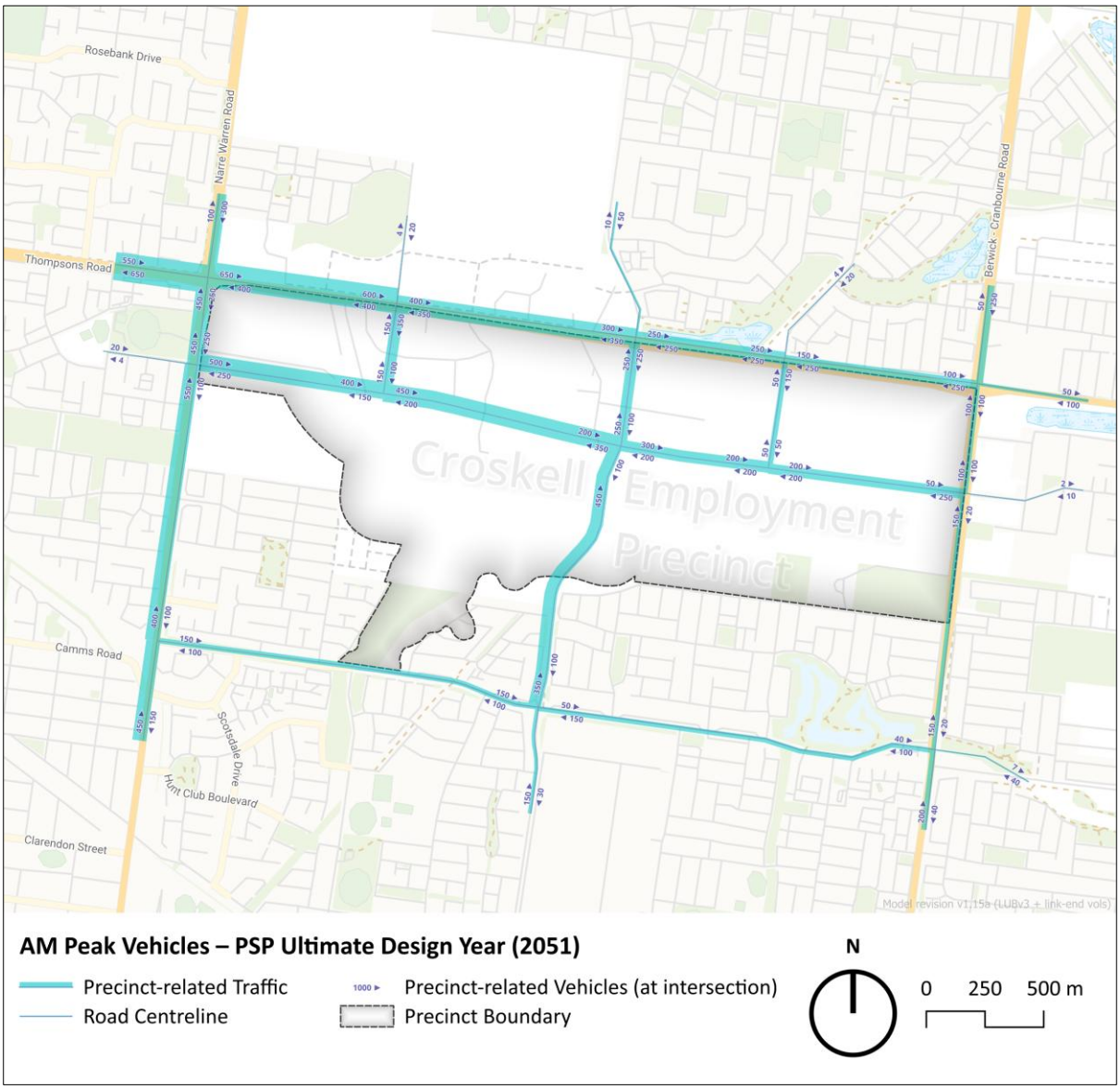
Planners and designers should NOT seek to provide for this level of private vehicle use, as that would encourage the maximum private vehicle use (which would be contrary to State legislation). Providing for this upper limit of private vehicle use would also breach a wide range of Transport and Planning Principles stated in legislation, policy and strategic documents. Providing for unconstrained high traffic volumes would also undermine the vision for both Croskell and Melbourne as a whole.

The outputs demonstrate, that without significant active transport and public transport options, the three neighbouring primary State arterial roads are likely to be at maximum carrying capacity and experiencing traffic congestion over the peak period in 2051. However, they are also likely to be operating well below maximum capacity for 80% of each day and week of the year.

It should be noted that improvements to bus services have not been included in the modelling, and would have a significant impact on the likely traffic congestion in 2051 should the government wish to reduce traffic congestion in the area. Current public transport options are very limited and do not connect the Croskell (Employment) precinct with key residential areas to provide direct, single seat journeys that people would need to make the bus a viable option. These services are very easy to implement, and relatively cheap (in that they could be provided by using existing resources more efficiently).

