

**ADDITIONAL INFORMATION 19 - AMENDED OVERSHADOWING AND VIEW
ANALYSIS**

MATILDA BAY BREWERY



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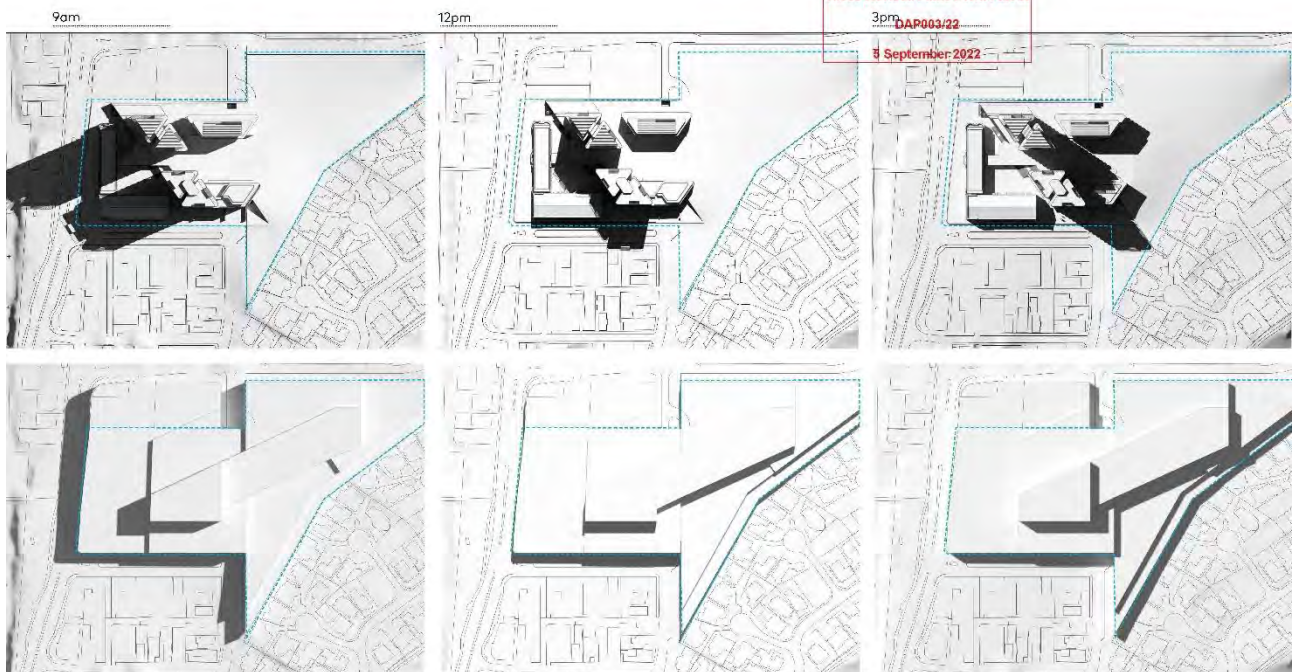
SHADOW DIAGRAMS AND VIEW ANALYSIS

SEPTEMBER 2022

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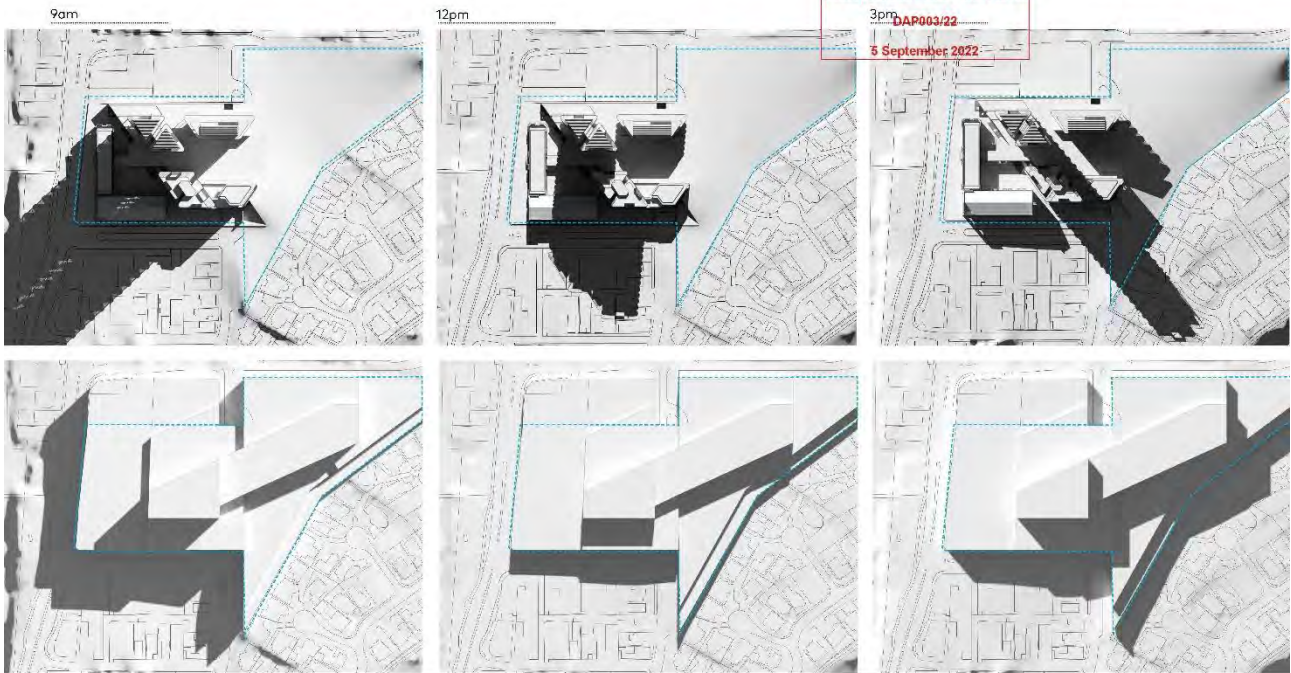
3 Oceans Property Pty Ltd

Built Form and Scale
Shadow Diagrams
21st March Comparisons



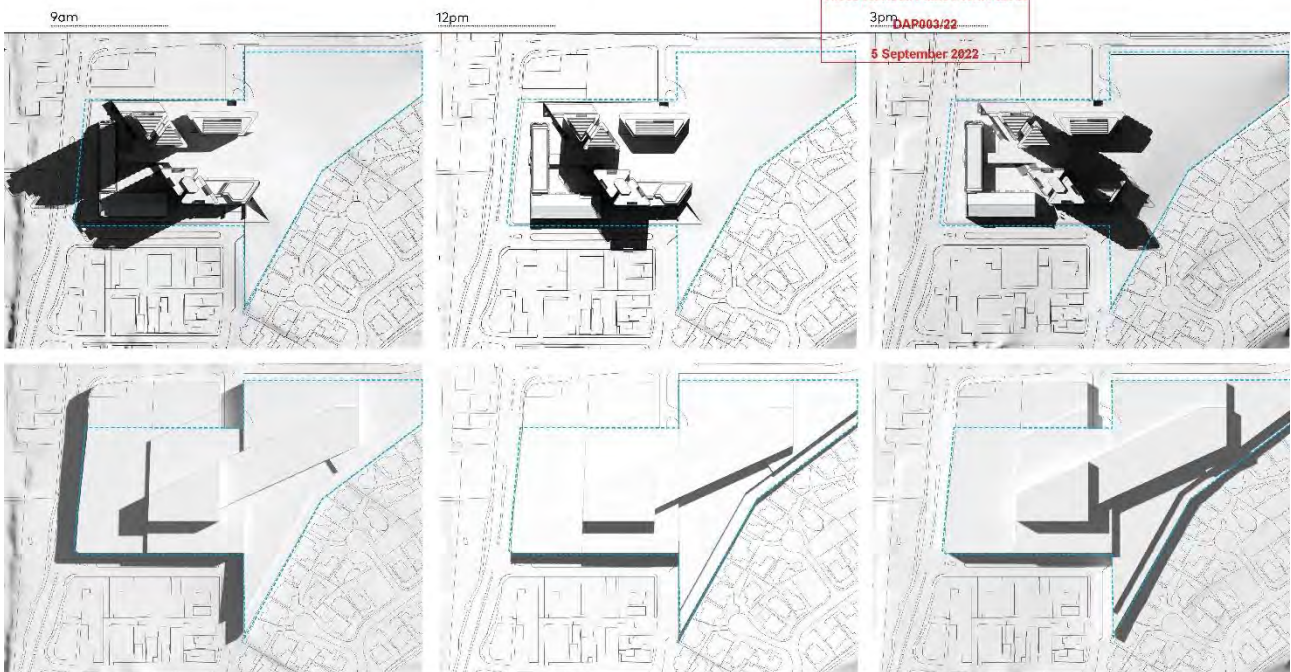
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CITY OF FREMANTLE
These Revised Plans Form Part of
DAP003/22
5 September 2022



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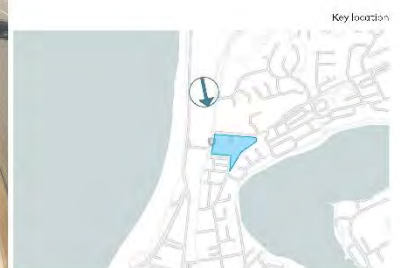
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5 September 2022

Built Form and Scale
View Corridor Analysis
 Mt Lyell Park
 Existing Circumstance



Proposed Scheme



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Built Form and Scale
View Corridor Analysis
 Buckland Hill - Obelisk
 Existing Circumstance



Proposed Scheme



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**ADDITIONAL INFORMATION 20 - CITY OF FREMANTLE HERITAGE IMPACT
ASSESSMENT**

Heritage Impact Assessment - Internal

Name: Ford Motor Co. Factory (Fmr.)
Other Names: Matilda Bay Brewing Co. (Fmr)
Address: 130 Stirling Highway, North Fremantle
Application number: DAP003/22
Proposal: Demolition, alterations and additions to heritage buildings and construction of three new tower blocks on a raised podium
Requesting officer: Erik Dybdahl
Date: 13/10/2022



130 Stirling Highway, part of Landgate aerial map 2021, CoF ESRI.

INTRODUCTION

The purpose of this heritage comment is to assess the changes to the place that are proposed in DAP003/22 and the affect that they will have upon the heritage values of the former Matilda Bay Brewing Co. / Ford Motor Co. Factory. The proposed changes include:

- Construction of three residential towers on the eastern side of the site upon a large podium containing carparking and other facilities
- Crane Bay building (1929 & 1947)
 - Demolition of the 1947 section and 3.6m of the original 1929 section.
 - Extension of 1980s mezzanine floor for entire length of building.

- New masonry parapet wall to east elevation
- Modifications to south and east elevations
- Retention of copper brewing kettles inside building
- Office Building (1929)
 - Retention of west (Stirling Highway) and north façades and demolition of east wall, roof, ceilings and all internal timber framed glazed partitions, masonry walls etc
 - modification of west and north façades including removal of parts of pediment above entry, lowering window sills etc
 - Addition to east side of building with new north wall replicating design and detail of façade
 - Construction of new upper floor over Office building and new addition
 - Link bridge from new upper floor to tower podium level
- Factory Building (1929)
 - Demolish all

HERITAGE LISTINGS

State Register of Heritage Places

The place is not included in the State Register of Heritage Places but it has been identified as a place of interest to the Heritage Council.

Inherit

Inherit Database number - 03649

Heritage List and LHS

Ford Motor Co. (fmr.) is included on the Heritage List and the Local Heritage Survey. The place has the highest management category, Level 1B – Exceptional Significance – Not State Listed. "The City of Fremantle has identified this place as being of exceptional cultural heritage significance in its own right within the context of Fremantle and its conservation is required. It is recommended that this place be considered for entry in the Heritage Council of Western Australia's Register of Heritage Places."

Heritage Area

Ford Motor Co. (fmr.) is part of the North Fremantle Precinct Heritage Area which was designated as a Heritage Area in accordance with clauses 7.2.1 and 7.2.9 of Local Planning Scheme No. 4.

RELEVANT PREVIOUS DEALINGS

Recent meetings or discussions:

- City of Fremantle Design Advisory Committee
- Site visit October 2022

Previous relevant DAs:

- DA0725/09 Partial demolition – refer below for detail

Previous relevant legal dealings:

- N/A

BACKGROUND

Historical Information – North Fremantle

The following information on the industrial and residential development of North Fremantle was taken from the Inherit database:

The North Fremantle area proper did not develop until after the arrival of the convicts in 1850. In 1851, Captain J. Bruce, commanding officer of the pensioner guards, was granted 150 acres in the area and allotments were surveyed and allocated to the pensioner guards, who accompanied the convicts. Other places associated with the Convict Establishment period include the North Fremantle Convict Depot (on site of fmr North Fremantle School, and North Fremantle Railway Station) and the construction of the Fremantle-Perth Road.

With the impact of the goldrushes in the 1890s and 1900s, in particular the huge growth in population and the increase in prosperity, North Fremantle began to develop as a residential area. However, with the construction of the Rocky Bay Quarries in 1892 and the completion of the Inner Harbour in 1897, there were also opportunities for the development of industry, trade and commercial businesses in North Fremantle. Since the first decades of the twentieth century, North Fremantle has functioned as a mixed residential and medium to light industrial area.¹

The railway corridor created a separation of the more coastal parts of the peninsula from the more estuarine land. Relatively large portions of land were taken up for Railway uses; stores, works, future expansion, etc. Most of this was on the ocean side of the main railway line. Harbour works also consumed large portions of land and the originally settled lots between Lilburn Road and Lukin Road were resumed for intended Harbour works.

The impact of the railway initially was to provide better communication and accessibility for people and goods however its location ultimately became a divisive element with a predominately industrial character established to the west on the sand dune topography of the coast. A predominately residential character was established to the east by subdivision of the original Pensioner Lots on the limestone hills and alluvial flats. The rapid residential and industrial development coupled with the establishment of local government established a strong sense of local community and identity.

In the Gold-rush era industry developed with the establishment of the Fremantle Steam Laundry (1897), Burfords Soap factory (1905), Fergusons Timber Yard, Pearse Bros., yard, Victorian Galvanizing Iron Co., the Government Abattoirs at Port Beach (1907), Mount Lyall Mining Railway Company (later CSBP) and the State Engineering Works at Rocky Bay (1913). In the Inter-War era industrial development in North Fremantle was reflected in such landmark buildings as; The Great Southern Flour Mills (Dingo Flour), the Weeties factory, the Ford Factory, the Vacuum Oil Company, and the long corrugated iron sheds along North Quay, Port Beach and Leighton Beach.

The industrial development of North Fremantle, particularly west of the railway line and north of the Dingo Flour Mill intensified in the Inter-War period. The redevelopment of residential areas combined with the impact of the Great Depression led to the decline of North Fremantle as a residential suburb. By 1939 sixty-six per cent of the council's rates collections were from industrial concerns.²

¹ North Fremantle Heritage Study, 1993

² North Fremantle Heritage Study, 1993

Between 1950 and 1965 Fremantle Port was modernised and upgraded under a new General Manager of the Fremantle Harbour Trust, F. W. E. Tydeman. Tydeman implemented a program of mechanisation, containerisation and expansion of the port. Works in the Inner Harbour were focused on North Quay which was developed for handling general cargo with the construction of the North Quay Transit Sheds, improved methods for handling grain, modification of berths for roll on roll off ships and the installation of seven new quay cranes.³

Port Beach Road was constructed in 1960 and land was acquired in North Fremantle to expand the port and to upgrade railway facilities. In 1959 the Leighton Marshalling Yards were constructed and in 1961 work commenced on the realignment of the railway and construction of a new rail bridge to allow the north quay to be extended further eastward. Tydeman Road was constructed in the 1970s linking Port Beach Road to the new traffic bridge further upstream. These works gradually removed residential development east of the railway and by 1971 only one house left to the west of the railway line.⁴

The long period of port expansion and modernisation triggered by the agricultural and mineral booms of the 50s and 60s ended in the 1970s. In the 1980s and 1990s industry began to leave North Fremantle for industrial estates on the outskirts of the metropolitan area. The State Engineering works closed in 1987 followed by other businesses such as the Ford Motor Company, Harvest Road Iceworks, the Weeties factory, Bradford Insulation, Dillingham Shipyards, Precision Marine, Phillips and Joinery Works.⁵

The deindustrialisation of the suburb coincided with renewed interest in the place and its heritage values. This led to the redevelopment of post-industrial sites and the adaptive reuse of industrial buildings and warehouses.

Individual property history – Ford Motor Co. North Fremantle Assembly Plant

The following information was taken from the Local Heritage Survey listing for the place in the Inherit database.

In 1929, the Ford Motor Company had a factory built in North Fremantle. The factory was built to a standard Ford design, but did include the involvement of local architects, Oldham Boas and Ednie Brown. The building's modernist design influences place it at the forefront of factory design in Western Australia at the time.

Ford in Australia was part of Ford (Canada) as tariffs were not raised against imports from other Commonwealth countries. At the time, Australia was a good market for cars, with the third highest per capita ownership behind the United States and Canada. The Fremantle site was chosen because of its proximity to Fremantle Harbour, the railway line and roads. Chassis were sent by sea from Geelong in Victoria (Ford's largest factory in Australia) and the bodies were shipped from Canada. Later, cars were shipped ready made from Melbourne and, as cars now only required a clean and spray of paint where they had been damaged, staff numbers were reduced. According to workers, the Fremantle factory followed the Ford Motor Company principles of working to the clock and the glass front of the office allowed management to keep an eye on the workers.

The factory operated until 1987 when it was sold to Alan and John McGillvary of the Mac's food centres. They initially planned to turn the factory into shops and housing, with part of the building used as a museum. However, their plans changed and in 1988, Brewtech (Matilda

³ HCWA Register Entry, Victoria Quay, Fremantle, March 202

⁴ North Fremantle Heritage Study, 1993

⁵ North Fremantle Heritage Study, 1993

Bay Brewery) submitted an application to the City of Fremantle to use the existing ex-warehouse (Ford Motors) as a brewery warehouse, office and visitors' centre. The works involved the relocation of sales, marketing and warehousing to the site, involving the construction of cool rooms and refurbishment of the existing offices, construction of brewery plant (including new site access and refurbishment of the existing building) and construction of a visitors' centre. Previously located in Nedlands, in 1988 Matilda Bay Brewing's speciality beer market was one of the fastest growing in Australia. In 1996, the site was short listed in the Fremantle Awards New Development Category.

The place has been identified by the Heritage Council of Western Australia as being worthy of consideration for entry in the State Register of Heritage Places (March 2004).

This place was included in the 'North Fremantle Heritage Study' (1994) as a place contributing to the development and heritage of North Fremantle. It was also included in the list of heritage places in the City of Fremantle identified by the Fremantle Society (1979/80) - RED -significant for contributing to the unique character of Fremantle.

The design of the North Fremantle Ford Factory shares many of its design characteristics with other Ford assembly plants built around the world and in Australia in the first half of the 20th century.

The design of the Ford Factory is ascribed to local architects Oldham Boas and Ednie Brown. However, from photographic evidence of other Ford sites in Australia, it is clear that a relatively consistent design was used. The design style owes much to American architect, Albert Kahn. Kahn's 1909 design of the Highland Park plant for Henry Ford was significant for the automotive industry and wider industrial practice, as the place where Ford developed his assembly line method of construction of the Model T. Kahn also designed the massive River Rouge Plant for Ford in 1917 which grew into the largest manufacturing complex in the US with a workforce which peaked at 120,000. Because of the success of his designs, characterised by large volumes of unobstructed space and light, Kahn was commissioned by other manufacturers in the United States and in it is claimed that by 1938 his firm was responsible for the 20% of all architect designed factories in the US.⁶

Albert Kahn made a major contribution to the design of factories in America in the 20th century and the success of America's automobile industries. Kahn produced factory designs based on the use of what were at the time new building materials – reinforced concrete and steel. He also improved the natural lighting and ventilation of factories by enlarging windows and the extensive use of roof lights which became known as his "daylight factory" design.

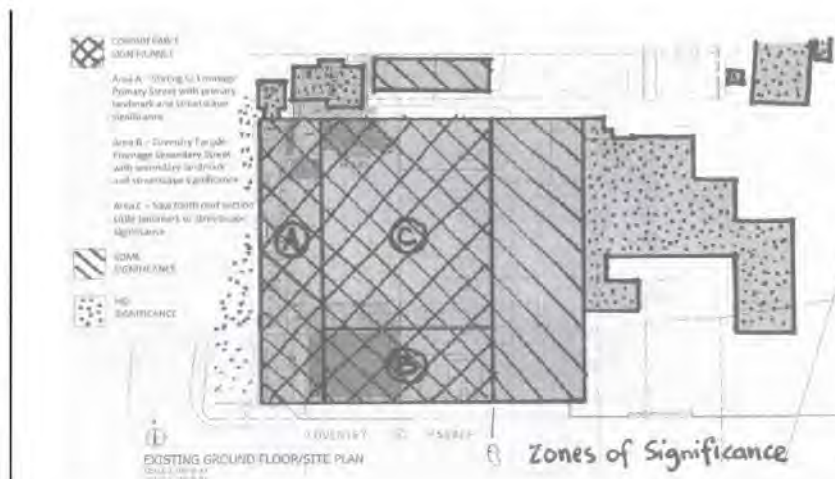
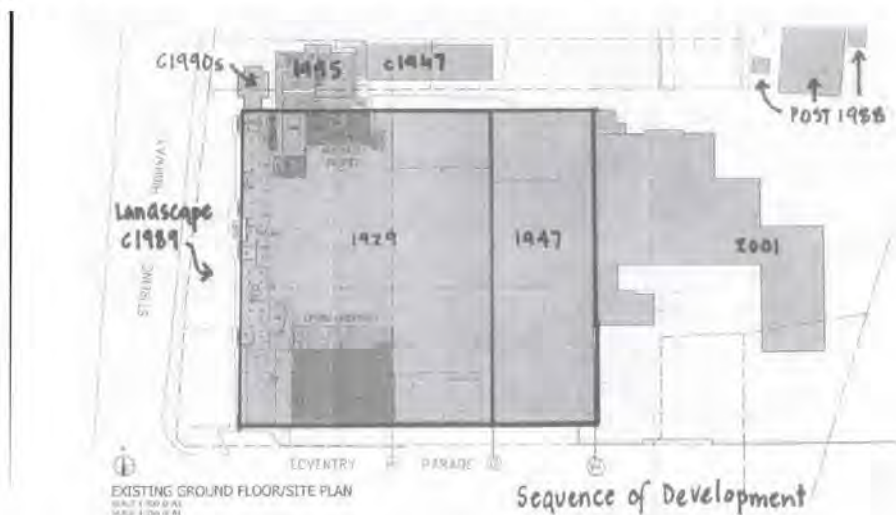
In 2004 130 Stirling Highway was nominated for the State Register of Heritage Places. In 2008 the Heritage Council determined that the place did meet the threshold for State Registration and a period of consultation was undertaken with the owners. This process was placed on hold pending further consultation with the then owner. The place is not currently on the State Register but the place is considered a place of interest to the Heritage Council.

In 2009 development application DA0725/09 was received for the partial demolition of the buildings on site. The original proposal was to demolition of the rear half of the building complex to the east of structural grid line K including the 1947 additions and half of the

⁶ Archival Record for 130 Stirling Highway, Stephen Carrick Architects, 2011

1929 original section. This proposal was not acceptable to the City of Fremantle or the Heritage Council of Western Australia. An external heritage assessment of the place commissioned by the City of Fremantle identified the sequence of development of the place and graded the significance of the building fabric based upon the statement of significance. The original 1929 section of the building including the Administration Wing, the Factory Wing and the Crane Bay wing were all graded as being of Considerable Significance and the 1947 additions were graded as being of some significance. Post 1947 additions and buildings were graded as having Little Significance.

Revised plans were submitted for DA0725/22 which retained all of the 1929 section of the Crane Bay wing and retained some of the 1947 section. Planning approval was granted in 2010 on the condition that the retained sections of the building were conserved including structural remediation of timber trusses in the retained two bays of the Factory wing.



Further historical research was carried out as part of the Archival Record prepared by Stephen Carrick Architects in September 2011 prior to the partial demolition of the building. Parts of this are included in the Heritage Impact Assessment by Stephen Carrick Architects, 2022.



Ford Factory, 1935, Stewart Gore, State Library of WA



North Fremantle Ford Factory, 1936.

Sequence of development

	<u>1929 - 1947</u> Landgate aerial photograph, 1947 showing the 1929 Ford Factory with working additions commencing on the 1947 additions.
	<u>1948 – 2010</u> Landgate aerial photograph, 1954 showing the completed Ford Factory building.
	<u>2011 – 2022</u> Landgate aerial photograph, 2011 showing the demolition of half of the original 1929 saw tooth truss Factory building and the 1947 additions. This is the extent of remaining fabric in 2022.

Comparative examples in Australia

	<u>Victoria</u> Geelong Ford Assembly Plant, the first Ford factory in Australia was constructed in 1926 and became the model for the other smaller plants across Australia. Ford closed this plant in 2016 and in 2019 it was sold for use as a 'hi-tec' hub – more recently used as a vaccination centre. Photo 1935, Ford Australia Archives
	Administration building at Norlane, Geelong prior to 2016. Note the similarities in the architectural style and detailing to the façade between Norlane and North Fremantle buildings..
	<u>South Australia</u> In 1926 Ford Australia established an Assembly Plant at the Largs Bay industrial area, near Port Adelaide. The plant was closed in 1965 and has since been <u>demolished</u>.
	<u>Queensland</u> Ford Assembly Plant Eagle Farm Queensland (photo 1936). The plant was closed in 1998 and <u>demolished</u> around 2016.

	<u>Western Australia</u> North Fremantle assembly plant constructed in 1929. Photograph 1936.
	<u>New South Wales</u> The Ford Motor Company assembly plant was first established at Sandown. In 1935, operations in New South Wales were relocated to a new site at 350-374 Parramatta Road, Homebush. The factory was closed in 1994 and was used as a Linfox distribution centre before being redeveloped as the Campus Homebush Business Park in 2005

USA

	Ford Motor Company Assembly plant, Richmond California. The largest plant on the west coast of the USA it closed in 1965 and was redeveloped as a cultural centre in 2018. While the scale of this plant is much larger the Australian examples the key component parts of the factory and stylistic and design influences are clearly similar.
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Physical Description

The following information was taken from the Local Heritage Survey listing for the place in the Inherit database:

Large volume factory with single storey office area attached. The former Ford Factory building is constructed of rendered masonry with large expanses of small pane windows. The factory frontage is dominant on the Stirling Highway frontage. It has a large pyramidal shaped parapet wall. It presents a classical balance of horizontal banding and vertical brick pilasters former by the recessed vertical glazed panels. In contrast to the dominant factory frontage, the offices provide a horizontal counterbalance. The single storey office frontage is as for the factory frontage, symmetrical and classically proportioned. The entrance is centrally located and recessed with a flat suspended canopy over it. A mosaic tile rectangular detail located in the parapet responds to the geometric shaped detail in the gable parapet of the factory front. Although now painted over the building is red brick with stone and stucco horizontal banding. It is an example of the Inter war Stripped Classical style of architecture.

The Ford Motor Co, (Fmr.) is made up of three main parts, the Administration Wing (facing Stirling Highway), the Workshop Wing (behind Administration) and the Factory Wing (corner of Stirling Highway and Coventry Parade).



HERITAGE IMPACT ASSESSMENT

Impact on the Ford Motor Co. (Fmr) / Matilda Bay Brewing Building (Fmr)

The proposed development of Ford Motor Co. (Fmr) at 130 Stirling Highway was assessed against the following values identified in the statement of significance for the place prepared by HCWA in 2008:

Matilda Bay Brewing Company Building (Ford Motor Co.), an industrial complex consisting of a single storey brick and iron administrative wing attached to a steel and timber framed open factory space clad with corrugated steel and glass in the Inter War Functionalist style, has cultural heritage significance for the following reasons:

The place is a rare and intact example of a large scale purpose-built industrial building in the Inter War Functionalist style with simple geometric shapes, asymmetrical massing and steel framed windows;	Major impact
The place has considerable landmark value as an imposing physical presence on a prominent site on Stirling Highway;	Minor impact
The place is associated with two key business activities in Western Australia: the assembly of motor vehicles and the development of the micro brewery;	Major impact
The place is associated with the practice of the Federal Government requisitioning factories to supply military equipment during World War Two, and the migration scheme which saw new migrants employed in a variety of jobs in the post-war boom;	Major impact
The place is an important element in the industrial landscape of North Fremantle, demonstrating industrial practices in the area both past and present;	Major impact
The place is associated with the founders of the Matilda Bay Brewery, Phillip Sexton and Gary Gosetti, whose successful small brewery fundamentally changed the marketing and retailing of traditionally brewed beers in Western Australia; and	No discernible impact
The place is associated with the prominent and prolific architectural firm of Oldham Boas Ednie-Brown.	No discernible impact

Impact on Significance

The impact of the proposed development of the place has been assessed using the heritage values from the ICOMOS Burra Charter, 2013:

Aesthetic value	Major impact	Condition	No discernible impact
Historic value	Medium impact	Integrity	Major impact
Scientific value	No discernible impact	Authenticity	Major impact
Social value	No discernible impact	Historical evolution	No discernible impact
Rarity	Major impact	Streetscape	Major impact
Representativeness	Major impact		

Statement of Significance for the North Fremantle Heritage Area

The proposed development of the place was assessed against the following values identified in the statement of significance for the North Fremantle Heritage Area:

North Fremantle is significant as a mixed residential and industrial area located to the north of the Swan River and the Port of Fremantle with a history of European settlement dating back to the Pensioner Guards in the mid nineteenth century. It has cultural heritage significance for the following reasons:

Its connection with the Convict Establishment, convict built public works and the Pensioner Guards whose former Barracks and settlement were located in the area;	No discernible impact
its unique topography located between the river and the ocean which contributes to its unique character;	Minor impact
its role in World War II defences with the establishment of the Leighton Battery;	No discernible impact
its concentration of mainly modest workers accommodation dating from the Federation and Inter-War periods together with some pockets of more substantial development around areas such as Brucetown;	No discernible impact
its focus on the industries relating to the Port of Fremantle, the railways and associated industries established in the area;	Major impact
its former industrial character resulting from the former Leighton Marshalling Yards, State Engineering Workshops and other industries such as the Dingo Flour Mill, the Ford Motor Factory etc;	Major impact
because of its association with boat building and the marine industry.	No discernible impact
its cultural diversity resulting from successive periods of migrant settlement in the area;	No discernible impact
its long connection with places of recreation including Leighton and Port Beaches together with the Swan River banks and beaches and the Gill Fraser Oval	No discernible impact
surviving natural landforms located at Cypress Hill and the cliffs and cave limestone formations of Rocky Bay together with remnant indigenous flora in these areas	No discernible impact

HERITAGE IMPACT COMMENTS

Loss of Heritage fabric and heritage value.

The current proposal is not acceptable because of the loss of historic building fabric of considerable and some significance and the loss of the significant industrial character. (Refer Burra Charter Article 15)

The Ford Motor Co (Fmr.) is a highly significant piece of the industrial heritage of Western Australia and Fremantle and a major contributor to the heritage character of the North Fremantle Heritage Area. The place is part of a bigger historic story of the automotive industry in Australia and across the world. The place has high authenticity, rarity and representativeness values

The heritage building at 130 Stirling Highway is made up of three parts, the Administration Wing (facing Stirling Highway), the Workshop Wing (behind Administration) and the Factory Wing (lining Coventry Parade). As a part of the assessment of DA0725/09 for partial demolition of the heritage buildings in 2009 a Heritage Assessment graded the significance of the elements of the place and found that the 1929 sections of the three wings all have Considerable Heritage Significance and the 1947 additions have Some Significance. The three wings combine to create a significant complex which demonstrates the story of the Ford Assembly Plant in North Fremantle and later the Matilda Bay Brewing Company. The retention of all three wings makes the complex more significant and allows the full storey of the place to be understood and interpreted.

In 2009 the partial demolition proposal was initially refused by the City of Fremantle and the Heritage Council because the extent of demolition was considered excessive. Revised drawings were later approved which allowed the demolition of the 1947 section of the Workshop wing and half of the 1929 section on the condition that the remaining heritage fabric of Some and Considerable significance was conserved.

The current application proposes extensive demolition of fabric of considerable and some significance. Much of the 1929 Administration Wing will be demolished with only the Stirling Highway façade and north façade being retained. The entire remaining section of the 1929 Workshop Wing including the distinctive roof lights and sawtooth parapet which is visible from Stirling Highway will be demolished. The entire remaining 1947 section of the Factory Wing and part of the 1929 section of the Factory Wing will also be demolished. The design and finishes of the refurbishment and additions to the retained heritage fabric does not respect the industrial character of the place but responds more to the character of the new residential towers proposed for the site.

The decision to build a roof top bar over the 1929 Administration Wing is the cause of much of the loss of the original heritage fabric of the Ford Motor Co. (Fmr.) including:

- Rear wall, internal walls, ceilings and roof of the Administration Wing
- Entire remaining section of the Workshop Wing including the sawtooth parapet wall

The size of the podium for the new towers has also resulted in the loss of much original heritage fabric including:

- Remaining section of 1929 Workshop Wing

- Remaining 1947 section of Factory Wing including original curtain wall glazing and part of the 1929 section

Administration Wing

The proposed works to this wing result in an unacceptable loss of fabric and overwhelm the scale of this single storey building. These works will reduce the heritage values of this part of the building.

1. The extent of demolition of this wing is unacceptable. The current proposal seeks to demolish the roof, ceiling, rear wall (east) and all internal walls and partitions. The only items that appear to be retained are the street façade and the north wall. Generally, this level of demolition is a poor approach to conservation because of the high loss of heritage fabric reduces the value of the place and its potential to interpret the historic and social values of the place.
2. The ground floor addition to the rear of the wing roughly doubles the footprint of this wing. Externally the addition appears to exactly replicate the finishes and details of the façade so that the east wall facing into the 'courtyard' is now almost identical to the façade - this creates the illusion that the original wing was originally a much bigger structure. This approach is poor conservation practice because it erases the earlier industrial character of the rear wall of the building and because it is difficult to differentiate between old and new building fabric. (Refer Burra Charter Article 22).
3. Modifications to façade. The extent of modification of the façade is somewhat unclear and there are some inconsistencies between the plans, elevations and perspectives regarding the extent of modification. While the modification of a limited number of windows to doors is acceptable, modifying the parapet over the entrance to the wing to provide views from the upper floor is not acceptable because of the loss of significant design features such as the pediment form and mosaic tile inlay.
4. Loss of the distinctive stepped parapet to the rear wall of the administration wing. This parapet wall is part of the roof lights to the Workshop Wing which area a key feature in the design of Ford Assembly plants in Australia and around the world. This parapet is visible from Stirling Highway and contributes to the aesthetic composition of the main facade of the complex.
5. Upper floor addition. Revised drawings have reduced the scale of the upper floor bar but it still overwhelms the single storey Administration wing and detracts from the dynamic and distinctive asymmetrical composition of the street façade. Importantly, this addition necessitates the removal of the distinctive saw tooth truss roof parapet and the entire Workshop Wing behind together with much of the Administration Wing which will substantially reduce the significance of this heritage place and its ability to interpret its historic and social values.
6. Removal of internal glazed timber partitions and ceiling panels with timber cover battens. The timber partitions and ceiling in the Administration Wing appear very similar to those in historic internal photos of administration areas in other Ford Assembly plants suggesting a standard design. While there has been modification of the internal partitions over time some the original form could be accurately reinstated because of the survival of some original partitions and all ceilings which show the original partition arrangement. The loss of these elements will reduce the authenticity of the building and its heritage value. While refurbishment of this

building for a new hospitality use will require internal alterations, the retention of some partitioning and the ceiling treatment should have been explored.

 Ford Motor Co viewed from Stirling Highway – Note the distinctive sawtooth parapet detail of the skylights to the	 Original proposal with dominant roof top bar addition requiring demolition of much of the Administrative and all the Workshop Wing.  Revised scheme with roof top bar reduced in scale but still requiring same demolition
 Detailing to front entrance with distinctive design similar to other Ford assembly plants in Australia.	 Loss of distinctive design features - Large openings cut in pediment and parapet remove significant design features.
	

North-west corner of Administration wing showing how it is a narrow 'façade' concealing the Workshop wing behind	Proposed additions to the Administration Wing double the width of the wing and replicate the original wind disguising the extent of original fabric and confusing the history of the place.
	
Rear (east) wall of Administration Wing viewed from inside the Workshop Wing showing the utilitarian finishes typical of industrial buildings of the era and the sawtooth truss skylights.	New east wall to Administration Wing additions which replicate the design and detailing of the west façade disguising the industrial nature of the place and the extent of original fabric.
	
Glazed timber partitioning to interior of Administration wing – all partitions, ceilings and other internal features will be demolished.	Historic photograph of glazed timber partitioning to administration area of Ford offices in Long Beach, Los Angeles County showing standard detailing in Ford buildings.
	
Historic drawings and close inspection of the interior of the Administration Wing reveal changes to internal partitioning including reuse of original material and addition of new material to match original detailing. This work	Original ceilings with decorative mouldings, cornices and vents are intact within the Administration Wing. The ceilings provide clear evidence showing how the partitions have been modified over time to suit new

is in accordance with good conservation practice where additions are sympathetic but discernible as new on closer inspection.	requirements but provide good evidence to allow an accurate reconstruction if required.
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Workshop Wing

The demolition of the two remaining bays of the 1927 Workshop Wing with its distinctive saw tooth trusses and roof lights will reduce the heritage significance and authenticity of the Ford Motor Co. complex because it removes a key element of the Ford assembly plant. The ability for the building fabric to interpret the historic use of the place will be substantially reduced.

From a heritage perspective, a better solution would have been to retain the Workshop Wing and refurbish it as part of the hospitality venue in the Administration Wing.

 Ford Motor Co. (Fmr) viewed across Stirling Highway – the parapet walls to the distinctive roof lights are clearly visible.	 Ford complex Geelong showing roof lights visible above main entrance.
 Workshop Wing viewed from the east – the back wall was constructed following the removal of the other half of this structure c. 2010	 Proposed new additions constructed on site of Workshop Wing (original drawings)
 Interior of Workshop Wing showing complex timber trusses and roof lights	 Historic photo of Interior of assembly building, Ford Motor Company, Long Beach, Los Angeles County

Factory Wing / Crane Bay

The Factory Wing was functionally important in the car assembly process as it contained a gantry for moving large crates of components and parts along the assembly production line. The wing was also visually important in the aesthetic composition of the place. With the scale and massing of the wing providing a dynamic contrast to the horizontal Administration Wing and anchoring the overall composition of the main façade.

- The proposed demolition of the 1947 section of the Factory Wing and 3.6 m of the 1929 section will result in a loss of original fabric and will reduce the scale of the large south façade which has such an imposing presence in Coventry Parade.
 - o The loss of part of the 1929 section will remove part of a bay resulting in an awkward termination at the east end of the elevation.
 - o The 1947 section is graded as having Some Significance and is important as the last remaining part of the 1947 additions which are associated with Post-War industrial development and the return of the plant to the assembly of civilian vehicles. The glazing in this part of the building is the only remnant of the original curtain wall system used in these factories and has a distinctive pattern of small panes with regularly spaced hopper sashes for ventilation.
- New External openings - The modification of the Coventry Parade facade to create new entrances is acceptable in principle if change to original and early fabric is minimised and new openings work with the existing structural grid.
- New wall treatments - The modification of the lower half of the North facade to install new glazing where the Factory Wing adjoined the Workshop Wing is acceptable. New glazing should be sympathetic with the existing glazing and structural grid but it should be subtly different so it can read as a modern change.
- Upper floor - The retention of the Matilda Bay Brewery mezzanine and copper tanks provides an opportunity to interpret the history of the Matilda Bay Brewery. However, it more important to interpret the original car assembly use and the enormous scale of the building by retaining some area(s) of its full height space. The proposed refurbishment will install a new upper floor for the full extent of the space with no area of full height space.
- Loss of Industrial character – this is an industrial building, and this special character needs to be retained. Perspectives of the proposed new interiors suggest a gentrified interior with polished timber floor boards and ceiling linings.



Interior of Factory Wing, 2022



Interior of similar space converted into a performance space at Long Beach, Los Angeles.



Glazing to south elevation of Factory Wing. Original small pane glazing to 1947 section and replacement glazing to 1929 section.



Detail of original small pane glazing to 1947 section of Factory Wing which is proposed for demolition.



Factory Wing, 2022



Factory wing in 1935 showing original glazing

North Fremantle Precinct Heritage Area

The statement of significance for this heritage area states that – “North Fremantle is significant as a mixed residential and industrial area located to the north of the Swan River and the Port of Fremantle with a history of European settlement dating back to the Pensioner Guards in the mid nineteenth century”. The heritage values that are closely associated with 130 Stirling Hwy include:

- its unique topography located between the river and the ocean which contributes to its unique character
- its focus on the industries relating to the Port of Fremantle, the railways and associated industries established in the area;
- its concentration of mainly modest workers accommodation dating from the Federation and Inter-War periods together with some pockets of more substantial development around areas such as Brucetown;
- its former industrial character resulting from the former Leighton Marshalling Yards, State Engineering Workshops and other industries such as the Dingo Flour Mill, the Ford Motor Factory etc;

Appropriate retention, conservation and interpretation of the historic Ford Motor Factory buildings will make a major contribution to the heritage value of the North Fremantle Precinct and its significant mixed residential and industrial character. As discussed above there are issues with the proposed works regarding the demolition of significant heritage fabric, the loss of authentic industrial character and unsympathetic additions to the roof of the building.

New development on this site should respect and respond to the built form character of the area and its significant streetscapes. The heritage impact of the proposed development has been considered against the recommendations of the recently adopted policy LPP3.6 Heritage Areas – section 3.6 Infill Development. Please note that this is a generic policy that has been adopted to provide broad guidance for all the heritage areas in Fremantle until each area has been reviewed and a specific policy written, however, the intent of this section of the policy is described below:

New buildings within a heritage area should respect and complement the heritage significance of the area. A respectful design approach gives special consideration to the siting, scale, architectural style and form, materials and finishes of the proposed development in relation to its neighbours, without copying historic detailing or decoration. New infill buildings should respond sympathetically to the heritage values of the heritage area as a whole, and also to that part of the heritage area in the vicinity of the proposed development. Imaginative, well designed and harmonious construction is encouraged.

The existing characteristics of the immediate streetscapes and areas surrounding 130 Stirling Highway include:

- North of 130 Stirling Highway. This area includes 140 Stirling Highway and other large industrial sites where carefully designed façade buildings address the main street frontage and simple industrial sheds with uniform heights and repetitive roof forms extend behind to largely cover the entire site. These buildings are a key feature of the character of this heritage area.

- East of 130 Stirling Highway. The site of the former State Implement Works has been redeveloped in the last 20 years as a suburban area of substantial free-standing houses. This area has little heritage significance within the context of the North Fremantle Heritage Precinct and should not influence the design of new development.
- South of 130 Stirling Highway. This area includes several streets of traditional housing from the Federation and Inter-war eras where modest single storey houses with pitched roofs and front verandahs address the street and form a coherent streetscape. Buildings have simple rectangular plan forms and are placed parallel to the site boundary. These buildings are a key feature of the character of this heritage area.

The proposed infill development with a podium base supporting three towers with triangular and diamond shaped floor plans does not respect and compliment the established urban form of the area or the character of its surrounding streetscapes. The scale and form of the buildings, their dissociation from the established street grid and the use of contrasting materials and finishes does not respond sympathetically to the established historic context of the North Fremantle Heritage Area.

RECOMMENDATIONS:

Generally, this proposal is not acceptable on heritage grounds due to the loss of heritage building fabric and the reduction of the heritage values of this significant part of Fremantle and Western Australia's industrial heritage.

Our Ref: IEM148096 / TP1
Your Ref: DA0200/22
DAP Ref: DAP/22/02252

Enquiries to: Pacey Lang 9383 6600

18 August 2022

City of Fremantle
151 High Street
FREMANTLE WA 6160

Attention: Erik Dybdahl, Senior Planning Officer

Dear Sir/Madam,

NO. 130 STIRLING HIGHWAY, NORTH FREMANTLE (FMR MATILDA BAY BREWING COMPANY SITE) – TOWN OF MOSMAN PARK REFERRAL RESPONSE

The Town of Mosman Park (**the Town**) thanks the City of Fremantle (**the City**), the opportunity to comment on the referred Development Assessment Panel (**DAP**) application on the proposed mixed use development at Lots 5 and 220 Stirling Highway (No. 130), Lots 12 and 253 McCabe Place and Lot 221 Thompson Road, North Fremantle (**the subject site**).

The Town would like to draw your attention to the following comments regarding the proposal as follows:

- Bulk and Scale;
- Context and Character;
- Heritage Adaptation;
- Landscaping;
- Car parking; and
- Traffic Management.

Bulk and Scale

The Town is aware that the subject site forms part of a Development Area known as 'Development Area No. 18' in the City of Fremantle's Local Planning Scheme No. 4 (**LPS4**) and is subject to a Structure Plan approved by the WAPC in October 2020 and Local Planning Policy 3.11 'McCabe Street Area, North Fremantle – height of New Buildings' (**LPP 3.11**).

The mixed use development proposed departs significantly from the primary controls of the R160 density code outlined in the Structure Plan approved for the subject site and maximum 17.0m building height outlined in LPP 3.11.

The combination of the following the plot ratio and building height variations outlined below:

- Plot ratio of 2.19 in lieu of 2.0;
- Tower 1 building height of 73.4m or 16 storeys in lieu of 17.0m;
- Tower 2 building height of 59m or 11 storeys in lieu of 17.0m; and
- Tower 3 building height of 55.8m or 10 storeys in lieu of 17.0m.

The variations results in a development with considerable bulk and scale impacts that is inconsistent with the City's planning framework and site context.

When considering the wider context of the area and what has been recently approved by the JDAP such as:

- 19-21 McCabe Street, North Fremantle – 8 storey mixed use development;
- 11 McCabe Street, North Fremantle – 5 storey residential apartment development; and
- 9 McCabe Street, North Fremantle – 7 storey residential apartment development.

The massing and building height of the proposed 10, 11 and 16 storey towers on the subject site when viewed from the McCabe Street to the north, Stirling Highway to the west, Coventry Parade to the south and residential lots to the east, does not respond to the existing or emerging and future scale and character of the local area.

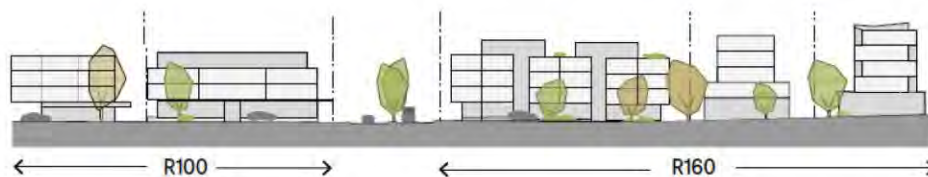
Context and Character

The R-Codes Vol. 2 provides practical guidance on what is typically considered to be appropriate urban form for higher density residential streetscapes in the context of metropolitan Perth. It identifies that higher density residential streetscapes as:

Higher density residential

Context: Higher density residential neighbourhoods are high **amenity**, predominately residential areas, located within a walking distance of a centre, **high-frequency** transport node and/or high amenity **open space**. The predominant built form is tall **apartment developments** in **landscaped streetscapes** with some mid-rise terrace style housing and walk-up apartments. The area may include **mixed use developments** that are compatible with the residential character of the area.

Character: Streetscapes retain an attractive **landscaped character** through **street** planting and landscaping of the private realm. Built form is typically 6 storeys or greater and **buildings** are separated to maintain residential amenity. Development should reflect the prevailing or planned pattern of side and street **setbacks** while taking advantage of the location, aspect and orientation of the **site**. Lower level **podiums** and **terraces** should achieve a pedestrian scale at the street **frontage**.



Based on the proposed development envelope and massing, the proposal does not fit within the current streetscape and the development is more representative of a high density urban centre. As a result, the proposal does not respond to the desired scale and

character of the surrounding streets and local area, which have been designated within the City's structure plan as Residential R160.

Heritage Adaptation

The Town appreciates the proposed work by the applicant to adapt and retention of the former Matilda Bay Brewing Co. building and Ford Factory Building. The Town is supportive of the adaptive reuses of the two buildings which will assist in promoting the cultural heritage significance of the place.

Landscaping

The Town notes that it is unclear how much tree canopy (m²) is being proposed by the development? It is recommended that the landscape architect includes a matrix with a breakdown of deep soil area, tree provisions and canopy calculations.

Car Parking

The Town acknowledges that a higher number of car parking bays are allocated to residential parking car bays of 340 car bays in lieu of 226 car bays for the residential component.

However, given the significant non-residential car parking shortfall and no dedicated visitor car parking provided (commercial car bays of 122 in lieu of 322 car bays), it is likely that this shortfall may negatively impact on the amenity and streetscape of the local residential area and impact upon the existing road network in the area. In addition, the development does not provide or have demonstrated the provision of any ACROD bays.

It is recommend that further bays are needed to avoid utilising local streets within the area as parking bays. It is considered that the proposed commercial car parking shortfall currently does not satisfy the Element Objectives of Element 3.9 of the R-Codes Vol. 2.

Traffic Management

The Town is aware of the ongoing traffic concerns and issues along the western end of McCabe Street towards Stirling Highway that has been consistently raised by residents from the Town and City.

The Town has engaged and undertaken a comprehensive peer review of the Traffic Impact Assessment (TIA) for Stage 1, TIA for Stage 1 and 2 and the Parking Management Plan (PMP) for Stage 1 by a qualified senior traffic and road safety engineer from i3 Consultants.

The Town has attached a copy of each of the following peer reviews undertaken by i3 Consultants and a high number of recommendations that need to be addressed by the applicant as follows:

- Peer review of TIA for Stage 1: a large number of identified issues, resulting in **38 recommendations** (refer to Attachment 1).

- Peer review of TIA for Stages 1 and 2: a number of identified issues, resulting in **11 recommendations** (refer to Attachment 2).
- Peer review of PMP for Stage 1: a number of identified issues, resulting in **9 recommendations** (refer to Attachment 3).

In summary the TIAs and PMP prepared by Stantec fail to assess the traffic and parking impacts correctly and in detail, making it very difficult to identify appropriate measures to address the impacts, resulting in the most significant issues being the:

1. Failure to undertake video surveys and modelling as per the Main Roads requirements;
2. Failure to undertake the TIAs in accordance with the WAPC requirements;
3. Failure to assess the requirement for an internal link road as per the City's LPS4; and
4. Failure to provide commentary (and hence warrant) on why there is an excess in residential parking that cannot be used for the assessed 'undersupply' of non-residential parking.

Should you have any further queries, please contact Pacey Lang, Principal Statutory Urban Planner on 9383 6600 or alternatively PLang@mosmanpark.wa.gov.au

Yours sincerely,



Ross Minett
Chief of Urban Planning and Development

Enclosed: Attachment 1: Peer review of TIA for Stage 1 by i3 Consultants
Attachment 2: Peer review of TIA for Stages 1 and 2 by i3 Consultants
Attachment 3: Peer review of PMP for Stage 1 by i3 Consultants



MATILDA BAY BREWERY – STAGE 1

LOTS 5 & 20 STIRLING HWY, LOTS 12, 253 & 314 MCCABE PL, LOTS 218,
219 & 221 THOMPSON RD, NORTH FREMANTLE

PEER REVIEW OF TRANSPORT IMPACT ASSESSMENT



Prepared by i3 consultants WA for
Town of Mosman Park

www.i3consultants.com

**Matilda Bay Brewery – Stage 1 | Lots 5 & 20 Stirling Hwy, Lots 12, 253 & 314
McCabe Pl, Lots 218, 219 & 221 Thompson Rd, North Fremantle | Peer Review of
Transport Impact Assessment**

Prepared by

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Description

A peer review of the "Transport Impact Assessment | Matilda Bay Brewery – Stage 1, North Fremantle – Issue for Development Approval" (CW1147800 / 304900169) report prepared by Cardno (now Stantec) for a Proposed Mixed Use Development (207 Residential Apartments, Restaurant/ Café, Tavern, Function Rooms, Providedore, Creative Studio and Co-working offices) on Lots 5 & 20 Stirling Hwy, Lots 12, 253 & 314 McCabe Pl, Lots 218, 219 & 221 Thompson Rd in the City of Fremantle suburb of North Fremantle.

Client

Town of Mosman Park

Project ID 2910701

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This is not an approved document unless certified below

A handwritten digital signature in black ink.

Digitally signed by David Wilkins

• Date: 2022.07.14 15:47:28
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About the Author

David Wilkins is an RTA NSW Certified Level 3 Lead Auditor (RSA-08-0178) and Main Roads Western Australia (MRWA) accredited Senior Road Safety Auditor (SRSA 0101). In addition to this, David is an MRWA accredited Crash Investigation Team Leader and Roadworks Traffic Manager (MRWA-RTM-10-RTM20). David has undertaken over 460 road safety audits in Australia since 2001 across the full range of stages from feasibility through to pre-opening, including roadworks, existing roads, schools, and mine sites.

David specialises in undertaking and preparing traffic impact assessments in accordance with either the WAPC *Transport Impact Assessment Guidelines* or Austroads *Guide to Traffic Management Part 12: Integrated Transport Assessments for Developments*. He has authored over 200 of these since 2001.

David is a member of Engineers Australia and committee member of Transport Australia society and is guided by its Charter and Code of Ethics which states that its members act in the interest of the community, ahead of sectional or personal interests towards a sustainable future. Engineers are members of the community and share the community's aspirations for Australia's future prosperity.

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EXECUTIVE SUMMARY

This document represents a peer review of the Stage 1 TIA prepared for a Mixed-Use Development on the Matilda Bay Brewery Site on the east side of Stirling Hwy just south of McCabe St.

This peer review has been undertaken as a check against the requirements of Volume 4 (Individual Developments) of the Western Australia Planning Commission Transport Impact Assessment Guidelines and Austroads Guide to Traffic Management Part 12: Integrated Transport Assessments for Developments.

The preparation of a TIA in accordance with the WAPC Guidelines is consistent with, and ensures compliance with, Clause 67(t) of the Planning and Development (Local Planning Schemes) Regulations 2015.

This peer review has been undertaken by David Wilkins, Senior Traffic & Road Safety Engineer at i3 consultants WA. David specialises in undertaking and preparing traffic impact assessments in accordance with either the WAPC Guidelines or AGTM12. He has authored over 200 of these since 2001.

This peer review has identified a number of deficiencies with the Stage 1 TIA and makes the following recommendations to address these:

1. Revise the *Stage 1 TIA* to include assessment of the requirements of the City of Fremantle's *Local Planning Scheme 4* for the site under 'DA18' as well as the previous *Structure Plan TA*, noting differences and providing commentary on these.
2. Revise the *Stage 1 TIA* to include an assessment of the forecast performance of McCabe Pl between McCabe St and the access to the development site taking into account the provision of any security gates and the impact of this on queues back to McCabe St, including revising the assessment of this intersection if this is forecast to occur.
3. Revise the *Stage 1 TIA* to include assessment of whether access from the development to the nearest bus stops and/ or railway station are direct, safe, and convenient, as per the requirements of Section 7.17 of Volume 4 of the WAPC Guidelines. (Note: this is also an important requirement of the *Parking Management Plan*).
4. Revise the *Stage 1 TIA* to show and assess the pedestrian routes to attractors and generators within a 5-minute walk of the Development Site. (Note: this is also an important requirement of the *Parking Management Plan*).
5. Revise the *Stage 1 TIA* to show and assess the cycle routes to attractors and generators within a 5-minute bicycle trip of the Development Site. (Note: this is also an important requirement of the *Parking Management Plan*).
6. Revise the *Stage 1 TIA* to include a Summary after Section 1 (Background) that includes a brief description of the development proposal, the key transport issues, potential transport impacts and any proposed modifications to the surrounding transport networks, as per guidance provided in Section 7.2 of Volume 4 of the *WAPC Guidelines*.
7. Revise the *Stage 1 TIA* to identify the 'Applicant' in Section 1.
8. Revise the *Stage 1 TIA* to include a correctly completed Checklist in Appendix A.
9. Undertake peak hour traffic movement surveys for the Stirling Hwy/ McCabe St, McCabe St/ McCabe Pl, and Stirling Hwy/ Coventry Pde intersections between 7-9 AM and 4-6 PM in 15-minute intervals



to identify actual peak hours and existing heavy and light vehicle turning volumes and use these, along with longer term data to:

- a. determine likely average annual light and heavy vehicle volumes, for the traffic models and update the *Stage 1 TIA* to reflect this.
 - b. record average delays and queue lengths and analyse these for the existing intersections to enable the SIDRA models to be calibrated to represent actual intersection operation.
10. Revise the *Stage 1 TIA* to include a description of existing site uses in Section 2.
 11. Revise the *Stage 1 TIA* to include a description of existing parking provision and demand in Section 2.
 12. Revise the *Stage 1 TIA* to include a description of the existing access arrangements in Section 2.
 13. Revise the *Stage 1 TIA* to include a description of existing site traffic in Section 2.
 14. Revise the *Stage 1 TIA* to include an assessment of existing traffic management on the frontage roads in Section 2, as per the requirements of Section 7.4 of Volume 4 of the WAPC Guidelines.
 15. Revise the *Stage 1 TIA* to include the correct peak hour data for the mid-block sites clearly identifying that this data is for the assessment peak hours and not the site's peak hours.
 16. Revise the *Stage 1 TIA* to include and assess the latest crash data, i.e., for the five-year period ending 31 December 2021.
 17. Revise the *Stage 1 TIA* to include the required definitions of floor areas used for subsequent trip generation and parking assessments, i.e., GLA or NLA.
 18. Revise the *Stage 1 TIA* to include details of the access arrangements for people arriving by public transport, bicycle or on foot as well as for people with a disability, i.e., locations of pedestrian entrances to the building, as per the requirements of Section 7.5 of Volume 4 of the WAPC Guidelines. (Note: this is also an important requirement of the *Parking Management Plan*).
 19. Revise the *Stage 1 TIA* to include details of end of trip facilities for walking and cycling (for example, lockers and showers), as per the requirement of Section 7.5 of Volume 4 of the WAPC Guidelines. (Note: this is also an important requirement of the *Parking Management Plan*).
 20. Revise the *Stage 1 TIA* to include identification of deficiencies in the surrounding transport networks, and/ or areas where improvements could be made, as per the requirements of Section 7.7 of Volume 4 of the WAPC Guidelines.
 21. Review the trip generation rates for the residential dwellings in the context of the rates that Cardno (now Stantec) has used for recent similar developments in the area and ensure that the calculations are checked and that each land use volume is rounded up and free of errors.
 22. Revise the *Stage 1 TIA* to include analysis of the development accesses as per the requirements of Section 7.12 of Volume 4 of the WAPC Guidelines.
 23. Ensure all SIDRA models are prepared in accordance with the Main Roads WA Operational Modelling Guidelines.
 24. Revise the *Stage 1 TIA* to include assessment of the impact of the development in neighbouring areas as per the requirements of Section 7.15 of Volume 4 of the WAPC Guidelines.
 25. Revise the *Stage 1 TIA* to include assessment of the impact of the development on the safety of the blackspot intersection of Stirling Hwy and McCabe St, as per the requirements of Section 7.16 of Volume 4 of the WAPC Guidelines.



26. Revise the *Stage 1 TIA* to include combined pedestrian information provided earlier in a number of separate sections into a single section and provide an inventory of existing and proposed pedestrian access and amenity, as per the requirements of Section 7.18 of Volume 4 of the WAPC Guidelines.
27. Revise the *Stage 1 TIA* to include combined cyclist information provided earlier in a number of separate sections into a single section and provide an inventory of existing and proposed cycle access and amenity, as per the requirements of Section 7.19 of Volume 4 of the WAPC Guidelines.
28. Revise the *Stage 1 TIA* to include analysis of the operation and safety of the external pedestrian/cycle networks, as per the requirements of Section 7.20 of Volume 4 of the WAPC Guidelines.



1 INTRODUCTION

i3 consultants WA has been engaged by the Town of Mosman Park (*the Town*) to undertake a peer review of the “Transport Impact Assessment | Matilda Bay Brewery – Stage 1, North Fremantle – Issue for Development Approval” (CW1147800 / 304900169) report prepared by Cardno (now Stantec) for a Proposed Mixed Use Development (207 Residential Apartments, Restaurant/ Café, Tavern, Function Rooms, Provedore, Creative Studio and Co-working offices) on Lots 5 & 20 Stirling Hwy, Lots 12, 253 & 314 McCabe Pl and Lots 218, 219 & 221 Thompson Rd in the City of Fremantle suburb of North Fremantle (*Stage 1 TIA*).

This peer review has been undertaken as a check against the requirements of Volume 4 (Individual Developments) of the Western Australia Planning Commission (*WAPC Transport Impact Assessment Guidelines* (*WAPC Guidelines* ⁽¹⁾)) and Austroads *Guide to Traffic Management Part 12: Integrated Transport Assessments for Developments* (*AGTM12* ⁽²⁾).

The preparation of a *TIA* in accordance with the *WAPC Guidelines* is consistent with, and ensures compliance with, Clause 67(t) of the *Planning and Development (Local Planning Schemes) Regulations 2015* ⁽³⁾ which state “*due regard should be given the amount of traffic likely to be generated by the development, particularly in relation to the capacity of the road system in the locality and the probable effect on traffic flow and safety*”.

This peer review has been undertaken by David Wilkins, Senior Traffic & Road Safety Engineer at i3 consultants WA.

David is an RTA NSW Certified Level 3 Lead Auditor (RSA-08-0178), Main Roads Western Australia (*MRWA*) accredited Senior Road Safety Auditor (SRSA 0101) and Qld DMR Road Safety Auditor. In addition to this, David is an MRWA accredited Crash Investigation Team Leader and Roadworks Traffic Manager (MRWA-RTM-10-RTM20). David has undertaken over 460 road safety audits in Australia since 2001 across the full range of stages from feasibility through to pre-opening, including roadworks, existing roads, schools, and mine sites.

David specialises in undertaking and preparing traffic impact assessments in accordance with either the *WAPC Guidelines* or *AGTM12*. He has authored over 200 of these since 2001.

David is a member of Engineers Australia and committee member of Transport Australia society and is guided by its Charter and Code of Ethics which states that its members act in the interest of the community, ahead of sectional or personal interests towards a sustainable future. Engineers are members of the community and share the community’s aspirations for Australia’s future prosperity.



2 PRIOR TRANSPORT IMPACT ASSESSMENTS

The majority of individual developments are part of a structure plan or subdivision for which a TIA has already been carried out. A search and review of this will provide valuable background information with respect to the transport network.

The *Development TIA* does not refer to any Structure Plan or previous TIAs.

An internet search undertaken by the author has revealed the existence of the following documents:

- Former Matilda Bay Brewery Site Structure Plan (*Structure Plan*) ⁽⁴⁾;
- Matilda Bay Brewery Redevelopment Transport Assessment (*Structure Plan TA*) ⁽⁵⁾.

The *Structure Plan* was prepared by Greg Rowe and Associates under the provisions of the City of Fremantle Local Planning Scheme (*LPS4*) ⁽⁶⁾ and was adopted by resolution of the WAPC on 6 October 2020. The *Structure Plan TA* was prepared by Aurecon and is included as Appendix 7 of the *Structure Plan*.

A review of the *Structure Plan TA* has revealed significant differences in reported transport data between it and the *Stage 1 TIA*. An example of this is provided as Figure 1 on the following page.

It is also noted that the *Structure Plan TA* recommended southbound traffic on the new McCabe Place link is limited to development access only. This recommendation was made on the basis of “ensuring that the volume of traffic associated with the development has appropriate access from the McCabe Street intersection, without impacting the other intersections further south along Stirling Highway i.e., Craig Street and Alfred Street. Also, by preventing southbound traffic through McCabe Place, the potential rat running concern during the morning peak period is removed.” The *Structure Plan TA* states that with this access arrangement, the design takes into account recommendations from both the City of Fremantle and Main Roads WA.

In addition to the above, the *Structure Plan TA* uses a microsimulation (microscopic) traffic model (Aimsun 8.0.5) whilst the *Stage 1 TIA* uses a lane based micro-analytical congestion model (SIDRA Intersection 9).

Section 2 of Part C of Volume 4 of the WAPC Guidelines states:

“The development may be part of a structure plan or subdivision for which a TIA has already been undertaken. If this is the case, the development TIA should extract the relevant information and revise or expand it as appropriate.”

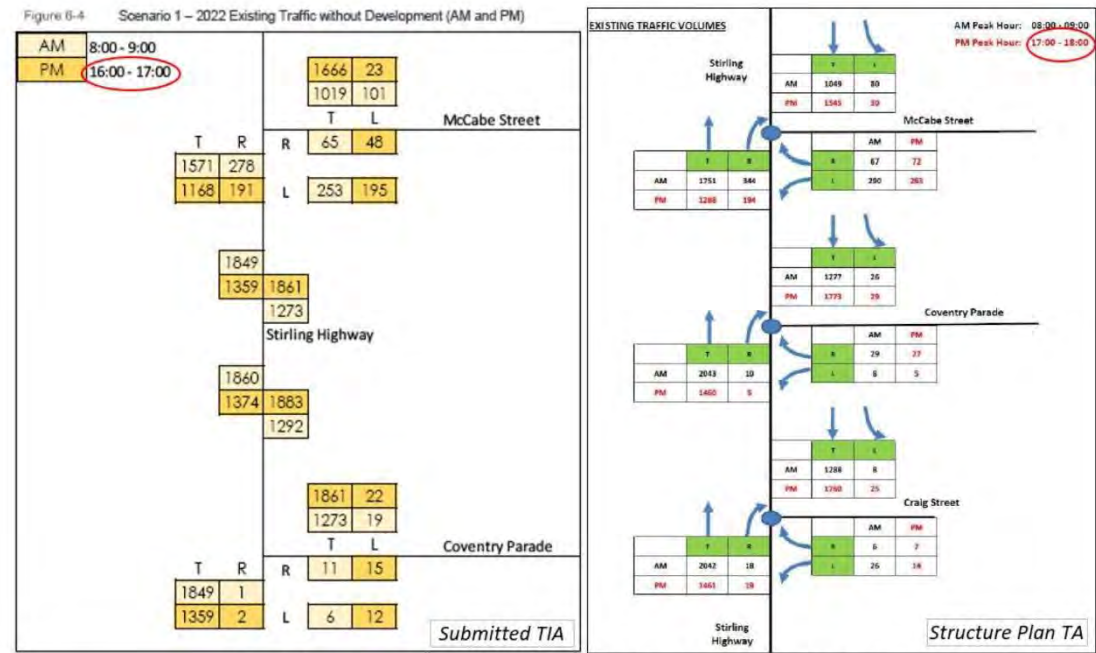


Figure 1 – Comparison between 'existing traffic data' in the Stage 1 TIA and the Structure Plan TA



A review of the Structure Plan requirements in the City of Fremantle's Local Planning Scheme 4 (LPS4⁽⁶⁾) has revealed the following:

DA 18	McCabe-Coventry Street North Fremantle and 130-138 Stirling Highway and 2-4 McCabe Street North Fremantle	1. A structure plan is to be prepared and adopted for this development area before any future subdivision or development is undertaken 2. Investigations of potential site contamination to the satisfaction of the DEC. 3. No development shall be permitted within the proposed road widening on Stirling Highway and McCabe Street as indicated in the proposed Metropolitan Region Scheme (MRS) Amendment 1210/41 or as in a finalised MRS Amendment. 4. Any structure plan for the land of No. 130 Stirling Highway (including Lot 5, 12, 218, 219, 220, 221, 314 and 253) and No. 2 – 4 McCabe Street (including Lot 9, 10 and 11), North Fremantle, is to include an internal link road connecting McCabe Street/McCabe Place to Coventry Parade/Thompson Road. 5. Development applications received prior to adoption of a structure plan, shall be assessed via Mixed Use provisions of the Scheme. Applications for any form of residential development and subdivision should be deferred until the structure plan is adopted in order that servicing, open space provision, environmental remediation and other issues are resolved.
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It is noted that the *Stage 1 TIA* does not make any reference to the above requirements. As such it fails to assess requirement 4, i.e., "is to include an internal link road connecting McCabe St/ McCabe Pl to Coventry Pde/ Thompson Pde. This is seen as a significant failure of the *Stage 1 TIA* as the provision of a connecting road would significantly change the assessed impacts on the roads and intersections in the vicinity of the proposed development. It would also have an impact on parking provision.

Recommendation 2.1:

It is recommended that the *Stage 1 TIA* is updated to include assessment of the requirements of the City of Fremantle's Local Planning Scheme 4 for the site under 'DA18' as well as the previous *Structure Plan TA*, noting differences and providing commentary on these.



3 EXTENT OF ASSESSMENT

Section 4 of Part C of Volume 4 of the *WAPC Guidelines* states:

"The TIA should cover, as a minimum:

- *all sections of road where the development traffic would be likely to increase traffic on any lane by more than 100 vehicles per hour¹, (Refer comment 3.1 below)*
- *all intersections where flows on any leg would increase by 10 per cent, or any movement by 20 per cent, (Refer comment 3.2 below)*
- *Existing and proposed public transport routes, (Refer comment 3.3 on the following page)*
- *pedestrian routes to the nearest bus stop (for all bus routes passing within 400 metres of the development), (Refer comment 3.4 on the following page)*
- *pedestrian routes to the nearest train station(s), (if within 800 metres of the development), (Refer comment 3.5 on the following page)*
- *pedestrian routes to any major attractors within 400 metres, (five-minute walk), of the development, (Refer comment 3.6 on the following page)*
- *cycle routes to any major attractors within 1,200 metres, (five-minute cycle), of the development." (Refer comment 3.6 on the following page)*

3.1 Figure 6-3 (Development Volumes – Opening Year for Stage 1) of the *Stage 1 TIA* indicates that the only section of roads where the development is likely to increase traffic on any lane by more than 100 vehicles per hour is McCabe Pl south of McCabe St, i.e., 112 and 147 in what is assumed to be the PM peak hour (no legend provided). Whilst the *Stage 1 TIA* assesses the forecast performance of the McCabe St/ McCabe Pl intersection, it does not include an assessment of the performance of McCabe Pl between McCabe St and the development site. The performance of this section of road will be significantly reduced if there is a security gate provided at the access (this detail is not shown on the development drawings). This in turn will result in a different assessment of the performance of the McCabe St/ McCabe Pl intersection to that in the *Stage 1 TIA* as queueing from any access gate is likely to extend back to this intersection with the forecast peak hour volumes of 147.

3.2 In the absence of any existing turning volume data for the McCabe St/ McCabe Ct intersection, it is only possible to assess the two Stirling Hwy intersections in the context of increased flows. The maximum increased volume through these intersections is 4.3% (Stirling Hwy/ McCabe St PM Peak Hour). Increased flows in excess of 10% on any leg are forecast on the McCabe St right turn lane approaches to Stirling Hwy in the AM peak hour (47%) and the right and left turn approaches in the PM peak hour (49% and 16% respectively). The left turn Stirling Hwy approaches to McCabe St are forecast to be 18% and 58% respectively in the AM peak hour and 174% and 73% respectively in the

¹ The 100 vph threshold equates to around 10% of the mic-block capacity of an urban arterial lane.

PM peak hour. Analysis of the Stirling Hwy/ McCabe St, Stirling Hwy/ Coventry Pde and McCabe St/ McCabe Pl is included in the *Stage 1 TIA* (Sections 6.6 and 6.7).

- 3.3** Existing public transport routes are shown and described in Section 2.6 of the *Stage 1 TIA*. This notes that Transperth Bus Route 103 was recently dis-continued due to low patronage. Proposed Bus Routes are discussed in Section 4.3 of the *Stage 1 TIA*. This states: “The PTA has advised that there are no changes planned in the short to medium term.” Transperth Bus Route 103 now operates between Claremont Station and Elizabeth Quay Bus Station only. The WAPC has identified Stirling Highway as a bus priority route and has identified the introduction of bus priority lanes at multiple intersections, including McCabe St. This will further improve the attractiveness of public transport as a transport option.
- 3.4** The *Stage 1 TIA* does not show and assess the pedestrian routes to the nearest bus stops, it simply shows their location in Figure 2-8. The nearest bus stop on Stirling Hwy for northbound services is located on the west side just south of Vlamingh Pde (#10348). The pedestrian route and pedestrian crossing (north of Vlamingh Pde) is poor, as shown in Photograph 1 below.



Photograph 1 – Bus Stop 10348 and poor facilities associated with this

- 3.5** The nearest train station to the development site is North Fremantle, located just within an 800 m radius of the Development Site. Despite this, the *Stage 1 TIA* does not show or assess pedestrian routes to and from this train station.
- 3.6** Figure 5-1 in the *Stage 1 TIA* identifies attractors and generators in the surrounding area but does not show or assess pedestrian routes to those within a 5-minute (400 m) walk or cycle routes (other than generically in Figure 2-9) to those within 1.2 kms (5-minute cycle) of the Development Site.



Recommendation 3.1:

It is recommended that the *Stage 1 TIA* is updated to include an assessment of the forecast performance of McCabe Pl between McCabe St and the access to the development site taking into account the provision of any security gates and the impact of this on queues back to McCabe St, including revising the assessment of this intersection if this is forecast to occur.

Recommendation 3.2:

It is recommended that the *Stage 1 TIA* is updated to show and assess the pedestrian routes between the Development Site and the nearest Bus Stops including the identification of any existing issues and any proposals or recommendations to address these.

Recommendation 3.3:

It is recommended that the *Stage 1 TIA* is updated to show and assess the pedestrian routes between the Development Site and North Fremantle Train Station including the identification of any existing issues and any proposals or recommendations to address these.

Recommendation 3.4:

It is recommended that the *Stage 1 TIA* is updated to show and assess the pedestrian routes to attractors and generators within a 5-minute walk of the Development Site.

Recommendation 3.5:

It is recommended that the *Stage 1 TIA* is updated to show and assess the cycle routes to attractors and generators within a 5-minute bicycle trip of the Development Site.



4 TIA CHECKLIST ASSESSMENT

A checklist of the typical information required is provided in Appendix A2 of Volume 4 of the WAPC Guidelines. This checklist is to be filled out, signed by the proponent and the transport specialist, and submitted with the TIA, as part of the development application. In the case that revision of the TIA or further information is required by the approving authority, a checklist is included to ensure requested information is included.

The Checklist headings have been used in the following sections of this peer review report in order to ensure that critical and relevant information has been identified, used, and assessed in the *Stage 1 TIA*.

4.1 SUMMARY

The *Stage 1 TIA* does not include a summary at the start *“including a brief description of the development proposal, the key transport issues, potential transport impacts and any proposed modifications to the surrounding transport networks”* as per guidance provided in Section 7.2 of Volume 4 of the WAPC Guidelines.

A summary is included at the end of the *Stage 1 TIA* as Section 7 (Conclusions and Summary), but this does not describe the proposed development or identify key transport issues.

Recommendation 4.1:

It is recommended that the *Stage 1 TIA* is updated to include a Summary after Section 1 (Background) that includes a brief description of the development proposal, the key transport issues, potential transport impacts and any proposed modifications to the surrounding transport networks, as per guidance provided in Section 7.2 of Volume 4 of the *WAPC Guidelines*.



4.2 INTRODUCTION/ BACKGROUND

This section of a TIA should provide a brief description of the development and the purpose and contents of the TIA including any appropriate background information.

4.2.1 Name of Applicant and Consultant

Section 1 of the *Stage 1 TIA* states: Applicant: 3 Oceans Property Pty Ltd (identified as the 'Client'). Consultant: Cardno (now Stantec).

Recommendation 4.2.1:

It is recommended that the *Stage 1 TIA* is updated to identify the 'Applicant' in Section 1.

4.2.2 Development Location and Context

Adequately included in Section 2 of the *Stage 1 TIA*.

4.2.3 Brief Description of Development Proposal

The completed Checklist in Appendix A of the *Stage 1 TIA* states that a brief description of the development proposal is included in Section 2. Section 2 of the *Stage 1 TIA* only describes existing site conditions. The development proposal is described in Section 3.

Recommendation 4.2.2:

It is recommended that the *Stage 1 TIA* is updated to include a correct Checklist in Appendix A.



4.3 EXISTING SITUATION

This section of the TIA describes the existing situation.

4.3.1 Existing Site Uses

Section 7.4 of Volume 4 of the *WAPC Guidelines* requires that the existing site uses are described.

The completed Checklist in Appendix A of the *Stage 1 TIA* states that existing site uses are described in Section 2.

The existing site uses are not described anywhere in the *Stage 1 TIA*.

Section 6.2 of the *Stage 1 TIA* states: *“For the purpose of a robust assessment, the traffic volumes associated with the existing development has not been removed from the background traffic”* and *“The McCabe Street/ McCabe Place intersection has not been assessed for Scenario 1 as the traffic volumes generated by the existing development are expected to be low.”*

As indicated above, the author of the *Stage 1 TIA* has highlighted the importance a *“robust assessment”*. The accepted methodology for achieving a robust assessment is to undertake traffic movement surveys instead of assuming low volumes and to identify the existing land uses and trip generation associated with this.

Recommendation 4.3.1:

It is recommended that the *Stage 1 TIA* is updated to include a correct Checklist in Appendix A.

Recommendation 4.3.2:

It is recommended that peak hour traffic movement surveys are undertaken for the Stirling Hwy/ McCabe St, McCabe St/ McCabe Pl, and Stirling Hwy/ Coventry Pde intersections to identify existing turning volumes and that these are used, along with longer term data to determine likely average annual volumes, for the traffic models and that the *Stage 1 TIA* is updated to include this.

Recommendation 4.3.3:

It is recommended that the *Stage 1 TIA* is updated to include a description of existing site uses in Section 2.

4.3.2 Existing Parking and Demand

Section 7.4 of Volume 4 of the *WAPC Guidelines* requires that the existing parking provision and demand is described.

The completed Checklist in Appendix A of the *Stage 1 TIA* states that existing parking provision and demand is described in Section 2.

The existing parking provision and demand is not described anywhere in the *Stage 1 TIA*, with the exception of commentary regarding existing bicycle parking provision in Section 2.7, i.e., “*Bicycle parking facilities are available at the North Fremantle Station.*”

There is currently on-street parking, including angled parking with a 2-hour limit between 8 AM and 6 PM Mon – Fri and 8 AM – 1 PM Saturday for up to 30 cars on Coventry Pde, as well as on-street parking for up to 7 cars on McCabe St between Stirling Hwy and McCabe Pl that is not mentioned in the *Stage 1 TIA*. Also not mentioned, is the current practice of verge parking on McCabe St east of McCabe Pl that suggests existing parking demand is higher than current parking provision.



Photograph 2 – Aerial photograph of Coventry Pde east of Stirling Hwy showing existing parking



Photograph 3 – Example of existing verge parking on McCabe St just east of McCabe Pl

Recommendation 4.3.4:

It is recommended that the *Stage 1 TIA* is updated to include a correct Checklist in Appendix A.

Recommendation 4.3.5:

It is recommended that the *Stage 1 TIA* is updated to include a description of existing parking provision and demand in Section 2.



4.3.3 Existing Access Arrangements

Section 7.4 of Volume 4 of the *WAPC Guidelines* requires that the existing access arrangement is described.

The completed Checklist in Appendix A of the *Stage 1 TIA* states that existing access arrangement is described in Section 3. This section describes the Development Proposal. Section 2 is for Existing Site conditions. Section 2 does not describe the existing access arrangement.

Recommendation 4.3.6:

It is recommended that the *Stage 1 TIA* is updated to include a correct Checklist in Appendix A.

Recommendation 4.3.7:

It is recommended that the *Stage 1 TIA* is updated to include a description of the existing access arrangements in Section 2.

4.3.4 Existing Site Traffic

Section 7.4 of Volume 4 of the *WAPC Guidelines* requires that the existing site traffic is described. The explanatory note to this requirement states:

"For other than vacant or greenfield sites, provide details of the current levels of traffic generated by the existing uses on the site. For small sites, an estimate of the likely level of traffic would normally be sufficient.

For large and/ or high generating sites this should be determined by traffic surveys and include, as appropriate, counts of cars, commercial vehicles, public transport users, pedestrians, and cyclists."

The site is a large site and is not a vacant or greenfield site. Despite this, no peak hour traffic movement surveys of existing site traffic have been undertaken.

The completed Checklist in Appendix A of the *Stage 1 TIA* states that existing site traffic is described in Section 2 when it is not.

Recommendation 4.3.8:

It is recommended that the *Stage 1 TIA* is updated to include a correct Checklist in Appendix A.

Recommendation 4.3.9:

It is recommended that peak hour traffic movement surveys are undertaken for the Stirling Hwy/ McCabe St, McCabe St/ McCabe Pl, and Stirling Hwy/ Coventry Pde intersections to identify existing turning volumes and that these are used, along with longer term data to determine likely average annual volumes, for the traffic models and that the *Stage 1 TIA* is updated to include this.

Recommendation 4.3.10:

It is recommended that the *Stage 1 TIA* is updated to include a description of existing site traffic in Section 2.



4.3.5 Surrounding Land Uses

Existing land uses surrounding the Development Site are adequately described in Section 2.2 of the *Stage 1 TIA*.

4.3.6 Surrounding Road Network

Section 7.4 of Volume 4 of the *WAPC Guidelines* requires that the existing road network is described. The explanatory note to this requirement states:

"The existing road network in the study area should be documented in the text and shown on appropriate maps and plans. The required information includes:

- *road hierarchy and jurisdiction for example, Main Roads WA (MRWA) or local government;*
- *road network – basic cross-section, number of lanes, widths, posted speed;*
- *intersection layout and traffic control including traffic signals/ roundabouts lane configuration, movement/turning restrictions, etc...;*
- *heavy vehicle/freight restrictions, if any."*

The completed Checklist in Appendix A of the *Stage 1 TIA* states that the surrounding road network is described in Section 2.

The road hierarchy, jurisdiction, number of lanes, widths and posted speed of Stirling Hwy, McCabe St, McCabe Pl, and Thomson Rd are described in Section 2.3 of the *Stage 1 TIA*. Only the hierarchy of Coventry Pde is described.

The layouts and type of control at the Stirling Hwy/ McCabe St, Stirling Hwy/ Coventry Pde and McCabe St/ McCabe Pl intersections are described in Section 2.4 of the *Stage 1 TIA*. There are no turning restrictions other than that the McCabe St approach to Stirling Hwy consists of two lanes with the left lane restricted to left turns and the right lane restricted to right turns, as shown in Figure 2-4 in the *Stage 1 TIA*.

The existing peak hour traffic volumes shown in Figure 6.4 of the *Stage 1 TIA* do not show a breakdown between heavy and light vehicles. Section 6.2 of the *Stage 1 TIA* states *"Heavy vehicle volumes are based on the traffic data obtained from Main Roads Traffic Map."*

The traffic data on the Main Roads website in the vicinity of the Development Site is limited to mid-block traffic data collection sites on Stirling Hwy north of Queen Victoria St (2020/21), Stirling Hwy south of Wellington St (2019/20) and McCabe St east of Stirling Hwy, as well as Traffic Signal (SCATS) data at the Stirling Hwy/ McCabe St intersection. Whilst the mid-block data includes a breakdown of vehicle classes, the SCATS data does not and hence there is no breakdown of existing data into light and heavy vehicles for any of the assessed intersections. The SIDRA models for the existing volumes uses generic HV percentages based on daily percentages of heavy vehicles despite a breakdown of percentages of heavy vehicle data for each peak hour available on the Main Roads website. This results in significant differences, e.g., the existing SIDRA



model uses a generic 8.9% HV for Stirling Hwy through traffic volumes in both directions for both the AM and PM peak hour when the data indicates this is 12.8% for northbound vehicles in the AM peak hour. The assessed differences are shown in Figure 2 below.

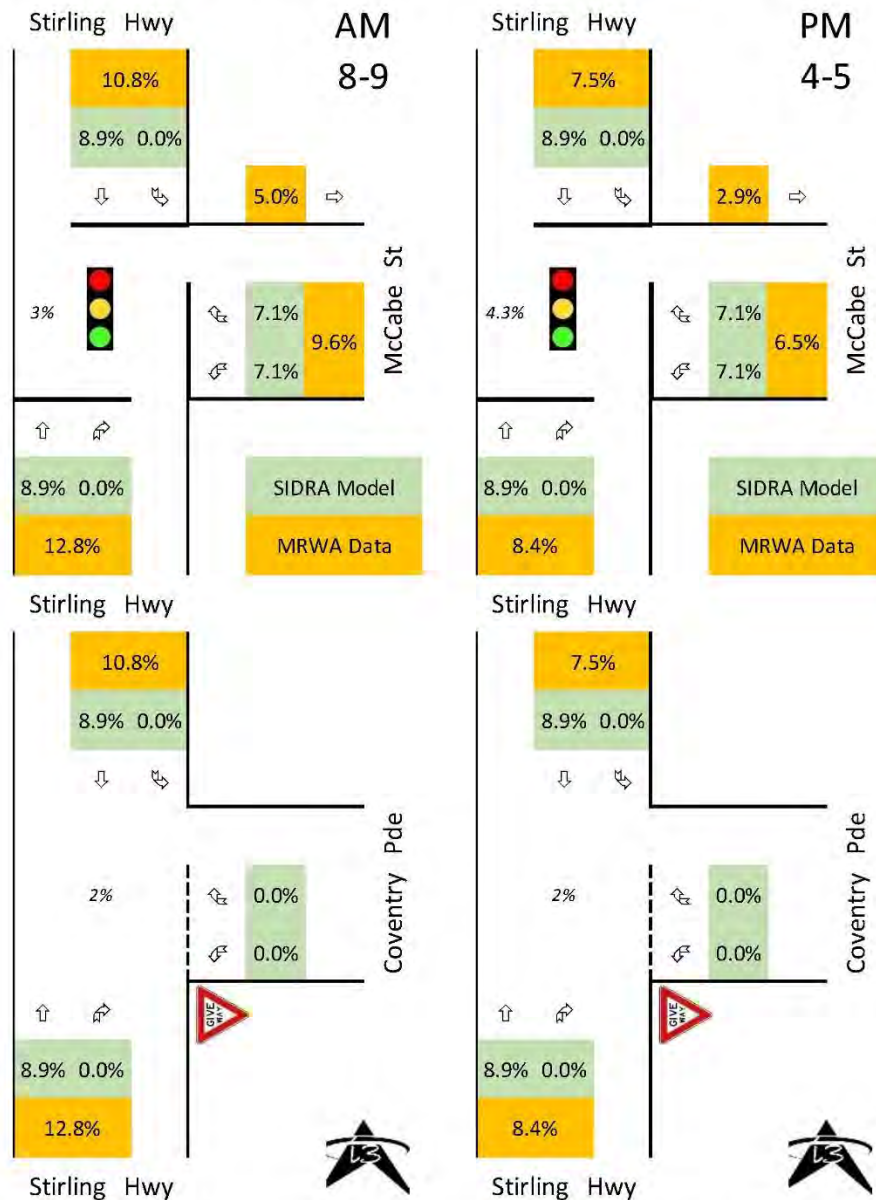


Figure 2 – Assessed differences between Heavy Vehicle percentages used in SIDRA model in the Stage 1 TIA and the Main Roads Data

The Stage 1 TIA does not identify that the section of Stirling Hwy adjacent to the Development Site is not part of the Restricted Access Vehicle network.



Recommendation 4.3.11:

It is recommended that peak hour traffic movement surveys are undertaken for the Stirling Hwy/ McCabe St, McCabe St/ McCabe Ct, and Stirling Hwy/ Coventry Pde intersections to identify existing heavy and light vehicle turning volumes and these are used, along with longer term data to determine likely average annual light and heavy vehicle volumes, for the traffic models and that the *Stage 1 TIA* is updated to include this.

4.3.7 Traffic Management on Frontage Roads

Section 7.4 of Volume 4 of the *WAPC Guidelines* requires that the existing traffic management on frontage roads is described. The explanatory note to this requirement states:

“Describe/show the existing traffic management on the roads fronting the development and for 100 metres either side of the development. Information to include:

- *road width/ number of lanes;*
- *footpaths/ cycleways;*
- *parking provision or restrictions;*
- *posted traffic speed;*
- *intersections and type of control (for example, give way, roundabout etc.);*
- *accesses/driveways to properties (for roads fronting development only).*

The completed Checklist in Appendix A of the *Stage 1 TIA* states ‘NA’.

Traffic management on the frontage roads is an important element of any Transport Impact Assessment and requires identification and assessment. The failure to do this in the *Stage 1 TIA* has resulted in important information relating to existing access driveways, on-street and verge parking not being adequately assessed, as indicated in **Sections 4.3.2, 4.3.3, 4.3.4 and 4.3.6** of this peer review report.

Recommendation 4.3.12:

It is recommended that the *Stage 1 TIA* is updated to include an assessment of existing traffic management on the frontage roads in Section 2, as per the requirements of Section 7.4 of Volume 4 of the *WAPC Guidelines*.

4.3.8 Traffic Flows on Surrounding Roads

(Usually AM and PM Peak Hours)

Section 7.4 of Volume 4 of the *WAPC Guidelines* requires that the available traffic counts on existing roads surrounding the development are described. This has been included as Table 2-2 in Section 2.5 of the *Stage 1 TIA*, but it contains some errors, as shown in the annotated copy provided as Figure 3 below.

Road Name	Date	Average Two-Way Daily Traffic Volume	Average Two-Way AM Peak Traffic Volume	Average Two-Way PM Peak Traffic Volume
Stirling Highway (south of Wellington St) ✓	2019/20 ✓	34,503 ✓	2,682 ✓	2,854 ✗
Stirling Highway (north of Queen Victoria St) ✓	2020/21 ✓	30,908 ✓	2,281 ✓	2,495 ✓
McCabe Street ✓	2021/22 ✓	6,713 ✓	712 ✓	645 ✗

Weekday (Mon-Fri) Volume

Mon-Fri 5-6 PM Volume

Mon-Fri 3-4 PM Volume

Figure 3 – Annotated copy of Table 2-2 in *Stage 1 TIA* showing erroneous data

An assessment of the correct mid-block data from the indicated Main Roads WA data sites is provided as Table 1 below.

Street	Location	Year	Actual Peak Hour Start		Actual Peak Hour Volume		Assessed Peak Hour Volume		Submitted TIA Table 2-2	
			AM	PM	AM	PM	8-9 AM	4-5 PM	AM	PM
Stirling Hwy	South of Wellington St	2019/ 2020	7:45 AM	4:45 PM	2,710	2,857	2,682	2,750	2,682	2,854
Stirling Hwy	North of Queen Victoria St	2021/2022	8:00 AM	4:45 PM	2,281	2,511	2,281	2,495	2,281	2,495
McCabe St	East of Stirling Hwy	2021/ 2022	7:45 AM	3:00 PM	725	645	712	530	712	645

Table 1 – Assessed mid-block peak hour data from the indicated Main Roads WA data sites

Recommendation 4.3.13:

It is recommended that the *Stage 1 TIA* is updated to include the correct peak hour data for the mid-block sites clearly identifying that this data is for the assessment peak hours and not the site's peak hours.



4.3.9 Traffic Flows at Major Intersections

(Usually AM and PM Peak Hours)

Section 7.4 of Volume 4 of the *WAPC Guidelines* requires that the available traffic counts at major intersections surrounding the development site are described and shown. The explanatory note to this requirement states:

*"Traffic counts are to be provided for the main roads and intersections surrounding the development. The counts are to be by direction for the roads **and turning movement counts for the intersections.**"*

The traffic data should be for the following periods:

- *the peak period(s) on the surrounding roads (generally the AM and PM weekday peak hours);*
- *the peak period(s) for the proposed development (See also Section 7.9 of the WAPC Guidelines).*

The required data can be obtained either from existing traffic flow databases or from traffic surveys. The two main sources of existing data are MRWA and local councils.

Further advice on obtaining the required data is provided in the traffic data section of Volume 5 - Technical Guidance of the WAPC Guidelines."

The completed Checklist in Appendix A of the *Stage 1 TIA* states that the traffic flows at major intersections are described in Section 2. They are not.

Recommendation 4.3.14:

It is recommended that the *Stage 1 TIA* is updated to include a correct Checklist in Appendix A.

Recommendation 4.3.15:

It is recommended that peak hour traffic movement surveys are undertaken for the Stirling Hwy/ McCabe St, McCabe St/ McCabe Ct, and Stirling Hwy/ Coventry Pde intersections to identify existing heavy and light vehicle turning volumes and these are used, along with longer term data to determine likely average annual light and heavy vehicle volumes, for the traffic models and that the *Stage 1 TIA* is updated to include this.



4.3.10 Operation of Surrounding Intersections

Section 7.4 of Volume 4 of the *WAPC Guidelines* requires that the available traffic counts at major intersections surrounding the development site are described and shown. The explanatory note to this requirement states:

"The main intersections around the site should be analysed using approved techniques under existing traffic flows for the peak periods above. The result of the intersection analysis should be compared with and calibrated against observed traffic conditions during the peaks. This comparison should include average delays, queue lengths and levels of service as appropriate.

For traffic signals, the analysis should use actual signal timings and saturation flow measurements may be required to calibrate the relevant analysis models.

These intersection analysis models will form the basis of the analysis of the impact of the development generated traffic and of any proposed intersection improvements. It is therefore important that the initial models accurately represent the actual intersection operation.

See Volume 5 – Assessment of intersections for further guidance on appropriate analytical techniques for the intersection analysis."

The completed Checklist in Appendix A of the *Stage 1 TIA* states that the operation of surrounding intersections is included in Section 6.

Section 6 does not provide any details regarding the current operation of the assessed intersections other than 'assumed' existing (2022) turning movements in Figure 6-4. Section 6.2 (Key Assumptions) of the *Stage 1 TIA* states:

"The Stirling Highway/ Coventry Parade intersection has been calibrated to the maximum observed delays. To achieve this, the following parameters were modified:

- *Gap acceptance values for the right turn out of Coventry Parade was reduced to the Austroads minimums*
- *Extra bunching was increased on the northern and southern approaches."*

There is no mention or inclusion of peak hour video surveys or observational data in the *Stage 1 TIA*.

Recommendation 4.3.16:

It is recommended that peak hour traffic movement surveys are undertaken for the Stirling Hwy/ McCabe St, McCabe St/ McCabe Ct, and Stirling Hwy/ Coventry Pde intersections to identify existing heavy and light vehicle turning volumes and these are used, along with longer term data to determine likely average annual light and heavy vehicle volumes, for the traffic models and that the *Stage 1 TIA* is updated to include this.

Recommendation 4.3.17:

It is recommended that average delays and queue lengths are recorded and analysed for the existing intersections to enable the SIDRA models to be calibrated to represent actual intersection operation.



4.3.11 Existing Pedestrian/ Cycle Networks

The existing pedestrian and cycle networks are shown in the *Stage 1 TIA* in the form of a reproduction of the Cycle Network Map. There is commentary on the 'high quality' shared paths along Stirling Hwy north of McCabe St but no mention of the quality of the path to and from the nearest bus stops, as discussed in **Section 3.4** of this peer review report.

Recommendation 4.3.18:

It is recommended that the *Stage 1 TIA* is updated to show and assess the pedestrian routes between the Development Site and the nearest Bus Stops including the identification of any existing issues and any proposals or recommendations to address these.

Recommendation 4.3.19:

It is recommended that the *Stage 1 TIA* is updated to show and assess the pedestrian routes between the Development Site and North Fremantle Train Station including the identification of any existing issues and any proposals or recommendations to address these.

4.3.12 Existing Public Transport Services Surrounding Proposed Development

The existing public transport routes and bus stops/ train stations in the vicinity of the Development Site, including frequencies and locations, are adequately addressed in Section 2.6 of the *Stage 1 TIA* (with the exception of assessment of the pedestrian routes to the bus stops and North Fremantle Train Station, as discussed in **Section 4.3.11** above).

4.3.13 Crash Data

The crash data in Section 2.8 of the *Stage 1 TIA* is for the five-year period ending 31 December 2020. The date of the *Stage 1 TIA* is 2 June 2022. The latest Crash Data for the five-year period ending 31 December 2021 was published at the end of March 2022 and should have been used.

Recommendation 4.3.20:

It is recommended that the *Stage 1 TIA* is updated to include and assess the latest crash data, i.e., for the five-year period ending 31 December 2021.



4.4 DEVELOPMENT PROPOSAL

This section of a TIA describes the development proposal.

4.4.1 Regional Context

Section 7.5 of Volume 4 of the *WAPC Guidelines* requires that the regional and structure plan context is described and shown.

The completed Checklist in Appendix A of the *Stage 1 TIA* states that the regional context is described in Section 3. It is not.

The failure to consider the proposed Development in the context of the *Structure Plan* has been identified in Section 2 of this peer review report.

Recommendation 4.4.1:

It is recommended that the *Stage 1 TIA* is updated to include a correct Checklist in Appendix A.

Recommendation 4.4.2:

It is recommended that the *Stage 1 TIA* is updated to include acknowledgement of the previous *Structure Plan TA* with commentary on significant differences between these two documents.

4.4.2 Proposed Land Uses

The proposed land uses are adequately described in Section 3 of the *Stage 1 TIA*.



4.4.3 Table of Land Uses and Quantities

A list of the quantum of each land use proposed (e.g., number of dwellings, floor areas) is included in Section 3 of the *Stage 1 TIA* but it fails to clearly identify whether the quoted floor areas are for the same floor area definitions used for trip generation and parking requirements, i.e., Gross Lettable Area (GLA)² or Net Lettable Area (NLA)³.

Recommendation 4.4.3:

It is recommended that the *Stage 1 TIA* is updated to include the required definitions of floor areas used for subsequent trip generation and parking assessments, i.e., GLA or NLA.

4.4.5 Staging of the Development

The *Stage 1 TIA* is for Stage 1 Development. Section 5.2 indicates that a second stage is also planned adjacent to the east comprising of townhouses, aged care living and a child care facility. It also indicates that discussions are under way to redevelop the site to the north although the land uses for this have not been identified as it is still at the early planning stages.

A TIA for Stage 1+2 Development has been prepared by Cardno (now Stantec) and is the subject of a separate peer review report.

² GLA: Generally, the floor space contained within a tenancy at each floor level measured from the outside of main faces of external walls and, where applicable, the centre lines of internal inter-tenancy, partition, and common area walls, but excluding features such as balconies and verandahs and, if there are two or more occupiers or tenants, excluding common use areas, service areas, and non-exclusive public spaces and thoroughfares. In the case of retail tenancy areas such as shops, measurements are often made from the internal finished surface of external building walls, service passage walls, etc. (Some commercial and public authorities use variants of this definition.)

³ NLA: The area for which a tenant could be charged for occupancy under a lease. Generally, it is the floor space contained within a tenancy at each floor level measured from the internal finished surfaces of permanent external walls and permanent internal walls but excluding features such as balconies and verandahs, common use areas, areas less than 1.5 m in height, service areas, and public spaces and thoroughfares. (Some commercial and public authorities use variants of this definition.)



4.4.6 Access Arrangements

Section 7.5 of Volume 4 of the *WAPC Guidelines* requires that the access arrangement for cars, service vehicles, public transport, pedestrians and cyclists and people with disabilities are described and shown.

The completed Checklist in Appendix A of the *Stage 1 TIA* states that these access arrangements are described in Section 3.

Section 3.2 of the *Stage 1 TIA* only describes and shows vehicular access arrangements.

Recommendation 4.4.3:

It is recommended that the *Stage 1 TIA* is updated to include details of the access arrangements for people arriving by public transport, bicycle or on foot as well as for people with a disability, i.e., locations of pedestrian entrances to the building, as per the requirements of Section 7.5 of Volume 4 of the *WAPC Guidelines*.

4.4.7 Parking Provision

Car and cycle parking provision details are included in detail in Section 3.3 (Parking Review) of the *Stage 1 TIA*.

4.4.8 End of Trip Facilities

Section 7.5 of Volume 4 of the *WAPC Guidelines* requires that end of trip facilities for walking and cycling (for example, lockers and showers), are described and shown.

The completed Checklist in Appendix A of the *Stage 1 TIA* states that these facilities are described in Section 3. They are not.

Recommendation 4.4.4:

It is recommended that the *Stage 1 TIA* is updated to include a correct Checklist in Appendix A.

Recommendation 4.4.5:

It is recommended that the *Stage 1 TIA* is updated to include details of end of trip facilities for walking and cycling (for example, lockers and showers), as per the requirement of Section 7.5 of Volume 4 of the *WAPC Guidelines*.



4.5 INTEGRATION WITH SURROUNDING AREA

The intent of this section is to identify how well the proposed development integrates with the surrounding land uses with respect to transport links and accessibility. This is to be a qualitative assessment of the level of accessibility between the development and the surrounding land uses.

4.5.1 Surrounding Major Attractors/ Generators

Major attractors and generators are adequately identified and described in Section 5.1 and Figure 5-1 in the *Stage 1 TIA*.

4.5.2 Committed Developments and Transport Proposals

Committed Developments and Transport Proposals are adequately identified and described in Section 4 in the *Stage 1 TIA*.

4.5.3 Proposed Changes to Land Uses within 1.2 kms

The completed Checklist in Appendix A of the *Stage 1 TIA* states that proposed changes to land uses within 1.2 kms of the Development Site are described in Section 4. There are no proposed changes to land use identified in Section 4.

Recommendation 4.5.1:

It is recommended that the *Stage 1 TIA* is updated to include a correct Checklist in Appendix A.



4.5.4 Travel Desire Lines from Development to these Attractors/ Generators

Section 7.7 of Volume 4 of the *WAPC Guidelines* requires that the main desire lines between the development and external attractors and generators are identified and assessed.

The completed Checklist in Appendix A of the *Stage 1 TIA* states 'NA' for this item.

The failure to identify and assess travel desire lines between the development and external attractors and generators has been identified as a deficiency in **Section 3.6** of this peer review.

Recommendation 4.5.2:

It is recommended that the *Stage 1 TIA* is updated to show and assess the pedestrian routes between the Development Site and the nearest Bus Stops including the identification of any existing issues and any proposals or recommendations to address these.

Recommendation 4.5.3:

It is recommended that the *Stage 1 TIA* is updated to show and assess the pedestrian and cyclist routes between the Development Site and North Fremantle Train Station including the identification of any existing issues and any proposals or recommendations to address these.

Recommendation 4.5.4:

It is recommended that the *Stage 1 TIA* is updated to show and assess the pedestrian routes to attractors and generators within a 5-minute walk of the Development Site.

Recommendation 4.5.5:

It is recommended that the *Stage 1 TIA* is updated to show and assess the cycle routes to attractors and generators within a 5-minute bicycle trip of the Development Site.



4.5.5 Adequacy of Existing Transport Network

Section 7.7 of Volume 4 of the WAPC Guidelines requires an assessment of whether the existing transport networks, plus any proposed changes, would adequately match the above desire lines, particularly for pedestrians, cyclists, and public transport users. The explanatory note to this requirement states:

“The assessment should consider the directness of the route(s) and the quality of the connecting pedestrian and cycle networks. It should identify whether there are any existing public transport services or whether any are proposed.”

The completed Checklist in Appendix A of the *Stage 1 TIA* indicates this assessment is included in Section 6. This Section does not include any assessment of the directness and quality of the connecting pedestrian and cycle networks.

Recommendation 4.5.6:

It is recommended that the *Stage 1 TIA* is updated to include a correct Checklist in Appendix A.

Recommendation 4.5.7:

It is recommended that the *Stage 1 TIA* is updated to include an assessment of the directness and quality of the connecting pedestrian and cycle networks, as per the requirements of Section 7.7 of Volume 4 of the *WAPC Guidelines*.



4.5.6 Deficiencies in Existing Transport Networks

Section 7.7 of Volume 4 of the WAPC Guidelines requires the identification of any deficiencies in the surrounding transport networks, and/ or areas where improvements could be made. The explanatory note to this requirement states:

“Potential deficiencies, or areas for improvement, could include missing or substandard sections of footpath and/or cycle path, the absence of safe crossing facilities where major roads need to be crossed and the absence of public transport links.”

The completed Checklist in Appendix A of the *Stage 1 TIA* states ‘NA’ for this item.

The failure to identify and assess deficiencies in the surrounding transport networks, and/ or identify areas where improvements could be made has been identified as a deficiency in **Sections 3.4** and **4.3.11** of this peer review.

Recommendation 4.5.8:

It is recommended that the *Stage 1 TIA* is updated to include identification of deficiencies in the surrounding transport networks, and/ or areas where improvements could be made, as per the requirements of Section 7.7 of Volume 4 of the *WAPC Guidelines*.



4.6 ANALYSIS OF TRANSPORT NETWORKS

This section of a TIA requires a more detailed quantitative analysis of the impact of the development-generated traffic on the surrounding transport networks.

The analysis should also demonstrate that the proposed development would provide a high level of accessibility and safety for all modes.

4.6.1 Assessment Years

Assessment years of 2022, 2024 and 2034 have been identified in Section 6.1 of the *Stage 1 TIA*. This is consistent with the usual requirement for assessment of the existing situation (2022), first year of operation/ full occupation (assumed to be 2024) and 10 years from this date (2034).

4.6.2 Time Periods

Peak Times of 8 – 9 AM and 4 – 5 PM have been identified in Section 6.1 of the *Stage 1 TIA*.

Section 7.9.2 of Volume 4 of the WAPC Guidelines indicates that the assessment times are generally the peak periods of the surrounding road network and the peak periods for the development.

As indicated in **Section 4.3.8** of this peer review, there are some errors in the peak hour volumes shown in Table 2-2. This section has also indicated that the road network peak hours are more likely to be 7.45 – 8.45 AM and 4.45 – 5.45 PM (refer Table 1 on page 23 of this peer review report).

It is agreed that the development peak hours are most likely to be the same as the road network peak hours.

Recommendation 4.6.1:

It is recommended that traffic movement surveys are undertaken for the Stirling Hwy/ McCabe St, McCabe St/ McCabe Ct, and Stirling Hwy/ Coventry Pde intersections between the hours of 7-9 AM and 4-6 PM in intervals of 15 minutes or less to identify the existing AM and PM road network peak hours.



4.6.3 Development Generated Traffic

Section 6.3 of the *Stage 1 TIA* indicates it uses trip generation rates from the 10th Edition of the ITE (USA) database and *RTA Guide to Traffic generating Developments* ⁽⁴⁾. It does not indicate why the ITE (USA) rates were used instead of the updated RTA Guide rates included in the *RMS Guide to Traffic Generating Developments Updated Traffic Surveys*. ⁽⁵⁾

Section 5 of Volume 5 of the *WAPC Guidelines* states:

“The Guide to Traffic Generating Developments and its 2013/04a Updated Traffic Surveys; and the ITE Trip Generation Manual remain recognised sources for trip generation rates, however, these databases are generally based on surveys from NSW, SA, and the USA. Much of the data is old and may not be particularly relevant to WA. The rates also tend to be averages implying that, even if they are appropriate, 50 per cent of that type of development is likely to generate at a higher rate.”

If using these databases, sensitivity tests using higher rates (for example, 85th percentile) may need to be carried out to ensure that if the development does generate at a higher rate than the average, the additional traffic can be accommodated.”

The ‘2013/04a Updated Traffic Surveys’ data referred to above was published by NSW Transport as a Technical Direction (*TDT 2013/03a*) in 2013 with the directive that it “*must be followed when RMS is undertaking trip generation and/or parking demand assessments.*” Whilst this is not an RMS NSW project, it is nevertheless commonly used by traffic engineers and transport professionals in WA, as is evidenced in many of the TIAs prepared by Cardno (now Stantec). The High-Density Residential Rates from *TDT 2013/03a* is reproduced as Table 2 below.

Weekday Rates	Sydney Average	Sydney Range	Regional Average	Regional Range
AM peak (1 hour) vehicle trips per unit	0.19	0.07-0.32	0.53	0.39-0.67
AM peak (1 hour) vehicle trips per car space	0.15	0.09-0.29	0.35	0.32-0.37
AM peak (1 hour) vehicle trips per bedroom	0.09	0.03-0.13	0.21	0.20-0.22
PM peak (1 hour) vehicle trips per unit	0.15	0.06-0.41	0.32	0.22-0.42
PM peak (1 hour) vehicle trips per car space	0.12	0.05-0.28	0.26	0.11-0.40
PM peak (1 hour) vehicle trips per bedroom	0.07	0.03-0.17	0.15	0.07-0.22
Daily vehicle trips per unit	1.52	0.77-3.14	4.58	4.37-4.78
Daily vehicle trips per car space	1.34	0.56-2.16	3.22	2.26-4.18
Daily vehicle trips per bedroom	0.72	0.35-1.29	1.93	1.59-2.26

Table 2 – High Density Residential Trip Generation Rates from *TDT 2103/03a*

The *Stage 1 TIA* uses trip generation rates of 0.34 and 0.39 per dwelling for the AM and PM peak hours respectively. The adopted AM rate is higher than the indicated Sydney Range (0.07-0.32) and the PM rate is within the Sydney Range (0.06-0.41).

A review of TIA’s for recent similar types of development in the area has revealed that Cardno (now Stantec) used a trip generation rate of 0.57 per dwelling for both the AM and PM peak hour in its TIA for a Mixed-Use Development with 48 dwellings at 8 & 10 Glyde St, Mosman Park (near Stirling Hwy and Mosman Park Train Station).



A review of the trip generation data in the *Stage 1 TIA* has indicated that it either includes some errors in the calculations or that each land use trip generation volumes have not been rounded up. It also indicates that adopting the same trip generation rates that Cardno (now Stantec) used for the development in Mosman Park would result in an additional 48 trips in the AM peak hour and an additional 37 trips in the PM peak hour, as shown in Table 3 below.

	Units	Source	Weekday AM			Weekday PM			Weekday AM			Weekday PM		
			Rate	IN	OUT	Rate	IN	OUT	IN	OUT	TOTAL	IN	OUT	TOTAL
Apartments	207 dwellings	ITE 222	0.34 per dwelling	21%	79%	0.39 per dwelling	62%	38%	15	56	71	51	31	82
Function Room	200 people	1s P	0.30 per person	50%	50%	0.30 per person	50%	50%	30	30	60	30	30	60
Restaurant/ Café	937 m ²	RTA	5.00 per 100 m ²	80%	20%	5.00 per 100 m ²	61%	39%	38	10	48	29	19	48
Tavern	1300 m ²	RTA	0.00 per 100 m ²	0%	0%	5.00 per 100 m ²	68%	32%	0	0	0	45	21	66
Provedore	807 m ²	RTA	5.00 per 100 m ²	80%	20%	5.00 per 100 m ²	61%	39%	33	9	42	25	16	41
Creative Studio/ Co-working	289 m ²	ITE 495	1.86 per 100 m ²	63%	37%	2.48 per 100 m ²	46%	54%	4	2	6	4	4	8
Totals											227			305

Cardno's TIA RMS rates for 8 & 10 Glyde St, Mosman Park														
Apartments	207 dwellings	RMS	0.57 per dwelling	27%	73%	0.57 per dwelling	60%	40%	32	87	119	71	48	119
Totals											275			342
Difference											48			37

Table 3 – Assessed trip generation using the *Stage 1 TIA* rates and Glyde St Development Rates

The total forecast trips in the *Stage 1 TIA* are 216 in the AM peak hour and 277 in the PM peak hour. These forecast volumes are not consistent with the rates used in the *Stage 1 TIA* and are less than the forecast total trips using the Glyde St Development rates ascertained by Cardno (now Stantec).

Recommendation 4.6.2:

It is recommended that a review of the trip generation rates for the residential dwellings is undertaken in the context of the rates that Cardno (now Stantec) has used for recent similar developments in the area and that the calculations are checked to ensure that each land use volume is rounded up and free of errors.



4.6.4 Distribution of Generated Traffic

Section 6.4 of the *Stage 1 TIA* indicates that Trip Distribution (Assignment) to the road network is based on:

- *“Location of the development and vehicle access points relative to the surrounding area.*
- *Driver behaviour based on the local and arterial road network.*
- *Existing traffic distribution along the surrounding road network.”*

It is difficult to determine ‘existing traffic distribution’ without any traffic surveys having been undertaken for each intersection. The only identifiable existing distribution based on the SCATS data at the Stirling Hwy/McCabe St intersection is the westbound McCabe St approach (due to dedicated and separate left and right turn lane with their own loop detectors) and the northbound Stirling Hwy approach to McCabe St (due to a dedicated right turn lane with its own loop detector). The existing traffic distribution for the adopted AM and PM peak hours, along with the adopted distribution for the indicated approaches are shown in Figure 4 below. This indicates a significant difference for the McCabe St approach.

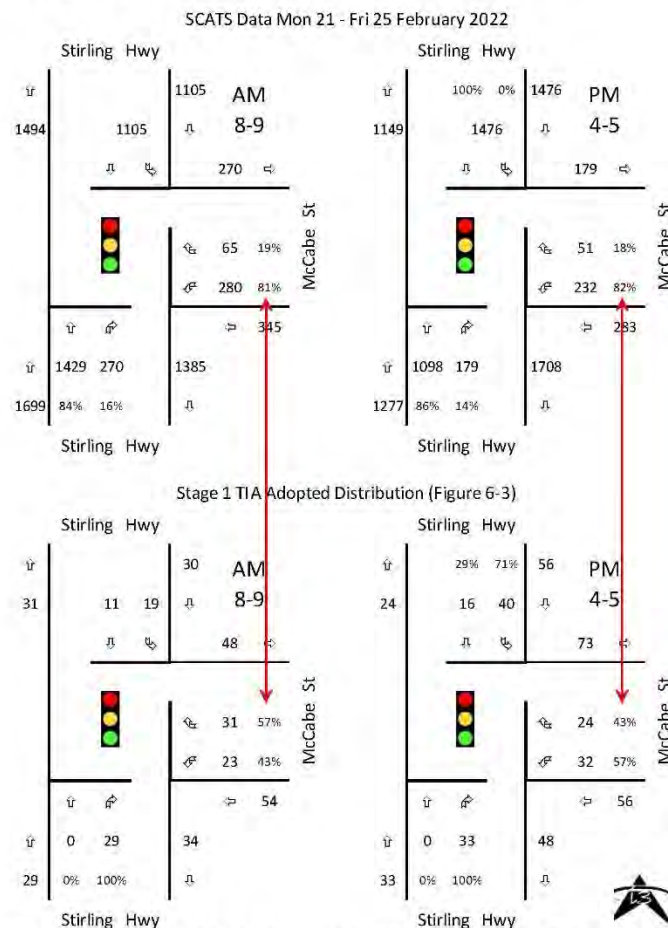


Figure 4 – Assessment of existing and adopted traffic distribution for identifiable approaches



Recommendation 4.6.3:

It is recommended that peak hour traffic movement surveys are undertaken for the Stirling Hwy/ McCabe St, McCabe St/ McCabe Ct, and Stirling Hwy/ Coventry Pde intersections to identify existing heavy and light vehicle turning volumes and these are used, along with longer term data to determine likely average annual light and heavy vehicle volumes, for the trip distribution and traffic models and that the *Stage 1 TIA* is updated to include this.

4.6.5 Parking Supply and Demand

Section 3.3 of the Stage 1 TIA indicates that a total of 463 parking bays are proposed to accommodate the statutory parking provision requirements under the City of Fremantle's *LPS4*.

Section 3.3.2 of the Stage 1 TIA indicates:

"An additional parking demand assessment has been conducted which provides further detail regarding the anticipated parking demand for the proposed development. The parking demand assessment has been detailed in a separate technical note and a summary of the parking demand assessment results are shown in Figure 3-3. The parking demand assessment assumes a 'worst-case' design day scenario, illustrating the development at its potential maximum activity which includes a 100-person function."

It concludes that *"the anticipated parking requirement (demand) for the proposed development is approximately 120 spaces."*

The 'separate technical note' is included as a Technical Memorandum prepared by Cardno (now Stantec) titled "Matilda Bay Brewery Stage 1 Development – Parking Demand and Supply Analysis" dated 02/06/2022 in the Parking Management Plan (*PMP*), also prepared by Cardno (now Stantec), dated 02/06/2022.

i3 consultants WA has been engaged by the Town of Mosman Park to prepare a separate peer review report of the *PMP*.

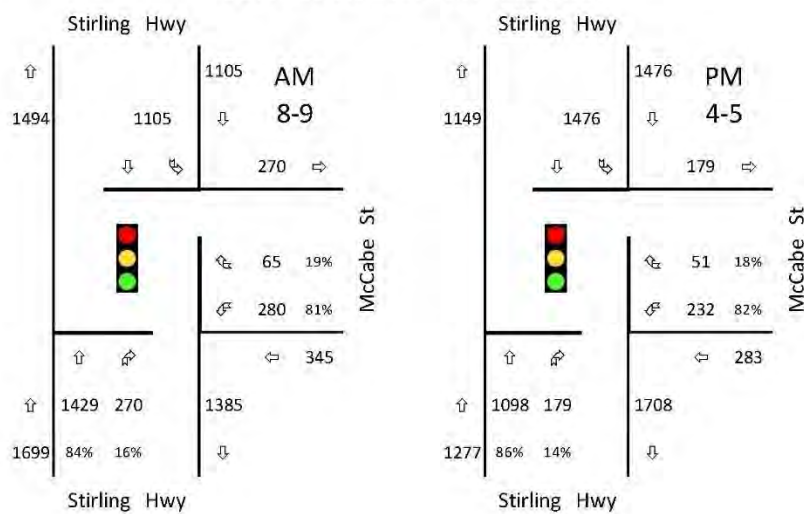


4.6.6 Base and 'With Development' Traffic Flows

Base traffic flows are included in the *Stage 1 TIA* for the 2022 and 2024 years as Figure 6-4 (Scenario 1) and Figure 6-5 (Scenario 2).

There are concerns with the Base Data used due to the lack of any traffic surveys and possibility of incorrect peak hour adoption (Refer **Section 4.6.2** of this peer review report). Analysis of the Base Volumes used in the *Structure Plan TA* and February 2022 SCATS data indicates that the adopted base volumes in the *Stage 1 TIA* are significantly different to current 2022 volumes (based on the adopted peak hours), as shown in Figure 1 on page 10 of this peer review report and in Figure 5 below.

SCATS Data Mon 21 - Fri 25 February 2022



Stage 1 TIA Existing 2022 Volumes (Figure 6-4)

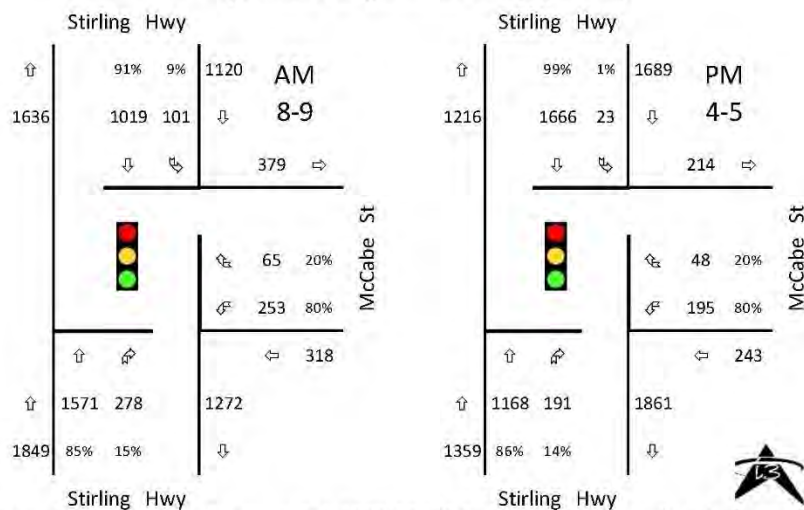


Figure 5 – Comparison between Feb 2022 SCATS Data and 2022 Base Data in *Stage 1 TIA*



Analysis of the SCATS data has also revealed that the weekday peak hours and peak hour volumes are significantly different on Mondays and Fridays, as shown in the assessment below. This indicates that Thursdays are representative of the average weekday peak hours and volumes.

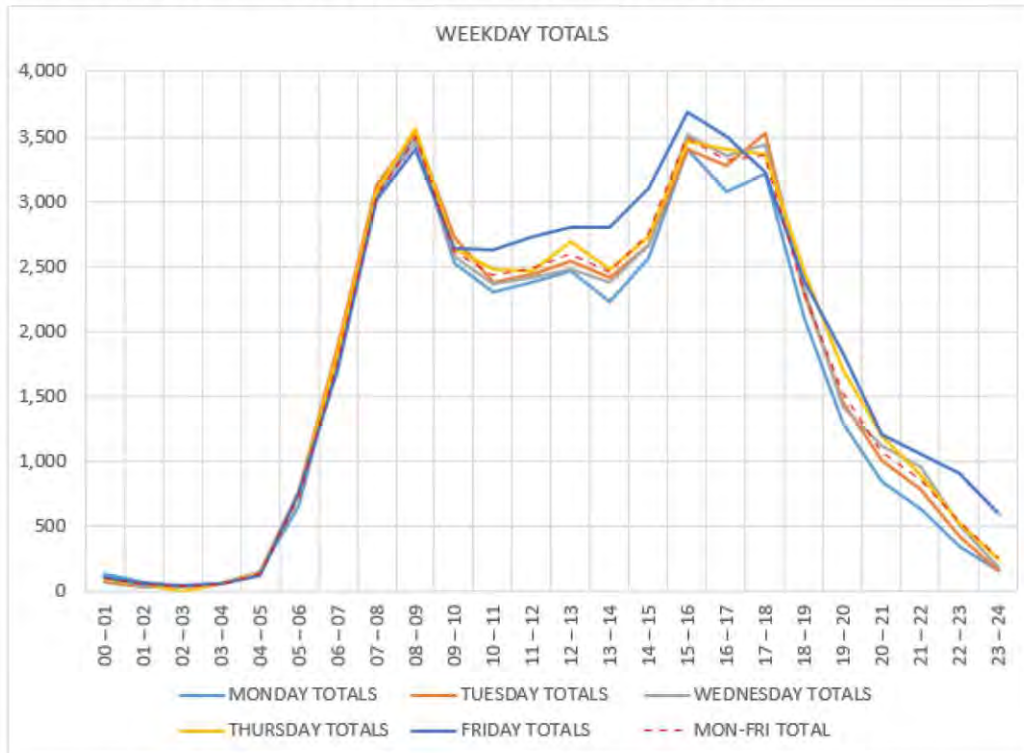


Figure 6 – Assessment of hourly weekday traffic volumes based on Feb 2022 SCATS data

Recommendation 4.6.4:

It is recommended that traffic movement surveys are undertaken for the Stirling Hwy/ McCabe St, McCabe St/ McCabe Ct, and Stirling Hwy/ Coventry Pde intersections on a Thursday between the hours of 7-9 AM and 4-6PM in intervals of 15 minutes or less to identify the existing AM and PM road network peak hours and that the Stage 1 TIA is revised to reflect these volumes and actual road network peak hours.



4.6.7 Analysis of Development Accesses

Section 7.12 of Volume 4 of the *WAPC Guidelines* requires the TIA to “*Demonstrate that adequate sight distance is provided at each proposed access. Undertake an analysis of the operation of each access to demonstrate that it would be able to accommodate the projected development generated traffic.*”

The completed Checklist in Appendix A of the *Stage 1 TIA* states that analysis of the development accesses is included in Section 6. There is no analysis of the development accesses in Section 6.

Recommendation 4.6.5:

It is recommended that the *Stage 1 TIA* is updated to include a correct Checklist in Appendix A.

Recommendation 4.6.6:

It is recommended that the *Stage 1 TIA* is updated to include analysis of the development accesses as per the requirements of Section 7.12 of Volume 4 of the *WAPC Guidelines*.



4.6.8 Impact on Surrounding Roads

Section 7.12 of Volume 4 of the *WAPC Guidelines* requires the TIA to:

“– Assess whether the existing road cross-sections, for example, two lane or four lane, would be adequate to accommodate the above design traffic flows; and

– If not, indicate what improvements would be required.

The impact of changes in traffic flows on the roads surrounding the development are to be assessed using the appropriate volumes of the Austroads Guides to Road Design and Traffic Management, or a recognised alternative technique as agreed with the approving authority.

The assessment is to consider the capacity of the links to carry the projected volumes, and, where appropriate, the likely change in level of service or impact on travel times and safety.”

The completed Checklist in Appendix A of the *Stage 1 TIA* states that the impact on surrounding roads is included in Section 6. There is no assessment of the impact of the development on surrounding roads in Section 6.

Whilst it is acknowledged that the impact on Stirling Hwy is negligible, there is a significant impact on McCabe Pl and this requires assessment, particularly if a security gate is to be provided at the access (refer **Recommendation 4.6.6**). There will also be an impact of the current on-street parking on McCabe St and Coventry Pde, as discussed in **Section 4.3.2** of this peer review report.

Recommendation 4.6.7:

It is recommended that the *Stage 1 TIA* is updated to include a correct Checklist in Appendix A.

Recommendation 4.6.8:

It is recommended that the *Stage 1 TIA* is updated to include analysis of the development accesses as per the requirements of Section 7.12 of Volume 4 of the *WAPC Guidelines*.



4.6.9 Impact on Intersections

Section 7.12 of Volume 4 of the *WAPC Guidelines* requires the TIA to:

“– Assess whether the existing intersections would be able to accommodate the above design traffic flows; and

– If not, indicate what improvements would be required.

The analysis of intersections will be a major component of the assessment of the surrounding road network as the greatest impacts of a development’s traffic usually occur at intersections. Most approving authorities would expect such analysis to be carried out using a recognised intersection analysis software package, such as SIDRA.

The relevant input and output files should be supplied as an addendum to the assessment report, as well as a list of all assumptions made in the analysis and justifications for any variations from the software’s standard default values.”

A SIDRA Model has been prepared and used for the assessment of the following three intersections:

- Stirling Hwy/ McCabe St (Traffic Signals)
- Stirling Hwy/ Coventry Pde (Give-way T)
- McCabe St/ McCabe Pl (Give-Way T)

No SIDRA models have been prepared for the access points (refer **Section 4.6.7** and **Recommendation 4.6.6** of this peer review report).

An electronic copy of the SIDRA models was provided to the author for the purpose of this peer review.

Section 6.2 (Key Assumptions) of the Stage 1 TIA states the following with respect to the SIDRA models developed and used for assessment on the intersections with and without development traffic:

- *Traffic volumes along Stirling Highway have remained steady over time with some sections experiencing a slight decline in volumes. Therefore, for the purpose of this assessment, a growth rate of 1% per annum has been adopted. The growth rates that were suggested by Main Roads WA were relatively high (approximately 3-4%) which suggests that local development traffic has been included. Therefore, these rates were not used to avoid the doubling up of development traffic.*
- *For the purpose of a robust assessment, the traffic volumes associated with the existing development has not been removed from the background traffic.*
- *Heavy vehicle volumes are based on the traffic data obtained from Main Roads Traffic Map.*
- *The Stirling Highway/Coventry Parade intersection has been calibrated to the maximum observed delays. To achieve this, the following parameters were modified:*
 - *Gap acceptance values for the right turn out of Coventry Parade was reduced to the Austroads minimums*



- *Extra bunching was increased on the northern and southern approaches*
- *The Stirling Highway/McCabe Street intersection has been modified based on the Main Roads WA concept design shown in Section 4.1.1 for the future scenarios (Scenario 4 and 5).*
- *The default/existing signal phasing and timing for the Stirling Highway/McCabe Street intersection has been used for all scenarios.*

The quality of the output of traffic models directly correlates with the quality of the input data and calibration using the model settings and observed and recorded criteria. Without the benefit of peak hour traffic surveys, it is not possible to calibrate the model to reflect observed and recorded criteria such as queue lengths and delays. It is noted that the *Stage 1 TIA* report states that the Stirling Hwy/ Coventry Pde intersection model was “calibrated to the maximum observed delays. To achieve this, the following parameters were modified: Gap acceptance values for the right turn out of Coventry Parade was reduced to the Austroads minimums, and Extra bunching was increased on the northern and southern approaches.” The absence of turning movement surveys and the indication that gap acceptance values were reduced to Austroads minimums raises significant concerns with this ‘calibration’ as these settings should be adjusted to reflect observed criteria, not to minimum values.

In a recent peer review of a TIA undertaken by Cardno (now Stantec), it was reported that SIDRA Models for Main Roads controlled Roads and intersections, i.e., Stirling Hwy and the traffic signal-controlled intersection of Stirling Hwy/ McCabe St, must be prepared in accordance with the Main Roads WA Operational Modelling Guidelines (OMG) ⁽⁹⁾.

The OMG emphasises the importance of data accuracy by stating:

“Collection of high-quality, accurate traffic data, network characteristics and site observations is extremely important for the development of any traffic model. A significant amount of data collection will be required to produce well-calibrated and validated models. Modellers should be satisfied with the accuracy of all data used for modelling purposes and ensure that it is included in the modelling report.

All traffic volume data should be checked thoroughly by someone with local area knowledge to ensure validity as there is significant potential for error when collating large volumes of traffic data. The raw data collected should be provided as part of the model submission.

Ideally, all data collected, all observations made and all measurements taken should be on the same day. As this may not be possible, particularly across networks where all data collection and measurements need to be undertaken across multiple sites in one peak hour, it is recommended that surveys be designed to capture as much information as possible by video so that observations and measurements can be made off-site without time restrictions.”



As indicated previously, this peer review report has identified a large number of concerns with respect to the input data, particularly the lack of turning movement surveys to inform this. In summary, these are:

- Concerns with the identification of AM and PM peak hours times;
- Concerns with existing 2022 Peak Hour Volumes;
- Concerns with generic % 'heavy vehicles' used instead of actual % for each peak hour;
- Concerns with the adopted dwelling trip generation rates, and
- Concerns with the forecast peak hour volumes and assignment to the road network.

All of the above concerns would be addressed by undertaking simultaneous video traffic movement surveys for the Stirling Hwy/ McCabe St, McCabe St/ McCabe Ct and Stirling Hwy/ Coventry Pde intersections between the hours of 7-9 AM and 4-6PM in intervals of 15 minutes or less to identify the existing AM and PM road network peak hours, as per **Recommendation 4.6.1** and reviewing the trip generation and distribution data as per **Recommendation 4.6.2**.

A review of the SIDRA model provided has indicated that it has not been prepared in accordance with the *OMG* and that some criteria have been altered without any identification or reasoning provided for this in the *Stage 1 TIA*. An example of this is that 0% Extra Bunching has been applied to the north and south Stirling Hwy approaches to the McCabe St intersection in the existing model and that 20% Extra Bunching has been applied to these approaches in the '+Development' models. It is also noted that 20% Extra Bunching has been applied to the McCabe St approach for all models. Extra Bunching allows for the effect of upstream signals on gap acceptance to be modelled and should be specified as a percentage based on Approach Distance and Proportion Queued at upstream signals. The adoption of 20% Extra Bunching represents the impact of upstream traffic signals within 100 m. There are no upstream traffic signals on McCabe St and the nearest traffic signals on Stirling Hwy are located approximately 900 m north and 800 m south. It is acknowledged that this criterion is sometimes used to 'calibrate' the model, but any such calibration is only done on exiting models to reflect observed criteria. It is also recommended that the 'Area Type Factor' is used to calibrate models, but this has remained at the default value of 1.0. In addition to this, there is an error in the breakdown of vehicle approaches as HV is used as well as Buses and Classes 3-5, 6-9, 10, 11 & 12. The HV class in the SIDRA model represents a combination of these vehicles, as shown in Table 4 below. Using both, doubles up the volumes of these classes.

Heavy Vehicles					
Light/Medium Rigid	42%	5500	90	16.4	42%
Medium Rigid	10%	10000	120	12.0	90%
Medium / Heavy Truck	10%	16000	170	10.6	100%
Heavy Truck	3%	28000	260	9.3	100%
Heavy Articulated	19%	38000	300	7.9	100%
Bus	15%	8000	170	21.3	80%
Combined (Default)	100%	15000	126	12.0	80%

Table 4 – Composition of Heavy Vehicle Movement Classes in SIDRA



It should also be noted that all the traffic signals along Stirling Highway are coordinated, but the model does not include these. This is likely to result in worse impacts for McCabe St than forecast as it is unlikely that more time will be provided for this leg during peak hours.

Recommendation 4.6.9:

It is recommended that traffic movement surveys are undertaken for the Stirling Hwy/ McCabe St, McCabe St/ McCabe Ct, and Stirling Hwy/ Coventry Pde intersections between the hours of 7-9 AM and 4-6 PM in intervals of 15 minutes or less to identify the existing AM and PM road network peak hours.

Recommendation 4.6.10:

It is recommended that a review of the trip generation rates for the residential dwellings is undertaken in the context of the rates that Cardno (now Stantec) has used for recent similar developments in the area and that the calculations are checked to ensure that each land use volume is rounded up and free of errors.

Recommendation 4.6.11:

It is recommended that all SIDRA models are prepared in accordance with the Main Roads WA Operational Modelling Guidelines.

4.6.10 Impact on Neighbouring Areas

Section 7.15 of Volume 4 of the *WAPC Guidelines* requires the TIA to:

"Identify whether the proposed development traffic has the potential to adversely impact surrounding residential areas.

The potential for traffic generated by the proposed land uses to impact on surrounding residential areas is often a sensitive issue that needs to be considered by the approval authority.

Where the traffic assignment indicates additional traffic flows in such areas, the assessment should address this issue directly. The capacity thresholds identified in Sections 7.13 and 7.14 should form part of this discussion, but the assessment should also consider the potential social, and in some cases environmental, impacts. Possible treatments to minimise potential problems should be discussed."

The completed Checklist in Appendix A of the *Stage 1 TIA* states that the impact of neighbouring areas is assessed in Section 6. There is no assessment of the impact on neighbouring areas in Section 6.

Recommendation 4.6.12:

It is recommended that the *Stage 1 TIA* is updated to include a correct Checklist in Appendix A.

Recommendation 4.6.13:

It is recommended that the *Stage 1 TIA* is updated to include assessment of the impact of the development in neighbouring areas as per the requirements of Section 7.15 of Volume 4 of the *WAPC Guidelines*.



4.6.11 Road Safety

Section 7.16 of Volume 4 of the *WAPC Guidelines* requires the TIA to:

- “– Determine whether the development generated traffic could potentially raise any road safety issues;*
- If so, propose remedial measures to address the safety concerns.*

The assessment should examine any particular intersections or other locations that have been identified as black spots or may be of concern, (that is, identified from examination of the existing crash data in Section 7.4, identified as part of the assessment, or raised by the approval authority).”

A review of the latest crash data for the five-year period ending 31 December 2021 has indicated that the Stirling Hwy/ McCabe St intersection is an identified Blackspot with 12 crashes (3 Casualty). It ranks 17 in the Federal Pre-qualified and 25 in the State pre-qualified locations.

The completed Checklist in Appendix A of the *Stage 1 TIA* states N/A. This is clearly not appropriate and requires assessment.

Recommendation 4.6.14:

It is recommended that the *Stage 1 TIA* is updated to include a correct Checklist in Appendix A.

Recommendation 4.6.15:

It is recommended that the *Stage 1 TIA* is updated to include assessment of the impact of the development on the safety of the blackspot intersection of Stirling Hwy and McCabe St, as per the requirements of Section 7.16 of Volume 4 of the *WAPC Guidelines*.



4.6.12 Public Transport Access

Section 7.17 of Volume 4 of the *WAPC Guidelines* states:

The main issue to be addressed in the assessment is whether access from the development to the nearest bus stops and/ or railway station is direct, safe, and convenient.

Factors that may be considered include:

- conflicts between pedestrian and vehicle movements;
- the ability to cross major roads;
- directness of pedestrian routes;
- adequacy of street lighting and shelter;
- bus stop location(s); and
- building orientation and access points.

The completed Checklist in Appendix A of the *Stage 1 TIA* states this is covered in Section 2. This is not appropriate as Section 2 refers to existing facilities and assessment. It does not cover the above issues in the context of the new development.

Recommendation 4.6.16:

It is recommended that the *Stage 1 TIA* is updated to include a correct Checklist in Appendix A.

Recommendation 4.6.17:

It is recommended that the *Stage 1 TIA* is updated to include assessment of whether access from the development to the nearest bus stops and/ or railway station is direct, safe, and convenient, as per the requirements of Section 7.17 of Volume 4 of the *WAPC Guidelines*.



4.6.13 Pedestrian Access/ Amenity

Section 7.18 of Volume 4 of the *WAPC Guidelines* states:

“Describe/show the existing level of access/amenity for pedestrians, including:

- existing pedestrian facilities/routes within the site; (refer Section 4.3.11 of this peer review report)*
- existing pedestrian access to the site; (refer Section 4.3.11 of this peer review report)*
- existing pedestrian facilities on the surrounding roads; (refer Section 4.3.11 of this peer review report)*
- any potential deficiencies or areas where improvements may be warranted or of benefit, for example, missing sections of footpath or uncontrolled crossings of major roads; (refer Sections 4.5.4 and 4.5.6 of this peer review report)*
- Describe/show any proposals to improve access/amenity for pedestrians, including:*
 - pedestrian facilities within the development;*
 - pedestrian access to the site;*
 - pedestrian facilities on the surrounding roads.*

This section essentially combines the pedestrian information provided earlier in a number of separate sections into a single section. It therefore provides an inventory of existing and proposed pedestrian access and amenity.”

The completed Checklist in Appendix A of the *Stage 1 TIA* states this is covered in Section 2. This is not appropriate as Section 2 refers to existing facilities and assessment. It does not combine the pedestrian information provided earlier in a number of separate sections into a single section. It therefore does not provide an inventory of existing and proposed pedestrian access and amenity, as required in Section 7.18 of Volume 4 of the *WAPC Guidelines*.

Recommendation 4.6.17:

It is recommended that the *Stage 1 TIA* is updated to include a correct Checklist in Appendix A.

Recommendation 4.6.18:

It is recommended that the *Stage 1 TIA* is updated to include combined pedestrian information provided earlier in a number of separate sections into a single section and provide an inventory of existing and proposed pedestrian access and amenity, as per the requirements of Section 7.18 of Volume 4 of the *WAPC Guidelines*.



4.6.14 Cycle Access/ Amenity

Section 7.19 of Volume 4 of the *WAPC Guidelines* states:

Describe/show the existing level of access/amenity for cycles, including:

- existing cycle facilities/routes within the site; (refer **Section 4.3.11** of this peer review report)
- existing cycle access to the site; (refer **Section 4.3.11** of this peer review report)
- existing cycle facilities on the surrounding roads; (refer **Section 4.3.11** of this peer review report)
- any potential deficiencies or areas where improvements may be warranted, or of benefit, for example, missing sections of cycle paths or lanes or uncontrolled crossings of major roads; (refer **Sections 4.5.4 and 4.5.6** of this peer review report)

Describe/show any proposals to improve access/amenity for cycles, including:

- cycle facilities within the development;
- cycle access to the site;
- cycle facilities on the surrounding roads.

This section essentially combines the cycle information provided earlier in a number of separate sections into a single section. It therefore provides an inventory of existing and proposed cycle access and amenity.”

The completed Checklist in Appendix A of the *Stage 1 TIA* states this is covered in Section 2. This is not appropriate as Section 2 refers to existing facilities and assessment. It does not combine the cyclist information provided earlier in a number of separate sections into a single section. It therefore does not provide an inventory of existing and proposed cycle access and amenity, as required in Section 7.19 of Volume 4 of the *WAPC Guidelines*.

Recommendation 4.6.19:

It is recommended that the *Stage 1 TIA* is updated to include a correct Checklist in Appendix A.

Recommendation 4.6.20:

It is recommended that the *Stage 1 TIA* is updated to include combined cyclist information provided earlier in a number of separate sections into a single section and provide an inventory of existing and proposed cycle access and amenity, as per the requirements of Section 7.19 of Volume 4 of the *WAPC Guidelines*.



4.6.15 Analysis of Pedestrian/ Cycle Networks

Section 7.20 of Volume 4 of the *WAPC Guidelines* requires that the TIA includes an “analysis of the operation and safety of the external pedestrian/cycle networks including:

- identifying which roads could potentially be difficult for pedestrians and cyclists to cross;
- identifying where safe crossing facilities should be provided;
- indicating where safe crossing facilities are proposed.”

The completed Checklist in Appendix A of the *Stage 1 TIA* states this is covered in Section 2. This is not appropriate as Section 2 refers to existing facilities and assessment. This section refers to an analysis of the operation and safety of the external pedestrian/cycle network in the context of the additional walking and cycling trips likely to be generated by the development itself.

The *Parking Management Plan* refers to “internal trip capture within the 400m walking catchment (e.g., on-site, and nearby residents walking to restaurants and retail), resulting in a significant decrease in parking demand” and “the considerable reduction in parking demand related to visitors walking in from on-site and adjacent residences”. It is clear that the *Parking Management Plan* relies on a relatively high volumes of walking and cycling trips to the development site and it is therefore important that the identification of barriers to these trips, such as lack of safe crossing facilities on Stirling Hwy to the bus stops, are documented along with measures to address these.

Recommendation 4.6.21:

It is recommended that the *Stage 1 TIA* is updated to include a correct Checklist in Appendix A.

Recommendation 4.6.22:

It is recommended that the *Stage 1 TIA* is updated to include analysis of the operation and safety of the external pedestrian/cycle networks, as per the requirements of Section 7.20 of Volume 4 of the *WAPC Guidelines*.



References

1. **Western Australian Planning Commission.** *Transport Impact Assessment Guidelines*. Department of Planning, Government of Western Australia. Perth, Western Australia : Western Australian Planning Commission, August 2016. p. 182, Revised August 2016. The current version of the WAPC Guidelines (August 2016) has been endorsed by the WAPC.
2. **Austroads.** *Guide to Traffic Management Part 12: Integrated Transport Assessments for Developments*. Austroads. Sydney, NSW : Austroads Ltd, April 2020. p. 113, Guide to Traffic Management. ISBN 978-1-925854-86-2.
3. **Government of Western Australia.** *Planning and Development (Local Planning Schemes) Regulations 2015*. Perth : Government of Western Australia, As at 01 Jul 2016. p. 205. Version 00-d0-02.
4. **Roads and Traffic Authority NSW.** *Guide to Traffic Generating Developments*. Transport Planning Section. Sydney : Roads and Traffic Authority NSW, October 2002. p. 174. Version 2.2. ISBN 0 7305 9080 1.
5. **NSW Government.** *Guide to Traffic Generating Developments Updated traffic surveys*. Transport, Roads & Maritime Services. Sydney : NSW Government, August 2013. p. 22, Technical Direction. RMS.13.298.
6. **Government of Western Australia.** *Main Roads Operational Modelling Guidelines*. Main Roads WA. Perth : Main Roads WA, January 2021. p. 289, Version 2.0.

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TECHNICAL NOTE

Mr Luke Harris | Senior Strategic Urban Planner
Town of Mosman Park
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14 July 2022
Our Ref: 2910702
Your Ref: RFQ2022-21

MATILDA BAY BREWERY – STAGES 1 + 2 PEER REVIEW OF TRANSPORT IMPACT ASSESSMENT

Dear Luke,

This document has been prepared by myself David Wilkins, Principal and Senior Traffic Engineer at i3 consultants WA, in response to your request for peer review of Stages 1 + 2 (*Stage 1+2 TIA*) of the above development, following a peer review of the TIA for Stage 1 (*Stage 1 TIA*) and in conjunction with a peer review of the Parking Management Plan (*PMP*) for Stage 1.

Due to the large number of issues identified with the peer review of the *Stage 1 TIA*, this peer review of the *Stage 1+2 TIA* has been undertaken in the form of a Technical Note to be used in conjunction with the *Stage 1 TIA* peer review report and hence reduce reproducing the issues identified in the *Stage 1 TIA* peer review.



1 DIFFERENCES BETWEEN STAGE 1 AND STAGE 2

The *Stage 1+2 TIA* does not clearly identify the differences between Stage 1 development and 2 development in any of the drawings and images.

Table 3-3 in the *Stage 1+2 TIA* summarises the different land uses in each stage, as shown in Table 1 below.

Stage 1	Stage 2
207 residential apartments	120 residential apartments
Restaurant/café – 937 m ²	20 townhouses
Tavern – 1,300 m ²	Aged care (70 Individual living units)
Function – 750 m ²	Aged care (High care)- 40 beds
Provedore – 807 m ²	Child care centre (100 children)
Co-working and Creative Studio (internal) – 289 m ²	

Table 1 -Stage 1 + 2 Development Summary

Figure 3-2 in the *Stage 1+2 TIA* indicates that it shows the overall extent of Stage 1 and 2 development and is reproduced as Figure 1 below. As can be seen, it is not clear what the stages are.



Figure 1 – Overall development of Stage 1 and 2



An overlay of the site plan in the *Stage 1 TIA* on the overall development plan shown on the previous page is provided as Figure 2 below.

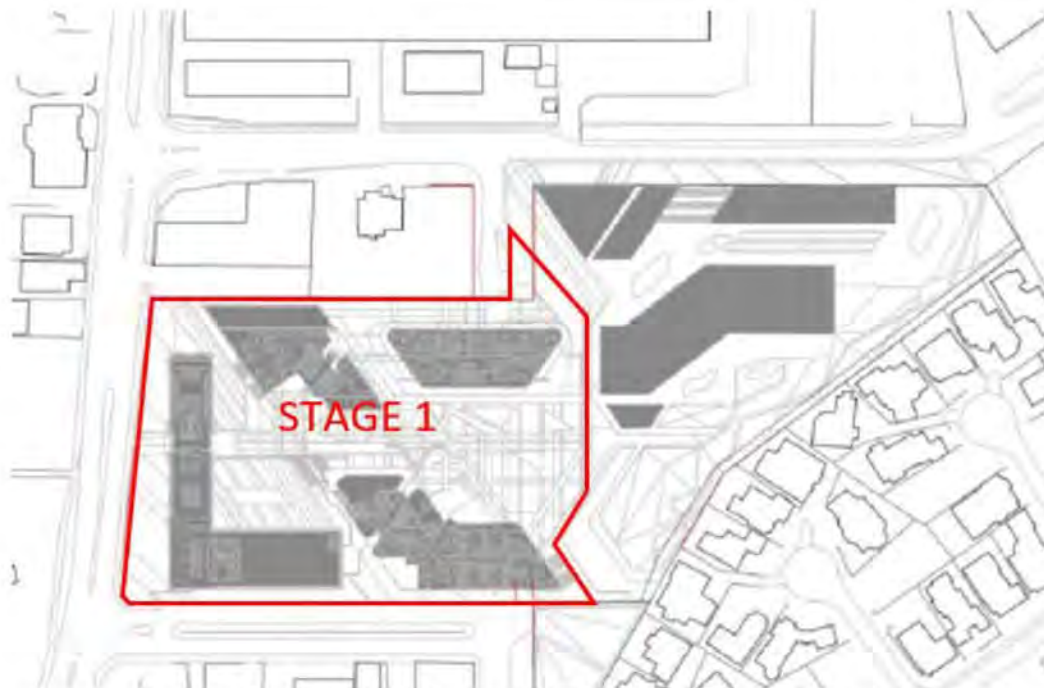


Figure 2 – Overlay of Stage 1 development outline with overall development plan

Recommendation 1.1:

It is recommended that the *Stage 1+2 TIA* is revised to include clearer images and descriptions of Stage 1 and Stage 2 development on the site.

2 ACCESS

Section 3.2 of the *Stage 1+2 TIA* indicates that access to Stage 2 is via the two access locations for Stage 1, as shown in Figure 3 below and described below this.



Figure 3 – Site Access Location

“Access 1 – located on the north boundary of the Site providing access to/ from McCabe Place. This access links to the ground floor of the Stage 1 Site. In the vicinity of this access an entry/ exit roadway is proposed which leads into the Stage 2 facilities.

Access 2 – located on the southern boundary of the Site providing access from Coventry Parade. This access links to the ground floor of the Site and only allows inbound movements.”

The *Stage 1 TIA* peer review report identified a number of concerns with the proposed access points. Recommendations to address these concerns are included as Recommendations 2, 10, 13, 14, 15, 16, 17, 21, 22, 25, 27, 29, 30, 31, 32 and 33 in the *Stage 1 TIA* peer review report.

Recommendation 2.1:

It is recommended that the access issues identified in the *Stage 1 TIA* are addressed and then applied to the proposed access arrangements and forecast trip generation with Stage 1+2 development.



3 PARKING DEMAND

Table 3-3 in the *Stage 1+2 TIA* indicates an assessed statutory requirement for an additional 254 bays for the indicated land uses in Stage 2.

Section 3.3.1.3 of the *Stage 1+2 TIA* states “The Stage 2 parking requirements are summarised in Table 3-3 and is to be accommodated in future planning and design stages for this site.” None of the drawings show the parking area to accommodate this.

Table 3-3 contains an error in the number of residential dwellings, but the calculation is correct. It is noted that rounding up has not been applied to Town House Visitor Bay requirements. Rounding this up would result in a statutory requirement for 255 bays instead of the indicated 254 bays, as shown in Figure 4 below.

Table 3-3 Parking Requirements (Stage 2)

Land Use	Source	Yield	Parking Rate	Parking Required
1 Bed Apartment	R-codes	24	0.75 per dwelling	18 ✓
2 or more bed Apartment	R-codes	96	1 per dwelling	96 ✓
Residential (Visitor)	R-codes	208 ✗ 120	1 bay per 4 dwellings up to 12 dwellings	3 ✓
			1 bay per 8 dwellings for the 13th dwelling and above	14 ✓
Town House (Private)	R-codes	20	1 bay per dwelling	20 ✓
Town House (Visitor)	R-codes	20	1 bay per 4 dwellings + 1 additional bay for every 4 dwellings above 17	5 ✗ 6 (roundup)
Total Residential				156 ✗ 157
Residential Aged Care	Town of Mosman Park LPS 3	110	1 per 4 beds	28 ✓
		35	1 per staff member	35 ✓
Child Care	LPS 4	25	1:1 employee	25 ✓
		100	1:10 children	10 ✓
Total Commercial				98 ✓
TOTAL (RESIDENTIAL + COMMERCIAL)				254 ✗ 255

Figure 4 – Review of Table 3-3 in the *Stage 1+2 TIA*

Recommendation 3.1:

It is recommended that Table 3-3 in the *Stage 1+2 TIA* is corrected as per Figure 4 in this peer review technical note.

Recommendation 3.1:

It is recommended that drawings showing how all the assessed parking demands for Stage 2, i.e., car, motorcycle, and cycle, will be accommodated.



4 ANALYSIS OF TRANSPORT NETWORK

4.1 METHODOLOGY CONCERNS

There are some significant concerns with the methodology and analysis of the Transport Network for Stage 1 Development that require addressing and incorporation into the *Stage 1+2 TIA* assessment. In summary these are:

- Concerns with the identification of AM and PM peak hours times;
- Concerns with existing 2022 Peak Hour Volumes;
- Concerns with generic % 'heavy vehicles' used instead of actual % for each peak hour;
- Concerns with the adopted dwelling trip generation rates (lack of consistency with previously prepared TIAs in the area), and
- Concerns with the forecast peak hour volumes and assignment to the road network.

It is also noted that all the traffic signals along Stirling Highway are co-ordinated, but the model does not include these. This is likely to result in worse impacts for McCabe St than forecast as it is unlikely that more time will be provided for this leg during peak hours.

Recommendation 4.1:

It is recommended that peak hour traffic movement surveys for the Stirling Hwy/ McCabe St, McCabe St/ McCabe Pl, and Stirling Hwy/ Coventry Pde intersections between 7-9 AM and 4-6 PM in 15-minute intervals to identify actual peak hours and existing heavy and light vehicle turning volumes and that these are then used, along with longer term data to determine likely average annual light and heavy vehicle volumes, for the traffic models and update the *Stage 1+2 TIA* to reflect this.

Recommendation 4.2:

It is recommended that vision from the peak hour traffic surveys is used to record average delays and queue lengths to enable the SIDRA models to be calibrated to represent actual intersection operation.

Recommendation 4.3:

It is recommended all SIDRA models are prepared in accordance with the Main Roads WA Operational Modelling Guidelines.



4.2 TRIP GENERATION

There are concerns with some of the trip generation rates used in Table 6-2 in the *Stage 1+2 TIA*, especially with the use of ITE (USA) rates when there are Australian surveyed rates that can be used instead, as well as inconsistencies with the adopted rates to those that Cardno has used for recent similar land uses and developments. There also appears to be errors in the Total Trip Generation calculations in Table 6-4, as shown in Table 2 below.

Land Use	Weekday AM Peak		Weekday PM Peak	
	In	Out	In	Out
STAGE 1				
Apartments	15	56	50	31
Function Room	38	38	38	38
Restaurant/Café	28	7	21	14
Tavern	0	0	33	16
Providore	24	6	18	12
Coworking and Creative Studio	3	2	3	4
Sub-total	108	108	164	113
STAGE 2				
Apartments	9	32	29	18
Townhouses	3	8	8	5
Aged Care (ILU)	11	12	12	10
Aged Care (HC)	4	4	5	5
Child Care	27	24	33	37
Sub-total	53	80	86	76
TOTAL	161	188	250	198

Table 2 – Table 6.4 from the *Stage 1+2 TIA*: Total Trip Generation

An assessment of all the trip generation data has been undertaken by the author and is shown in Table 3 below. The cells shaded green are those that correspond to the totals in the *Stage 1+2 TIA* based on it's rates and distribution (IN/ OUT split). Using rates that Cardno has recently used in its TIAs for other similar land use developments are shown in the additional 2 rows at the bottom and indicate that actual trip generation may be up to 105 trips in the AM peak hour and up to 57 trips in the PM peak hour than shown in Table 6-4.

Stage	Land Use	Units	Source	Weekday AM			Weekday PM			Weekday AM			Weekday PM			
				Rate	IN	OUT	Rate	IN	OUT	IN	OUT	TOTAL	IN	OUT	TOTAL	
1	Apartments	207 dwellings	ITE 222	0.34 per dwelling	21%	79%	0.39 per dwelling	62%	38%	15	56	71	51	31	82	
	Function Room	200 people	Is P	0.30 per person	50%	50%	0.30 per person	50%	50%	30	30	60	30	30	60	
	Restaurant/ Café	937 m ²	RTA	5.00 per 100 m ²	80%	20%	5.00 per 100 m ²	61%	39%	38	10	48	29	19	48	
	Tavern	1300 m ²	RTA	0.00 per 100 m ²	0%	0%	5.00 per 100 m ²	68%	32%	0	0	0	45	21	66	
	Providore	807 m ²	RTA	5.00 per 100 m ²	80%	20%	5.00 per 100 m ²	61%	39%	33	9	42	25	16	41	
	Creative Studio	289 m ²	ITE 495	1.86 per 100 m ²	63%	37%	2.48 per 100 m ²	46%	54%	4	2	6	4	4	8	
2	Apartments	120 dwellings	ITE 222	0.34 per dwelling	21%	79%	0.39 per dwelling	62%	38%	9	33	42	30	18	48	
	Townhouses	20 dwellings	ITE 220	0.46 per dwelling	28%	72%	0.67 per dwelling	46%	54%	3	7	10	7	8	15	
	Aged Care (ILU)	70 dwellings	ITE 252	0.33 per dwelling	47%	53%	0.31 per dwelling	46%	54%	11	13	24	10	12	22	
	Aged Care (HC)	40 dwellings	ITE 255	0.19 per bed	53%	47%	0.25 per bed	46%	54%	5	4	9	5	6	11	
	Child Care	100 children	RTA	0.50 per child	53%	47%	0.70 per child	46%	54%	27	24	51	33	38	71	
										Totals	175	188	363	203	472	
Cardno's previous TIA rates*																
1+2	Apartments	327 dwellings	Cardno*	0.57 per dwelling	27%	73%	0.57 per dwelling	60%	40%	51	137	188	112	75	187	
2	Child Care	100 children	Cardno*	0.80 per child	53%	47%	0.70 per child	47%	53%	43	38	81	33	38	71	
*Derived from previous TIAs prepared by Cardno for similar land use developments																
											Totals	218	250	468	300	529
											Difference	43	62	105	31	57

Table 3 – Assessment of trip generation data within the *Stage 1+2 TIA*



An example of the different Child Care Centre rates used in the *Stage 1+2 TIA* to those that Cardno has used for Child Care Centre TIAs it has recently prepared are shown in Table 4 below.

Stage 1+2 TIA

Land Use	Source	Weekday AM Peak	Weekday PM Peak
Child Care	RTA	0.5 per child	0.7 per child

Ardross 2021

Table 2-1 Trip Generation Rate

Land Use	Source	AM Peak	PM Peak
Long-day Care	RTA – Table 3.6	0.8 trips per child	0.7 trips per child

Table 2-2 Directional Split

Land Use	Yield	AM Peak		PM Peak	
		In	Out	In	Out
Childcare	62 Children	53%	47%	47%	53%

Mundijong 2021

Table 4-1 Adopted Generation Rates

Land Use	ITE Code/Source	Trip rate per child		
		AM Peak Hour	PM Peak Hour	Daily
Child Care Centre	ITE 565	0.79	0.81	4.09

Table 4-2 Trip Directionality Rates

Land Use	ITE Code/Source	AM Peak		PM Peak	
		In	Out	In	Out
Child Care Centre	ITE 565	53%	47%	47%	53%

Kalamunda

Table 4-1 Adopted Trip Generation Rates

Land Use	ITE Code/Source	AM Peak	PM Peak
Child Care Centre	RTA V2.2	0.80 trip per child	0.70 trip per child

Table 4-2 Trip Directionality Rates

Land Use	Yield	ITE Code/Source	AM Peak		PM Peak	
			In	Out	In	Out
Child Care Centre	69 children	RTA V2.2	53%	47%	47%	53%

Table 4 – Child Care Centre rates used in *Stage 1+2 TIA* compared to rates used in other Cardno TIAs

Recommendation 4.4:

It is recommended that the *Stage 1+2 TIA* is revised to include the required definitions of floor areas used for subsequent trip generation and parking assessments, i.e., GLA or NLA.

Recommendation 4.5:

It is recommended that the trip generation rates for the residential dwellings and child care centre in the *Stage 1+2 TIA* are reviewed in the context of the rates that Cardno (now Stantec) has used for recent similar land use developments and ensure that the calculations are checked and that each land use volume is rounded up and free of errors.

4.3 TRIP DISTRIBUTION/ ASSIGNMENT

Refer Findings and recommendations in the *Stage 1 TIA* peer review report.

4.4 INTERSECTION PERFORMANCE

No SIDRA model has been provided for the Stage 1+2 development.

It is noted that the SIDRA model for Coventry Pde (Fig 6-13) shows a 2-lane approach for 60 m, as shown in Figure 5 below

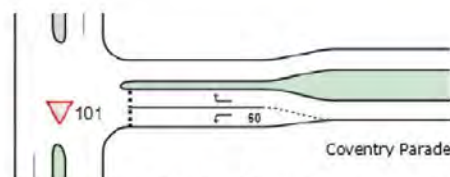


Figure 5 – Extract from Fig 6.13 showing 2-lane 60 m approach on Coventry Pde



Figure 6 – Aerial photograph of Coventry Pde approach to Stirling Hwy showing 60 m dimension in blue

There are no on-street parking restrictions on the south side of Coventry Pde and therefore it is unlikely that the space required for two approach lanes of traffic will always be available at peak time, as shown in Photograph 1 below. This provides a good example of the importance of assessing the traffic management on the frontage roads and undertaking video surveys, as indicated in the *Stage 1 TIA* peer review report.



Photograph 1 – Looking west on Coventry Pde approach to Stirling Hwy



It is noted that Section 7 of the *Stage 1+2 TIA* states:

“The SIDRA analysis indicated that for the future 2034 scenario some movements, particularly right turn movements, are expected to operate at LOS F and experience long queues and reaching capacity, although the overall level of service is still considered to be acceptable.”

The SIDRA Movement Summary included in the *Stage 1+2 TIA* (Appendix C) indicates a forecast Average Delay of 326 seconds (over 5 minutes) for drivers wishing to turn right out of Coventry Pde into Stirling Hwy in the morning peak hour in 2024, as shown in the extract provided as Table 5.

Vehicle Movement Performance														
Mov. ID	Turn	DEMAND FLOWS		ARRIVAL FLOWS		Deg. Satn	Aver. Delay	Level of Service	85% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[Total veh/h]	[HV %]	[Total HV / veh/h]	[HV %]				[Veh. veh]	[Dist m]				
South: Stirling Highway (S)														
2	T1	2016	8.9	2016	8.9	0.622	0.2	LOS A	0.1	0.8	0.00	0.00	0.01	59.4
3	R2	1	0.0	1	0.0	0.622	26.4	LOS D	0.1	0.8	0.01	0.00	0.01	55.4
Approach		2017	8.9	2017	8.9	0.622	0.2	NA	0.1	0.8	0.00	0.00	0.01	59.4
East: Coventry Parade														
4	L2	6	0.0	6	0.0	0.008	8.3	LOS A	0.0	0.3	0.57	0.56	0.57	42.3
6	R2	12	0.0	12	0.0	0.644	326.3	LOS F	1.7	12.1	0.99	1.04	1.18	1.4
Approach		18	0.0	18	0.0	0.644	214.0	LOS F	1.7	12.1	0.84	0.87	0.97	3.9
North: Stirling Highway (N)														
7	L2	32	0.0	32	0.0	0.399	5.6	LOS A	0.0	0.0	0.00	0.03	0.00	53.4
8	T1	1391	8.9	1391	8.9	0.399	0.0	LOS A	0.0	0.0	0.00	0.01	0.00	59.4
Approach		1422	8.7	1422	8.7	0.399	0.2	NA	0.0	0.0	0.00	0.01	0.00	59.3
All Vehicles		3457	8.6	3457	8.8	0.644	1.3	NA	1.7	12.1	0.01	0.01	0.01	56.6

Table 5 – Extract from SIDRA Movement Summary sheet: Stirling Hwy/ Coventry Pde AM Peak Hour 2024

No driver will wait for the indicated time to perform the right turn and will attempt to take smaller gaps in traffic than they usually would, resulting in safety concerns. Despite this, the *Stage 1-2 TIA* concludes that this delay is “acceptable” and indicates, in Appendix B (headed ‘Site Plans’ but should be ‘WAPC Checklist’) that a Safety Assessment is not required, i.e.: “N/A”.

Recommendation 4.6:

It is recommended that the SIDRA Model prepared for the *Stage 1+2 TIA* is provided for peer review.

Recommendation 4.7:

It is recommended that all the issues raised in the *Stage 1 TIA* peer review are assessed and resolved to ensure that relevant issues such as the impact of current on-street parking practices on intersection capacity, performance and safety has been taken into consideration.



5 SUMMARY

In summary, this *Stage 1+2 TIA* peer review has identified a number of concerns that require addressing, in conjunction with the 28 concerns identified in the *Stage 1 TIA* peer review, to bring both TIAs up to the standard required and enable a more thorough peer review of the *Stage 1+2 TIA* to be undertaken.

Digitally signed by David Wilkins
• Date: 2022.07.14 15:47:28
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David Wilkins

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ABOUT THE AUTHOR

David Wilkins is an RTA NSW Certified Level 3 Lead Auditor (RSA-08-0178), Main Roads Western Australia (MRWA) accredited Senior Road Safety Auditor (SRSA 0101) and Qld DMR Road Safety Auditor. In addition to this, David is an MRWA accredited Crash Investigation Team Leader and Roadworks Traffic Manager (MRWA-RTM-10-RTM20). David has undertaken over 460 road safety audits in Australia since 2001 across the full range of stages from feasibility through to pre-opening, including roadworks, existing roads, schools, and mine sites.

David specialises in undertaking and preparing traffic impact assessments in accordance with either the WAPC Guidelines or AGTM12. He has authored over 200 of these since 2001.

David is a member of Engineers Australia and committee member of Transport Australia society and is guided by its Charter and Code of Ethics which states that its members act in the interest of the community, ahead of sectional or personal interests towards a sustainable future. Engineers are members of the community and share the community's aspirations for Australia's future prosperity.



MATILDA BAY BREWERY – STAGE 1

LOTS 5 & 20 STIRLING HWY, LOTS 12, 253 & 314 MCCABE PL, LOTS 218,
219 & 221 THOMPSON RD, NORTH FREMANTLE

PEER REVIEW OF PARKING MANAGEMENT PLAN



Final

Prepared by i3 consultants WA for
Town of Mosman Park

**Matilda Bay Brewery – Stage 1 | Lots 5 & 20 Stirling Hwy, Lots 12, 253 & 314
McCabe Pl, Lots 218, 219 & 221 Thompson Rd, North Fremantle | Peer Review of
Parking Management Plan**

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Description

A peer review of the "Parking Management Plan | Matilda Bay Brewery – Stage 1, North Fremantle" (CW1147800-TR-RP-003-A) report prepared by Cardno (now Stantec) for a Proposed Mixed Use Development (207 Residential Apartments, Restaurant/ Café, Tavern, Function Rooms, Provedore, Creative Studio and Co-working offices) on Lots 5 & 20 Stirling Hwy, Lots 12, 253 & 314 McCabe Pl, Lots 218, 219 & 221 Thompson Rd in the City of Fremantle suburb of North Fremantle.

Client

Town of Mosman Park

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David specialises in undertaking and preparing traffic impact assessments in accordance with either the WAPC *Transport Impact Assessment Guidelines* or Austroads *Guide to Traffic Management Part 12: Integrated Transport Assessments for Developments*. He has authored over 200 of these since 2001.

David is a member of Engineers Australia and committee member of Transport Australia society and is guided by its Charter and Code of Ethics which states that its members act in the interest of the community, ahead of sectional or personal interests towards a sustainable future. Engineers are members of the community and share the community's aspirations for Australia's future prosperity.

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EXECUTIVE SUMMARY

This document represents a peer review of the Stage 1 Parking Management Plan prepared for a Mixed Use Development on the Matilda Bay Brewery Site on the east side of Stirling Hwy just south of McCabe St.

This peer review has been undertaken by David Wilkins, Senior Traffic & Road Safety Engineer at i3 consultants WA. David specialises in undertaking and preparing traffic impact assessments in accordance with either the *WAPC Guidelines* or *AGTM12*. He has authored over 200 of these since 2001.

This peer review has identified a number of issues with the Parking Management Plan (*PMP*) and makes the following nine (9) recommendations to address these:

1. Ensure consistency between the assessment documents (Stage 1 TIA, Stage 1+2 TIA, Parking Management Plan and Parking Demand Assessment) and the drawings submitted for assessment or provide comments where these differ.
2. Undertake a detailed review of the design of the parking areas to ensure compliance with *AS/ NZS 2890.1* and *AS/ NZS 2890.6*.
3. Revise the *PMP* to include an assessment of the oversupply/ undersupply of parking bays and provide commentary on why the oversupply bays cannot be re-allocated to the undersupply bay categories.
4. Revise *PMP* and *TIAs* to include assessment of ACROD bay provision in accordance with the *BCA* and include these on the design drawings in accordance with *AS/ NZS 2890.6*.
5. Include minimum requirements in Table 4-4.
6. Undertake and use a detailed assessment of the 5-minute walkable catchment based on actual available walking routes and facilities instead of a simplistic application of a 400 m radius.
7. Include a recommendation that the function room is restricted to a maximum capacity of 100 people through a legal arrangement, as per Clause 4.7.3 (v) of *LPS4*, to ensure that shared parking demand does not exceed 120 bays.
8. Undertake and use a detailed assessment of the pedestrian routes to and from the nearest bus stops and include recommendations to encourage their use, e.g., improved paths and a formal pedestrian crossing of Stirling Hwy.
9. Include reference to Clause 4.7.3 of *LPS4* and provide commentary and recommendations with respect to compliance with (a), (iii) and (v).



1 INTRODUCTION

i3 consultants WA has been engaged by the Town of Mosman Park (*the Town*) to undertake a peer review of the “Parking Management Plan | Matilda Bay Brewery – Stage 1, North Fremantle – Issue for Development Approval” (CW1147800 / 304900169) report (*PMP*) prepared by Cardno (now Stantec) for a Proposed Mixed Use Development (207 Residential Apartments, Restaurant/ Café, Tavern, Function Rooms, Provedore, Creative Studio and Co-working offices) on Lots 5 & 20 Stirling Hwy, Lots 12, 253 & 314 McCabe Pl and Lots 218, 219 & 221 Thompson Rd in the City of Fremantle suburb of North Fremantle (*Stage 1 TIA*).

The *PMP* indicates it is proposed to provide a total of 463 parking bays across three levels of the Stage 1 development, and 15 on-street bays within the site (north side of Coventry Pde).

This peer review has been undertaken by David Wilkins, Senior Traffic & Road Safety Engineer at i3 consultants WA.

David is an RTA NSW Certified Level 3 Lead Auditor (RSA-08-0178), Main Roads Western Australia (MRWA) accredited Senior Road Safety Auditor (SRSA 0101) and Qld DMR Road Safety Auditor. In addition to this, David is an MRWA accredited Crash Investigation Team Leader and Roadworks Traffic Manager (MRWA-RTM-10-RTM20). David has undertaken over 460 road safety audits in Australia since 2001 across the full range of stages from feasibility through to pre-opening, including roadworks, existing roads, schools, and mine sites.

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David is a member of Engineers Australia and committee member of Transport Australia society and is guided by its Charter and Code of Ethics which states that its members act in the interest of the community, ahead of sectional or personal interests towards a sustainable future. Engineers are members of the community and share the community’s aspirations for Australia’s future prosperity.



2 PARKING BAY REQUIREMENTS AND PROVISION

A review of the Architectural Drawings has revealed a total of 484 parking bays across the three levels of Stage 1 development, as summarised below.

- Basement level – 243 bays including 2 ACROD (residential bays);
- Ground Floor – 121 bays including 2 ACROD (visitor and commercial bays)
- Coventry Pde – 15 bays on-street (visitor and commercial bays); and
- Podium Level – 105 bays including 1 ACROD (residential bays).

The review of the Architectural Drawings also identified that there were a number of bays that did not meet the requirements of the Standards (AS/ NZS 2890.1 for regular bays and AS/ NZS 2890.6 for ACROD bays). Deleting these non-standard bays results in the provision of 441 parking bays across the three levels of Stage 1 development, as summarised below, with a summary provided as Table 1 below this.

- Basement level – 240 bays including 2 ACROD (residential bays);
- Ground Floor – 101 bays including 1 ACROD (visitor and commercial bays)
- Coventry Pde – 0 bays on-street (visitor and commercial bays); and
- Podium Level – 100 bays including 1 ACROD (residential bays).

CMP			Drawings						
Level	Regular	♿	Level	Regular	♿	Coventry	Non-std bays	Compliant Std Bays	Compliant ♿ Bays
Basement	236	2	Basement	242	2		5	238	2
Ground	120	2	Ground	119	2	15	20	100	1
Mid Garage	102	1	Podium	104	1		5	99	1
TOTAL	458	5	TOTALS	465	5	15	30	437	4
	463							441	

Table 1 – Assessment of provided parking bays

The *PMP* has indicated a statutory requirement for 548 parking bays. The proposed provision of 441 compliant parking bays represents a shortfall of 107 bays. A breakdown of the proposed compliant parking bays by intended use is provided as Table 2 below.

Level	Res Std	Res ♿	Other	Other ♿
Basement	238	2		
Ground			100	1
Podium	99	1		
TOTALS	337	3	100	1
	441			
Statutory Requirement	226	0	320	2
	548			
Over/ Under	111	3	-220	-1
	-107			

Table 2 – Assessment of provided compliant bays with statutory required bays



Table 2 on the previous page indicates there is a significant shortfall in the provision of parking bays for the non-residential uses, i.e., 221 bays, whilst there is an oversupply of 114 bays.

The *PMP* fails to identify, or quantify, the statutory requirement for the provision of parking bays allocated for the use by people with a disability (called ACROD bays in the *PMP*). These requirements are indicated in the Building Code of Australia (*BCA*) and are determined on the class of the building. Despite there not being a requirement for ACROD bays for residential uses, three ACROD bays have been provided on the residential floors meaning that they are unlikely to be accessible by the public. Based on an assumption that the 101 bays provided for non-residential use are 'Class 6' in the *BCA*, there is a requirement for 1 space for 50 car parking spaces or part thereof, i.e., 2 ACROD bays on the non-residential floors.

Section 2 of the 'Parking Demand Assessment' included as Appendix B in the *PMP* states:

"Based strictly off the statutory parking requirements, the commercial/ visitor component has a significant shortfall of bays. However, these parking requirements do not consider the benefits of shared parking, and assume that each component of the development operates in complete isolation from its local context. In reality, the high density of nearby residential will have a significant impact on the need for visitors to drive and park, while the flexibility of a shared on-site supply will support a more efficient parking arrangement."