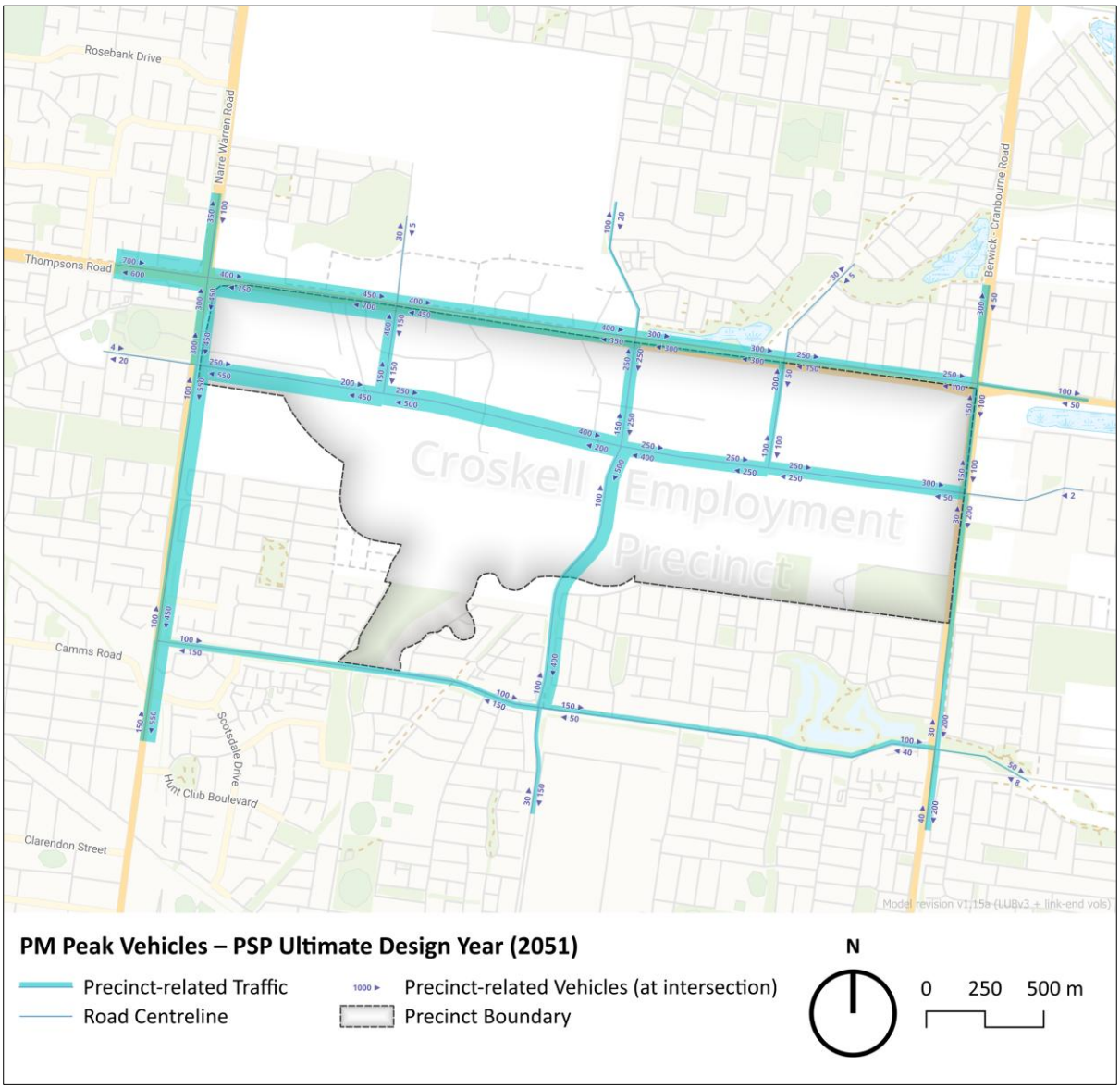
AM and PM peak hour traffic flow diagrams follow in Figure 14 and Figure 15 below. The 'tidal' nature of traffic generated by the residential land uses is evident in the two figures – primarily towards the north-west in the AM peak and mirrored in the reverse direction in the PM peak. Note these present the traffic generated by Croskell's development alone – without external background traffic volumes.

Figure 14: Average weekday AM peak vehicle volumes generated by full Croskell development



Source: M&PC traffic modelling

Figure 15: Average weekday PM peak vehicle volumes generated by full Croskell development



Source: M&PC traffic modelling

6 Transport modal assessment

The transport modal assessment aims to assess the ability of proposed plans and infrastructure design treatments to facilitate movement across various transport modes. These transport modes include:

- Walking access (inclusive of people with mobility aids)
- Bicycle riding access (inclusive of micromobility)
- Public transport access
- Vehicle access (inclusive of freight)

For each mode, a series of strengths, challenges, and opportunities are developed.

6.1 Walking access

Council's existing plans provide the following infrastructure to better pedestrian access within the Croskell (Employment) precinct.

- Footpaths on both sides of the road: Footpaths at least 1.5m wide are provided on both sides of all roads within the precinct. This reduces the need for people to cross roadways to access footpaths. They provide basic access for people with a disability (as required by Commonwealth law), some of whom may require solid ground surfaces to support their mobility needs
- Safe signalised crossing points: These provide pedestrians with dedicated safe crossing points across high-speed primary State arterial roads. It also improves connectivity between the Croskell (Employment) precinct and nearby neighbourhoods
- Direct Wayfinding: Precinct connector streets have been kept relatively straight which improves wayfinding and decreases walking distances
- Logical road layout and crossing points: Connector streets meet directly with other connector streets that travel through surrounding areas. Signalised crossing points are set to be provided at these logical primary State arterial road crossing locations
- Footpaths buffered from roadways: A 3m wide nature strip is provided alongside connector streets. This improves pedestrian comfort by creating a buffer between the pedestrians and fast-moving vehicles
- Canopy coverage improves public realm: Canopy coverage provides multiple benefits that enhance the pedestrian experience. These include reducing ambient air temperatures, providing shelter from the sun, and improving the aesthetics of the street

Challenges and Opportunities

There are several challenges that may inhibit pedestrian access within the precinct, some of which could undermine the Croskell vision or compliance with the Disability Discrimination Act. These challenges, as well as potential opportunities are outlined below.

- Poor pedestrian permeability across roadways: Current PSP documents do not state whether crossing facilities are to be provided along the precinct's connector streets, particularly around locations with a higher provision of commercial and mixed land uses. These connector streets are likely to see higher vehicles volumes (including heavy vehicles) during the AM and PM peak, of which will require treatments to allow pedestrians to cross

safely by pausing vehicle movements. Potential opportunities to be considered at subsequent stages of the planning and approvals process include:

  - Raised threshold crossings at all intersections: These enable people with a disability to cross the road more easily and reduce the speed of vehicles entering and exiting the intersection making it safer for all road users
  - Increase the provision of crossing points: This can include signalised or raised pedestrian crossings, provided along the precinct's connector streets. These crossings should be located at logical crossing points, such as with streets located in neighbourhoods adjacent to the precinct. It is particularly important to feed pedestrian connections directly into neighbouring connector streets, which lead to nearby activity centres and community facilities
  - Ensure high visibility of crossing points: Ensure that these crossing points are highly visible through increased street lighting and minimised obstructive physical elements (signs, posts, trees, and tall shrubbery)

- Safety issues crossing at roundabouts: Roundabouts can be difficult for pedestrians to cross safely during periods of higher vehicle volumes. Although the type of local street intersection control is not nominated at this (strategic) level of the planning process, it is expected that roundabouts will be widely used across the precinct to manage cross intersections. Potential opportunities to consider include:
  - Install raised threshold pedestrian and bicycle crossings on all legs of the roundabout: Ensure that these crossing points are highly visible through street lighting and minimising obstructive physical features through a Dutch style roundabout design
  - Reduce speed limits at roundabout: Consider design or regulatory approaches that limit vehicle speeds to 30km/h when approaching roundabouts
- Decreased pedestrian safety and comfort at intersections: Existing intersections along the precinct's primary State arterial roads do not support pedestrian safety and comfort. Pedestrian waiting areas within the primary State arterial road's median strips do not provide enough of a buffer from fast-moving vehicles. This is evident along the eastern arm of the Thompsons Road/William Thwaites Boulevard intersection. The slip lane pedestrian crossing is level with the roadway, of which does not physically prevent cars from illegally failing to give way to pedestrians. Potential opportunities to consider include:
  - Raise pedestrian crossings: Raise future pedestrian crossings at all intersections
  - Limit vehicle crossovers over key pedestrian corridors: Ensure that vehicle crossovers are minimised through roadway closures whilst maintaining pedestrian accessibility (for example, by keeping road medians closed to prevent cross-traffic) to keep car use down and give priority and better safety for pedestrians on those links
  - Widen refuge islands: Ensure that pedestrian refuge islands are wide enough to ensure pedestrian comfort
- Lack of footpath space in higher activity spaces: Consistent footpath widths of 1.5m are present in all three proposed typical cross sections in chapter 4.3. However this is not wide enough to accommodate higher pedestrian volumes typically found along streets surrounded by retail, commercial, and mixed land uses. It is also inconsistent with existing footpath provisions in neighbouring connector streets.

  - Review footpath widths when developing sites in higher pedestrian activity areas: Wider footpaths may be accommodated without increasing total cross section width through removal of nature strip provisions within higher pedestrian activity areas surrounded by mixed-use, commercial, and retail land uses. Canopy tree planting can be maintained to provide shelter from the sun and improve the visual appearance of the street
  - Provide a consistent pedestrian experience along connector streets by adopting a minimum footpath width of 2.5m: All connector streets adjoining Croskell currently have 2.5m footpaths on at least one side of the road. Croskell will interface directly with most of these at 4-way intersections – Casey Fields, Linsell, Mountainview and William Thwaites Boulevards, Springhill Drive and Wheelers Park Drive.

- Poor public realm activation at night-time: Precincts that are mostly comprised of singular land use types can have issues of activation outside the peak periods of visitation. In Croskell, this is likely to occur during the evening, at night, and on weekends. The lack of passive surveillance during these times can create issues of safety and security for pedestrians. Potential opportunities to consider include:
  - Locate mixed land uses along key pedestrian corridors: Consider applying mixed land uses along key commercial and logical pedestrian access routes (connector streets)

6.2 Bicycle riding access

The place based and transport plan provides the following infrastructure to better bicycle riding and micromobility access to, from, and within the Croskell (Employment) precinct.

- Logical provision of bicycle paths and lanes: Arterial roads (both primary state and secondary) and connector streets provide the most direct and uninterrupted route through the precinct. Signalised intersections are provided at the intersection of primary State arterial roads and connector streets, of which can safely facilitate bicycle riding movement between links that are also provided alongside these roads
- Connected with existing links: Proposed bicycle riding paths are often an extension of existing links in surrounding neighbourhoods. Some of these existing links include SCCs that are currently provided along Narre Warren-Cranbourne Road, Berwick-Cranbourne Road, and Linsell Boulevard. Croskell can support the provision of uninterrupted pathways through the municipality

Challenges and opportunities

There are a number of challenges that may inhibit access by bicycle and micromobility to, from and within the precinct. These challenges, as well as potential opportunities are outlined below.

- Lack of safe crossing opportunities: There are a lack of safe crossing opportunities along connector and arterial roads.
  - Increase the provision of crossing points: An increased provision of crossing opportunities is needed, particularly in higher activity areas and at logical crossing points (where bicycle paths and roadways intersect)
- Some bicycles lanes traverse through isolated areas: The diagonal bicycle lane that runs through the public open space that is located within the centre of the precinct can provide a calm and pleasant riding experience during the daytime. The night-time use of this path could pose safety risk unless it includes appropriate lighting, activity, and passive surveillance

- Provide alternative more visible bicycles routes: Ensure that alternative routes are provided on the outside of the public open space for riders who would prefer to ride in more open and visible spaces. Examples of isolated and open interfaces along a shared-path are provided in Figure 16 below.

Figure 16: Isolated (left) and activated (right) shared paths

Source: M&PC (2021) (left) and Google Maps (2019) (right)

6.3 Public transport access

Existing plans indicate the following infrastructure to better public transport access to, from, and within the Croskell (Employment) precinct.

- Co-located bus stops at signalised crossing points: New bus stops are provided along Thompsons Road and Berwick-Cranbourne Road. These bus stops have been strategically located close to a safe signalised crossing point, to reduce the walking distance bus commuters have to make to access each bus stop
- Bus capable roads: Bus capable roads have been established along all primary State arterial roads and connector streets. Infrastructure design treatments on these roads are likely to enable bus to operate smoothly
- Extension of the PPTN: The PPTN has been extended along Narre Warren-Cranbourne Road, Berwick-Cranbourne Road, and Linsell Boulevard. These corridors represent future commitments to deliver higher quality public transport services, and to support integrated land use and transport development

Challenges and opportunities

It is critical to facilitate access by public transport to the site. This can enable medium and long-distance travellers to access to site via alternative non-car-based modes.

Encouraging the highest intensity land uses and development to locate along Thompsons Road is the most important thing to meaningfully encourage public transport uptake, as it will place the greatest proportion of trip attractors and destinations along the most significant public transport corridor in the area.