The 'Parking Demand Assessment' is considered to be flawed as it makes no mention of the over-supply of residential parking and hence fails to consider re-allocation of some of these bays to address the shortfall in non-residential bays. It is important to note that the Podium Level has 100 compliant parking spaces, all of which have been allocated for residential use. Each of these bays is 2.6 m wide and 5.4 m long and hence suitable for non-residential use, including the 24 bays provided in a tandem arrangement, by allocating these to the same commercial tenant.

The assessment of each parking floor is shown in the following figures with commentary provided for each annotated bay below the figure.

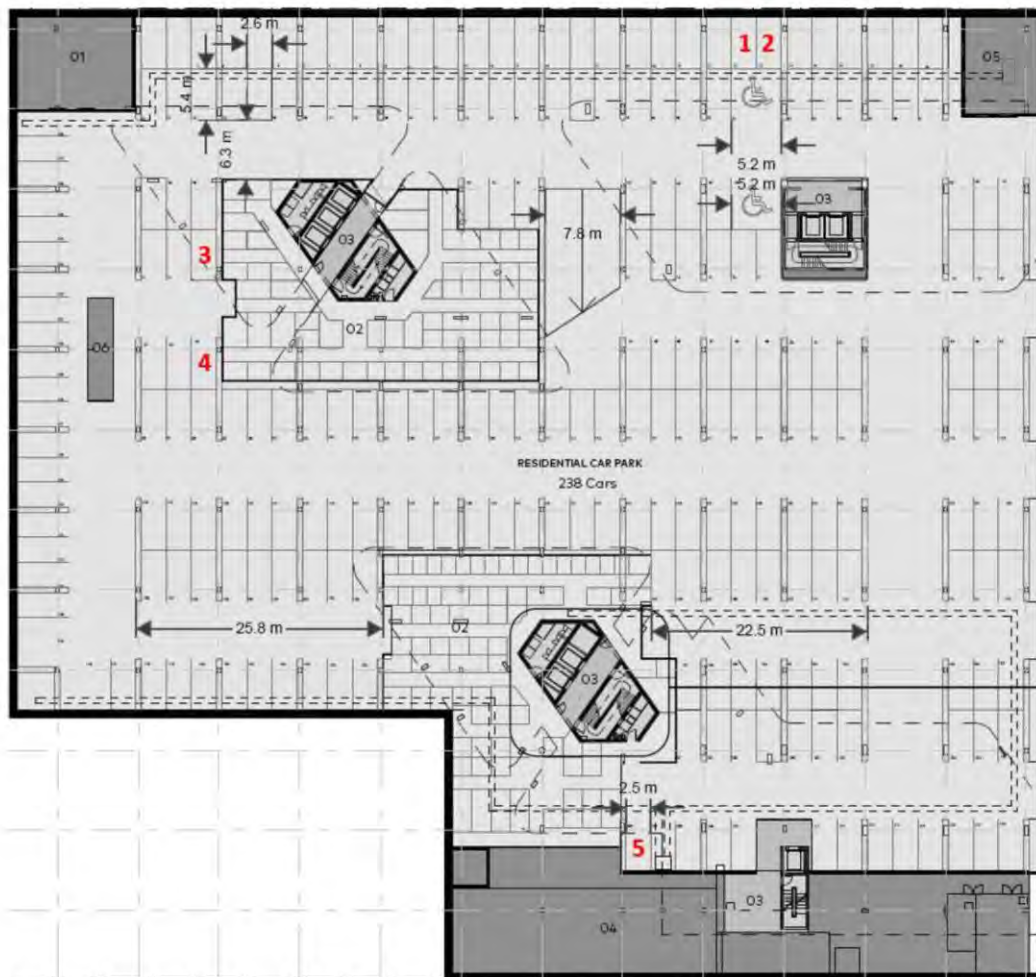


Figure 1 – Basement Level Car Park Assessment

Annotated bays 1 & 2 are behind the 'disabled bay' and are not accessible. Annotated bays 3 & 4 are in a blind aisle arrangement. Clause 5.4.2 (c) of AS/ NZS 2890.1 requires that "the aisle shall be extended a minimum of 1 m beyond the last parking space and the last parking space widened by at least 300 mm if it is bounded by a wall or fence". Only part of the aisle has been extended.

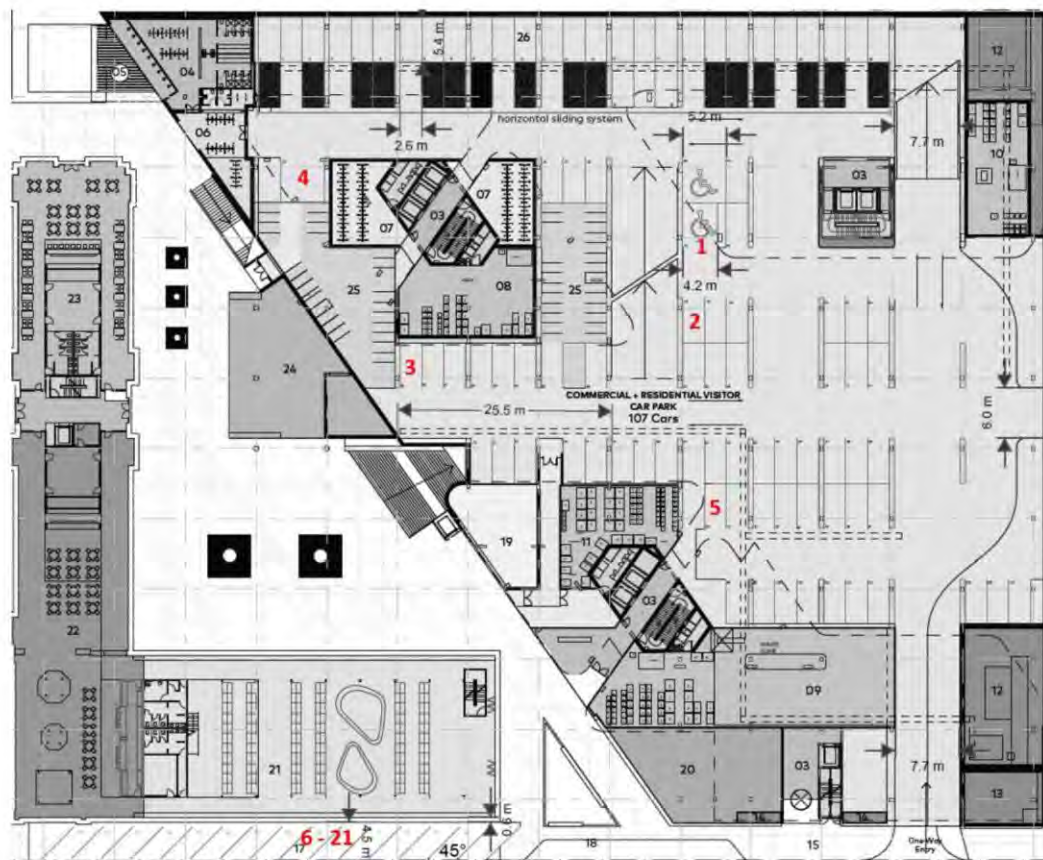


Figure 2 – Ground Level Car Park Assessment

Annotated bay 1 is 4.2 m wide. This does not allow for it to be marked out in accordance with Figure 2.1 of AS/ NZS 2890.6, i.e., a 2.4 m wide bay with an adjacent 2.4 m wide shared area, a total of 4.8 m. Annotated bays 1 & 2 are in a blind aisle arrangement. Clause 5.4.2 (c) of AS/ NZS 2890.1 requires that “the aisle shall be extended a minimum of 1 m beyond the last parking space and the last parking space widened by at least 300 mm if it is bounded by a wall or fence”. There is no aisle extension provided. Annotated bays 3, 4 & 5 have been described as ‘Turnaround Bays’ in Section 4.3 of the PMP and must be left vacant “to provide non-residential/visitor users a means to exit these blind aisles.” Annotated Bays 6-21 are 45° angled bays on the north side of Coventry Pde within the site boundary. Unfortunately, they are below the dimensions specified in Figure 2.2 of AS/ NZS 2890.1, i.e., ‘C’ = 4.5 m when ‘C’ is required to be 4.8 m, as shown below.

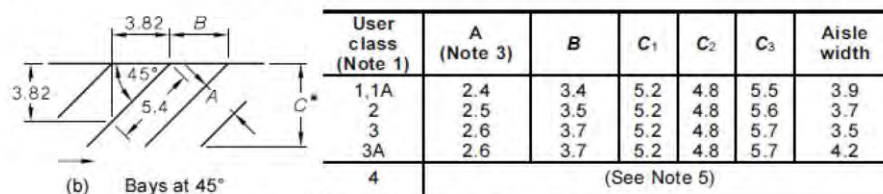


Figure 3 – Extract from Figure 2.2 of AS/ NZS 2890.1



Figure 4 – Podium (Mid Garage) Level Car Park Assessment

Annotated bay 1 is at the end of a blind aisle almost 60 m long with no turning area. Cars should not reverse for more than 6 bay widths, i.e., approx 15 m (Clause 5.4.2 (c) of AS/ NZS 2890.1). It is noted that the two bays near this have been allocated as 'Turnaround bays' in the PMP but it makes little sense to use 2 bays as a turnaround area for 1 bay. Annotated bays 2, 3, 4 & 5 are in a blind aisle arrangement. Clause 5.4.2 (c) of AS/ NZS 2890.1 requires that "the aisle shall be extended a minimum of 1 m beyond the last parking space and the last parking space widened by at least 300 mm if it is bounded by a wall or fence".

3 MANAGEMENT AND ALLOCATION OF ON-SITE PARKING

Section 4.3 of the *PMP* includes three figures showing the intended allocation of parking bays to Residential, Non-residential/ Visitor, ACROD ('disabled'), on-street bays (Coventry Pde) and Ride-Share bays (Coventry Pde).

As indicated in **Section 2** of this peer review report, the proposed bays on Coventry Pde are within the site boundary and as such can be considered 'on-site parking' however, they are not to the standard in terms of dimensions for 45° bays and therefore are not included in this peer review assessment as 'compliant' bays.

It is also noted that the ACROD bays are not to the standard although some can easily be converted to the standard through correct pavement marking. An example of the standard for these bays is shown in Figure 5 below.

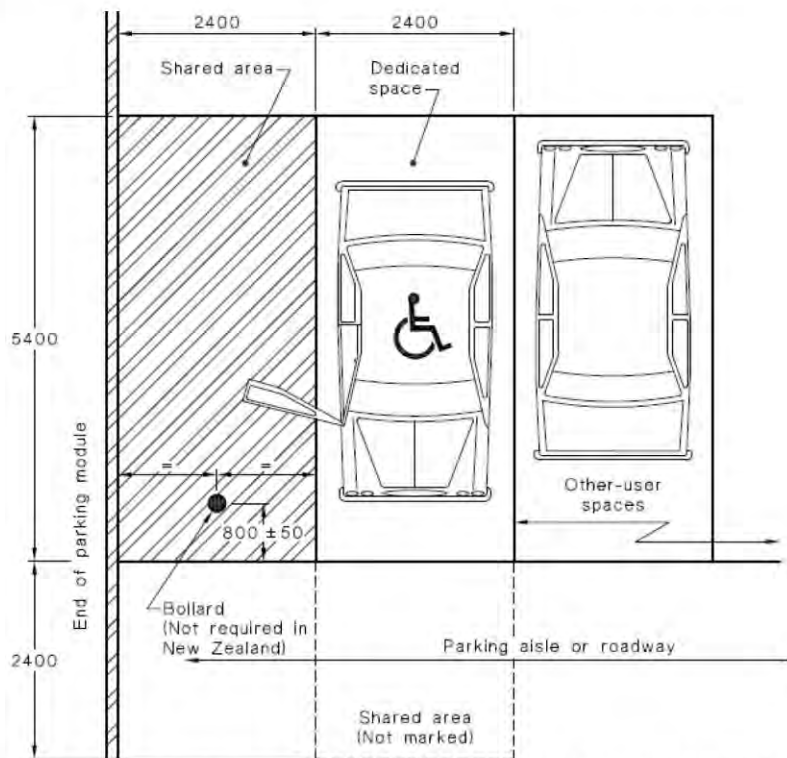


Figure 5 – Example of an ACROD bay with required adjacent shared space (Fig 2.2 AS/ NZS 2890.6)

Also as indicated in **Section 2** of this peer review report, the *PMP* indicates that it is proposed to provide 453 bays when the statutory assessment indicates a requirement for 548 bays, i.e., a shortfall of 95 bays. Based on the 'compliance' assessment undertaken in **Section 2**, this shortfall increases to 107 bays. It is envisaged that this shortfall could return to around 95 through a revision of the proposed parking layout in the context of addressing the issues raised in this peer review report.



It is important to note that the statutory requirements are based on the land use and as such, the bays are required to be assigned to users of these land uses, either individually, as in the case of residential tenant and residential visitor bays, or in modules, as is the case for the non-residential land uses.

Clause 2.3.4 of AS/ NZS 2890.1 states: *"In a private car park a single module catering for a mixture of classes (e.g., employees plus visitors) may be used provided that the spaces for each separate class are grouped together."*

The proposed assignment of parking bays complies with this requirement with the exception of the provision of the ACROD bays. As indicated in **Section 2**, the required number of these bays is 2, based on BCA Class 6, and they must all be provided in an accessible location within the non-residential classes. The proposed design has five (5), three (3) of which are on residential floors. One (1) of the two (2) bays on the non-residential floor is not to the standard, hence there is only one (1) ACROD bay currently provided, instead of the two (2) required.

Section 4.3 of the *PMP* indicates that the allocation of the parking bays is based on the *"minimum requirements summarised in Table 4-1."* There are no minimum requirements specified in Table 4-4, as shown in Table 3 below.

Legend	
Residential Bays	GREEN
Horizontal Sliding system	DARK BLUE
Non-Residential/Visitor Car Bays	RED
ACROD Bays	LIGHT BLUE
Turnaround Bays	ORANGE
On-Street Bays	PINK
Ride Share Bays	PURPLE

Table 3 – Reproduction of Table 4-4 from the *PMP*

The assessed minimum requirements, based on Table 4-1 (Parking Requirements) with the addition of the required 2 ACROD bays, along with the assessed compliant number of bays on the drawings, are shown in Table 4 below.

	Res Std	Res	Other	Other
Statutory Requirement	226	0	320	2
Design Drawings (Compliant)	337	3	100	1
Over/ Under	111	3	-220	-1
	-107			

Table 4 – Assessment of minimum and provided compliant parking bays



The design of the car park and allocation of parking bays within it represents a significant deviation from the statutory requirements. Section 4.2 (Policy Requirements) of the *PMP* provides the following statement after the assessment of the statutory parking requirements: *“An additional parking demand assessment has been conducted which provides further detail regarding the anticipated parking demand for the commercial tenancies for the proposed development. This is included in Appendix B.”*

A review of the *“additional parking demand assessment”* is included in the following section.



5 PARKING DEMAND ASSESSMENT

The *Parking Demand Assessment (PDA)* (Cardno Technical Memorandum included as Appendix B to the *PMP*) states that the Statutory Parking Requirements within *LPS 4* “do not consider the benefits of shared parking and assume that each component of the development operates in complete isolation from its local context”. This statement is incorrect as *LPS4* does consider the benefits of shared parking and allows for a reduction in the parking requirement based on shared parking principles, i.e.:

Clause 4.7.3 of *LPS4* states:

“Council may—

(a) Subject to the requirements of Schedule 7, waive or **reduce the standard parking requirement specified in Table 2 subject to the applicant satisfactorily justifying a reduction due to one or more of the following—***

(i) the availability of car parking in the locality including street parking,

(ii) the availability of public transport in the locality,

*(iii) **any reduction in car parking demand due to the sharing of car spaces by multiple uses, either because of variation of car parking demand over time or because of efficiencies gained from the consolidation of shared car parking spaces,***

(iv) any car parking deficiency or surplus associated with the existing use of the land,

*(v) **legal arrangements have been made in accordance with clause 4.7.5 for the parking or shared use of parking areas which are in the opinion of the Council satisfactory,***

(vi) any credit which should be allowed for a car parking demand deemed to have been provided in association with a use that existed before the change of parking requirement,

(vi) the proposal involves the restoration of a heritage building or retention of a tree or trees worthy of preservation,

(viii) any other relevant considerations.

*Note: *In some sub areas identified in Schedule 7 reduction of parking bays is not permitted. The requirements of Schedule 7 prevail over this clause.*

(b) Council may require an applicant to submit a report completed by a suitably qualified person or persons justifying any of the points cited above.

Note: Provides greater flexibility to vary car-parking requirements based upon alternative transport opportunities.”

Schedule 7 of *LPS4* indicates that the development site is within Local Planning Area 3 (North Fremantle). There are no identified parking requirements in this schedule that preclude the use of shared parking.



Section 2 of the PDA also states: *“In reality, the high density of nearby residential will have a significant impact on the need for visitors to drive and park, while the flexibility of a shared on-site supply will support a more efficient parking arrangement.”*

Section 3 of the PDA states that the assessment is *“based on best-practice profiles from the Urban Land Institute’s Shared Parking and Institute of Transport Engineers ITE Parking Generation and the City of Fremantle LPS No.4 parking supply rates for the above on-site land uses.”*

5.1 MODEL RATIONALE

Understanding the relationship between land use patterns and parking demand is critical. A study area functions as a mixed-use parking district with a unique user behaviour profile that poses challenges in managing parking resources. Traditional development expectations often assume that parking will be provided for each separate use on site, with little or no consideration of shared parking or access among different uses. This may be applicable to sites with a lot of space and isolated single land uses, but is not appropriate in a mixed-use environment (particularly in a transit-oriented district and/ or a walkable place) where a number of land uses, each with different demand profiles across the course of the day, are located in close proximity to each other and could more efficiently share local parking resources.

In a principle often referred to as “staggered peaks,” the actual demand for parking varies by use throughout the hours of a day and days of a week: office space generates parking demand during traditional weekday business hours; parking for residential housing is often highest overnight as many residents use their cars during the day; and the parking demand generated by bars and restaurants is highest during meal times and in the evening. If parking is shared between multiple uses, the aggregated parking demand by time of day is less than the total that would be allocated separately for each use.

5.2 TRADITIONAL DEMAND PROJECTIONS

The shared parking demand forecast methodology is different from traditional parking generation due to the consideration of staggered peaks. Most often, parking generation analyses rely solely on the Institute of Transportation Engineers’ (ITE) periodic report titled Parking Generation, which is the prevailing national standard in determining expected parking demand for a development or set of land uses. ITE standards are based on parking demand studies submitted to ITE by a variety of parties, including public agencies, developers and consulting firms. These studies are often based on peak-hour demand measures at suburban sites with isolated, single land uses that provide free parking¹.

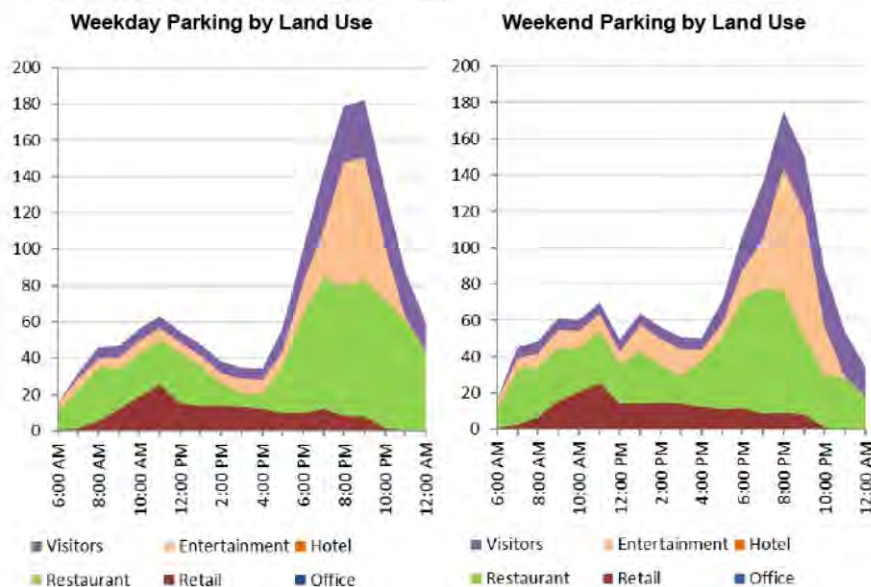
¹ Institute of Transportation Engineers, Parking Generation 4th Edition, 2010.

5.2 ASSESSMENT OF SHARED PARKING MODEL USED IN THE PDA

The shared parking model methodology used in the *PDA* is generally consistent with accepted practice, i.e.,

1. Identification of walkable catchment (Figure 3-1 in the *PDA*) – Refer **Section 5.3** commentary;
2. Analysis of land use yields within the development and within the walkable catchment (Table 3-1 in the *PDA*);
3. Identification, assessment, and determination of hourly parking demand throughout each week day and weekend for each land use (Sections 3.2 and 3.3 of the *PDA*);
4. Assessment of public transport amenity and attractiveness for use (Section 3.4 of the *PDA*) – Refer **Section 5.4** commentary; and
5. Provision of 'ride-share' facilities (Section 3.4 of the *PDA*).

Based on the above methodology, the *PDA* concludes "The combination of all of the non-residential parking demands, including those of residential visitors, is shown below:



Despite the adopted shared model indicating a requirement for around 180 non-residential parking bays, the *PDA* reduces this to an assessed demand of 120 bays based on the assumption that the function centre will never reach its maximum capacity, i.e., it states that "the City's Parking Policy assumes a rate of 1 space per 5 guests or 5 m², it assumes a maximum capacity for the function room of 420 persons. This is substantially higher than the anticipated use."

Despite being a 'Parking Management Plan', it does not recommend that the function room is restricted to a maximum capacity of 100 people through a legal arrangement, as per Clause 4.7.3 (v) of *LPS4*, to ensure that shared parking demand does not exceed 120 bays.

5.3 WALKABLE CATCHMENT

The PDA uses a 400 m radius to identify the 5-minute walkable catchment area. This simplistic approach assumes that everyone in this area can walk to or from the proposed development in 5 minutes, which is not factual given the layout of the streets. An example of this is shown in Figure 6 below.

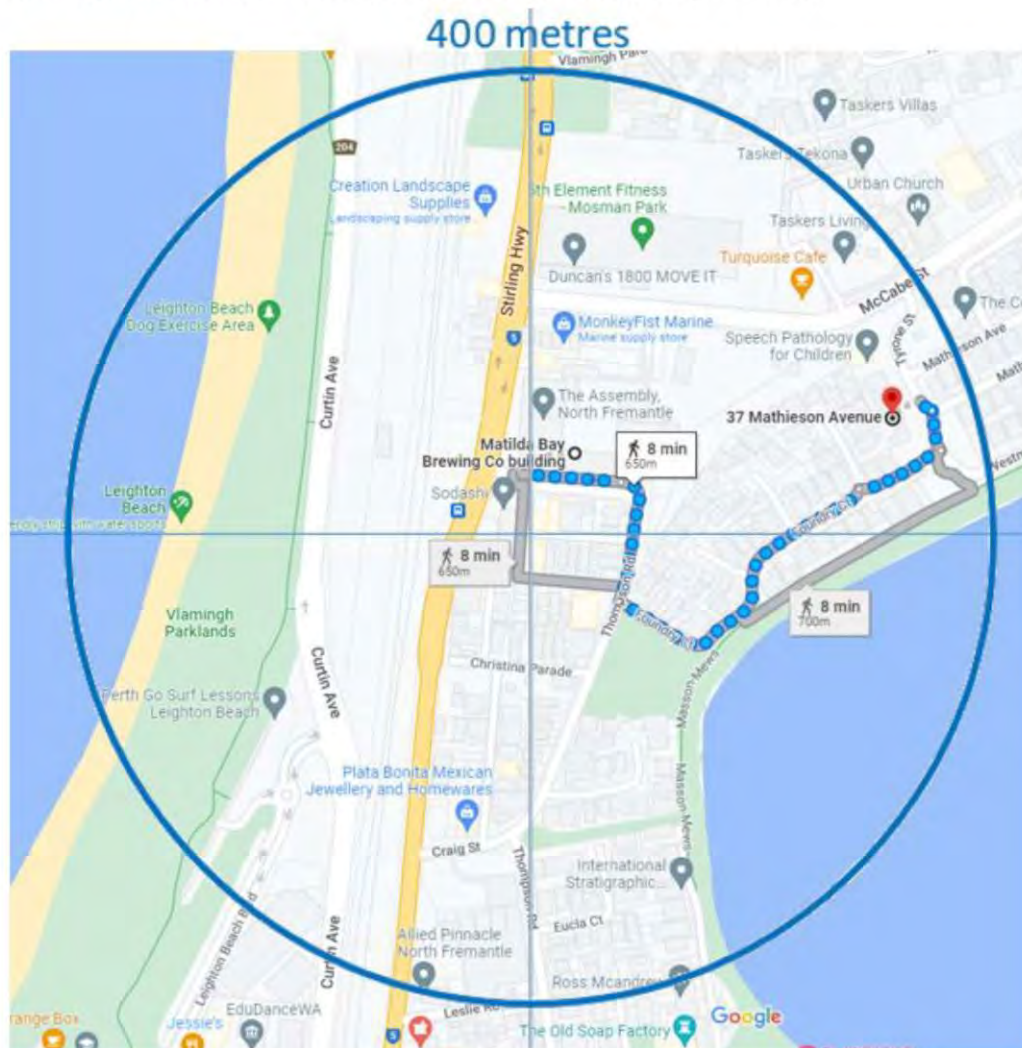


Figure 6 – Example of single residence within 400 m radius of site that is a 700 m walk

In addition to the above, the TIAs for Stage 1 and Stage 2 development of the site fail to show and assess the pedestrian routes to attractors and generators within a 5-minute walk of the Development Site, including the nearest bus stops.



5.4 PUBLIC TRANSPORT AMENITY

The TIAs for Stage 1 and Stage 2 development of the site fail to show and assess the pedestrian routes to the nearest bus stops, it simply shows their locations. The nearest bus stop on Stirling Hwy for northbound services is located on the west side just south of Vlamingh Pde (#10348). The pedestrian route and pedestrian crossing (north of Vlamingh Pde) is poor, as shown in Photograph 1 below.



Photograph 1 – Bus Stop 10348 and poor facilities associated with this



6 FINDINGS AND RECOMMENDATIONS

Finding	Recommendation
1 Differences between the number of proposed parking bays and small differences in the layout diagrams to that shown in the drawings submitted for assessment.	Ensure consistency between the assessment documents (Stage 1 TIA, Stage 1+2 TIA, Parking Management Plan and Parking Demand Assessment) and the drawings submitted for assessment or provide comments where these differ.
2 Parking bays not to the Standard (AS/ NZS 2890.1 and AS/ NZS 2890.6).	Undertake a detailed review of the design of the parking areas to ensure compliance with AS/ NZS 2890.1 and AS/ NZS 2890.6.
3 No assessment of oversupply/ undersupply of parking bays based on allocated land use. Peer review indicates oversupply of 114 residential bays and undersupply of 221 non-residential bays.	Revise the PMP to include an assessment of the oversupply/ undersupply of parking bays and provide commentary on why the oversupply bays cannot be re-allocated to the undersupply bays.
4 No assessment of ACROD bay provision requirements in accordance the BCA. Design currently provides 5, 3 on the residential parking floors where they are not accessible and 2 on the non-residential floor. Estimated requirement is 2 ACROD bays, both on the accessible non-residential floors.	Revise PMP and TIAs to include assessment of ACROD bay provision in accordance with the BCA and include these on the design drawings in accordance with AS/ NZS 2890.6.
5 No minimum requirements specified in Table 4-4.	Include minimum requirements in Table 4-4.

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Finding	Recommendation
6 The walkable catchment assessment in the PDA is too simplistic and does not consider that many local residents will not be able to walk to the site within 5 minutes due to the layout of the streets and paths.	Undertake and use a detailed assessment of the 5 minute walkable catchment based on actual available walking routes and facilities within this time.
7 Despite being a 'Parking Management Plan', it does not recommend that the function room is restricted to a maximum capacity of 100 people through a legal arrangement, as per Clause 4.7.3 (v) of LPS4, to ensure that shared parking demand does not exceed 120 bays.	Include a recommendation that the function room is restricted to a maximum capacity of 100 people through a legal arrangement, as per Clause 4.7.3 (v) of LPS4, to ensure that shared parking demand does not exceed 120 bays.
8 The TIAs for Stage 1 and Stage 2 development of the site fail to show and assess the pedestrian routes to the nearest bus stops, it simply shows their locations. The nearest bus stop on Stirling Hwy for northbound services is located on the west side just south of Vlamingh Pde (#10348). The pedestrian route and pedestrian crossing (north of Vlamingh Pde) is poor.	Undertake and use a detailed assessment of the pedestrian routes to and from the nearest bus stops and include recommendations to encourage their use, e.g., improved paths and a formal pedestrian crossing of Stirling Hwy.
9 The PDA states that the Statutory Parking Requirements within LPS4 "do not consider the benefits of shared parking and assume that each component of the development operates in complete isolation from its local context". This statement is incorrect as LPS4 does consider the benefits of shared parking and allows for a reduction in the parking requirement based on shared parking principles.	Include reference to Clause 4.7.3 of LPS4 and provide commentary and recommendations with respect to compliance with (a), (iii) and (v).

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**ADDITIONAL INFORMATION 22 - APPLICANT RESPONSE TO TOWN OF MOSMAN
PARK COMMENT**

1 Response to Attachment 1 Peer review of TIA for Stage 1

Traffic Comments	Cardno now Stantec's Response
1. Revise the Stage 1 TIA to include assessment of the requirements of the City of Fremantle's Local Planning Scheme 4 for the site under 'DA18' as well as the previous Structure Plan TA, noting differences and providing commentary on these.	Noted. Stage 1 TIA has been updated to address this comment.
2. Revise the Stage 1 TIA to include an assessment of the forecast performance of McCabe Pl between McCabe St and the access to the development site taking into account the provision of any security gates and the impact of this on queues back to McCabe St, including revising the assessment of this intersection if this is forecast to occur.	There is approximately 45m of road space between the entrance of the Site and McCabe Street so queuing is likely to occur along this section of road. The assessment at this intersection shows that queuing will be minimal at this location and is unlikely to extend back to McCabe Street. Additionally, the security gates at the entrances are anticipated to remain open during normal business hours.
3. Revise the Stage 1 TIA to include assessment of whether access from the development to the nearest bus stops and/ or railway station are direct, safe, and convenient, as per the requirements of Section 7.17 of Volume 4 of the WAPC Guidelines. (Note: this is also an important requirement of the Parking Management Plan)	Noted. Stage 1 TIA and PMP has been updated to include comment.
4. Revise the Stage 1 TIA to show and assess the pedestrian routes to attractors and generators within a 5-minute walk of the Development Site. (Note: this is also an important requirement of the Parking Management Plan).	Noted. Stage 1 TIA and PMP has been updated to include comment.
5. Revise the Stage 1 TIA to show and assess the cycle routes to attractors and generators within a 5-minute bicycle trip of the Development Site. (Note: this is also an important requirement of the Parking Management Plan).	Noted. Stage 1 TIA and PMP has been updated to include comment.
6. Revise the Stage 1 TIA to include a Summary after Section 1 (Background) that includes a brief description of the development proposal, the key transport issues, potential transport impacts and any proposed modifications to the surrounding transport networks, as per guidance provided in Section 7.2 of Volume 4 of the WAPC Guidelines.	Noted. This information is provided throughout the report.

7. Revise the Stage 1 TIA to identify the 'Applicant' in Section 1.	Section 1 of the TIA indicates the 'Client' as the company/person acting as the 'Applicant'.
8. Revise the Stage 1 TIA to include a correctly completed Checklist in Appendix A.	A WAPC Checklist has been included in the TIA report. The checklist will be amended once the Stage 1 TIA is updated.
9. Undertake peak hour traffic movement surveys for the Stirling Hwy/ McCabe St, McCabe St/ McCabe Pl, and Stirling Hwy/ Coventry Pde intersections between 7-9 AM and 4-6 PM in 15-minute intervals to identify actual peak hours and existing heavy and light vehicle turning volumes and use these, along with longer term data to:	Main Roads Traffic map provides SCATS information at the Stirling Highway / McCabe Street from February 2022. There are counting stations in the proximities of the site to identify light and heavy vehicle movements.
a. determine likely average annual light and heavy vehicle volumes, for the traffic models and update the Stage 1 TIA to reflect this.	The heavy vehicle volumes were based on the data provided on Main Roads Traffic map and are considered to be appropriate for the purposes of the assessment.
b. record average delays and queue lengths and analyse these for the existing intersections to enable the SIDRA models to be calibrated to represent actual intersection operation.	The results from the base model for the Stirling Highway McCabe Street intersection was in line with on-site observations and therefore minimal modification were made at this intersection. Regarding the Stirling Highway/Coventry Parade intersection, the delays were calibrated to on-site observations as mention in the report assumptions.
10. Revise the Stage 1 TIA to include a description of existing site uses in Section 2.	Noted. TIA updated to include description of the existing site uses as part of Stage 1.
11. Revise the Stage 1 TIA to include a description of existing parking provision and demand in Section 2.	The image provided appears to be from Google street view, from March 2021. The parking is likely to be associated with the construction of the tasker site apartments, as various trade vehicles were parked at these locations. The most recent aerial imagery from Metromap (March 2022) shows the parking demand along McCabe Street is relatively low.
12. Revise the Stage 1 TIA to include a description of the existing access arrangements in Section 2.	Considered not relevant for the purpose of the TIA, which evaluates the impacts of the proposed development.
13. Revise the Stage 1 TIA to include a description of existing site traffic in Section 2.	The description of existing site traffic is considered irrelevant for the purposes of this TIA, since the proposed development will change the existing uses as well as the traffic generation and distribution which are key elements for the evaluation of the surrounding road network.

14. Revise the Stage 1 TIA to include an assessment of existing traffic management on the frontage roads in Section 2, as per the requirements of Section 7.4 of Volume 4 of the WAPC Guidelines.	Information requested in the explanatory note 4 has been included in Table 2.1 for the adjacent roads.
15. Revise the Stage 1 TIA to include the correct peak hour data for the mid-block sites clearly identifying that this data is for the assessment peak hours and not the site's peak hours.	Noted. The TIA has been updated to include this suggestion.
16. Revise the Stage 1 TIA to include and assess the latest crash data, i.e., for the five-year period ending 31 December 2021.	Noted. The Stage 1 TIA has been updated to include the latest crash data.
17. Revise the Stage 1 TIA to include the required definitions of floor areas used for subsequent trip generation and parking assessments, i.e., GLA or NLA.	Areas are in GLA unless stated otherwise.
18. Revise the Stage 1 TIA to include details of the access arrangements for people arriving by public transport, bicycle or on foot as well as for people with a disability i.e. locations of pedestrian entrances to the building, as per the requirements of Section 7.5 of Volume 4 of the WAPC Guidelines. (Note: this is also an important requirement of the Parking Management Plan).	Noted. The full development plans are provided in the Appendix which includes the access locations.
19. Revise the Stage 1 TIA to include details of end of trip facilities for walking and cycling (for example, lockers and showers), as per the requirement of Section 7.5 of Volume 4 of the WAPC Guidelines. (Note: this is also an important requirement of the Parking Management Plan).	Stage 1 TIA updated to include comment. The PMP is more focused on parking, therefore it has not been included in the PMP.
20. Revise the Stage 1 TIA to include identification of deficiencies in the surrounding transport networks, and/or areas where improvements could be made, as per the requirements of Section 7.7 of Volume 4 of the WAPC Guidelines.	An additional scenario has been included assessing potential intersection upgrades to improve operation.
21. Review the trip generation rates for the residential dwellings in the context of the rates that Cardno (now Stantec) has used for recent similar developments in the area and ensure that the calculations are checked and that each land use volume is rounded up and free of errors.	Trip generation has been calculated for the proposed development utilising trip generation rates from the <i>Institute of Transportation Engineers (ITE) "Trip Generation" 10th Ed and RTA Guide to Traffic Generating Developments</i> which is considered to be appropriate for the proposed development. The volumes have been reviewed and updated.
22. Revise the Stage 1 TIA to include analysis of the development accesses as per the requirements of Section 7.12 of Volume 4 of the WAPC Guidelines.	The southern access has not been assessed as the impacts of inbound only volumes at this access will be negligible.

23. Ensure all SIDRA models are prepared in accordance with the Main Roads WA Operational Modelling Guidelines.	Noted. All SIDRA models have been prepared in accordance with the MRWA Operational Modelling Guidelines.
24. Revise the Stage 1 TIA to include assessment of the impact of the development in neighbouring areas as per the requirements of Section 7.15 of Volume 4 of the WAPC Guidelines.	The assessment of the network was conducted with a 2% pa growth rate to take into account the impact of the neighbouring areas.
25. Revise the Stage 1 TIA to include assessment of the impact of the development on the safety of the blackspot intersection of Stirling Hwy and McCabe St, as per the requirements of Section 7.16 of Volume 4 of the WAPC Guidelines.	Noted. additional commentary has been provided regarding eligibility to be included in Federal and State Black Spot programs.
26. Revise the Stage 1 TIA to include combined pedestrian information provided earlier in a number of separate sections into a single section and provide an inventory of existing and proposed pedestrian access and amenity, as per the requirements of Section 7.18 of Volume 4 of the WAPC Guidelines.	Noted. Stage 1 TIA has been updated to include comment.
27. Revise the Stage 1 TIA to include combined cyclist information provided earlier in a number of separate sections into a single section and provide an inventory of existing and proposed cycle access and amenity, as per the requirements of Section 7.19 of Volume 4 of the WAPC Guidelines.	Noted. Stage 1 TIA has been updated to include comment.
28. Revise the Stage 1 TIA to include analysis of the operation and safety of the external pedestrian/cycle networks, as per the requirements of Section 7.20 of Volume 4 of the WAPC Guidelines.	See response in comment 26 above. No further changes required.

2 Response to Attachment 2 Peer review of TIA for Stage 1+2

Traffic Comments	Cardno now Stantec's Response
Recommendation 1.1: It is recommended that the Stage 1+2 TIA is revised to include clearer images and descriptions of Stage 1 and Stage 2 development on the site	Noted. TIA report has been updated to include clearer imagery of the Site and provide description.
Recommendation 2.1: It is recommended that the access issues identified in the Stage 1 TIA are addressed and then applied to the proposed access arrangements and forecast trip generation with Stage 1+2 development.	Noted. TIA report has been updated to include comment following the modifications on the Stage 1 report.
Recommendation 3.1: It is recommended that Table 3-3 in the Stage 1+2 TIA is corrected as per Figure 4 in this peer review technical note. Recommendation 3.1: It is recommended that drawings showing how all the assessed parking demands for Stage 2, i.e., car, motorcycle, and cycle, will be accommodated.	Noted. Current details for Stage 2 are limited and the main purpose of the Stage 2 assessment is to estimate the additional traffic impacts for this stage.
Recommendation 4.1: It is recommended that peak hour traffic movement surveys for the Stirling Hwy/ McCabe St, McCabe St/ McCabe Pl, and Stirling Hwy/ Coventry Pde intersections between 7-9 AM and 4-6 PM in 15-minute intervals to identify actual peak hours and existing heavy and light vehicle turning volumes and that these are then used, along with longer term data to determine likely average annual light and heavy vehicle volumes, for the traffic models and update the Stage 1+2 TIA to reflect this. Recommendation 4.2: It is recommended that vision from the peak hour traffic surveys is used to record average delays and queue lengths to enable the SIDRA models to be calibrated to represent actual intersection operation. Recommendation 4.3: It is recommended all SIDRA models are prepared in accordance with the Main Roads WA Operational Modelling Guidelines.	The SIDRA assessment used the most recent SCATS data (Feb 2022) and supplemented by traffic data from Main Roads Traffic Map and turning counts at select locations which is considered to be appropriate for the purposes of this assessment. The Stirling Highway/McCabe Street base model results were in line with site observations. The Stirling Highway/Coventry Parade intersection was calibrated to observed delays. The SIDRA files have been provided to Main Roads WA who has not provided any comments regarding to the SIDRA model set-up
Recommendation 4.4: It is recommended that the Stage 1+2 TIA is revised to include the required definitions of floor areas used for subsequent trip generation and parking assessments, i.e., GLA or NLA.	Noted. As per comment 17 above, the TIA has been updated to include the appropriate floor area definitions and calculations have been checked and rounded.

Recommendation 4.5: It is recommended that the trip generation rates for the residential dwellings and childcare centre in the Stage 1+2 TIA are reviewed in the context of the rates that Cardno (now Stantec) has used for recent similar land use developments and ensure that the calculations are checked and that each land use volume is rounded up and free of errors.	
Recommendation 4.6: It is recommended that the SIDRA Model prepared for the Stage 1+2 TIA is provided for peer review. Recommendation 4.7: It is recommended that all the issues raised in the Stage 1 TIA peer review are assessed and resolved to ensure that relevant issues such as the impact of current on-street parking practices on intersection capacity, performance and safety has been taken into consideration.	Noted. This can be provided upon request. The intersection Stirling Highway/Coventry Parade intersection has been updated to account for on-street parking along Coventry Parade.

3 Response to Attachment 3 Peer review of PMP

Traffic Comments	Cardno now Stantec's Response
1. Differences between the number of proposed parking bays and small differences in the layout diagrams to that shown in the drawings submitted for assessment Recommendation: Ensure consistency between the assessment documents (Stage 1 TIA, Stage 1+2 TIA, Parking Management Plan and Parking Demand Assessment) and the drawings submitted for assessment or provide comments where these differ.	Noted. TIA diagrams have been updated to ensure no inconsistencies with the imagery provided throughout the report.
2. Parking bays not to the Standard (AS/ NZS 2890.1 and AS/ NZS 2890.6). Recommendation: Undertake a detailed review of the design of the parking areas to ensure compliance with AS/ NZS 2890.1 and AS/ NZS 2890.6.	Noted, parking compliance to be reviewed again during future design stages of this project.
3. No assessment of oversupply/ undersupply of parking bays based on allocated land use. Peer review indicates oversupply of 114 residential bays and undersupply of 221 non-residential bays. Recommendation: Revise the PMP to include an assessment of the oversupply/ undersupply of parking bays and provide commentary on why the oversupply bays cannot be re-allocated to the undersupply bays.	The number of residential parking bays provided is intended to accommodate the market demands of apartment seekers. Furthermore, there is no maximum cap requirement for the residential bays. Regarding the non-residential parking, it is acknowledged that there will be a shortfall based on the statutory parking rates. The parking demand assessment attempts to estimate the likely demand (with consideration for shared and reciprocal parking) that this site is anticipated to generate and how this will be accommodated.
4. No assessment of ACROD bay provision requirements in accordance the BCA. Design currently provides 5, 3 on the residential parking floors where they are not accessible and 2 on the non-residential floor. Estimated requirement is 2 ACROD bays, both on the accessible non-residential floors. Recommendation: Revise PMP and TIAs to include assessment of ACROD bay provision in accordance with the BCA and include these on the design drawings in accordance with AS/ NZS 2890.6.	Architect to review
5. No minimum requirements specified in Table 4-4. Recommendation: Include minimum requirements in Table 4-4.	Text has been amended in revised TIA.

6. The walkable catchment assessment in the PDA is too simplistic and does not consider that many local residents will not be able to walk to the site within 5 minutes due to the layout of the streets and paths. Recommendation: Undertake and use a detailed assessment of the 5-minute walkable catchment based on actual available walking routes and facilities within this time.	Text has been amended in revised TIA
7. Despite being a 'Parking Management Plan', it does not recommend that the function room is restricted to a maximum capacity of 100 people through a legal arrangement, as per Clause 4.7.3 (v) of LPS4, to ensure that shared parking demand does not exceed 120 bays. Recommendation: Include a recommendation that the function room is restricted to a maximum capacity of 100 people through a legal arrangement, as per Clause 4.7.3 (v) of LPS4, to ensure that shared parking demand does not exceed 120 bays.	Noted. PMP has been updated to provide commentary around the restriction of the function room to not exceed a maximum capacity of 100 people.
8. The TIAs for Stage 1 and Stage 2 development of the site fail to show and assess the pedestrian routes to the nearest bus stops, it simply shows their locations. The nearest bus stop on Stirling Hwy for northbound services is located on the west side just south of Vlamingh Pde (#10348). The pedestrian route and pedestrian crossing (north of Vlamingh Pde) is poor Recommendation: Undertake and use a detailed assessment of the pedestrian routes to and from the nearest bus stops and include recommendations to encourage their use, e.g., improved paths and a formal pedestrian crossing of Stirling Hwy	Noted. The TIA report has been updated to include this information.
9. The PDA states that the Statutory Parking Requirements within LPS4 "do not consider the benefits of shared parking and assume that each component of the development operates in complete isolation from its local context". This statement is incorrect as LPS4 does consider the benefits of shared parking and allows for a reduction in the parking requirement based on shared parking principles. Recommendation: Include reference to Clause 4.7.3 of LPS4 and provide commentary and recommendations with respect to compliance with (a), (iii) and (v).	The comment in the PDA is specifically referring to the parking rates as these rates typically only consider the land use in isolation and does not account for the nuances and synergies resulting from shared and reciprocal parking between other land uses. The comment was not intended to infer that the LSP4 does not consider shared or reciprocal parking in any capacity.

**ADDITIONAL INFORMATION 23 – APPLICANT RESPONSE TO PUBLIC
SUBMISSIONS**

Job Ref: 8191
23 September 2022

Chief Executive Officer
City of Fremantle
151 High Street
FREMANTLE WA 6160

Attention: Mr Erik Dybdahl – Senior Planning Officer

Dear Mr Dybdahl

Proposed Mixed Use Development (DA003/22 & DAP/22/02252)
Various Lots – No. 130 Stirling Highway, North Fremantle

Rowe Group acts on behalf of 3 Oceans Property Pty Ltd, the landowner of Lots 5 and 220 (No. 130) Stirling Highway, Lots 12 and 253 McCabe Place, Lot 314 McCabe Street and Lots 218, 219 and 221 Thomson Road, North Fremantle (the 'subject site'), also known as the former 'Matilda Bay Brewing Company' site.

An Application for Development Approval ('Development Application') seeking approval for a mixed-use residential development at the subject site was lodged with the City of Fremantle on 3 June 2022 for its consideration. The Development Application was advertised for public comment from the period of 22 June 2022 to 20 July 2022 inclusive, with a total of 112 submissions received on the proposal.

In response to the submissions raised during the public advertising period, the following changes have been made to improve the development proposal:

1. Increasing the setback of the podium of Tower 2 to the north of Coventry Parade by 10m from 4.7m to 15m and reducing the height of the podium from 5-storey to 3-storeys.
2. As a result of the increased setback to Coventry Parade, the provision of a roundabout at the intersection of Coventry Parade and Thompson Road is proposed to manage traffic movements, with additional parking proposed within the future area of public open space (which may be removed prior to the construction of Stage 2 subject to City of Fremantle's design intention for the open space).
3. Reduction in height of the Tower 2 podium to minimise impacts of overshadowing of those properties south of Coventry Parade.
4. Increasing the setback of the podium of Tower 2 to Minim Cove to the east from 35m to 40m.



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5. Reducing the height of Tower 3 from 10-storeys to 6-storeys (plus roof amenities).
6. Reducing the overall yield from 207 dwellings to 198 dwellings.
7. Provision of 27 car parking bays as exclusive residential visitor bays.
8. Reconfigured on-street car parking along Coventry Parade (13-bays) and Thompson Road (10-bays).
9. Increase the height of Tower 1 from 16-storeys to 19-storeys and Tower 2 from 11-storeys to 14-storeys as a result of the reconfigured building mass (i.e. reduction of podium and Tower 3 heights).

The modifications described above have been discussed on several occasions with representatives of the community who reside in, and own property, to the south of Coventry Parade and Thompson Road. Based on the Project Team's most recent discussions with several of these landowners, the modifications to the design largely address the community's concerns regarding how the development interfaces with Coventry Parade and are now supported.

Further, following our meeting held at the City's office on Tuesday, 20 September 2022 we reiterate the following key matters:

- The proposed roundabout has been included to improve the flow of traffic to along Coventry Parade and to provide for an improved urban design outcome. Notwithstanding, it is noted that the proposal is not contingent on the inclusion of the roundabout. As such, the Applicant being happy to be guided by the City's Technical Officers in this regard.
- Stephen Carrick Architects and Cox Architecture are coordinating a site walk with the City's Heritage Coordinator in the week commencing 3 October 2022, following which additional information relating to the heritage components of the development will be provided.
- With respect to building height, additional view corridor diagrams will be prepared by Cox Architecture for the City's consideration.
- We understand the City is seeking to finalise its broader "regional" traffic study as a matter of priority, which will provide further clarity on the improvements required to the local traffic network.
- Cox Architecture will be prepare and provide an external colours and materials schedule for the development, to be submitted to the City for its consideration.

Response to Submissions

The City has provided Rowe Group with a summary of the submissions received during public advertising period, with 20 of the submissions being in support of the development, and 92 opposed to the development proposal. We have reviewed each of the submissions made and set out below our responses to the key issues raised, under the relevant corresponding headings for your ease of reference.

Building Height and Scale

The proposed building height, scale and form of the development is a reoccurring theme within the schedule of submissions. The development (as submitted) proposes three (3) residential towers as follows:

- Tower 1: 16-storeys;
- Tower 2: 11-storey tower and 5-storey podium; and
- Tower 3: 10-storeys.

In response to the comments provided by the Development Advisory Committee ('DAC') and the comments received in public submissions, the overall form of the development has been revised, as follows:

- Tower 1: Increased tower height of 19-storeys;
- Tower 2: Reduced podium height of 3-storeys with increased tower height of 14-storeys; and
- Tower 3: Reduced tower height of 6-storeys.

While the amended development heights still exceed the heights prescribed within Local Planning Policy 3.11 – McCabe Street Area, North Fremantle – Height of New Buildings, the overall form of the development has been reviewed in response to the concerns raised by the DAC and community. The revised form of development is considered to address the concerns relating to building bulk and scale, which predominantly relate to the Coventry Parade and Thompson Road interface, through shifting the predominant building mass north, away from the site boundary.

The collective design changes of increasing the setback of the development to Coventry Parade and reducing the height of the podium are considered to address the community's concerns regarding bulk and scale, which provides for an improved development outcome. Additional view corridor diagrams will be provided as requested by the City.

Overshadowing

In response to the feedback provided by the Development Advisory Committee ('DAC') and the comments received in public submissions, the Project Team have further interrogated the overall form of the development with a view to minimising impacts of overshadowing on residential lots to the south of Coventry Parade and Thompson Road. Whilst it has been acknowledged that even a 'compliant' development would result in some overshadowing of these lots, in addition to many of the dwellings being subject to overshadowing from existing street trees and their own private structures, the form of development has been revised, where possible, to minimise the impact arising from overshadowing.

This has been achieved through the following:

- Increasing the setback of the podium of Tower 2 to the north of Coventry Parade by 10m from 4.7m to 15m and reducing the height of the podium from 5-storey to 3-storeys.
- Reducing the podium height of Tower 2 to 3-storeys; and
- Reducing the tower height of Tower 3 to 6-storeys.

As a result of the design modifications, the resultant overshadowing impact has improved, with the total time the properties to the south of Coventry Parade are subject to overshadowing being reduced from that of the

original proposal. This is due to the overshadowing being generated from the more slender tower forms of the development, which move more quickly than that of shadows generated by the podium levels.

Plot Ratio

The submission in relation to plot ratio is noted.

The development (as submitted) proposed a total plot ratio of 2.19 : 1.0 in lieu of the maximum 2.0 : 1.0 limit permitted under the R-Codes. As outlined within Section 5.3.2 of the Development Application report, when considering the revitalised heritage components provided by the development, the exceedance in plot ratio is considered acceptable, and minor in nature and is therefore considered to satisfy the relevant design principles of the R-Codes.

Parking and Traffic

The Applicant notes the comments received from the community in relation to the carparking shortfall and impacts on traffic.

In response to these concerns, the proponent has committed to providing the 27 car parking bays required for residential visitors in accordance with the requirements of R-Codes Vol. 2. This has been addressed by way of the amended development plans, with a total of 110 bays to be provided for the non-residential uses. Whilst this still represents a shortfall for the non-residential component of the development, the following additional justification is provided:

- The City of Fremantle Local Planning Scheme No. 4 and applicable car parking generation requirements were gazetted in 2007 which do not accurately reflect current “best practice” with respect to car parking / modes of transport.
- The Local Government Car Parking Guidelines prepared by the Western Australian Local Government Association (WALGA, 2020) acknowledges that the minimum parking ratios set by local governments is geared towards car dependency and seeks to cater for peak-demand minimum car parking ratios for each individual land use. It is also noted WALGA acknowledged that incentivising high levels of car use through the provision of car parking bays has a number of ramifications including, but not limited to:
 - › Increased vehicle use, increasing noise, air and water pollution;
 - › Increased traffic congestion and reduced public and active transport;
 - › Increased construction and business costs, which can reduce housing affordability and business viability and deter redevelopment of older buildings;
 - › Suboptimal use of land; and
 - › Reduced ability of authorities to consider a development on merit in respect to location, operating hours, staffing, shared parking and a customer’s ability to park once and walk to several services.

In light of the above, the 110 bays provided to cater for the non-residential uses at the site is considered to be sufficient and promotes more sustainable methods of transport, which are readily accessible to the site.

Furthermore, it is noted that should additional parking be provided it will support increased vehicle use and exacerbate traffic issues within the area.

In this regard, it is also noted that the City of Fremantle and Town of Mosman Park has engaged in a “working group” with the State government to resolve broader regional traffic related issues. These wider regional shortfalls within the transport network are outside of the proponent’s control, albeit, the proponent remains committed to contributing to the upgrading of the road network and ultimately, resolution of the traffic and transport related issues.

Density

It is noted that a number of the submissions received queried the need for additional density within the City of Fremantle. The density targets for the site are pre-determined with respect to the ‘Former Matilda Bay Brewery Structure Plan’ (the ‘Structure Plan’) which was approved by the Western Australian Planning Commission (‘WAPC’) in October 2020. The Structure Plan provides for the comprehensive redevelopment of the site for high-density residential uses (and areas of mixed use development), with an estimated *minimum* number of 500 dwellings and a population of 1,015 people. In this regard, it is noted that the development proposes to provide a total of 198 dwellings, representing 40% of the dwelling density of the Structure Plan area. That is, the proposed development does not exceed the anticipated dwelling density of the Structure Plan area and rather, provides less than half of the total number of dwellings for the Structure Plan area.

Further to the above, as outlined within Section 5.1.2 of the Development Application Town Planning Report, having regard to the *Central Sub-Regional Planning Framework*, the proposal recognises the strategic location and importance of the subject site in providing centralised residential development and commercial uses along a prominent activity corridor (being Stirling Highway). The proposed development poses as a logical urban infill development on a site that has remained vacant and underutilised for several decades.

Conformity to State and Local Planning Framework

Several submissions referenced non-compliance with the State and Local Planning Framework, addressed as follows:

State Planning Policy 2.6 – State Coastal Planning Policy

While the subject site is positioned in a coastal location, it is situated approximately 270m east of the foreshore, in an elevation position behind major infrastructure, including railway lines and regional roads. The WAPC’s State Planning Policy 2.6 – State Coastal Planning Policy (‘SPP 2.6’) provides provisions relating to coastal processes, foreshore management, erosion and like. As such, given the site’s proximity from the coast, SPP 2.6 is not a relevant planning consideration to the proposal.

Local Planning Policy 3.11 – McCabe Street Area, North Fremantle – Height of New Buildings

Clause 67 (2) (g) of Schedule 2 – Deemed Provisions of the *Planning and Development (Local Planning Schemes) Regulations 2015* (the 'Regulations') requires a decision-maker to have “*due regard*” to any local planning policy for the Scheme area. That is, the decision-maker is to have due regard to but is not bound by the local planning policy and variations can be approved.

In this regard, it is noted that Local Planning Policy 3.11 – McCabe Street Street Area, North Fremantle – Height of New Buildings ('LPPP 3.11') provides specific 'Additional Height Criteria', whereby additional height can be considered. In this regard, extensive justification against the 'Additional Height Criteria' has been provided within the Development Application Report and in response to the City's request for additional information.

Architecture

The comments relating to the architectural form and materiality are noted. The architectural design of the development has been driven around the principle of preserving the significance of the heritage building to allow the Ford Factory and administration wing to become the focal point and generator of re-imagined community amenity. The colour and material palette selected for the development has been the subject of extensive review and is reflective of the site's coastal and riverine context, which has been crafted into the resultant architectural form.

In this regard, it is noted that the materiality of the development will be reviewed further and developed during detailed design (i.e. at the Building Permit stage), with specific consideration to the requirements of the Sustainability Report and Australian Standards to be undertaken at this stage. Notwithstanding, to provide further detail and clarity with respect to the materiality, a preliminary materials schedule will be prepared by Cox Architecture for the external components of the development.

Impact on Views

Consideration has been given to submissions received which reference impact on view corridors. In this regard, as a result of the revised form of development, view corridors have generally improved, with the reduction in height of Tower 3 providing for increased views from Mount Lyell Park as depicted on the revised View Analysis Plans (i.e. the separation between the buildings is now more prominent).

Public Open Space

In accordance with the approved Structure Plan, a total of 2,000m² of public open space is required to be provided at the southernmost portion of the site. In this regard, it is noted that this portion of land is outside of the Stage 1 area and is therefore, not indicated within the current plans. Notwithstanding, this area of public open space will ultimately be delivered at the time of subdivision (to occur post-development approval) and subsequently, will be ceded to the State of WA. It is anticipated a condition of subdivision approval would be imposed requiring the preparation of a landscaping plan (as per the requirements of the Structure Plan), with the City to have the option to accept the ongoing maintenance and management of the POS (by way of a management order).

As such, the publicly accessible open space provided as part of the development seeks to provide a new and high-quality public realm on what is currently privately owned land that unlocks a previously closed off site to the public. This provides for new opportunities for places to meet, and a venue for community events and activities that is not otherwise required.

Waste Management

A Waste Management Plan ('WMP') was prepared by Encycle as part of the Development Application documentation. The WMP demonstrates that the anticipated waste generation from the development can be adequately managed, subject to the recommendations of the WMP being implemented.

It is also noted that the development has been designed to allow for the City's waste collection provider to enter the development and collect waste internally, without the need for bin pads along Coventry Parade. The Applicant is actively discussing the waste collection methods with the City's Waste Services.

Heritage

The retention of the heritage components of the subject site has been at the forefront of the proponent's vision for the development. In this regard, the development proposes the retention of the majority of the existing fabric 1929 Ford Assembly heritage building, in addition to the retention of the three (3) mature palm trees adjacent to Stirling Highway. The heritage building will be refurbished to comprise a range of commercial offerings which are publicly accessible and provide a direct community benefit, as opposed to privatising the buildings for residential purposes.

The Inter War Functionalist architectural style will remain clearly evident in the proposed development due to the simple geometric shaped features on the façade, in addition to the asymmetrical massing with the lower scaled Office Building, and the larger volume Workshop Building being retained. The heritage components of the development are clearly visible when viewed from Stirling Highway, with the steel windows to the Workshop Building being conserved.

Whilst the proposal incorporates demolition of portions of the original building fabric, the proponent does not agree with the various statements that the extent of demolition is "*excessive, unnecessary and detrimental to the cultural heritage significance of the place*" which is both vague and unjustified.

The 1929 bays to the Workshop Building, facing Coventry Parade, are being retained, with the bays that were added in 1947 to the east end of the Workshop Building being proposed for removal. The Workshop Building, together with its industrial aesthetic, will be adapted to a Provedore (Shop) use, meaning significant portions of the original building fabric are being retained.

In addition to the retention of the existing physical buildings, extensive interpretive signage will also be included throughout the proposal (once developed) which further responds to the cultural heritage significance of the site.



Setbacks

As outlined within the R-Codes Vol. 2 assessment, the development is consistent with the primary street and lot boundary setbacks. Notwithstanding, in response to the concerns raised by the community, Tower 2 is proposed to be set back an additional 10m (north) from Coventry Parade (i.e. 15m from Coventry Parade) to further improve the interface with Coventry Parade. This design modification was developed in consultation with the affected landowners to the south of Coventry Parade and along Thompson Road who are supportive of the proposed amendments.

Public Consultation

Public consultation has been undertaken in accordance with Part 7 Cl. 64 of the Regulations. Furthermore, during the public advertising period, two (2) proponent held two voluntary community “drop-in” sessions were held on on-site, on Wednesday, 29 June 2022 and Thursday, 20 June 2022.

It is also noted that the City of Fremantle conducted a “Talk to a Planner” Session on Thursday, 14 July 2022 (which is in excess of the minimum public consultation requirements prescribed under the Regulations).

In addition, the proponent created a project specific consultation website (<https://fremantleassembly.com.au/>) to provide information pertaining to the project and encourage the community to liaise directly with members of the project team. As such, the Applicant is of the view that extensive public consultation over and above the standard requirements has been undertaken as part of the Development Application process.

Landscaping

The site has historically been used for “industrial” land uses and as such, the site is largely cleared of remnant vegetation. In delivering the proposed development, the Applicant has identified the need to provide extensive landscaping (inclusive of areas of deep soil planting) across the site.

In this regard, the landscape design response for the proposed development has been prepared by See Design Studio. The landscape design responds to the scale, form and function of the architecture, as well as the local context of the site. The vegetation profiles have been carefully selected to reflect the transition between ocean and the river, as well as reflection of the heritage of the site.

As outlined in the Landscaping Report, landscaping will public a vital role in transforming the development into a thriving precinct and destination by creating habitable spaces on the lower and upper plazas.

The Landscape Plan will be further refined post-approval in consultation with the City of Fremantle, which is expected to be imposed as a condition of approval to provide further opportunity to revise the proposed landscape response.

Context and Character

The site is located on the boundary of two local government precincts effectively forming a “gateway” site into the City of Fremantle. The proposed development will create a new spatial nexus which extends and links existing landscapes and pathways to create enriched journeys and stories through the site connecting the river and ocean, while allowing residents and the public more broadly to actively move through the precinct and engage with all community benefits (which is currently closed off to the public).

Interpretation of the site’s history has been a key consideration at the forefront of the project’s design vision. Conservation and adaption of the original Ford Factory and subsequent brewery into a Matilda Market Ground integrating alfresco dining, fresh provedore and event opportunities will create a living village within the heart of the precinct. In this regard, it is considered that the proposed development considered the current and future context and character of the North Fremantle precinct and positively responds, and contributes to, the community and locality.

Overlooking

As outlined within the Residential Design Codes Volume 2 (R-Codes Vol. 2) Assessment prepared in support of the Development Application, the proposed development exceeds the minimum street, side and rear boundary setback requirements. As such, the development complies with the visual privacy requirements of the R-Codes Vol 2. Notwithstanding, building design elements such as moveable louvre screens will be explored further at the detailed design stage.

Proposed use

A Community Needs Assessment was prepared by Urbis in support of the proposed development. The Community Needs Assessment used the following “best practice” approach to identify social infrastructure requirements in the City of Fremantle:

- Identification of the demographic characteristics of the current community and likely demographic characteristics of the future population;
- Understanding of the site context including the unique features and characteristics of the area;
- Understanding of the existing provision of social infrastructure and identifying key gaps in the existing provision; and
- Understanding leading practice principles and benchmarks and applying these appropriate to the site.

In this regard, Urbis undertook a ‘supply assessment’ and to assess the supply of the following amenities in the City of Fremantle:

- Open Space and Recreation;
- Cafes and Restaurants;
- Fresh Food Offerings;

- Co-working spaces;
- Local community facilities; and
- Site connectivity.
- Overshadowing

The development therefore incorporates a well-considered, diverse and vibrant mix of uses (some of which are currently lacking within the City's municipality and locality more generally) to provide significant amounts of amenity for the existing and new residents of North Fremantle and its surrounds. It is therefore considered that the uses proposed as part of the development are consistent with current market drivers and are therefore, suitable for the locality.

Staging

Given the complexity and size of the parent lots, this development represents Stage 1 of a 2-stage development of the overall subject site. That is, no portion of Stage 2 is proposed to be developed as part of this Development Application. Notwithstanding, the Applicant notes that any future development of Stage 2 would be the subject of a separate Development Application which will require review and consideration by the City of Fremantle and the decision maker (i.e. the JDAP).

Noise

It is anticipated that a Noise Management Plan ('NMP') will be imposed as a condition of approval, with the recommendations of the NMP to be incorporated into the building design.

Wind

A Pedestrian Wind Assessment was prepared by RWDI as part of the Development Application reporting. The recommendations from the Wind Assessment will be incorporated into the development at the detailed design stage. The development is therefore considered to appropriately respond to wind related matters.

Impact on Environment

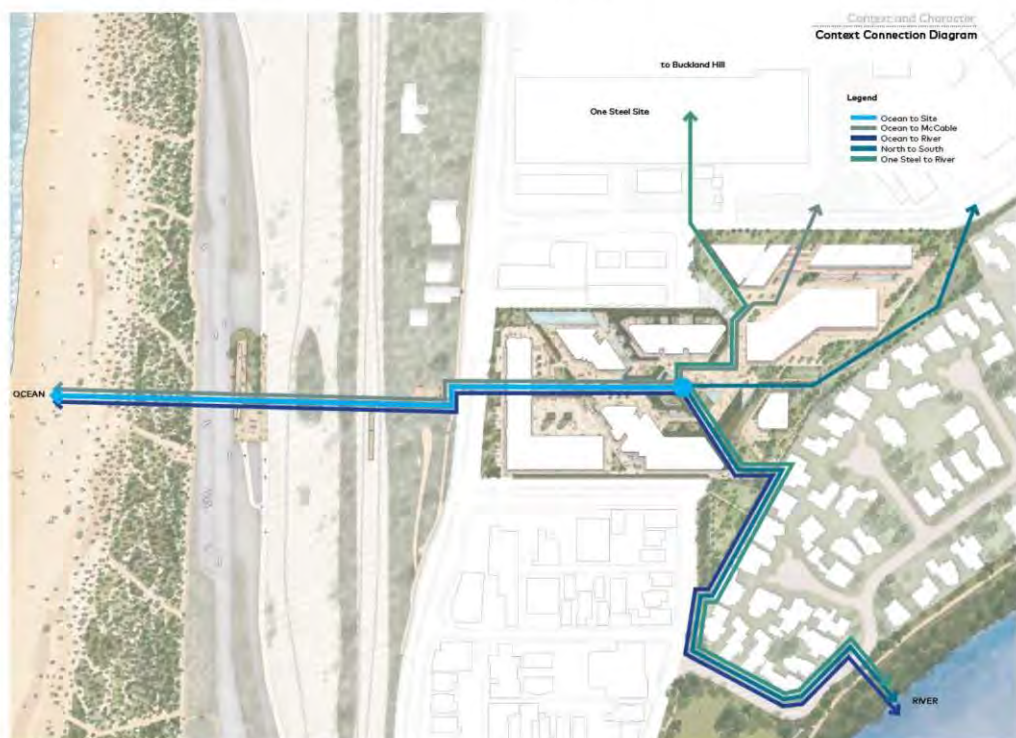
The submissions related to the impact on the environment are noted. As detailed within the Sustainability Report, the development is designed to the equivalent standard of a 5-star Green Star Design and As Built v1.3 rating system.

In addition to the above, extensive landscaping across the development is proposed to improve the public realm and create micro-climates across the site and directly reduce the urban heat island effect.

Pedestrian Connectivity

As outlined within the Development Application Report, the developer's underlying vision and objective for the site is to improve the surrounding public realm by prioritising pedestrian amenity throughout, and adjacent to, the development. This key objective has been at the forefront of the project team's ambition for the proposed development. As part of the context analysis, Cox Architecture has prepared the below plan to depict how the development improves pedestrian connection through the site and its surrounds.

It is also noted that the pedestrian link to the west (outside of the development site) does not form part of this Application. The desired improvements to the immediate locality remain the subject of further review and investigations with the stakeholder group (comprising representatives of Main Roads WA, Public Transport Authority, Department of Planning, Lands and Heritage, City of Fremantle and Town of Mosman Park), however, the developer remains committed to assisting the City of Fremantle to address the issue of pedestrian connectivity and safety along Stirling Highway and McCabe Street.





Summary and Conclusion

In summary, we confirm the following modifications have been made to the development proposal as a means of addressing the feedback received from the community through the public advertising process:

1. Increasing the setback of the podium of Tower 2 to the north of Coventry Parade by 10m from 4.7m to 15m and reducing the height of the podium from 5-storey to 3-storeys.
2. As a result of the increased setback to Coventry Parade, the provision of a roundabout at the intersection of Coventry Parade and Thompson Road is proposed to manage traffic movements, with additional parking proposed within the future area of public open space (which may be removed prior to the construction of Stage 2 subject to City of Fremantle's design intention for the open space).
3. Reduction in height of the Tower 2 podium to minimise impacts of overshadowing of those properties south of Coventry Parade.
4. Increasing the setback of the podium of Tower 2 to Minim Cove to the east from 35m to 40m.
5. Reducing the height of Tower 3 from 10-storeys to 6-storeys (plus roof amenities).
6. Reducing the overall yield from 207 dwellings to 198 dwellings.
7. Provision of 27 car parking bays as exclusive residential visitor bays.
8. Reconfigured on-street car parking along Coventry Parade (13-bays) and Thompson Road (10-bays).
9. Increase the height of Tower 1 from 16-storeys to 19-storeys and Tower 2 from 11-storeys to 14-storeys as a result of the reconfigured building mass (i.e. reduction of podium and Tower 3 heights).

The modifications described above have been presented to representatives of the community who reside in, and own property, to the south of Coventry Parade and Thompson Road. Based on the Project Team's most recent discussions with several of these landowners, the cumulative modifications to the design largely address the community's concerns regarding how the development interfaces with Coventry Parade and Thompson Road and are now supported.

We trust the above addresses the various matters raised by the community during public advertising. Should you require any further information or clarification in relation to this matter, please contact the undersigned or our Mr Adrian Dhue (Senior Urban Planner) on 9221 1991.

Yours faithfully,

Reyne Dial
Rowe Group

**ADDITIONAL INFORMATION 24 - STANTEC MCCABE STREET AREA TRAFFIC
STUDY**

McCabe Street Area, North Fremantle

Traffic Study

304900736 / CW1200352



Prepared for
City of Fremantle

19 September 2022



now



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Our report is based on information made available by the client. The validity and comprehensiveness of supplied information has not been independently verified and, for the purposes of this report, it is assumed that the information provided to Cardno is both complete and accurate. Whilst, to the best of our knowledge, the information contained in this report is accurate at the date of issue, changes may occur to the site conditions, the site context or the applicable planning framework. This report should not be used after any such changes without consulting the provider of the report or a suitably qualified person.

304900736 / CW1200352 | 19 September 2022 | Commercial in Confidence

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Executive Summary

The City of Fremantle has commissioned Cardno now Stantec to undertake a study of the existing and potential future traffic movements and related issues affecting the local road network in the North Fremantle area around McCabe Street, Coventry Parade and connecting streets.

Specifically, this report aims to assess the impacts of demand growth along both Stirling Highway and McCabe Street in the context of traffic congestion and multi-modal provision. The scenarios investigated include the full redevelopment potential for the Matilda Bay and OneSteel sites, in addition to the projected growth of Stirling Highway.

As part of assessing the development impacts, a SIDRA assessment was undertaken for the following scenarios.

SIDRA Assessment Summary

Scenario	Results
Scenario 0 – Current intersection operation (2022) and future intersection operation (2035) without development or any changes to the intersections.	Although the intersection currently operates at an acceptable level of service, projected traffic growth along the Stirling Highway corridor causes significant queues and delays to occur at the intersection, with the designated 'failure' criteria reached by 2034.
Scenario 1 – Existing configuration for Stirling Highway, retaining background traffic flow patterns for a 2035 horizon.	The SIDRA results show that the Stirling Highway/McCabe Street intersection will operate well beyond practical capacity under an assumed 2% per year background growth plus development traffic scenario. All movements experience significant delays and queues as the current intersection arrangement does not have sufficient capacity to accommodate this amount of traffic. For the Stirling Highway/Coventry Parade intersection, right turn movements in particular experience significant delays. This is likely due to excessive traffic volumes along Stirling Highway where very few gaps are available for turning movements. However, the volume of right turn movements at this intersection is expected to be very low under all circumstances. The SIDRA results for McCabe Street/McCabe Place and McCabe Street/OneSteel Access 2 show that both intersections operate at an acceptable level for service (worst movement at LOS D for McCabe Street/McCabe Place and LOS C at the McCabe Street/OneSteel Access 2).
Scenario 2 – Minor modifications to Stirling Highway and McCabe Street to facilitate improved access.	The SIDRA analysis indicates that there is some improvement to the operation of the Stirling Highway/McCabe Street intersection during the AM and PM peak hour periods as a result of the changes to the road network assumed for this scenario. However, the primary impact on this signalised intersection is the increase in through movements along Stirling Highway, which exceeds the practical capacity of the approach during the peak periods. Regarding the Stirling Highway/Coventry Parade intersection, the proposed intersection upgrades result in a significant improvement to the intersection operation. The SIDRA results for McCabe Street/McCabe Place and McCabe Street/OneSteel Access 2 shows that both intersections operate at an acceptable level for service (worst movement at LOS B for McCabe Street/McCabe Place and McCabe Street/OneSteel Access 2).
Scenario 3 – Significant upgrades to Stirling Highway in-line with the SHACS plan, in addition to the above local changes. Intersection upgrades.	The inclusion of upgrades and treatments at the Stirling Highway/McCabe Street and Stirling Highway/Coventry Parade intersections results in some significant operational improvement during the AM peak. However, despite improvements in performance during the PM peak, the DOS for some key movements remain above 1.0 due to the increase in background through traffic. The inclusion of the right turn pocket along Stirling Highway and a restriction of right turn movements out of Coventry Parade results in a significant improvement in performance at the Stirling Highway/Coventry Parade intersection. The delays, though still high, are not considered to be excessive. The SIDRA results for McCabe Street/McCabe Place and McCabe Street/OneSteel Access 2 show that both intersections operate at an acceptable level for service (worst movement at LOS B for McCabe Street/McCabe Place and LOS C at the McCabe Street/OneSteel Access 2).

Furthermore, a Sensitivity Assessment Scenario (Scenario 4) has been conducted for the Stirling Highway/McCabe Street intersection under the following scenarios:

- Current intersection layout with background traffic growth only (Scenario 4A)
- Intersection layout based on SHACS plan with background traffic only (Scenario 4B)
- Current intersection layout with background traffic growth and development traffic (Scenario 4C)
- Intersection layout based on SHACS plan, right turn lane into Coventry Parade with background traffic growth and development traffic (Scenario 4D).
- Intersection layout based on SHACS plan, double right turn on the southern approach of the Stirling Highway/McCabe Street intersection, right turn lane into Coventry Parade with background traffic growth and development traffic (Scenario 4E).

The table below shows the results of the sensitivity analysis including the year when the capacity threshold is expected to be reached.

Summary of Overall Intersection Performance at Stirling Highway/McCabe Street – Scenario 4

Intersection Approach	Year	AM Peak				PM Peak			
		DOS	Delay	LOS	95% Queue (m)	DOS	Delay	LOS	95% Queue (m)
Scenario 4A	2034	1.012	46.9	D	443.3	1.026	59.8	E	770.1
Scenario 4B	2036	0.988	40.1	D	403.1	1.023	57.7	E	767.1
Scenario 4C	2025	0.907	32.7	C	203.8	1.061	79.1	E	485.6
Scenario 4D	2032	0.885	24.5	C	223.4	1.041	60.4	E	606.9
Scenario 4E	2036	0.757	18.9	B	216.4	1.045	59.3	E	665.2

Based on the sensitivity assessment, an indicative staging timeline was established for the proposed intersection and access upgrades as illustrated in the figure below. Concept drawings for these options for each of these upgrades are also provided.



1 Introduction

1.1 Background

The City of Fremantle has commissioned Cardno now Stantec to undertake a study of the existing and potential future traffic movements and related issues affecting the local road network in the North Fremantle area around McCabe Street, Coventry Parade and connecting streets.

Specifically, this report aims to assess the impacts of demand growth along both Stirling Highway and McCabe Street in the context of traffic congestion and multi-modal provision. The scenarios investigated include the full redevelopment potential for the Matilda Bay and OneSteel sites, in addition to projected growth of Stirling Highway.

The outputs of this Study focus on traffic operations and circulation within the nearby McCabe Street Precinct, and the constraints inherent in the local network that might induce mode shift to alternative transport modes. A range of upgrade scenarios have been investigated, including:

- Modifications of the Stirling Highway / McCabe Street signalised intersection;
- Extension of McCabe Place to Coventry Parade/Thompson Road; and
- Upgrades to the Stirling Highway / Coventry Parade priority intersection

2 Existing Development

2.1 Existing Development Content and Land Use

The study area is located on the eastern boundary of Stirling Highway and bounded by a number of local residential dwellings and roads including McCabe Street, Craig Street, Thompson Road and Foundry Court as shown in **Figure 2-1**.

The existing land uses within the study area are predominately residential as shown in **Figure 2-2**. The proposed developments within the study area are zoned as "Development Zone" and have been labelled DA 18.

The southeast section is zoned as R25 while the southern area bounded by Stirling Highway, Coventry Parade, Craig Street and Thompson Road is zoned for mixed-use development.

Figure 2-1 Study Area



Figure 2-2 McCabe Street Zoning from Local Planning Scheme No.4

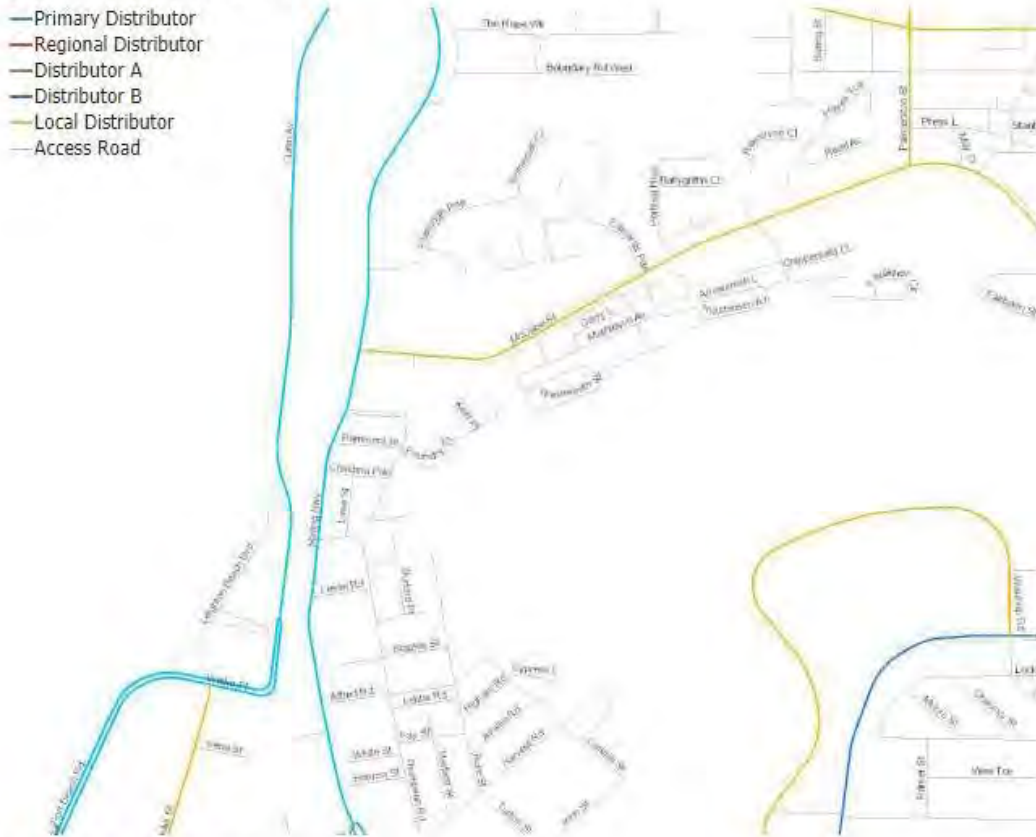


Source: City of Fremantle

2.2 Existing Road Network

The classification of the existing road network within the study area is shown in **Figure 2-3**, with detailed descriptions of each of the roads within the study area provided through **Section 2.2.2** through **Section 2.2.6**.

Figure 2-3 Study Area Road Hierarchy



Source: MRWA Road Information Mapping

2.2.2 McCabe Street

McCabe Street is a two way two lane undivided road with an approximate kerb-to-kerb width of 6.0m. This road is classified as a Local Distributor in the Main Road's Metropolitan Functional Road Hierarchy (MFRH) and has a posted speed limit of 50km/h.

At the intersection of McCabe Street and Stirling Highway, a 50m left turn auxiliary lane is provided as shown in **Figure 2-4**.

Footpaths are provided around the intersection of Stirling Highway and McCabe Street.

Figure 2-4 McCabe Street and Stirling Highway Intersection



2.2.3 Coventry Parade

Coventry Parade is a two way two lane divided road with a 5.5m central median extending to the corner of Thompson Road.

This road is classified as an Access Road in the MRFH and has a posted speed limit of 50km/h.

As shown in **Figure 2-5**, the intersection of Coventry Parade and Stirling Highway is a full movement priority intersection with localised widening provided to allow for both left and right turning movements at this intersection.

Figure 2-5 Intersection of Coventry Parade and Stirling Highway



2.2.4 Stirling Highway

Stirling Highway is a two-way, four-lane divided road separated by a 1.3m central median with undivided sections to allow for turning movements at intersections as shown in **Figure 2-6**.

This road is classified as a Primary Distributor in the MRFH and has a posted speed limit of 60km/h.

Footpaths are provided on both sides of Stirling Highway to allow for pedestrian access to buildings, bus stops, etc. Within the study area there is only one signalised intersection along Stirling Highway (at McCabe Street).

Figure 2-6 Stirling Highway



2.2.5 Thompson Street / Craig Street

Craig Street is a two way, two lane undivided and unmarked road which transitions into Thompson Street near the intersection of Lime Street.

This road is classified as an Access Road in the MRFH and has a posted speed limit of 50km/h.

As shown in **Figure 2-7**, a footpath is provided on the northern side of Craig Street.

The intersection of Craig Street and Stirling Highway is a priority intersection allowing full turning movements with Stirling Highway having priority over Craig Street.

Figure 2-7 Thompson/Craig Street and Stirling Highway Intersection



2.2.6 McCabe Place

McCabe Place is currently a two way, two lane undivided unmarked unsigned road and is currently used as an entry and exit road for the business located at Lot 220 (Matilda Bay Brewery).

This road is classified as an Access Road in the MRFH and has a posted speed limit of 50km/h.

As shown in **Figure 2-8**, the intersection McCabe Place/McCabe Street is a priority intersection allowing full turning movements with McCabe Street having priority over McCabe Place.

Figure 2-8 McCabe Place and McCabe Street intersection



2.3 Existing Intersections

The six key intersections within the study area are shown in **Figure 2-9** and listed in **Table 2-1** below.

Figure 2-9 Intersections within the Study Area



The intersections within the study are listed in **Table 2-1**.

Table 2-1 Intersections within Study Area

Intersections	Intersection Type	Movement
Stirling Highway/ McCabe Street	Signalised	Full movements
Stirling Highway/Coventry Parade	Priority	Full movements
Stirling Highway/Pamment Street	Priority	Left in, left out
Stirling Highway/Craig Street	Priority	Full movements
Pamment Street/Thompson Road	Priority	Full movements
Thompson Road/Craig Street	Priority	Full movements

2.4 Existing Traffic Volumes

The existing traffic volumes for the surrounding road network were obtained from Main Roads WVA Traffic Map and summarised in **Table 2-2**.

Table 2-2 Existing Traffic on Major Roads

Road Name	Date	Average Two-Way Daily Traffic Volume	Average Two-Way AM Peak Traffic Volume	Average Two-Way PM Peak Traffic Volume
Stirling Highway (south of Wellington St)	2019/20	34,503	2,682	2,854
Stirling Highway (north of Queen Victoria St)	2020/21	30,908	2,281	2,495
McCabe Street (east of Stirling Hwy)	2021/22	6,713	712	645

3 Key Development Sites

3.1 Development Sites

As shown in **Figure 3-1**, there are two key development sites within the immediate Study Area. The se development sites include:

- > Matilda Bay site
- > OneSteel site

The previous assessment completed in 2015 included the Tasker site; however, this development has since been completed. It is noted all development sites are proposed to have frontage access to McCabe Street via internal circulation network.

Figure 3-1 Development Sites



3.1.2 Matilda Bay Site

The Matilda Bay site is located at 130 Stirling Highway and 2-4 McCabe Place. Based on the information provided for proposed future uses for this Site, it will ultimately comprise a mix of medium to high density residential development, plus small-scale commercial development.

3.1.3 OneSteel Site

The OneSteel site is located at 140 Stirling Highway. The proposed development form comprises of a number of multi-storey structures including both high-density residential apartments and commercial/retail floor space. Some degree of medium-density townhouse residential development is also proposed.

3.2 Site Visit

A site visit was conducted on 30/06/2022 during the AM and PM peak hours at the intersections shown in **Figure 3-4**. During the site visit, sample traffic counts were undertaken at a number of intersections within the study area and several key observations were made:

- At the intersection of McCabe Street/Stirling Highway, there is a substantial degree of queuing during school peak periods, which was observed to extend to up to 190m at its longest.

Figure 3-2 and **Figure 3-3** highlights the queue lengths during the morning and afternoon peak periods.