High-level public transport service and infrastructure suggestions are provided below:

- Provide bus only lanes at congested points in the road network: Provide bus priority infrastructure where bus services are likely to be held up by traffic congestion. Infrastructure

initiatives can include queue-jump lanes and bus-only lanes. This may require on-street car parking spaces to be removed along the precinct's connector streets

- Co-locate future bus stops close to safe pedestrian crossing points: Continue to locate bus stops close to safe pedestrian crossing points to minimise the walking distance to bus stops.
- Extend existing bus routes through the precinct: There are numerous bus routes that terminate close to the precinct periphery. There are opportunities to extend these bus routes through the precinct, along arterial roads and connector streets, terminating at key locations such as Cranbourne Station
- Establish new direct bus routes with high service frequencies: Existing bus routes are poor in quality due to indirect route alignments and low service frequencies. There is a need to provide a greater number of bus services that travel directly to key locations across a wider service span

6.4 Vehicle access

Existing plans indicate the following infrastructure to support vehicle movements and parking within the Croskell (Employment) precinct.

- Improved road network permeability: The northern half of the precinct adopts a dense connector street spacing through the precinct. These routes offer alternative routes for local residents and workers to access the site, while the east-west connector street provides internal connectivity, as well as 'last-mile' alternative to Thompsons Road. Through-moving vehicles are unlikely to use these connector streets as speed limits will be lower and offer only one traffic lane in each direction
- Facilitates neighbourhood trips by reinforcing the 'one-mile grid': Extending Casey Fields Boulevard as a connector street through Croskell provides connectivity between the precinct and the larger (primarily) residential land uses to the south. This reduces unnecessary east-west movements and frees up the main north-south primary State arterial roads to cater for longer distance trips
- Safe and signalised intersections: Signalised traffic intersections are provided along all locations where primary State arterial roads intersect with connector streets. This provides safer locations to undertake turning and road-crossing movements. This is particularly important along Thompsons Road which will see higher freight vehicle volumes given its PFN status
- Appropriate on-street parking: On-street spaces for car parking are provided along every connector and local street. This provision ensures that visitors who arrive by car are always ensured a convenient and space to store their vehicle, if parking restrictions are set to appropriately manage availability during peak demand periods. Care should be taken not to over-supply car parking such that restrictions are not required or more than 20% of spaces are always vacant. An outcome of low on-street occupancy would illustrate a waste of resources, more expensive development, reduced sustainability, increased urban heat island effect, reduced road safety and more expensive to maintain infrastructure.

Challenges and opportunities

There are a number of challenges that may inhibit the safe and efficient movement of vehicles through the precinct. These challenges, as well as potential opportunities are outlined below.

- Vehicle dependence leads to increased traffic congestion: Future land uses in Croskell are not highly accessible by active and public transport. There are no nearby train stations and

local bus routes do not connect the likely employees directly into the Croskell (Employment) precinct. Low density development expands the distance between destinations and makes walking trips less likely to be feasible. Opportunities for linked trips (e.g. a person walking home from work, stopping by a post office and grocery store) are limited as most of the precinct is zoned for singular land uses. A restricted ability to meet multiple travel needs via active and public transport will lead to a higher vehicle mode share and greater congestion on all roads to, from, and within the precinct

  - Encourage developments to incorporate varied land uses: Reducing the distance between different land use types encourages shorter trips, which are more easily completed via active modes, and reducing the demand for private vehicle travel
  - Improve access by active and public transport modes: Bettering active and public transport infrastructure, particularly to sites with a higher density of trips (commercial and retail zones), will ease vehicle volumes anticipated due to the development

- The Victorian Desalination Plant HV cable limits north-south connectivity: The VDP cable increases the cost and complexity of road links between the north and south halves of the precinct. As a result, it's infeasible for Croskell (Employment) PSP to match the 400m-800m spacing observed in other surrounding areas. Along Croskell's 3.3km length, this would equate to 3 – 7 road connections, all of which would need to cross the VDP cable
  - Support Casey Fields Boulevard's critical role providing connectivity across the VDP cable easement: The precinct's central north-south connector street is essential in connecting the precinct to the surrounding neighbourhood. It splits the 3.3km-long barrier, assists balancing east-west and north-south travel movements, and facilitates economic connections between the precinct and the greater region
  - Develop Casey Fields Boulevard as a two-lane road with a high-quality shared user path: The road should be developed with only one lane in each direction to minimise the impact on the VDP cable. The road cross section should include a high quality direct shared user path so that if traffic congestion does occur on Casey Fields Boulevard, the active transport options are abundantly clear for all car drivers to see. This is the best way to encourage those who can, to use active transport for local trips.

7 PSP Guidelines alignment assessment

Proposed plans are assessed against the precinct's ability to support existing features, principles, and targets within the VPA's "Precinct Structure Planning Guidelines: New Communities in Victoria" document. Key features related to transport planning are discussed below, including:

- Safe streets and spaces (Feature 4)
- Movement and Place (Feature 5)
- Walkability and safe cycling networks (Feature 6)
- Public transport (Feature 7)
- Well-connected to public transport, jobs & services within the region (Feature 8)
- Local employment opportunities (Feature 9)
- Green streets and spaces (Feature 11)

Each feature contains multiple principles, selected to form our assessment criteria. Several relevant targets were also identified, including:

- The arterial road network should provide a 1.6km road grid with safe and efficient connections, adjusted where necessary to reflect local context (Target 5)
- Off-road bicycle paths should be provided on all connector streets and arterial roads, connecting with the Principal Bicycle Network and Strategic Cycling Corridors where possible (Target 6)
- All streets should have footpaths on both sides of the reservation (Target 7)
- Pedestrian and cyclist crossings provided every 400-800m, where appropriate, along arterial roads, rail lines, waterways and any other accessibility barriers (Target 8)
- 95% of dwellings should be located within one of the following walking distances (800m to a train station, 600m to a tram stop; or 400m to a future bus route or bus capable road) (Target 9)

Each of these items are discussed on alignment in the following sections.

7.1 Safe streets and spaces (Feature 4)

There is a need to ensure that future streets and public spaces support the proposed density and housing expected in the PSP. Transport relevant principles within this feature include:

- *The design of the public realm should ensure these spaces feel safe and are inviting to pedestrians and cyclists (F 4.2)*
- *Permeability of the street network for pedestrians and cyclists and direct access routes to services and facilities should be a feature of the street and path network in precincts. Heightened permeability should be considered in areas where a higher intensity and density of land uses are proposed (F 4.3)*

The current plans align with the feature and principles through the following infrastructure design treatments:

- Footpaths appropriately buffered away from roadways
- Canopy coverage along connector and local streets

- Safe and segregated bicycle lanes are provided along all arterial and connector streets
- Alignment of walking and cycling corridors (along connector streets) with safe arterial road crossing locations

Some additional considerations have been identified to ensure that the proposed development meets the principles, including:

- Enhance pedestrian permeability around higher-order land use zone areas (such as commercial, retail, and mixed-use zones)
- Increase the frequency of safe pedestrian crossings to the 400m spacing specified in Target 8 for higher-order land use areas and arterials
- Strategically align pedestrian crossings with the precinct's main pedestrian and bicycle riding corridors

7.2 Movement and Place (Feature 5)

The future transport network needs to balance the competing roles of movement with the aspirational place vision of an area. Transport relevant principles within this feature include:

- *Adopt a 'movement and place' approach to identifying an arterial and connector street network that provides a supportive context for the proposed type and intensity of land uses (F 5.1)*
- *Land should be planned and reserved for the future expansion of transport network needs (including other uses such as stabling yards). The minimum appropriate number and width of traffic lanes should be based upon its anticipated level of service and should consider the 'place' role of the network (F 5.2)*

The VPA has not applied the Movement and Place Framework to develop aspirational classifications for each street in the proposed plans. Existing and proposed infrastructure treatments indicate an aspirational outcome for each of the different modes.

A high-level evaluation of these existing and future infrastructure treatments suggests the following Movement and Place Framework outcomes:

- Higher walking and place classifications along streets that traverse through commercial, retail, and mixed land use zones. There is a need to ensure that the surrounding built form and footpath treatments respond to the higher classification brought on by higher pedestrian volumes
- Higher cycling classifications along segregated bicycle riding corridors that are provided along the precinct's connector streets. There is a need to secure these aspirational classifications by reducing the number of conflicts with roadways and footpaths
- Higher bus classifications need to be assigned along precinct connector streets that will be made bus capable. This indicates that there may need to be further infrastructure treatments to provide bus stops if required
- Higher bus classifications could be assigned along Berwick-Cranbourne Road and Narre Warren-Cranbourne Road as they have been identified as PPTN/priority routes. There may need to be future considerations to install bus priority infrastructure to facilitate efficient movement of buses through congested road segments

The most appropriate number of traffic lanes, their width and design of other cross section details will need to take the Movement and Place Framework objectives and aspirational classifications into account, as required by *Feature 5.2* above.

During the detailed design phase, the aspirational classifications and Movement and Place Framework (M+PF) objectives are a more important consideration than the forecast traffic volumes and potential for traffic congestion. This is because, quite deliberately the M+PF aims to balance the expenditure and focus across all modes and specifically encourages traffic congestion in locations where this would make the road safer, and the place more amenable and enjoyable.

While acknowledging the likelihood of congested traffic conditions on the surrounding network, the appropriate planning response is to ensure that best efforts are put into reducing the demand for car travel it places on the road network (rather than adding additional traffic lanes). This is the only way to achieve the vision for the Croskell (Employment) precinct and objectives of planning in Victoria.

The points for consideration for Croskell are:

- The need to reduce demand for car travel while providing connectivity for local trips without using the primary State arterial road network is only further reinforced by the forecast congestion levels outside Croskell
- Two-lane road cross sections are proposed for all local and connector streets within Croskell, improving amenity for other travel modes and reducing attractiveness of rat-running. This feature of the current PSP should be retained on the expectation that the intensity of development will also result in higher-level place aspirations for these areas
- Future increases in traffic lanes may lessen the amenity and safety of a street. This may become an issue if there are visions to create highly walkable and pleasant environments where retail and commercial land uses align the precincts primary State arterial roads, of which may see high levels of traffic congestion and heavy volumes of freight

7.3 Walkability and safe cycling networks (Feature 6)

Croskell should provide high amenity, safe, accessible, direct, and comfortable walking and cycling environments. This will encourage active transport uptake and create better places for people. A transport relevant principle within this feature includes:

- *Streets should be carefully and deliberately designed (in terms of their scale, design speeds, configuration and landscaping treatments) to respond to the site context (i.e. topography, natural features), proposed land use context (i.e. future urban form, intensity of activity) and to support early habits for walking and cycling (F 6.1)*

The current plans align with the feature and principle through the following infrastructure treatments:

- All arterial and connector streets include footpaths and segregated bicycle paths
- Off-road paths connect with green spaces in most cases
- Higher-order land uses are located close to bus stops and bicycle riding corridors
- Bus stops on arterial roads are co-located with signalised crossings providing safe crossing opportunities
- Connector streets are limited to two lanes which is conducive to creating pleasant, human scale, non-car-dominated environments

Some additional considerations will help the proposed development meet the principles, such as:

- Consider the impact of future primary State arterial road upgrades on public spaces. Complexities may arise where high amenity pedestrian spaces are sought along corridors that also function as primary State arterial road and freight corridors. There is a need to ensure that future road infrastructure works are not to the detriment of these public spaces
- Decrease spacing of signalised pedestrian crossings to 400m as defined in the guidelines, particularly along arterial roads that travel through higher-order land use zones
- Ensure future developments identify the critical role that build form has in enhancing the attractiveness of the public realm for pedestrians, through active street frontages, buildings built to the property boundary and car parking set towards the rear of each property
- Consider provision of raised crossings where bicycle riding lanes and footpaths intersect side streets that branch off from arterial and connector streets
- Consider maximum building setbacks of zero and ensure parking is not put between the property boundary and building frontage as this does not comply with the Commonwealth Disability Discrimination Act as it prioritises people without a disability over those that have a disability and cannot drive

The built form and building setbacks along streets will provide an aesthetic contribution to streetscapes that can make the street appear more attractive. Some of the above considerations are also required to comply with legislative requirements on access for people with a disability. The built form will be determined at subsequent stages of the planning and approvals process.