Figure 3-2 Queue Lengths on McCabe Street – AM

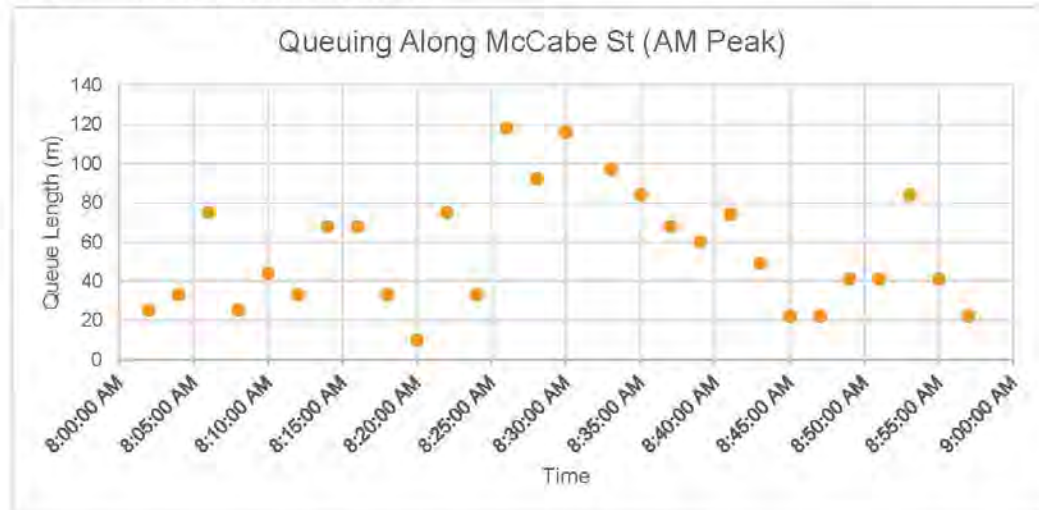
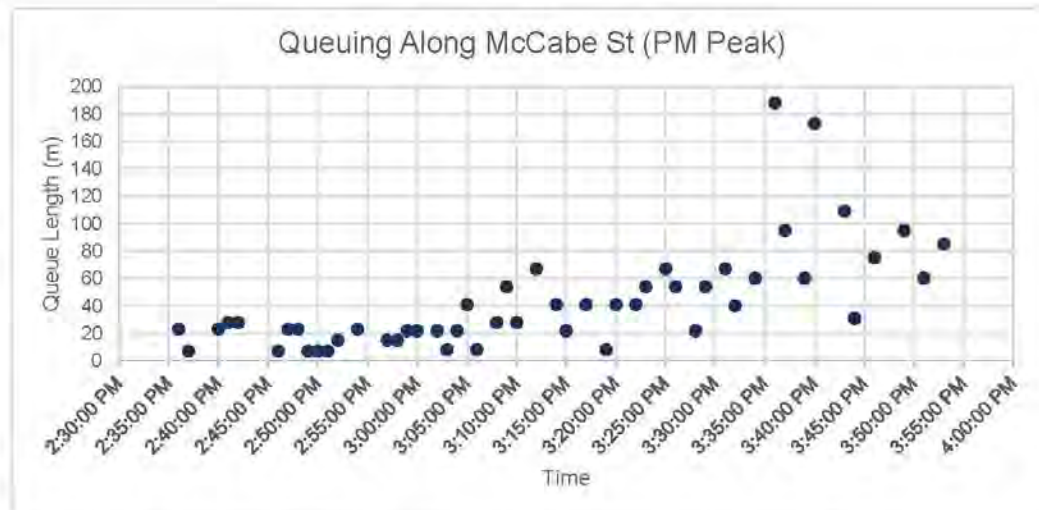


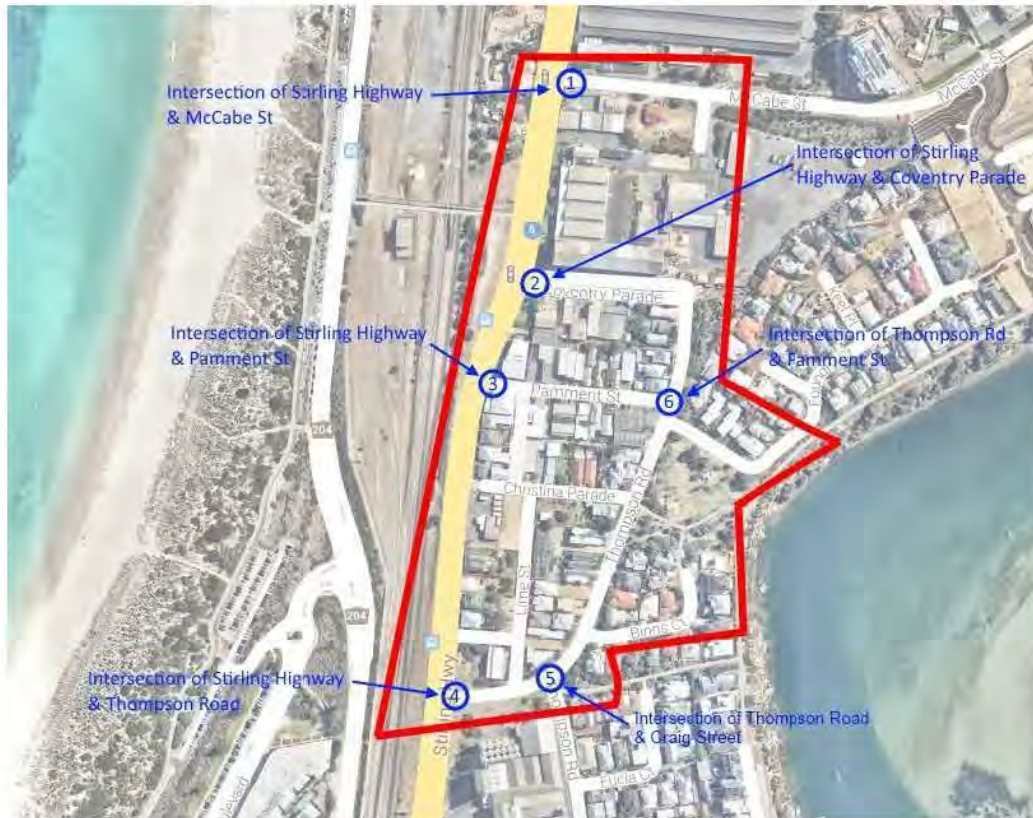
Figure 3-3 Queue Lengths on McCabe Street – PM



- Despite the traffic queues on McCabe Street, the traffic signals allowed sufficient green time to clear 100% of queueing on McCabe Street. The total green time was found to vary substantially, from less than 10 seconds to approximately 30 seconds, as required to accommodate queued traffic.
- During periods of long queues, vehicles intending to enter the right turn slip lane were observed to enter the opposing traffic lane to get around the traffic queues, thereby presenting a safety hazard.

- > Observations at the intersection of Craig Street / Stirling highway showed drivers had difficulty turning left out from Craig Street to Stirling Highway, especially during peak traffic hours. This was due to the large volume of traffic on Stirling Highway in both directions and the truncated sightlines to southbound traffic along Stirling Highway, as a result of the downward grade, the existing bend in the road (~200m to the north), and minor visual obstructions (power poles).

Figure 3-4 Traffic Count Locations

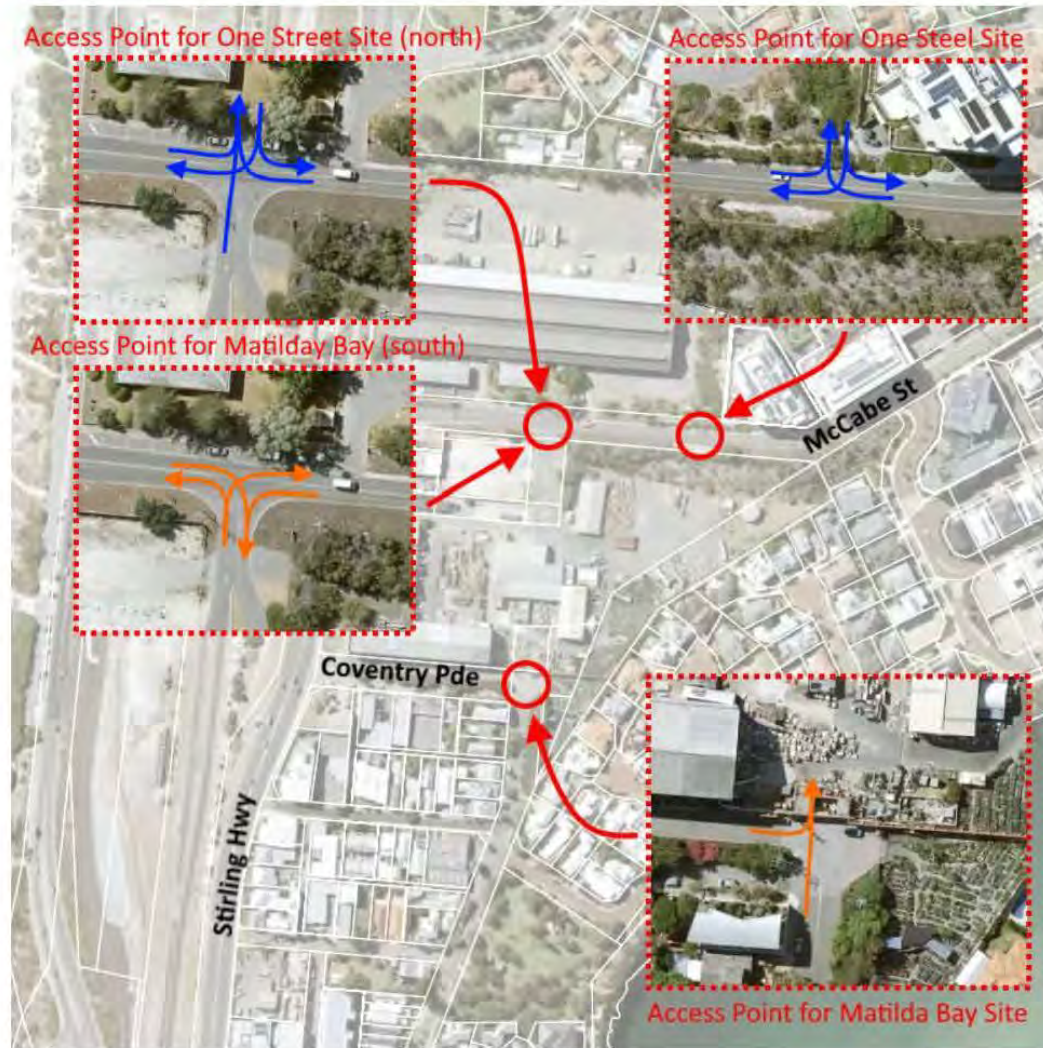


4 Key Development Traffic Generation

4.1 Access Arrangements

The access points for each of the development sites are shown in **Figure 4-1**. All development access points allow for full turning movements.

Figure 4-1 Location of Site Access Points



4.1.2 Matilda Bay Site

Access to the Matilda Bay site is proposed to be provided at two locations, as follows:

- A full movement access proposed at the McCabe Street and McCabe Place intersection.
This intersection is proposed to be reconfigured to a 4 way roundabout with the southern approach providing access to the Matilda Bay Site.
- Inbound-only access (left in and right in only) located on Coventry Parade.

4.1.3 OneSteel Site

Access is proposed at two locations on McCabe Street.

- A full movement access proposed at the McCabe Street and McCabe Place intersection.
This intersection is proposed to be reconfigured to a 4 way roundabout with the northern approach providing access to the OneSteel Site.
- A full movement access further east along McCabe Street, at the south-eastern corner of the OneSteel Site.

4.1.3.1 Site Distance Requirements

A sight distance assessment has been conducted based on AS2890.1 for the OneSteel Site access located to the east and illustrated in **Figure 4-2**.

Figure 4-2 Minimum Sight Distance Requirements



The assessment is based on a 50km/h frontage road speed, however, vehicles traveling westbound will likely be traveling at a reduced speed as there is a 20km/h advisory speed imposed at the Tasker Site access due to the bend in the road and reinforced using a road hump.

Given the height difference at the access between the property boundary and the road edge, modifications to the embankment may be necessary to ensure that visibility is unobstructed.

4.2 Background (Non-Development) Traffic

The existing traffic volumes for the study area was estimated from data provided by various sources and information inferred from existing counts for areas traffic data was otherwise unavailable.

Background traffic volumes were initially sourced from the following sources:

- Vehicle and turning movement surveys were undertaken by Cardno on 28/06/2022. Turning movement surveys were undertaken for the following intersections:
 - Stirling Highway/McCabe Street
 - Stirling Highway/Coventry Parade
 - Stirling Highway/Pamment Street
 - Stirling Highway/Craig Street
 - Thompson Road/Craig Street
 - Thompson Road/Pamment Street

4.3 Trip Generation and Distribution

4.3.1 Development Yields

Indicative yields for the proposed development sites to be included in this traffic study are summarised in the table below. This represents a projection of the overall intensity of development at the time of the assessment and has been used to estimate the trip generation and distribution of new development within the Precinct.

Table 4-1 provides a summary of the development yields for both Sites.

Table 4-1 Indicative Development Yields

Land Use	Yield (NLA)
Proposed Matilda Bay Site	
Apartments	330 dwellings
Townhouses	20 dwellings
Aged Care	110 units
Child Care	100 places
Function^	800 sqm
F&B	2,300 sqm
Retail	800 sqm
Office/Commercial	300 sqm
Proposed OneSteel Site	
Apartments	280 dwellings
Townhouses	40 dwellings
F&B	3,000 sqm
Retail/Supermarket	3,000 sqm
Health/Wellness	1,600 sqm
Function^	1,600 sqm
Entertainment*	1,600 sqm
Childcare	100 places

* there are a number of different entertainment uses that might eventuate. The majority of these operate during the evening and weekends.

[^] Function uses tend to leverage adjacent F&B or entertainment spaces and are interdependent with these. The maximum function size is determined through the licensing process, with larger functions resulting in a reduction in trip generation for the associated uses.

As the Tasker Site has already been built, it has not been included for this assessment since the associated traffic volumes are considered to be included in the existing background traffic.

4.3.2 Matilda Bay Site

Traffic generation has been established based on standard best-practice figures from ITE's *Trip Generation Guidelines* (10th ed.) and RTA's *Trip Generation Analysis*.

Included within the modelling is a degree of internal trip catchment, calculated to be approximately 25% during identified peak periods. This internal trip catchment references the relationship between on-site and nearby residents and complementary commercial / entertainment uses.

It is expected that trips currently using McCabe Street to access commercial, retail and restaurant outside of the local catchment would be redirected to the proposed uses at the OneSteel and Matilda Bay site. This would result in a reduction in trips at the Stirling Highway intersection. However, for the purpose of creating a conservative and robust assessment, no pass-by trade or redirection effects have been included in the following analysis.

The outcomes of these traffic generation assumptions for the Matilda Bay site are detailed in **Table 4-2**.

Table 4-2 Estimated Trip Generation the Matilda Bay Site

Land Use	Weekday AM Peak		Weekday PM Peak	
	In	Out	In	Out
Apartments	24	88	79	49
Function Room	38	38	38	38
Restaurant/Café	52	13	39	26
Tavern	0	0	33	16
Commercial	3	2	3	4
Townhouses	3	8	8	5
Aged Care	15	16	17	15
Child Care	27	24	33	37
TOTAL	161	188	250	198

4.3.3 OneSteel Site

The outcomes of these traffic generation assumptions for the OneSteel site are listed in **Table 4-3**.

Table 4-3 Estimated Trip Generation for the OneSteel Site

Land Use	Weekday AM Peak		Weekday PM Peak	
	In	Out	In	Out
Apartments	19	73	66	40
Restaurants	88	22	67	43
Entertainment	20	11	73	58
Townhouses	4	11	13	9
Retail/Supermarket	47	35	66	63
Health/Wellness/Gym	25	19	28	29
Childcare	14	16	22	20
Function	5	4	6	4
TOTAL	222	192	340	267
	414		607	

4.4 Directional Distribution

The anticipated development traffic distribution uses the existing traffic distribution within the current road network. **Figure 4-6** shows the anticipated traffic distribution to and from both developments.

It is likely that the residential component of development will travel west and use Stirling Hwy to travel either to the north or to the south. However, the non-residential component, which represents a significant volume generated by the proposed developments, is likely to attract a larger proportion of local travel within the surrounding area, particularly from the Mosman Park residential precinct to the east. The distribution assessment is explained further below.

The proposed connection of Coventry Parade to McCabe Place provides an alternative route for inbound movements to development sites and/or to McCabe Street. Sensitivity analysis has been undertaken to determine the benefit of this route, and to identify the potential extent (and impact) of any redirection that may occur.

The traffic distribution described below shows the result of this assessment, which assigns 30% of right-turning inbound traffic (i.e. from Stirling Highway turning right into McCabe Street) to Coventry Parade. This value provides an appropriate balance between delay and queuing capacity and is considered to be generally representative of emergent behaviour.

4.4.1 Traffic Distribution

Based on data collection from household travel surveys, the trip distribution by purpose of trips is generally as follows:

- Home Based Work – 28%
- Home Based Education – 24%
- Home Based Shopping/Other – 48%

4.4.2 Trips Generated by Residents of Developments- Home Based Work

Home Based Work trips were proportioned based on ABS Census data (2016) for journey to work by car employment areas for residents of Mosman Park. These trips were distributed to the network as follows:

- North towards to the Perth CBD and other northern suburbs – 56% – Stirling Highway provides a direct route to the CBD and areas beyond
- South towards Fremantle and other southern suburbs – 32% – the proximity of Fremantle attracts a large proportion of work trips to/from the area as it is a major employment destination.
- East within Mosman Park / Peppermint Grove – 12% – home based work trips to the adjacent Mosman Park area, are considered to be low as the area comprising mostly of residential dwellings.

4.4.3 Trips Generated by Residents of Developments - Home Based Education

The proportion of public and private school education within the Mosman Park/North Fremantle areas were obtained from the ABS census data and summarised in **Table 4-4**. Note that the data excludes university and tertiary education as these people are less likely to drive, and preschool education which tends to be provided locally.

Table 4-4 Public/Private Education with Mosman Park and North Fremantle (from ABS)

Education Level	Government (Public)	Non-Government (Private)	Total
Primary Education	28%	18%	46%
Secondary Education	11%	43%	54%
Total	39%	61%	100%

Table 4-5 provides a summary of the nearby private schools within North Fremantle and Mosman Park and public schools that are located nearby or are a part of the catchment area of the Site.

Table 4-3 Home Based Education Trip Proportion

School	Public/Private	Access to/from Study Area	Likely Proportion of Students from the Site	Adjusted Proportion
St Hilda's Anglican School for Girls (both Campuses)	Private Primary/Secondary	East	61%	14.35%
The Beehive Montessori School	Private Primary	North	18%	3.6%
Scotch College	Private Primary/Secondary	North	61%	14.35%
Christ Church Grammar School	Private Primary/Secondary	North	61%	14.35%
Iona Presentation College (both Campuses)	Private Primary/Secondary	East	61%	14.35%
North Fremantle Primary School	Public Primary	South	28%	14%
Mosman Park Primary School	Public Primary	East	28%	14%
John Curtin College of the Arts*	Public Secondary	South	11%	2.75%
Fremantle College*	Public Secondary	South	11%	2.75%
Melville Senior High School*	Public Secondary	South	11%	2.75%
Shenton College*	Public Secondary	North	11%	2.75%

* the Site location is within the optional intake area for these schools

The home base education trips are summarised as follows:

- North – 35%
- South – 22%
- East – 43%

Figure 4-3 illustrates the location of the schools listed above table.

Figure 4-3 Location of Nearby Schools



4.4.4 Trips Generated by Residents of Developments - Home Based Shopping/Other

These trips involve visits to retail stores/supermarkets including trips to recreational type uses such as local sporting clubs, leisure centres and public parks.

Figure 4-4 shows the locations key shopping and recreational areas near the study area. Given the scale of the proposed developments, a proportion of the shopping trips will be captured internally (25% is assumed for the purpose of this assessment). The Mosman Park area has a large number of recreational facilities which include a golf course, tennis courts, football/cricket fields which will attract a high proportion of locals.

Other than the Mosman Park locality, there are also numerous recreational facilities to the south of the Site in the Fremantle/East Fremantle areas which will also attract a sizeable proportion of users though not as many as they are located further away.

Figure 4-4 Key Attractors East of the Site



The resulting origin/destination zone designations and percentages for home based trips are shown in **Table 4-6**.

Table 4-6 Zone Proportions for Development Traffic

	Work (28% of all trips)	Education (24% of all trips)	Shopping/Other (48% of all trips)	Total Resident Trip Proportion
Stirling Highway North	58%	35%	8%	28%
Stirling Highway South	32%	22%	32%	30%
McCabe Street East	12%	43%	60%	42%
Total	100%	100%	100%	100%

4.4.5 Trips Generated by Visitors to Development

Visitor trips from the local catchment will comprise mostly people living locally in either North Fremantle, Mosman Park and the southern boundary of Cottesloe. Given the types of uses proposed by the developments, the majority of visitation trips are expected to be from within the local catchment (assumed to be 60%). Trip distributions have been calculated based on an estimated local catchment of 2 km from the development.

In addition, regional visitor traffic beyond the local catchment has also been considered. This catchment is assumed to account for 40% of visitor trips with a 50/50 split to the north and to the south.

Figure 4-5 Local Catchment Trip Capture (approximately 2 km radius from the Site)



Based on the catchment area, the distribution is summarised in **Table 4-7**.

Table 4-7 Proportion of Visitor Trip Proportion

Travel Direction	Local Catchment (60% of trips)	Regional Catchment (40% of trips)	Total Visitor Trip Proportion
Stirling Highway North	14%	50%	28%
Stirling Highway South	7%	50%	25%
McCabe Street East	79%	0%	47%

4.4.6 Trips Generated by Employees of Development

The proportion of employee trips to and from the study area were based on the journey to work data obtained from the ABS census data and summarised in **Table 4-8**.

Table 4-8 Proportion of Employees Trip Proportion

Travel Direction	Employee Trip Proportion
Stirling Highway North	36%
Stirling Highway South	50%
McCabe Street East	14%
Total	100%

Note that not all employee trips will occur during the development peak periods

4.4.7 Trip Distribution Summary

Based on the calculated trip generation for the proposed developments in **Section 4.3**, the proportion of residential and non-residential trips are summarised as follows:

- 32% of development traffic are residential trips
- 68% of development traffic are non-residential trips

With regards to the proportion of visitor and employees within the non-residential trip component, the ITE Parking Generation Manual 4th Edition provides information on the parking required for visitors/customers and employees for various land uses. This information can be distilled to estimate the proportion of visitor and employee trips for each land use and determine an average across the proposed developments summarised as follows:

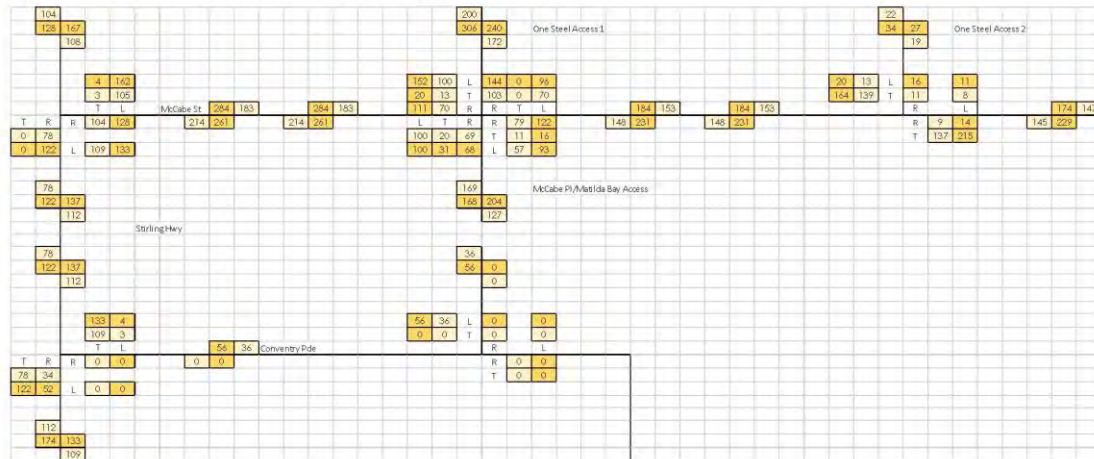
- 77% of non-residential trips are visitors/customer (52% of development traffic)
- 23% of non-residential trips are employees (16% of development traffic)

Finally, **Table 4-9** provides a summary of the overall trip distribution for the Site.

Table 4-9 Trip Distribution Summary

Travel Direction	Residential Trip Proportion (32% of development traffic)	Visitor Trip Proportion (52% of development traffic)	Employee Trip Proportion (16% of development traffic)	Total Distribution Across the Road Network
Stirling Highway North	28%	28%	36%	29%
Stirling Highway South	30%	25%	50%	30%
McCabe Street East	42%	47%	14%	40%

Figure 4-6 Development Traffic Distribution for OneSteel and Matilda Bay Sites (Scenario 2 and 3)



4.5 Development Assumptions

The following assumptions have been made for the development:

- Analysis has been undertaken for the 2035 design year; based on a 10-year horizon beyond a theoretical development build-out in 2025.
- While traffic volumes along Stirling Highway have remained steady over time, with some sections experiencing a slight decline in volumes, a conservative traffic growth rate of 2% per annum has been used as per discussion with the City of Fremantle.

It should be noted that projections from Main Roads WA suggest growth rates in the order of 3-4%, which are likely to include local development traffic from the above sites.

These higher rates have *not* been used, to avoid duplication of development traffic and to provide a greater level of detail with respect to the effects of adjoining development.

- For the purpose of a conservative assessment, traffic volumes associated with the existing developments on the Matilda Bay and OneSteel sites have not been removed from the background traffic (the existing traffic is considered to be minimal, in any case).
- The effect of trip redirection and pass-by trips have not been included, however an internal trip catchment value of 25% has been applied to applicable demands, referencing the high density of complementary uses within and adjacent to the development Sites.
- Heavy vehicle volumes have been based on traffic data obtained from Main Roads Traffic Map.
- The existing signal phasing and timing for the Stirling Highway/McCabe Street intersection has been used in the base scenario, and changes required to optimise function under future scenarios have been clearly defined.
 - The filter right turn from the southern approach of the Stirling Highway/McCabe Street intersection has been removed for all future assessments as allowing this movement against high volume southbound traffic is a critical safety issue.
 - Though including the filter movement in SIDRA is likely to improve traffic operations, it does not take into consideration of the real world safety implications of drivers taking risks to "make the gap" (as indicated by the most recent 5 year crash data where 5 of the 12 crashes at the intersection were the result of right turn thru crashes).
- Consideration for regional redirection of traffic has been included in commentary, but redistribution of traffic beyond the boundaries of the Study Area has not been used to mitigate any congestion effects.

5 Assessment Scenarios

5.1 Scenarios

The City of Fremantle has requested an analysis of three different scenarios in order to determine the potential future traffic volume and movement patterns, as well as its impact on the local road network within the study area. All scenarios from 1 through 4 include full build-out of the nearby developments at the One Steel and Matilda Bay sites.

To this end, the following scenarios road extensions have been proposed:

- Scenario 0 – Current intersection operation (2022) and future intersection operation (2035) without development or any changes to the intersections. The only changes applied is the 2% growth per year up to 2035 and removal of the right-turn filter.
- Scenario 1 – Existing configuration for Stirling Highway, retaining background traffic flow patterns for a 2035 horizon.
- Scenario 2 – Minor modifications to Stirling Highway and McCabe Street to facilitate improved access, including:
 - Upgraded median and right turn pocket into Coventry Parade.
 - Under this arrangement the right turn out of Coventry Parade is restricted, with these traffic movements redirected to the nearest intersection where right turn movements are allowed (i.e. Stirling Highway/McCabe Street intersection).
 - 4-way roundabout at McCabe Street / McCabe Place
 - Access permitted from through the Matilda Bay site to McCabe Street (northbound only).
 - This change allows vehicles to avoid the right-turn at the McCabe Street signals while minimising the impact on adjacent residents. It is expected to be particularly attractive for vehicles destined for the OneSteel and Matilda Bay site.
- Scenario 3 – Significant upgrades to Stirling Highway in-line with the SHACS plan, in addition to the above local changes. Intersection upgrades, including:
 - An additional left-turn pocket and give-way slip lane for traffic turning left from Stirling Highway into McCabe Street
 - Bus lanes/ queue jump lanes in both northbound and southbound directions
 - Signal optimisation to support reallocation of capacity
- Sensitivity Assessment Scenario (Scenario 4) – Sensitivity analysis

The inclusion of this assessment is intended to show the capacity thresholds for the Stirling Highway/McCabe Street intersection and when these thresholds will be reached. For this assessment, full build-out of development Sites is presumed.

Background growth is applied to the intersection up to the point where the overall intersection performance reaches LOS E (the selected failure criteria).

Sensitivity analysis has been conducted for the Stirling Highway/McCabe Street intersection under the following scenarios:

- Current intersection layout with background traffic growth only (Scenario 4A)
- Intersection layout based on SHACS plan with background traffic only (Scenario 4B)
- Current intersection layout with background traffic growth and development traffic (Scenario 4C)
- Intersection layout based on SHACS plan, right turn lane into Coventry Parade with background traffic growth and development traffic (Scenario 4D).
- Intersection layout based on SHACS plan, double right turn on the southern approach of the Stirling Highway/McCabe Street intersection, right turn lane into Coventry Parade with background traffic growth and development traffic (Scenario 4E).

5.2 Scenario Assumptions

The following assumptions have been made for the scenarios.

- As previously described, the Matilda Bay site is assumed to have two access points with one located on McCabe Place and the other on Coventry Parade. As the Coventry Parade access only allows inbound movements only, the majority of development traffic will likely use the McCabe Place access.
- Through movements along Stirling Highway have been assumed to grow at a conservative 2% per annum. This is considerably higher than observed through recent history, and may reflect the outcomes of SHACS upgrades, or traffic increases outside of peak periods only.
- Traffic growth along McCabe Street has been determined from the generation by the two key development Sites only. However, traffic volumes associated with the existing developments on the Matilda Bay and OneSteel sites will not be removed from the background traffic, and the effects of trip redirection and pass-by trips have not been considered. The result is considered to be conservative from an impact perspective.
- With regards to the trip generation, a proportion of development trips associated with the F&B, retail, commercial and health/fitness tenancies will be generated internally, and therefore do not result in vehicle trips. This has been calculated at approximately 25% during relevant peak periods.
- Heavy vehicle volumes have been determined based on traffic data obtained from Main Roads Traffic Map.
- The existing signal phasing and timing for the Stirling Highway/McCabe Street intersection have been used for the base scenario, but have been modified to remove the right-turn filter under all future scenarios, and then updated to reflect changes required to optimise function.

6 Analysis of Transport Network

6.1 Intersection Performance

Analysis of the traffic impacts has been undertaken for the following intersections summarised in table using SIDRA modelling software.

Table 6-1 Summary of SIDRA Assessment Intersections and Scenarios

Land Use	Scenario 0	Scenario 1	Scenario 2	Scenario 3	Scenario 4
Stirling Highway/McCabe Street	✓	✓	✓	✓	✓
Stirling Highway/Coventry Parade	✓	✓	✓	✓	
McCabe Street/McCabe Place		✓	✓	✓	
McCabe Street/Access 2		✓	✓	✓	

The Stirling Highway/Craig Street, Stirling Highway/Pamment Street, Pamment Street/Thompson Road and Craig Street/Thompson Road intersections have not been assessed as the anticipated traffic volumes passing through these intersections will continue to be very low, and traffic demand growth is anticipated to have negligible impact.

Scenario 4 describes the outcomes of sensitivity assessment for the Stirling Highway/McCabe Street intersection.

This analysis was undertaken to determine the existing conditions as well as with the addition of the development traffic associated with the proposal. The identified intersections have been analysed for each scenario using the SIDRA v9 analysis program. This program calculates the performance of intersections based on input parameters, including intersection geometry and traffic volumes. As an output SIDRA provides values for the Degree of Saturation (DOS), queue lengths and delays. Based on the criteria listed in the Highway Capacity Manual (HCM), the following upper limits for the DOS (where it is considered that the operation of the intersection is constrained) are:

- ✦ 0.80 for unsignalised intersections
- ✦ 0.85 for roundabouts
- ✦ 0.90 for signalised intersections

A DOS exceeding these values indicates that the intersection is exceeding its practical capacity. Above these values, users of the intersection are likely to experience unsatisfactory queuing and delays during the peak hour periods.

SIDRA is a commonly used intersection-modelling tool by traffic engineers for all types of intersections. SIDRA outputs are presented in the form of Degree of Saturation, Level of Service, Average Delay and 95% Queue. These characteristics are defined as follows:

- **Degree of Saturation:** is the ratio of the arrival traffic flow to the capacity of the approach during the same period. The Degree of Saturation ranges from close to zero for varied traffic flow up to one for saturated flow or capacity.
- **Level of Service (LOS):** is the qualitative measure describing operational conditions within a traffic stream and the perception by motorists and/or passengers. In general, there are 6 levels of services, designated from A to F, with Level of Service A representing the best operating condition (i.e. free flow) and Level of Service F the worst (i.e. forced or breakdown flow).
- **Average Delay:** is the average of all travel time delays for vehicles through the intersection.
- **95% Queue:** is the queue length below which 95% of all observed queue lengths fall.

All SIDRA results for all scenarios analysed are shown in **Appendix A** (including the base 2035 assessment scenario for comparison).

6.2 Existing Transport Network

6.2.1 Scenario 0

6.2.1.1 Stirling Highway/McCabe St Intersection

The existing form of the Stirling Highway/McCabe Street intersection is shown in **Figure 6-1** (as modelled in SIDRA) and the results summarised in **Table 6-2** and **Table 6-3**.

Figure 6-1 Existing Intersection Geometry of Stirling Highway/McCabe Street Intersection as Modelled in SIDRA

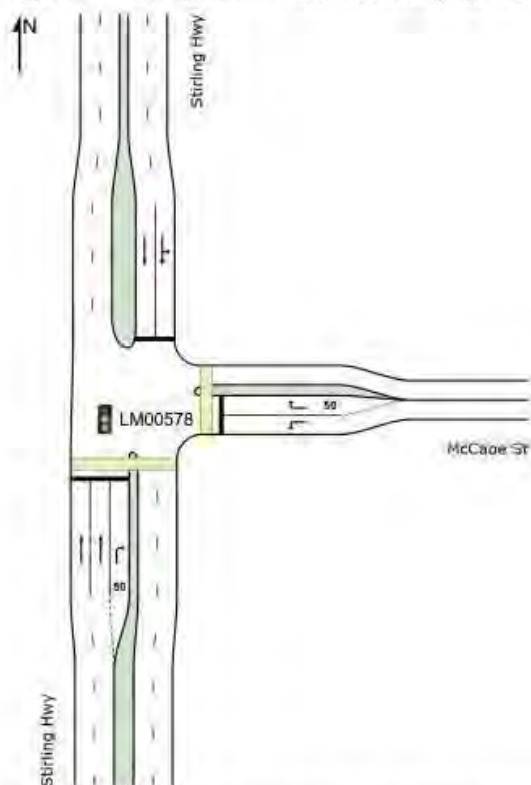


Table 6-2 SIDRA Results for Stirling Highway/McCabe Street Intersection (2022) – Scenario 0

Intersection Approach		AM Peak				PM Peak			
		DOS	Delay	LOS	95% Queue (m)	DOS	Delay	LOS	95% Queue (m)
Stirling Hwy (S)	T	0.619	4.4	A	173.9	0.397	3.8	A	76
	R	0.430	17.2	B	77.6	0.561	37.2	D	62.9
McCabe Street (E)	L	0.381	33.5	C	91.5	0.568	44.4	D	100.2
	R	0.416	68.5	E	35.1	0.379	60.0	E	29.4
Stirling Hwy (N)	L	0.563	32.7	C	176.5	0.769	24.1	C	277.8
	T	0.563	27	C	178.6	0.769	18.5	B	279
All Vehicles		0.619	16.4	B	178.6	0.769	17.3	B	279

The baseline analysis shows a degree of congestion and delay for key turning movements.

Table 6-3 SIDRA Results for Stirling Highway/McCabe Street Intersection (2035) – Scenario 0

Intersection Approach		AM Peak				PM Peak			
		DOS	Delay	LOS	95% Queue (m)	DOS	Delay	LOS	95% Queue (m)
Stirling Hwy (S)	T	0.78	5.8	A	244.8	0.559	4.3	A	132.1
	R	1.029	132.9	F	244.8	1.041	131.8	F	176
McCabe Street (E)	L	0.27	21.1	C	68.9	0.487	40.7	D	95.1
	R	0.416	68.5	E	35.1	0.379	60	E	29.4
Stirling Hwy (N)	L	1.011	110.7	F	465.1	1.027	99.9	F	783
	T	1.011	104.9	F	471.3	1.027	94.2	F	785.9
All Vehicles		1.029	50.8	D	471.3	1.041	61.1	E	785.9

Growth along the Stirling Highway corridor and removal of the right-turn filter results in a reduction in performance, particularly for turning traffic. The increase in background traffic results in northbound lanes exceeding peak period capacity, and an intersection LOS E for the PM peak (meeting the designated 'failure' criteria in 2034) even without any development along McCabe Street.

6.2.1.2 Stirling Highway/Coventry Parade Intersection

The existing form of the Stirling Highway/Coventry Parade intersection is shown in **Figure 6-2** (as modelled in SIDRA) and the results summarised in **Table 6-4** and **Table 6-5**.

Figure 6-2 Existing Intersection Geometry of Stirling Highway/Coventry Parade Intersection as Modelled in SIDRA

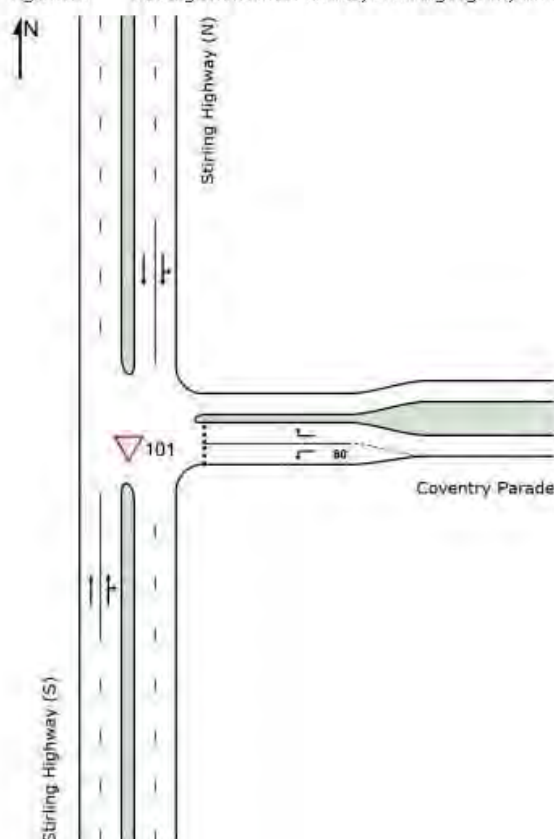


Table 6-4 SIDRA Results for Stirling Highway/Coventry Parade Intersection (2022) – Scenario 0

Intersection Approach		AM Peak				PM Peak			
		DOS	Delay	LOS	95% Queue (m)	DOS	Delay	LOS	95% Queue (m)
Stirling Hwy (S)	T	0.566	0.1	A	2.6	0.363	0.2	A	1.9
	R	0.566	18.6	C	2.6	0.363	29.9	D	1.9
Coventry Pde (E)	L	0.001	7.5	A	0	0.013	11.7	B	0.5
	R	0.13	124.7	F	4.8	0.576	152.2	F	12.7
Stirling Hwy (N)	L	0.325	5.6	A	0	0.523	5.6	A	0
	T	0.325	0	A	0	0.523	0.1	A	0
All Vehicles		0.566	0.5	A	4.8	0.576	1.3	A	12.7

The current intersection form at this intersection does not permit staged right turns, resulting in excessive delays even where turning volumes are very low.

Table 6-5 SIDRA Results for Stirling Highway/Coventry Parade Intersection (2035) – Scenario 0

Intersection Approach		AM Peak				PM Peak			
		DOS	Delay	LOS	95% Queue (m)	DOS	Delay	LOS	95% Queue (m)
Stirling Hwy (S)	T	0.649	0.3	A	117.6	0.512	0.7	A	7.4
	R	0.649	30.4	D	117.6	0.512	52.2	F	7.4
Coventry Pde (E)	L	0.001	8.7	A	0.1	0.022	16.5	C	0.9
	R	0.368	342.2	F	13.7	1.165	469.2	F	43.8
Stirling Hwy (N)	L	0.407	5.6	A	0	0.644	5.6	A	0
	T	0.407	0	A	0	0.644	0.1	A	0
All Vehicles		0.649	1.1	A	117.6	1.165	3.8	A	43.8

6.2.1.3 Scenario 0 Results Summary

Though the intersection currently operates at an acceptable level of service, projected traffic growth along the Stirling Highway corridor causes significant queues and delays to occur at the intersection, with the designated 'failure' criteria reached by 2034.

6.2.2 Scenario 1

6.2.2.1 Stirling Highway/McCabe St Intersection

The existing form of the Stirling Highway/McCabe Street intersection is shown in **Figure 6-1** (as modelled in SIDRA) and the results summarised in **Table 6-6**.

Table 6-6 SIDRA Results for Stirling Highway/McCabe Street Intersection – Scenario 1

Intersection Approach		AM Peak				PM Peak			
		DOS	Delay	LOS	95% Queue (m)	DOS	Delay	LOS	95% Queue (m)
Stirling Hwy (S)	T	0.809	6	A	244.8	0.574	4.4	A	134.3
	R	1.168	232.8	F	244.8	1.336	367.6	F	244.8
McCabe Street (E)	L	0.509	21.9	C	99.3	0.742	35.9	D	135.4
	R	1.042	137.3	F	131.4	1.103	171.1	F	160.2
Stirling Hwy (N)	L	1.146	209.2	F	661.5	1.315	341	F	1461
	T	1.146	203.1	F	690.6	1.315	335.2	F	1484.1
All Vehicles		1.168	98	F	690.6	1.336	206.1	F	1484.1

The increased traffic demands on McCabe Street exceed capacity, exacerbating the issues shown for the 2035 background growth scenario.

6.2.2.2 Stirling Highway/Coventry Parade Intersection

The existing form of the Stirling Highway/Coventry Parade intersection is shown in **Figure 6-2** (as modelled in SIDRA) and the results summarised in **Table 6-7**.

Table 6-7 SIDRA Results for Stirling Highway/Coventry Parade Intersection – Scenario 1

Intersection Approach		AM Peak				PM Peak			
		DOS	Delay	LOS	95% Queue (m)	DOS	Delay	LOS	95% Queue (m)
Stirling Hwy (S)	T	0.686	0.5	A	290.7	0.511	0.7	A	279.2
	R	0.686	33.2	D	290.7	0.511	44.3	E	279.2
Coventry Pde (E)	L	0.001	8.6	A	0.1	0.018	12.9	B	0.7
	R	1.338	849	F	24	3.148	2133.2	F	117.6
Stirling Hwy (N)	L	0.401	5.6	A	0	0.56	5.6	A	0
	T	0.401	0	A	0	0.56	0.1	A	0
All Vehicles		1.338	2.4	A	290.7	3.148	15.9	A	279.2

6.2.2.3 McCabe Street/McCabe Place

The McCabe Street/McCabe Place intersection is shown in **Figure 6-3** (as modelled in SIDRA) and the results summarised in **Table 6-8**.

Figure 6-3 Intersection Geometry of McCabe Street/McCabe Place Intersection as Modelled in SIDRA

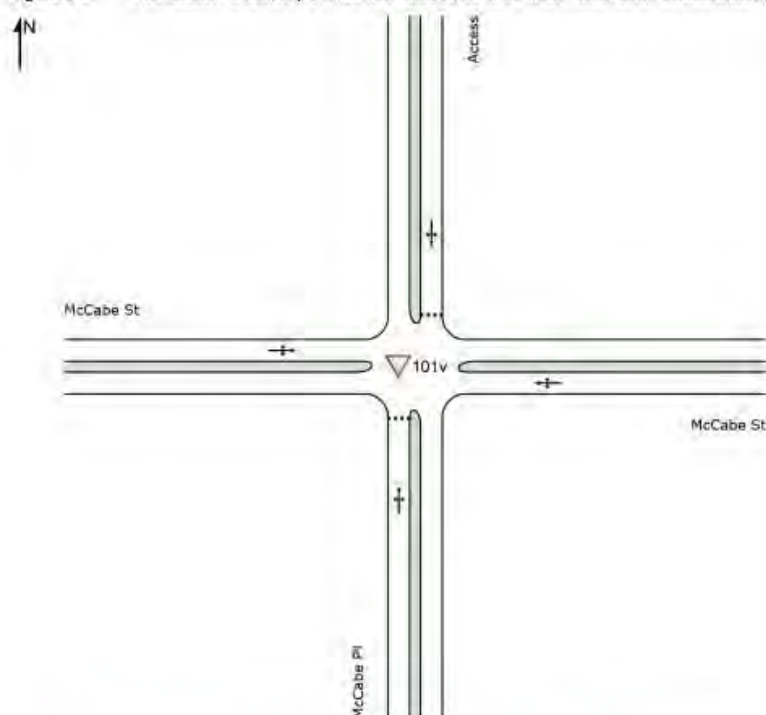


Table 6-8 SIDRA Results for McCabe Street/McCabe Place Intersection – Scenario 1

Intersection Approach		AM Peak				PM Peak			
		DOS	Delay	LOS	95% Queue (m)	DOS	Delay	LOS	95% Queue (m)
McCabe Pl (S)	L	0.332	6.7	A	8.8	0.399	7.3	A	9.5
	T	0.332	11.8	B	8.8	0.399	12.1	B	9.5
	R	0.332	14.3	B	8.8	0.399	15	C	9.5
McCabe St (E)	L	0.34	6.8	A	10.9	0.463	6.6	A	18.7
	T	0.34	1.9	A	10.9	0.463	2.4	A	18.7
	R	0.34	7.4	A	10.9	0.463	7.1	A	18.7
Access (N)	L	0.433	8.3	A	13	0.671	11.6	B	24.1
	T	0.433	12.9	B	13	0.671	17.6	C	24.1
	R	0.433	16.7	C	13	0.671	20.6	C	24.1
McCabe St (W)	L	0.323	5.8	A	7.4	0.291	6	A	9
	T	0.323	2.5	A	7.4	0.291	3.1	A	9
	R	0.323	6.9	A	7.4	0.291	7	A	9
All Vehicles		0.433	5.6	A	13	0.671	7.3	A	24.1

6.2.2.4 McCabe Street/OneSteel Access 2

The McCabe Street/OneSteel Access 2 intersection is shown in **Figure 6-4** (as modelled in SIDRA) and the results summarised in **Table 6-9**.

Figure 6-4 Intersection Geometry of McCabe Street/OneSteel Access 2 Intersection as Modelled in SIDRA.

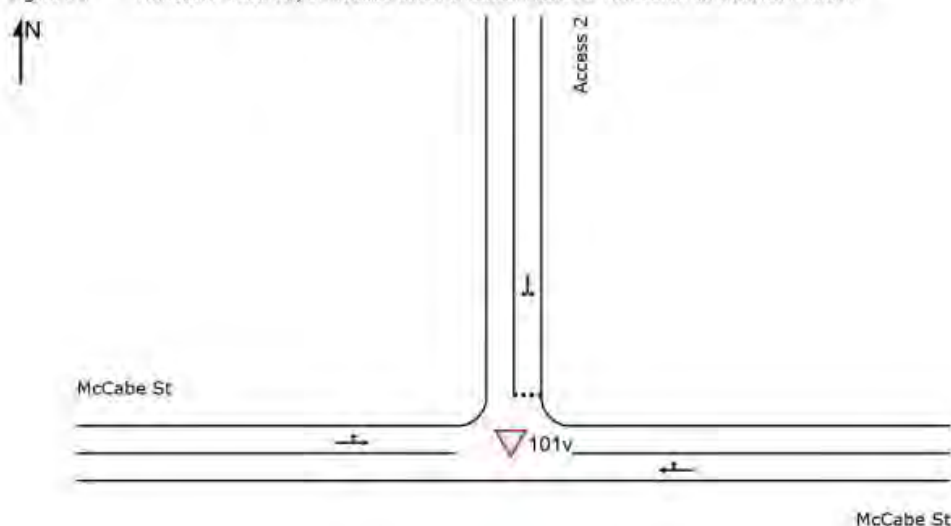


Table 6-9 SIDRA Results for McCabe Street/OneSteel Access 2 Intersection – Scenario 1

Intersection Approach		AM Peak				PM Peak			
		DOS	Delay	LOS	95% Queue (m)	DOS	Delay	LOS	95% Queue (m)
McCabe St (E)	T	0.258	0.1	A	1	0.301	0.1	A	1.3
	R	0.258	8.7	A	1	0.301	7.8	A	1.3
Access 2 (N)	L	0.038	7.7	A	0.8	0.051	7	A	1.1
	R	0.038	12.6	B	0.8	0.051	12.3	B	1.1
McCabe St (W)	L	0.283	5.5	A	0	0.218	5.5	A	0
	T	0.283	0	A	0	0.218	0	A	0
All Vehicles		0.283	0.4	A	1	0.301	0.6	A	1.3

6.2.2.5 Scenario 1 Results Summary

The SIDRA results show that the Stirling Highway/McCabe Street intersection will operate well beyond practical capacity under an assumed 2% per year background growth plus development traffic scenario. All movements experience significant delays and queues as the current intersection arrangement does not have sufficient capacity to accommodate this amount of traffic.

For the Stirling Highway/Coventry Parade intersection, right turn movements in particular experience significant delays. This is likely due to excessive traffic volumes along Stirling Highway where very few gaps are available for turning movements. However, the volume of right turn movements at this intersection is expected to be very low under all circumstances.

The SIDRA results for McCabe Street/McCabe Place and McCabe Street/OneSteel Access 2 show that both intersections operate at an acceptable level for service (worst movement at LOS D for McCabe Street/McCabe Place and LOS C at the McCabe Street/OneSteel Access 2).

6.2.3 Scenario 2

6.2.3.1 Stirling Highway/McCabe St Intersection

The Stirling Highway/McCabe Street intersection geometry is unchanged in this scenario (consistent with **Figure 6-1**, as modelled in SIDRA). The impacts of minor road improvements to adjacent intersections on the signalised intersection are summarised in **Table 6-10**.

Table 6-10 SIDRA Results for Stirling Highway/McCabe Street Intersection – Scenario 2

Intersection Approach		AM Peak				PM Peak			
		DOS	Delay	LOS	95% Queue (m)	DOS	Delay	LOS	95% Queue (m)
Stirling Hwy (S)	T	0.765	6	A	244.8	0.559	4.7	A	129.6
	R	1.008	121.2	F	244.8	1.165	223.8	F	244.8
McCabe Street (E)	L	0.544	24.9	C	107.6	0.874	53.8	D	173.8
	R	1.010	118.9	F	127.5	1.160	216	F	179.5
Stirling Hwy (N)	L	1.004	105.4	F	472.8	1.162	207.2	F	1134.8
	T	1.004	99.1	F	490.6	1.162	201.2	F	1150.4
All Vehicles		1.01	51.4	D	490.6	1.165	130	F	1150.4

6.2.3.2 Stirling Highway/Coventry Parade Intersection

The Stirling Highway/Coventry Parade intersection is shown in **Figure 6-5** (as modelled in SIDRA) and the results summarised in **Table 6-11**.

Figure 6-5 Modified Intersection Geometry of Stirling Highway/Coventry Parade Intersection as Modelled in SIDRA

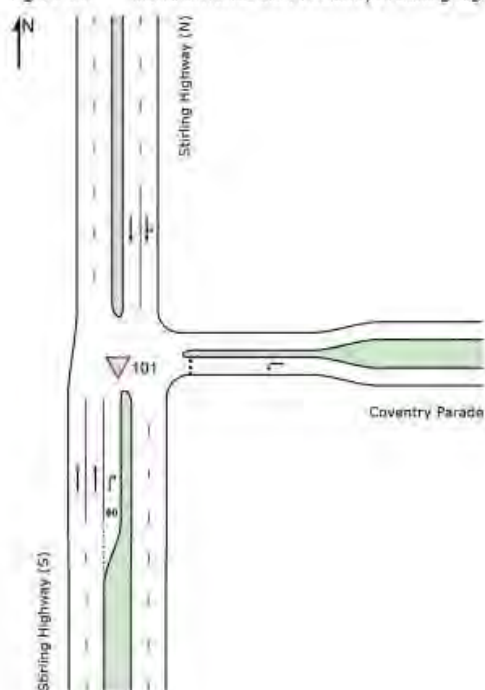


Table 6-11 SIDRA Results for Stirling Highway/Coventry Parade Intersection – Scenario 2

Intersection Approach		AM Peak				PM Peak			
		DOS	Delay	LOS	95% Queue (m)	DOS	Delay	LOS	95% Queue (m)
Stirling Hwy (S)	T	0.642	0.3	A	35	0.47	0.1	A	34.9
	R	0.388	19	C	12.1	0.706	51.2	F	24
Coventry Pde (E)	L	0.002	9.3	A	0.1	0.021	15.1	C	0.8
Stirling Hwy (N)	L	0.44	5.6	A	0	0.616	5.6	A	0
	T	0.44	0.1	A	0	0.616	0.1	A	0
All Vehicles		0.642	0.9	A	35	0.706	1.7	A	34.9

6.2.3.3 McCabe Street/McCabe Place

The McCabe Street/McCabe Place intersection is shown in **Figure 6-6** (as modelled in SIDRA) and the results summarised in **Table 6-12**.

Figure 6-6 Intersection Geometry of McCabe Street/McCabe Place Intersection as Modelled in SIDRA



Table 6-12 SIDRA Results for McCabe Street/McCabe Place Intersection – Scenario 2

Intersection Approach		AM Peak				PM Peak			
		DOS	Delay	LOS	95% Queue (m)	DOS	Delay	LOS	95% Queue (m)
McCabe Pl (S)	L	0.39	6.4	A	16.8	0.557	9.3	A	22.5
	T	0.39	6.4	A	16.8	0.557	9.2	A	22.5
	R	0.39	10.9	B	16.8	0.557	13.7	B	22.5
McCabe St (E)	L	0.473	4	A	22.7	0.813	8.2	A	45.5
	T	0.473	4.1	A	22.7	0.813	8.4	A	45.5
	R	0.473	8.4	A	22.7	0.813	12.7	B	45.5
Access (N)	L	0.233	6.9	A	11.1	0.41	5.8	A	13.1
	T	0.233	6.9	A	11.1	0.41	5.7	A	13.1
	R	0.233	11.4	B	11.1	0.41	10.2	B	13.1
McCabe St (W)	L	0.478	4.8	A	23.7	0.425	4.8	A	19.3
	T	0.478	5.1	A	23.7	0.425	5.2	A	19.3
	R	0.478	9.3	A	23.7	0.425	9.3	A	19.3
All Vehicles		0.478	6.5	A	23.7	0.813	8.6	A	45.5

6.2.3.4 McCabe Street/OneSteel Access 2

The McCabe Street/OneSteel Access 2 intersection is shown in **Figure 6-4** (as modelled in SIDRA) and the results summarised in **Table 6-13**.

Table 6-13 SIDRA Results for McCabe Street/OneSteel Access Intersection – Scenario 2

Intersection Approach		AM Peak				PM Peak			
		DOS	Delay	LOS	95% Queue (m)	DOS	Delay	LOS	95% Queue (m)
McCabe St (E)	T	0.259	0.1	A	1.1	0.302	0.1	A	1.5
	R	0.259	9.2	A	1.1	0.302	8.2	A	1.5
Access 2 (N)	L	0.041	8	A	0.9	0.054	7.2	A	1.2
	R	0.041	13.4	B	0.9	0.054	12.8	B	1.2
McCabe St (W)	L	0.309	5.5	A	0	0.24	5.5	A	0
	T	0.309	0	A	0	0.24	0	A	0
All Vehicles		0.309	0.4	A	1.1	0.302	0.6	A	1.5

6.2.3.5 Scenario 2 Results Summary

As seen in the SIDRA analysis, there is some improvement to the operation of the Stirling Highway/McCabe Street intersection during the AM and PM peak period as a result of the changes to the road network assumed for this scenario. However, the primary impact on this signalised intersection is the increase in through movements along Stirling Highway, which exceed the practical capacity of the approach during the peak period.

Regarding the Stirling Highway/Coventry Parade intersection, the intersection upgrades results in a significant improvement to the intersection operation.

The SIDRA results for McCabe Street/McCabe Place and McCabe Street/OneSteel Access 2 show that both intersections operate at an acceptable level for service (worst movement at LOS B for McCabe Street/McCabe Place and McCabe Street/OneSteel Access 2).

6.2.4 Scenario 3

6.2.4.1 Stirling Highway/McCabe St Intersection

The existing form of the Stirling Highway/McCabe Street intersection is shown in **Figure 6-7** (as modelled in SIDRA) and the results summarised in **Table 6-14**.

Figure 6-7 Modified Intersection Geometry of Stirling Highway/McCabe Street Intersection as Modelled in SIDRA

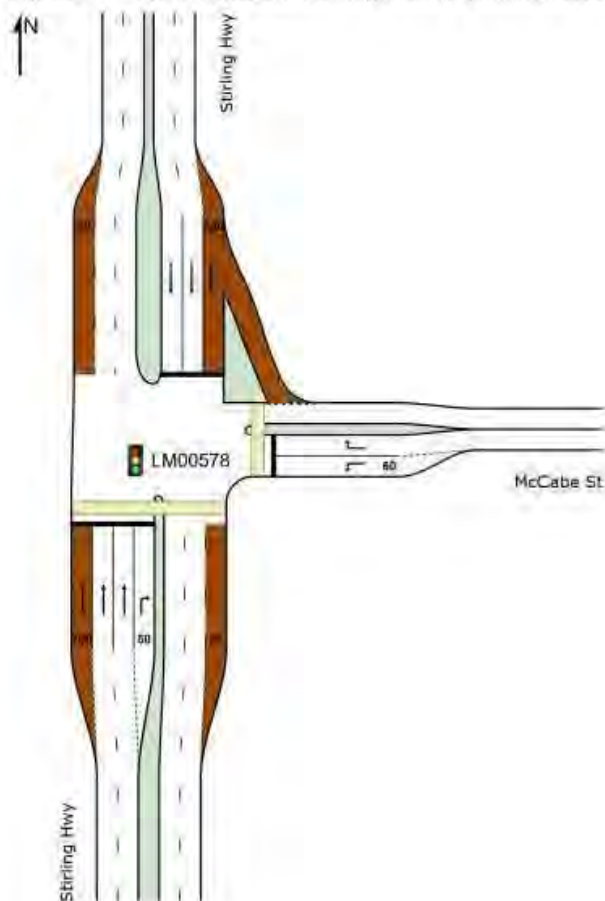


Table 6-14 SIDRA Results for Stirling Highway/McCabe Street Intersection – Scenario 3

Intersection Approach		AM Peak				PM Peak			
		DOS	Delay	LOS	95% Queue (m)	DOS	Delay	LOS	95% Queue (m)
Stirling Hwy (S)	T	0.879	18.6	B	244.8	0.567	5	A	120.5
	R	0.882	40.5	D	89.9	1.094	157.9	F	214.2
McCabe Street (E)	L	0.47	19	B	57.5	0.829	48.2	D	140.7
	R	0.786	36.6	D	44.8	1.065	133.6	F	149
Stirling Hwy (N)	L	0.193	11.2	B	19.9	0.247	12.4	B	41.1
	T	0.876	29.2	C	149.8	1.081	129.2	F	776.3
All Vehicles		0.882	23.8	C	244.8	1.094	80.4	F	776.3

6.2.4.2 Stirling Highway/Coventry Parade Intersection

The Stirling Highway/Coventry Parade intersection is shown in **Figure 6-5** (as modelled in SIDRA) and the results summarised in **Table 6-15**.

Table 6-15 SIDRA Results for Stirling Highway/Coventry Parade Intersection – Scenario 3

Intersection Approach		AM Peak				PM Peak			
		DOS	Delay	LOS	95% Queue (m)	DOS	Delay	LOS	95% Queue (m)
Stirling Hwy (S)	T	0.727	0.4	A	9.9	0.579	0.2	A	0
	R	0.391	19.1	C	12.2	0.819	74.6	F	32.5
Coventry Pde (E)	L	0.002	9.3	A	0.1	0.023	17	C	0.9
Stirling Hwy (N)	L	0.442	5.6	A	0	0.654	5.6	A	0
	T	0.442	0.1	A	0	0.654	0.1	A	0
All Vehicles		0.727	1	A	12.2	0.819	2.4	A	32.5

6.2.4.3 McCabe Street/McCabe Place

The McCabe Street/McCabe Place intersection is shown in **Figure 6-6** (as modelled in SIDRA) and the results summarised in **Table 6-16**.

Table 6-16 SIDRA Results for McCabe Street/McCabe Place Intersection – Scenario 3

Intersection Approach		AM Peak				PM Peak			
		DOS	Delay	LOS	95% Queue (m)	DOS	Delay	LOS	95% Queue (m)
McCabe Pl (S)	L	0.361	6.4	A	16.8	0.471	7.9	A	20.5
	T	0.361	6.4	A	16.8	0.471	7.9	A	20.5
	R	0.361	10.9	B	16.8	0.471	12.4	B	20.5
McCabe St (E)	L	0.408	4	A	22.4	0.663	5.3	A	33.3
	T	0.408	4.1	A	22.4	0.663	5.5	A	33.3
	R	0.408	8.4	A	22.4	0.663	9.8	A	33.3
Access (N)	L	0.209	6.8	A	10.7	0.345	5.9	A	13.2
	T	0.209	6.7	A	10.7	0.345	5.9	A	13.2
	R	0.209	11.2	B	10.7	0.345	10.4	B	13.2
McCabe St (W)	L	0.481	4.8	A	24	0.468	4.9	A	22.3
	T	0.481	5.1	A	24	0.468	5.3	A	22.3
	R	0.481	9.3	A	24	0.468	9.4	A	22.3
All Vehicles		0.481	6.5	A	24	0.663	7.3	A	33.3

6.2.4.4 McCabe Street/OneSteel Access 2

The McCabe Street/OneSteel Access 2 intersection is shown in **Figure 6-4** (as modelled in SIDRA) and the results summarised in **Table 6-17**.

Table 6-17 SIDRA Results for McCabe Street/OneSteel Access Intersection – Scenario 3

Intersection Approach		AM Peak				PM Peak			
		DOS	Delay	LOS	95% Queue (m)	DOS	Delay	LOS	95% Queue (m)
McCabe St (E)	T	0.259	0.1	A	1.1	0.303	0.1	A	1.6
	R	0.259	9.2	A	1.1	0.303	8.4	A	1.6
Access 2 (N)	L	0.042	8	A	0.9	0.055	7.3	A	1.2
	R	0.042	13.5	B	0.9	0.055	13.1	B	1.2
McCabe St (W)	L	0.31	5.5	A	0	0.251	5.5	A	0
	T	0.31	0	A	0	0.251	0	A	0
All Vehicles		0.31	0.4	A	1.1	0.303	0.6	A	1.6

6.2.4.5 Scenario 3 Results Summary

The inclusion of upgrades and treatments at the Stirling Highway/McCabe Street and Stirling Highway/Coventry Parade intersections results in some significant operational improvement during the AM peak. However, despite improvements in performance during the PM peak, the DOS for some key movements remain above 1 due to the increase in background through traffic.

The inclusion of the right turn pocket along Stirling Highway and a restriction of right turn movements out of Coventry Parade results in a significant improvement in performance at the Stirling Highway/Coventry Parade intersection. The delays, though still high, are not considered to be excessive.

The SIDRA results for McCabe Street/McCabe Place and McCabe Street/OneSteel Access 2 show that both intersections operate at an acceptable level for service (worst movement at LOS B for McCabe Street/McCabe Place and LOS C at the McCabe Street/OneSteel Access 2).

6.2.5 Scenario 4

Table 6-18 shows the results of the sensitivity analysis including the year when the capacity threshold is reached. The full movement summary for each of these assessments is included in **Appendix A**.

The following summary of intersection performance shows:

- Year: represents the year when the failure criteria is reached (overall intersection LOS E)
- DOS: represents the movement at the intersection which has the highest DOS
- Delay: overall average delay of all movements at the intersection
- LOS: function of the average delay
- 95% queue: movement with the longest queue observed at the intersection

Table 6-18 Summary of Overall Intersection Performance at Stirling Highway/McCabe Street – Scenario 4

Intersection Approach	Year	AM Peak				PM Peak			
		DOS	Delay	LOS	95% Queue (m)	DOS	Delay	LOS	95% Queue (m)
Scenario 4A	2034	1.012	46.9	D	443.3	1.026	59.8	E	770.1
Scenario 4B	2036	0.988	40.1	D	403.1	1.023	57.7	E	767.1
Scenario 4C	2025	0.907	32.7	C	203.8	1.061	79.1	E	485.6
Scenario 4D	2032	0.885	24.5	C	223.4	1.041	60.4	E	606.9
Scenario 4E	2036	0.757	18.9	B	216.4	1.045	59.3	E	665.2

Without any future development or intersection upgrades and a 2% growth applied to Stirling Highway, the intersection exceeds the LOS E capacity threshold at 2034.

The SHACS plan does offer minor improvements to the intersection, extending the capacity threshold of the intersection though only marginally as the intersection still reaches capacity at 2036. The proposed modifications from the SHACS focus more on improving public transport amenity rather than increasing the intersection capacity, as the only modification that benefits to vehicular operations is the left turn pocket on the northern approach.

The inclusion of future development on McCabe Street, in the absence of intersection upgrades and with a 2% p.a. growth applied to Stirling Highway, would result in the intersection reaching capacity in the opening year. Note that this is under the assumption that both the OneSteel and Matilda Bay sites are fully occupied and operational and generating traffic at its full potential at opening year. In reality, the occupation of the apartments and the non-residential tenancies will occur gradually over time and both of these developments will likely be staged with various components within each site being constructed over time.

With the inclusion of the SHACS plan, plus other intersection and access upgrades, the intersection is able to handle this additional traffic up until 2032 (close to the business-as-usual outcome). In the case, the capacity improvement is the result of the SHACS plan combined with redirecting a proportion of right turning traffic onto Coventry Parade.

With the inclusion of the SHACS plan, plus a double right turn at the Stirling Highway/McCabe St intersection and other intersection and access upgrades, the overall capacity of the intersection is extended again, reaching 2036 before exceeding the set threshold. Though the additional of the double right turn does offer significant benefits, the additional lane will require further widening in addition to the SHACs plan widening.

Overall, it is anticipated that under a 2% per annum growth scenario, the Stirling Highway/McCabe Street intersection will reach its capacity threshold eventually regardless of whether the surrounding area development is built or not. Though historic growth along Stirling Highway does not appear to reflect this level of growth, this does provide an opportunity to encourage mode shift and promote the usage of other transport modes such as public transport, walking and cycling (as described in the following sections).

6.2.5.2 Indicative Timing for Intersection and Access Upgrades

Note that the timings for the intersection and access upgrades are indicative as the timeframes for delivery of these developments has not been confirmed at this point in time. Based on the currently available information, the Matilda Bay Site will comprise of 2 stages and the OneSteel Site will comprise of 5 stages.

The above assessment assumes a worse-case scenario with both OneSteel and Matilda Bay sites being fully developed at the opening year, and assuming a very conservative growth rate applied to Stirling Highway through movements. Realistically, the staging of these developments combined with the fact that the apartments and tenancies will be occupied gradually over time will likely result in a steady increase in development traffic over time, rather than the dramatic step-change illustrated in the analysis.

For the purposes of providing a timeline of the indicative upgrade staging, the following assumptions have been used:

- The opening year for the Matilda Bay Site is 2025
- The opening year for the OneSteel Site is 2026

As such, the 2026 horizon represents the base year for the full-development scenario.

Table 6-19 Summary of Indicative Timings for Intersection and Access Upgrades

Proposed Upgrades	Indicative Timing	Year of Implementation
Upgraded median and right turn pocket into Coventry Parade	The proposed modifications to this intersection should be coincide with the first stages of the Matilda Bay development. This intersection will require additional modifications to accommodate the widening of Stirling Highway as part of the SHACS upgrades. Completion of the northbound only internal roadway prior to this upgrade will minimise disruptions during construction as it provides an alternative route (through to McCabe Street) for existing road users.	Before 2025 (for the initial upgrades coinciding with construction works for the Matilda Bay Development) 2034 – modifications coinciding with SHACS upgrade works
4-way roundabout at McCabe Street / McCabe Place	The SIDRA results show that the priority T-intersection would operate at an acceptable level of service for individual development scenarios. Therefore, assuming that the Matilda Bay Site is commenced first, this upgrade is not required as part of the initial development. The main purpose of this upgrade is to facilitate safe and efficient access to these developments (while also minimising impacts to through traffic on McCabe Street). This upgrade should therefore coincide with associated access to the OneSteel Development.	At the commencement of OneSteel development works
Access permitted from through the Matilda Bay site to McCabe Street (northbound only).	The proposed northbound only roadway link has been incorporated as part of the design and should be available when the development is completed.	2025 (during construction of the Matilda Bay Development)
Stirling Highway/McCabe Street Left-Turn Pocket and Give-way	The intersection operation with full development traffic from both Sites results in significant capacity constraints at this intersection and this upgrade will be required before reaching this point. The southbound left-turn pocket on Stirling Highway is enabled by the OneSteel development, and its construction has a demonstrable benefit for traffic accessing McCabe Street. Ground works can commence as part of initial development stages at the OneSteel site, with construction of the road upgrade required prior to full development of the two Sites (nominally commencing works at 50% of development capacity).	2026 (Prior to full development of the OneSteel Site)
Stirling Highway/McCabe Street Bus queue jump and signal upgrades.	Without development, this road upgrade will be required to be completed prior to 2034 to ensure that there is sufficient capacity to accommodate the assumed traffic growth along the Stirling Highway corridor.	Prior to 2034

Only marginal benefit is realised for McCabe Street, but demand growth along the corridor will necessitate improvements to public transport infrastructure to increase capacity and reliability.

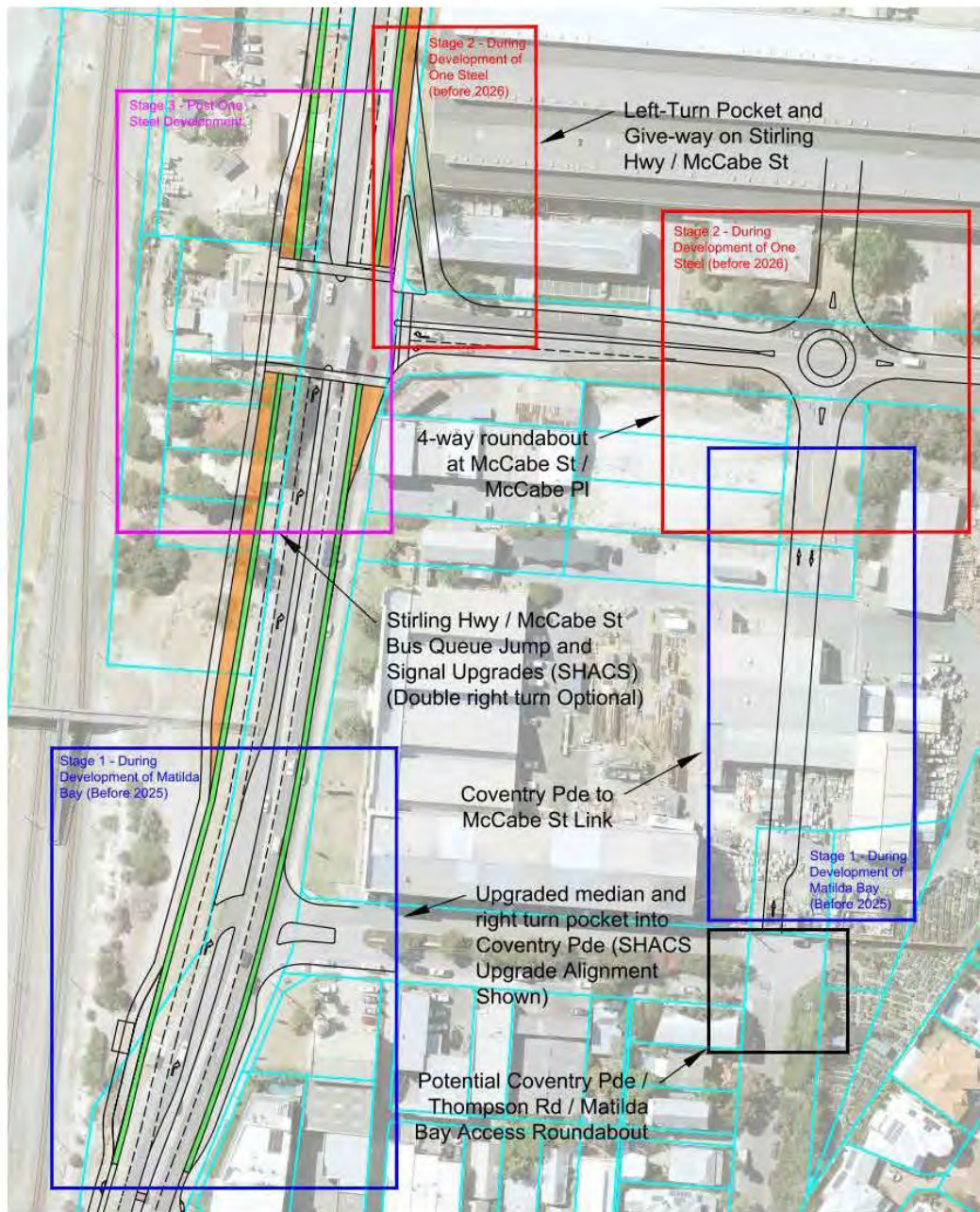
Double Right Turn on the southern approach of Stirling Highway/McCabe Street	The inclusion of the double right turn on the southern approach of the Stirling Highway/McCabe Street intersection results in significant improvements to the operation at this intersection and is worth as part of the SHACS upgrades	2034 – coinciding with SHACS upgrade works
--	---	--

Figure 6-8 illustrates the indicative timeline for the proposed access and intersection upgrade relative the development staging with a phasing diagram illustrating the upgrades in **Figure 6-9** (and **Appendix B** for the high-quality plans).

Figure 6-8 Upgrade Timeline



Figure 6-9 Intersection and Access Upgrades Phasing Diagram



7 Alternative Transport Provision

7.1 Existing Pedestrian Facilities

The extent of existing pedestrian / cycling facilities in the vicinity of the Study Area is shown in **Figure 7-1**.

These facilities include:

- Shared paths along Stirling Highway and Curtin Avenue/Port Beach Road.
- A foot bridge to access Leighton Beach.
- A drinking fountain and change room facilities are also available at a Leighton Beach.

Figure 7-1 Existing Pedestrian and Cycling Network



Source: Department of Transport

7.2 Existing Cycling Facilities

As shown in **Figure 7-1**, there is a high-quality cycling environment provided along the Fremantle Rail line Principal Shared Path, accessible via the pedestrian overpass located approximately 100m south of McCabe Street.

However, the riding environment along Stirling Highway is poor, comprising only a 1.8m concrete footpath. It is noted that on the western side of Stirling Highway along the river, a good conditioned shared walking/cycling path is provided.

Further high quality cycling facilities are provided along the Swan River foreshore, which can be access via either Tyrone Street or Thompson Road.

There are no dedicated on-road and limited off-road cyclist facilities in vicinity of the proposed development sites.

7.3 Existing Bus Services

Information pertaining to the existing bus services has been sourced from the Public Transport Authority (PTA) **Figure 7-2**. These bus services are listed in **Table 7-1** below.

Table 7-1 Existing Bus Services within Study Area

Bus Routes	Route Description	Frequencies		
		Weekdays	Saturdays	Sundays and Public Holidays
107	Claremont to Fremantle Station	30 minutes	60 minutes	60-120 minutes
998	Circle Route – Clockwise (Fremantle Station – Stirling Station)	10 minutes	15 minutes	30 minutes
999	Circle Route – Anti-Clockwise (Stirling Station – Fremantle Station)	10 minutes	15 minutes	30 minutes

It is noted that the Fremantle train line also runs parallel with Stirling Highway and stops at North Fremantle Station located approximately 800 metres to the south of the proposed development sites.

Figure 7-2 Surrounding Public Transport



Source: Transperth

7.4 Impacts on Alternative Transport

Development of Sites along McCabe Street as analysed in this report are unlikely to have any negative impact on the existing bus services or network as these services do not utilise McCabe Street or any of the adjacent roads within the study area.

However, should the projected increases in through traffic along Stirling Highway eventuate, this will have a substantial negative effect on bus travel time, as these services operate in a mixed-traffic environment. Where bus stops are provided in the form of embayments, this adds delays as a result of the need to merge into traffic.

The proposed form of the SHACS plan, which includes bus priority in the form of queue jumps at the McCabe Street signalised intersection, will mitigate the impact of traffic congestion to some extent.

From a pedestrian perspective, the proposed McCabe Place would provide better connectivity between residential areas, in particular creating the opportunity for a coherent and legible link between Thompson Road and the adjacent foreshore, and the Buckland Hill Reserve to the north. To realise this opportunity, internal pedestrian and cycling facilities within the development Sites will be necessary.

7.5 Opportunities for Alternative Transport

The future of transport across the greater Perth Metropolitan Region is defined in State planning documents including *Perth and Peel@3.5million* and the *Sub-Regional Planning Framework*.

These documents identify extensive growth in development throughout the Metro area, generating additional transport demand that must be assigned to a network that is already approaching capacity. There is insufficient road capacity to accommodate this transport growth under the current paradigm of predominantly private vehicle trips during the peak hour. This focus on moving cars and trucks in traffic lanes effectively limits the people moving capacity of the corridor to current, or minor incremental improvements. As such, an alternative framework and infrastructure solution must be considered which prioritises the movement of people and goods over traffic.

The *Central Sub-Regional Planning Framework* is a planning document to guide the development of land use and to support the overarching goals of the region, which include:

- Support for Activity Centres through urban and economic development
- Protection of existing and proposed major corridors such that development does not affect efficiency for road users
- Promotion of development around train stations.

As part of this vision, it identifies a high quality public transport network, consisting of corridors where:

"High-quality public transport routes will be planned to provide frequent reliable services, with targets such as minimum frequencies of every 10–15 minutes or better during peak and off-peak periods. Where possible, individual routes will be coordinated to provide maximum frequencies along common corridors and a number of planned corridors..."

In this context, High-Quality Public Transport Routes may be considered analogous to the *Transport @ 3.5 million* High-Priority Public Transit Corridors, at least in function. It is noted that the *Transport @ 3.5 Million* Network is coarser than that defined by the *Planning Framework* (see extract below, **Figure 7-3**), but both clearly identify the importance of Stirling Highway to public transport function.

Figure 7-3. Urban corridor plan



Source: Central Sub-regional Planning Framework

The *Planning Framework* differentiates between Public Transport and Urban Corridors, while recognising that there are opportunities for increased density where there is high quality public transport. This then creates a link between mobility and activity in a way that is not explicitly identified in *Transport @ 3.5million*.

The current public transport provision along Stirling Highway in the Study Area comprises only 1 conventional bus route running in mixed traffic, plus a segment of the 998/999 'high-frequency bus route'.

However, as detailed above, the *Perth and Peel Transport Plan for 3.5 Million People and Beyond* and the *Central Sub-Regional Planning Framework* both designate this section of Stirling Highway for high-frequency public transport services with priority measures.

Many of the bus stops are in indented lay-bys to enable the buses to stop with minimal disruption to other traffic. However, this does potentially cause disruption to the service reliability if heavy traffic delays their departure from the bus stops. Future increases in public transport frequency would need to be supported by in-lane stopping along with queue jump facilities or dedicated bus lanes (peak-hour only or full-time) for all untimed stops.

Curtis and Tiwari (2008) describe an Activity Corridor as a street that provides a high level of mixed-use transit spaces. These streets create a good popular destination for people to travel to, and therefore generate good economic and social activity (Curtis & Tiwari, 2008).

This research identifies two fundamental approaches in designing/planning for an Activity Corridor:

- **A focus on traffic/trade**, such that traffic is either diverted through an activity site or passing traffic is captured by the site.
- **A focus on place making** over traffic function; reducing vehicle speeds within activity centres.

It is not uncommon for planners, engineers and designers to rebuff the idea of Activity Corridors due to traffic congestion. However, it is important to remember that the focus of the transport network should be on *people and goods* movement, rather than vehicular movement.

Activity Corridors can also be defined as connections between centres; operating as corridors for not only vehicular movement, but also for major infrastructure, locations for increased and diversified employment and places for people to live (*Department of Planning & Western Australian Planning Commission, 2015*).

7.5.2 Discussion and Summary

- Urban infill will continue to create more travel demand along Stirling Highway. This corridor is highly constrained during peak periods and **cannot** accommodate a proportional increase in private vehicle traffic. As such, public transport improvements are necessary to facilitate sustainable economic growth.
- The introduction of high-quality fixed-route public transport service will result in private vehicle transport reallocating to other routes, as well as a decrease in driving mode share. This is consistent with the impacts seen in international and national exemplars.
- Upfront enabling infrastructure, in the form of high-quality public transport, is critical to support intense development. Therefore, public transport improvements must *precede* development to maximise ultimate transport and development sustainability goals.
- A TransPriority framework which acts to create a hierarchy of transport modes, and provides infrastructure in support of this hierarchy. Priorities for a specific corridor may vary by time of day and may consider reallocation of particular modes to a parallel route.
- Realising active transport opportunities requires the creation of safe and legible connections to primary routes and Activity Centres. The *Long Term Cycling Network* acknowledges the limitations for provision along Stirling Highway itself, prioritising routes along the Swan River Foreshore, the beachfront and Fremantle Rail PSP. McCabe Street does have an important role to play in this plan, however, forming a key Local Route through the Stirling Highway signals to the pedestrian overbridge and connecting to both north-south Primary Routes.

Figure 7.4 LTCN route map



Source: Department of Transport

To enable this link, improvements will be necessary to pedestrian facilities along both sides of McCabe Street, as well as connections to and through the adjacent development Sites. Signal timings and phase arrangements are also critical, including the removal of the existing filter phase.

- “Change is necessary” both for the operation of the corridor, the local area and for Perth as a whole. This change will ultimately result in a reorientation away from peak period private vehicle movement, and towards more sustainable transport opportunities. Such change will be enabled through the provision of alternative transport facilities, but will likely be catalysed by the increasing congestion and delay along the Stirling Highway corridor. As such, the worsening intersection performance modelled for future scenarios should not be considered as wholly negative – but rather as a necessary component for achieving the broader objectives of the *Transport @ 3.5 million* strategy.

8 Site Specific Issues

8.1 Crash Assessment

Crash data between January 2017 to December 2021 has been obtained from MRWA for 3 intersections within the study area and is summarised in **Table 8-1** through to **Table 8-3** below.

Table 8-1 Intersection of Stirling Highway and Coventry Parade

Type of Crash (RUM Code)	Fatal	Hospital	Medical	Major Property Damage	Minor Property Damage	Total Crashes
Hit Object	-	-	-	1	-	1
Rear End	-	-	-	1	-	1
Right Turn Thru	-	-	1	-	-	1
Total	0	0	1	2	0	3

Table 8-2 Intersection of Stirling Highway and Craig Street

Type of Crash (RUM Code)	Fatal	Hospital	Medical	Major Property Damage	Minor Property Damage	Total Crashes
Rear End	-	-	-	1	-	1
Right Angle	-	-	2	-	-	2
Total	0	0	2	1	0	3

Table 8-3 Intersection of Stirling Highway and McCabe Street

Type of Crash (RUM Code)	Fatal	Hospital	Medical	Major Property Damage	Minor Property Damage	Total Crashes
Rear End	-	-	1	3	1	5
Right Turn Thru	-	-	2	3	-	5
Right Angle	-	-	-	1	-	1
Unspecified	-	-	-	1	-	1
Total	0	0	3	8	1	12

8.2 Safety Review

8.2.1 Crash Data Analysis

It should be noted that highest concentration of crashes for the 3 intersections listed is at the intersection of Stirling Highway/McCabe Street.

From the analysis, it is observed that the majority of the crash types are rear-end collision, which represents 27.8% of overall crashes at the three intersections.

The majority of crashes severity is of the type classified as 'major property damage' (61.1%) with 'minor property damage' comprising of 5.6% and the remainder requiring medical attention (33.3%).

8.2.2 Hazardous Driver Behaviour

From the site visit that undertaken previously, it was observed that as the queues build up along McCabe Street, a tendency was observed for some drivers of using the opposing traffic lanes to transition to the right turn lane at the intersection. As the observed queues from the most recent survey were much shorter, this type of movement was less prevalent though the potential still remains. An example of this observed behaviour is shown in **Figure 8-1**. As this may increase the risk of a collision with oncoming traffic, it is

recommended that safety mitigations be investigated to deter drivers from this type of behaviour. An example of a potential mitigation measure may be to extend the length of the turning lanes or to construct a physical barrier such as a central median.

Figure 8-1 Dangerous Driver Behaviour



9 Recommendations

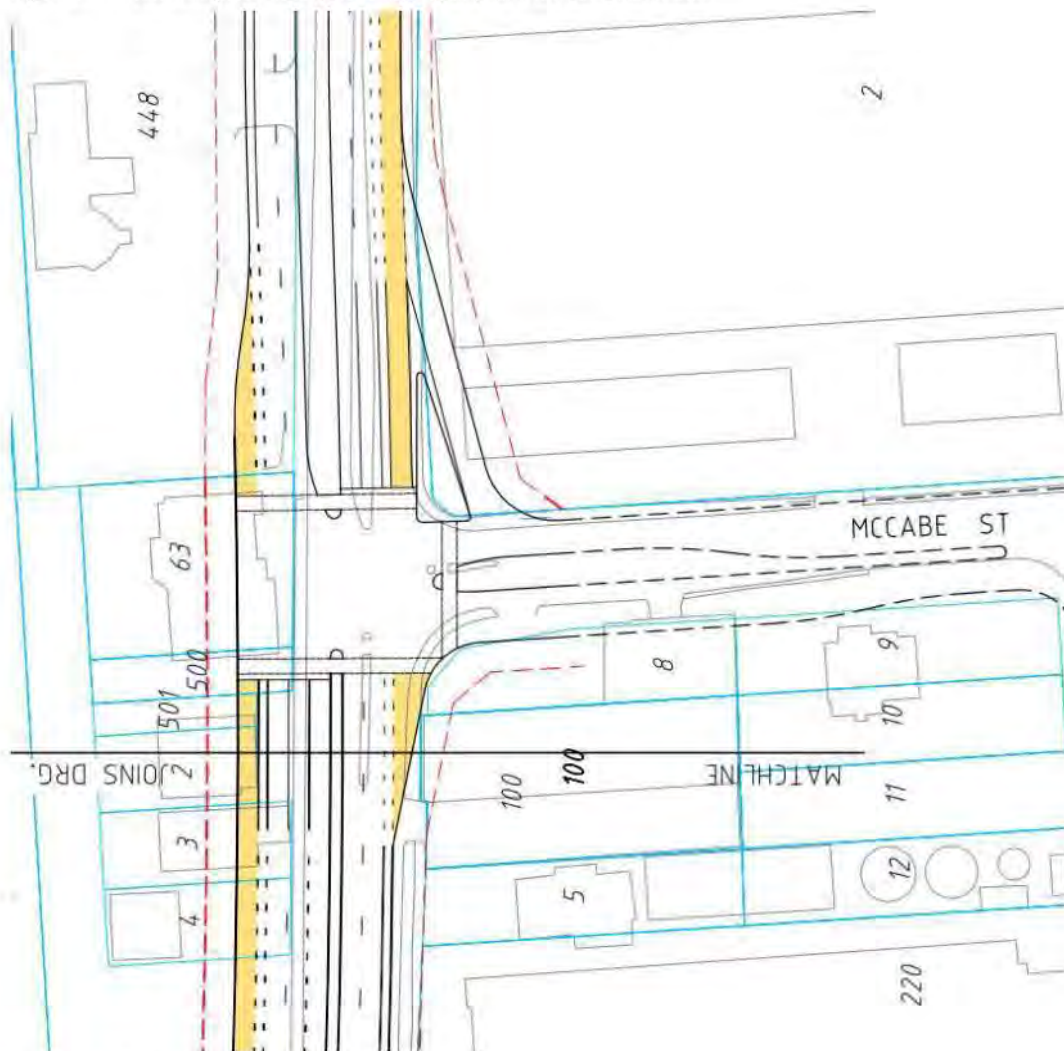
9.1 Modifications to Stirling Highway/McCabe Street Intersection

Previous discussions with Main Roads WA indicated that there are plans to upgrade several intersections along Stirling Highway to include bus priority lanes at the intersection approaches. Bus priority lanes are proposed along the Stirling Highway approaches and includes widening Stirling Highway to accommodate these lanes. Additionally, a left turn slip lane is proposed on the northern approach of the intersection.