7.4 Public transport (Feature 7)

Areas with higher intensity land uses tend to support higher levels of public transport service. These should be able to efficiently connect people to, from, and between key destinations and major trip generating facilities. Croskell is proposed to have many larger trip-generating facilities. Future public transport services should aim to shift travel journeys away from being made by private vehicles to mitigate traffic congestion. Transport relevant principles within this feature include:

- *The public transport network identifies public transport as the preferred means of transport, when cycling or walking is not possible or practical (i.e. distance or physical mobility) (F 7.1)*
- *Provision and timing of the public transport network should consider the likely development staging of the PSP area; and its role in facilitating higher intensity uses (F 7.2)*

The current plans align with the feature and principles through the following infrastructure treatments:

- Higher-order retail and commercial land uses have been located along the precinct proposed PPTN bus corridors
- All connector streets have been made bus capable, of which can enable local bus routes to operate through the middle of the precinct

Additional considerations to ensure the development meets the principles include:

- Consider extending the existing bus network through the precinct. This will better connect local residents to the new destinations that are provide in the Croskell precinct, improving transport choices and reducing the need for car trips to and through the precinct

- Ensure that future bus routes are high in frequency and provide direct access through residential catchment areas where future workers are likely to live. This will encourage greater public transport uptake (and reduce future vehicle volumes)
- Bus-priority infrastructure (bus-only lanes and queue-jump lanes) will be required along congested road segments to improve public transport efficiency, reducing operational cost and reducing traffic congestion

7.5 Well-connected to public transport, jobs & services within the region (Feature 8)

Future economic activity areas and places of employment should be highly accessible by public transport. A transport relevant principle within this feature includes:

- *Protect existing and future priority freight routes from conflicting land uses (F 8.4)*

The current plans align with this principle through the following infrastructure treatments:

- Residential land uses have been buffered away from Thompsons Road, which has been designated as part of the Principal Freight Network

However, in alignment with this principle, future development planning should consider:

- The need to achieve high-amenity place outcomes in commercial and retail zones next to freight routes. Given that Thompsons Road is a Principal Freight Network route, adjacent areas will require purposeful place planning in order to meet this feature's objective
- The need to consider and prioritise freight movements along Thompsons Road given its PFN status. This may limit the degree of which future developments may be considered appropriate and also whether priority public transport infrastructure can be created (given that it reduces road space for freight vehicles)

7.6 Local employment opportunities (Feature 9)

Local employment opportunities should be supported by ensuing that employees are afforded the ability to travel via. public and active transport. A transport relevant principle within this feature includes:

- *Locate and design mixed-use residential and employment areas to ensure residents and employees have access to public and active transport, local community and retail services, and open space (F 9.1)*

The current plans align with the feature and principle through the following infrastructure treatments:

- Mixed land use zone is located along a connector street, which can facilitate direct and safe active travel movements. The western-most section of the zone is located within the Narre Warren-Cranbourne Road PPTN corridor
- Higher-order employment areas (retail and commercial land uses) are provided along bus capable arterial roads

Additional considerations to ensure the development meets the principles include:

- Proposed mixed land use zone does not have strong public transport accessibility because detail of how the bus network might be extended into the area is not yet clear. The Department of Transport and Planning will need to develop bus network expansion plans very quickly in order to ensure the bus network planning, costing and funding is complete in time for services to start once development is complete

- There is a lack of higher-density residential areas within a walkable distance to deliver the activity levels required to make a place vibrant. To increase local employment, there need to be a highly walkable environment AND a significant number of local residents (thus making walking the obvious choice for a high volume of people). We recommend some of the residential activity, particularly in areas close to public transport stops enable an intensity that yields 150 people per hectare which is the intensity required to create local employment opportunities
- Future bus network reforms should aim to provide improved levels of service and quality to encourage greater public transport uptake to higher-order land uses located along key corridors. This will enhance public transport access to employment opportunities

7.7 Green streets and spaces (Feature 11)

Streetscape and public realm treatments should deliver safe, comfortable, high amenity, and resilient environments. The quality of the public realm is a critical component that encourages walking as a mode of travel. A transport relevant principle within this feature is:

- *Design of the public realm, public infrastructure amenity and open space should support climate change adaption, and be designed to encourage passive surveillance by adjoining land uses and activity consider the movement and place function of roads and streets (F 11.1)*

The current plans align with this feature and principle through the following infrastructure treatments:

- Canopy tree planting along connector and local streets will make walking more pleasant and help to mitigate the impacts of climate change
- Regular and frequent tree planting along connector and local streets also creates visual obstructions that narrow a driver's field of vision and slow their driving. They also tend to obscure signage that would otherwise be distracting to drivers

Additional considerations to ensure the development meets the principles include:

- Future built form should engage with the public realm and provide passive surveillance along streets. This is particularly important along the precinct's most direct walking routes, which will consist of connector streets and off-road walking and bicycle riding corridors

7.8 Arterial road network (Target 5)

The following target was identified within the PSP Guidelines:

- *The arterial road network should provide a* 1.6km road grid *with safe and efficient connections, adjusted where necessary to reflect local context (Target 5)*

The existing arterial road network surrounding Croskell is provided through primary State arterial roads that are spaced each 3.3km in each direction. Planning for Linsell Boulevard as a secondary arterial road will enable the 1.6km arterial grid spacing to be realised for east-west links.

The precinct's central north-south street (aligned with Casey Fields Boulevard) is identified as a connector street within the Croskell (Employment) PSP – a departure from the desired regular 1.6km arterial spacing.

However, it is reasonable to make contextual adjustments as the target adds. Building this link as a connector street within Croskell (rather than a secondary arterial) is consistent with the existing boulevard cross sections of William Thwaites Boulevard (north) and Casey Fields Boulevard (south) to

which it will connect. However, there may be future works to establish Casey Fields Boulevard as a secondary arterial road.