Figure 9-1 shows the concept layout of the intersection upgrades. Main Roads WA have advised that this project is not part of their 4 year forward estimated construction program and is considered to be long term project.

As mentioned in **Section 6.2.5.2**, the left turn pocket component of this upgrade has a demonstrable benefit for traffic accessing McCabe Street and is enabled by development at the OneSteel site. Construction of the turn-pocket and left-turn slip should be completed prior to full-build-out of the Site.

Figure 9-1 Bus Priority Lane Concept at Stirling Highway / McCabe Street Intersection



Source: Main Roads WA

9.2 McCabe Street/McCabe Place Roundabout

The proposed treatment for the McCabe Street/McCabe Place intersection is a compact roundabout with the proposed arrangement (concept shown in **Figure 9-2**):

- The northern leg serves as the main access to the One Steel site
- The eastern and western legs form the continuation of McCabe Street
- The southern leg serves as the Matilda Bay access

The development of this option will require further input and collaboration between the developers of the OneSteel and Matilda Bay sites.

Currently, on-site observations show that queues at the signals will at times extend east beyond McCabe Place. The analysis from Scenario 2 and 3 assessment also corroborates this, with queues extending through the roundabout along McCabe Street. Despite the queuing, the impacts are relatively minor as the roundabout operates at an acceptable level of service (LOS B for the worst operating movement for Scenario 2 and 3) with minimal queuing at the site access approaches.

As such, while some peak period limitations are expected, the roundabout still represents the preferred solution for development access.

Figure 9-2 McCabe Street/McCabe Place Roundabout Concept



9.3 Right Turn Lane at Stirling Highway/Coventry Street Intersection

As shown in the above assessment, the inclusion of a right turn pocket into Coventry Parade as well as the removal of the right turn movement out significantly improves the operation of the intersection. Furthermore, the ability of this intersection to accept safe right turn traffic is expected to result in performance improvements for the Stirling Highway/McCabe Street intersection. This will prolong the function of the network, but would not be sufficient to offset the impacts of through-traffic demand growth along Stirling Highway.

Figure 9-3 shows the conceptual layout of the intersection which includes the following elements:

- 60m long right turn pocket on the southern approach of the intersection to facilitate right turn movements into Coventry Parade without impacting through traffic along Stirling Highway.
- Widening of the central median to accommodate the right turn pocket. This will also involve shifting the northbound traffic lanes further west and relocating the bus stop and embayment to suit the reconfigured road alignment.
- To physically prevent right turn movements out of Coventry Parade, the median and roadway kerbing has been adjusted to discourage drivers from attempting this movement (in addition to regulatory signage to inform drivers).
- Additional land will need to be acquired to the west (understood to be owned by the PTA) to facilitate the median widening, reconfiguration of the northbound traffic lanes and the relocation of the bus stop and embayment.

Figure 9-3 Coventry Parade Right Turn Pocket Concept (with SHACS upgrade)

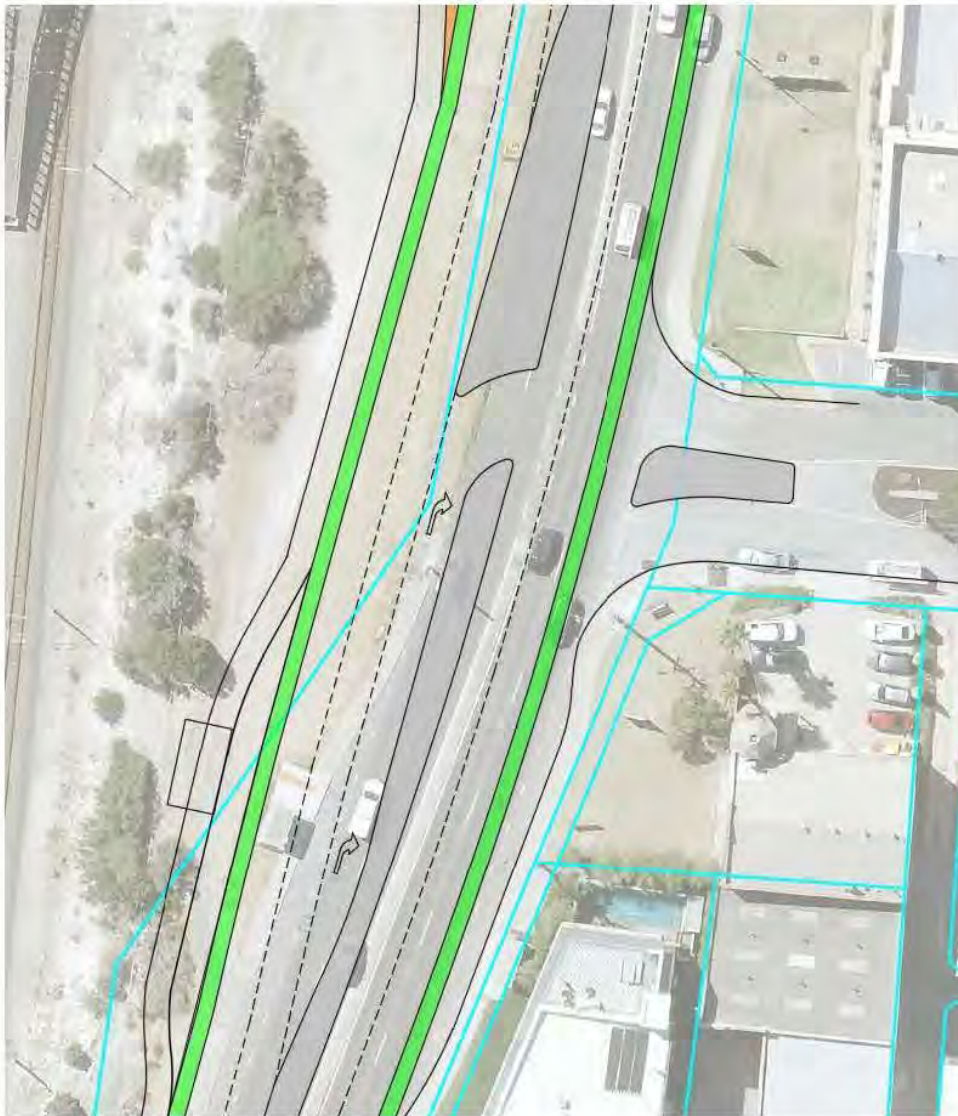
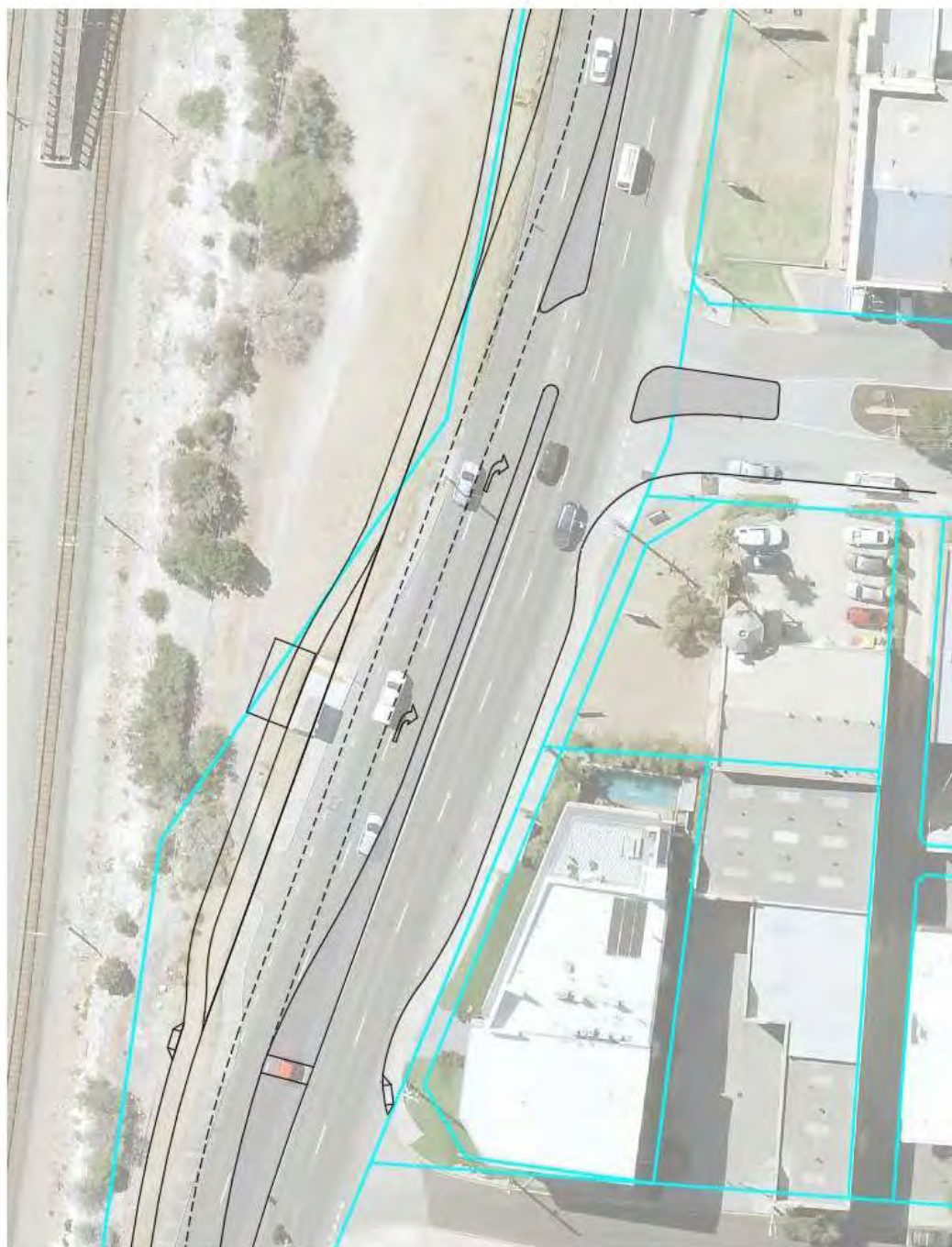


Figure 9-4 Coventry Parade Right Turn Pocket Concept (with existing road layout)



9.4 Coventry Parade/Thompson Road/Matilda Bay Access Roundabout

There have been internal discussions regarding the conversion of this junction to a roundabout though this option is still under discussion with no finalised design. The proposed arrangement is summarised as follows:

- The western leg forms Coventry Parade
- The southern leg forms Thompson Road
- The northern leg forms an inbound only access to the Matilda Bay site
- A potential eastern leg to additional site parking

The above arrangement is intended to support efficient access to development Sites along McCabe Street, while eliminating the potential for deleterious rat-running from McCabe Street via McCabe Place to Stirling Highway Southbound. This movement is considered likely to impact residential amenity along Thompson Road and is inconsistent with the local road hierarchy.

The northbound movement from Coventry Parade to McCabe Place is considered to be substantially less attractive for regional trips, and has minimal impact on residents south of Coventry Parade. Nevertheless, redirection of a portion of right-turning movements away from the Stirling Highway / McCabe Street signals represents a substantial benefit to network function.

APPENDIX

A

SIDRA RESULTS



now



MOVEMENT SUMMARY

Site: LM00578 [S0-Stirling Highway/McCabe Street_AM (Site Folder: Background (2022))]

Network: N101 [AM PEAK (Network Folder: Existing (2022))]

New Site

Site Category: (None)

Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 135 seconds (Site User-Given Cycle Time)

Vehicle Movement Performance														
Mov ID	Turn	DEMAND FLOWS		ARRIVAL FLOWS		Deg. Satn	Aver Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver No. Cycles	Aver Speed
		[Total veh/h	HV %	[Total HV] veh/h	%				[Veh veh	Dist m				
South: Stirling Hwy (S)														
2	T1	1616	4.5	1616	4.5	*0.619	4.4	LOS A	22.5	173.9	0.37	0.34	0.37	49.6
3	R2	303	2.1	303	2.1	0.430	17.2	LOS B	10.3	77.6	0.76	0.81	0.76	35.8
Approach		1919	4.1	1919	4.1	0.619	6.5	LOS A	22.5	173.9	0.43	0.42	0.43	45.6
East: McCabe St (E)														
4	L2	272	2.3	272	2.3	0.361	33.5	LOS C	12.2	91.5	0.73	0.77	0.73	23.6
6	R2	73	2.3	73	2.3	*0.416	68.5	LOS E	4.7	35.1	0.98	0.77	0.98	19.4
Approach		344	2.3	344	2.3	0.416	40.9	LOS D	12.2	91.5	0.79	0.77	0.79	22.3
North: Stirling Hwy (N)														
7	L2	41	7.7	41	7.7	0.563	32.7	LOS C	22.7	176.5	0.77	0.70	0.77	31.1
8	T1	938	5.0	938	5.0	0.563	27.0	LOS C	23.0	178.6	0.77	0.69	0.77	18.6
Approach		979	5.1	979	5.1	0.563	27.3	LOS C	23.0	178.6	0.77	0.69	0.77	19.5
All Vehicles		3242	4.2	3242	4.2	0.619	16.4	LOS B	23.0	178.6	0.57	0.54	0.57	32.4

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).

Vehicle movement LOS values are based on average delay per movement.

Intersection and Approach LOS values are based on average delay for all vehicle movements.

Delay Model: SIDRA Standard (Geometric Delay is included).

Gap-Acceptance Capacity: SIDRA Standard (Akcelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

* Critical Movement (Signal Timing)

Pedestrian Movement Performance											
Mov ID	Crossing	Dem. Flow	Aver. Delay	Level of Service	AVERAGE BACK OF QUEUE		Prop. Que	Effective Stop Rate	Travel Time	Travel Dist	Aver. Speed
		ped/h	sec		[Ped ped	Dist m			sec	m	m/sec
South: Stirling Hwy (S)											
P1	Full	53	62.7	LOS F	0.2	0.2	0.97	0.97	96.1	40.0	0.42
East: McCabe St (E)											
P2	Full	53	60.8	LOS F	0.2	0.2	0.95	0.95	88.9	33.7	0.38
All Pedestrians		105	61.8	LOS F	0.2	0.2	0.96	0.96	92.5	36.9	0.40

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)

Pedestrian movement LOS values are based on average delay per pedestrian movement.

Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

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MOVEMENT SUMMARY

Site: LM00578 [S0-Stirling Highway/McCabe Street_PM (Site Folder: Background (2022))]

Network: N101 [PM PEAK (Network Folder: Existing (2022))]

New Site

Site Category: (None)

Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 118 seconds (Site User-Given Cycle Time)

Vehicle Movement Performance														
Mov ID	Turn	DEMAND FLOWS		ARRIVAL FLOWS		Deg. Satn	Aver Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver No. Cycles	Aver Speed
		[Total veh/h	HV %	[Total HV] veh/h	%				[Veh veh	Dist m				
South: Stirling Hwy														
2	T1	1199	2.7	1199	2.7	0.397	3.8	LOS A	10.0	76.0	0.32	0.29	0.32	51.0
3	R2	196	2.2	196	2.2	*0.561	37.2	LOS D	8.4	62.9	0.96	0.92	0.96	26.5
Approach		1395	2.6	1395	2.6	0.561	8.5	LOS A	10.0	76.0	0.41	0.38	0.41	42.8
East: McCabe St (E)														
4	L2	267	2.8	267	2.8	0.568	44.4	LOS D	13.2	100.2	0.91	0.82	0.91	20.1
6	R2	69	2.8	69	2.8	*0.379	60.0	LOS E	3.9	29.4	0.98	0.76	0.98	21.0
Approach		337	2.8	337	2.8	0.568	47.6	LOS D	13.2	100.2	0.92	0.81	0.92	20.4
North: Stirling Hwy														
7	L2	39	8.1	39	8.1	*0.769	24.1	LOS C	36.8	277.8	0.81	0.75	0.81	35.6
8	T1	1720	2.1	1720	2.1	0.769	18.5	LOS B	37.1	279.0	0.81	0.75	0.81	23.8
Approach		1759	2.2	1759	2.2	0.769	18.6	LOS B	37.1	279.0	0.81	0.75	0.81	24.3
All Vehicles		3491	2.4	3491	2.4	0.769	17.3	LOS B	37.1	279.0	0.66	0.61	0.66	30.0

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).

Vehicle movement LOS values are based on average delay per movement.

Intersection and Approach LOS values are based on average delay for all vehicle movements.

Delay Model: SIDRA Standard (Geometric Delay is included).

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

* Critical Movement (Signal Timing)

Pedestrian Movement Performance											
Mov ID	Crossing	Dem. Flow	Aver. Delay	Level of Service	AVERAGE BACK OF QUEUE		Prop Que	Effective Stop Rate	Travel Time	Travel Dist	Aver. Speed
		ped/h	sec		[Ped ped	Dist] m			sec	m	m/sec
South: Stirling Hwy											
P1	Full	53	54.2	LOS E	0.2	0.2	0.96	0.96	87.6	40.0	0.46
East: McCabe St (E)											
P2	Full	53	52.3	LOS E	0.2	0.2	0.94	0.94	80.4	33.7	0.42
All Pedestrians		105	53.3	LOS E	0.2	0.2	0.95	0.95	84.0	36.9	0.44

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)

Pedestrian movement LOS values are based on average delay per pedestrian movement.

Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

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 Project: K:\Projects\CW\1200352_304900736 City of Free North Fremantle Traffic Study\5_Technical\TrafficModelling\Updated Model\SIDRA Assessment (base).slp9

MOVEMENT SUMMARY

Site: 101 [S0-Stirling Highway/Coventry Parade_AM (Site Folder: Background (2022))]

Network: N101 [AM PEAK (Network Folder: Existing (2022))]

New Site
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance														
Mov ID	Turn	DEMAND FLOWS		ARRIVAL FLOWS		Deg. Satn	Aver Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver No. Cycles	Aver Speed
		[Total veh/h	HV %	[Total HV veh/h	%				[Veh veh	Dist m				
South: Stirling Highway (S)														
2	T1	1913	3.9	1913	3.9	0.566	0.1	LOS A	0.4	2.6	0.01	0.00	0.02	57.7
3	R2	5	0.0	5	0.0	0.566	18.6	LOS C	0.4	2.6	0.03	0.00	0.04	56.4
Approach		1918	3.9	1918	3.9	0.566	0.2	NA	0.4	2.6	0.01	0.00	0.02	57.7
East: Coventry Parade (E)														
4	L2	1	0.0	1	0.0	0.001	7.5	LOS A	0.0	0.0	0.53	0.49	0.53	34.0
6	R2	7	0.0	7	0.0	0.130	124.7	LOS F	0.7	4.8	0.98	0.99	0.98	5.6
Approach		8	0.0	8	0.0	0.130	110.1	LOS F	0.7	4.8	0.93	0.93	0.93	6.3
North: Stirling Highway (N)														
7	L2	19	0.0	19	0.0	0.325	5.6	LOS A	0.0	0.0	0.00	0.02	0.00	58.6
8	T1	1199	4.1	1199	4.1	0.325	0.0	LOS A	0.0	0.0	0.00	0.01	0.00	59.2
Approach		1218	4.0	1218	4.0	0.325	0.1	NA	0.0	0.0	0.00	0.01	0.00	59.2
All Vehicles		3144	3.9	3144	3.9	0.566	0.5	NA	0.7	4.8	0.01	0.01	0.01	56.1

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).

Vehicle movement LOS values are based on average delay per movement.

Minor Road Approach LOS values are based on average delay for all vehicle movements.

NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.

Delay Model: SIDRA Standard (Geometric Delay is included).

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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MOVEMENT SUMMARY

Site: 101 [S0-Stirling Highway/Coventry Parade_PM (Site Folder: Background (2022))]

Network: N101 [PM PEAK (Network Folder: Existing (2022))]

New Site
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance														
Mov ID	Turn	DEMAND FLOWS		ARRIVAL FLOWS		Deg. Satn	Aver Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver No. Cycles	Aver Speed
		[Total veh/h	HV %	[Total HV] veh/h	%				[Veh veh	Dist m				
South: Stirling Highway (S)														
2	T1	1369	2.3	1369	2.3	0.363	0.2	LOS A	0.3	1.9	0.01	0.00	0.01	57.1
3	R2	2	0.0	2	0.0	0.363	29.9	LOS D	0.3	1.9	0.02	0.00	0.03	54.5
Approach		1372	2.3	1372	2.3	0.363	0.3	NA	0.3	1.9	0.01	0.00	0.01	57.1
East: Coventry Parade														
4	L2	7	0.0	7	0.0	0.013	11.7	LOS B	0.1	0.5	0.69	0.64	0.69	28.8
6	R2	23	0.0	23	0.0	0.576	152.2	LOS F	1.8	12.7	0.99	1.05	1.22	4.7
Approach		31	0.0	31	0.0	0.576	118.3	LOS F	1.8	12.7	0.91	0.95	1.09	5.9
North: Stirling Highway (N)														
7	L2	26	0.0	26	0.0	0.523	5.6	LOS A	0.0	0.0	0.00	0.02	0.00	58.6
8	T1	1963	2.4	1963	2.4	0.523	0.1	LOS A	0.0	0.0	0.00	0.01	0.00	59.1
Approach		1989	2.4	1989	2.4	0.523	0.1	NA	0.0	0.0	0.00	0.01	0.00	59.1
All Vehicles		3392	2.3	3392	2.3	0.576	1.3	NA	1.8	12.7	0.01	0.01	0.02	51.6

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).

Vehicle movement LOS values are based on average delay per movement.

Minor Road Approach LOS values are based on average delay for all vehicle movements.

NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.

Delay Model: SIDRA Standard (Geometric Delay is included).

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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MOVEMENT SUMMARY

Site: LM00578 [S0-Stirling Highway/McCabe Street_AM (Site Folder: Background (2035))]

Network: N101 [AM PEAK (Network Folder: Existing (2035))]

New Site

Site Category: (None)

Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 135 seconds (Site User-Given Cycle Time)

Vehicle Movement Performance														
Mov ID	Turn	DEMAND FLOWS		ARRIVAL FLOWS		Deg Satn	Aver Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver No. Cycles	Aver Speed
		[Total veh/h	HV %	[Total HV] veh/h	%	v/c	sec		[Veh veh	Dist m				km/h
South: Stirling Hwy (S)														
2	T1	2036	4.5	2036	4.5	0.780	5.8	LOS A	31.7	244.8	0.48	0.45	0.48	47.2
3	R2	382	2.1	382	2.1	*1.029	132.9	LOS F	32.6	244.8	1.00	1.16	1.73	11.7
Approach		2418	4.1	2418	4.1	1.029	25.9	LOS C	32.6	244.8	0.56	0.56	0.68	27.8
East: McCabe St (E)														
4	L2	272	2.3	272	2.3	0.270	21.1	LOS C	9.2	68.9	0.56	0.72	0.56	29.3
6	R2	73	2.3	73	2.3	*0.416	68.5	LOS E	4.7	35.1	0.98	0.77	0.98	19.4
Approach		344	2.3	344	2.3	0.416	31.1	LOS C	9.2	68.9	0.65	0.73	0.65	25.7
North: Stirling Hwy (N)														
7	L2	52	7.7	52	7.7	1.011	110.7	LOS F	59.7	465.1	1.00	1.30	1.52	14.6
8	T1	1182	5.0	1182	5.0	*1.011	104.9	LOS F	60.6	471.3	1.00	1.31	1.52	6.2
Approach		1234	5.1	1234	5.1	1.011	105.1	LOS F	60.6	471.3	1.00	1.30	1.52	6.7
All Vehicles		3996	4.3	3996	4.3	1.029	50.8	LOS D	60.6	471.3	0.70	0.81	0.94	16.9

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).

Vehicle movement LOS values are based on average delay per movement.

Intersection and Approach LOS values are based on average delay for all vehicle movements.

Delay Model: SIDRA Standard (Geometric Delay is included).

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

* Critical Movement (Signal Timing)

Pedestrian Movement Performance											
Mov ID	Crossing	Dem. Flow	Aver. Delay	Level of Service	AVERAGE BACK OF QUEUE		Prop. Que	Effective Stop Rate	Travel Time	Travel Dist	Aver. Speed
		ped/h	sec		[Ped ped	Dist m			sec	m	m/sec
South: Stirling Hwy (S)											
P1	Full	53	62.7	LOS F	0.2	0.2	0.97	0.97	96.1	40.0	0.42
East: McCabe St (E)											
P2	Full	53	60.8	LOS F	0.2	0.2	0.95	0.95	88.9	33.7	0.38
All Pedestrians		105	61.8	LOS F	0.2	0.2	0.96	0.96	92.5	36.9	0.40

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)

Pedestrian movement LOS values are based on average delay per pedestrian movement.

Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

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MOVEMENT SUMMARY

Site: LM00578 [S0-Stirling Highway/McCabe Street_PM (Site Folder: Background (2035))]

Network: N101 [PM PEAK (Network Folder: Existing (2035))]

New Site

Site Category: (None)

Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 118 seconds (Site User-Given Cycle Time)

Vehicle Movement Performance														
Mov ID	Turn	DEMAND FLOWS		ARRIVAL FLOWS		Deg. Satn	Aver Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver No. Cycles	Aver Speed
		[Total veh/h	HV %	[Total HV] veh/h	%	v/c	sec		[Veh veh	Dist m				km/h
South: Stirling Hwy														
2	T1	1511	2.7	1508	2.7	0.559	4.3	LOS A	17.4	132.1	0.37	0.34	0.37	49.8
3	R2	246	2.2	246	2.2	*1.041	131.8	LOS F	23.4	176.0	1.00	1.21	1.93	11.7
Approach		1757	2.6	1754	2.6	1.041	22.2	LOS C	23.4	176.0	0.46	0.46	0.59	29.8
East: McCabe St (E)														
4	L2	267	2.8	267	2.8	0.487	40.7	LOS D	12.6	95.1	0.87	0.81	0.87	21.2
6	R2	69	2.8	69	2.8	*0.379	60.0	LOS E	3.9	29.4	0.98	0.76	0.98	21.0
Approach		337	2.8	337	2.8	0.487	44.6	LOS D	12.6	95.1	0.89	0.80	0.89	21.1
North: Stirling Hwy														
7	L2	49	8.1	49	8.1	1.027	99.9	LOS F	103.9	783.0	1.00	1.37	1.56	15.8
8	T1	2167	2.1	2167	2.1	*1.027	94.2	LOS F	104.5	785.9	1.00	1.37	1.56	6.8
Approach		2217	2.2	2217	2.2	1.027	94.3	LOS F	104.5	785.9	1.00	1.37	1.56	7.1
All Vehicles		4311	2.4	4308	2.4	1.041	61.1	LOS E	104.5	785.9	0.77	0.96	1.11	13.5

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).

Vehicle movement LOS values are based on average delay per movement.

Intersection and Approach LOS values are based on average delay for all vehicle movements.

Delay Model: SIDRA Standard (Geometric Delay is included).

Gap-Acceptance Capacity: SIDRA Standard (Akcelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

* Critical Movement (Signal Timing)

N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.

Pedestrian Movement Performance											
Mov ID	Crossing	Dem. Flow	Aver. Delay	Level of Service	AVERAGE BACK OF QUEUE		Prop. Que	Effective Stop Rate	Travel Time	Travel Dist	Aver. Speed
		ped/h	sec		[Ped ped	Dist] m			sec	m	m/sec
South: Stirling Hwy											
P1	Full	53	54.2	LOS E	0.2	0.2	0.96	0.96	87.6	40.0	0.46
East: McCabe St(E)											
P2	Full	53	52.3	LOS E	0.2	0.2	0.94	0.94	80.4	33.7	0.42
All Pedestrians		105	53.3	LOS E	0.2	0.2	0.95	0.95	84.0	36.9	0.44

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)

Pedestrian movement LOS values are based on average delay per pedestrian movement.

Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

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Assessment (base).slp

MOVEMENT SUMMARY

Site: 101 [S0-Stirling Highway/Coventry Parade_AM (Site Folder: Background (2035))]

Network: N101 [AM PEAK (Network Folder: Existing (2035))]

New Site
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance														
Mov ID	Turn	DEMAND FLOWS		ARRIVAL FLOWS		Deg Satn	Aver Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver No. Cycles	Aver Speed
		[Total veh/h	HV %	[Total HV] veh/h	%				[Veh veh	Dist m				
South: Stirling Highway (S)														
2	T1	2409	3.9	2409	3.9	0.649	0.3	LOS A	16.1	117.6	0.02	0.00	0.03	55.9
3	R2	6	0.0	6	0.0	0.649	30.4	LOS D	16.1	117.6	0.04	0.00	0.07	52.8
Approach		2416	3.9	2416	3.9	0.649	0.4	NA	16.1	117.6	0.02	0.00	0.03	55.8
East: Coventry Parade (E)														
4	L2	1	0.0	1	0.0	0.001	8.7	LOS A	0.0	0.1	0.59	0.52	0.59	32.3
6	R2	9	0.0	9	0.0	0.368	342.2	LOS F	2.0	13.7	1.00	1.02	1.08	2.2
Approach		11	0.0	11	0.0	0.368	308.9	LOS F	2.0	13.7	0.96	0.97	1.03	2.4
North: Stirling Highway (N)														
7	L2	24	0.0	24	0.0	0.407	5.6	LOS A	0.0	0.0	0.00	0.02	0.00	58.5
8	T1	1511	4.1	1498	4.1	0.407	0.0	LOS A	0.0	0.0	0.00	0.01	0.00	59.2
Approach		1535	4.0	1522	4.0	0.407	0.1	NA	0.0	0.0	0.00	0.01	0.00	59.1
All Vehicles		3961	3.9	3949	3.9	0.649	1.1	NA	16.1	117.6	0.02	0.01	0.02	51.6

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).

Vehicle movement LOS values are based on average delay per movement.

Minor Road Approach LOS values are based on average delay for all vehicle movements.

NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.

Delay Model: SIDRA Standard (Geometric Delay is included).

Gap-Acceptance Capacity: SIDRA Standard (Akcelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.

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MOVEMENT SUMMARY

Site: 101 [S0-Stirling Highway/Coventry Parade_PM (Site Folder: Background (2035))]

Network: N101 [PM PEAK (Network Folder: Existing (2035))]

New Site
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance														
Mov ID	Turn	DEMAND FLOWS		ARRIVAL FLOWS		Deg Satn	Aver Delay	Level of Service	95% BACK OF QUEUE		Prop Que	Effective Stop Rate	Aver No. Cycles	Aver Speed
		[Total veh/h]	[HV %]	[Total HV]	[%]				[Veh veh]	[Dist m]				
South: Stirling Highway (S)														
2	T1	1725	2.3	1725	2.3	0.512	0.7	LOS A	1.0	7.4	0.02	0.00	0.03	51.5
3	R2	3	0.0	3	0.0	0.512	52.2	LOS F	1.0	7.4	0.05	0.00	0.08	43.7
Approach		1728	2.3	1728	2.3	0.512	0.8	NA	1.0	7.4	0.02	0.00	0.03	51.5
East: Coventry Parade														
4	L2	9	0.0	9	0.0	0.022	16.5	LOS C	0.1	0.9	0.78	0.70	0.78	24.6
6	R2	29	0.0	29	0.0	1.165	469.2	LOS F	6.3	43.8	1.00	1.44	2.67	1.6
Approach		39	0.0	39	0.0	1.165	359.1	LOS F	6.3	43.8	0.95	1.26	2.21	2.0
North: Stirling Highway (N)														
7	L2	34	0.0	33	0.0	0.644	5.6	LOS A	0.0	0.0	0.00	0.02	0.00	58.3
8	T1	2474	2.4	2417	2.4	0.644	0.1	LOS A	0.0	0.0	0.00	0.01	0.00	58.8
Approach		2507	2.4	2450	2.4	0.644	0.2	NA	0.0	0.0	0.00	0.01	0.00	58.8
All Vehicles		4275	2.3	4218	2.3	1.165	3.8	NA	6.3	43.8	0.02	0.02	0.03	40.1

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).

Vehicle movement LOS values are based on average delay per movement.

Minor Road Approach LOS values are based on average delay for all vehicle movements.

NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.

Delay Model: SIDRA Standard (Geometric Delay is included).

Gap-Acceptance Capacity: SIDRA Standard (Akcelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.

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MOVEMENT SUMMARY

Site: LM00578 [S1-Stirling Highway/McCabe Street_AM (Site Folder: S1-Background (2035) (no upgrades) + Dev)]

Network: N101 [AM PEAK (Network Folder: Existing (2035) (no upgrades) + Dev)]

New Site

Site Category: (None)

Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 135 seconds (Site User-Given Cycle Time)

Vehicle Movement Performance														
Mov ID	Turn	DEMAND FLOWS		ARRIVAL FLOWS		Deg Satn	Aver Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver No. Cycles	Aver Speed
		[Total veh/h	HV %	[Total HV] veh/h	%	w/c	sec		[Veh veh	Dist m				km/h
South: Stirling Hwy														
2	T1	2036	4.5	2035	4.5	0.809	6.0	LOS A	33.2	244.8	0.50	0.47	0.50	46.8
3	R2	498	2.1	498	2.1	* 1.168	232.8	LOS F	34.2	244.8	1.00	1.40	2.27	2.4
Approach		2534	4.0	2532	4.0	1.168	50.6	LOS D	34.2	244.8	0.60	0.65	0.85	16.1
East: McCabe St														
4	L2	386	2.1	386	2.1	0.509	21.9	LOS C	13.9	99.3	0.60	0.74	0.60	14.6
6	R2	182	2.2	182	2.2	* 1.042	137.3	LOS F	18.3	131.4	1.00	1.20	1.86	6.9
Approach		568	2.1	568	2.1	1.042	58.9	LOS E	18.3	131.4	0.73	0.88	1.00	9.1
North: Stirling Hwy														
7	L2	162	7.7	162	7.7	1.146	209.2	LOS F	88.4	661.5	1.00	1.69	2.12	3.3
8	T1	1184	5.0	1184	5.0	* 1.146	203.1	LOS F	92.8	690.6	1.00	1.74	2.11	3.3
Approach		1346	5.3	1346	5.3	1.146	203.8	LOS F	92.8	690.6	1.00	1.74	2.11	3.3
All Vehicles		4448	4.2	4447	4.2	1.168	98.0	LOS F	92.8	690.6	0.74	1.01	1.25	8.2

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).

Vehicle movement LOS values are based on average delay per movement.

Intersection and Approach LOS values are based on average delay for all vehicle movements.

Delay Model: SIDRA Standard (Geometric Delay is included).

Gap-Acceptance Capacity: SIDRA Standard (Akcelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

* Critical Movement (Signal Timing)

N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.

Pedestrian Movement Performance											
Mov ID	Crossing	Dem. Flow	Aver. Delay	Level of Service	AVERAGE BACK OF QUEUE		Prop. Que	Effective Stop Rate	Travel Time	Travel Dist	Aver. Speed
		ped/h	sec		[Ped ped	Dist m			sec	m	m/sec
South: Stirling Hwy											
P1	Full	53	62.7	LOS F	0.2	0.2	0.97	0.97	96.1	40.0	0.42
East: McCabe St											
P2	Full	53	60.8	LOS F	0.2	0.2	0.95	0.95	88.9	33.7	0.38
All Pedestrians		105	61.8	LOS F	0.2	0.2	0.96	0.96	92.5	36.9	0.40

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)

Pedestrian movement LOS values are based on average delay per pedestrian movement.

Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

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Assessment V3 (S1,S2,S3) updated distribution.sip9

MOVEMENT SUMMARY

Site: 101 [S1-Stirling Highway/Coventry Parade_AM (Site Folder: S1-Background (2035) (no upgrades) + Dev)]

Network: N101 [AM PEAK (Network Folder: Existing (2035) (no upgrades) + Dev)]

New Site
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance														
Mov ID	Turn	DEMAND FLOWS		ARRIVAL FLOWS		Deg. Satn	Aver Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver No. Cycles	Aver Speed
		[Total veh/h	HV %	[Total HV] veh/h	%				[Veh veh	Dist m				
South: Stirling Highway (S)														
2	T1	2525	4.2	2525	4.2	0.686	0.5	LOS A	39.5	290.7	0.03	0.00	0.05	58.3
3	R2	8	0.0	8	0.0	0.686	33.2	LOS D	39.5	290.7	0.06	0.00	0.09	54.0
Approach		2534	4.2	2534	4.2	0.686	0.6	NA	39.5	290.7	0.03	0.00	0.05	58.2
East: Coventry Parade														
4	L2	1	0.0	1	0.0	0.001	8.6	LOS A	0.0	0.1	0.59	0.51	0.59	42.0
6	R2	9	0.0	9	0.0	1.338	849.0	LOS F	3.4	24.0	1.00	1.30	2.20	0.5
Approach		11	0.0	11	0.0	1.338	765.0	LOS F	3.4	24.0	0.96	1.22	2.04	0.7
North: Stirling Highway (N)														
7	L2	26	0.0	24	0.0	0.401	5.6	LOS A	0.0	0.0	0.00	0.02	0.00	53.8
8	T1	1626	4.1	1478	4.0	0.401	0.0	LOS A	0.0	0.0	0.00	0.01	0.00	59.5
Approach		1653	4.0	1502	4.0	0.401	0.1	NA	0.0	0.0	0.00	0.01	0.00	59.5
All Vehicles		4197	4.1	4047	4.3	1.338	2.4	NA	39.5	290.7	0.02	0.01	0.03	54.0

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).

Vehicle movement LOS values are based on average delay per movement.

Minor Road Approach LOS values are based on average delay for all vehicle movements.

NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.

Delay Model: SIDRA Standard (Geometric Delay is included).

Gap-Acceptance Capacity: SIDRA Standard (Akcelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.

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Project: K:\Projects\CW\1200352_304900736 City of Freo_North Fremantle Traffic Study\5_TechnicalTrafficModelling\Updated Model\SIDRA Assessment V3 (S1,S2,S3) updated distribution.sip9

MOVEMENT SUMMARY

Site: 101v [S1-McCabe St/McCabe Pl_AM - Conversion (Site Folder: S1-Background (2035) (no upgrades) + Dev)]

Network: N101 [AM PEAK (Network Folder: Existing (2035) (no upgrades) + Dev)]

New Site
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance														
Mov ID	Turn	DEMAND FLOWS		ARRIVAL FLOWS		Del. Satn	Aver Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver No. Cycles	Aver Speed
		[Total veh/h	HV %	[Total veh/h	HV %	v/c	sec		[Veh veh	Dist m				km/h
South: McCabe Pl														
1	L2	105	0.0	105	0.0	0.332	6.7	LOS A	1.3	8.8	0.56	0.78	0.67	39.5
2	T1	2	0.0	2	0.0	0.332	11.8	LOS B	1.3	8.8	0.56	0.78	0.67	43.8
3	R2	73	0.0	73	0.0	0.332	14.3	LOS B	1.3	8.8	0.56	0.78	0.67	39.5
Approach		180	0.0	180	0.0	0.332	9.8	LOS A	1.3	8.8	0.56	0.78	0.67	39.6
East: McCabe St														
4	L2	60	0.0	60	0.0	0.340	6.8	LOS A	1.5	10.9	0.33	0.25	0.34	46.3
5	T1	356	4.6	356	4.6	0.340	1.9	LOS A	1.5	10.9	0.33	0.25	0.34	37.0
6	R2	83	0.0	83	0.0	0.340	7.4	LOS A	1.5	10.9	0.33	0.25	0.34	45.9
Approach		499	3.3	499	3.3	0.340	3.4	NA	1.5	10.9	0.33	0.25	0.34	42.8
North: Access														
7	L2	74	0.0	74	0.0	0.433	8.3	LOS A	1.9	13.0	0.60	0.85	0.85	36.8
8	T1	1	0.0	1	0.0	0.433	12.9	LOS B	1.9	13.0	0.60	0.85	0.85	42.0
9	R2	108	0.0	108	0.0	0.433	16.7	LOS C	1.9	13.0	0.60	0.85	0.85	36.8
Approach		183	0.0	183	0.0	0.433	13.3	LOS B	1.9	13.0	0.60	0.85	0.85	36.8
West: McCabe St														
10	L2	125	0.0	108	0.0	0.323	5.8	LOS A	1.0	7.4	0.20	0.39	0.20	46.7
11	T1	447	9.8	388	10.5	0.323	2.5	LOS A	1.0	7.4	0.20	0.39	0.20	39.1
12	R2	86	0.0	74	0.0	0.323	6.9	LOS A	1.0	7.4	0.20	0.39	0.20	46.3
Approach		659	6.7	570	7.2	0.323	3.7	NA	1.0	7.4	0.20	0.39	0.20	44.0
All Vehicles		1521	4.0	1432	4.2	0.433	5.6	NA	1.9	13.0	0.34	0.45	0.39	41.2

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).

Vehicle movement LOS values are based on average delay per movement.

Minor Road Approach LOS values are based on average delay for all vehicle movements.

NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.

Delay Model: SIDRA Standard (Geometric Delay is included).

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.

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MOVEMENT SUMMARY

Site: 101v [S1-McCabe St/Access 2 (Site Folder: S1-Background (2035) (no upgrades) + Dev)]

Network: N101 [AM PEAK
(Network Folder: Existing (2035)
(no upgrades) + Dev)]

New Site
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance														
Mov ID	Turn	DEMAND FLOWS		ARRIVAL FLOWS		Deg. Satn	Aver Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver No. Cycles	Aver Speed
		[Total veh/h	HV %	[Total HV] veh/h	%				[Veh veh	Dist] in				
East: McCabe St														
11	T1	488	4.6	488	4.6	0.258	0.1	LOS A	0.1	1.0	0.03	0.01	0.03	57.8
12	R2	9	0.0	9	0.0	0.258	8.7	LOS A	0.1	1.0	0.03	0.01	0.03	56.1
Approach		498	4.5	498	4.5	0.258	0.3	NA	0.1	1.0	0.03	0.01	0.03	57.6
North: Access 2														
1	L2	8	0.0	8	0.0	0.038	7.7	LOS A	0.1	0.8	0.60	0.78	0.60	45.2
3	R2	12	0.0	12	0.0	0.038	12.6	LOS B	0.1	0.8	0.60	0.78	0.60	44.7
Approach		20	0.0	20	0.0	0.038	10.5	LOS B	0.1	0.8	0.60	0.78	0.60	45.0
West: McCabe St														
4	L2	14	0.0	12	0.0	0.283	5.5	LOS A	0.0	0.0	0.00	0.01	0.00	57.0
5	T1	580	9.8	523	10.3	0.283	0.0	LOS A	0.0	0.0	0.00	0.01	0.00	59.2
Approach		594	9.6	535 ^{N1}	10.0	0.283	0.1	NA	0.0	0.0	0.00	0.01	0.00	59.1
All Vehicles		1112	7.1	1053 ^{N1}	7.5	0.283	0.4	NA	0.1	1.0	0.03	0.03	0.03	57.6

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).

Vehicle movement LOS values are based on average delay per movement.

Minor Road Approach LOS values are based on average delay for all vehicle movements.

NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.

Delay Model: SIDRA Standard (Geometric Delay is included).

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.

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MOVEMENT SUMMARY

Site: LM00578 [S1-Stirling Highway/McCabe Street_PM (Site Folder: S1-Background (2035) (no upgrades) + Dev)]

Network: N101 [PM PEAK (Network Folder: Existing (2035) (no upgrades) + Dev)]

New Site

Site Category: (None)

Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 118 seconds (Site User-Given Cycle Time)

Vehicle Movement Performance														
Mov ID	Turn	DEMAND FLOWS		ARRIVAL FLOWS		Deg Satn	Aver Delay	Level of Service	95% BACK OF QUEUE		Prop Que	Effective Stop Rate	Aver No. Cycles	Aver Speed
		[Total veh/h	HV %	[Total HV] veh/h	%	w/c	sec		[Veh veh	Dist] m				km/h
South: Stirling Hwy														
2	T1	1511	3.8	1496	3.8	0.574	4.4	LOS A	18.3	134.3	0.37	0.34	0.37	49.8
3	R2	426	2.2	422	2.2	* 1.336	367.6	LOS F	34.1	244.8	1.00	1.75	3.18	1.5
Approach		1937	3.4	1918	3.5	1.336	84.3	LOS F	34.1	244.8	0.51	0.65	0.99	10.6
East: McCabe St														
4	L2	407	2.8	407	2.8	0.742	35.9	LOS D	18.7	135.4	0.84	0.83	0.86	10.1
6	R2	204	2.8	204	2.8	* 1.103	171.1	LOS F	22.2	160.2	1.00	1.36	2.22	5.7
Approach		612	2.8	612	2.8	1.103	81.1	LOS F	22.2	160.2	0.89	1.01	1.32	7.0
North: Stirling Hwy														
7	L2	220	8.1	220	8.1	1.315	341.0	LOS F	200.1	1461.0	1.00	2.39	2.99	2.1
8	T1	2172	2.9	2172	2.9	* 1.315	335.2	LOS F	205.5	1484.1	1.00	2.46	2.99	2.1
Approach		2392	3.4	2392	3.4	1.315	335.7	LOS F	205.5	1484.1	1.00	2.45	2.99	2.1
All Vehicles		4940	3.3	4921	3.3	1.336	206.1	LOS F	205.5	1484.1	0.80	1.57	2.00	3.9

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).

Vehicle movement LOS values are based on average delay per movement.

Intersection and Approach LOS values are based on average delay for all vehicle movements.

Delay Model: SIDRA Standard (Geometric Delay is included).

Gap-Acceptance Capacity: SIDRA Standard (Akcelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

* Critical Movement (Signal Timing)

N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.

Pedestrian Movement Performance											
Mov ID	Crossing	Dem. Flow	Aver. Delay	Level of Service	AVERAGE BACK OF QUEUE		Prop. Que	Effective Stop Rate	Travel Time	Travel Dist	Aver. Speed
		ped/h	sec		[Ped ped	Dist] m			sec	m	m/sec
South: Stirling Hwy											
P1	Full	53	54.2	LOS E	0.2	0.2	0.96	0.96	87.6	40.0	0.46
East: McCabe St											
P2	Full	53	52.3	LOS E	0.2	0.2	0.94	0.94	80.4	33.7	0.42
All Pedestrians		105	53.3	LOS E	0.2	0.2	0.95	0.95	84.0	36.9	0.44

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)

Pedestrian movement LOS values are based on average delay per pedestrian movement.

Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

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Assessment V3 (S1,S2,S3) updated distribution.sip9

MOVEMENT SUMMARY

Site: 101 [S1-Stirling Highway/Coventry Parade_PM (Site Folder: S1-Background (2035) (no upgrades) + Dev)]

Network: N101 [PM PEAK (Network Folder: Existing (2035) (no upgrades) + Dev)]

New Site
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance														
Mov ID	Turn	DEMAND FLOWS		ARRIVAL FLOWS		Deg Satn	Aver Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver No. Cycles	Aver Speed
		[Total veh/h	HV %	[Total HV] veh/h	%				[Veh veh	Dist m				
South: Stirling Highway (S)														
2	T1	1905	2.3	1905	2.3	0.511	0.7	LOS A	38.9	279.2	0.03	0.00	0.04	57.7
3	R2	5	0.0	5	0.0	0.511	44.3	LOS E	38.9	279.2	0.06	0.00	0.09	52.9
Approach		1911	2.3	1911	2.3	0.511	0.8	NA	38.9	279.2	0.03	0.00	0.04	57.6
East: Coventry Parade														
4	L2	9	0.0	9	0.0	0.018	12.9	LOS B	0.1	0.7	0.71	0.67	0.71	38.0
6	R2	29	0.0	29	0.0	3.148	2133.2	LOS F	16.8	117.6	1.00	1.91	4.64	0.2
Approach		39	0.0	39	0.0	3.148	1617.5	LOS F	16.8	117.6	0.93	1.60	3.69	0.4
North: Stirling Highway (N)														
7	L2	38	0.0	31	0.0	0.560	5.6	LOS A	0.0	0.0	0.00	0.02	0.00	53.8
8	T1	2614	2.2	2105	2.2	0.560	0.1	LOS A	0.0	0.0	0.00	0.01	0.00	59.3
Approach		2652	2.2	2136	2.2	0.560	0.2	NA	0.0	0.0	0.00	0.01	0.00	59.3
All Vehicles		4601	2.2	4085	2.5	3.148	15.9	NA	38.9	279.2	0.02	0.02	0.06	35.8

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).

Vehicle movement LOS values are based on average delay per movement.

Minor Road Approach LOS values are based on average delay for all vehicle movements.

NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.

Delay Model: SIDRA Standard (Geometric Delay is included).

Gap-Acceptance Capacity: SIDRA Standard (Akcelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.

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MOVEMENT SUMMARY

Site: 101v [S1-McCabe St/McCabe Pl_PM - Conversion (Site Folder: S1-Background (2035) (no upgrades) + Dev)]

Network: N101 [PM PEAK (Network Folder: Existing (2035) (no upgrades) + Dev)]

New Site
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance														
Mov ID	Turn	DEMAND FLOWS		ARRIVAL FLOWS		Deg. Satn	Aver Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver No. Cycles	Aver Speed
		[Total veh/h	HV %	[Total veh/h	HV %	v/c	sec		[Veh veh	Dist m				km/h
South: McCabe Pl														
1	L2	105	0.0	105	0.0	0.399	7.3	LOS A	1.4	9.5	0.56	0.81	0.73	39.0
2	T1	3	0.0	3	0.0	0.399	12.1	LOS B	1.4	9.5	0.56	0.81	0.73	43.5
3	R2	72	0.0	72	0.0	0.399	15.0	LOS C	1.4	9.5	0.56	0.81	0.73	39.0
Approach		180	0.0	180	0.0	0.399	10.4	LOS B	1.4	9.5	0.56	0.81	0.73	39.1
East: McCabe St														
4	L2	98	0.0	98	0.0	0.463	6.6	LOS A	2.6	18.7	0.37	0.30	0.43	45.6
5	T1	354	5.6	354	5.6	0.463	2.4	LOS A	2.6	18.7	0.37	0.30	0.43	34.7
6	R2	128	0.0	128	0.0	0.463	7.1	LOS A	2.6	18.7	0.37	0.30	0.43	45.2
Approach		580	3.4	580	3.4	0.463	4.2	NA	2.6	18.7	0.37	0.30	0.43	42.5
North: Access														
7	L2	101	0.0	101	0.0	0.671	11.6	LOS B	3.4	24.1	0.53	0.91	1.07	34.3
8	T1	1	0.0	1	0.0	0.671	17.6	LOS C	3.4	24.1	0.53	0.91	1.07	40.3
9	R2	152	0.0	152	0.0	0.671	20.6	LOS C	3.4	24.1	0.53	0.91	1.07	34.3
Approach		254	0.0	254	0.0	0.671	17.0	LOS C	3.4	24.1	0.53	0.91	1.07	34.3
West: McCabe St														
10	L2	192	0.0	143	0.0	0.291	6.0	LOS A	1.2	9.0	0.31	0.40	0.31	45.3
11	T1	317	10.3	238	10.9	0.291	3.1	LOS A	1.2	9.0	0.31	0.40	0.31	34.7
12	R2	138	0.0	103	0.0	0.291	7.0	LOS A	1.2	9.0	0.31	0.40	0.31	44.9
Approach		646	5.0	485	5.4	0.291	4.8	NA	1.2	9.0	0.31	0.40	0.31	43.1
All Vehicles		1660	3.2	1498	3.5	0.671	7.3	NA	3.4	24.1	0.40	0.49	0.53	40.0

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).

Vehicle movement LOS values are based on average delay per movement.

Minor Road Approach LOS values are based on average delay for all vehicle movements.

NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.

Delay Model: SIDRA Standard (Geometric Delay is included).

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.

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MOVEMENT SUMMARY

Site: 101v [S1-McCabe St/Access 2 (Site Folder: S1-Background (2035) (no upgrades) + Dev)]

Network: N101 [PM PEAK
(Network Folder: Existing (2035)
(no upgrades) + Dev)]

New Site
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance														
Mov ID	Turn	DEMAND FLOWS		ARRIVAL FLOWS		Deg. Satn	Aver Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver No. Cycles	Aver Speed
		[Total veh/h	HV %	[Total HV] veh/h	%				[Veh veh	Dist In				
East: McCabe St														
11	T1	563	5.6	563	5.6	0.301	0.1	LOS A	0.2	1.3	0.04	0.02	0.04	57.4
12	R2	15	0.0	15	0.0	0.301	7.8	LOS A	0.2	1.3	0.04	0.02	0.04	56.4
Approach		578	5.5	578	5.5	0.301	0.3	NA	0.2	1.3	0.04	0.02	0.04	57.3
North: Access 2														
1	L2	12	0.0	12	0.0	0.051	7.0	LOS A	0.2	1.1	0.55	0.75	0.55	45.6
3	R2	17	0.0	17	0.0	0.051	12.3	LOS B	0.2	1.1	0.55	0.75	0.55	45.2
Approach		28	0.0	28	0.0	0.051	10.1	LOS B	0.2	1.1	0.55	0.75	0.55	45.4
West: McCabe St														
4	L2	21	0.0	18	0.0	0.218	5.5	LOS A	0.0	0.0	0.00	0.03	0.00	56.9
5	T1	468	10.3	396	10.5	0.218	0.0	LOS A	0.0	0.0	0.00	0.03	0.00	58.7
Approach		489	9.9	414 ⁽¹⁾	10.1	0.218	0.3	NA	0.0	0.0	0.00	0.03	0.00	58.5
All Vehicles		1096	7.3	1020 ⁽¹⁾	7.8	0.301	0.6	NA	0.2	1.3	0.04	0.04	0.04	56.7

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).

Vehicle movement LOS values are based on average delay per movement.

Minor Road Approach LOS values are based on average delay for all vehicle movements.

NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.

Delay Model: SIDRA Standard (Geometric Delay is included).

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.

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MOVEMENT SUMMARY

Site: LM00578 [S2-Stirling Highway/McCabe Street_AM (Site Folder: S2-Background (2035) + Dev (minor upgrades))]

Network: N101 [AM PEAK (Network Folder: Existing (2035) + Dev (Upgraded))]

New Site

Site Category: (None)

Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 135 seconds (Site User-Given Cycle Time)

Vehicle Movement Performance														
Mov ID	Turn	DEMAND FLOWS		ARRIVAL FLOWS		Deg. Satn	Aver Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver No. Cycles	Aver Speed
		[Total veh/h	HV %	[Total HV] veh/h	%	v/c	sec		[Veh veh	Dist m				km/h
South: Stirling Hwy														
2	T1	2037	4.5	2037	4.5	0.765	6.0	LOS A	33.2	244.8	0.48	0.45	0.48	46.7
3	R2	349	2.1	349	2.1	*1.008	121.2	LOS F	34.2	244.8	1.00	1.13	1.66	4.5
Approach		2386	4.1	2386	4.1	1.008	22.9	LOS C	34.2	244.8	0.56	0.55	0.65	27.6
East: McCabe St														
4	L2	386	2.1	386	2.1	0.544	24.9	LOS C	15.0	107.6	0.65	0.75	0.65	13.3
6	R2	192	2.2	192	2.2	*1.010	118.9	LOS F	17.8	127.5	1.00	1.14	1.73	7.9
Approach		578	2.1	578	2.1	1.010	56.1	LOS E	17.8	127.5	0.76	0.88	1.00	9.7
North: Stirling Hwy														
7	L2	162	7.7	162	7.7	1.004	105.4	LOS F	63.1	472.8	1.00	1.24	1.48	6.5
8	T1	1184	5.0	1184	5.0	*1.004	99.1	LOS F	65.9	490.6	1.00	1.26	1.48	6.5
Approach		1346	5.3	1346	5.3	1.004	99.9	LOS F	65.9	490.6	1.00	1.26	1.48	6.5
All Vehicles		4311	4.2	4311	4.2	1.010	51.4	LOS D	65.9	490.6	0.72	0.82	0.96	14.3

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).

Vehicle movement LOS values are based on average delay per movement.

Intersection and Approach LOS values are based on average delay for all vehicle movements.

Delay Model: SIDRA Standard (Geometric Delay is included).

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

* Critical Movement (Signal Timing)

Pedestrian Movement Performance											
Mov ID	Crossing	Dem. Flow	Aver Delay	Level of Service	AVERAGE BACK OF QUEUE		Prop. Que	Effective Stop Rate	Travel Time	Travel Dist	Aver Speed
		ped/h	sec		[Ped ped	Dist m			sec	m	m/sec
South: Stirling Hwy											
P1	Full	53	62.7	LOS F	0.2	0.2	0.97	0.97	96.1	40.0	0.42
East: McCabe St											
P2	Full	53	60.8	LOS F	0.2	0.2	0.95	0.95	88.9	33.7	0.38
All Pedestrians		105	61.8	LOS F	0.2	0.2	0.96	0.96	92.5	36.9	0.40

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)

Pedestrian movement LOS values are based on average delay per pedestrian movement.

Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

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MOVEMENT SUMMARY

Site: 101 [S2-Stirling Highway/Coventry Parade_AM (Site Folder: S2-Background (2035) + Dev (minor upgrades))]

Network: N101 [AM PEAK (Network Folder: Existing (2035) + Dev (Upgraded))]

New Site
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance														
Mov ID	Turn	DEMAND FLOWS		ARRIVAL FLOWS		Deg Satn	Aver Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver No. Cycles	Aver Speed
		[Total veh/h	HV %	[Total HV] veh/h	%	v/c	sec		[Veh veh	Dist m				km/h
South: Stirling Highway (S)														
2	T1	2378	4.2	2378	4.2	0.642	0.3	LOS A	4.8	35.0	0.00	0.00	0.00	59.2
3	R2	149	0.0	149	0.0	0.388	19.0	LOS C	1.7	12.1	0.82	0.99	1.04	33.9
Approach		2527	4.0	2527	4.0	0.642	1.4	NA	4.8	35.0	0.05	0.06	0.06	55.9
East: Coventry Parade														
4	L2	1	0.0	1	0.0	0.002	9.3	LOS A	0.0	0.1	0.62	0.53	0.62	41.3
Approach		1	0.0	1	0.0	0.002	9.3	LOS A	0.0	0.1	0.62	0.53	0.62	41.3
North: Stirling Highway (N)														
7	L2	26	0.0	26	0.0	0.440	5.6	LOS A	0.0	0.0	0.00	0.02	0.00	53.7
8	T1	1626	4.1	1621	4.1	0.440	0.1	LOS A	0.0	0.0	0.00	0.01	0.00	59.5
Approach		1653	4.0	1648	4.0	0.440	0.1	NA	0.0	0.0	0.00	0.01	0.00	59.4
All Vehicles		4181	4.0	4176	4.0	0.642	0.9	NA	4.8	35.0	0.03	0.04	0.04	57.5

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).

Vehicle movement LOS values are based on average delay per movement.

Minor Road Approach LOS values are based on average delay for all vehicle movements.

NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.

Delay Model: SIDRA Standard (Geometric Delay is included).

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.

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MOVEMENT SUMMARY

Site: 101 [S2-McCabe St/McCabe Pl_AM (Site Folder: S2-Background (2035) + Dev (minor upgrades))]

Network: N101 [AM PEAK (Network Folder: Existing (2035) + Dev (Upgraded))]

New Site
Site Category: (None)
Roundabout

Vehicle Movement Performance														
Mov ID	Turn	DEMAND FLOWS		ARRIVAL FLOWS		Deg. Satn	Aver Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver No. Cycles	Aver Speed
		[Total veh/h	HV %	[Total HV] veh/h	%	v/c	sec		[Veh veh	Dist m				km/h
South: McCabe Pl														
1	L2	114	0.0	114	0.0	0.390	6.4	LOS A	2.4	16.8	0.72	0.79	0.72	40.5
2	T1	21	0.0	21	0.0	0.390	6.4	LOS A	2.4	16.8	0.72	0.79	0.72	45.6
3	R2	182	0.0	182	0.0	0.390	10.9	LOS B	2.4	16.8	0.72	0.79	0.72	40.5
Approach		317	0.0	317	0.0	0.390	9.0	LOS A	2.4	16.8	0.72	0.79	0.72	41.1
East: McCabe St														
4	L2	60	0.0	60	0.0	0.473	4.0	LOS A	3.1	22.7	0.48	0.50	0.48	44.2
5	T1	356	4.6	356	4.6	0.473	4.1	LOS A	3.1	22.7	0.48	0.50	0.48	30.8
6	R2	83	0.0	83	0.0	0.473	8.4	LOS A	3.1	22.7	0.48	0.50	0.48	46.0
Approach		499	3.3	499	3.3	0.473	4.8	LOS A	3.1	22.7	0.48	0.50	0.48	38.9
North: Access														
7	L2	74	0.0	74	0.0	0.233	6.9	LOS A	1.6	11.1	0.72	0.70	0.72	40.1
8	T1	1	0.0	1	0.0	0.233	6.9	LOS A	1.6	11.1	0.72	0.70	0.72	45.3
9	R2	108	0.0	108	0.0	0.233	11.4	LOS B	1.6	11.1	0.72	0.70	0.72	40.1
Approach		183	0.0	183	0.0	0.233	9.6	LOS A	1.6	11.1	0.72	0.70	0.72	40.1
West: McCabe St														
10	L2	105	0.0	105	0.0	0.478	4.8	LOS A	3.2	23.7	0.41	0.55	0.41	44.5
11	T1	334	9.8	332	9.8	0.478	5.1	LOS A	3.2	23.7	0.41	0.55	0.41	32.0
12	R2	74	0.0	73	0.0	0.478	9.3	LOS A	3.2	23.7	0.41	0.55	0.41	46.4
Approach		513	6.4	509	6.4	0.478	5.7	LOS A	3.2	23.7	0.41	0.55	0.41	40.3
All Vehicles		1512	3.2	1508	3.3	0.478	6.5	LOS A	3.2	23.7	0.54	0.60	0.54	40.2

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).

Roundabout LOS Method: SIDRA Roundabout LOS.

Vehicle movement LOS values are based on average delay per movement.

Intersection and Approach LOS values are based on average delay for all vehicle movements.

Roundabout Capacity Model: SIDRA Standard.

Delay Model: SIDRA Standard (Geometric Delay is included).

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.

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MOVEMENT SUMMARY

Site: 101v [S2-McCabe St/Access 2 AM (Site Folder: S2-Background (2035) + Dev (minor upgrades))]

Network: N101 [AM PEAK (Network Folder: Existing (2035) + Dev (Upgraded))]

New Site
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance														
Mov ID	Turn	DEMAND FLOWS		ARRIVAL FLOWS		Deg. Satn	Aver Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver No. Cycles	Aver Speed
		[Total veh/h	HV %	[Total HV] veh/h	%				[Veh veh	Dist In				
East: McCabe St														
11	T1	488	4.6	488	4.6	0.259	0.1	LOS A	0.1	1.1	0.04	0.01	0.04	57.5
12	R2	9	0.0	9	0.0	0.259	9.2	LOS A	0.1	1.1	0.04	0.01	0.04	56.1
Approach		498	4.5	498	4.5	0.259	0.3	NA	0.1	1.1	0.04	0.01	0.04	57.4
North: Access 2														
1	L2	8	0.0	8	0.0	0.041	8.0	LOS A	0.1	0.9	0.64	0.80	0.64	44.7
3	R2	12	0.0	12	0.0	0.041	13.4	LOS B	0.1	0.9	0.64	0.80	0.64	44.0
Approach		20	0.0	20	0.0	0.041	11.1	LOS B	0.1	0.9	0.64	0.80	0.64	44.3
West: McCabe St														
4	L2	14	0.0	14	0.0	0.309	5.5	LOS A	0.0	0.0	0.00	0.01	0.00	57.0
5	T1	575	9.8	573	9.8	0.309	0.0	LOS A	0.0	0.0	0.00	0.01	0.00	59.2
Approach		588	9.6	586	9.6	0.309	0.1	NA	0.0	0.0	0.00	0.01	0.00	59.0
All Vehicles		1106	7.1	1104	7.1	0.309	0.4	NA	0.1	1.1	0.03	0.03	0.03	57.5

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).

Vehicle movement LOS values are based on average delay per movement.

Minor Road Approach LOS values are based on average delay for all vehicle movements.

NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.

Delay Model: SIDRA Standard (Geometric Delay is included).

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.

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MOVEMENT SUMMARY

Site: LM00578 [S2-Stirling Highway/McCabe Street_PM (Site Folder: S2-Background (2035) + Dev (minor upgrades))]

Network: N101 [PM PEAK (Network Folder: Existing (2035) + Dev (Upgraded))]

New Site

Site Category: (None)

Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 118 seconds (Site User-Given Cycle Time)

Vehicle Movement Performance														
Mov ID	Turn	DEMAND FLOWS		ARRIVAL FLOWS		Deg. Satn	Aver Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver No. Cycles	Aver Speed
		[Total veh/h	HV %	[Total HV] veh/h	%	v/c	sec		[Veh veh	Dist m				km/h
South: Stirling Hwy														
2	T1	1508	2.4	1508	2.4	0.559	4.7	LOS A	18.0	129.6	0.38	0.35	0.38	49.2
3	R2	301	2.2	301	2.2	* 1.165	223.8	LOS F	34.1	244.8	1.00	1.44	2.48	2.5
Approach		1809	2.4	1809	2.4	1.165	41.1	LOS D	34.1	244.8	0.49	0.54	0.73	18.8
East: McCabe St														
4	L2	407	2.8	407	2.8	0.874	53.8	LOS D	24.1	173.8	0.92	0.95	1.14	7.2
6	R2	233	2.8	233	2.8	* 1.160	216.0	LOS F	24.8	179.5	1.00	1.48	2.47	4.6
Approach		640	2.8	640	2.8	1.160	112.8	LOS F	24.8	179.5	0.95	1.14	1.62	5.4
North: Stirling Hwy														
7	L2	220	8.1	220	8.1	1.162	207.2	LOS F	156.2	1134.8	1.00	1.87	2.28	3.4
8	T1	2172	2.1	2172	2.1	* 1.162	201.2	LOS F	160.3	1150.4	1.00	1.91	2.27	3.4
Approach		2392	2.7	2392	2.7	1.162	201.8	LOS F	160.3	1150.4	1.00	1.91	2.27	3.4
All Vehicles		4841	2.6	4841	2.6	1.165	130.0	LOS F	160.3	1150.4	0.80	1.29	1.61	6.0

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).

Vehicle movement LOS values are based on average delay per movement.

Intersection and Approach LOS values are based on average delay for all vehicle movements.

Delay Model: SIDRA Standard (Geometric Delay is included).

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

* Critical Movement (Signal Timing)

Pedestrian Movement Performance											
Mov ID	Crossing	Dem. Flow	Aver Delay	Level of Service	AVERAGE BACK OF QUEUE		Prop. Que	Effective Stop Rate	Travel Time	Travel Dist	Aver Speed
		ped/h	sec		[Ped ped	Dist m			sec	m	m/sec
South: Stirling Hwy											
P1	Full	53	54.2	LOS E	0.2	0.2	0.96	0.96	87.6	40.0	0.46
East: McCabe St											
P2	Full	53	52.3	LOS E	0.2	0.2	0.94	0.94	80.4	33.7	0.42
All Pedestrians		105	53.3	LOS E	0.2	0.2	0.95	0.95	84.0	36.9	0.44

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)

Pedestrian movement LOS values are based on average delay per pedestrian movement.

Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

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MOVEMENT SUMMARY

Site: 101 [S2-Stirling Highway/Coventry Parade_PM (Site Folder: S2-Background (2035) + Dev (minor upgrades))]

Network: N101 [PM PEAK (Network Folder: Existing (2035) + Dev (Upgraded))]

New Site
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance														
Mov ID	Turn	DEMAND FLOWS		ARRIVAL FLOWS		Deg Satn	Aver Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver No. Cycles	Aver Speed
		[Total veh/h	HV %	[Total HV] veh/h	%	v/c	sec		[Veh veh	Dist m				km/h
South: Stirling Highway (S)														
2	T1	1779	2.3	1779	2.3	0.470	0.1	LOS A	4.9	34.9	0.00	0.00	0.00	59.6
3	R2	128	0.0	128	0.0	0.706	51.2	LOS F	3.4	24.0	0.96	1.16	1.63	20.5
Approach		1907	2.1	1907	2.1	0.706	3.6	NA	4.9	34.9	0.06	0.08	0.11	50.9
East: Coventry Parade														
4	L2	9	0.0	9	0.0	0.021	15.1	LOS C	0.1	0.8	0.76	0.69	0.76	36.2
Approach		9	0.0	9	0.0	0.021	15.1	LOS C	0.1	0.8	0.76	0.69	0.76	36.2
North: Stirling Highway (N)														
7	L2	38	0.0	34	0.0	0.616	5.6	LOS A	0.0	0.0	0.00	0.02	0.00	53.6
8	T1	2614	2.2	2315	2.2	0.616	0.1	LOS A	0.0	0.0	0.00	0.01	0.00	59.2
Approach		2652	2.2	2349	2.2	0.616	0.2	NA	0.0	0.0	0.00	0.01	0.00	59.1
All Vehicles		4568	2.2	4265	2.3	0.706	1.7	NA	4.9	34.9	0.03	0.04	0.05	55.7

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).

Vehicle movement LOS values are based on average delay per movement.

Minor Road Approach LOS values are based on average delay for all vehicle movements.

NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.

Delay Model: SIDRA Standard (Geometric Delay is included).

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.

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MOVEMENT SUMMARY

Site: 101 [S2-McCabe St/McCabe Pl_PM (Site Folder: S2-Background (2035) + Dev (minor upgrades))]

Network: N101 [PM PEAK (Network Folder: Existing (2035) + Dev (Upgraded))]

New Site
Site Category: (None)
Roundabout

Vehicle Movement Performance														
Mov ID	Turn	DEMAND FLOWS		ARRIVAL FLOWS		Deg. Satn	Aver Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver No. Cycles	Aver Speed
		[Total veh/h	HV %	[Total veh/h	HV %	v/c	sec		[Veh veh	Dist m				km/h
South: McCabe Pl														
1	L2	135	0.0	135	0.0	0.557	9.3	LOS A	3.2	22.5	0.79	0.94	0.97	38.6
2	T1	33	0.0	33	0.0	0.557	9.2	LOS A	3.2	22.5	0.79	0.94	0.97	44.3
3	R2	143	0.0	143	0.0	0.557	13.7	LOS B	3.2	22.5	0.79	0.94	0.97	38.6
Approach		311	0.0	311	0.0	0.557	11.3	LOS B	3.2	22.5	0.79	0.94	0.97	39.6
East: McCabe St														
4	L2	98	0.0	98	0.0	0.813	8.2	LOS A	6.3	45.5	0.61	0.72	0.78	41.6
5	T1	354	5.6	354	5.6	0.813	8.4	LOS A	6.3	45.5	0.61	0.72	0.78	25.5
6	R2	128	0.0	128	0.0	0.813	12.7	LOS B	6.3	45.5	0.61	0.72	0.78	43.2
Approach		580	3.4	580	3.4	0.813	9.3	LOS A	6.3	45.5	0.61	0.72	0.78	36.5
North: Access														
7	L2	101	0.0	101	0.0	0.410	5.8	LOS A	1.9	13.1	0.64	0.69	0.64	41.0
8	T1	1	0.0	1	0.0	0.410	5.7	LOS A	1.9	13.1	0.64	0.69	0.64	45.9
9	R2	152	0.0	152	0.0	0.410	10.2	LOS B	1.9	13.1	0.64	0.69	0.64	41.0
Approach		254	0.0	254	0.0	0.410	8.4	LOS A	1.9	13.1	0.64	0.69	0.64	41.1
West: McCabe St														
10	L2	160	0.0	137	0.0	0.425	4.8	LOS A	2.6	19.3	0.40	0.57	0.40	44.2
11	T1	243	10.3	209	10.3	0.425	5.2	LOS A	2.6	19.3	0.40	0.57	0.40	31.4
12	R2	117	0.0	100	0.0	0.425	9.3	LOS A	2.6	19.3	0.40	0.57	0.40	46.1
Approach		520	4.8	447	4.8	0.425	6.0	LOS A	2.6	19.3	0.40	0.57	0.40	42.0
All Vehicles		1664	2.7	1591	2.8	0.813	8.6	LOS A	6.3	45.5	0.59	0.72	0.69	39.5

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).

Roundabout LOS Method: SIDRA Roundabout LOS.

Vehicle movement LOS values are based on average delay per movement.

Intersection and Approach LOS values are based on average delay for all vehicle movements.

Roundabout Capacity Model: SIDRA Standard.

Delay Model: SIDRA Standard (Geometric Delay is included).

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.

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Project: K:\Projects\CW\1200352_304900736 City of Freo_ North Fremantle Traffic Study\5_Technical\TrafficModelling\Updated Model\SIDRA Assessment V3 (S1,S2,S3) updated distribution.sip9

MOVEMENT SUMMARY

Site: 101v [S2-McCabe St/Access 2 PM (Site Folder: S2-Background (2035) + Dev (minor upgrades))]

Network: N101 [PM PEAK (Network Folder: Existing (2035) + Dev (Upgraded))]

New Site
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance														
Mov ID	Turn	DEMAND FLOWS		ARRIVAL FLOWS		Deg. Satn	Aver Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver No. Cycles	Aver Speed
		[Total veh/h	HV %	[Total HV] veh/h	%				[Veh veh	Dst In				
East: McCabe St														
11	T1	563	5.6	563	5.6	0.302	0.1	LOS A	0.2	1.5	0.04	0.02	0.04	57.3
12	R2	15	0.0	15	0.0	0.302	8.2	LOS A	0.2	1.5	0.04	0.02	0.04	56.3
Approach		578	5.5	578	5.5	0.302	0.3	NA	0.2	1.5	0.04	0.02	0.04	57.2
North: Access 2														
1	L2	12	0.0	12	0.0	0.054	7.2	LOS A	0.2	1.2	0.58	0.77	0.58	45.2
3	R2	17	0.0	17	0.0	0.054	12.8	LOS B	0.2	1.2	0.58	0.77	0.58	44.7
Approach		28	0.0	28	0.0	0.054	10.5	LOS B	0.2	1.2	0.58	0.77	0.58	45.0
West: McCabe St														
4	L2	21	0.0	20	0.0	0.240	5.5	LOS A	0.0	0.0	0.00	0.03	0.00	56.9
5	T1	466	10.3	435	10.3	0.240	0.0	LOS A	0.0	0.0	0.00	0.03	0.00	58.7
Approach		487	9.9	455 ^{N1}	9.8	0.240	0.3	NA	0.0	0.0	0.00	0.03	0.00	58.5
All Vehicles		1094	7.3	1061 ^{N1}	7.5	0.302	0.6	NA	0.2	1.5	0.04	0.04	0.04	56.7

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).

Vehicle movement LOS values are based on average delay per movement.

Minor Road Approach LOS values are based on average delay for all vehicle movements.

NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.

Delay Model: SIDRA Standard (Geometric Delay is included).

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.

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MOVEMENT SUMMARY

Site: LM00578 [S3-Stirling Highway/McCabe Street AM (Site Folder: S3-Background (2035) + Dev (Upgraded) + Sig Mods)]

Network: N101 [AM PEAK (Network Folder: Existing (2035) + Dev (Upgraded) + sig mods)]

New Site

Site Category: (None)

Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 60 seconds (Site Practical Cycle Time)

Vehicle Movement Performance														
Mov ID	Turn	DEMAND FLOWS		ARRIVAL FLOWS		Deg Satn	Aver Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver No. Cycles	Aver Speed
		[Total veh/h]	[HV %]	[Total veh/h]	[HV %]	v/c	sec		[Veh veh]	[Dist m]				km/h
South: Stirling Hwy														
2	T1	2037	6.5	2037	6.5	0.879	18.6	LOS B	33.1	244.8	0.78	0.88	0.99	32.2
3	R2	349	2.1	349	2.1	*0.882	40.5	LOS D	12.5	89.9	1.00	1.05	1.47	12.0
Approach		2386	5.9	2386	5.9	0.882	21.8	LOS C	33.1	244.8	0.81	0.91	1.06	28.4
East: McCabe St														
4	L2	386	2.3	386	2.3	0.470	19.0	LOS B	8.0	57.5	0.74	0.78	0.74	17.3
6	R2	192	2.3	192	2.3	*0.786	36.6	LOS D	6.2	44.8	1.00	0.96	1.31	19.3
Approach		578	2.3	578	2.3	0.786	24.9	LOS C	8.0	57.5	0.83	0.84	0.93	18.3
North: Stirling Hwy														
7	L2	162	7.7	162	7.7	0.193	11.2	LOS B	2.4	19.9	0.51	0.63	0.51	32.8
8	T1	1184	6.5	1184	6.5	*0.876	29.2	LOS C	20.3	149.8	0.99	1.08	1.31	17.8
Approach		1346	6.6	1346	6.6	0.876	27.0	LOS C	20.3	149.8	0.93	1.03	1.22	18.7
All Vehicles		4311	5.6	4311	5.6	0.882	23.8	LOS C	33.1	244.8	0.85	0.94	1.09	24.2

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).

Vehicle movement LOS values are based on average delay per movement.

Intersection and Approach LOS values are based on average delay for all vehicle movements.

Delay Model: SIDRA Standard (Geometric Delay is included).

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

* Critical Movement (Signal Timing)

Pedestrian Movement Performance											
Mov ID	Crossing	Dem. Flow	Aver Delay	Level of Service	AVERAGE BACK OF QUEUE		Prop Que	Effective Stop Rate	Travel Time	Travel Dist	Aver Speed
		ped/h	sec		[Ped ped]	[Dist m]			sec	m	m/sec
South: Stirling Hwy											
P11	Stage 1	53	24.4	LOS C	0.1	0.1	0.90	0.90	52.9	34.2	0.65
P12	Stage 2	53	24.4	LOS C	0.1	0.1	0.90	0.90	50.1	30.9	0.62
East: McCabe St											
P2	Full	53	23.5	LOS C	0.1	0.1	0.89	0.89	51.5	33.7	0.65
All Pedestrians		158	24.1	LOS C	0.1	0.1	0.90	0.90	51.5	32.9	0.64

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)

Pedestrian movement LOS values are based on average delay per pedestrian movement.

Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

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MOVEMENT SUMMARY

Site: 101 [S3-Stirling Highway/Coventry Parade_AM (Site Folder: S3-Background (2035) + Dev (Upgraded) + Sig Mods)]

Network: N101 [AM PEAK (Network Folder: Existing (2035) + Dev (Upgraded) + sig mods)]

New Site
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance														
Mov ID	Turn	DEMAND FLOWS		ARRIVAL FLOWS		Deg. Satn	Aver Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver No. Cycles	Aver Speed
		[Total veh/h	HV %	[Total HV] veh/h	%				[Veh veh	Dist m				
South: Stirling Highway (S)														
2	T1	2378	4.2	2378	4.2	0.727	0.4	LOS A	1.3	9.9	0.00	0.00	0.00	58.8
3	R2	149	0.0	149	0.0	0.391	19.1	LOS C	1.7	12.2	0.82	0.99	1.04	33.8
Approach		2527	4.0	2527	4.0	0.727	1.5	NA	1.7	12.2	0.05	0.06	0.06	55.5
East: Coventry Parade														
4	L2	1	0.0	1	0.0	0.002	9.3	LOS A	0.0	0.1	0.62	0.53	0.62	41.3
Approach		1	0.0	1	0.0	0.002	9.3	LOS A	0.0	0.1	0.62	0.53	0.62	41.3
North: Stirling Highway (N)														
7	L2	26	0.0	26	0.0	0.442	5.6	LOS A	0.0	0.0	0.00	0.02	0.00	53.7
8	T1	1626	4.1	1626	4.1	0.442	0.1	LOS A	0.0	0.0	0.00	0.01	0.00	59.5
Approach		1653	4.0	1653	4.0	0.442	0.1	NA	0.0	0.0	0.00	0.01	0.00	59.4
All Vehicles		4181	4.0	4181	4.0	0.727	1.0	NA	1.7	12.2	0.03	0.04	0.04	57.3

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).

Vehicle movement LOS values are based on average delay per movement.

Minor Road Approach LOS values are based on average delay for all vehicle movements.

NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.

Delay Model: SIDRA Standard (Geometric Delay is included).

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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MOVEMENT SUMMARY

Site: 101 [S3-McCabe St/McCabe Pl_AM (Site Folder: S3-Background (2035) + Dev (Upgraded) + Sig Mods)]

Network: N101 [AM PEAK (Network Folder: Existing (2035) + Dev (Upgraded) + sig mods)]

New Site
Site Category: (None)
Roundabout

Vehicle Movement Performance														
Mov ID	Turn	DEMAND FLOWS		ARRIVAL FLOWS		Deg. Satn	Aver Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver No. Cycles	Aver Speed
		[Total veh/h]	[HV %]	[Total veh/h]	[HV %]	W/C	sec		[Veh veh]	[Dist m]				km/h
South: McCabe Pl														
1	L2	114	0.0	114	0.0	0.361	6.4	LOS A	2.4	16.8	0.72	0.78	0.72	40.5
2	T1	21	0.0	21	0.0	0.361	6.4	LOS A	2.4	16.8	0.72	0.78	0.72	45.6
3	R2	182	0.0	182	0.0	0.361	10.9	LOS B	2.4	16.8	0.72	0.78	0.72	40.5
Approach		317	0.0	317	0.0	0.361	9.0	LOS A	2.4	16.8	0.72	0.78	0.72	41.1
East: McCabe St														
4	L2	60	0.0	60	0.0	0.408	4.0	LOS A	3.1	22.4	0.48	0.50	0.48	44.2
5	T1	356	4.6	356	4.6	0.408	4.1	LOS A	3.1	22.4	0.48	0.50	0.48	30.8
6	R2	83	0.0	83	0.0	0.408	8.4	LOS A	3.1	22.4	0.48	0.50	0.48	46.0
Approach		499	3.3	499	3.3	0.408	4.8	LOS A	3.1	22.4	0.48	0.50	0.48	38.9
North: Access														
7	L2	74	0.0	74	0.0	0.209	6.8	LOS A	1.5	10.7	0.72	0.71	0.72	40.2
8	T1	1	0.0	1	0.0	0.209	6.7	LOS A	1.5	10.7	0.72	0.71	0.72	45.4
9	R2	108	0.0	108	0.0	0.209	11.2	LOS B	1.5	10.7	0.72	0.71	0.72	40.2
Approach		183	0.0	183	0.0	0.209	9.4	LOS A	1.5	10.7	0.72	0.71	0.72	40.2
West: McCabe St														
10	L2	105	0.0	105	0.0	0.481	4.8	LOS A	3.2	24.0	0.45	0.56	0.45	44.3
11	T1	334	9.8	334	9.8	0.481	5.1	LOS A	3.2	24.0	0.45	0.56	0.45	31.7
12	R2	74	0.0	74	0.0	0.481	9.3	LOS A	3.2	24.0	0.45	0.56	0.45	46.2
Approach		513	6.4	513	6.4	0.481	5.7	LOS A	3.2	24.0	0.45	0.56	0.45	40.1
All Vehicles		1512	3.2	1512	3.2	0.481	6.5	LOS A	3.2	24.0	0.55	0.60	0.55	40.1

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).

Roundabout LOS Method: SIDRA Roundabout LOS.

Vehicle movement LOS values are based on average delay per movement.

Intersection and Approach LOS values are based on average delay for all vehicle movements.

Roundabout Capacity Model: SIDRA Standard.

Delay Model: SIDRA Standard (Geometric Delay is included).

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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MOVEMENT SUMMARY

Site: 101v [S3-McCabe St/Access 2 AM (Site Folder: S3-Background (2035) + Dev (Upgraded) + Sig Mods)]

Network: N101 [AM PEAK (Network Folder: Existing (2035) + Dev (Upgraded) + sig mods)]

New Site
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance														
Mov ID	Turn	DEMAND FLOWS		ARRIVAL FLOWS		Deg. Satn	Aver Delay	Level of Service	95% BACK-OF-QUEUE		Prop. Que	Effective Stop Rate	Aver No. Cycles	Aver Speed
		[Total veh/h	HV %	[Total HV] veh/h	%				[Veh veh	Dist m				
East: McCabe St														
11	T1	488	4.6	488	4.6	0.259	0.1	LOS A	0.2	1.1	0.04	0.01	0.04	57.5
12	R2	9	0.0	9	0.0	0.259	9.2	LOS A	0.2	1.1	0.04	0.01	0.04	56.1
Approach		498	4.5	498	4.5	0.259	0.3	NA	0.2	1.1	0.04	0.01	0.04	57.4
North: Access 2														
1	L2	8	0.0	8	0.0	0.042	8.0	LOS A	0.1	0.9	0.64	0.80	0.64	44.6
3	R2	12	0.0	12	0.0	0.042	13.5	LOS B	0.1	0.9	0.64	0.80	0.64	44.0
Approach		20	0.0	20	0.0	0.042	11.2	LOS B	0.1	0.9	0.64	0.80	0.64	44.3
West: McCabe St														
4	L2	14	0.0	14	0.0	0.310	5.5	LOS A	0.0	0.0	0.00	0.01	0.00	57.0
5	T1	575	9.8	575	9.8	0.310	0.0	LOS A	0.0	0.0	0.00	0.01	0.00	59.2
Approach		588	9.6	588	9.6	0.310	0.1	NA	0.0	0.0	0.00	0.01	0.00	59.0
All Vehicles		1106	7.1	1106	7.1	0.310	0.4	NA	0.2	1.1	0.03	0.03	0.03	57.5

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).