It would be unreasonable to omit the connection altogether, as this would leave the entire 3.3km length of the precinct without a vehicular connection to the south, and would disproportionately isolate the precinct from surrounding land uses. Furthermore, this road will provide a key connection between Casey Fields and Casey Central Activity Centre, with the business and commercial land uses that are provided within the Croskell (Employment) precinct and along Thompsons Road. Future local bus services can then be consolidated along this corridor given the higher-density of high-order land uses.

7.9 Off-road bicycle paths (Target 6)

The following target was identified within the PSP Guidelines:

- *T6 –* Off-road bicycle paths *should be provided on* all connector streets *and arterial roads, connecting with the Principal Bicycle Network and Strategic Cycling Corridors where possible (Target 6)*

Off-road bicycle paths have been provided on all connector streets. These paths also connect with significant off-road links, such as the diagonal running Melbourne Water Pipe Track which is being developed as a key regional bicycle riding corridor.

Similarly, the proposed plans connect a shared user path from east to west along the electricity Transmission Lines easement connecting to existing paths east of Berwick-Cranbourne Road and west of Narre Warren-Cranbourne Road.

The proposed plans therefore align with this target.

7.10 Footpaths (Target 7)

The following target was identified within the PSP Guidelines:

- *T7 – All streets should have* footpaths on both sides *of the reservation (Target 7)*

All streets within the precinct are set to provide footpaths on both sides of the road, as per the designs provided on the connector and local street cross sections. The proposed plans align with this target.

7.11 Pedestrian and cyclist crossings (Target 8)

The following target was identified within the PSP Guidelines:

- *T8 – Pedestrian and cyclist* crossings provided every 400-800m*, where appropriate, along arterial roads, rail lines, waterways and any other accessibility barriers (Target 8)*

Crossing opportunities are set to be provided approximately every 800m along Thompsons Road. Pedestrian crossing facilities are provided at a greater frequency (approximately every 400m) along Narre Warren-Cranbourne Road and Berwick-Cranbourne Road.

There could be further consideration to increase pedestrian crossing frequencies along Thompsons Road and along the precinct's connector streets, particularly where higher pedestrian volumes are likely to occur, such as around activity centre and primary school access routes.

7.12 Access to public transport (Target 9)

The following target was identified within the PSP Guidelines:

- *T9 – 95% of dwellings should be located within either of the following walking distances (800m to a train station, 600m to a tram stop; or 400m to a future bus route or bus capable road) (Target 9)*

Some residential dwellings along the utility easement will be more than 400m away from a bus capable road. However, commuters are often willing to walk greater distance to a bus stop if there is a high service frequency. This can be achieved for potential bus routes that travel along nearby PPTN corridors (Berwick-Cranbourne Road and Linsell Boulevard).

These locations that are beyond the 400m, walking distance threshold should be the lowest density residential areas in the whole Croskell (Employment) precinct, with higher residential density in close proximity to the bus stops helping to offset these low-density pockets. This will also help to ensure that overall, the proportion of dwellings located outside the 400m walking catchment is less than 5%.

8 Summary Conclusions

Key conclusions from this transport assessment are summarised below.

8.1 Existing conditions

The precinct presently contains remnant, largely unused former farmland, an intensive smallholding, concrete plant and a few other land uses fronting Thompsons Road. There is minimal significant existing traffic generated by the land uses, and there are no public road accesses into the precinct.

Surrounding areas are mainly residential and are quite recently developed as part of the Growth Area.

The surrounding primary State arterial road network carries significant and growing traffic volumes, with greater traffic intensity to the north and north-west. Thompsons Road is an important truck route. Recent and planned road improvements are ongoing in tandem with residential growth. Road crashes are quite frequent, with particular concentrations on Thompsons Road and Narre Warren-Cranbourne Road.

Public transport in the area is limited to bus services, mostly quite low frequency. There are no railway stations within walking distance; Cranbourne, Merinda Park and the future Cranbourne East stations are 2-3km away, while Narre Warren and Berwick stations are about 6km away to the north.

Several Principal Bicycle Network (PBN) links are planned nearby, including from:

- Berwick to Cranbourne through the precinct along the Melbourne Water pipe track
- Merinda Park Station to Clyde North along the electricity Transmission Line easement.

There are also several Strategic Cycling Corridors (SCC) nearby, located along Narre Warren-Cranbourne Road, Berwick-Cranbourne Road, and Linsell Boulevard.

8.2 Issues, Constraints and Opportunities

Transport issues and constraints to the development and future function of the Croskell (Employment) precinct include the high-speed, busy primary State arterial roads, the low density of surrounding development that reduces viability of the limited bus network and services all of which contribute to a high dependence of private vehicles and a lack of transport options or choices.

However, there are some good opportunities to integrate active transport links with existing links that venture into surrounding areas, and to extend and improve the bus services through Croskell and onwards. This will open up new north-south and east-west access opportunities across multiple modes.

The commercial, business and industrial activities in the Croskell (Employment) precinct will increase local jobs, potentially reducing the distance that locals need to travel for work. However, this will also need the support of other 'activating' land uses to make Croskell a more complete 'place' for workers and residents alike.

8.3 Traffic demand and implications

Using traffic generation assumptions typical of comparable areas in Melbourne, the precinct could generate about 58,400 vehicles per average weekday once fully developed. Most of the travel demand will be generated to and from places to the north and north-west from Croskell, adding significantly to the already high and fast-growing traffic volumes Thompsons Road and Narre Warren–Cranbourne Road.

Strong measures including very high-quality pedestrian and bicycle infrastructure with prioritised crossings across all streets will be needed to ensure the development is inclusive and compliant with existing legislation. Actions to improve transport choices should also help to reduce car use and traffic congestion generally. In addition, some parts of the Croskell (Employment) precinct (particularly those in close proximity to key public transport corridors and mixed-use destinations) could have higher intensity of residential development to increase the level of pedestrian activity in the area.

8.4 Integrated Transport Assessment

This Integrated Transport Assessment assesses the VPA's proposed plans (delivered at the time of preparing this report) and cross sections against the ability to deliver positive transport modal benefits, and abide by Features and Targets set out in the VPA PSP Guidelines document.