Vehicle movement LOS values are based on average delay per movement.

Minor Road Approach LOS values are based on average delay for all vehicle movements.

NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.

Delay Model: SIDRA Standard (Geometric Delay is included).

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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MOVEMENT SUMMARY

Site: LM00578 [S3-Stirling Highway/McCabe Street PM (Site Folder: S3-Background (2035) + Dev (Upgraded) + Sig Mods)]

Network: N101 [PM PEAK (Network Folder: Existing (2035) + Dev (Upgraded) + sig mods)]

New Site

Site Category: (None)

Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 100 seconds (Site Practical Cycle Time)

Vehicle Movement Performance														
Mov ID	Turn	DEMAND FLOWS		ARRIVAL FLOWS		Deg. Satn	Aver Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver No. Cycles	Aver Speed
		[Total veh/h]	[HV %]	[Total veh/h]	[HV %]	1/c	sec		[Veh veh]	[Dist m]				km/h
South: Stirling Hwy														
2	T1	1508	4.4	1508	4.4	0.567	5.0	LOS A	16.7	120.5	0.43	0.39	0.43	48.6
3	R2	301	2.2	301	2.2	*1.094	157.9	LOS F	29.8	214.2	1.00	1.40	2.32	3.5
Approach		1809	4.0	1809	4.0	1.094	30.5	LOS C	29.8	214.2	0.52	0.56	0.74	23.0
East: McCabe St														
4	L2	407	2.8	407	2.8	0.829	48.2	LOS D	19.5	140.7	0.92	0.92	1.09	8.7
6	R2	233	2.8	233	2.8	*1.065	133.6	LOS F	20.6	149.0	1.00	1.39	2.18	7.2
Approach		640	2.8	640	2.8	1.065	79.2	LOS E	20.6	149.0	0.95	1.09	1.49	7.7
North: Stirling Hwy														
7	L2	220	8.1	220	8.1	0.247	12.4	LOS B	4.8	41.1	0.43	0.63	0.43	31.6
8	T1	2172	4.1	2172	4.1	*1.081	129.2	LOS F	108.1	776.3	0.99	1.71	1.98	5.6
Approach		2392	4.5	2392	4.5	1.081	118.5	LOS F	108.1	776.3	0.94	1.61	1.84	5.6
All Vehicles		4841	4.1	4841	4.1	1.094	80.4	LOS F	108.1	776.3	0.78	1.15	1.38	9.2

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).

Vehicle movement LOS values are based on average delay per movement.

Intersection and Approach LOS values are based on average delay for all vehicle movements.

Delay Model: SIDRA Standard (Geometric Delay is included).

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

* Critical Movement (Signal Timing)

Pedestrian Movement Performance											
Mov ID	Crossing	Dem. Flow	Aver Delay	Level of Service	AVERAGE BACK OF QUEUE		Prop. Que	Effective Stop Rate	Travel Time	Travel Dist	Aver Speed
		ped/h	sec		[Ped ped]	[Dist m]			sec	m	m/sec
South: Stirling Hwy											
P11	Stage 1	53	44.3	LOS E	0.1	0.1	0.94	0.94	70.6	34.2	0.48
P12	Stage 2	53	44.3	LOS E	0.1	0.1	0.94	0.94	68.0	30.9	0.45
East: McCabe St											
P2	Full	53	43.3	LOS E	0.1	0.1	0.93	0.93	71.4	33.7	0.47
All Pedestrians		158	44.0	LOS E	0.1	0.1	0.94	0.94	70.0	32.9	0.47

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)

Pedestrian movement LOS values are based on average delay per pedestrian movement.

Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY

Site: 101 [S3-Stirling Highway/Coventry Parade_PM (Site Folder: S3-Background (2035) + Dev (Upgraded) + Sig Mods)]

Network: N101 [PM PEAK (Network Folder: Existing (2035) + Dev (Upgraded) + sig mods)]

New Site
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance														
Mov ID	Turn	DEMAND FLOWS		ARRIVAL FLOWS		Deq. Satn	Aver Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver No. Cycles	Aver Speed
		[Total veh/h	HV %	[Total HV] veh/h	%	v/c	sec		[Veh veh	Dist m				km/h
South: Stirling Highway (S)														
2	T1	1779	2.3	1779	2.3	0.579	0.2	LOS A	0.0	0.0	0.00	0.00	0.00	59.3
3	R2	128	0.0	128	0.0	0.819	74.6	LOS F	4.6	32.5	0.98	1.26	2.03	15.9
Approach		1907	2.1	1907	2.1	0.819	5.2	NA	4.6	32.5	0.07	0.09	0.14	47.7
East: Coventry Parade														
4	L2	9	0.0	9	0.0	0.023	17.0	LOS C	0.1	0.9	0.79	0.70	0.79	34.7
Approach		9	0.0	9	0.0	0.023	17.0	LOS C	0.1	0.9	0.79	0.70	0.79	34.7
North: Stirling Highway (N)														
7	L2	38	0.0	36	0.0	0.654	5.6	LOS A	0.0	0.0	0.00	0.02	0.00	53.6
8	T1	2614	2.2	2456	2.2	0.654	0.1	LOS A	0.0	0.0	0.00	0.01	0.00	59.1
Approach		2652	2.2	2491	2.2	0.654	0.2	NA	0.0	0.0	0.00	0.01	0.00	59.0
All Vehicles		4568	2.2	4408	2.2	0.819	2.4	NA	4.6	32.5	0.03	0.04	0.06	54.4

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).

Vehicle movement LOS values are based on average delay per movement.

Minor Road Approach LOS values are based on average delay for all vehicle movements.

NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.

Delay Model: SIDRA Standard (Geometric Delay is included).

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.

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MOVEMENT SUMMARY

Site: 101 [S3-McCabe St/McCabe Pl_PM (Site Folder: S3-Background (2035) + Dev (Upgraded) + Sig Mods)]

Network: N101 [PM PEAK (Network Folder: Existing (2035) + Dev (Upgraded) + sig mods)]

New Site
Site Category: (None)
Roundabout

Vehicle Movement Performance														
Mov ID	Turn	DEMAND FLOWS		ARRIVAL FLOWS		Deg. Satn	Aver Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver No. Cycles	Aver Speed
		[Total veh/h	HV %	[Total HV %		v/c	sec		[Veh veh	Dist m				km/h
South: McCabe Pl														
1	L2	135	0.0	135	0.0	0.471	7.9	LOS A	2.9	20.5	0.79	0.87	0.87	39.7
2	T1	33	0.0	33	0.0	0.471	7.9	LOS A	2.9	20.5	0.79	0.87	0.87	45.1
3	R2	143	0.0	143	0.0	0.471	12.4	LOS B	2.9	20.5	0.79	0.87	0.87	39.7
Approach		311	0.0	311	0.0	0.471	10.0	LOS A	2.9	20.5	0.79	0.87	0.87	40.6
East: McCabe St														
4	L2	98	0.0	98	0.0	0.663	5.3	LOS A	4.6	33.3	0.62	0.64	0.66	43.3
5	T1	354	5.6	354	5.6	0.663	5.5	LOS A	4.6	33.3	0.62	0.64	0.66	28.9
6	R2	128	0.0	128	0.0	0.663	9.8	LOS A	4.6	33.3	0.62	0.64	0.66	45.1
Approach		580	3.4	580	3.4	0.663	6.4	LOS A	4.6	33.3	0.62	0.64	0.66	39.1
North: Access														
7	L2	101	0.0	101	0.0	0.345	5.9	LOS A	1.9	13.2	0.67	0.71	0.67	40.9
8	T1	1	0.0	1	0.0	0.345	5.9	LOS A	1.9	13.2	0.67	0.71	0.67	45.8
9	R2	152	0.0	152	0.0	0.345	10.4	LOS B	1.9	13.2	0.67	0.71	0.67	40.9
Approach		254	0.0	254	0.0	0.345	8.6	LOS A	1.9	13.2	0.67	0.71	0.67	40.9
West: McCabe St														
10	L2	160	0.0	152	0.0	0.468	4.9	LOS A	3.0	22.3	0.47	0.59	0.47	44.0
11	T1	243	10.3	231	10.6	0.468	5.3	LOS A	3.0	22.3	0.47	0.59	0.47	30.9
12	R2	117	0.0	111	0.0	0.468	9.4	LOS A	3.0	22.3	0.47	0.59	0.47	45.9
Approach		520	4.8	494	5.0	0.468	6.1	LOS A	3.0	22.3	0.47	0.59	0.47	41.7
All Vehicles		1664	2.7	1638	2.7	0.663	7.3	LOS A	4.6	33.3	0.62	0.68	0.64	40.6

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).

Roundabout LOS Method: SIDRA Roundabout LOS.

Vehicle movement LOS values are based on average delay per movement.

Intersection and Approach LOS values are based on average delay for all vehicle movements.

Roundabout Capacity Model: SIDRA Standard.

Delay Model: SIDRA Standard (Geometric Delay is included).

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.

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MOVEMENT SUMMARY

Site: 101v [S3-McCabe St/Access 2 PM (Site Folder: S3-Background (2035) + Dev (Upgraded) + Sig Mods)]

Network: N101 [PM PEAK (Network Folder: Existing (2035) + Dev (Upgraded) + sig mods)]

New Site
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance														
Mov ID	Turn	DEMAND FLOWS		ARRIVAL FLOWS		Deg. Satn	Aver Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver No. Cycles	Aver Speed
		[Total veh/h	HV %	[Total HV] veh/h	%				[Veh veh	Dist In				
East: McCabe St														
11	T1	563	5.6	563	5.6	0.303	0.1	LOS A	0.2	1.6	0.04	0.02	0.05	57.2
12	R2	15	0.0	15	0.0	0.303	8.4	LOS A	0.2	1.6	0.04	0.02	0.05	56.3
Approach		578	5.5	578	5.5	0.303	0.3	NA	0.2	1.6	0.04	0.02	0.05	57.1
North: Access 2														
1	L2	12	0.0	12	0.0	0.055	7.3	LOS A	0.2	1.2	0.59	0.78	0.59	45.0
3	R2	17	0.0	17	0.0	0.055	13.1	LOS B	0.2	1.2	0.59	0.78	0.59	44.5
Approach		28	0.0	28	0.0	0.055	10.7	LOS B	0.2	1.2	0.59	0.78	0.59	44.8
West: McCabe St														
4	L2	21	0.0	21	0.0	0.251	5.5	LOS A	0.0	0.0	0.00	0.03	0.00	56.8
5	T1	466	10.3	456	10.4	0.251	0.0	LOS A	0.0	0.0	0.00	0.03	0.00	58.7
Approach		487	9.9	476 ⁽¹⁾	10.0	0.251	0.3	NA	0.0	0.0	0.00	0.03	0.00	58.5
All Vehicles		1094	7.3	1083 ⁽¹⁾	7.3	0.303	0.6	NA	0.2	1.6	0.04	0.04	0.04	56.6

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).

Vehicle movement LOS values are based on average delay per movement.

Minor Road Approach LOS values are based on average delay for all vehicle movements.

NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.

Delay Model: SIDRA Standard (Geometric Delay is included).

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.

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MOVEMENT SUMMARY

Site: LM00578 [S4A-Stirling Highway/McCabe Street_AM (Site Folder: Background (2034 sensitivity))]
 Network: N101 [AM PEAK (Network Folder: Existing (2034))]

New Site

Site Category: (None)

Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 135 seconds (Site User-Given Cycle Time)

Vehicle Movement Performance														
Mov ID	Turn	DEMAND FLOWS		ARRIVAL FLOWS		Deg. Satn	Aver Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver No. Cycles	Aver Speed
		[Total veh/h]	[HV %]	[Total veh/h]	[HV %]	v/c	sec		[Veh veh]	[Dist m]				km/h
South: Stirling Hwy (S)														
2	T1	2003	4.5	2003	4.5	0.768	5.6	LOS A	31.7	244.8	0.47	0.44	0.47	47.4
3	R2	376	2.1	376	2.1	*1.012	122.7	LOS F	32.6	244.8	1.00	1.13	1.66	12.5
Approach		2379	4.1	2379	4.1	1.012	24.1	LOS C	32.6	244.8	0.55	0.55	0.66	28.8
East: McCabe St (E)														
4	L2	272	2.3	272	2.3	0.270	21.1	LOS C	9.2	68.9	0.56	0.72	0.56	29.3
6	R2	73	2.3	73	2.3	*0.416	68.5	LOS E	4.7	35.1	0.98	0.77	0.98	19.4
Approach		344	2.3	344	2.3	0.416	31.1	LOS C	9.2	68.9	0.65	0.73	0.65	25.7
North: Stirling Hwy (N)														
7	L2	51	7.7	51	7.7	0.994	101.5	LOS F	56.2	437.5	1.00	1.25	1.46	15.7
8	T1	1163	5.0	1163	5.0	*0.994	95.6	LOS F	57.0	443.3	1.00	1.25	1.46	6.8
Approach		1214	5.1	1214	5.1	0.994	95.9	LOS F	57.0	443.3	1.00	1.25	1.46	7.2
All Vehicles		3937	4.3	3937	4.3	1.012	46.9	LOS D	57.0	443.3	0.70	0.78	0.90	17.9

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).

Vehicle movement LOS values are based on average delay per movement.

Intersection and Approach LOS values are based on average delay for all vehicle movements.

Delay Model: SIDRA Standard (Geometric Delay is included).

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

* Critical Movement (Signal Timing)

Pedestrian Movement Performance											
Mov ID	Crossing	Dem. Flow	Aver Delay	Level of Service	AVERAGE BACK OF QUEUE		Prop. Que	Effective Stop Rate	Travel Time	Travel Dist	Aver Speed
		ped/h	sec		[Ped ped]	[Dist m]			sec	m	m/sec
South: Stirling Hwy (S)											
P1	Full	53	62.7	LOS F	0.2	0.2	0.97	0.97	96.1	40.0	0.42
East: McCabe St (E)											
P2	Full	53	60.8	LOS F	0.2	0.2	0.95	0.95	86.7	33.7	0.39
All Pedestrians		105	61.8	LOS F	0.2	0.2	0.96	0.96	91.4	36.9	0.40

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)

Pedestrian movement LOS values are based on average delay per pedestrian movement.

Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

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MOVEMENT SUMMARY

Site: LM00578 [S4A-Stirling Highway/McCabe Street_PM (Site Folder: Background (2034 sensitivity))] Network: N101 [PM PEAK (Network Folder: Existing (2034))]

New Site

Site Category: (None)

Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 118 seconds (Site User-Given Cycle Time)

Vehicle Movement Performance														
Mov ID	Turn	DEMAND FLOWS		ARRIVAL FLOWS		Deg. Satn	Aver Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver No. Cycles	Aver Speed
		[Total veh/h	HV %	[Total HV] veh/h	%	v/c	sec		[Veh veh	Dist m				km/h
South: Stirling Hwy														
2	T1	1486	2.4	1486	2.4	0.541	4.3	LOS A	16.5	124.3	0.37	0.34	0.37	50.0
3	R2	243	2.2	243	2.2	*1.012	115.2	LOS F	21.5	161.6	1.00	1.16	1.80	13.1
Approach		1729	2.4	1729	2.4	1.012	19.9	LOS B	21.5	161.6	0.46	0.45	0.57	31.5
East: McCabe St														
4	L2	267	2.8	267	2.8	0.473	39.7	LOS D	12.4	93.9	0.86	0.80	0.86	21.5
6	R2	69	2.8	69	2.8	*0.379	60.0	LOS E	3.9	29.4	0.98	0.76	0.98	21.0
Approach		337	2.8	337	2.8	0.473	43.9	LOS D	12.4	93.9	0.88	0.80	0.88	21.3
North: Stirling Hwy														
7	L2	48	8.1	48	8.1	1.026	99.6	LOS F	101.8	767.3	1.00	1.37	1.55	15.8
8	T1	2133	2.1	2133	2.1	*1.026	93.8	LOS F	102.4	770.1	1.00	1.37	1.55	6.8
Approach		2181	2.2	2181	2.2	1.026	94.0	LOS F	102.4	770.1	1.00	1.37	1.55	7.1
All Vehicles		4247	2.3	4247	2.3	1.026	59.8	LOS E	102.4	770.1	0.77	0.95	1.10	13.7

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).

Vehicle movement LOS values are based on average delay per movement.

Intersection and Approach LOS values are based on average delay for all vehicle movements.

Delay Model: SIDRA Standard (Geometric Delay is included).

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

* Critical Movement (Signal Timing)

Pedestrian Movement Performance											
Mov ID	Crossing	Dem. Flow	Aver Delay	Level of Service	AVERAGE BACK OF QUEUE		Prop. Que	Effective Stop Rate	Travel Time	Travel Dist	Aver Speed
		ped/h	sec		[Ped ped	Dist m			sec	m	m/sec
South: Stirling Hwy											
P1	Full	53	54.2	LOS E	0.2	0.2	0.96	0.96	87.6	40.0	0.46
East: McCabe St											
P2	Full	53	52.3	LOS E	0.2	0.2	0.94	0.94	78.2	33.7	0.43
All Pedestrians		105	53.3	LOS E	0.2	0.2	0.95	0.95	82.9	36.9	0.44

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)

Pedestrian movement LOS values are based on average delay per pedestrian movement.

Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

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MOVEMENT SUMMARY

Site: LM00578 [S4B-Stirling Highway/McCabe Street_AM
(sensitivity with MRWA upgrades) (Site Folder: Background
(2036) (sensitivity with MRWA upgrades))]

Network: N101 [AM PEAK
(sensitivity with MRWA
upgrades) (Network Folder:
Existing (2036 sensitivity with
MRWA upgrades))]

New Site

Site Category: (None)

Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 135 seconds (Site User-Given Cycle Time)

Vehicle Movement Performance														
Mov. ID	Turn	DEMAND FLOWS		ARRIVAL FLOWS		Deg. Satn	Aver. Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[Total veh/h	HV %	[Total HV veh/h	%	V/c	sec		[Veh. veh	Dist m				km/h
South: Stirling Hwy														
2	T1	2068	6.5	2068	6.5	0.767	5.1	LOS A	31.7	244.8	0.44	0.41	0.44	48.5
3	R2	388	0.0	388	0.0	*0.988	95.0	LOS F	31.2	229.2	0.73	1.02	1.29	5.8
Approach		2457	5.5	2457	5.5	0.988	19.4	LOS B	31.7	244.8	0.48	0.51	0.57	30.1
East: McCabe St														
4	L2	272	2.3	272	2.3	0.261	21.6	LOS C	8.8	66.5	0.54	0.71	0.54	15.6
6	R2	73	2.3	73	2.3	*0.447	69.8	LOS E	4.7	35.5	0.99	0.77	0.99	12.3
Approach		344	2.3	344	2.3	0.447	31.7	LOS C	8.8	66.5	0.63	0.72	0.63	14.1
North: Stirling Hwy														
7	L2	53	7.7	53	7.7	0.128	19.7	LOS B	1.7	16.5	0.66	0.65	0.66	24.9
8	T1	1200	6.5	1200	6.5	*0.979	86.0	LOS F	52.3	403.1	0.99	1.20	1.39	7.7
Approach		1253	6.6	1253	6.6	0.979	83.2	LOS F	52.3	403.1	0.98	1.18	1.36	7.7
All Vehicles		4054	5.5	4054	5.5	0.988	40.1	LOS D	52.3	403.1	0.65	0.73	0.82	17.4

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).

Vehicle movement LOS values are based on average delay per movement.

Intersection and Approach LOS values are based on average delay for all vehicle movements.

Delay Model: SIDRA Standard (Geometric Delay is included).

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

* Critical Movement (Signal Timing)

Pedestrian Movement Performance											
Mov. ID	Crossing	Dem. Flow	Aver. Delay	Level of Service	AVERAGE BACK OF QUEUE		Prop. Que	Effective Stop Rate	Travel Time	Travel Dist	Aver. Speed
		ped/h	sec		[Ped ped	Dist m			sec	m	m/sec
South: Stirling Hwy											
P11	Stage 1	53	61.8	LOS F	0.2	0.2	0.96	0.96	88.1	34.2	0.39
P12	Stage 2	53	61.8	LOS F	0.2	0.2	0.96	0.96	85.5	30.9	0.36
East: McCabe St											
P2	Full	53	60.8	LOS F	0.2	0.2	0.95	0.95	86.7	33.7	0.39
All Pedestrians		158	61.5	LOS F	0.2	0.2	0.96	0.96	86.8	32.9	0.38

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)

Pedestrian movement LOS values are based on average delay per pedestrian movement.

Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

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Project: K:\Projects\CW1200352_304900736 City of Freo_ North Fremantle Traffic Study\5_Technical\TrafficModelling\Updated Model\SIDRA
Assessment V4 (sensitivity S4) updated distribution.slp9

MOVEMENT SUMMARY

Site: LM00578 [S4B-Stirling Highway/McCabe Street_PM
(sensitivity with MRWA upgrades) (Site Folder: Background
(2036) (sensitivity with MRWA upgrades))]

Network: N101 [PM PEAK
(sensitivity with MRWA
upgrades) (Network Folder:
Existing (2036 sensitivity with
MRWA upgrades))]

New Site

Site Category: (None)

Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 118 seconds (Site User-Given Cycle Time)

Vehicle Movement Performance														
Mov ID	Turn	DEMAND FLOWS		ARRIVAL FLOWS		Deg. Satn	Aver. Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver No. Cycles	Aver Speed
		[Total veh/h	HV %	Total HV veh/h	%	V/c	sec		[Veh. veh	Dist m				km/h
South: Stirling Hwy														
2	T1	1535	4.4	1535	4.4	0.541	3.9	LOS A	16.2	122.4	0.35	0.32	0.35	50.7
3	R2	251	2.2	251	2.2	*1.022	120.7	LOS F	22.8	171.5	1.00	1.19	1.84	4.6
Approach		1785	4.1	1785	4.1	1.022	20.3	LOS C	22.8	171.5	0.44	0.44	0.56	29.4
East: McCabe St														
4	L2	267	2.8	267	2.8	0.433	42.1	LOS D	11.9	90.0	0.82	0.79	0.82	9.8
6	R2	69	2.8	69	2.8	*0.409	61.2	LOS E	3.9	29.7	0.98	0.76	0.98	13.6
Approach		337	2.8	337	2.8	0.433	46.0	LOS D	11.9	90.0	0.86	0.79	0.86	11.0
North: Stirling Hwy														
7	L2	49	8.1	49	8.1	0.109	16.0	LOS B	2.4	24.4	0.44	0.53	0.44	29.1
8	T1	2202	4.1	2202	4.1	*1.023	90.7	LOS F	102.0	767.1	0.99	1.35	1.52	7.4
Approach		2252	4.2	2252	4.2	1.023	89.0	LOS F	102.0	767.1	0.98	1.33	1.49	7.2
All Vehicles		4374	4.0	4374	4.0	1.023	57.7	LOS E	102.0	767.1	0.75	0.93	1.06	12.4

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).

Vehicle movement LOS values are based on average delay per movement.

Intersection and Approach LOS values are based on average delay for all vehicle movements.

Delay Model: SIDRA Standard (Geometric Delay is included).

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

* Critical Movement (Signal Timing)

Pedestrian Movement Performance											
Mov ID	Crossing	Dem. Flow	Aver. Delay	Level of Service	AVERAGE BACK OF QUEUE		Prop. Que	Effective Stop Rate	Travel Time	Travel Dist	Aver. Speed
		ped/h	sec		[Ped ped	Dist m			sec	m	m/sec
South: Stirling Hwy											
P11	Stage 1	53	53.3	LOS E	0.2	0.2	0.95	0.95	79.6	34.2	0.43
P12	Stage 2	53	53.3	LOS E	0.2	0.2	0.95	0.95	77.0	30.9	0.40
East: McCabe St											
P2	Full	53	52.3	LOS E	0.2	0.2	0.94	0.94	78.2	33.7	0.43
All Pedestrians		158	53.0	LOS E	0.2	0.2	0.95	0.95	78.3	32.9	0.42

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)

Pedestrian movement LOS values are based on average delay per pedestrian movement.

Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

Organisation: CARDNO PTY LTD | Licence: NETWORK / Enterprise | Processed: Thursday, 25 August 2022 1:12:38 PM
Project: K:\Projects\CW\1200352_304900736 City of Freo_ North Fremantle Traffic Study\5_Technical\TrafficModelling\Updated Model\SIDRA
Assessment V4 (sensitivity S4) updated distribution.slp9

MOVEMENT SUMMARY

Site: LM00578 [S4C-Stirling Highway/McCabe Street_AM
(sensitivity+dev) (Site Folder: Background (2025) (sensitivity +
dev))]

Network: N101 [AM PEAK
(2025 sensitivity + dev)
(Network Folder: Existing (2025
sensitivity + dev))]

New Site

Site Category: (None)

Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 135 seconds (Site User-Given Cycle Time)

Vehicle Movement Performance														
Mov ID	Turn	DEMAND FLOWS		ARRIVAL FLOWS		Deg. Satn	Aver. Delay	Level of Service	AVERAGE BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[Total veh/h]	HV %	[Total HV veh/h]	%	V/c	Sec		[Veh. veh]	Dist m				km/h
South: Stirling Hwy (S)														
2	T1	1714	4.5	1714	4.5	0.671	5.9	LOS A	17.3	133.3	0.44	0.41	0.44	47.0
3	R2	308	2.1	308	2.1	*0.907	64.8	LOS E	12.5	93.8	0.78	0.93	1.12	19.5
Approach		2022	4.1	2022	4.1	0.907	14.9	LOS B	17.3	133.3	0.49	0.48	0.54	35.7
East: McCabe St (E)														
4	L2	388	2.3	388	2.3	0.547	24.4	LOS C	9.1	68.8	0.64	0.75	0.64	27.6
6	R2	192	2.3	192	2.3	*0.892	80.9	LOS F	8.7	65.8	1.00	0.97	1.34	17.5
Approach		580	2.3	580	2.3	0.892	43.0	LOS D	9.1	68.8	0.76	0.82	0.87	22.2
North: Stirling Hwy (N)														
7	L2	156	7.7	156	7.7	0.901	64.3	LOS E	25.1	196.0	1.00	1.02	1.18	21.2
8	T1	997	5.0	997	5.0	*0.901	58.0	LOS E	26.2	203.8	1.00	1.03	1.17	10.3
Approach		1153	5.4	1153	5.4	0.901	58.8	LOS E	26.2	203.8	1.00	1.03	1.18	12.4
All Vehicles		3755	4.2	3755	4.2	0.907	32.7	LOS C	26.2	203.8	0.69	0.70	0.79	23.2

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).

Vehicle movement LOS values are based on average delay per movement.

Intersection and Approach LOS values are based on average delay for all vehicle movements.

Delay Model: SIDRA Standard (Geometric Delay is included).

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

* Critical Movement (Signal Timing)

Pedestrian Movement Performance											
Mov ID	Crossing	Demand Flow	Aver. Delay	Level of Service	AVERAGE BACK OF QUEUE		Prop. Que	Effective Stop Rate	Travel Time	Travel Dist	Aver. Speed
		ped/h	sec		[Ped ped]	Dist m			sec	m	m/sec
South: Stirling Hwy (S)											
P1	Full	53	61.8	LOS F	0.2	0.2	0.96	0.96	95.1	40.0	0.42
East: McCabe St (E)											
P2	Full	53	60.8	LOS F	0.2	0.2	0.95	0.95	86.7	33.7	0.39
All Pedestrians		105	61.3	LOS F	0.2	0.2	0.95	0.95	90.9	36.9	0.41

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)

Pedestrian movement LOS values are based on average delay per pedestrian movement.

Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

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Organisation: CARDNO PTY LTD | Licence: NETWORK / Enterprise | Processed: Monday, 19 September 2022 12:59:38 PM
Project: K:\Projects\CW1200352_304900736 City of Freo_ North Fremantle Traffic Study\6_Technical\TrafficModelling\Updated Model\SIDRA Assessment V4 (sensitivity S4) updated distribution.sip9

MOVEMENT SUMMARY

Site: LM00578 [S4C-Stirling Highway/McCabe Street_PM (sensitivity+dev) (Site Folder: Background (2025) (sensitivity + dev))]

Network: N101 [PM PEAK (2025 sensitivity + dev) (Network Folder: Existing (2025 sensitivity + dev))]

New Site

Site Category: (None)

Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 118 seconds (Site User-Given Cycle Time)

Vehicle Movement Performance														
Mov ID	Turn	DEMAND FLOWS		ARRIVAL FLOWS		Deg. Satn	Aver. Delay	Level of Service	AVERAGE BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[Total veh/h	HV %	[Total HV veh/h	%	V/c	Sec		[Veh. veh	Dist m				km/h
South: Stirling Hwy														
2	T1	1268	2.4	1260	2.4	0.435	4.9	LOS A	7.6	57.2	0.37	0.34	0.37	48.8
3	R2	275	2.2	273	2.2	*1.061	145.7	LOS F	17.0	127.7	1.00	1.25	2.01	10.8
Approach		1543	2.4	1533	2.4	1.061	29.9	LOS C	17.0	127.7	0.48	0.50	0.66	25.6
East: McCabe St														
4	L2	409	2.8	409	2.8	0.838	46.7	LOS D	13.6	103.1	0.89	0.90	1.04	19.5
6	R2	232	2.8	232	2.8	*1.044	129.4	LOS F	13.2	99.9	1.00	1.24	1.93	12.4
Approach		641	2.8	641	2.8	1.044	76.6	LOS E	13.6	103.1	0.93	1.03	1.36	15.5
North: Stirling Hwy														
7	L2	214	8.1	214	8.1	1.054	122.4	LOS F	62.5	476.3	1.00	1.45	1.72	13.4
8	T1	1827	2.1	1827	2.1	*1.054	116.2	LOS F	64.6	485.6	1.00	1.47	1.71	5.6
Approach		2041	2.7	2041	2.7	1.054	116.9	LOS F	64.6	485.6	1.00	1.47	1.72	6.6
All Vehicles		4225	2.6	4215	2.6	1.061	79.1	LOS E	64.6	485.6	0.80	1.05	1.28	11.8

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).

Vehicle movement LOS values are based on average delay per movement.

Intersection and Approach LOS values are based on average delay for all vehicle movements.

Delay Model: SIDRA Standard (Geometric Delay is included).

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

* Critical Movement (Signal Timing)

N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.

Pedestrian Movement Performance											
Mov ID	Crossing	Dem. Flow	Aver. Delay	Level of Service	AVERAGE BACK OF QUEUE		Prop. Que	Effective Stop Rate	Travel Time	Travel Dist	Aver. Speed
		ped/h	sec		[Ped ped	Dist m			sec	m	m/sec
South: Stirling Hwy											
P1	Full	53	54.2	LOS E	0.2	0.2	0.96	0.96	87.6	40.0	0.46
East: McCabe St											
P2	Full	53	52.3	LOS E	0.2	0.2	0.94	0.94	78.2	33.7	0.43
All Pedestrians		105	53.3	LOS E	0.2	0.2	0.95	0.95	82.9	36.9	0.44

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)

Pedestrian movement LOS values are based on average delay per pedestrian movement.

Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

Organisation: CARDNO PTY LTD | Licence: NETWORK / Enterprise | Processed: Monday, 19 September 2022 12:59:44 PM
Project: K:\Projects\CW\1200352_304900736 City of Freo_ North Fremantle Traffic Study\5_Technical\TrafficModelling\Updated Model\SIDRA
Assessment V4 (sensitivity S4) updated distribution.slp9

MOVEMENT SUMMARY

Site: LM00578 [S4D-Stirling Highway/McCabe Street_AM (Dev Int Upgrades + Sig Mods) (Site Folder: Background (2032 sensitivity) + (Dev Int Upgrades + Sig Mods))]

Network: N101 [AM PEAK (Network Folder: Existing (2032 sensitivity) + Dev Int Upgrades + sig mods)]

New Site

Site Category: (None)

Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 100 seconds (Site User-Given Cycle Time)

Vehicle Movement Performance														
Mov ID	Turn	DEMAND FLOWS		ARRIVAL FLOWS		Deg. Satn	Aver. Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[Total veh/h	HV %	[Total HV veh/h	%	v/c	Sec		[Veh. veh	Dist m				km/h
South: Stirling Hwy														
2	T1	1940	6.5	1940	6.5	0.758	6.4	LOS A	28.9	213.3	0.54	0.50	0.54	46.3
3	R2	338	0.0	338	0.0	*0.880	48.7	LOS D	16.7	117.0	0.82	0.94	1.15	10.3
Approach		2278	5.5	2278	5.5	0.880	12.6	LOS B	28.9	213.3	0.58	0.57	0.63	36.5
East: McCabe St														
4	L2	388	2.3	388	2.3	0.409	21.9	LOS C	11.4	82.3	0.65	0.75	0.65	15.5
6	R2	192	2.3	192	2.3	*0.874	61.6	LOS E	10.7	76.7	1.00	1.00	1.39	13.6
Approach		580	2.3	580	2.3	0.874	35.0	LOS D	11.4	82.3	0.77	0.84	0.90	14.4
North: Stirling Hwy														
7	L2	161	7.7	161	7.7	0.205	12.4	LOS B	3.2	26.1	0.53	0.67	0.53	31.5
8	T1	1128	6.5	1128	6.5	*0.885	44.6	LOS D	30.3	223.4	0.99	1.05	1.21	13.1
Approach		1289	6.6	1289	6.6	0.885	40.6	LOS D	30.3	223.4	0.93	1.00	1.12	13.9
All Vehicles		4147	5.4	4147	5.4	0.885	24.5	LOS C	30.3	223.4	0.72	0.74	0.82	23.8

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).

Vehicle movement LOS values are based on average delay per movement.

Intersection and Approach LOS values are based on average delay for all vehicle movements.

Delay Model: SIDRA Standard (Geometric Delay is included).

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

* Critical Movement (Signal Timing)

Pedestrian Movement Performance											
Mov ID	Crossing	Demand Flow	Aver. Delay	Level of Service	AVERAGE BACK OF QUEUE		Prop. Que	Effective Stop Rate	Travel Time	Travel Dist	Aver. Speed
		ped/h	sec		[Ped ped	Dist m			sec	m	m/sec
South: Stirling Hwy											
P11	Stage 1	53	44.3	LOS E	0.1	0.1	0.94	0.94	70.6	34.2	0.48
P12	Stage 2	53	44.3	LOS E	0.1	0.1	0.94	0.94	68.0	30.9	0.45
East: McCabe St											
P2	Full	53	43.3	LOS E	0.1	0.1	0.93	0.93	69.3	33.7	0.49
All Pedestrians		158	44.0	LOS E	0.1	0.1	0.94	0.94	69.3	32.9	0.48

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)

Pedestrian movement LOS values are based on average delay per pedestrian movement.

Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY

Site: LM00578 [S4D-Stirling Highway/McCabe Street_PM (Dev Int Upgrades + Sig Mods) (Site Folder: Background (2032 sensitivity) + (Dev Int Upgrades + Sig Mods))]
Network: N101 [PM PEAK (Network Folder: Existing (2032 sensitivity) + Dev Int Upgrades + sig mods)]

New Site

Site Category: (None)

Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 90 seconds (Site Practical Cycle Time)

Vehicle Movement Performance														
Mov ID	Turn	DEMAND FLOWS		ARRIVAL FLOWS		Deg. Satn	Aver. Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[Total veh/h]	[HV %]	[Total HV]	[%]	V/c	Sec		[Veh. veh]	[Dist m]				km/h
South: Stirling Hwy														
2	T1	1436	4.4	1436	4.4	0.499	4.9	LOS A	12.6	90.4	0.43	0.39	0.43	48.8
3	R2	294	2.2	294	2.2	*1.024	103.6	LOS F	21.7	155.9	1.00	1.27	2.01	5.3
Approach		1729	4.0	1729	4.0	1.024	21.7	LOS C	21.7	155.9	0.53	0.54	0.70	28.2
East: McCabe St														
4	L2	409	2.8	409	2.8	0.779	41.4	LOS D	16.8	121.3	0.92	0.89	1.02	10.1
6	R2	232	2.8	232	2.8	*1.041	111.8	LOS F	17.7	128.2	1.00	1.37	2.15	8.4
Approach		641	2.8	641	2.8	1.041	66.8	LOS E	17.7	128.2	0.95	1.06	1.43	9.0
North: Stirling Hwy														
7	L2	219	8.1	219	8.1	0.241	11.1	LOS B	4.2	35.5	0.42	0.60	0.42	33.3
8	T1	2068	4.1	2068	4.1	*1.039	96.1	LOS F	84.5	606.9	0.99	1.57	1.81	7.1
Approach		2287	4.5	2287	4.5	1.039	87.9	LOS F	84.5	606.9	0.93	1.47	1.67	7.3
All Vehicles		4658	4.1	4658	4.1	1.041	60.4	LOS E	84.5	606.9	0.79	1.07	1.28	11.8

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).

Vehicle movement LOS values are based on average delay per movement.

Intersection and Approach LOS values are based on average delay for all vehicle movements.

Delay Model: SIDRA Standard (Geometric Delay is included).

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

* Critical Movement (Signal Timing)

Pedestrian Movement Performance											
Mov ID	Crossing	Demand Flow	Aver. Delay	Level of Service	AVERAGE BACK OF QUEUE		Prop. Que	Effective Stop Rate	Travel Time	Travel Dist	Aver. Speed
		ped/h	sec		[Ped ped]	[Dist m]			sec	m	m/sec
South: Stirling Hwy											
P11	Stage 1	53	39.3	LOS D	0.1	0.1	0.94	0.94	65.6	34.2	0.52
P12	Stage 2	53	39.3	LOS D	0.1	0.1	0.94	0.94	63.1	30.9	0.49
East: McCabe St											
P2	Full	53	38.4	LOS D	0.1	0.1	0.92	0.92	64.3	33.7	0.52
All Pedestrians		158	39.0	LOS D	0.1	0.1	0.93	0.93	64.3	32.9	0.51

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)

Pedestrian movement LOS values are based on average delay per pedestrian movement.

Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY

Site: LM00578 [S4E-Stirling Highway/McCabe Street_AM (Dev Int Upgrades + Sig Mods + double right) (Site Folder: Background (2036 sensitivity) + (Dev Int Upgrades + Sig Mods + double right))]
Network: N101 [AM PEAK - Copy (Network Folder: Existing (2036 sensitivity) + Dev Int Upgrades + sig mods + double right)]

New Site

Site Category: (None)

Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 100 seconds (Site User-Given Cycle Time)

Vehicle Movement Performance														
Mov ID	Turn	DEMAND FLOWS		ARRIVAL FLOWS		Deg. Satn	Aver. Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver No. Cycles	Aver Speed
		[Total veh/h	HV %	[Total HV veh/h	%				[Veh. veh	Dist m				
South: Stirling Hwy														
2	T1	2069	6.5	2069	6.5	*0.757	7.7	LOS A	29.3	216.4	0.60	0.56	0.60	44.2
3	R2	355	0.0	355	0.0	0.661	44.6	LOS D	11.8	82.8	0.95	0.82	0.95	11.1
Approach		2424	5.5	2424	5.5	0.757	13.1	LOS B	29.3	216.4	0.65	0.60	0.66	36.1
East: McCabe St														
4	L2	388	2.3	388	2.3	0.583	32.8	LOS C	14.9	107.4	0.84	0.82	0.84	11.3
6	R2	193	2.3	193	2.3	*0.753	53.2	LOS D	9.8	70.1	1.00	0.89	1.14	15.2
Approach		581	2.3	581	2.3	0.753	39.6	LOS D	14.9	107.4	0.89	0.84	0.94	13.2
North: Stirling Hwy														
7	L2	165	7.7	165	7.7	0.177	11.6	LOS B	3.2	26.6	0.41	0.62	0.41	33.2
8	T1	1203	6.5	1203	6.5	0.662	21.6	LOS C	22.0	162.6	0.82	0.74	0.82	21.9
Approach		1368	6.6	1368	6.6	0.662	20.4	LOS C	22.0	162.6	0.77	0.72	0.77	22.8
All Vehicles		4374	5.5	4374	5.5	0.757	18.9	LOS B	29.3	216.4	0.72	0.67	0.73	27.8

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).

Vehicle movement LOS values are based on average delay per movement.

Intersection and Approach LOS values are based on average delay for all vehicle movements.

Delay Model: SIDRA Standard (Geometric Delay is included).

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

* Critical Movement (Signal Timing)

Pedestrian Movement Performance											
Mov ID	Crossing	Dem. Flow	Aver. Delay	Level of Service	AVERAGE BACK-OF-QUEUE		Prop. Que	Effective Stop Rate	Travel Time	Travel Dist	Ave. Speed
		ped/h	sec		[Ped ped	Dist] m			sec	m	m/sec
South: Stirling Hwy											
P11	Stage 1	53	44.3	LOS E	0.1	0.1	0.94	0.94	73.1	37.5	0.51
P12	Stage 2	53	44.3	LOS E	0.1	0.1	0.94	0.94	68.0	30.9	0.45
East: McCabe St											
P2	Full	53	43.3	LOS E	0.1	0.1	0.93	0.93	71.8	37.0	0.52
All Pedestrians		158	44.0	LOS E	0.1	0.1	0.94	0.94	71.0	35.1	0.49

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)

Pedestrian movement LOS values are based on average delay per pedestrian movement.

Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

Organisation: CARDNO PTY LTD | Licence: NETWORK / Enterprise | Processed: Monday, 19 September 2022 1:10:14 PM
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Assessment V4 (sensitivity S4) updated distribution.slp9

MOVEMENT SUMMARY

Site: LM00578 [S4E-Stirling Highway/McCabe Street_PM (Dev Int Upgrades + Sig Mods + double right) (Site Folder: Background (2036 sensitivity) + (Dev Int Upgrades + Sig Mods + double right))]
Network: N101 [PM PEAK - Copy (Network Folder: Existing (2036 sensitivity) + Dev Int Upgrades + sig mods + double right)]

New Site

Site Category: (None)

Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 90 seconds (Site Practical Cycle Time)

Vehicle Movement Performance														
Mov ID	Turn	DEMAND FLOWS		ARRIVAL FLOWS		Deg. Satn	Aver. Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver No. Cycles	Aver Speed
		[Total veh/h]	HV %	[Total HV veh/h]	%	V/c	sec		[Veh. veh]	[Dist m]				km/h
South: Stirling Hwy														
2	T1	1532	4.4	1532	4.4	0.557	5.6	LOS A	15.3	110.3	0.47	0.43	0.47	47.7
3	R2	304	2.2	304	2.2	*0.989	74.0	LOS E	14.2	101.8	0.99	1.08	1.62	7.2
Approach		1836	4.0	1836	4.0	0.989	16.9	LOS B	15.3	110.3	0.56	0.54	0.66	32.2
East: McCabe St														
4	L2	409	2.8	409	2.8	0.874	53.3	LOS D	19.8	143.1	0.96	0.99	1.25	8.1
6	R2	235	2.8	235	2.8	*0.967	74.4	LOS E	14.2	102.6	1.00	1.20	1.75	11.8
Approach		644	2.8	644	2.8	0.967	61.0	LOS E	19.8	143.1	0.98	1.06	1.43	10.0
North: Stirling Hwy														
7	L2	222	8.1	222	8.1	0.236	10.4	LOS B	3.8	32.4	0.39	0.59	0.39	35.1
8	T1	2206	4.1	2206	4.1	*1.045	99.0	LOS F	92.7	665.2	0.99	1.59	1.83	7.1
Approach		2428	4.5	2428	4.5	1.045	90.9	LOS F	92.7	665.2	0.93	1.50	1.70	7.2
All Vehicles		4908	4.1	4908	4.1	1.045	59.3	LOS E	92.7	665.2	0.80	1.08	1.28	12.1

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).

Vehicle movement LOS values are based on average delay per movement.

Intersection and Approach LOS values are based on average delay for all vehicle movements.

Delay Model: SIDRA Standard (Geometric Delay is included).

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

* Critical Movement (Signal Timing)

Pedestrian Movement Performance											
Mov ID	Crossing	Dem. Flow	Aver. Delay	Level of Service	AVERAGE BACK OF QUEUE		Prop. Que	Effective Stop Rate	Travel Time	Travel Dist	Aver. Speed
		ped/h	sec		[Ped ped]	[Dist m]			sec	m	m/sec
South: Stirling Hwy											
P11	Stage 1	53	39.3	LOS D	0.1	0.1	0.94	0.94	68.1	37.5	0.55
P12	Stage 2	53	39.3	LOS D	0.1	0.1	0.94	0.94	63.1	30.9	0.49
East: McCabe St											
P2	Full	53	38.4	LOS D	0.1	0.1	0.92	0.92	66.8	37.0	0.55
All Pedestrians		158	39.0	LOS D	0.1	0.1	0.93	0.93	66.0	35.1	0.53

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)

Pedestrian movement LOS values are based on average delay per pedestrian movement.

Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

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Assessment V4 (sensitivity S4) updated distribution.slp9

APPENDIX

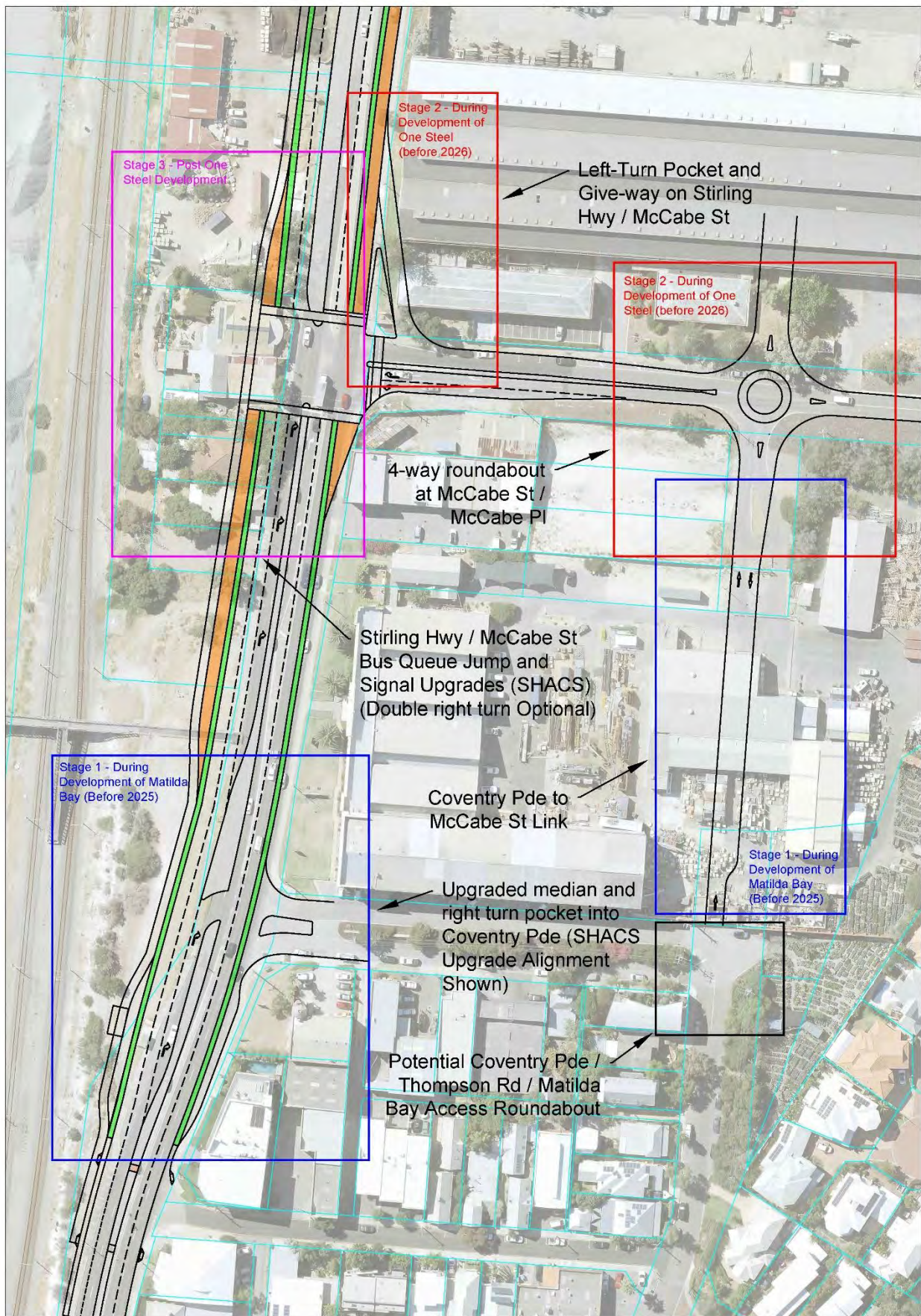
B

PHASING DIAGRAM FOR ACCESS AND
INTERSECTION UPGRADES



now





Stage 1 - During
Development of Matilda
Bay (Before 2025)

Upgraded median and
right turn pocket into
Coventry Pde (existing
road layout alignment)

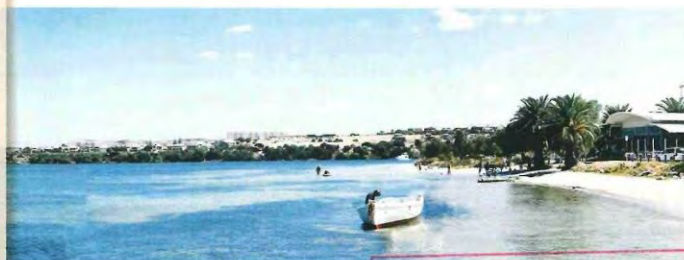
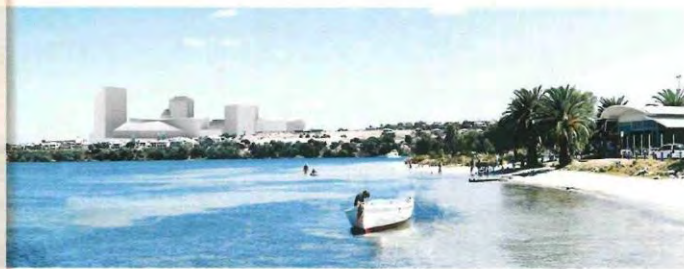
McCabe Street Height Study

Final Report

Prepared for:

City of Fremantle

May 2008



Scenic Spectrums Pty Ltd

Geo-Environmental • Planning • Design • Visual • Tourism • Research • Development

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McCABE STREET HEIGHT STUDY

Prepared for:
City of Fremantle

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May 2008**

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Executive Summary

Background

The McCabe Street Height Study has been commissioned by the City of Fremantle in order to determine the most appropriate height and bulk of new development on a number of potential redevelopment sites within and adjacent to Development Area 18 (DA18) in the McCabe Street area of North Fremantle. The potential development area includes a number of individual property allotments that make up what have been identified as six separate sites for the purposes of this study, as indicated in Figure 1 and including:

1. the East Leighton Road Site (133-141 Stirling Highway, MRS Reserve-East Leighton, between the Port of Fremantle Railway Line and the Stirling Highway, just west of McCabe Street; public land identified for potential redevelopment by the Minister for Planning);
2. the former One Steel Site (140 Stirling Highway, at the northeast corner of the Stirling Highway and McCabe Street, currently owned by the SAS Global Property Group Pty Ltd);
3. the former Tasker Site (9-15 McCabe Street, just east of the One Steel Site on the north side of McCabe Street, combining three allotments owned by McCabe Street Joint Venture, a consortium of land owners);
4. the Bertram Site (17-19 McCabe Street, just east of the Tasker Site on the north side of McCabe Street, multiple allotments and owners – the Bertram name is used generically in this case);
5. the former Matilda Bay Brewery Site (130 Stirling Highway, currently occupied by Foster's Brewery on the corner of the Stirling Highway and Coventry Pde. and extending eastward to the Foundry Court Residential Area and northward to the south side of McCabe Street, opposite the One Steel and the Tasker Sites; again, this area consists of multiple land titles, currently owned by Jamac Properties Pty Ltd);
6. the Magnetic Corner Site (132-138 Stirling Highway on the corner of the Stirling Highway and McCabe Street, where Magnetic Auto Electrics and other mixed use businesses exist adjacent to the former Matilda Bay Brewery Site on the south side of McCabe Street, opposite the former One Steel Site; multiple allotments owned by various landholders).

The McCabe Street area is located adjacent to the boundary between the municipalities of the City of Fremantle and the Town of Mosman Park and is separated from the Leighton Beach by the railway line and Curtin Avenue. The area is located in a relatively prominent position on a secondary ridgeline just southwest of Buckland Hill in Mosman Park. Many residents of North Fremantle, Mosman Park and elsewhere in the vicinity have demonstrated their sensitivity to and opposition to higher density development that may involve buildings higher than 2-4 storeys.

Study Aims and Objectives

The aims and objectives of the study are to:

1. Investigate and identify key contextual considerations in the physical environment that should be taken into account in assessing the appropriateness of the scale (in particular height and bulk) of the proposed new buildings in the study area, for example topographical features, important views from the public domain, features of cultural heritage significance and existing residential amenity (privacy, overshadowing, etc.);

2. Consider the potential impact of different development scenarios in terms of building height upon the considerations identified above;
3. Make recommendations on the most appropriate maximum heights for new buildings within the study area, having regard to the considerations referred to above and to relevant adopted State and local government planning and urban design policies.

Method of Assessment

The method of assessment applied involved the selection of ten key representative public and private viewpoints in the landscape surrounding the subject development sites, photograph the existing views from these viewpoints, prepare 3D models and photomontages of three structure plan (building development) scenarios, and assess the visual results of the photomontages for each of the three scenarios against a set of Visual Performance Standards (guidelines). The Bertram Site was left unchanged due to the owners having no future redevelopment intentions.

Based on an analysis of the existing landscape and viewing context of the McCabe Street project area and existing Local and State planning strategies, policies and guidelines, Visual Performance Standards or guidelines/assessment factors regarding issues of visual amenity, views, building heights and mass have included the following:

- Landscape Character
- Scenic Quality
- Scenic Integrity
- Coastal Height Policy
- Horizon and Panoramic Views
- Views to Key Landscape Features
- Overlooking into Neighboring Properties
- Overshadowing onto Neighboring Properties
- Cumulative Visual Effects.

Exterior treatments in terms of the use of colours that are complementary and harmonious with the surrounding landscape, the avoidance or minimisation of reflective surfaces and other architectural/urban design considerations regarding building setbacks, articulation, style, materials and site landscaping would normally also be included among key assessment factors, however, in this case, such details are not yet proposed for all development sites in the project area. Hence the focus has been on how the aspects of building locations, heights and mass may affect the key factors noted above.

The three potential development scenarios have been developed based on an iterative process from one to another in which building footprints, heights and configurations have been adjusted to reveal different potential desirable and undesirable visual effects. The three scenarios are generally described as follows:

1. **Scenario No. 1:** based on current development proposals by land owners of the One Steel and Tasker sites, plus hypothetical potential building development on the Matilda Bay, Corner and East Leighton sites, with no change to the Bertram sites east of Taskers. The Matilda Bay site includes a larger footprint apartment building with 12 levels of accommodation, the Taskers Site includes 7 medium to low-rise apartment buildings and townhouses, the Matilda Bay Site includes 3 larger buildings and the Leighton Site includes two medium-sized apartment buildings, each with five levels.
2. **Scenario No. 2:** based on a decrease in total ground floor footprint areas as a proportion of overall allotment sizes compared to Scenario 1, while generally increasing building heights, including the introduction of three high-rise towers with 15, 22 and 23 levels of accommodation, respectively. Key view corridors representing angles of view from residential areas to the north and from Mt. Lyell Lookout have been used as a general guide to partially retain views to the Indian Ocean.

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May 2008
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3. **Scenario No. 3:** based on an overall decrease in building heights, with buildings fronting the Stirling Highway and McCabe Street not exceeding four levels (plus roof) and buildings internally within the sites not exceeding 2-3 levels (plus roof). This scenario allows for medium to high density townhouse and multi-dwelling residential development with higher footprint densities than Scenarios 1 and 2.

It is emphasised that neither Scenic Spectrums nor Fremantle Council advocate any of the three scenarios as a final solution in terms of the potential redevelopment of the study area. However, the three scenarios provide useful information that may lead to the establishment of certain principles and guidelines that can be applied to potential development plans to maintain and enhance visual and landscape character values for the area.

Comparative Summary of Assessment Results

A summary comparison of the visual assessments of the three development scenarios analysed reveals the following key points:

1. Scenario 1:

- reflects existing development proposals for two of the development sites and hypothetical development layouts for the other three assessed.
- building heights range from 9 m on the Corner Site to over 65 m on the One Steel Site.
- Total Footprint to Site Ratios range from approximately 30 % (0.300) on the East Leighton Site to just over 50% (0.514) on the Corner Site (refer to Table 4).
- Gross Plot Ratios Range from just over 100% (1.027) on the Corner Site to nearly 230% (2.279) on the Matilda Bay Site (with the One Steel Site not far behind at 1.969 – refer to Table 4).
- significant potential adverse visual effects to Landscape Character, Scenic Integrity, Scenic Quality, Horizon and Panoramic Views, Key Landscape Features, Overlooking, Overshadowing and its Cumulative Effect. The overall height, massing and orientation of buildings could create a visually dominant mass that blocks views to key features without significant positive visual benefits to outweigh the negative visual effects for the community in the wider visual catchment and in particular for residents in established adjacent residential properties. Buildings MB2 and MB3 in the Matilda Bay Site would be within the 300 m setback of the State Coastal Policy 2.6 and at 8 storeys could exceed the policy guidelines, depending on potential variations under the Local Planning Scheme.
- in terms of internal site design and amenity, the One Steel Site proposal potentially offers the most beneficial structure plan in its appearance and likely visual/landscape amenity opportunities for prospective residents and for the surrounding neighborhood. Tasker Site and Matilda Bay site designs potentially offer the least visual/landscape amenity opportunities for future residents and neighbors, while the Corner Site and the Leighton Site would be only average to low in this respect.
- the OS2 building of the One Steel Site does offer a potential landmark quality to enhance the Buckland Hill Ridgeline, but this would be understated compared to those of Scenario 2;
- the Leighton Site development design would potentially create an "urban canyon" effect along the Stirling Highway.

2. Scenario 2:

- reflects hypothetical development proposals for five of the development sites assessed.
- building heights range from 5 m on the East Leighton Site to over 93m on the Matilda Bay Site. High-rise towers occur on three different sites: Matilda Bay – MB2 tower to 100 m AHD with 22 levels; One Steel – OS2 tower to 97 m AHD – 23 levels; Tasker – TS1 tower to 79 m AHD – with 15 levels.
- Total Footprint to Site Ratios range from approximately 17 % (0.169) on the East Leighton Site to just over 40% (0.402) on the One Steel Site, with Matilda Bay Site not far behind on 386% (0.386) (refer to Table 6).
- Gross Plot Ratios Range from nearly 17 % (0.169) on the Leighton Site to just under 380% (3.795) on the Matilda Bay Site – refer to Table 7).
- significant potential adverse visual effects in relation to Landscape Character (high contrast in concentration/density of built forms), Scenic Integrity (heavily modified – dominant alterations), Scenic Quality (depending on perceptions – much closer to achieving objectives than Scenario 1), Horizon and Panoramic Views (when viewed from Viewpoints 4, 5, 7, 12, and 18), Overlooking (particularly into Riversea View properties from the Tasker Site), and its Cumulative Effect (in terms of mass of lower portion of built forms as viewed from the south and southeast and from the northwest). The overall height, massing and orientation of buildings in Scenario 2 is such that it could potentially appear as a visually dominant mass of built form, particularly as viewed from southeastern, northwestern and some northern viewpoints. Buildings MB2 of the Matilda Bay Site and OS2 of the One Steele Site would be within the 300 m setback of the State Coastal Policy 2.6 and at 22 to 23 storeys could exceed the policy guidelines, depending on potential variations under the Local Planning Scheme.
- significant positive beneficial visual effects in relation to Landscape Character (creating much more visually interesting urban form with 3 potential landmark buildings, attractive streetscapes with generous setbacks and visual breaks and views to key features between upper built forms), Scenic Integrity (positive counterpoint to dominant alteration, visually exciting and more open), Scenic Quality (improvement over existing Low Scenic Quality and to overall building mass could potentially result in Moderate Scenic Quality over time, depending on changes in community perceptions), Horizon and Panoramic Views (objectives achieved when viewed from Viewpoints 3, 8, 9, 14 and probably 20), Key Landscape Features (views to key features well maintained, industrial look of Buckland Hill improved in views from south by landmark treatment), Overlooking (could be mitigated through architectural design and vegetative screening), Overshadowing (objectives met), Cumulative Effect (reasonably tight development, visual breaks allow for important view corridors and reduce upper mass, McCabe St. corridor and views very positive, performance standards achieve from most viewpoints).
- in terms of internal site design and amenity all five sites in Scenario 2 potentially offer very beneficial plans in terms of their appearance and visual/landscape amenity opportunities for prospective residents and for the surrounding neighborhood. The MB4 building presents the only major issue in terms of its overall horizontal mass in relation to adjacent residences and views from the Swan River corridor, however, it effectively utilises and awkwardly shaped space and steps down in a visually sensitive manner from upper levels along McCabe Street to its interface with existing residential areas below.
- the MB2, OS2 and TS1 buildings offer more exciting landmark qualities to enhance the Buckland Hill Ridgeline,

- development design suggested for the Leighton, Corner and One Steel sites could create an attractive open park-like appearance to the intersection of the Stirling Highway and McCabe Street, providing enhanced views and compatibility in relation to Fremantle Foreshore and the pedestrian railway bridge. It would also be an attractive gateway to the DA18 development area and to residential areas further east on McCabe Street.

3. Scenario 3:

- reflects hypothetical development proposals for five of the development sites assessed.
- building heights range from 7 m on the Tasker Site to 14 m -15 m on all five sites.
- Total Footprint to Site Ratios range from 427 % (0.427) on the Matilda Bay Site to 514% on the One Steel Site, however the Corner Site would have the highest ratio, with 830% (0.830) on (refer to Table 9).
- Gross Plot Ratios Range from approximately 140% (1.387) on the Tasker Site to about 300% (3.012) on the Corner Site (refer to Table 9).
- Horizon and Panorama (moderate issue as seen from Viewpoints 12 and 18 along Swan River, but may be alleviated by tree planting), Overlooking and Overshadowing (MB4 and MB6 buildings may need to have greater setbacks from the property boundary), Cumulative Effects (guidelines not achieved due to visual overlapping of the buildings, but the low profile of all of the buildings greatly reduces the importance of this guideline, as most of the existing views are retained from exterior viewpoints).
- significant positive beneficial visual effects in relation to Landscape Character (change in function and appearance, but essentially retaining existing views and existing skyline profile of Buckland Hill Ridgeline as seen from off-site viewpoints), Scenic Integrity and Scenic Quality objectives would be achieved (moderate alteration and Moderate Scenic Quality), Horizon and Panorama (objectives achieved from all viewpoints except Viewpoints 12 and 18), Key Landscape Features, (views to all desired features are well maintained), Overlooking (guideline generally achieved but MB4 and MB6 would require greater setbacks), Overshadowing (objectives achieved).
- development designs suggested for the Leighton Site would potentially create an attractive open park-like appearance at the intersection of the Stirling Highway and McCabe Street, providing enhanced views and compatibility in relation to Fremantle Foreshore and the pedestrian railway bridge. However, compared to Scenario 2, this effect could be considerably reduced by the requirement to provide adequate car parking areas for the townhouses/offices developed, unless that parking is provided under the buildings.
- the internal site design and amenity of the five sites in Scenario 3 would be considerably reduced as compared with Scenario 2. Enhancement through landscaping and tree planting is certainly possible, but the areas are quite crowded with buildings to the point where car parking would either have to be provided under the buildings or the overall size of buildings would have to be reduced. Amenity benefits to residents of the new development and to existing residents in the surrounding community would be relatively low.
- many of the adverse visual effects of Scenario 3 could potentially be overcome if standard single dwelling residential allotments were to be developed rather than with multi-dwelling residential. Although such a scenario has not been modeled and developed into photomontages, the result of Scenario 3 would indicate that standard two-storey housing would have as many or more visual benefits as 3-4 level multi-dwelling townhouses and apartment buildings, but would result in greater internal and public streetscape visual/landscape benefits than would multi-dwelling development.

Concluding Remarks

The visual assessment of the three structure plan or development scenarios for Development Area 18 has provided comparisons of the visual effects of each scenario in terms of a range of Visual Performance Standards (guidelines) and from ten different viewpoints in the surrounding landscape, representative of a range of private residential and public vantage points.

The results quite clearly indicated that of the three scenarios analysed, Scenario 1, which incorporates the current structure plan proposals for the One Steel Site and the Tasker Site, would be the least desirable outcome from the standpoint of visual effects and overlooking.

Scenario 2 overcomes many of the drawbacks of Scenario 1 through the utilization of three high-rise towers that assist in greatly reducing the overall density of building footprints on the site and increasing the openness and landscape amenity of the sites internally as well as in the public domain. Scenario 2 offers significant streetscape amenity advantages and also protects most existing views to key landscape features, as well as creates new views and connectivity between the DA18 area and Leighton Foreshore. Scenario 2 offers the potential for a visually interesting and exciting structure plan; however, the dramatic change in building heights within the surrounding low-rise residential neighborhoods would present a complete change in landscape character to the local neighborhoods and the broader landscape, as well as potentially greater overshadowing effects.

Scenario 3 satisfies more of the Visual Performance Standards than do Scenarios 1 and 2 by keeping most built forms within the current skyline profile of the area and by almost completely maintaining most existing views to key landscape features. Scenario 3 also minimises potential problems with overlooking and overshadowing of adjacent residential properties. However, Scenario 3 would result in higher overall density of building footprints than would Scenario 1 or Scenario 2. This would not only potentially place a squeeze on the site for car parking space (most likely requiring underground parking), but would greatly reduce the internal visual/landscape amenity of each of the five development sites assessed. In addition, Scenario 3 would not likely be the most detrimental scenario to public streetscape amenity along McCabe Street or the Stirling Highway. Some new views and connectivity would be created between DA18 and Leighton Foreshore, however, this would be diminished compared to Scenario 2.

As it stands, both Scenario 2 and Scenario 3 offer many positive benefits worth further consideration and both offer potential adverse visual and amenity affects that may require caution and design improvements. Here, it is obvious that Scenario 3 would probably best satisfy what appears to be the dominant community opinion regarding the maintenance of low building heights and the retention of views. However, the Scenario 3 approach would also create the much higher footprint density described above, which adds little to the internal amenity of the sites for those who may live there and which creates little other streetscape or public open space benefits in the area. Due to this anomaly, Scenic Spectrums does not make a recommendation as to whether Scenario 2 or Scenario 3 would be preferable. We can only state relatively categorically that Scenario 1 would not produce an overall desirable result.

Two additional observations are made:

1. The series of photomontages produced would provide an excellent opportunity to further explore public perceptions regarding the alternative structure plan scenarios in a much more objective way than the usual method of simply reviewing public submissions, which the content of which is usually highly unstructured, often quite emotional and sometimes politically driven. A scenic perception survey could be established in a manner that tests representative community groups according to their locality of residence as well as by set socio-economic characteristics. Such a test could solicit responses from existing residents in surrounding neighborhoods, as well as from people who might represent typical prospective residents of the development area. Questions would be posed and analysed using objective formats and procedures. People would be reacting to a combination of plans and visual images from known vantage points. Photomontages from all three scenarios could be assessed. Ratings of perceived scenic quality, acceptability of alteration and other visual factors, as well as descriptive, qualitative

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responses, could be gathered. This would provide Council with a more objective basis for decision making, while also providing valuable insights regarding potential future projects in other areas.

2. It has been mentioned in this report that Perth metropolitan residents generally appear to be more averse to high-rise development than perhaps residents in the cities of Melbourne and Sydney. Although it may be true that as communities become more used to having high-rise developments and a "bigger city look", it should also be noted that most high-rise development in Melbourne and Sydney is likely to be built within existing CBD areas or within larger industrial areas that are undergoing redevelopment to commercial/residential precincts (e.g., Melbourne's Docklands Precinct), while very few if any such developments would be located in smaller industrial areas sandwiched between relatively recent up-market single dwelling residential areas (as is the case for DA18 and the surrounding project area).

Recommendations

Given the results of this investigation, Scenario 3 would most likely meet the approval of adjacent residents and satisfy other established strategic policies and planning/design guidelines for the general area. Scenic Spectrums would encourage Council, however, to give full consideration to the positive and negative implications of Scenario 2, Scenario 3 and an additional Scenario 4, which could consist entirely of two-storey single dwelling and/or mixed residential allotments (dual occupancy, multi-dwelling or lower-scale townhouses and apartments). Although Scenario 4 has not been modeled in this investigation, it is clear that it would have all the positive visual benefits of Scenario 3, while it would be likely to have greater internal and public streetscape visual/landscape amenity than Scenario 3.

McCABE STREET HEIGHT STUDY

Prepared for:
City of Fremantle

By:
Scenic Spectrums Pty Ltd

1 INTRODUCTION

1.1 Study Aims and Objectives

The McCabe Street Height Study has been commissioned by the City of Fremantle in order to determine the most appropriate height and bulk of new development on a number of potential redevelopment sites in the McCabe Street area of North Fremantle. The potential development area includes a number of individual property allotments that make up what have been identified as six separate sites for the purposes of this study, as indicated in Figure 1 and including:

1. the East Leighton Road Site (133-141 Stirling Highway, MRS Reserve-East Leighton, between the Port of Fremantle Railway Line and the Stirling Highway, just west of McCabe Street; public land identified for potential redevelopment by the Minister for Planning);
2. the former One Steel Site (140 Stirling Highway, at the northeast corner of the Stirling Highway and McCabe Street, currently owned by the SAS Global Property Group Pty Ltd);
3. the former Tasker Site (9-15 McCabe Street, just east of the One Steel Site on the north side of McCabe Street, combining three allotments owned by a consortium of land owners);
4. the Bertram Site (17-19 McCabe Street, just east of the Tasker Site on the north side of McCabe Street, multiple allotments and owners – the Bertram name is used generically in this case);
5. the former Matilda Bay Brewery Site (130 Stirling Highway, currently occupied by Foster's Brewery on the corner of the Stirling Highway and Coventry Pde and extending eastward to the Foundry Court Residential Area and northward to the south side of McCabe Street, opposite the One Steel and the Tasker Sites; again, this area consists of multiple land titles, currently owned by Jamac Properties Pty Ltd);
6. the Magnetic Corner Site (132- 138 Stirling Highway on the corner of the Stirling Highway and McCabe Street, where Magnetic Auto Electrics and other mixed use businesses exist adjacent to the former Matilda Bay Brewery Site on the south side of McCabe Street, opposite the former One Steel Site; multiple allotments owned by various owners).

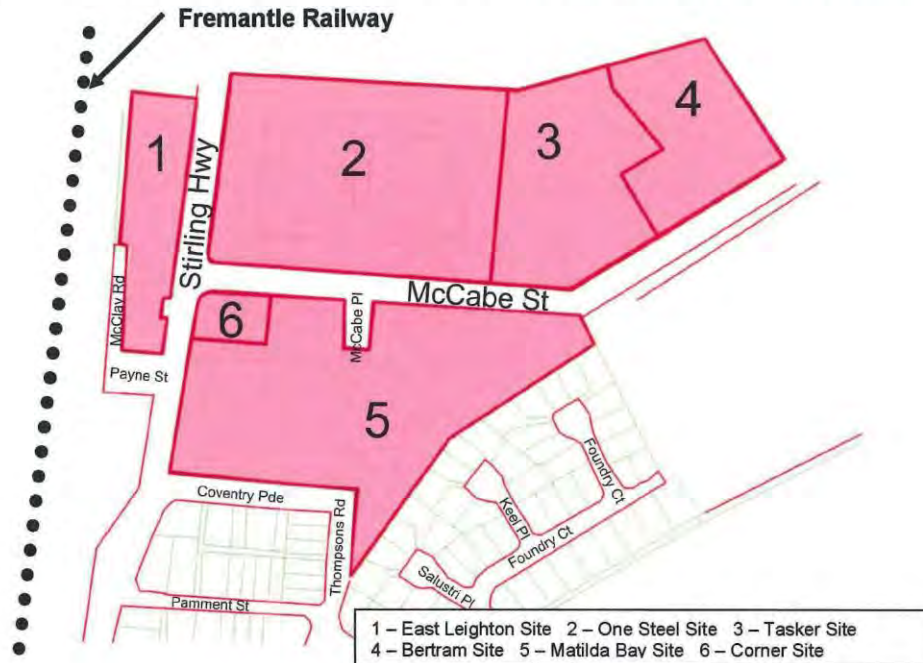
The McCabe Street area is located adjacent to the boundary between the municipalities of the City of Fremantle and the Town of Mosman Park and is separated from the North Fremantle Beach by the railway line and Curtin Avenue. The area is located in a relatively prominent position on a secondary ridgeline just southwest of Buckland Hill in Mosman Park.

The aims and objectives of the study are to:

- 1.** Investigate and identify key contextual considerations in the physical environment that should be taken into account in assessing the appropriateness of the scale (in particular height and bulk) of the proposed new buildings in the study area, for example topographical features, important views from the public

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Figure 1 McCabe Street Study Area and the Six Potential Development Sites



domain, features of cultural heritage significance and existing residential amenity (privacy, overshadowing, etc.);

2. Consider the potential impact of different development scenarios in terms of building height upon the considerations identified above;
3. Make recommendations on the most appropriate maximum heights for new buildings within the study area, having regard to the considerations referred to above and to relevant adopted State and local government planning and urban design policies.

1.2 Study Background

The study area contains a number of parcels of land, some of which are affected to varying degrees by current or potential future proposals for redevelopment. The sites located north of McCabe Street and east of Stirling Highway are currently zoned "Development Zone No. 18" under the Fremantle Planning Strategy (LPS4). The sites located south of McCabe Street and east of Stirling Highway are zoned "Industrial" under LSP4. The East Leighton sites are zoned "Parks and Recreation" under LSP4. All of the subject sites are generally being used by their owners or by leasees for light industrial and commercial uses.

The nearness of these sites to the Indian Ocean foreshore, the Swan River, the Stirling Highway and a railway line between Fremantle and Perth city centres gives them a high redevelopment potential for residential or mixed land uses.

There is now a trend toward higher density development by developers to not only maximise economic returns on investment, but also to provide a more environmentally sustainable development response in terms of numbers of residents served in proportion to provision of services and infrastructure and the affordability of energy efficient building design and materials, solar energy, grey water and water storage systems, etc. This also relates to higher density living being a counter to urban sprawl in terms of land utilisation and costs. As such, it is highly likely that developers may seek to achieve built forms that exceed the predominantly 2-3 storey scale of existing residential buildings in the surrounding area.

Most of the area of concern is currently not subject to maximum height requirements under the "Development Area Zone No. 18" and "Industrial" zones of the City of Fremantle Planning Scheme No. 4 (LSP4). The State Coastal Planning Policy (Section 5.3 of the State Planning Policy 2.6: State Coastal Planning Policy, Planning and Development Act 2005, 19 December, 2006; Gazette No. 225) sets a height limit of five storeys (21m) within 300 m of the horizontal setback datum (HSD) along the coastal foreshore. A varied distance for the HSD can be approved through local planning scheme controls and higher structures up to eight storeys (32 m) may be permitted under specified conditions of the State policy. A proposed Metropolitan Region Scheme (MRS) amendment to rezone the Leighton Site from the current Parks and Recreation zone to an Urban or Development Zone is opposed by the City of Fremantle on pre-maturity grounds and the need for conceptual design work to demonstrate how site constraints may be addressed.

Currently, the Development Area 18 Zone under LPS4 is located on the three sites on the north side of McCabe Street and east of the Stirling Highway. A Metropolitan Region Scheme (MRS) amendment to rezone these sites (One Steel, Tasker and Bertram sites) from Industrial to Urban zones is currently in the final Parliamentary stages.

Structure Plans are required by the City of Fremantle in relation to Development Areas, providing a framework for the co-ordinated subdivision and development of land within such areas. As the height and mass of buildings is a key issue for each of these sites, an integrated investigation into this issue for all sites is a prudent approach and will avoid adhoc decisions being made as different development proposals evolve over time.

A structure plan proposing residential development on the former One Steel site was submitted to Council during 2004 and Council resolved to adopt the plan subject to various amendments during 2005. A plan incorporating the amendments was not received until August 2007 and the plan has not been referred to the Western Australian Planning Commission (WAPC) for approval as the Council has been advised (2007) that the proponents intended to submit a further revised structure plan for consideration. A new structure plan for the former One Steel site has recently been submitted to Council by SAS Global Property Group for consideration.

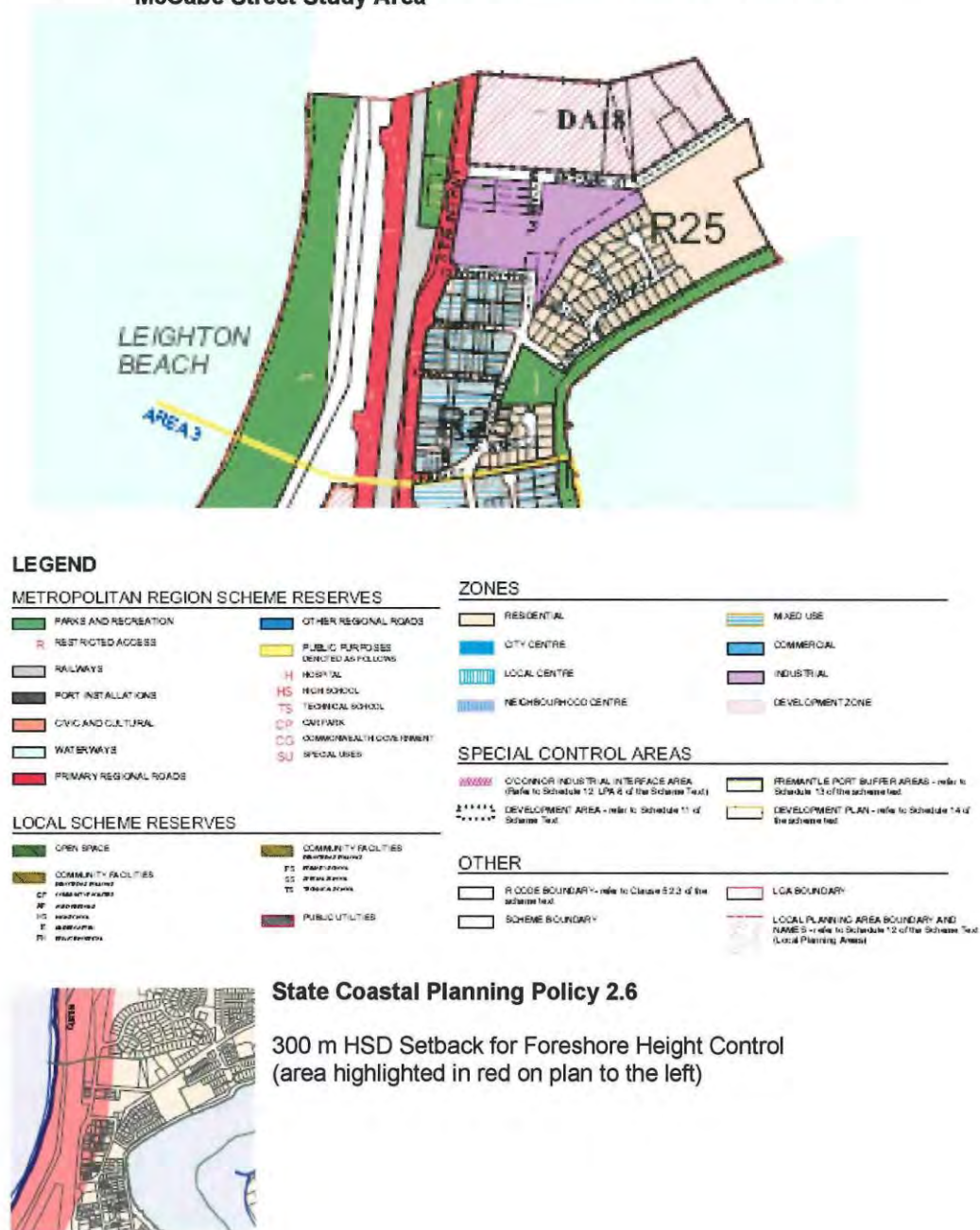
A structure plan has recently been submitted to Council for consideration by the owners/development proponents of the former Tasker site and has been advertised under the requirements of LPS4. This plan proposes several medium to high density residential apartment blocks and townhouse type built forms with heights ranging up to 17 m adjacent to McCabe Street.

At the former Matilda Bay site, the landowner has made preliminary inquiries regarding the procedure to rezone the land to Urban under the MRS and Development Area under LPS4, with a view to possible redevelopment of part or the entire site when Fosters current lease expires around 2013.

The various landowners of allotments in the Bertram Site have indicated they have no interest in redeveloping their land at the present time.

Figure 2 shows the current zoning, development area, structure plan areas and MRS amendment areas within the study area.

Figure 2 Current Zoning and Planning Mechanisms Associated with the McCabe Street Study Area



2 Methodology

The study methodology and key tasks are outlined in the following stages of investigation.

2.1 Initial Background Reviews and Analysis

- ▶ Inception Meeting with Council's Representative;
- ▶ Review of relevant planning policies, reports, and MRS amendments;
- ▶ Discussions with land owners/development proponents to clarify their structure plan applications, current development plans and objectives;
- ▶ Review of the concerns and issues raised by surrounding residents and stakeholders based on public submissions re exhibited structure plans and Local Planning Scheme No. 4 (LPS4);
- ▶ Map and prioritise key viewpoints in further consultation with Council's Representatives. 50 mm SLR and digital photographs taken from each of these key viewpoints, recording GPS positions and elevations;
- ▶ Generate elevational profiles (cross-sections) from each of the key viewpoints across the Study Area building sites to key features beyond the Study Area to provide initial information regarding key viewlines and building heights required to maintain or disrupt those viewlines.
- ▶ Map significant viewlines, panoramas, natural and cultural landscape features, and travelways;
- ▶ Determine preferred upper, intermediate and lower height limits and potential building envelopes for each of the designated land parcels based on the knowledge available and through consultation with Council's representatives.

2.2 Integration of Digital Base Data, 3D Building Models and Photomontages

- ▶ Council provision of available GIS terrain contour (DEM) files, allotment and known building envelop boundaries, roads and other relevant features in AutoCAD files and available aerial photography for the Study Area;
- ▶ Computer modeling of simple block-form buildings modeled for each of the six main development sites. Each building is modeled with three optional heights;
- ▶ Integration of the 3D building models with the terrain to produce a minimum of three overall built form development scenarios for the study area. Key features of the surrounding terrain (e.g. ridgelines, rivers, beaches/shorelines, key roads etc.) are also be integrated with the terrain model;
- ▶ Analysis of the model views from the selected key viewpoints, with further adjustments to the three built form scenarios being made if necessary;
- ▶ Preparation of ten (10) photomontages of views from the top priority viewpoints for each of the three (3) selected built form development scenarios;
- ▶ Shadow analysis plans of buildings for each of the 3 Development Scenarios are prepared for early morning, 12 noon and late afternoon sun angles for the Summer and Winter Solstice periods.

2.3 Analyses, Assessment and Draft Recommendations

- ▶ Preparation of a written and graphic analysis of potential effects of each of the 3 Development Scenarios as viewed from key viewpoints and in relation to surrounding areas and features;
- ▶ Recommendation of the Optimal Development Scenario regarding heights for each building on each of the six (6) land parcels of the Study Area;

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- The provision of the above information to the City of Fremantle as a Draft A4 Report (1 electronic and 2 hard copies).

2.4 Review of Draft Report and Recommendations by City of Fremantle

- Review of the Draft Report and its recommendations by the Council's Representatives, with comments provided to Scenic Spectrums and any necessary adjustments as agreed.

2.5 Final Report and Recommendations by City of Fremantle

- Provision of the Final Report and its recommendations and all electronic files generated to the City of Fremantle in the form of one (1) electronic and three (3) hard copies (one unbound);
- Provision of a one hour presentation to Fremantle City Council and Council Officers in the Council offices.

3 Background Reviews and Analysis

3.1 Review of Relevant Planning Policies, Reports and MRS Amendments

Key Planning Policies and Schemes

The key relevant planning schemes and policies include:

- The State Planning Framework – Statement of Planning Policy (No. 1) (SPP) – Section 5AA of the *Town Planning and Development Act 2005*
- The Metropolitan Region Scheme [MRS] (Western Australian Planning Commission, date?);
- State Planning Policy 2.6: *State Coastal Planning Policy, Planning and Development Act 2005*, 19 December, 2006; Gazette No. 225)
- Fremantle Planning Strategy: Local Planning Scheme No. 4 (City of Fremantle, July, 2001)
- North Fremantle – Local Planning Area (LPA3) (Fremantle Planning Strategy, July, 2001)
- The Perth Metropolitan Coastal Planning Strategy (Western Australian Planning Commission – in preparation)
- North Fremantle Foreshore Framework Plan (WAPC, believed to be in preparation)
- North Fremantle Foreshore Plan, Design Guideline N7, Development and Land Use Policy Manual (City of Fremantle, 17 November 1986).

The State Planning Framework – Statement of Planning Policy (No. 1) (SPP) is made under Section 25 of the *Planning and Development Act 2005* and lists all existing State and regional plans, policies, and guidelines that apply to land use and development in Western Australia. It provides a framework for decision-making on land use and development. Under the legislation, SPPs have force and effect to be implemented through planning processes, including town planning schemes. The Metropolitan Region Scheme (MRS) provides the legal basis for physical planning and development control in the Perth metropolitan region. It defines the future use of land, dividing it into broad zones and reservations. The MRS requires local government town planning schemes to provide detailed zones and reserves for their parts of the region, which must be consistent with the MRS.

Additional relevant documents that may apply to the McCabe Street Height Study include:

Statements of Planning Policy

Statements of planning policy include:

- SPP No. 2 – Environment and Natural Resources Policy (2003);
- SPP No. 6 – State Coastal Planning Policy (2003);
- SPP No. 3 – Urban Growth and Settlement (2005)
- SPP No. 3.1 – Residential Design Codes (2002);
- SPP No. 4 – Metropolitan Centres Policy (2000);
- SPP No. 5 – Telecommunications Infrastructure (2004)
- Draft SPP Metropolitan Freight Network (2005) and Draft SPP Road and Rail Transport Noise (2005);

Regional Strategies

Regional Strategies include:

- Metroplan (1990);
- Fremantle Regional Strategy (1994);
- Network City (2004)

Strategic Policies and Other Regional Planning Documents

Strategic policies and other regional planning documents of relevance include:

- Draft Livable Neighborhood Edition 3 (2004)
- Draft Coastal Zone Management Policy (2004)
- Vlamingh Parklands (1998)
- Leighton Regional Planning Guidelines (2004)

In addition to the above, the City of Fremantle have a number of specific planning policies and guidelines regarding aspects of residential and non-residential subdivision, landscape guidelines, heritage building protection, and other topics that may have a bearing on the McCabe Street Study Area.

3.2 Review of Structure Plan Applications and Current Development Plans and Objectives of Land Owners/Development Proponents

Figures 3 and 4 show the recently proposed structure plan for the Tasker Site, with 7 apartment buildings of up to 20 m in height.

A structure plan for a 4-level building and a 12-13 level building on the former One Steel Site was proposed by the SAS Global Property Group Pty Ltd during February/March 2008, as shown in Figures 5 – 8.

Firm development plans have not yet been proposed for the Matilda Bay Site, but Jamac Properties have indicated that 5 buildings with heights up to 30 m as shown in Figure 9 may represent one potential option to consider for the site.

Figure 3 Structure Plan for Tasker Site prepared by McCabe Street Joint Venture during February 2008



Figure 4 Building Elevations for the Tasker Site Proposed by the McCabe Street Joint Venture during February 2008

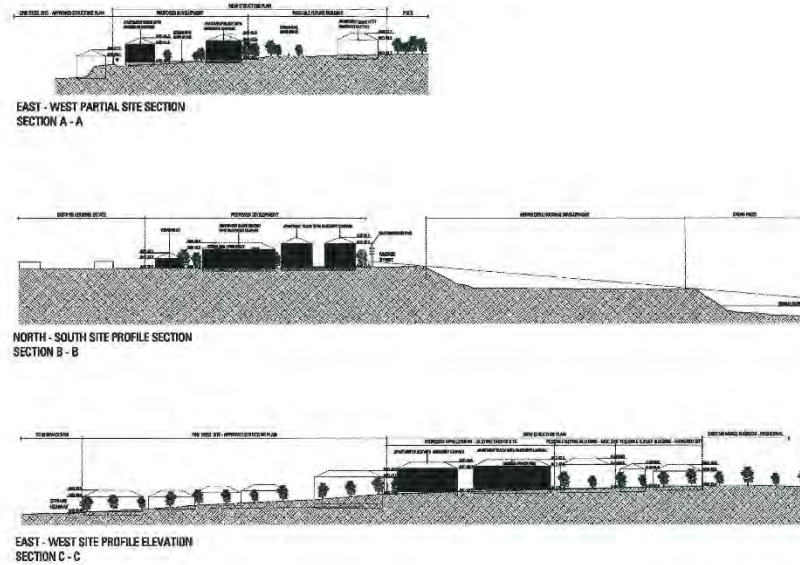
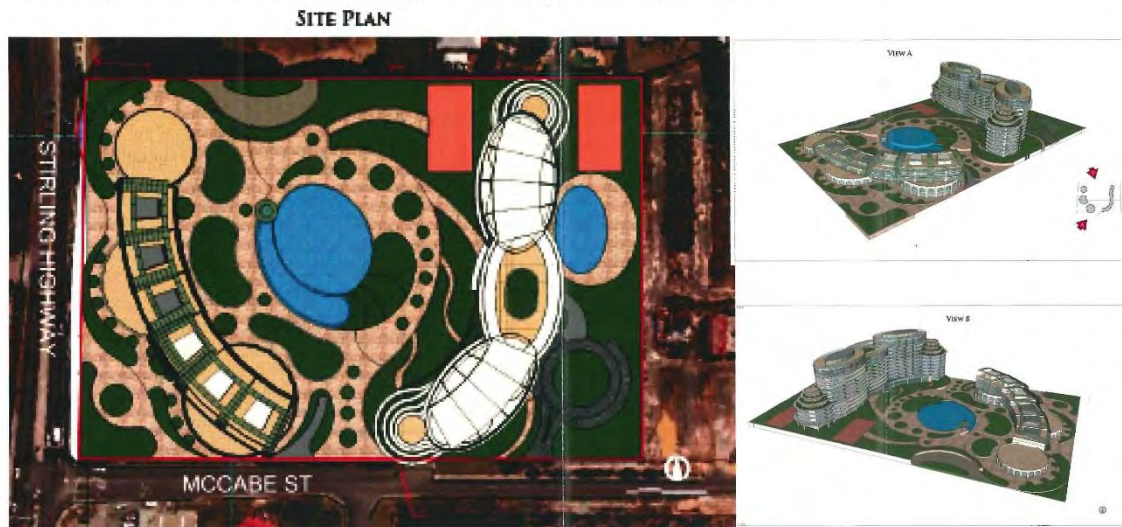
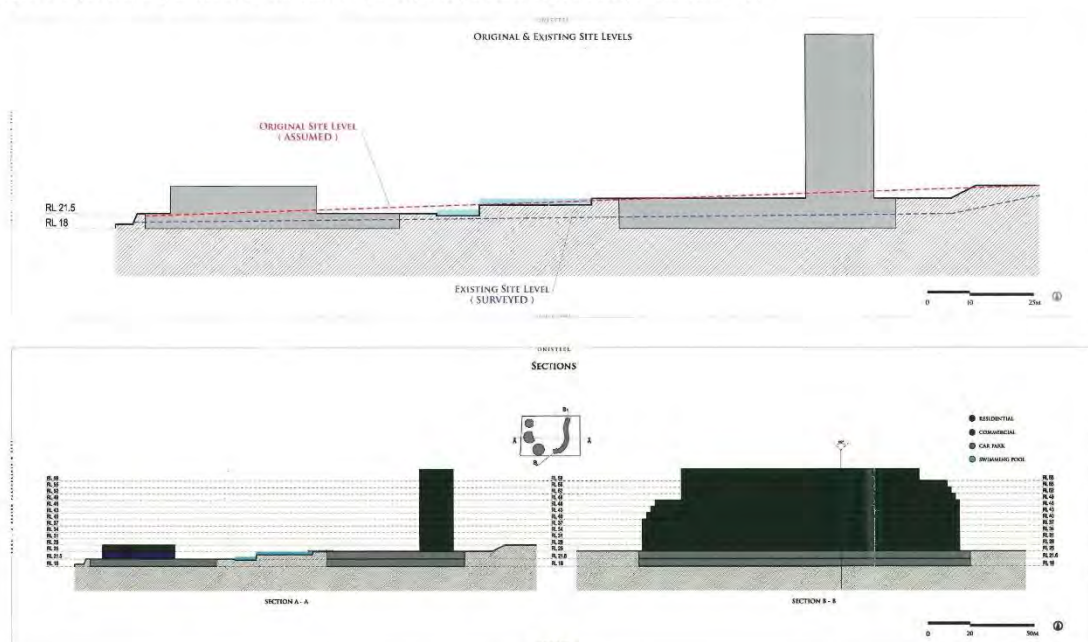


Figure 5 Structure Plan & Model for the Former One Steel Site Prepared by SAS Global Property Group during March/April 2008



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Figure 6 Proposed Building Elevations for Former One Steel Site Prepared by SAS Global Property Group, February/March 2008



Prepared by Scenic Spectrums Pty Ltd
May 2008
WPOCCS/McCabeSt-Fremantle/Reports/Plat/Plat-02300008

Figure 7 Artist's Impression of Proposed SAS Global Property Group Development on the Former One Steel Site, February/March 2008



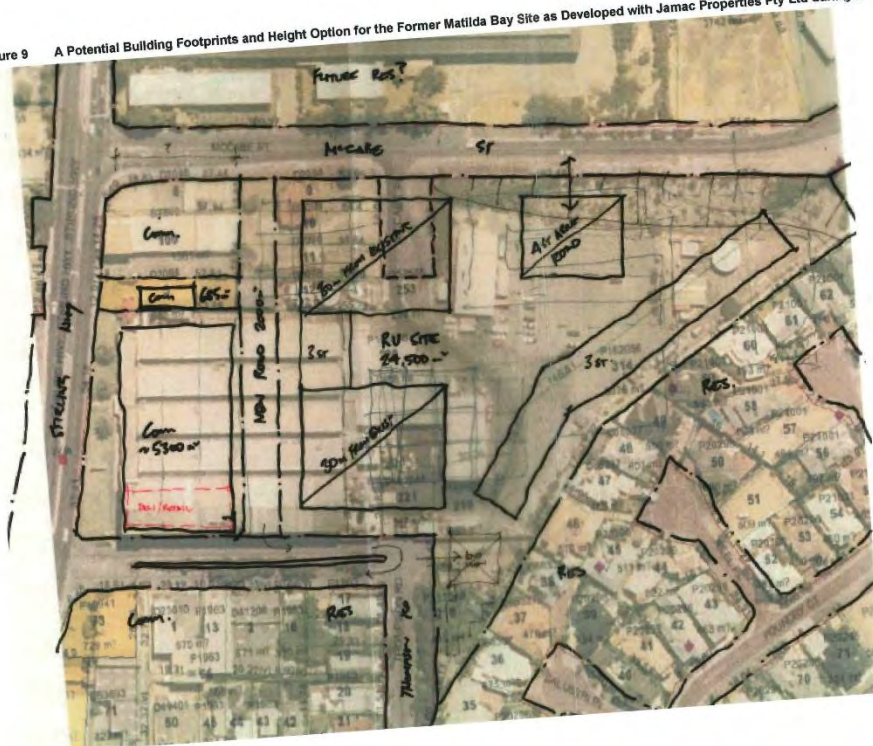
Figure 8 Shadow Plans for Proposed SAS Global Property Group Development on the Former One Steel Site.



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McCabe Street Height Study
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Figure 9 A Potential Building Footprints and Height Option for the Former Matilda Bay Site as Developed with Jamac Properties Pty Ltd during March 2008



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The Corner, East Leighton and Bertram sites have had no potential development plans prepared. We have explored alternative building footprints and heights for the first two of these sites in our development scenarios, but have assumed no change to the Bertram site for the foreseeable future.

3.3 Review of the Concerns and Issues Raised by Surrounding Residents and Stakeholders

Community responses to the proposed Tasker Site Structure Plan submitted to Council during January 2008 included 84 residents with submissions against the proposed development and 27 residents with submissions in favour of the proposed development. Some of the key comments regarding the issues of built form, height, mass and views include:

- Vista for normal views is not maintained
- Overshadowing needs consideration
- Heights of the Dingo Flour Mill, commercial buildings of central Fremantle, buildings of Leighton Village and the Rose Hotel are not appropriate examples as comparative height limits
- Development will dominate the skyline and block natural vistas of Seven Sisters Hill Lookout
- Buildings will tower over the surrounding structures
- No further increases in height over the standard existing 8.2 m (to 8.5 m) standard should be approved
- No reductions in setback dimensions below the normal 6m and 7 m boundary setbacks should be allowed at the rear or front of the development
- The high density development will detract from what should be a prestige streetscape at the major entrance to Mosman Park, Minim Cove and Buckland Hill residential areas
- Dominating ugliness of bulk
- High rise not appropriate on the coastal strip
- Bulk and scale is too imposing
- Height allowances are possible (e.g., 12m – 15 m) if buildings are staggered and allow vistas between the buildings so the negative visual impact is reduced
- Visual pollution too close to my home
- Height will reduce panorama and views
- Multi-storey developments with a 2.7 m setback is ludicrous, it will destroy privacy and amenity of adjoining homes
- 21 m high buildings will permanently scar the entire area
- Should be R20 density, proposal represents an R40+ density

Typical comments in support of the proposed Tasker Site development included:

- Will provide positive contribution to existing environment
- Will bring life to McCabe Street, which is currently an eyesore; an ugly unused industrial area
- Maximum height provisions of at least 5 storeys should be approved
- In keeping with Leighton Development

3.4 Mapping of Key Viewpoints

A field analysis of views to the Study Area and its six development sites has revealed that the McCabe Street area sits on an elevated ridgeline which is an extension from the higher elevation Buckland Hill, located to the northeast in the Town of Mosman Park. The ridgeline running through the study area has elevations ranging from 35 m AHD to 17 m AHD, as compared to Buckland Hill at 62 m AHD which is the highest hill in the general vicinity. The nearby shoreline of the Indian Ocean, which can be considered as 0 m AHD at mean low water mark (MLWM), and the Swan River at 0 m AHD at the Swan River Marina.

The elevated position of the study area results in most of the potential development sites being visible from innumerable locations within the surrounding viewshed. Twenty-five (25) key viewpoints have been selected, representing the types of views that are possible, as illustrated in Figure 10 and listed by Viewpoint No. below, with photo pans following:

1. View from northwest picnic platform at Buckland Hill obelisk looking south-southwest over Buckland Hill Residential Area to the McCabe Street Area.
2. View from Buckland Hill Water Tank overlooking Buckland Hill residential area and the McCabe Street Site from south to west (viewpoint located 25 m west of southeast corner of water reservoir compound, along south fence line).
3. View from upper rear balcony of 11 Riversea View looking southwest over the McCabe Street Site to the ocean (right) and the Swan River (left). Horizontal angle of view to the Indian Ocean is typical of such views from many residences located along the eastern section of Riversea View.
4. View from 17 Riversea View raised planter wall adjacent to backyard patio looking southwest over the McCabe Street Site. View is generally typical of views from residences along the western portion of Riversea View.
5. View from Stirling Highway north of Vlamingh Parade near crest of low hill looking south-southeast to McCabe Street area with beach on right.
6. View from the corner of Cable Cove and Vlamingh Parade looking southwest over One Steel site (viewpoint position at centre of Cable Cv. and north kerb of Vlamingh Pde).
7. View from Leighton Beach Foreshore off Curtin Avenue, south of the Beehive Montessori School, looking southeast to the McCabe Street area (viewpoint position is at picnic shelter south end of car park, adjacent to walking track).
8. View from footbridge over railway – centre of west end looking directly east at Matilda Bay building and northeast to the One Steel and Tasker sites in the McCabe Street Area (view from centre west end of bridge upper deck).
9. View from Fremantle Surf Life Saving Club, looking north-northeast to Matilda Bay and One Steel Sites in the McCabe Street area at top of hill (viewpoint location at barrier wall between the carpark and footpath).
10. View from northeast corner of Oyster Bar Cafe carpark looking north – northeast along Port Beach Road to McCabe Street sites (viewpoint located on south end of median b/w bike track and outside nth bound lane).
11. View from Leighton Battery Lookout, Buckland Park Military Museum, looking southwest to south toward the McCabe Street area (viewpoint position is front centre on brick paved seating area).
12. View from Swan River Walking Track just south of Rule Street Parklands, opposite Phyllis Street, looking north to northeast over the Swan River to the McCabe Street Area, Buckland Hill and Mt Lyell.
13. View from lookout area in Sew Park at north end of Rule Street, looking northwest to the Matilda Bay Site and northeast to the Tasker Site, with residential in between (viewpoint located at southeast fence corner).
14. View from Bolton Street Park, corner of Bolton and Angwin Streets, East Fremantle, looking northwest to north, with McCabe Street area visible on hill above marina on the Swan River (viewpoint position is from west end of park bench).

15. View from Locke Crescent at corner of Munro Street, East Fremantle, looking northwest to the McCabe Street area (viewpoint position near designated scenic overlook on north kerb of Locke Cr. aligned with west kerb of Munro St.).
16. View from Swan River shoreline just off Blackwall Reach in East Fremantle, looking west-northwest to the McCabe Street area (viewpoint position near toilet block, corner wall edge of Swan River, just east of public swimming pool).
17. View from Swan River Walking Track opposite rock groyne at Swan River Marina, looking northwest to the McCabe Street area.
18. View from Public Boat Ramp on Swan River south of Zephyr's Cafe, East Fremantle, looking northwest to McCabe Street area (viewpoint located on concrete next to rock shoring – approx. half-way along rock shoring, 2m east of timber gang plank).
19. View from bike path on west side of Riverside Road, East Fremantle, looking north-northwest to the McCabe Street area (viewpoint position is at a right angle to northeast corner of Red Herring Restaurant near East Side Angling Club).
20. View from Mt Lyell Lookout looking west over Minim Cove Residential Area and McCabe Street to the Tasker, One Steel and Matilda Bay Brewery Sites, with Buckland Hill Residential Area on hill to the right and Swan River to the left (viewpoint location is on west side of lookout wall on upper deck).
21. View from current north end of Dublin Lane looking southwest to west over Swan River and McCabe Street area (viewpoint position is on corner fence pillar of last lot, north side of Dublin Lane).
22. View from McCabe Street opposite the centre of entry gates to Bertram Site – third building east of the Tasker Building opposite Open Space Parklands in East Fremantle (viewpoint position is on south side of street opposite the 11th stone fence column from the west end of stone fence along the Minim Cove Residential Development).
23. View from northeast court of Foundry Court looking southwest to northwest toward Matilda Bay Brewery Site behind houses (viewpoint location is south driveway of house currently uphill of vacant block).
24. View from McCabe Street opposite eastern property line of the Tasker Site looking southwest to west over the Matilda Bay, Tasker and One Steel Sites (viewpoint location on south kerb of McCabe).
- 25a. View from intersection of Stirling Highway and McCabe Street looking north to east toward the One Steel Site (viewpoint located on west kerb of Stirling Highway, directly opposite the centre median of McCabe Street).
- 25b. View from intersection of Stirling Highway and McCabe Street looking east to southeast toward the One Steel Site (viewpoint located on west kerb of Stirling Highway, directly opposite the centre median of McCabe Street).

Figure 10 Selected Key Viewpoints in the Viewshed Surrounding the McCabe Street Study Area



VIEWPOINT 1: View from northwest picnic platform at Buckland Hill obelisk looking south-southwest over Buckland Hill Residential Area to the McCabe Street Area.



VIEWPOINT 2: View from Buckland Hill Water Tank overlooking Buckland Hill residential area and the McCabe Street Site from south to west (viewpoint located 25 m west of southeast corner of water reservoir compound, along south fence line).



VIEWPOINT 3: View from upper rear balcony of 11 Riversea View looking southwest over the McCabe Street Site to the ocean (right) and the Swan River (left). Horizontal angle of view to the Indian Ocean is typical of such views from many residences located along the eastern section of Riversea View.



VIEWPOINT 4: View from 17 Riversea View raised planter wall adjacent to backyard patio looking southwest over the McCabe Street Site. View is generally typical of views from residences along the western portion of Riversea View.



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VIEWPOINT 5: View from Stirling Highway north of Vlamingh Parade near crest of low hill looking south-southeast to McCabe Street area with beach on right.



VIEWPOINT 6: View from the corner of Cable Cove and Vlamingh Parade looking southwest over One Steel site (viewpoint position at centre of Cable Cv. and north kerb of Vlamingh Pde).



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VIEWPOINT 7: View from Leighton Beach Foreshore off Curtin Avenue, south of the Beehive Montessori School, looking southeast to the McCabe Street area (viewpoint position is at picnic shelter south end of car park, adjacent to walking track).



VIEWPOINT 8: View from footbridge over railway – centre of west end looking directly east at Matilda Bay building and northeast to the One Steel and Tasker sites in the McCabe Street Area (view from centre west end of bridge upper deck).



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VIEWPOINT 9: View from Fremantle Surf Life Saving Club, looking north-northeast to Matilda Bay and One Steel Sites in the McCabe Street area at top of hill (viewpoint location at barrier wall between the carpark and footpath).



VIEWPOINT 10: View from northeast corner of Oyster Bar Cafe carpark looking north – northeast along Port Beach Road to McCabe Street sites (viewpoint located on south end of median b/w bike track and outside nth bound lane).



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VIEWPOINT 11: View from Leighton Battery Lookout, Buckland Park Military Museum, looking southwest to south toward the McCabe Street area (viewpoint position is front centre on brick paved seating area).



VIEWPOINT 12: View from Swan River Walking Track just south of Rule Street Parklands, opposite Phyllis Street, looking north to northeast over the Swan River to the McCabe Street Area, Buckland Hill and Mt Lyell.



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VIEWPOINT 13: View from lookout area in Sew Park at north end of Rule Street, looking northwest to the Matilda Bay Site and northeast to the Tasker Site, with residential in between (viewpoint located at southeast fence corner).



VIEWPOINT 14: View from Bolton Street Park, corner of Bolton and Angwin Streets, East Fremantle, looking northwest to north, with McCabe Street area visible on hill above marina on the Swan River (viewpoint position is from west end of park bench).



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VIEWPOINT 15: View from Locke Crescent at corner of Munro Street, East Fremantle, looking northwest to the McCabe Street area (viewpoint position near designated scenic overlook on north kerb of Locke Cr. aligned with west kerb of Munro St.).



VIEWPOINT 16: View from Swan River shoreline just off Blackwall Reach in East Fremantle, looking west-northwest to the McCabe Street area (viewpoint position near toilet block, corner wall edge of Swan River, just east of public swimming pool).



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VIEWPOINT 17: View from Swan River Walking Track opposite rock groyne at Swan River Marina, looking northwest to the McCabe Street area.



VIEWPOINT 18: View from Public Boat Ramp on Swan River south of Zephyr's Cafe, East Fremantle, looking northwest to McCabe Street area (viewpoint located on concrete next to rock shoring – approx. half-way along rock shoring, 2m east of timber gang plank).



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VIEWPOINT 19: View from bike path on west side of Riverside Road, East Fremantle, looking north-northwest to the McCabe Street area (viewpoint position is at a right angle to northeast corner of Red Herring Restaurant near East Side Angling Club).



VIEWPOINT 20: View from Mt Lyell Lookout looking west over Minim Cove Residential Area and McCabe Street to the Tasker, One Steel and Matilda Bay Brewery Sites, with Buckland Hill Residential Area on hill to the right and Swan River to the left (viewpoint location is on west side of lookout wall on upper deck).



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VIEWPOINT 21: View from current north end of Dublin Lane looking southwest to west over Swan River and McCabe Street area (viewpoint position is on corner fence pillar of last lot, north side of Dublin Lane)



VIEWPOINT 22: View from McCabe Street opposite the centre of entry gates to Bertram Site – third building east of the Tasker Building opposite Open Space Parklands in East Fremantle (viewpoint position is on south side of street opposite the 11th stone fence column from the west end of stone fence along the Minim Cove Residential Development).



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VIEWPOINT 23: View from northeast court of Foundry Court looking southwest to northwest toward Matilda Bay Brewery Site behind houses (viewpoint location is south driveway of house currently uphill of vacant block)



VIEWPOINT 24: View from McCabe Street opposite eastern property line of the Tasker Site looking southwest to west over the Matilda Bay, Tasker and One Steel Sites (viewpoint location on south kerb of McCabe Street)



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VIEWPOINT 25a: View from intersection of Stirling Highway and McCabe Street looking north to east toward the One Steel Site (viewpoint located on west kerb of Stirling Highway, directly opposite the centre median of McCabe Street.)



VIEWPOINT 25b: View from intersection of Stirling Highway and McCabe Street looking east to southeast toward the One Steel Site (viewpoint located on west kerb of Stirling Highway, directly opposite the centre median of McCabe Street.)



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3.5 Mapping Significant Viewlines, Natural and Cultural Landscape Features, and Travelways

Analysis of Significant Travelways, Viewlines and Viewpoint Distance Zones

Figure 11 illustrates the significant viewlines, panoramas, natural/cultural landscape features and travelways in the areas surrounding and in relation to the study area. As the photographs show, there are many opportunities for panoramic views in this largely horizontal landscape, unless trees or structures limit the view.

The McCabe Street study area is flanked by some significant high sensitivity level travelways, including the Stirling Highway, the Fremantle Railway and Curtin Avenue to the west of the study area, along with the beach and foreshore area along the Indian Ocean that creates a parallel linear pedestrian and recreation area. Viewlines running at a tangent from these travelway corridors to the study area occur in numerous positions. In terms of views from southern viewpoints along Curtin Avenue and the foreshore, the lower vegetation densities and the relative openness of the highway-railway corridor visually expose the study area. From northern viewpoints along this corridor, the study area's western and northern portions are most exposed; however, trees and other vegetation in reserves and residential area of the Buckland Hill Estate area tend to screen existing buildings in the eastern and southern portions of the study area from view. In views in areas directly west of the study area, the One Steel and Matilda Bay sites tend to dominate, along with buildings in the East Leighton area. The pedestrian railway bridge and the former Matilda Bay Brewery building (and former Ford Motors factory) are heritage features.

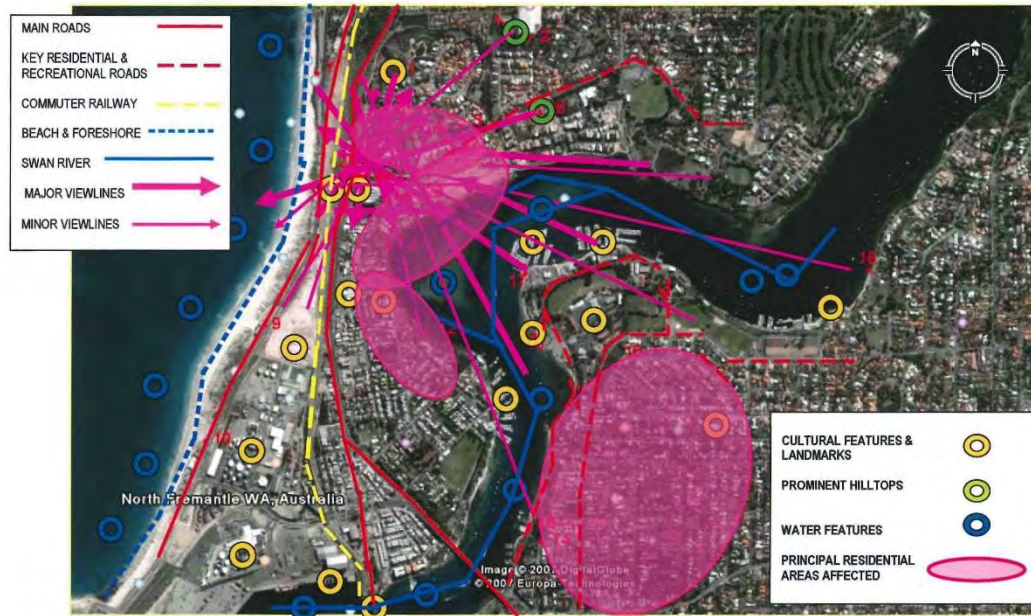
On the east, the study area is flanked by the Swan River, which forms a major bend near the study area, generating both direct viewlines and tangential viewlines across the study area. Riverside Road is a key recreational travelway for motorists, cyclists and walkers along the east and south edge of the river. Several marinas along the Swan River are cultural features and recreation nodes. The Swan River Walking Track along the north and west side of the river is a popular pedestrian and bicycle travelway. The longer distance viewlines along the Swan River corridor allow the study area to be seen in context with the whole of the Buckland Hill Ridge, which extends from the reservoir at the top of Buckland Hill, southwestward through the Buckland Hill Residential Area and the Study Area to the Stirling Highway at McCabe Road.

All of the views from the significant public travelways tend to be with the viewer in an inferior or lower elevation than the study area elevations.

In a few other locations, however, the viewpoints are either roughly level with the McCabe Street Study Area or superior (i.e., above it). Examples of this are the views from Buckland Hill, the Military Museum Lookout, from the Mt Lyell Lookout, from several residences on the upper hill slopes of Buckland Hill Ridge (particularly north and northeast of the eastern end of the study area), and in residential areas along above the Swan River from Rule Street southeast to Direction Way. In addition, a large residential area of East Fremantle is elevated on slopes and plateau benches well above the Swan River escarpment, with clear views across the river valley to the study area. Such views from residences in the Bolton Park and Locke Crescent vicinity are the most obvious examples, however, views from many different houses are possible along Preston Point Road, View Terrace and streets inland along the hillfaces with northward and westward orientation. Although not field checked, it is apparent that some residences on the river escarpment of the Blackwall Reach section of Bicton may also have more distant, but lower elevation views to the study area with viewlines down the Swan River. Residences on the opposite side of the river in the Chidley Point area are generally located on slopes facing away from the study area.

Closer distance views of the study area are possible from adjacent viewpoints on the Railway Pedestrian Overpass, from Stirling Highway as it passes through the McCabe Street area, from residences in the Foundry Estate, Minim Cove Development and Buckland Hill areas of North Fremantle and Mosman Park. Close distance views are also possible from McCabe Street as it passes through the study area and continues eastward to Mosman Park as a significant arterial access road used for residential and recreational access.

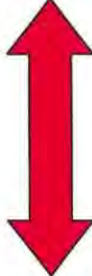
Figure 11 Significant Travelways, Viewlines, and Landscape Features



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The selected viewpoints have been classified into distance zone categories in Table 1. This shows that most of the key viewpoints are in Foreground Distance Zones (2 km or less), with only one viewpoint in the Near Middle-ground distance (2-4 km). These relatively close distances, combined with the high viewer sensitivity levels of surrounding residential, recreational and cultural viewpoints substantiate the fact that the study area is visually an area of high visual significance.

Table 1 Key Viewpoints Categorised by Distance Zones from the Centre of the Study Area

Distance Range	Distance Zone	Visual Influence	Viewpoint Nos. & Approx. Distances from Centre of Study Area
0 - 500 m	Near Foreground (NF)	Zone of Greatest Visual Influence	3 (300m), 4 (220m), 5 (400m), 6 (350m), 8 (380m), 11(400m), 13 (440m), 21 (300m), 22 (330m), 23 (200m), 24 (200m), 25a&b (200m)
500 m – 1000 m	Mid Foreground (MF)		1 (900m), 2 (880m), 7 (800m), 9(940m), 12(770m), 17 (720m), 20 (720m)
1 - 2 km	Far Foreground (FF)		9 (1.7 km), 14 (1.85 km), 15 (1.3 7 km), 18 (1.05 km)
2 - 4 km	Near Middleground (NM)		16 (2.25 km)
4 - 8 km	Far Middleground (FM)		
8 - 13 km	Near Background (NB)		
13 – 20+ km	Far Background (FB)	Zone of Least Visual Influence	

Analysis of Natural and Cultural Features

A wide range of cultural and natural landscape features have been identified within and surrounding the study area.

Cultural features include the former Matilda Bay Brewery (and former Ford Motor Factory) and the Fremantle Pedestrian Railway Bridge, which are classified in the Western Australia Register of Heritage Sites; the adjacent former harbor observation tower that stands as a local landmark (dismantled during week of 19 June); the Buckland Hill Military Museum Lookout, the Dingo Flour Mill building, a historic former industrial building in the Rule Street area, marinas along the Swan River, bridges over the Swan River, the Fremantle Wharf area and associated buildings, cranes and structures, HMAS Leeuwin Barracks, a water tank on an unnamed hill in East Fremantle and other recreational facilities along the Swan River and North Fremantle Beach.

Natural features include predominantly water features associated with the Indian Ocean to the west of the study area and the Swan River to the south and east of the study area. Two prominent hilltops are also features: firstly Buckland Hill, which has been highly modified with the installation of the water reservoir and associated observation turrets and picnic facilities (mostly disused), and; secondly, the Mt. Lyell Lookout. The former hill is the most prominent, however, its degree of modification and de-vegetation does not necessarily make it a highly scenic feature, only prominent. The Mt. Lyell Lookout is situated on a much smaller knob, well below Buckland Hill, but located in an advantageous position that affords good views overlooking the Swan River, as well as the

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study area. A relatively recently constructed gazebo on top of the hill gives this knob added visual prominence as viewed from McCabe Road, the Swan River corridor and nearby residential areas.

Scenic Quality and Perceptions

There has been no intention at this stage to conduct any formal scenic quality assessment of the study area and the surrounding landscape based on scenic perception surveys of the public. In general, based on previous perception research and community submissions received regarding proposed developments in the area (refer below), it is assumed that the existing industrial development of the McCabe Street Study Area would justifiably be classified as of low scenic quality. The former Matilda Bay Brewery building would be an exception to this. Surrounding established residential areas are assumed to be of moderate scenic quality and the key natural water features of the Indian Ocean (including the Fremantle Beach and dunal foreshore) and the Swan River (with some of the remnant vegetation on its fringing escarpments) might be considered to be of high scenic quality.

It may be useful to briefly consider the above assumptions in light of a couple of relevant scenic perception research findings.

Williamson & Chalmers (1982)

In the first of these research investigations Williamson and Chalmers (1982) surveyed the scenic perceptions of 253 observers (19 observer groups) regarding forest and rural farm landscapes in Northeast Victoria. Using Q-Sort ratings of 56 scenes presented in colour photographs, mean scenic quality ratings (Mean SQR) were determined for each scene, with the Mean SQR scores then analysed using statistical regression analysis against measurements of various land cover and abstract landscape variables.

It was found that landscape variety (expressed as vegetative and landcover diversity) were not significant predictors of the observers' scenic quality ratings. The research found that scenes rated with higher scenic quality levels were positively influenced by the effects of naturalism, extensive tree cover (especially eucalypt forest), rock outcrops, water and moderate to steep slopes. In fact, with the photo samples used, moderate slopes were a more positive predictor of scenic quality than steep slopes. The research also found negative perceived scenic effects associated with pine forest, logged areas, buildings and structures, other dominant man-made features and flat slopes. However, the most important aspect of the research is that it is usually the combination of features that influence people's perception of scenic quality.

Using a non-stratified regression the Naturalism Index (a measure of the absence of human alterations in the landscape) had by far the greatest predicative strength of any dimension in explaining the variance in scenic quality ratings. Seven landscape dimensions explained over 80% of the variance in the mean ratings with a 90% confidence level as follows:

▪ Naturalism Index	63.85% of Variance
▪ Total Tree Cover 5.30	
▪ 11-25% Slope	2.91
▪ Pine Forest	2.27
▪ Vegetative Diversity Index	1.95
▪ Water	1.91
▪ Building and Structures	1.16
▪ Area of View	0.95
	80.30%

In addition, a simple correlation analysis of the mean scenic quality ratings and the landscape dimension measurements of 56 photos (views) indicated the following relationships for dimensions with 95% confidence levels:

Scenic Quality Ratings tended to increase with -

• Naturalism Index	+ .799	Highest Correlation
• Eucalypt Forest	+ .658	
• Rock Outcrops	+ .480	
• Maximum Distance Seen	+ .407	
• Scenic Quality Index (VMS Predicted)	+ .397	%
• Background Seen Area	+ .383	
• High Scenic Quality (VMS Predicted)	+ .373	
• Area of View	+ .353	
• 11-25% Slope	+ .348	
• Water Area	+ .320	
• Total Tree Cover	+ .284	
• Alpine Grassland	+ .278	Lowest Correlation

Scenic Quality Ratings tended to decrease with -

• Pine Forest	- .384	Highest Correlation
• Recently Logged Area	- .359	
• Low Scenic Quality (Predicted)	- .339	%
• 0-10% Slope	- .283	
• Brown Agricultural Fields	- .279	
• Buildings and Structures	- .228	Lowest Correlation

Another regression of 11 easily measured landscape dimensions explained over 76% of the variance in perceived scenic quality at a 99.5% confidence level as follows:

	%Variance Explained	Effect on Scenic Quality
• Eucalypt Forest	43.34	+(Positive)
• Rock Outcrops	12.76	+
• Total Tree Cover	9.73	+
• Alpine Grassland	5.36	+
• Water Area	5.27	+
Total Scenic Quality Variance Explained	76.46%	

We note that although this research was conducted in a non-urban environment, there are aspects related to the scenic effects of natural features, particularly naturalism, water, native vegetation and views (distance and area of view) that have relevance to this study. The results regarding the presence of buildings showed negative relationships to assessed scenic quality. Although we cannot necessarily assume that the same would hold true within an urban environment, the research of Green and Nassar presented below seem to support this assumption.

Green (2000)

The second of these research findings involves the work of Dr. Ray Green (2000) of the University of Melbourne, in his article titled: *Perceptions of Landscape Character Assessed through Projective Mapping, Standard Deviation, Content, Cluster Analysis, Multidimensional Scaling Analysis and Categorical Principal Component Analysis*. Using projective mapping and associated methods, Dr Green describes his approach to determining a community's response to the perceptual and experiential consequences of environmental change resulting from rapid town growth at Airlie Beach in Queensland. His focus is on the assessment of visual amenity and local

character. This issue deals with the identification of the environmental attributes that support a distinctive, scenically attractive place image and those attributes that may detract from this image. .

The procedure involves four phases that "progress from obtaining a general description of the town's character image (as held by local residents and tourists) through to assessment by a sample of local residents of the scenic quality of individual environment types and elements" (Green, 2000a).

The phases are:

1. Face-to-Face Field interviews in which 105 respondents were asked to respond to three open-ended questions:
2. Describe in your own words the general character of the town. Imagine you are trying to describe what the town is like to someone who has never been here before;
3. List the features that most contribute to the town's distinctive character. These are distinctive elements of the town's built and/or natural environment that you feel most strongly convey its character;
4. List the features of the town that you think have been most responsible for loss and/or degradation of the town's distinctive character.

Projective mapping was completed, in which respondents are asked to 'indicate up to seven (7) views that best represent the range of scenes or different types of places in the town ... imagine you want to illustrate with photographs the range of local scenes and places in order to describe the town to someone who has never been here before. On the map indicate where you would take these photographs from' Respondents were also asked to indicate what environmental features were associated with each designated scene.

A photographic survey was carried out in which 55 views/scenes representing environment types and scenes most frequently identified in the projective maps were photographed in the field. The landscape elements and composition of the scenes, associated with selected vantage points, were suggested by the verbal descriptions of the scenes given by respondents during the projective mapping exercise. Several scenes were also selected by the researcher in order to test public preferences for specific architectural, landscape and roadside treatments. Photographic Sorting, using the Q-sort technique described above, was carried out with 21 local residents. The photos were sorted by the respondents into seven piles, with high scenic quality represented by Pile No. 1 and low scenic quality represented by Pile No. 7. The rating number for each photograph was recorded for each respondent. The respondents were then asked to identify the most distinguishing features in the three scenes they considered to be the 'most scenic' and those features they considered 'least scenic'.

Specific environmental features and the more general qualities supporting or detracting from the town's character were totalled by the frequency with which they were mentioned in the open ended street interviews. This provided a range of environmental elements (positive and negative) that were associated with the town's character image (for example, 'small town coastal feel (36%)' 'commercial and tourism' (34%) or 'poor quality building construction' (8%), 'ugly and inappropriate signage (9%), and 'lack of landscaping' (11 %)).

Towns may project either a strong character (positive or negative) or an unclear and indistinctive image.

Results of the photo-sorting task were used to help identify those scenes and associated environmental elements that contributed most strongly to perceptions of high scenic quality elements. For example, at Airlie Beach, some of those positive landscape elements identified were:

- the sea (13%)
- natural vegetation (13%)
- high quality architectural design (7%) beaches (7%) boats (6%)
- landscaping - including the use of shade and palm trees (6%)
- colour - including compatible, mixed and natural colours (5%) islands (4%)

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- mountains (4%)
- foreshore - unspoiled (3%) views (3%)
- tidiness and high level of upkeep of landscape (3%)
- parklands - and associated shade trees, palm trees, lawn areas (2%)
- atmospheric conditions such as cloud and mist covered mountains and seas (2%) sky and skyline (2%)
- hills and hillsides (2%)
- lack of development (2%) shade (2%)
- a timber bridge in the foreshore park (2%) awnings on shops (1 %)
- boats and the marina (1%).

At Airfie Beach, Green found that those scenes that rated lowest in scenic quality were predominantly those that contained buildings. (This presents a somewhat problematic dilemma, in that urban areas and cities are predominantly made up of buildings and other built forms.) Features most frequently identified as contributing to low scenic quality included:

- poor architectural design and construction (17%)
- inappropriate and ugly signage (particularly signs containing clashing, bright, garish colours or those that are over-sized (15%)
- out of character' architecture (7%) lack of natural vegetation (6%)
- asphalt parking lots - particularly those near the foreshore (6%) utility poles and wires (5%)
- lack of vegetative screening of unsightly buildings (5%)
- poorly maintained and 'dirty' buildings and landscapes
- (4%) bars located directly adjacent to the footpath (4%)
- too many square forms and straight lines in the built form (3%) road cuts (2%)
- derelict boats at Muddy Bay (2%) hillside development (2%)
- excessive width of the main street (1%) buildings that are too tall (1%) security fences (1%).

Green concludes from his study of the Standard Deviation analysis that "the community was shown not only to care about their own town's appearance but also to share similar preferences in respect to visual quality - visual preferences were not just reflective of individual tastes".

In more recent applications to the townships of Lorne and Apollo Bay in Victoria, Green has utilised the more refined methods of mail projective mapping and photo-rating from slides at community workshops to collect more data. He has found that variables such as 'naturalness', 'beauty', 'distinctiveness', 'historic buildings' or other 'aesthetically pleasing architectural structures' are correlated with perceived town character, which is the bigger notion of local concern.

Nasar (2002)

In his summary of visual perception research in reference to city environments, Jack Nasar (2002) has stated that:

"Research shows seven environmental features as prominent in human perception and evaluation of places: naturalness, order, complexity, novelty (atypicality), upkeep, openness, and historical significance. People recognise variation from natural (vegetation) to human-made. Research shows that humans prefer vegetation, that preference increases with the addition of vegetation, decreases with increases in human-made elements, and that people dislike obtrusive signs, utility poles, overhead wires, and billboards, traffic, and intense land uses...."

Preference for order has emerged for many kinds of urban settings and for various ordering variables, including legibility, coherence, identifiability, clarity, compatibility, and congruity. People also prefer well-kept to dilapidated areas....Complexity relates to the number of different elements and the distinctiveness between those elements in a scene. Research shows that people notice variations in complexity, and that interest, excitement, and viewing time increase with complexity, but that preference tends to be highest for moderate levels of complexity...."

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Research shows that novelty and atypicality also increase excitement and interest. People prefer moderate to low levels of novelty or atypicality....People readily notice changes in spaciousness. Preferences increase with openness, but people also like some spatial definition.

People also like mystery (in the form of deflected vistas), but for uncertain conditions such as urban areas deflected vistas and uncertainty about information ahead heightens fear...

Places may have historical significance or just look historical. In either case, they evoke favourable response. People also prefer popular styles to the high-style designs".

Key Assumptions Drawn from Previous Research

There are a number of assumptions that can be drawn from the above research studies regarding the assessment of the scenic character and quality of the McCabe Street area and the surrounding North Fremantle, East Fremantle and Mosman Park areas:

1. although the study area is located within urban surrounds, the research generally indicates that those areas that are either made up of natural features or appear to display greater degrees of naturalism (e.g., due to vegetation or water) should be regarded as having greater scenic quality than those areas that appear less natural;
2. the water of the Swan River and the Indian Ocean should be regarded as a highly positive attribute in its own right and as it tends to contribute to the naturalism of the area;
3. areas that are well-treed, grassed or otherwise well-vegetated (including parklands and golf courses with exotic as well as native vegetation species) should be regarded as a significant positive element that also contribute to the naturalism of the area;
4. rock outcrops, where they exist, should be regarded as positive attributes and also contribute to the naturalism of the area, but man-made rock features may be positive or negative, depending on location and how well they are designed;
5. sandy beaches, especially where they are clean and uncluttered, should be regarded as positive attributes that also contribute to the naturalism of the area;
6. cultural features and buildings that may stand out as atypical but visually compatible (not jarring or out of place) landmarks or which reflect a heritage structure may be regarded as positive scenic attributes;
7. buildings, engineering structures and signage in general do not contribute to naturalism and should generally be regarded as negative scenic attributes or of low to moderate scenic quality;
8. recreational boats in the Swan River (such as sailboats and yachts) and commercial cargo ships in the Indian Ocean and wharf areas of the Swan River should be considered as moderately positive elements primarily due to their general land use compatibility and visual fit with the Swan River and Indian Ocean;
9. open views, more panoramic (wide) views and longer distance views, particularly those to or over water would generally contribute positively to scenic quality;

The scenic perception research studies by Zube, Pitt and Anderson (1974), (Zube, 1976), Williamson and Chalmers (1982), Green (2000), Nasar (2002) and Scenic Spectrums (2003) show a broadly similar consistency in perceptions of scenic quality or visual preferences. To a large degree, stakeholder comments received in relation to this area are similar to many of the assumptions drawn from the research. This tends to refute the common assumption among planners and adjudicators in land use planning cases that the '*beauty is in the eye of the beholder*' and that everyone simply has their own opinion and therefore, the assumption that scenic quality is highly subjective and cannot be trusted as a basis for decision-making. However, it is also noted that the

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acceptability of different types of development and alterations to the landscape is, to a certain extent, a product of what the community is used to and attitudes regarding the acceptability of landscape changes may also change as the landscape evolves. In this respect, Perth community attitudes to higher rise development may be more conservative than community attitudes in Melbourne or Sydney, where such development has been established for a number of years.

3.6 Generation of Initial Cross-sections

Cross-sections have been generated for Scenario 1 from ten selected viewpoints (Viewpoint Nos. 3, 4, 5, 7, 8, 9, 12, 14, 18, and 20). The cross-sections were generated on the initial scenario to provide an understanding of the relative height and visual-spatial relationships between existing and potential buildings and the terrain based on the available AutoCAD drawings for the viewshed surrounding the project area, imported in 3D into the ArcGIS digital elevation model (DEM) and analysed as cross-sections. The example cross-sections are provided further on in Figure 24, while the other cross-sections are provided to Fremantle Council in digital format, but not as part of this report. The cross-sections show that with the exception of from Viewpoint No. 20, the project area is viewed from lower elevations looking uphill to the subject sites, with relatively minor to moderate visual screening provided by existing buildings, depending on the angle of view. This information has assisted the development of the subsequent development scenarios assessed.

3.7 Potential Development Scenarios

Three potential development scenarios have been developed based on an iterative process from one to another in which building footprints, heights and configurations have been adjusted to reveal different potential desirable and undesirable visual effects. The scenarios have been modeled and analysed using a combination of 3D computer modeling and photomontage analysis. The three scenarios are generally described as follows:

4. **Scenario No. 1:** based on current development proposals by land owners of the Matilda Bay, One Steel and Tasker sites, plus hypothetical potential building development on the Corner and East Leighton sites, with no change to the Bertram sites east of Taskers;
5. **Scenario No. 2:** based on a decrease in total ground floor footprint areas as a proportion of overall allotment sizes compared to Scenario 1, while increasing building heights in some cases. Here, key view corridors representing angles of view from residential areas to the north and from Mt. Lyell Lookout have been used as a guide to partially retain views to the Indian Ocean.
6. **Scenario No. 3:** based on an overall decrease in building heights, with buildings fronting the Stirling Highway and McCabe Street not exceeding four levels (plus roof) and buildings internally within the sites not exceeding 2-3 levels (plus roof). This scenario allows for medium to high density residential development while maintaining most views from surrounding residential areas to the Indian Ocean and to the Swan River and significantly reducing potential effects of over-looking and over-shadowing.

It is emphasised that neither Scenic Spectrums nor Fremantle Council advocate any of the three scenarios as a final solution in terms of the potential redevelopment of the study area. However, the three scenarios provide useful information that may lead to the establishment of certain principles and guidelines that can be applied to potential development plans to maintain and enhance visual and landscape character values for the area.

4 VISUAL ASSESSMENT GUIDELINES AND PERFORMANCE STANDARDS

4.1 Key Assessment Factors

Based on an analysis of the existing landscape and viewing context of the McCabe Street project area and existing Local and State planning strategies, policies and guidelines, key assessment factors regarding issues of visual amenity, views, building heights and mass include the following:

- Landscape Character
- Scenic Quality
- Scenic Integrity
- Coastal Height Policy
- Horizon and Panoramic Views
- Views to Key Landscape Features
- Overlooking into Neighboring Properties
- Overshadowing onto Neighboring Properties
- Cumulative Visual Effects

Exterior treatments such as of the use of complementary and harmonious colours, the avoidance or minimisation of reflective surfaces and other architectural/urban design considerations regarding building setbacks, articulation, style, materials and site landscaping would normally also be included among key assessment factors, however, in this case, such details are not yet proposed for all six development sites in the project area, hence we will focus on how the aspects of building locations, heights and mass may affect the key factors noted above.

The suggested visual assessment factors are further described in Table 2. These factors have been used for the purposes of this analysis. However, they should be considered as supplemental to and not replacing other visual or planning guidelines and considerations currently required by the City of Fremantle or the State Government.

5 Visual Analysis and Assessment of Scenario No. 1

5.1 Establishment of Potential Building Footprints and Heights

Building footprints and heights have been generated from Figures 3 – 9 for the former Matilda Bay, One Steel and Tasker sites. Footprints for the Corner Site have assumed a total redevelopment of that area, with replacement of all existing buildings with a relatively simple, L-shaped two-storey gable roof building that addresses the corner of McCabe Street and Stirling Highway, with some setback and open space/parking abutting the corner.

Footprints for the East Leighton Site have assumed two identical residential apartment and/or commercial office buildings, somewhat offset from each other and rising up to 5 storeys (15 m wall heights) with a 4.5 m high gable roof. Each building is designed with an angled central section, allowing the buildings to respond in form to the shape of the allotment. The buildings for the East Leighton site have been taken to what we would assume to be an absolute maximum height for the site, given its coastal location and visual relationship to other potential developments in the project area.

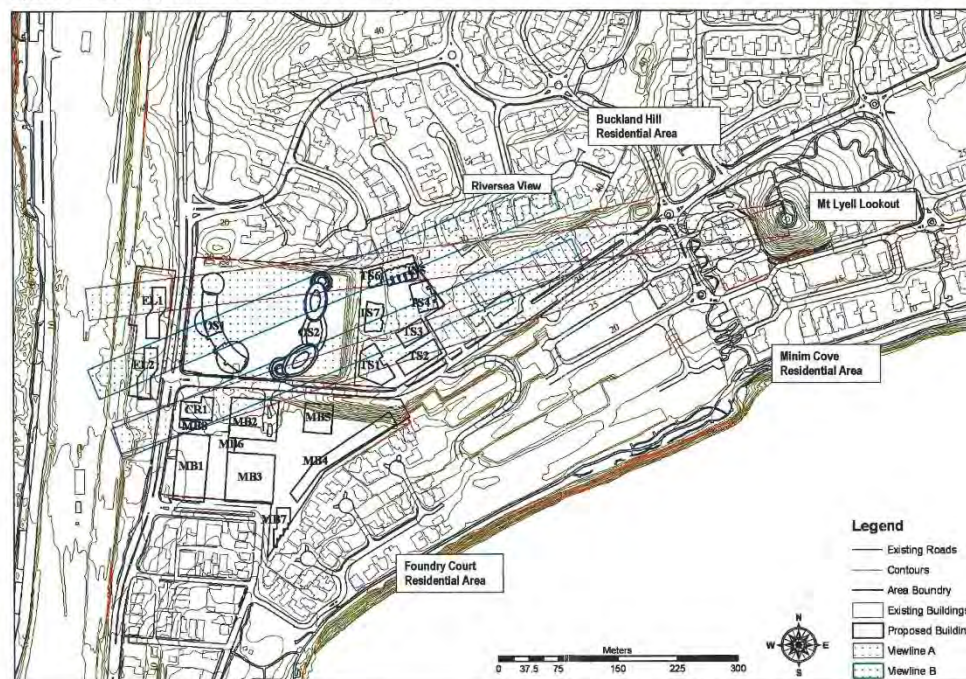
For this scenario, we have also assumed that the existing development on the Bertram Site to the east of the Tasker Site will remain unchanged from the current situation. The ground floor footprints for the Scenario 1 buildings are shown with representative viewlines from Mt. Lyell Lookout (Viewlines A) and the northern residential areas (Viewlines B) in Figure 12, with a more detailed illustration of building levels for the proposed One Steel development as shown in Figure 13. Table 3 provides Scenario 1 building heights and approximate building areas and total mass. (Note: all calculations in Table 3 and subsequent similar tables to be read as approximations.)

Table 2 Recommended Visual Performance Standards

Performance Issue	Visual Significance Zone
Landscape Character	The landscape character of the McCabe Street Area will express concentrations of human-influenced landscape elements and activity, primarily in the form of residential/retail residential and commercial uses of varying densities developed in a manner that will be visually compatible with surrounding single dwelling allotment residential uses and the open space and recreational environment of the North Fremantle Foreshore area. The Buckland Hill ridge line forms the dominant topographic feature of the area and should be retained, reinforced and possibly accentuated by the future built form of the area. Although the area is currently of a lower scenic quality due to the former industrial uses of the area, the area should be visually enhanced by future developments in terms of built forms, landscape treatments and views to, through and from the area. In particular views to the adjacent Indian Ocean, the Swan River and surrounding inland and foreshore parklands and beaches should be maintained and enhanced where possible. Special natural features such as water, native vegetation, rock outcrops, prominent hills, river terraces and escarpments, and benches should be retained where possible in the landscape. Special cultural features such as historic or heritage buildings, Norfolk Island pine trees, etc., should also be retained where possible in the landscape. The Urban Landscape Character of the surrounding viewshed (viewing catchment) will express concentrations of human activity, primarily in the form of period and contemporary residential, commercial, cultural, educational, transportation structures and supporting infrastructure. Natural landscape elements should be evident as retained, but may be outweighed in the overall landscape by human-influenced landscape elements and alterations.
Scenic Quality	Moderate to High: Scenic quality of the proposed development area and immediate surrounds should be enhanced and maintained as at least Moderate as viewed from all Foreground and Near Middleground viewpoints. Future development should be designed to rehabilitate and visually enhance the area as much as possible in order to improve the landscape (internally within development sites and within public streetscapes and open space reserves) toward a High Scenic Quality Level.
Scenic Integrity (Two options – the first being most desirable, but the second reflecting current situation and what often occurs within higher density urban developments)	Low - Modification VQO – Moderately Modified (Apparent Alteration): Landscapes where the valued natural landscape character "appears moderately modified". Modifications begin to dominate the valued landscape character being viewed, but they borrow valued attributes such as size, shape, edge effect and pattern of natural openings, vegetative type and architectural styles to be compatible or complementary to the surrounding landscape character. The existing landscape does not currently reflect this Scenic Integrity Level, but the Low level should be aspired. Moderate or higher levels of Scenic Integrity will not be possible given the existing degree of landscape and the land use circumstances. Very Low – Maximum Modification – Heavily Modified (Dominant Alteration): Landscapes where the valued natural landscape character "appears heavily modified". Alterations may strongly dominate the valued landscape character. Existing alterations may not always borrow from valued attributes such as size, shape, edge effect and pattern of natural openings, vegetative type changes or architectural styles within or adjacent the landscape being viewed. New landscape alterations should be sited and designed to protect, complement and enhance the existing positive natural and cultural features and views to and from such features so that they do not exceed this existing level of scenic integrity or dominate the landscape character or composition excessively more than existing alterations. This level of scenic integrity is currently reflected by the landscape of the surrounding viewshed. Although the intensity of development will always create a heavily modified landscape, this appearance should be enhanced where possible through any new landscape alterations that may take place.
Coastal Height Policy	State Coastal Planning Policy - Section 5.3: Height limit of five storeys (21m) within 300 m of the horizontal setback datum (HSD) along the coastal foreshore. A varied distance for the HSD can be approved through local planning scheme controls and higher structures up to eight storeys (32 m) may be permitted under specified conditions of the State policy (State Planning Policy 2.6: State Coastal Planning Policy, Planning and Development Act 2005, 19 December, 2006; Gazette No. 225).
Horizon Line & Panoramic Views	Limited Portion of Horizontal View Occupied by Development: Site buildings and structures to avoid or minimise interruptions to the panoramic, wide bay views. Where this is not possible, design the form and mass of such structures to create blended and gradual transitions with backdrop foreshores and hillsides. As viewed from Near Foreground viewpoints (0 m – 500m) new landscape alterations seek to not should not occupy more than 20° or one-ninth of the 180° panorama or horizontal line. As viewed from Mid Foreground and more distant viewpoints (500m or greater) new landscape alterations seek to not should not occupy more than 20° or one-ninth of the 180° panorama or horizontal line. Natural vegetated/watercourse breaks between separate new alteration sites should seek to create views of apparent undeveloped sweeps of approximately 15°- 20° or greater between buildings/structures in the horizontal view.
Key Landscape Features	Protect Views to Key Features: Avoid interruption of views to visually key or highly scenic landform, waterform, vegetation or cultural/heritage features or focal points by buildings and structures, including boats on swing moorings or in marina berths. Where avoidance is not possible, minimisation of such interruptions should be achieved.
Overlooking	Minimisation of Overlooking into Neighboring Properties: The potential for overlooking by occupants of future developments into the windows and yards (particularly backyards) of neighboring properties should be avoided completely or minimised where ever possible. Although the potential use of vegetative screening may be considered, significant views from neighboring properties should be retained as much as possible. Alternative solutions such as the use of architectural screens attached to future building facades to direct views away from neighboring properties may be one possible solution.
Overshadowing	Minimisation of Overshadowing onto Neighboring Properties: The potential for overshadowing by future developments into the windows and yards (particularly backyards) of neighboring properties should be avoided completely or minimised where ever possible. Where overshadowing occurs, it should not exceed 2-3 hours per day on any given day of the year. (Refer also to the R-Codes Section 6.9.1)
Cumulative Visual Effect	Tight Development Nodes with Gaps between Clusters and Villages: Avoid excessive expansion of established landscape alterations and building/structural nodes. Tight clusters of development are preferable. Provide a significant visual gap between building/structural clusters on a local basis and between foreshore and inland developments on a district/regional basis. Refer to Horizon Line & Panoramic Views text.

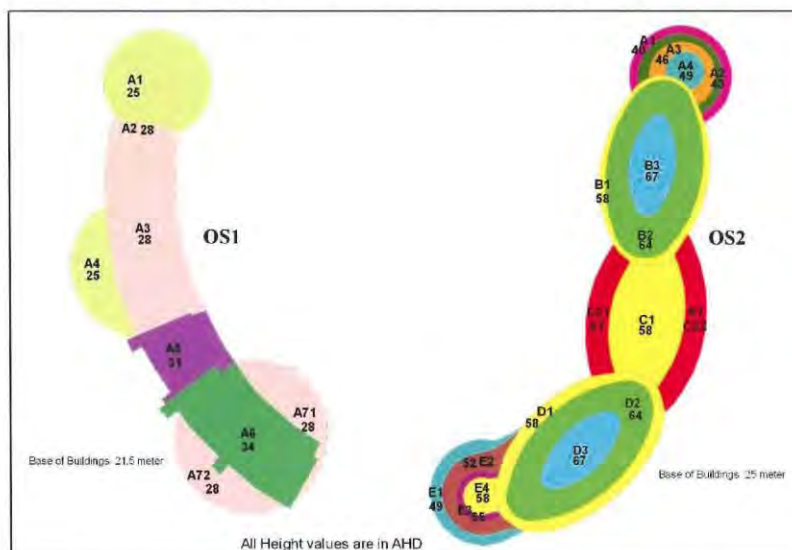
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Figure 12 Ground Floor Footprints for the Scenario 1 Buildings



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Figure 13 Building Footprints and Levels for the Former One Steel Site Proposed by SAS Property Group Pty Ltd (March/April 2008)*



* Sections of buildings labeled A1, B3, etc are referred to in height level and area calculations in Table 3.

Table 3 Scenario 1 Building Height, Area and Mass Dimensions

Site/Bldg No.	Base of Bldg AHD	Top of Wall (AHD)	Wall Meters	Top of Roof (AHD)	Roof Height Meters	Total Building Meters	Foot Prints Area (M ²)	No. Of Levels @ Ave. 3m Intervals	Total Floor Space (M ²)	Total Volume (M ³)	Roof Form
TASKER SITE											
TS1	29.5	46	16.5	50.5	4.5	21	1380.53	5	6902.65	25885	Gable
TS2	31	47.5	6.5	52	4.5	11	1114.38	2	2228.76	9751	Gable
TS3	31	47.5	6.5	52	4.5	11	747.42	2	1494.84	6540	Gable
TS4	30.5	43.5	13	48	4.5	17.5	851.05	4	3404.2	11064	Mansard
TS5	30.5	37.5	7	42	4.5	11.5	682.76	2	1365.52	4779	Flat
TS6	30.5	37.5	7	42	4.5	11.5	336.06	2	672.12	2352	Flat
TS7	28	41	13	45.5	4.5	17.5	727.09	4	2908.36	9452	Mansard
Total TS							5,839		18,976	105,459	
MATILDA BAY											
MB1 (Renovated Est.)	17	25/30	8/13	28/33.5	3/3.5	11/16.5	3271.91	2/3 (say 2)	6543.82		Skillion/Gable
MB2	19	44.5	25.5	49	4.5	30	2985.93	8	23887.40	82860	Gable
MB3	18	43.5	25.5	48	4.5	30	3620.16	8	28961.30	100459	Gable
MB4	17	26	9	30.5	4.5	13.5	2438.03	3	7314.09	27428	Gable
MB5	17	37	20	42	4.5	25	1258.44	6	7550.64	28000	Gable
MB6	18	27	9	32.5	4.5	13.5	150.35	3	451.05	1691	Gable
MB7	17	35	18	39.5	4.5	22.5	600.51	6	3603.06	10809	Flat
MB8	18	24	6	28.5	4.5	10.5	233.56	2	467.12	1927	Gable

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Site/Bldg No.	Base of Bldg AHD	Top of Wall (AHD)	Wall Meters	Top of Roof (AHD)	Roof Height Meters	Total Building Meters	Foot Prints Area (M ²)	No. Of Levels @ Ave. 3m Intervals	Total Floor Space (M ²)	Total Volume (M ³)	Roof Form
Total MB							14,559		72,199	253,174	
CORNER SITE											
CR1	18	24	6	27	3	9	950.61	2	1901.22	7130	Gable
EAST LEIGHTON SITE											
PS1 (EL1)	18	33	15	37.5	4.5	19.5	1046.39	5	5231.95	18050	Gable
PS2 (EL2)	17	32	15	36.5	4.5	19.5	1045.27	5	5226.35	18031	Gable
Subtotal							2,092		10,458	36,081	
ONESTEEL SITE											
OS1	21.5										
a1	21.5	25	3.5	25	0	3.5	582.32	1	582.32	2038	Flat
a2	21.5	28	6.5	28	0	6.5	29.32	2	58.64	191	Flat
a3	21.5	28	6.5	28	0	6.5	937.93	2	1875.86	6097	Flat
a4	21.5	25	3.5	25	0	3.5	299.6	1	299.6	1049	Flat
a5	21.5	31	9.5	31	0	9.5	326.05	3	978.15	3098	Flat
a6	21.5	34	12.5	34	0	12.5	737.39	4	2949.56	9217	Flat
a7	21.5	28	6.5	28	0	6.5	547.98	2	1095.96	3561	Flat
Total OS1							3461		7840	25251	
OS2											
a4	25	49	24	3		3	67.7	1	67.7	203	Flat
a3	25	46	21	3		3	161.01	1	161.01	483	Flat
a2	25	43	18	3		3	254.31	1	254.31	763	Flat
a1	25	40	15	15		15	375.56	5	1877.8	5633	Flat
Subtotal							841		2362	7083	
b3	25	67	42	3		3	247.58	1	247.58	743	Flat
b2	25	64	39	6		6	889.29	2	1778.58	5336	Flat
b1	25	58	33	33		33	1066.48	11	11731.3	35194	Flat
Subtotal							2,203		13757	41272	
c2	25	61	36	3		3	430.51	1	430.51	1292	Flat
c1	25	58	33	33		33	936.48	11	10301.3	30904	Flat
Subtotal							1,367		10732	32195	
d3	25	67	42	3		3	247.65	1	247.65	743	Flat
d2	25	64	39	6		6	873.81	2	1747.62	5243	Flat
d1	25	58	33	33		33	1240.16	11	13641.8	40925	Flat
Subtotal							2362		15637	46911	
e4	25	58	33	3		3	67.81	1	67.81	203	Flat
e3	25	55	30	3		3	112.23	1	112.23	337	Flat
e2	25	52	27	3		3	279.51	1	279.51	838	Flat
e1	25	49	24	24		24	442.97	8	3543.76	10631	Flat
Subtotal							903		4003	12010	
Total OS2							7,676		46,491	139,471	
Total OS							11,137		54,331	164,722	

In addition to the dimensional data shown in Table 3, we have also examined the ratio of total building footprint and floorspace areas to the total site areas for the five development sites to determine the Footprint to Site Ratio (total footprint m² ÷ total site area) and the Gross Plot Ratio (total floorspace m² ÷ total site area). These calculations are shown in Table 4. There is no attempt to make comparisons to R-Codes (2008 R-Codes) or other building density measurements as indicated in Statement of Planning No. 3.1 – Residential Design Codes

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(<http://www.wapc.wa.gov.au/Publications/150.aspx>) as recently gazetted by the Western Australian State Government, since we have no idea how many dwelling units may be proposed within each of the potential buildings or what the internal road systems and private/public open space areas may be. Hence, the ratios calculated only serve to provide a comparison between development sites and from one development scenario to another. (Note: all calculations in Table 4 and subsequent similar tables to be read as approximations.)

Table 4 Scenario 1 Site Footprint, Floor Space and Gross Plot Ratios

Development Site (Scenario 1)	Total Site Area M ²	Total Footprint M ²	Footprint to Site Ratio	Total Floor Space M ²	Gross Plot Ratio
1. East Leighton	6,966	2,092	0.300	10,458	1.505
2. One Steel	27,585	11,137	0.404	54,331	1.969
3. Tasker	14,078	5,839	0.414	24,562	1.744
4. Matilda Bay	30,838	14,559	0.472	72,199	2.341
5. Corner	2,040	951	0.466	1901	0.931
Total	81,507	34,578	0.424	157,865	1.937

5.2 Computer Modeling and Photomontage of Buildings for Each of the Six Development Sites

The Scenario No. 1 building footprints for each of the six development sites have been drafted in AutoCAD, importing footprints from site developers' CAD plans where possible. The building wall heights, roof heights and roof styles have been assigned to each building as per Table 3, according to what the developers have indicated in their drawings or, where such information was not available, as determined by Scenic Spectrums, providing some mix of simple gable roof styles and some flat and mansard-style roof styles. The AutoCAD building footprints have been first integrated with the AutoCAD topographic contours and roads imported into 3D Studio Max (3DSM).

The building forms have been modeled in 3D and integrated with the 3D terrain. As buildings associated with each of the six development sites are currently at various levels of design, or not designed at all, the buildings have been left in simplified block form with no façade detail, minimal articulation and no variation in colours and materials. A neutral medium grey colour has been applied to the rendered models.

Computerised camera views have been set to match the co-ordinates, heights, and camera lens and sun angles of the SLR camera used to take ten selected panoramic photographs. The computer camera views of the potential buildings and terrain have been superimposed on the panoramic photographs taken for each of the selected viewpoints. Portions of the scene that would remain in front of or above the potential buildings have been retained and portions of the scene that would be obscured behind the potential buildings have been cropped. The modeled image of potential buildings has been fully merged with the retained portions of the panoramic photograph to produce a photo-realistic image of the potential building's effects on the scene.

5.3 Photomontages of Scenario 1 Views from Selected Priority Viewpoints

Photomontages of the Scenario 1 views of the potential buildings modeled and montaged into the ten selected scenes are shown in Figures 14 -23.

(TEXT CONTINUES ON PAGE 51)

Figure 14 Scenario 1 Photomontage from Viewpoint No. 3 – Balcony View from Residence on Riversea View



Figure 15 Scenario 1 Photomontage from Viewpoint No. 4 – View from Patio Garden of Residence on Riversea View



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Figure 16 Scenario 1 Photomontage from Viewpoint No. 5 on Stirling Highway north of Vlamming Parade



Figure 17 Scenario 1 Photomontage from Viewpoint No. 7 – Footpath on Leighton Foreshore just South of Beehive Montessori School



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Figure 18 Scenario 1 Photomontage from Viewpoint No. 8 – Pedestrian Footbridge over Fremantle Railway Line Opposite the Matilda Bay Brewery Building



Figure 19 Scenario 1 Photomontage from Viewpoint No. 9 – Fremantle Surf Life Saving Club



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Figure 20 Scenario 1 Photomontage from Viewpoint No. 12 – Swan River Walking Track East of Phyllis Street, North Fremantle



Figure 21 Scenario 1 Photomontage from Viewpoint No.14 – Parkland at Corner of Bolton Street and Angwin Street, East Fremantle



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Figure 22 Scenario 1 Photomontage from Viewpoint No. 18 – Boat Ramp on Swan River South of Zephyr's Café, East Fremantle



Figure 23 Scenario 1 Photomontage from Viewpoint No. 20 – Mt Lyell Lookout east of the Minim Cove Residential Development in Mosman Park

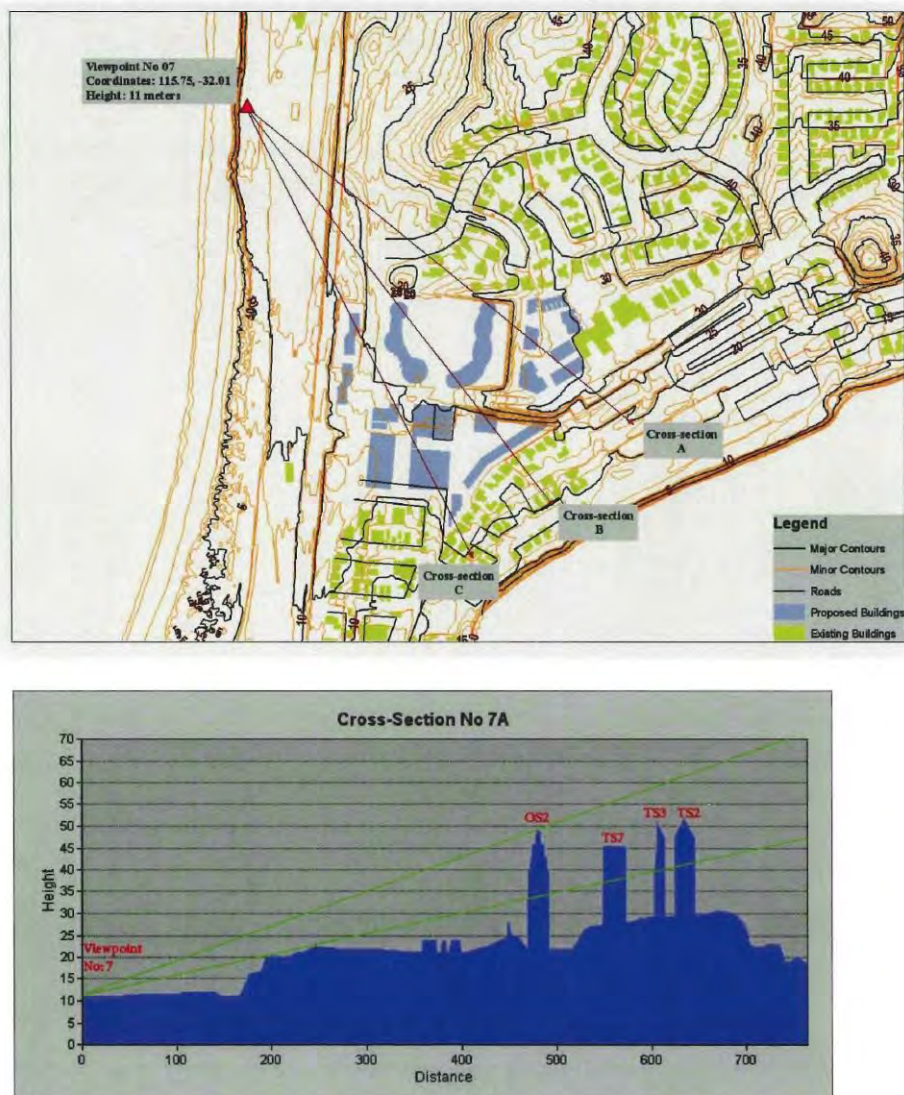


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5.4 Cross-Section Analysis of Viewlines from Key Viewpoints

Cross-section analysis of three viewlines from each of the twenty-five key viewpoints has been conducted to provide an understanding of the relative height and visual-spatial relationships between the Scenario 1 buildings and the viewpoints. Figure 24 shows an example plan of viewlines and three viewline cross-sections from Viewpoint No. 7. (It should be noted that due to the geometry of displaying the cross-sections on an A4 page, the vertical dimensions are necessarily exaggerated over the horizontal dimensions; however, the relative vertical relationships [heights measured in AHD levels] remain correct.)

Figure 24 Viewline Plan and Scenario 1 Cross-Sections for Viewpoint No. 7

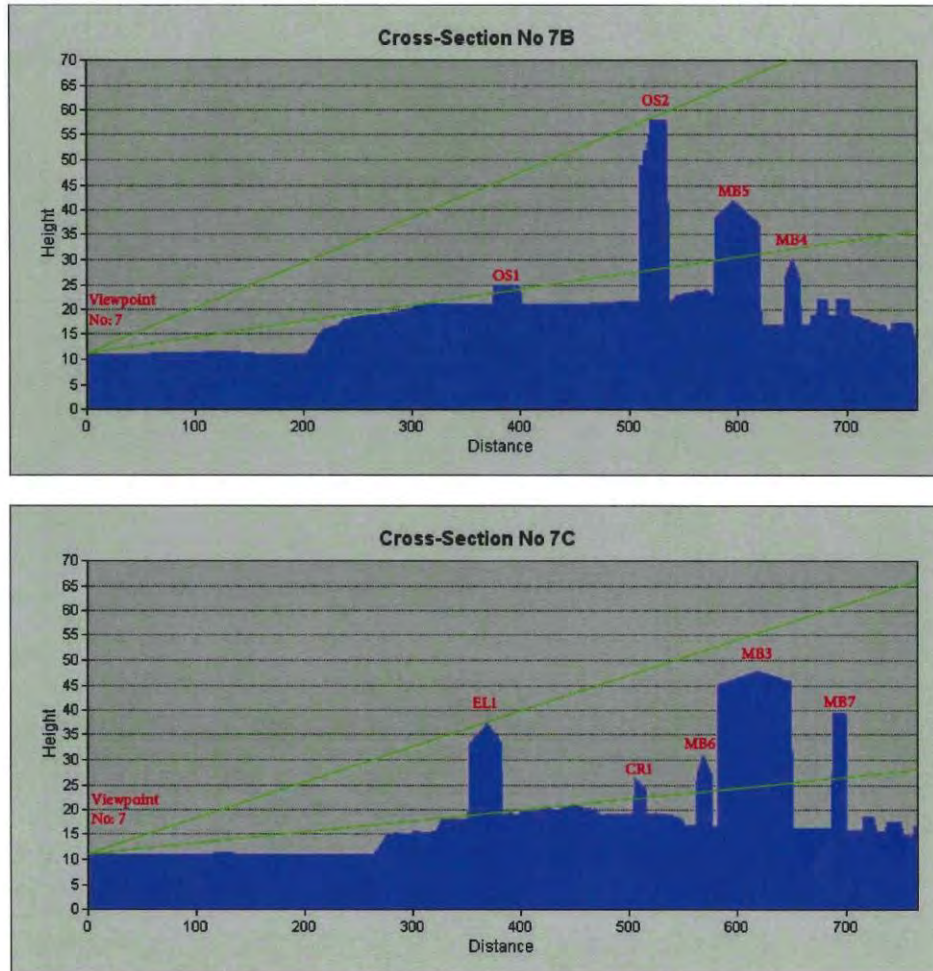


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Figure 24...continued



In the cross-sections, the visible portions of the buildings would be located between the two green lines, allowing for topographic screening alone and no screening by vegetation or intervening structures.

5.5 Shadow Analysis Plans

Shadow analysis plans have been prepared for the Scenario 1 buildings for 9.00 am, 12 noon and 3.00 pm on 22 June and 21 December, 2008 using sun azimuths for the Perth area as programmed in the 3DSM modeling software. These shadow analysis plans are shown in Figures 25 and 26.

Figure 25 Scenario No. 1 Shadow Analysis Plans for 21 December 2008



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Figure 25....continued



Figure 26 Scenario No. 1 Shadow Analysis Plans for 21 June 2008



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Figure 26....continued



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5.6 Visual Analysis and Assessment

Scenario No. 1 has been analysed and assessed according to the key assessment factors and visual performance criteria outlined in Table 2. This assessment has involved the review and analysis of the ten photomontage scenes in Figures 14 - 23. The visual assessment is summarised in Table 5. Key aspects of this assessment are also illustrated in plan form in Figure 29.

5.7 Discussion of Scenario 1 and Potential Improvements for Scenario No. 2

Discussion

In reviewing the potential visual effects of Scenario No. 1 we note that future where development sites increase building heights in order to decrease overall building footprint areas, the resulting mid-rise to high-rise structures could potentially become positive visual landmarks on Buckland ridge and in the vicinity of the gateway to Fremantle near it's boundary with Mosman Park along the Stirling Highway. This could also provide the opportunity to create enhanced visual/landscape amenity within the development sites and within the public streetscapes, while potentially allowing some views through the site from adjacent residential areas to key landscape features, namely the Indian Ocean and the Swan River. The SAS Global Property Group's proposal for the former One Steel Site is an example of such a development philosophy. However, particularly in relation to its proposed OS2 building, key views from residential areas through to the ocean have not been maintained and the OS2 building does not effectively accentuates the Buckland Hill Ridgeline. The north-south orientation and mass of the OS2 would tend to create a wall through which the key views to the ocean are blocked from the critical residential viewpoints. However, even if this building did not exist, the height and mass of buildings on the Tasker, Matilda Bay and East Leighton sites would also block a significant portion of the viewlines to the ocean from residences located to the north and east of the project area.

Orientation of taller buildings in an east-west or northeast to southwest manner could potentially open up more of the critical residential-to-ocean views. This could also allow a greater setback distance to be achieved from the northern boundaries of the One Steel and Tasker Sites, potentially reducing the overlooking problems regarding residences along Riversea View. However, overshadowing of other buildings to the southwest, south and southeast could well remain a problem.

The Tasker Site poses somewhat an opposite scenario to that of the One Steel Site. Here, the buildings are of much lower height than the OS2 building, but remain high enough to block residential views to the ocean (and in some isolated cases, possibly to the Swan River). However, the number and density of the buildings proposed on the Tasker Site would create a relatively imposing mass and result in internal open spaces that would not add desirable visual/landscape amenity within the site, while contributing little to the visual/landscape appearance of the public streetscape and the surrounding area.

The Matilda Bay Site reflects many of the same adverse issues as the Tasker Site, however, with the application of larger and taller buildings that would not only crowd the development site, but appear as visually undesirable and uninspiring built forms of no landmark value. The MB2 and MB3 buildings would also rise to 8 storeys and 30 m above ground level within the 300m HSD setback set by the State Coastal Planning Policy, requiring special consideration and allowance within the Fremantle Planning Scheme or alteration of the buildings design.

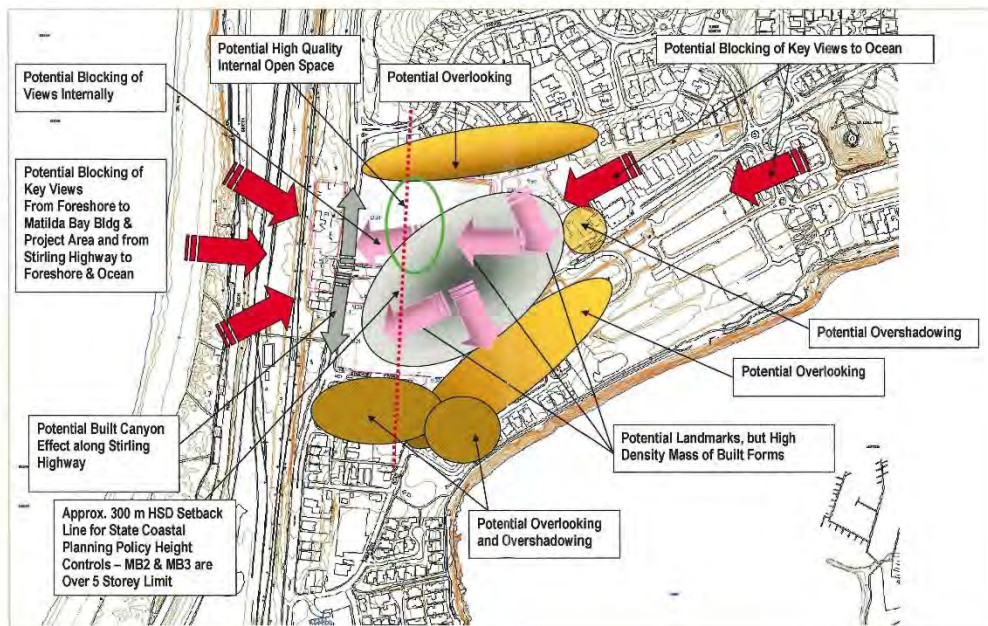
The East Leighton Site developments would achieve the Coastal Height Policy Visual Performance Standard, but would be visually dominant within the foreshore environment, potentially creating an urban canyon effect along the Stirling Highway, taking away from any positive benefits of the set-back and low-rise garden nature of OS1 and not taking advantage of potential views from the Stirling Highway and buildings to the east of it westward to the North Fremantle Foreshore and the Indian Ocean.

The potential Corner Site developments in Scenario No. 1 would be relatively low key and probably in keeping with a desirable visual fit with the Stirling Highway and McCabe Street intersection.

Table 5...continued

Horizon Line & Panoramic Views	Limited Portion of Horizontal View Occupied by Development: Site buildings and structures to avoid or minimize obstructions to the panoramic, wide bay views. Where this is not possible, design the form and mass of such structures to create blended and gradual transitions with background features and hillsides. As viewed from New Fingertown viewpoints (0 to ~500m) new landscape alterations seek to not should not occupy more than 80% or one-third the 180° panorama or horizontal line. As viewed from Mt Fingertown and other distant viewpoints (500m or greater) new landscape alterations seek to not should not occupy more than 20% or one-third of the 180° panorama or horizontal line. Natural vegetation/landscape breaks between separate new attraction sites should seek to create views of adjacent undeveloped views of approximately 10°-20° or greater between buildings/structures in the horizontal view.	Scenari 1 only achieves this Visual Performance Standard when viewed from Viewpoint 9 (Fig. 19). In the view from Viewpoint 14 (Fig. 21), the potential buildings would be close to meeting the desired maximum proportion of horizontal view unobstructed, however, they do not display the desired undeveloped visual breaks between building masses.	
Key Landscape Features	Protect Views to Key Features: Avoid interruption of views to visually key or highly scenic landscape, waterform, vegetation or cultural/heritage features or focal points by buildings and structures, including boats on sailing moorings or in marina berths.	- Significant adverse effects on views from residences along the southern side of Riverside View to the Indian Ocean, from residences along the south and of this street, views to the ocean would be largely obscured. For residences along the northern and of this street, up to 80% of the existing ocean views would be obscured. - Buildings on the One Steel, Tasker, Matilda Bay and probably East Leighton places would all contribute to this view loss. - The obstruction of existing views from residences in the Minim Cove and Buidard Hill areas east of the project area would be to a significantly lesser extent; however, approximately 40% of the existing view to the Indian Ocean would be blocked.	No significant loss of views to the Swan River have been identified, however, many residences along Riverside View do not currently have such views available and residences with such views elsewhere would not be affected by the potential developments.
Overlooking	Minimisation of Overlooking into Neighboring Properties: The potential for overlooking by occupants of future developments into the windows and yards (particularly balconies) of neighboring properties should be avoided completely or minimised where ever possible. Although the potential use of vegetative screening may be considered, significant views from neighboring properties should be retained as much as possible. Alternative solutions such as the use of architectural screens attached to future building facades to direct views away from neighboring properties may be one possible solution.	- Potential overlooking exists with the OS2, TS1 - TS5, and MS3-MS7 buildings. This is most exacerbated with the OS2 building, which would be 12°-steeply high with relatively short setbacks to neighboring properties to the north. - MS3 and MS7 would probably have the next greatest overlooking effects on residences in the south and south east. - The effects of the T1 and T2 buildings on residences in the Minim Cove development may be modified to some extent by the stone wall along McCabe Street and the change in levels due to the topographic escarpment just south of McCabe Street.	Overlooking into the areas to the south might also be more easily accommodated through the establishment of vegetation screens since Minim Cove views to the north and east are limited.
Overshadowing	Minimisation of Overshadowing into Neighboring Properties: The potential for overshadowing by future developments into the windows and yards (particularly balconies) of neighboring properties should be avoided completely or minimised where ever possible. Where overshadowing occurs, it should not exceed 2-3 hours per day on any given day of the year. (Refer also to R-Code Section 6.9.1)	- Overshadowing would primarily affect the residences in the Rule Street and Minim Cove developments during the early morning and late afternoon hours of the winter season, as shown in Fig. 20. - Summertime shadow effects are not pronounced on neighboring properties or the Signaling Highway. However, minimal shadow effects within the Tasker Site, the One Steel Site and the Matilda Bay Site are significant and may exceed the 2 hours per day.	
Cumulative Visual Effect	Tight Development Nodes with Gaps between Clusters and Villages: Avoid excessive expansion of established landscape alterations and building/structural nodes. Tight clusters of development are preferable. Provide a significant visual gap between building/structural clusters on a local basis and between townships and related developments on a sub-regional basis. Refer to Horizon Line & Panoramic Views text.	With an overall development area of approximately 8 ha this could be described as a relatively tight development cluster. However, there are relatively few visual gaps between the potential buildings on the six development sites and this leads to a higher cumulative effect in terms of built form massing, blocking of key views and overall visual alteration.	

Figure 27 Visual Analysis of Key Assessment Factors Regarding Development Scenario No. 1



Potential Improvements

Potential improvements to Scenario No. 1 for the purposes of adjustments in Scenario 2 are considered for each of the five development sites assessed as follows.

East Leighton

- Reduce building heights to allow foreshore views to and from the east side of the Stirling Highway and the highway as well.
- Reduce the north-south length of the buildings to provide viewing portals through the site from the highway to the foreshore and vice versa.
- Consider smaller buildings with east-west or northwest-southeast orientations to improve the viewlines through the site.