Transport modal assessment insights

Key transport modal benefits generated through proposed VPA plans include:

- Footpaths and bicycle riding infrastructure are generally well provided within proposed precinct plans
- Canopy tree planting will beautify the public realm and mitigate urban heat island effects, making environments more pleasant for pedestrians
- Footpaths and connector streets meet directly with safe signalised crossing points. Bus stops have also been co-located where safe pedestrian crossing opportunities exist, therefore reducing walking distances for bus commuters
- Permeability for vehicles has been improved through the establishment of new direct connector streets that travel through the Croskell (Employment) precinct. Appropriate streetscape treatments will reduce unnecessary through-movement by vehicles on long-distance trips

Additional consideration should be given to a range of opportunities, including to:

- Provide wider footpaths where higher volumes of pedestrians are anticipated, such as commercial, retail and mixed land use zoned areas
- Increase the provision of safe crossing opportunities across arterial roadways that travel past zones where higher volumes of pedestrians are anticipated
- Ensure all intersections include raised pedestrian crossings to slow vehicles down and improve pedestrian priority
- Improve access by public transport by extending existing bus routes serving the precinct and establishing higher frequency services on direct bus routes
- Consider bus priority infrastructure along congested segments of the road network (particularly along PPTN indicated segments)
- Reduce traffic congestion by encouraging active and public transport uptake

PSP Guidelines alignment insights

Key areas of alignment between the proposed VPA plans and PSP guidance document include:

- Safe streets and public spaces are being supported by pedestrian and bicycle riding infrastructure, in alignment with Feature 4. Footpaths and bicycle lanes are buffered from roadways, more safe road crossing opportunities are being provided, and canopy coverage seeks to beautify public spaces

- Priority pathways for each transport mode (to create balanced movement and place networks) have been identified on precinct plans. This includes dedicated bicycle lanes (inclusive of shared paths) on all arterial and connector streets and the identification of bus capable roads
- Improved walkability and safe bicycle riding pathways have been implemented, in accordance with Feature 6. This includes the provision of footpaths on all streets, direct and continuous bicycle riding lanes, and roadway designs to minimise car dominance on connector streets and arterial roads
- The proposed plans indicate attempts to encourage public transport usage through land use development and infrastructure provision, in alignment with Feature 7. This was achieved through the clustering of higher-order land uses along proposed bus capable PPTN corridors, and the decision to make all precinct connector streets bus capable
- There was a specific need to protect sensitive land uses against freight traffic, as indicated within a sub-feature under Feature 8. This has been achieved by ensuring that residential developments are buffered away from major freight corridors (Thompsons Road)
- All residential and employment areas have access to active and public transport options, and local community services and goods, in alignment with Feature 9. This was achieved through the clustering of higher-order land uses along arterial and connector streets, that will serve as bus capable roads (some highlighted as PPTN corridors)
- The design of the public realm has been developed to adapt against climate change, in alignment with Feature 11. This will be achieved through planting canopy trees along all local and connector streets

Additional consideration could be given to ensure alignment with some **Features** of the VPA PSP 2.0 Guidelines, including:

- Increase the provision of safe road crossing opportunities along arterial and connector streets, and consider implementing raised crossings at unsignalised crossing points. This should enhance walkability and safe bicycle riding in line with Feature 6
- Increasing bus service frequency particularly along the PPTN corridors in line with Feature 6
- Installing bus priority lanes on congested roads. This should encourage more people to consider public transport as a viable option when traveling to and from the precinct in line with Feature 7, note that some of this could be achieved through bus only access links such as right turns for bus only at some locations
- Review the location and carefully plan out the development of commercial and retail zones located next to primary State arterial roads, given the need to buffer sensitive land uses away from Principal Freight Network corridors. Improving this outcome will ensure alignment with Feature 8
- Consider how future built form engage with the public realm and provide passive surveillance along streets. This should enable support safe public spaces in line with Feature 11
- Ensure adequate continuous lighting in areas of expected higher pedestrian activity, primary bicycle routes, bus stops and crossing locations, while minimising the impact of light pollution on nighttime ambiance, residential properties and wildlife

There were mixed outcomes in terms of alignment with transport relevant **Targets** set within the VPA PSP 2.0 Guidelines too. Alignment outcomes are outlined below:

- *The arterial road should provide a 1.6km road grid with safe and efficient connections (Target 5)*

  The mid-precinct N-S road (aligned with Casey Fields Boulevard) is identified as a connector street within the Croskell (Employment) PSP – a departure from the desired regular 1.6km arterial spacing. However, this is consistent with the existing boulevard cross sections of William Thwaites Boulevard (north) and Casey Fields Boulevard (south) to which it will connect. The PSP supports this corridor as a vital local connection between Casey Fields precinct and the business, commercial and residential land uses within the Croskell and north of Thompsons Road.

- *Off-road bicycle paths should be provided on all connector streets and arterial roads (Target 6)*

  The proposed plans are in alignment as off-road road-adjacent links have been provided along all required roads, and off-road pathways seek to connect with multiple SCCs

- *Footpaths are to be provided on both side of all road reservations (Target 7)*

  The proposed plans are in alignment with this target

- *Pedestrian and cyclist crossing are to be provided every 400m-800m where appropriate along arterial roads and other accessibility barriers (Target 8)*

  The proposed plans are generally in alignment, although there are opportunities to increase the frequency of crossing opportunities along Thompsons Road and along connector streets

- *95% of dwellings should be located within 400m walking distance to a future bus route or bus capable road (Target 9)*

  The proposed plans are generally in alignment, except small pockets of low density residential along the precinct's southern boundary. There are opportunities to increase service frequencies on surrounding bus capable roads, as many bus users are willing to walk greater distance if services are highly frequent

Overall, the proposed plans meet most requirements found within the VPA guiding documents, and are evidently providing transport infrastructure across all modes.

Some additional considerations have been identified to maximise access to the precinct and minimise future traffic congestion. These include further active and public transport infrastructure improvements, and additional considerations on how proposed land use zones and built-forms can be better integrated with future transport infrastructure and needs.