Matilda Bay Site

- Overshadowing and overlooking problems cannot easily be avoided unless mid-rise to high-rise buildings are incorporated with a portion of MB1, which is a listed Heritage Building, requiring special design to be acceptable.
- Mid-rise buildings would be best located adjacent to the escarpment immediately south of McCabe Street, however, the height would need to be limited to avoid overshadowing and overlooking issues to the south. In addition, care must be taken to avoid any urban canyon effects along McCabe Street and to reinforce the westward view along the street to the ocean.
- Higher buildings should be avoided along the south and southeastern boundary of the site, due to the overlooking and overshadowing problems on the Foundry Court and Minim Developments. This would place them within the 300 m HSD Coastal Height Policy zone, however.
- The southern and eastern portion of the site more appropriately lends itself to a lower profile building with a larger footprint, possibly constructed on split levels to accommodate modest changes in site levels. Basement levels could also be established beneath such a structure.

One Steel Site

- This site provides the opportunity to either complement the Buckland Hill residential development to the north with similar types of development or to create another variation on smaller footprint high-rise development that may provide a more distinctive landmark building along Buckland Ridge and in proximity to the Stirling Highway and northern gateway to Fremantle.
- Mid-rise to high-rise buildings sited closer to McCabe Street and oriented east-west or southwest-northeast may provide a compromise between desired densities by the developers and retention of significant views to the ocean, while reducing overlooking issues to the north. However, this could place them within the 300 m HSD Coastal Height Policy zone and potentially create an urban canyon effect.
- Lower-rise development may be best located along the northern side of the allotment, permitting views from higher adjacent residences on the north over such buildings and through the site to the ocean (and, where possible, toward the Swan River).

Tasker Site

- This site provides the opportunity to either complement the Buckland Hill residential development to the north with similar types of development or to create another variation on smaller footprint high-rise development that may provide a landmark building along Buckland Ridge and in proximity to the Stirling Highway and northern gateway to Fremantle.
- Mid-rise to high-rise buildings sited closer to McCabe Street and oriented east-west or southwest-northeast may provide a compromise between desired densities by the developers and retention of significant views to the ocean, while reducing overlooking issues to the north. However, creation of an urban canyon effect along McCabe Street should be avoided if possible. Care must also be taken to align any higher buildings with similar high-rise buildings of the One Steel and Matilda Bay Sites to ensure that key viewlines to the ocean from the east (esp. Mt Lyell Lookout) are maintained and enhanced.
- Lower-rise development may be best located along the northern side of the allotment, permitting views from higher adjacent residences on the north over such buildings and through the site to the ocean (and, where possible, toward the Swan River).
- Fewer buildings with larger footprints should be created, but leaving more of the site available for open space should be considered.
- Consideration of a shared entry road with the One Steel Site could provide greater flexibility in the siting of buildings within the Tasker Site.

The Corner Site

- The Scenario 1 solution is generally acceptable and could remain.
- Another alternative for this site may be a high rise landmark building, setback from, but addressing the Stirling Highway.
- A third option would be to clear all buildings from this site and incorporate it with a more distinctive landmark building on the Matilda Bay Site that is set well back from the main road intersection. The Corner Site could then serve as a combination of attractive landscaping on the corner with carparking areas setback from McCabe Road closer to the entry to the landmark building.

6 Visual Analysis and Assessment of Scenario No. 2

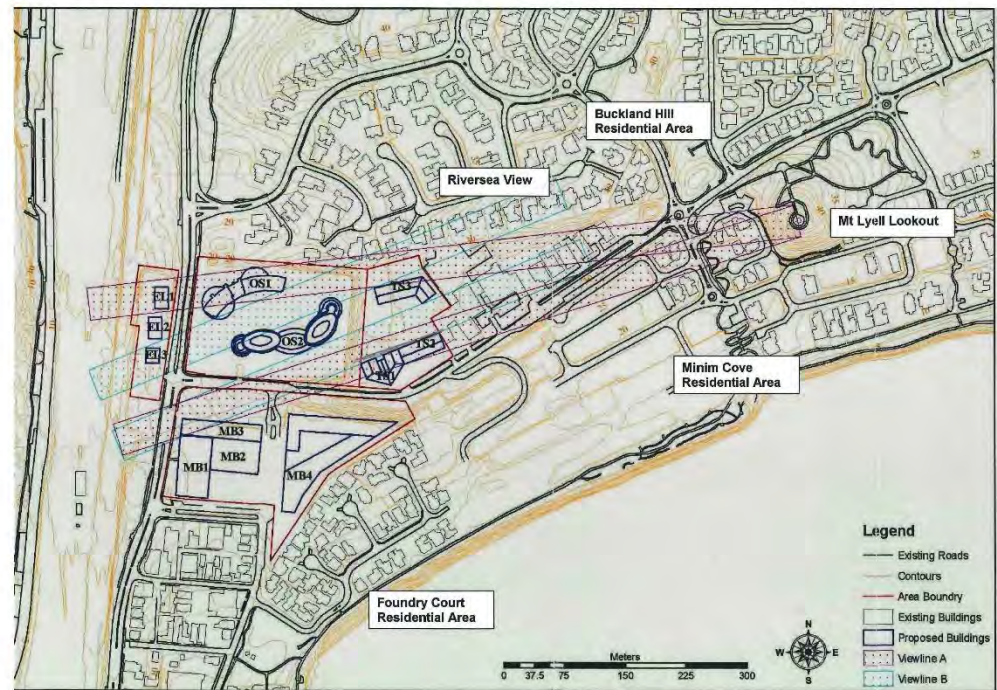
6.1 Establishment of Potential Building Footprints and Heights

Potential building footprints and heights have been developed for Scenario 2 based on consideration of the visual effects of Scenario 1 and the analysis of the potentials to achieve more benefits while reducing most of the adverse visual effects of Scenario 1. Maximisation of views to key features and visual/landscape amenity were central to the development theme, along with creation of strong vertical landmarks on or near the 300 m HSD Coastal Height Policy line. The proposed building footprints and roof outlines for Scenario 2 are shown in Figure 28 along with viewlines from Mt. Lyell Lookout (Viewline A) and the Buckland Hill residential area of Mosman Park (Viewline B). As it was clear from Scenario 1 that partially maintaining westward and southwestward views to the Indian Ocean could potentially improve the acceptability of higher rise structures, buildings were oriented and sited to allow for these view corridors through the sites to break up the apparent visual mass of the overall development, giving particular consideration to the residential area to the north.

Providing increased setbacks of taller buildings from the residences to the north was also a key consideration in Scenario 2, primarily to reduce potential for overlooking into the back yards of these residences.

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Figure 28 Scenario 2 Building Footprints and Roof Outlines



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The importance of views along McCabe Street toward the ocean and provision of the opportunity for a more park-like, green avenue effect also influenced the Scenario 2 layout. Along with this, it was important to avoid the canyon-effect created by the mid-rise Scenario 1 buildings on the East Leighton Site and to ensure that the buildings along the Stirling Highway did not unduly block views to the ocean from residences and new multi-dwelling buildings located further east within the development area.

As well as protecting and enhancing view corridors through and adjacent to the development area, another objective of Scenario 2 was to provide an option in which higher-rise buildings could take place in selected locations and that those buildings might better achieve a "landmark" effect for the area as seen from points along the coastal foreshore, along the Stirling Highway and along the Swan River corridor.

To achieve the above objectives, the buildings on the East Leighton Site were reduced to a single level in height (22-23 m AHD roof heights) and to a much smaller size. The site has been kept to only three buildings (EL1, EL2 and EL3) located north of McCabe Street. This would allow potential views toward the foreshore and ocean from McCabe Street at its intersection with the Stirling Highway. It would also create a greater sense of open space connection between current foreshore parklands and the Stirling Highway in the vicinity of the railway pedestrian bridge. The reverse view from the railway pedestrian bridge toward the Matilda Bay Building and the development area would also be relieved of current built-form clutter north of the bridge, providing a more aesthetic landscaped foreground through which future buildings in the development area could be appreciated. The length of the buildings on the East Leighton Site were also shortened and set apart to allow views through them to the foreshore and ocean. It was decided not to turn them at an angle to the Stirling Highway, however, as this would benefit views from the north or south only, and not in both directions.

Moving to the former One Steel Site, the same building footprints as proposed by the SAS Global Property Group in Scenario 1 were retained, but rotated to roughly northeast-southwest orientations running parallel with the residential view corridors. The two buildings were also kept separated by approximately the width of one of the view corridors. OS1, the shorter building (max. 4 levels at 34 m AHD), was located adjacent to the residential area to the north and set under a view corridor of Mt Lyell Lookout. OS2, the taller of the two buildings, was set back further from the residential areas to the north, with the levels of the tower at the northeast end made shorter in height (max 59 m AHD or 12 storeys) while the height of the tower at the southwest end was considerably increased (97 m AHD or 25 storeys) and the centre section of the building depressed to a lower height (53 m AHD) between the two towers. This was done not only to provide greater respect for residential sensitivities to overlooking, but to add greater visual interest to the building itself in the hope of creating a more attractive landmark building on the site. One drawback is that the high rise tower is just within the 300 m HSD Coastal Height Policy setback line, but the base elevation of OS2 was kept at 21.5 m AHD, lower than the 25 m AHD in Scenario 1. To further compensate somewhat for the added height of OS2 near McCabe Street and to respect the view corridors, OS2 was setback approximately 20 m or more from the street, allowing for greater landscaping. This would also reduce the effect of overshadowing by the building onto other building sites located on the south side of McCabe Road and on the adjacent Tasker Site.

The Tasker Site proved more difficult to improve without greatly reducing the number of buildings on the site to three overall. TS1 took on the same footprint as in Scenario 1; however, the building was rotated and moved closer to McCabe Street to avoid one of the residential view corridors. This shift also allowed a significant increase in the height of this building (79 m AHD or 16 levels) to be achieved in a location set well away from residences to the north. The TS2 building was set 4.5 m higher than in Scenario 1 (56.5 m AHD with 7 floor levels), but sited with a common wall with TS1. TS3 was located between the two residential view corridors and setback from the northern property line by approximately 20 m. The longer west wing of TS3 was raised up to a greater height (59 m AHD to roof with 8 levels) given it fell within the same viewline as the OS2 building to the east. The shorter south wing of the TS3 building was set at a lower height to permit views over it from the residential areas to the northeast through a view corridor between the OS2 and TS1 buildings.

It is envisaged that a new access road could be constructed along the boundary between the One Steel Site and the Tasker Site to provide vehicular access to both sites, permitting the building siting suggested for both sites and avoiding an access road intersection into the One Steel site further to the west.

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The Matilda Bay Site would retain the western portion of the Matilda Bay Brewery Building (MB1 – max. 33.5 m AHD) as a heritage building, but incorporate with it a landmark tower (MB2) rising to 97 m AHD (20 floor levels) immediately behind it to the east, but within the 300 m HSD Coastal Height Policy setback line. A longer, lower entry/forecourt building (MB3) would be on the north side of this complex. It is envisaged that the Corner Site might be incorporated as part of the future Matilda Bay development, but utilised for a landscaped area on the corner of McCabe Street and Stirling Highway as well as providing for car parking that would be setback approx. 20 m from McCabe Street, allowing the park-like avenue treatment to continue eastward from the intersection area. This would also provide a visually enhancing way for the Matilda Bay development to address Stirling Highway – drawing attention to it without creating a claustrophobic canyon-effect along the highway. A corporate sign or sculpture or both might be located within the corner landscape space. Hence, no building is proposed for the Corner Site in Scenario 2. The combination of MB2 and MB3 could potentially suite a hotel development, with good access via the heritage pedestrian footbridge over the railway to Leighton Beach.

MB4 would be an expansive building with a very large footprint filling much of the eastern portion of the Matilda Bay Site. This building would be setback at least 20 m from McCabe Street to allow a continuation of the park-like avenue effect, while avoiding building construction against the steep escarpment on the south side of McCabe Street (an access road could be provided between MB4 and McCabe Street, linking to the main entrance road within the site. The northern section of the MB4 building would rise above McCabe Road to 56 m AHD (12 floor levels), but with a lower triangular section with a flat roof/sundeck (50 m AHD or 11 levels) on its eastern end to reduce overshadowing effects on residents in Minim Cove to the east. The building roofline would drop down to a lower triangular-shaped central section of the building at 52 m AHD, with the roof sloping down to 37 m AHD in a southeastward direction toward the Minim Development, allowing views from the upper levels of the northern section of the building to the Swan River. The southeastern section of the building would drop down even lower to 26 AHD or 3 levels above existing ground level. This section of the building would be adjacent to existing residential housing, but setback from the property boundary to allow for some vegetative screening and a reduction of potential overlooking. The south corner section of the Matilda Bay Site, south of MB4 would be kept free of buildings to provide a more natural open space area.

Table 6 provides the Scenario 2 building heights and approximate building areas and total mass. (Note: all calculations in Table 6 and subsequent similar tables to be read as approximations.)

Table 6 Scenario 2 Building Height, Area and Mass Dimensions

Site/Bldg No. (Scenario 2)	Base of Bldg AHD	Top of Wall (AHD)	Wall Meters	Top of Roof (AHD)	Roof Height Meters	Total Building Meters	Foot Prints Area (M ²)	No. Of Levels @ 3m Intervals	Total Floor Area (M ²)	Total Volume (M ³)	Roof Status
TASKER SITE											
TS1	29.5	74.5	45	79	4.5	49.5	1380.53	15	20707.95	65230.0	Gable
TS2	31	52	21	56.5	4.5	25.5	1114.38	7	7800.66	25908.56	Gable
TS3a	30.5	54.5	24	59	4.5	28.5	1104.69	8	13830.48	28998.11	Gable
TS3b	30.5	36.5	6	41	4.5	10.5	405.84	2	811.68	3348.21	Gable
Total Tasker							4005.44		43150.77	94576.32	
MATILDA BAY SITE											
MB1	EXISTING BLDG										
MB2	17	83	66	100	17	93	2400.00	22	52800.00	178800.0	Skillion
MB3	18	36	18	39	3	21	1987.05	6	11922.3	38727.0	Skillion
MB4a	17	53	36	56	3	39	2516.89	12	30202.68	94383.38	Skillion
MB4b	17	50	33	50	0	33	257.56	11	2833.16	8499.48	Flat
MB4c	17	37	20	53	16	36	1665.15	6	9990.9	46624.2	Slope
MB4d	17	26	9	28	2	11	3096.02	3	9288.06	30960.02	Slope
Total MB4							7535.62		52315	180467	
Total MB							11922.67		117037.3	397994.0	

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Table 6 continued.....

Site/Bldg No. (Scenario 2)	Base of Bldg AHD	Top of Wall (AHD)	Wall Meters	Top of Roof (AHD)	Roof Height Meters	Total Building Meters	Foot Prints Area (M2)	No. of Levels @ 3m Interval	Total Floor Area (M2)	Total Mass (M3)	Roof Status
CORNER SITE											
No Building							NA		NA	NA	NA
EAST LEIGHTON SITE											
EL1	18.5	21.5	3	23.5	2	5	441.12	1	441.12	1764.48	Gable
EL2	18	21	3	23	2	5	441.12	1	441.12	1764.48	Gable
EL3	17	20	3	22	2	5	297.70	1	297.70	1190.20	Gable
Total E. Leighton							1179.94		1179.94	4719.16	
ONESTEEL SITE											
OS1	21.5										
a1	21.5	25	3.5	25	0	3.5	582.32	1	582.32	2038.1	Flat
a2	21.5	28	6.5	28	0	6.5	29.32	2	58.64	190.58	Flat
a3	21.5	28	6.5	28	0	6.5	937.93	2	1875.86	6096.5	Flat
a4	21.5	25	3.5	25	0	3.5	299.6	1	299.6	1048.6	Flat
a5	21.5	31	9.5	31	0	9.5	326.05	3	978.15	3097.5	Flat
a6	21.5	34	12.5	34	0	12.5	737.39	4	2949.56	9217.4	Flat
a7	21.5	28	6.5	28	0	6.5	547.98	2	1095.96	3561.9	Flat
Total OS1							3,461		7,840	25251	
OS2											
a4	75	78	3	78	0	3	67	1	67	199.8	Flat
a3	72	75	3	75	0	3	159	1	159	474.9	Flat
a2	69	72	3	72	0	3	250	1	250	748.2	Flat
a1	25	69	44	69	0	44	341	15	5115	16173.8	Flat
Subtotal							817		5591	17596.7	
b3	94	97	3	97	0	3	250	1	250	749.67	Flat
b2	90	94	3	94	0	3	891	1	891	3570.5	Flat
b1	25	90	65	90	0	65	1047	22	23034	68157.1	Flat
Subtotal							2188		24175	72477.3	
c2	50	53	3	53	0	3	440	1	440	1318.85	Flat
c1	25	50	25	50	0	25	972	8	7776	24287.6	Flat
Subtotal							1412		8216	25606.5	
d3	56	59	3	59	0	3	250	1	250	749.7	Flat
d2	53	56	3	56	0	3	877	1	877	2632.0	Flat
d1	25	53	28	53	0	28	1099	9	9891	30785.54	Flat
Subtotal							2226		11018	34167.2	
e4	50	53	3	53	0	3	86	1	86	258.6	Flat
e3	47	50	3	50	0	3	137	1	137	412.1	Flat
e2	44	47	3	47	0	3	303	1	303	909.2	Flat
e1	25	44	19	44	0	19	463	6	2778	8806.5	Flat
Subtotal							989		3,304	10386.4	
Total OS2							7,632		52,304	160,234	
Total One Steel							11,093		60,144	185,485	
GRAND TOTAL							28,201		229,352	682,774	

In addition to the dimensional data shown in Table 6, we have also examined the ratio of total building footprint and floor space areas to the total site areas for the five development sites to determine the Footprint to Site Ratio (total footprint m² ÷ total site area) and the Gross Plot Ratio (total floor space m² ÷ total site area). These calculations are shown in Table 7. (Note: all calculations in Table 7 and subsequent similar tables to be read as approximations.)

Table 7 Scenario 2 Site Footprint, Floor Space and Gross Plot Ratios

Development Site (Scenario 2)	Total Site Area M ²	Total Footprint M ²	Footprint to Site Ratio	Total Floor Space M ²	Gross Plot Ratio
1. East Leighton	6,966	1180	0.169	1180	0.169
2. One Steel	27,585	11,093	0.402	60,144	2.180
3. Tasker	14,078	4,005	0.284	43,151	3.065
4. Matilda Bay	30,838	11,923	0.386	117,037	3.795
5. Corner	2,040	NA	NA	NA	NA
Total	81,507	28,201	0.346	229,352	2.814

6.2 Computer Modeling and Photomontage of Buildings for Each of the Development Sites.

The Scenario No. 2 building footprints for the five development sites have been drafted in AutoCAD, importing footprints from site developers CAD plans where possible. The building wall heights, roof heights and roof styles have been assigned to each building as per Table 6, according to what the developers have indicated in their drawings or, where such information was not available, as determined by Scenic Spectrums, providing some mix of simple gable roof styles and some flat and mansard-style roof styles. The AutoCAD building footprints have been first integrated with the AutoCAD topographic contours and roads imported into 3D Studio Max (3DSM).

The 3D building forms have been modeled and computerised camera views generated in same manner as used for Scenario 1.

6.3 Photomontages of Scenario 2 Views from Selected Priority Viewpoints

Photomontages of the Scenario 2 views of the modeled potential buildings are shown in Figures 29-38.

6.4 Shadow Analysis Plans

Shadow analysis plans have been prepared for the Scenario 2 buildings for 9.00 am, 12 noon, 3.00 and 6 pm on 22 June and 21 December, 2008 using sun azimuths for the Perth area as programmed in the 3DSM modeling software. These shadow analysis plans are shown in Figures 39 and 40.

6.5 Visual Analysis and Assessment

Scenario No. 2 has been analysed and assessed according to the key assessment factors and visual performance criteria outlined in Table 2. This assessment has involved the review and analysis of the ten photomontage scenes in Figures 29 - 38. The visual assessment is summarised in Table 8. Key aspects of this assessment are also illustrated in plan form in Figure 41.

Figure 29 Scenario 2 Photomontage from Viewpoint No. 3 – Balcony View from Residence on Riversea View



Figure 30 Scenario 2 Photomontage from Viewpoint No. 4 – View from Patio Garden of Residence on Riversea View



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Figure 31 Scenario 2 Photomontage from Viewpoint No. 5 on Stirling Highway north of Vlamingh Parade



Figure 32 Scenario 2 Photomontage from Viewpoint No. 7 – Footpath on Leighton Foreshore just South of Beehive Montessori School



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Figure 33 Scenario 2 Photomontage from Viewpoint No. 8 – Pedestrian Footbridge over Fremantle Railway Line Opposite the Matilda Bay Brewery Building



Figure 34 Scenario 2 Photomontage from Viewpoint No. 9 – Fremantle Surf Life Saving Club



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Figure 35 Scenario 2 Photomontage from Viewpoint No. 12 – Swan River Walking Track East of Phyllis Street, North Fremantle



Figure 36 Scenario 2 Photomontage from Viewpoint No. 14 – Parkland at Corner of Bolton Street and Angwin Street, East Fremantle



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Figure 37 Scenario 2 Photomontage from Viewpoint No. 18 – Boat Ramp on Swan River South of Zephyr's Café, East Fremantle

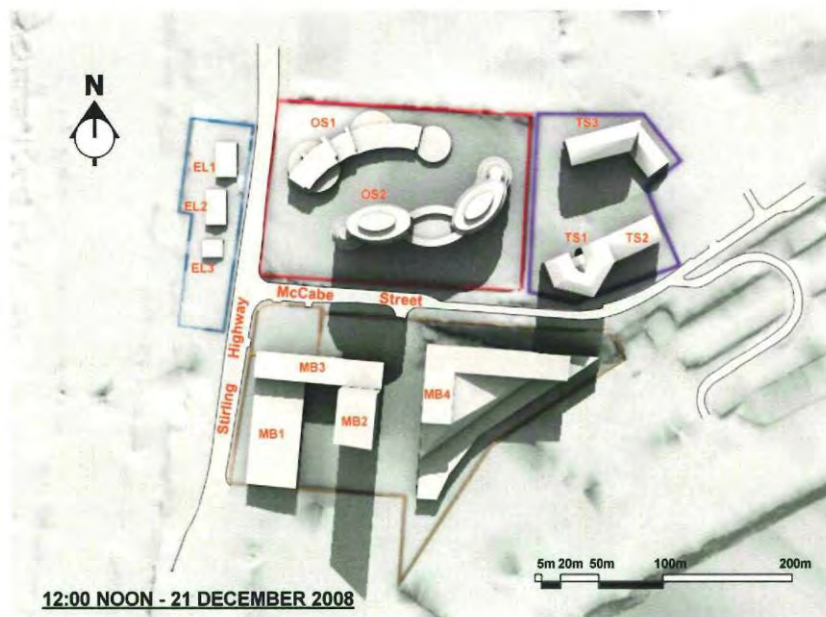
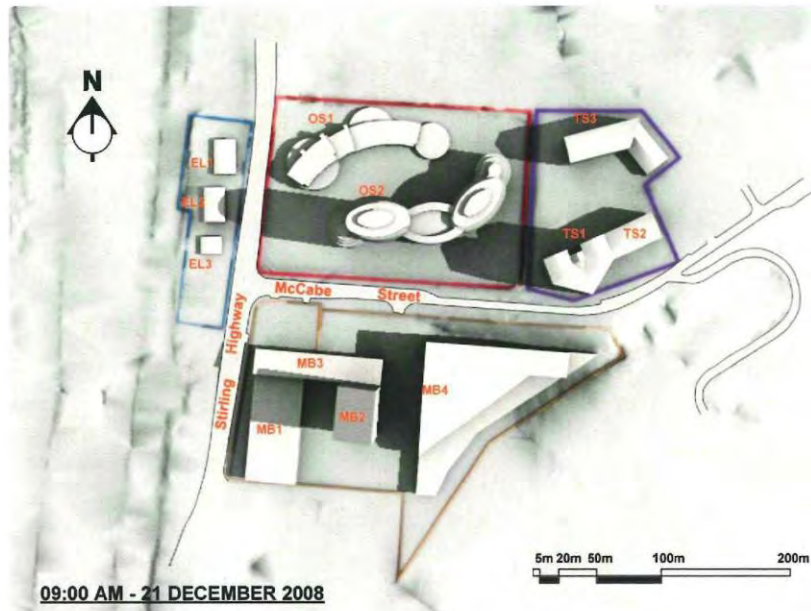


Figure 38 Scenario 2 Photomontage from Viewpoint No. 20 – Mt Lyell Lookout east of the Minim Residential Development in Mosman Park



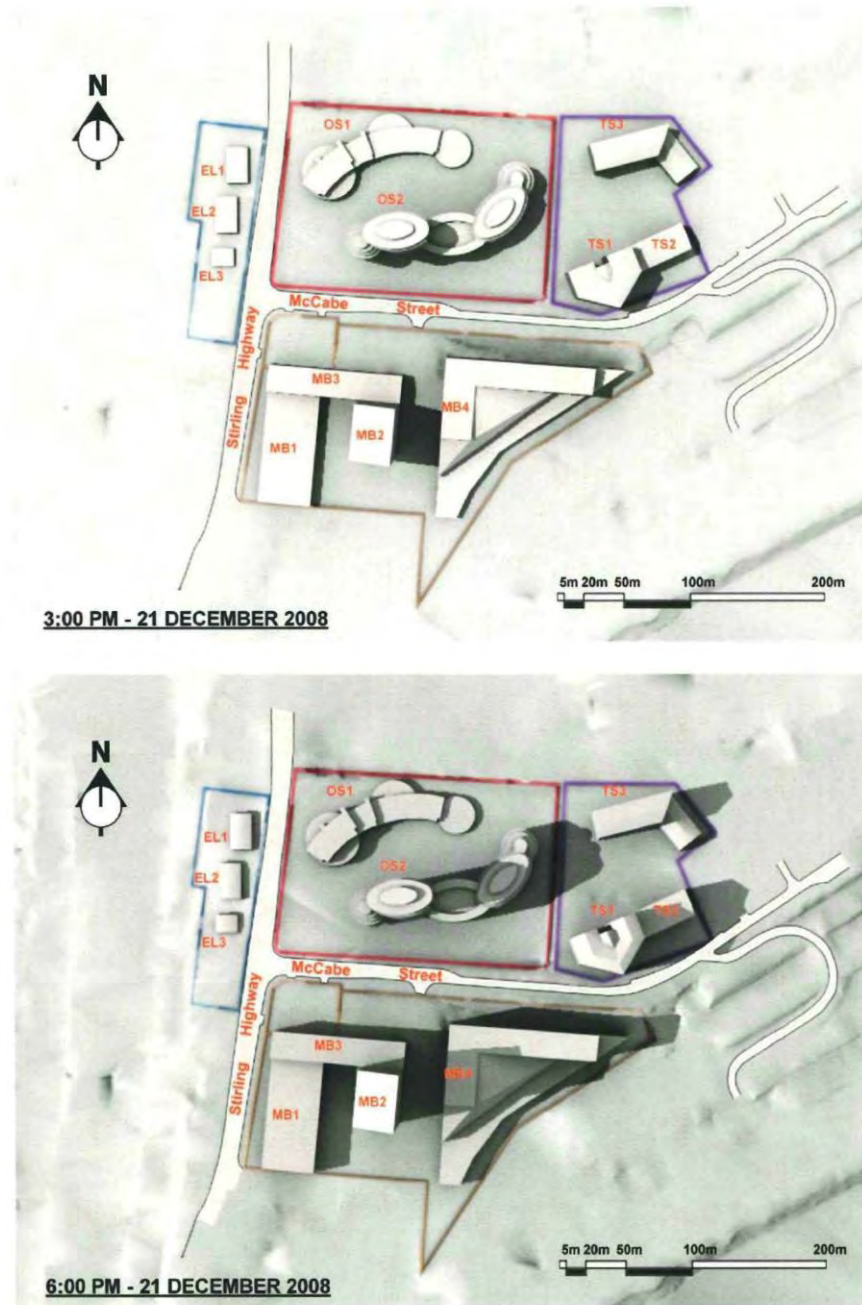
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Figure 39 Scenario No. 2 Shadow Analysis Plans for 21 December 2008



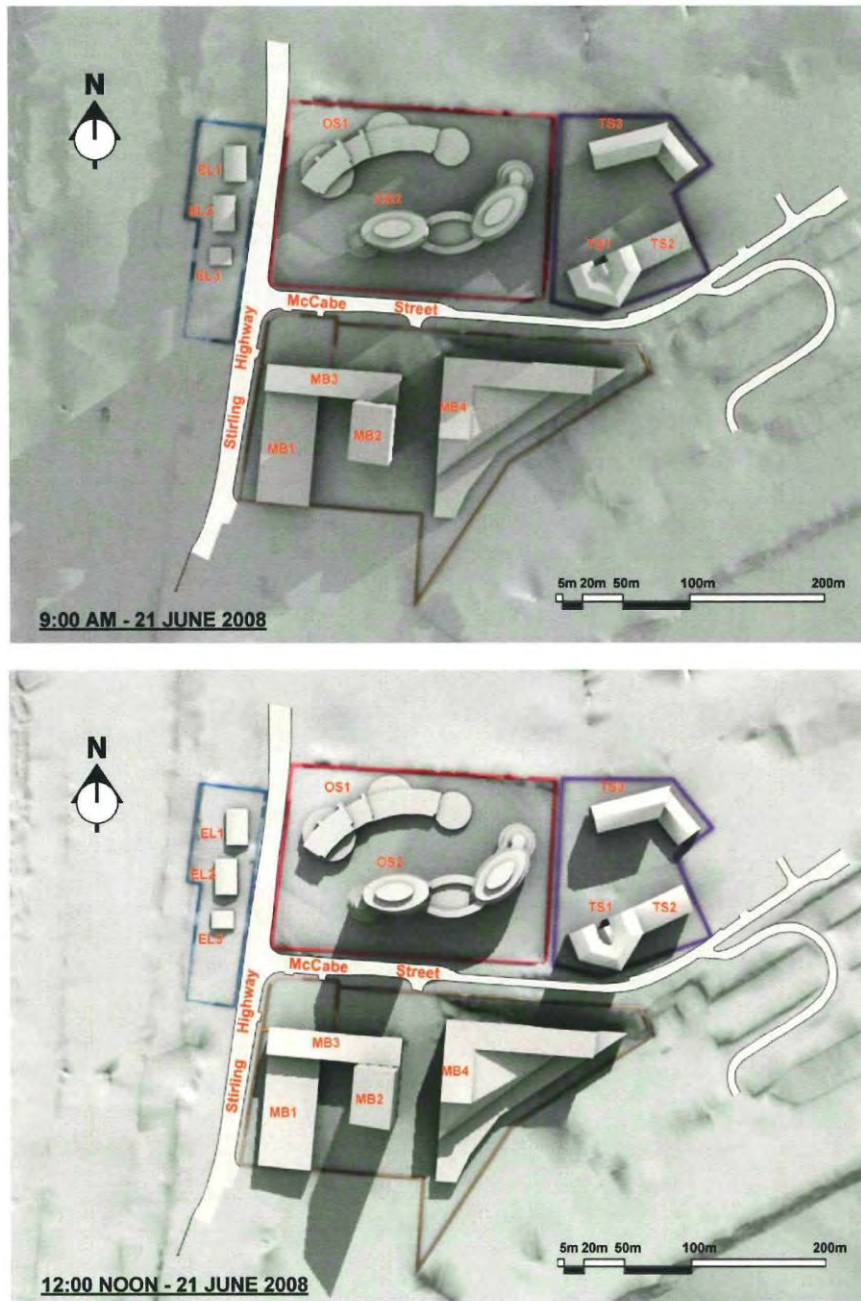
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Figure 39....continued



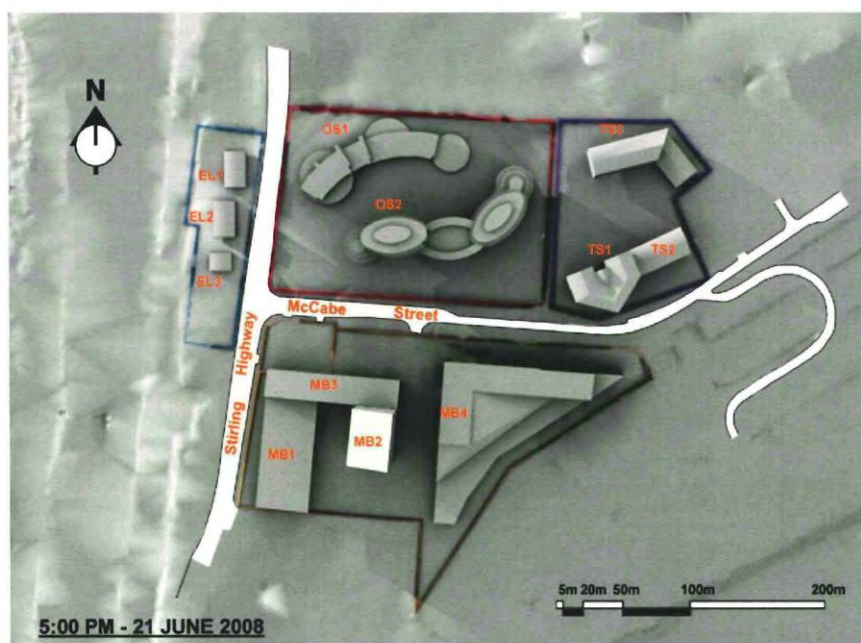
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Figure 40 Scenario No. 2 Shadow Analysis Plans for 22 June 2008



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Figure 40....continued

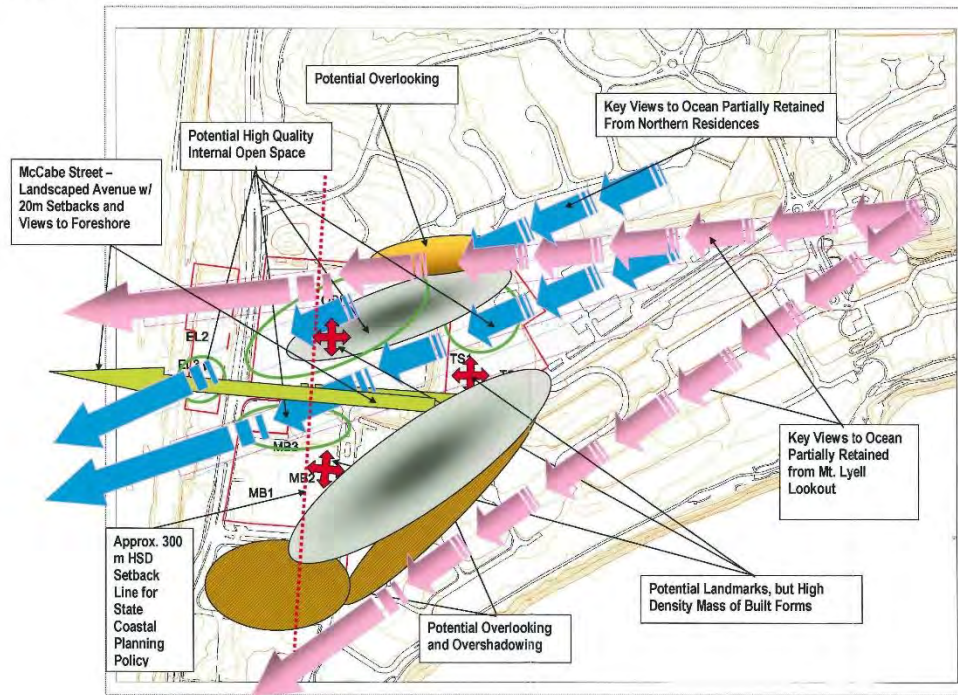


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Table 8...continued

Table 6.3-continued			
Horizon Line & Panoramic Views	Limited Portion of Horizontal View Obstructed by Development: Site buildings and structures to avoid or minimize obstructions to the panorama, wday bay views. When this is not possible, design the form and mass of such structures to create blended and gradual transitions with backdrop landscapes and ridgelines. As viewed from View Foreground viewpoints (0 m – 500m) new landscape alterations are not to not obstruct more than 10° or one-third the 180° panorama or horizontal line. As viewed from Mid Foreground and more distant viewpoints (500m or greater) new landscape alterations seek to not shield not occupy more than 20° or one-fifth of the 180° panorama or horizontal line. Natural vegetated landscape breaks between separate view station areas should seek to create views of apparent undeveloped seascapes of approximately 15°- 20° or greater between buildings/structures in the horizontal view.	Visual Performance Standard not achieved when viewed from Viewpoints 4, 5, 7, 12 and 16. As the view from Viewpoint 14 (Fig. 21), the potential buildings would be close to meeting the desired maximum proportion of horizontal view unobstructed, however, they do not display the desired undeveloped visual breaks between building masses.	- Visual Performance Standard would be achieved when viewed from Viewpoints 3, 8, 9 and 14. - From Viewpoint 23, Scenario 2 is close to meeting the desired maximum proportion of horizontal view unobstructed, and it does display the desired visual breaks between building masses allowing views through and around to the Indian Ocean.
Key Landscape Features	Protect Views to Key Features: Avoid interruption of views to visually key or highly scenic landscape, waterfront, vegetation or cultural/historical features or focal points by buildings and structures, including both on- and off-site proposals or in marine belts.	Obstruction of existing views from residences in the western end of Riverside View, however, current views to Swan River are possible for most residences in this area and views to Indian Ocean are minimal and could be blocked by standard Single Residential Housing.	- Views to desired features relatively well maintained from Viewpoints 3, 5, 7, 8 and 10. - Low profile and industrial look of Buckland Hills as viewed from viewpoints to south and south east may be seen as improved by the landscape treatment of Scenario 2 built form.
Overtaking	Minimisation of Overtaking into Neighboring Properties: The potential for overtaking by occupants of future developments into the windows and yards (particularly backyards) of neighboring properties should be avoided completely or minimised where ever possible. Although the potential use of vegetative screening may be considered, significant views from neighboring properties should be retained as much as possible. Alternative solutions such as the use of architectural screens attached to future building facades to direct views away from neighboring properties may be one possible solution.	- The potential for overtaking exists with the T334 building in particular. Some parallel with T31 and OS2, but both have reasonable setbacks from adjacent residences. - MB2 may possibly be a problem, but it is well setback and would be partially screened by MB4.	- The effects of the T33 & T34 buildings could be mitigated with the design of balconies orientated to the NW and skirting to screen walls to minimise views to residences immediately north. - Higher part of MB2 is well setback, as is MB2. - Potential for some vegetative screening between higher rise and single dwelling residential areas.
Overshadowing	Minimisation of Overshadowing onto Neighboring Properties: The potential for overshadowing by future developments into the windows and yards (particularly backyards) of neighboring properties should be avoided completely or minimised where ever possible. Where overshadowing occurs, it should not exceed 2-3 hours per day on any given day of the year. (Refer also to R-Code Section 5.6.1)	Residences in the Rude Street, Mirra Development and area south of Markita Bay Blvd. will primarily be affected during winter months, but not to much during summer. However, the sun appears to be moving relatively quickly during the winter and it is unlikely that any adjacent yard or house would be affected for more than 2-3 hrs.	Visual Performance Standard would be met in relation to adjacent properties not being adversely affected for more than 2-3 hrs per day and only seasonally.
Cumulative Visual Effect	Tight Development Nodes with Gaps between Clusters and Villages: Avoid excessive expansion of established landscape alterations and building/structural nodes. Tight clusters of development are preferable. Provide a significant visual gap between building/structural clusters on a local basis and between forelands and inland developments on a district/regional basis. Refer to Horizon Line & Panoramic Views text.	The relatively solid mass of the lower 10% to 1% of Scenario 2 buildings visible from viewpoints to the south & southeast and to the north-west could be desirable to break up more at ground level. (Such an effect is achieved near intersection of McCabe St. and Stirling Hwy., where lack of achievement near Corner Side and south end of East Leighton site opens up an excellent viewing portal from the west through the proposed development area and from the east along McCabe St. to foreshore and ocean areas.)	- Overall development area approx. 400 metres square is reasonably tight. - Visual gaps exist between the potential buildings with view corridors running mirror like E-W and NE-SW. Also gaps between the 3 tower buildings above the lower mass. - Effective visual gaps along McCabe St. corridor and view corridors between residences of Buckland Hill area and the Indian Ocean. - Scenario 2 achieves Visual Performance Standard from most viewpoints.

Figure 41 Visual Analysis of Key Assessment Factors Regarding Development Scenario No. 2



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6.6 Discussion of Scenario 2 and Potential Improvements for Scenario No. 3

Discussion

Scenario No. 2 relies greatly on increasing the building heights of three key buildings in order to decrease overall building footprint areas and allow view corridors to penetrate between the high-rises to the landscape and special features beyond (e.g. the Indian Ocean). This would potentially create positive visual landmarks on Buckland Hill ridge and in the vicinity of the gateway to Fremantle near its boundary with Mosman Park along the Stirling Highway. This could provide the opportunity to create greater visual/landscape amenity within the development sites that also adds aesthetic benefit to the surrounding area. In addition, generous setbacks would be provided along McCabe Street and park-like open space areas would be created surrounding much of the intersection of the Stirling Highway and McCabe Street. In turn, this would create a visually attractive landscaped gateway to the DA18 and adjacent development area and enhance the streetscape connection for residents living on the east side of the Stirling Highway with Leighton Foreshore.

Another key element of Scenario 2 is the reduction of heights of most buildings along the Stirling Highway corridor, eliminating any potential "urban canyon" effect and better allowing for ocean and foreshore views from buildings located to the east. Buildings within the East Leighton site have been reduced in number, size and height, providing a lower key opportunity for single storey commercial takeaway or office premises on the site with access off the Stirling Highway.

The Scenario 1 buildings on the former One Steel Site have been re-oriented in Scenario 2 to accommodate the views as described above. The result is that the lower OS1 building is located adjacent to the Buckland Hill residential area along the north of the site, while the taller OS2 building is setback further from the residential area and oriented such that overlooking is less of a problem than it was in Scenario 1. There is still an issue in this regard with the northeast end of the building, however, but some clever design or a turning of the building's tail to the south instead of the north at this end may further alleviate potential adverse effects. The west end of OS2 has also been raised to create a landmark tower, which now sits much closer to the Stirling Highway and competes with the suggested high-rise MB2 building for the limelight along Stirling Highway and as viewed from the foreshore. Both of these towers would be located just within the Coastal Planning Policy 300 m HSD setback line and far exceed the 5 storey and 8 storey limits suggested by the State Coastal Planning Policy 2.6. As such, these towers would require a special allowance within the City of Fremantle Planning Scheme and would have to be designed to meet other State Coastal Policy guidelines.

The drawback of the new OS2 orientation and height is that it creates a very large mass as viewed from viewpoints located to the north and to the south, in particular as viewed from the Stirling Highway and foreshore areas looking southeast into the development area. The form of OS2 combines with that of MB2, MB3, TS1, and TS3 to form a formidable wall of buildings from these vantage points. However, these buildings would not obstruct views to any key features (the Matilda Bay Building is left intact along the highway) and both their skyline profiles and what could be very interesting façade articulation and detailing would potentially create a positive urban design and architectural solution from the northern viewpoints.

The TS3 building would also form a visual mass looming up in front of residents along the western end of Riversea View. Although architectural solutions might be designed to minimise or avoid the overlooking issue, the visual mass and dominance of this building would seem to be extreme given the close distance to the neighboring residences. TS3 would be much less visually adverse if it were to be considerably lowered to 2 to 3 levels above ground level.

The MB2 building offers a more exciting, but perhaps more common, urban tower appearance to the mix. It is perhaps somewhat too wide in its footprint dimensions and could be improved somewhat if slimmed down or tapered vertically. It is approximately the same footprint dimension as the Rialto Tower in Melbourne, however, so it remains to be seen if a viable office or service complex would be feasible on a somewhat reduced footprint and floorplan area.

The MB4 building presents the last area of interest within Scenario 2. It would rise above McCabe Road by about 22 m along its north wing, but should not cause significant visual enclosure of the road due to its 20 m setback, making generous landscaping and minor road access possible in this area within the site. This section of the building would wrap around the west end of the structure. As described above, the remainder of the building drops in elevation in two additional levels to the south and southeast, with a deck area elevated about 30 m above ground. This deck and south facing windows would allow the opportunity for scenic views over the Swan River. Although there is some potential for overlooking into the adjacent residences of the Minim Development and the Foundry Court area, the angles of view and the building step-down design should preclude much of this and vegetation along the boundary could limit the problem further. Some minor overshadowing of neighboring yards and houses could also occur, but would not appear to be excessive according to the shadow analyses conducted. The building shape and design make good use of a fairly awkwardly shaped area of the allotment. However, as viewed from viewpoints to the south and southeast, the mass and bulk of this building along its upper level contribute greatly to the visual connection of buildings from TS2 through MB2. This makes the entire area look much more densely developed than is the case in plan view and from other angles of view. This problem could possibly be reduced somewhat by lowering the higher section by 5 m to 10 m. Of course, once street trees and other vegetation is established along the McCabe Street corridor, there would be a visual softening and separation of the buildings that appear almost as one interconnected building in viewpoints from the south and southeast.

Certainly the landmark high-rise character of Scenario 2 could be an attractive development option in terms of achieving greater floor space while minimising building infrastructure and maximizing landscape amenity within the development sites and for the area as a whole. It also presents an alternative for potential hotel development, particularly in relation to the MB2 building. However, this would have to be weighed up against construction and development practicalities, community perceptions/opinion and strategic planning and design objectives.

Potential Improvements

Potential improvements to Scenario No. 2 for the purposes of adjustments in Scenario 3 are considered for each of five development sites as follows.

East Leighton

- Visually satisfactory as shown in Scenario 2, but may not be commercially productive enough to make development worthwhile.
- Consider either townhouse style accommodation or commercial office/retail aligned with buildings backing the railway line, setback from the Stirling Highway to provide adequate parking and access between the two.

Matilda Bay Site

- Reduce the height of mid-rise buildings to approx. 12 m above road level adjacent to the escarpment immediately south of McCabe Street. Maintain setback to avoid any urban canyon effects along McCabe Street and to reinforce the westward view along the street to the ocean.
- Eliminate high-rise buildings.
- Incorporate multi-dwelling accommodation of no more than 3 levels plus roof internally within the site.
- Maintain adequate setbacks from residential area to the south to avoid overlooking issues.

One Steel Site

- Eliminate high-rise buildings.

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- Reduce the height of mid-rise buildings fronting McCabe Street to 12 m plus roof. Maintain setback to avoid any urban canyon effects along McCabe Street and to reinforce the westward view along the street to the ocean.
- Incorporate multi-dwelling accommodation of no more than 3 levels plus roof internally within the site.
- Lower-rise development may be best located along the northern side of the allotment, permitting views from higher adjacent residences on the north over such buildings and through the site to the ocean (and, where possible, toward the Swan River).
- Maintain adequate setbacks from residential area to the north to avoid overlooking issues.

Tasker Site

- Eliminate high-rise buildings.
- Reduce the height of mid-rise buildings fronting McCabe Street to 12 m plus roof. Maintain setback to avoid any urban canyon effects along McCabe Street and to reinforce the westward view along the street to the ocean.
- Incorporate multi-dwelling accommodation of no more than 3 levels plus roof internally within the site.
- Lower-rise development may be best located along the northern side of the allotment, permitting views from higher adjacent residences on the north over such buildings and through the site to the ocean (and, where possible, toward the Swan River).
- Maintain adequate setbacks from residential area to the north to avoid overlooking issues.
- Consideration of a shared entry road with the One Steel Site could provide greater flexibility in the siting of buildings within the Tasker Site.

The Corner Site

- The Scenario 2 solution is generally acceptable and could remain.
- Another alternative for this site would be to reduce the height of mid-rise buildings fronting McCabe Street to 12 m plus roof. Maintain adequate setback to avoid any urban canyon effects along McCabe Street and to reinforce the westward view along the street to the ocean.

7 Visual Analysis and Assessment of Scenario No. 3

7.1 Establishment of Potential Building Footprints and Heights

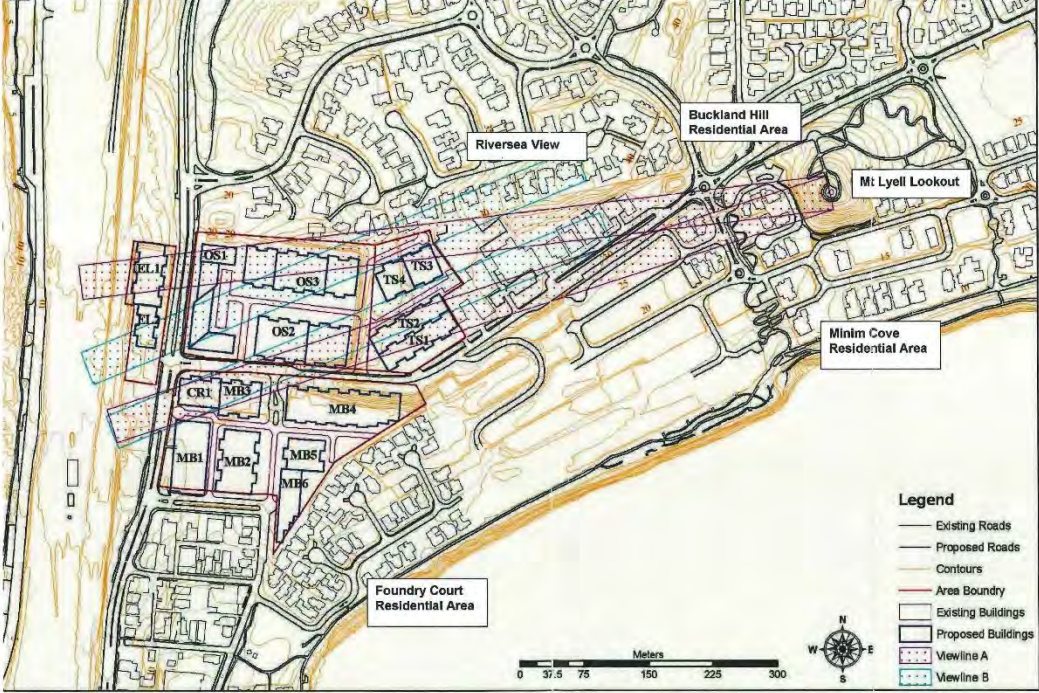
Potential building footprints and heights have been developed for Scenario 3 based on consideration of the visual effects of Scenario 2. In this case, it has been determined that a "low profile" development form with building heights closer to those of the surrounding residential neighborhoods and in keeping with previous Fremantle foreshore guidelines should be examined. The proposed building footprints and roof outlines for Scenario 3 are shown in Figure 42.

Although the key view corridors as outlined for previous scenarios have been kept in mind, the general guiding parameters in the development of Scenario 3 included:

- The height of all buildings fronting the Stirling Highway and McCabe Street would be no higher than 4 levels plus the roof height (i.e., 12 m + roof);
- The height of all buildings within the interior of the development sites would be no more than 3 levels plus the roof height (i.e., 9 m + roof);
- The multi-dwelling development style would be primarily townhouses or condominiums, with some apartment-style buildings;
- Setbacks from property lines along main roads would be reduced to a range of 0 m to 12 m, providing a tighter form of urban development with greater emphasis on landscaping within road reserves and less on landscaping within the frontage areas of the development sites;
- Setbacks from property lines adjacent to residential properties along the northern perimeter of the development area would be kept to a minimum of approximately 15 m in most cases;
- Setbacks from property lines adjacent to residential properties along the southern perimeter of the development area would be variable, allowing some zero lot line examples for the benefit of examining the visual results and implications.

(TEXT CONTINUES ON PAGE 84)

Figure 42 Scenario 3 Building Footprints



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- Buildings on the East Leighton Site would not be located south of McCabe Street in order to maintain a viewline from its intersection with the Stirling Highway to the foreshore to provide complimentary foreshore landscape amenity and potential carparking areas;
- Internal access roads are indicated for the One Steel, Tasker and Matilda Bay sites;
- As in Scenario 2, the development of a new access road along the boundary between the One Steel Site and the Tasker Site is incorporated to provide vehicular access to both sites, permitting the building siting as suggested for both sites;
- The principal access road into the Matilda Bay Site off McCabe Street utilises the existing entry road location;
- As in the previous scenarios, Scenario 3 retains the western portion of the Matilda Bay Brewery Building (MB1 – max. 33.5 m AHD) as a heritage building.

The ratio of total building footprint and floorspace areas to the total site areas for the five development sites to determine the Footprint to Site Ratio (total footprint m² ÷ total site area) and the Gross Plot Ratio (total floorspace m² ÷ total site area). These calculations are shown in Table 9. Table 10 provides the Scenario 2 building heights and approximate building areas and total mass. (Note: all calculations in Tables 9 and 10 should be read as approximations.)

Table 9 Scenario 3 Site Footprint, Floor Space and Gross Plot Ratios

Development Site (Scenario 3)	Total Site Area M ²	Total Footprint M ²	Footprint to Site Ratio	Total Floor Space M ²	Gross Plot Ratio
1. East Leighton	6,966	3,354	0.481	13,416	1.926
2. One Steel	27,585	14,173	0.514	51,016	1.849
3. Tasker	14,078	6,970	0.495	19,530	1.387
4. Matilda Bay	30,838	13,156	0.427	50,946	1.652
5. Corner	2,040	1,536	0.830	6,144	3.012
Total	81,507	39,189	0.481	141,052	1.730

7.2 Computer Modeling and Photomontage of Buildings for Each of the Development Sites.

The Scenario No. 2 building footprints for each of the five development sites have been drafted in AutoCAD, importing footprints from site developers CAD plans where possible. The building wall heights, roof heights and roof styles have been assigned to each building as per Table 10, according to what the developers have indicated in their drawings or, where such information was not available, as determined by Scenic Spectrums, providing some mix of simple gable roof styles and some flat and mansard-style roof styles. The AutoCAD building footprints have been first integrated with the AutoCAD topographic contours and roads imported into 3D Studio Max (3DSM).

The 3D building forms have been modeled and computerized camera views generated in same manner as used for the previous scenarios.

7.3 Photomontages of Scenario 3 Views from Selected Priority Viewpoints

Photomontages of the Scenario 3 views of the modeled potential buildings are shown in Figures 43 - 52.

(TEXT CONTINUES ON PAGE 91)

Table 10 Scenario 3 Building Height, Area and Mass Dimensions

Site/Bldg No.	Base of Bldg AHD	Top of Wall (AHD)	Wall Meters	Top of Roof (AHD)	Roof Height Meters	Total Building Meters	Foot Prints Area (M ²)	No. Of Levels @ 3m Intervals	Total Floor Area (M ²)	Total Volume (M ³)	Roof Status
TASKER SITE											
TS1	29.5	41.5	12	44	2.5	14.5	2135	4	8540	28288.75	Skillion
TS2	29.5	35.5	6	38	2.5	8.5	2135	2	4270	15478.75	Skillion
TS3	30	36	6	37	1	7	1380	2	2760	8970	Gable
TS4	28	37	9	37	0	9	1320	3	3960	11880	Flat
Total							6970		19530	64617.5	
MATILDA BAY											
MB1			0		0	0		0	0	0	
MB2	17	29	12	31	2	14	3066	4	12264	39858	Skillion
MB3	19	31	12	33	2	14	1872	4	7488	24336	Skillion
MB4	17	29	12	31	2	14	4992	4	19968	64896	Skillion
MB5	17	29	12	31	2	14	1548	4	6192	20124	Skillion
MB6	17	26	9	29	3	12	1678	3	5034	17619	Gable
Total							13156		50946	166833	
CORNER SITE											
CR1	18	30	12	32	2	14	1536	4	6144	19968	Skillion
EAST LEIGHTON SITE											
EL1	17	29	12	31.5	2.5	14.5	2304	4	9216	30528	Gable
EL2	17	29	12	29	0	12	1050	4	4200	12600	Flat
Total							3354		13416	43128	
ONESTEEL SITE											
OS1											
A	21	33	12	36	3	15	800	4	3200	10800	Gable
B	21	33	12	36	3	15	756	4	3024	10206	Gable
C	21	33	12	33	0	12	1102	4	4408	13224	Flat
D	21	33	12	36	3	15	871	4	3484	11758.5	Gable
Total							3529		14116	45988.5	
OS2											
A	21	33	12	36	3	15	2760	4	11040	37260	Gable
B	21	33	12	36	3	15	2208	4	8832	29808	Gable
Total							4968		19872	67068	
OS3											
A	21	30	9	32	2	11	1548	3	4644	15480	Gable
B	21	30	9	32	2	11	2580	3	7740	25800	Gable
C	21	30	9	32	2	11	1548	3	4644	15480	Gable
Total							5676		17028	56760	
Grand Total							39189		141052	464363	

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Figure 43 Scenario 3 Photomontage from Viewpoint No. 3 – Balcony View from Residence on Riversea View



Figure 44 Scenario 3 Photomontage from Viewpoint No. 4 – View from Patio Garden of Residence on Riversea View



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Figure 45 Scenario 3 Photomontage from Viewpoint No. 5 on Stirling Highway north of Vlamingh Parade



Figure 46 Scenario 3 Photomontage from Viewpoint No. 7 – Footpath on Leighton Foreshore just South of Beehive Montessori School



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Figure 47 Scenario 3 Photomontage from Viewpoint No. 8 – Pedestrian Footbridge over Fremantle Railway Line Opposite the Matilda Bay Brewery Building



Figure 48 Scenario 3 Photomontage from Viewpoint No. 9 – Fremantle Surf Life Saving Club



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Figure 49 Scenario 3 Photomontage from Viewpoint No. 12 – Swan River Walking Track East of Phyllis Street, North Fremantle



Figure 50 Scenario 3 Photomontage from Viewpoint No. 14 – Parkland at Corner of Bolton Street and Angwin Street, East Fremantle



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Figure 51 Scenario 3 Photomontage from Viewpoint No. 18 – Boat Ramp on Swan River South of Zephyr's Café, East Fremantle



Figure 52 Scenario 3 Photomontage from Viewpoint No. 20 – Mt Lyell Lookout east of the Minim Residential Development in Mosman Park



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7.4 Shadow Analysis Plans

Shadow analysis plans have been prepared for the Scenario 2 buildings for 9.00 am, 12 noon, 3.00 and 6 pm on 22 June and 21 December, 2008 using sun azimuths for the Perth area as programmed in the 3DSM modeling software. These shadow analysis plans are shown in Figures 53 and 54 (refer following pages).

7.5 Visual Analysis and Assessment

Scenario No. 3 has been analysed and assessed according to the key assessment factors and visual performance criteria outlined in Table 2. This assessment has involved the review and analysis of the ten photomontage scenes in Figures 43 - 52. The visual assessment is summarised in Table 11. Key aspects of this assessment are also illustrated in plan form in Figure 55.

7.6 Discussion of Scenario 3

Discussion

The building heights of key buildings Scenario 3 have been restricted to no more than 15 m above ground levels in order to minimise potential adverse visual effects.

In order to decrease overall building footprint areas and allow view corridors to penetrate between the high-rises to the landscape and special features beyond (e.g. the Indian Ocean). Overall, this strategy appears to have been effective. In most views, existing viewlines, skyline profiles and landscape character has been kept very much intact.

Notable changes to the built forms (but not general landscape character) would only occur in relation to the following views:

1. Viewpoints along the Stirling Highway and Fremantle Foreshore Area:
 - Viewpoints 5, 7, 8, and 9
2. Viewpoints to the south and southeast along the Swan River corridor
 - Viewpoints 12, 14 and 18

In relation to the viewpoints along the Stirling Highway and Fremantle Foreshore, the potential townhouses built to 3 levels on the East Leighton Site would create the greatest visual change and their degree of dominance would be greater than the building proposed for that site in Scenario 2, but less than that of Scenario 1. However, they are unlikely to create the "urban canyon" effect described in Scenario 1 due to their greater setback and their lower height. They would also impinge slightly less on the views and landscape as seen from the pedestrian railway bridge (Viewpoint 8) than the East Leighton buildings of Scenario 2.

In relation to views from the Swan River corridor, the profile of Buckland Hill ridge would remain quite close to its current form on the skyline, with the possible exception of the TS1 building on the Tasker Site, which pops up above the roofline of adjacent buildings to the east and above most other potential new buildings due to its elevated site position. Buildings on the Matilda Bay Site would stand slightly higher than the existing Matilda Bay Brewery building and above the existing residential development in the area, but not to enough to be excessively dominant. However, the massing of buildings is quite dense in this narrow band on the skyline compared to the existing scenes, in which a good portion of the Matilda Bay Site is currently undeveloped. This massing affect would no doubt be alleviated to some extent with the planting of trees in areas along the southern portion of the

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Table 11 Visual Assessment of McCabe Street Area Development Scenario No. 3

Performance Issue	Visual Significance Zone 1	Potential Adverse Visual Effects	Potential Beneficial Visual Effects 1
Landscape Character	<i>The landscape character of the McCabe Street Area will express concentrations of human-influenced landscape elements and activity, primarily in the form of residential/industrial residential and commercial uses of varying densities developed in a manner that will be visually compatible with surrounding single dwelling allotment residential uses and the open space and recreational environment of the North Fremantle Foreshore area. The Backland Hill ridge line forms the dominant topographic feature of the area and should be retained, reinforced and possibly accentuated by the future built form of the area. Although the area is currently of a lower scenic quality due to the former industrial uses of the area, the area should be visually enhanced by future developments in terms of built form, landscape treatments and views to, through and from the area. In particular views to the adjacent Indian Ocean, the Swan River and surrounding island and foreshore parklands and beaches should be maintained and enhanced where possible. Special natural features such as water, native vegetation, rock outcrops, prominent hilltops, river terraces and escarpments, and beaches should be retained where possible in the landscape. Street cultural features such as historic or heritage buildings, North Island pine trees, etc., should also be retained where possible in the landscape. The Urban Landscape Character of the surrounding viewshed (viewing catchment) will express concentrations of human activity, primarily in the form of period and contemporary residential, commercial, cultural, educational, transportation structures and supporting infrastructure. Natural landscape elements should be evident as retained, but may be outweighed in the overall landscape by human-influenced landscape elements and alterations.</i>	- Change in view, but not in essential landscape character in relation to the East Leighton townhouses, which would rise to approx. 15 m above ground level. - Minor change to skyline profile as viewed from viewpoints in along the Swan River Corridor and as viewed from residential areas in the Foundry Court and Minin Development areas.	- The existing Landscape Character is essentially retained as viewed from most viewpoints. - The Visual Performance Standard would be achieved by Scenario 3.
Scenic Integrity (Two options – the first being most desirable, but the second reflecting current situation and what often occurs within higher density urban developments)	Low – Modification VQ0 – Moderately Modified (Apparent Alteration): Landscapes where the valued natural landscape character “appears moderately modified”. Modifications begin to dominate the valued landscape character being viewed, but they borrow valued attributes such as site, shape, edge effect and pattern of natural openings, vegetative type and architectural styles to be compatible or complementary to the surrounding landscape character. The existing landscape does not currently reflect this Scenic Integrity Level, but the Low level should be assigned. Moderate or higher levels of Scenic Integrity will not be possible given the existing degree of modification in the landscape and the land use circumstances. Very Low – Maximum Modification – Heavily Modified (Dominant Alteration): Landscapes where the valued natural landscape character “appears heavily modified”. Alterations may strongly dominate the valued landscape character. Existing alterations may not always borrow from valued attributes such as site, shape, edge effect and pattern of natural openings, vegetative type changes or architectural styles within or adjacent to the landscape being viewed. New landscape alterations should be sited and designed to protect, complement and enhance the existing positive natural and cultural features and views to and from such features so that they do not exceed the existing level of scenic integrity or dominate the landscape character or composition excessively more than existing alterations. This level of scenic integrity is currently reflected by the landscape of the surrounding viewshed. Although the intensity of development will always create a heavily modified landscape, the appearance should be enhanced where possible through any new landscape alterations that may take place.	The East Leighton townhouses would create the greatest degree of visual change and could potentially be described as Dominant Alteration, but would retain the general landscape character of the existing area.	Scenario No.3 would achieve the Low Modification – Moderately Modified (Apparent Alteration) level of Scenic Integrity.
Scenic Quality	Moderate to High: Scenic quality of the proposed development area and immediate surrounds should be enhanced and maintained as at least Moderate as viewed from all Foreground and Near Middleground viewpoints. Future development should be designed to rehabilitate and visually enhance the area as much as possible in order to improve the landscape (internally within development sites and within public streetscapes and open space reserves) toward a High Scenic Quality Level.		Scenario 3 would likely achieve the Visual Performance Standard in terms of Moderate Scenic Quality, keeping this aspect much the same as existing in some areas, but probably offering improved scenic quality over the existing industrial land uses.
Coastal Height Policy	State Coastal Planning Policy – Section 5.3 – Height limit of five storeys (21m) within 300 m of the horizontal seabed datum (HSD) along the coastal foreshore. A varied distance for the HSD can be approved through local planning scheme controls and higher structures up to eight storeys (32 m) may be permitted under specified conditions of the State policy (State Planning Policy 2.6, State Coastal Planning Policy, Planning and Development Act 2005, 19 December, 2006, Gazette No. 229).		Scenario 3 would achieve the Visual Performance Standard in terms of the requirements and guidelines of the State Coastal Planning Policy – Section 5.3.

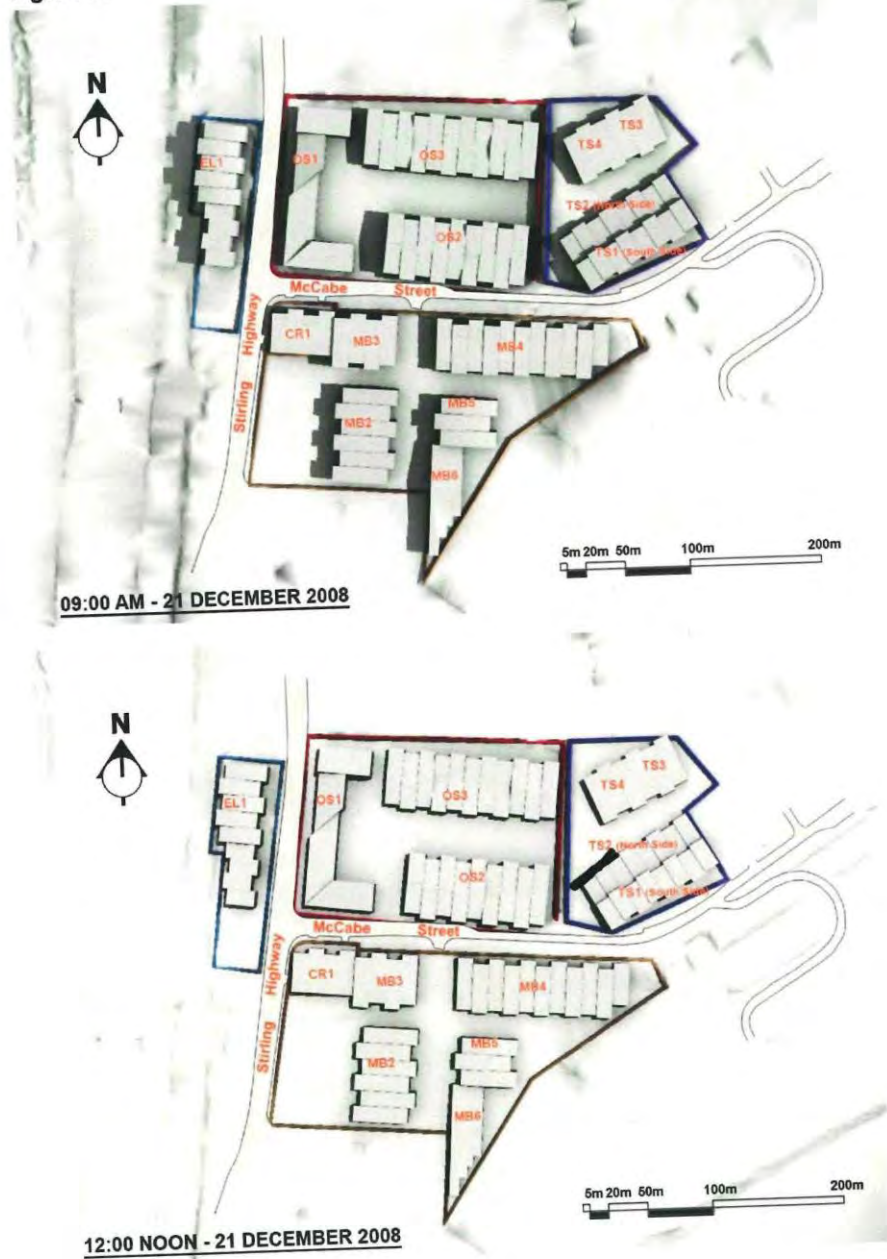
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Table 11...continued

Performance Issue	Visual Significance Zone 1	Potential Adverse Visual Effects	Potential Beneficial Visual Effects
Horizon Line & Panoramic Views	Limited Portion of Horizontal View Occupied by Development: Site buildings and structures to avoid or minimise interruptions to the panoramic, wide bay views. Where this is not possible, design the form and mass of such structures to create blended and gradual transitions with backdrop foreshores and hilltops. As viewed from Near Foreground viewpoints (0 m – 500m) new landscape alterations seek to not should not occupy more than 60° or one-third the 180° panorama or horizontal line. As viewed from Mid Foreground and more distant viewpoints (500m or greater) new landscape alterations seek to not should not occupy more than 20° or one-ninth of the 180° panorama or horizontal line. Natural or undeveloped areas between separate view alteration sites should seek to create open view sweeps of approximately 15°-20° or greater in the horizontal view.	Visual Performance Standard not achieved when viewed from Viewpoints 4, 5, 7, 9, 12, and 16. However, in Viewpoints 4, 5, 7 and 8, existing factory buildings occupy most of the area that would be replaced by the proposed Scenario 3 buildings. Hence the change is really minimal and the Visual Performance Standard is essentially achieved in terms of no or little change from these viewpoints.	Visual Performance Standard would be achieved when viewed from Viewpoints 3, 9, 14 and 20.
Key Landscape Features	Protect Views to Key Features: Avoid interruption of views to visually key or highly scenic landmark, waterform, vegetation or cultural heritage features or focal points by buildings and structures, including boats on sailing moorings or in marina berths.		- Views to defined features are well maintained from all of the selected viewpoints assessed. - Visual Performance Standard would be achieved.
Overlooking	Minimisation of Overlooking into Neighboring Properties: The potential for overlooking by occupants of future developments into the windows and yards (particularly backyards) of neighboring properties should be avoided completely or minimised where ever possible. Although the potential use of vegetative screening may be considered, significant views from neighboring properties should be retained as much as possible. Alternative solutions such as the use of architectural screens attached to future building facades to direct views away from neighboring properties may be one possible solution.	The potential for overlooking into Foundry Street and Minin Development exists with the eastern end of the MB4 building, the south end of the MB9 building and to some degree with the MB5 building. MB4 and MB9 buildings may need to have greater setbacks from the property boundary, but tree planting would resolve this issue with MB5.	Visual Performance Standard would be achieved, except in the case of MB4 and MB9 as discussed under adverse effects opposite.
Overshadowing	Minimisation of Overshadowing onto Neighboring Properties: The potential for overshadowing by future developments into the windows and yards (particularly backyards) of neighboring properties should be avoided completely or minimised where ever possible. Where overshadowing occurs, it should not exceed 2-3 hours per day on any given day of the year. (Refer also to R-Codes Section 6.9.1)	Residences in the Foundry Street, Minin Development would primarily be affected during Winter months, but not so much during Summer. However, the adjustments with buildings MB4 and MB9 suggested above should resolve this issue.	Visual Performance Standard would be met in relation to adjacent properties not being adversely affected for more than 2-3 hrs per day, and only seasonally.
Cumulative Visual Effect	Tight Development Nodes with Gaps between Clusters and Villages: Avoid excessive expansion of established landscape alterations and buildings/structural nodes. Tight clusters of development are preferable. Provide a significant visual gap between buildings/structural clusters or a local beach and between foreshore and inland developments on a district/regional basis. Refer to Horizon Line & Panoramic Views text.	This Visual Performance Standard is generally not achieved due to the overlapping effects of the buildings as viewed from ground level viewpoints in Scenario 3. However, the low profile of all of the buildings greatly reduces the importance of this guideline, as most of the existing views are retained from exterior viewpoints.	Overall development area approx. 400 metres square is reasonably tight.

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Figure 53 Scenario No. 3 Shadow Analysis Plans for 21 December 2008



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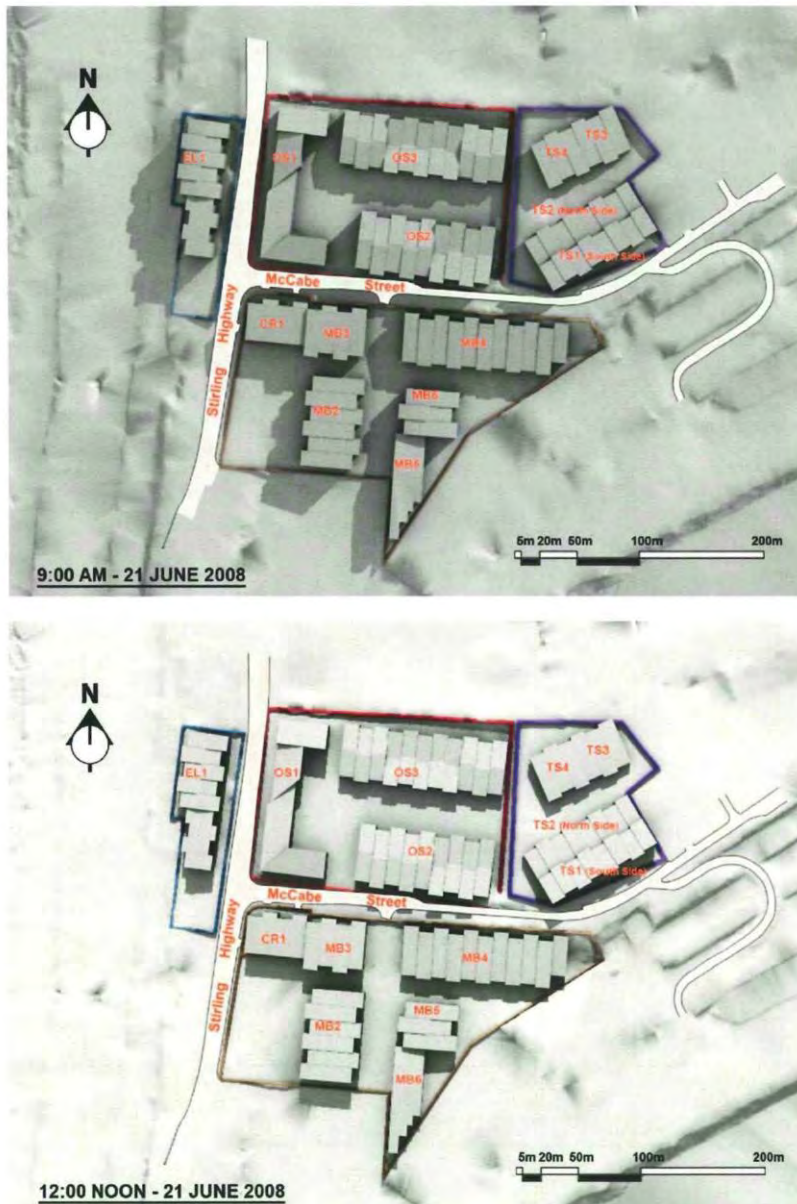
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Figure 53....continued



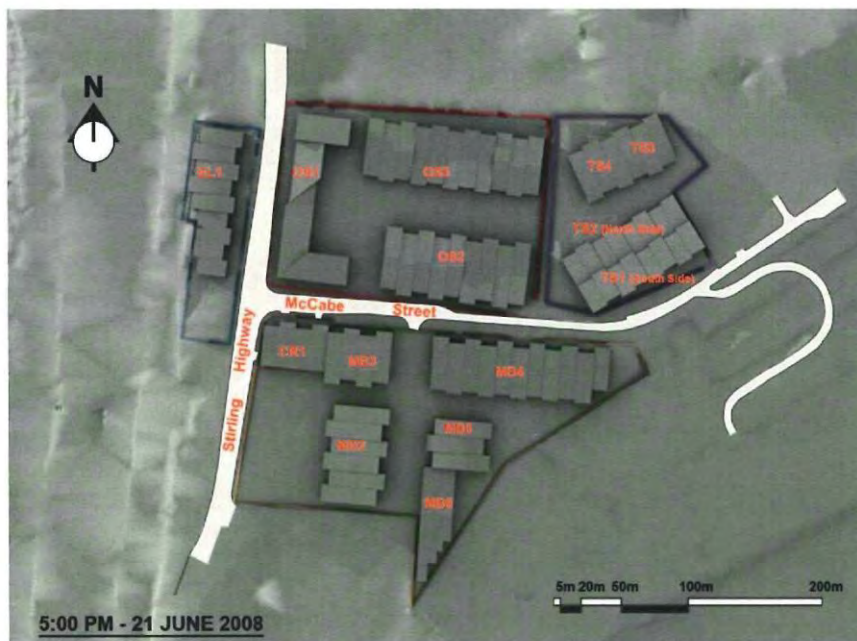
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Figure 54 Scenario No. 3 Shadow Analysis Plans for 21 June 2008



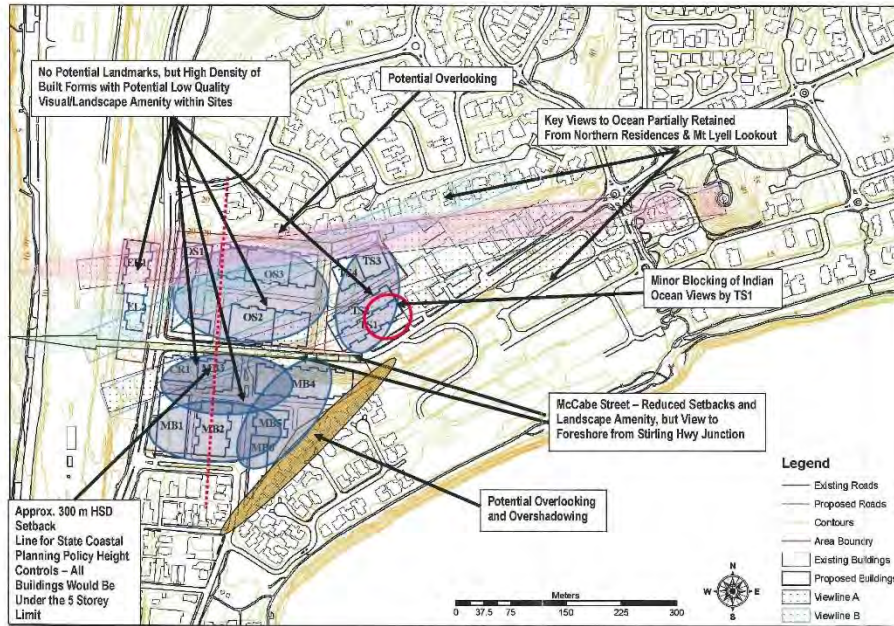
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Figure 54....continued



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Figure 55 Visual Analysis of Key Assessment Factors Regarding Development Scenario No. 3



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Matilda Bay Site and along McCabe Street, where the bulk of the upper portions of the OS2 townhouses and the TS1 building of the Tasker site add to the massing effects as viewed without vegetation.

Potential Improvements

Potential improvements to Scenario No. 3 for the purposes of visual and landscape enhancements would include the following points.

East Leighton

- Reduction of building heights to 1-2 levels plus roof, instead of the 3 levels shown in Scenario 3.
- Add tree planting and landscaping to soften effects of buildings and create greater privacy.

Matilda Bay Site

- MB4 and MB6 buildings may need to have greater setbacks from the property boundary, but tree planting would resolve the issue with MB5.
- Add tree planting and landscaping to soften effects of buildings and create greater privacy.

One Steel Site

- Increase setbacks from McCabe Street to at least 10 m.
- Increase setbacks from the northern property line to at least 20 m (to avoid any possible overlooking or privacy issues not identified in this assessment).
- Add tree planting and landscaping to soften effects of buildings and create greater privacy.

Tasker Site

- Add tree planting and landscaping to soften effects of buildings and create greater privacy.

The Corner Site

- Add tree planting and landscaping to soften effects of buildings and create greater privacy.

8 Conclusions

8.1 Comparative Summary

A summary comparison of the visual assessments of the three development scenarios analysed reveals the following key points:

1. Scenario 1:

- reflects existing development proposals for two of the development sites and hypothetical development layouts for the other three assessed.

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- building heights range from 9 m on the Corner Site to over 65 m on the One Steel Site.
- Total Footprint to Site Ratios range from approximately 30 % (0.300) on the East Leighton Site to just over 50% (0.514) on the Corner Site (refer to Table 4).
- Gross Plot Ratios Range from just over 100% (1.027) on the Corner Site to nearly 230% (2.279) on the Matilda Bay Site (with the One Steel Site not far behind at 1.969 – refer to Table 4).
- significant potential adverse visual effects to Landscape Character, Scenic Integrity, Scenic Quality, Horizon and Panoramic Views, Key Landscape Features, Overlooking, Overshadowing and its Cumulative Effect. The overall height, massing and orientation of buildings could create a visually dominant mass that blocks views to key features without significant positive visual benefits to outweigh the negative visual effects for the community in the wider visual catchment and in particular for residents in established adjacent residential properties. Buildings MB2 and MB3 in the Matilda Bay Site would be within the 300 m setback of the State Coastal Policy 2.6 and at 8 storeys could exceed the policy guidelines, depending on potential variations under the Local Planning Scheme.
- in terms of internal site design and amenity, the One Steel Site proposal potentially offers the most beneficial structure plan in its appearance and likely visual/landscape amenity opportunities for prospective residents and for the surrounding neighborhood. Tasker Site and Matilda Bay site designs potentially offer the least visual/landscape amenity opportunities for future residents and neighbors, while the Corner Site and the Leighton Site would be only average to low in this respect.
- the OS2 building of the One Steel Site does offer a potential landmark quality to enhance the Buckland Hill Ridgeline, but this would be understated compared to those of Scenario 2;
- the Leighton Site development design would potentially create an "urban canyon" effect along the Stirling Highway.

2. Scenario 2:

- reflects hypothetical development proposals for five of the development sites assessed.
- building heights range from 5 m on the East Leighton Site to over 93m on the Matilda Bay Site. High-rise towers occur on three different sites: Matilda Bay – MB2 tower to 100 m AHD with 22 levels; One Steel – OS2 tower to 97 m AHD – 23 levels; Tasker – TS1 tower to 79 m AHD – with 15 levels.
- Total Footprint to Site Ratios range from approximately 17 % (0.169) on the East Leighton Site to just over 40% (0.402) on the One Steel Site , with Matilda Bay Site not far behind on 386% (0.386) (refer to Table 6).
- Gross Plot Ratios Range from nearly 17 % (0.169) on the Leighton Site to just under 380% (3.795) on the Matilda Bay Site – refer to Table 7).
- significant potential adverse visual effects in relation to Landscape Character (high contrast in concentration/density of built forms), Scenic Integrity (heavily modified – dominant alterations), Scenic Quality (depending on perceptions – much closer to achieving objectives than Scenario 1), Horizon and Panoramic Views (when viewed from Viewpoints 4, 5, 7, 12, and 18), Overlooking (particularly into Riversea View properties from the Tasker Site), and its Cumulative Effect (in terms of mass of lower portion of built forms as viewed from the south and southeast and from the northwest). The overall height, massing and orientation of buildings in Scenario 2 is such that it could potentially appear as a visually dominant mass of built form, particularly as viewed from

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southeastern, northwestern and some northern viewpoints. Buildings MB2 of the Matilda Bay Site and OS2 of the One Steele Site would be within the 300 m setback of the State Coastal Policy 2.6 and at 22 to 23 storeys could exceed the policy guidelines, depending on potential variations under the Local Planning Scheme.

- significant positive beneficial visual effects in relation to Landscape Character (creating much more visually interesting urban form with 3 potential landmark buildings, attractive streetscapes with generous setbacks and visual breaks and views to key features between upper built forms), Scenic Integrity (positive counterpoint to dominant alteration, visually exciting and more open), Scenic Quality (improvement over existing Low Scenic Quality and to overall building mass could potentially result in Moderate Scenic Quality over time, depending on changes in community perceptions), Horizon and Panoramic Views (objectives achieved when viewed from Viewpoints 3, 8, 9, 14 and probably 20), Key Landscape Features (views to key features well maintained, industrial look of Buckland Hill improved in views from south by landmark treatment), Overlooking (could be mitigated through architectural design and vegetative screening), Overshadowing (objectives met), Cumulative Effect (reasonably tight development, visual breaks allow for important view corridors and reduce upper mass, McCabe St. corridor and views very positive, performance standards achieve from most viewpoints).
- in terms of internal site design and amenity all five sites in Scenario 2 potentially offer very beneficial plans in terms of their appearance and visual/landscape amenity opportunities for prospective residents and for the surrounding neighborhood. The MB4 building presents the only major issue in terms of its overall horizontal mass in relation to adjacent residences and views from the Swan River corridor, however, it effectively utilises and awkwardly shaped space and steps down in a visually sensitive manner from upper levels along McCabe Street to its interface with existing residential areas below.
- the MB2, OS2 and TS1 buildings offer more exciting landmark qualities to enhance the Buckland Hill Ridgeline.
- development design suggested for the Leighton, Corner and One Steel sites could create an attractive open park-like appearance to the intersection of the Stirling Highway and McCabe Street, providing enhanced views and compatibility in relation to Fremantle Foreshore and the pedestrian railway bridge. It would also be an attractive gateway to the DA18 development area and to residential areas further east on McCabe Street.

3. Scenario 3:

- reflects hypothetical development proposals for five of the development sites assessed.
- building heights range from 7 m on the Tasker Site to 14 m -15 m on all five sites.
- Total Footprint to Site Ratios range from 427 % (0.427) on the Matilda Bay Site to 514% on the One Steel Site, however the Corner Site would have the highest ratio, with 830% (0.830) on (refer to Table 9).
- Gross Plot Ratios Range from approximately 140% (1.387) on the Tasker Site to about 300% (3.012) on the Corner Site (refer to Table 9).
- Horizon and Panorama (moderate issue as seen from Viewpoints 12 and 18 along Swan River, but may be alleviated by tree planting), Overlooking and Overshadowing (MB4 and MB6 buildings may need to have greater setbacks from the property boundary), Cumulative Effects (guidelines not achieved due to visual overlapping of the buildings, but the low profile of all of the buildings greatly

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reduces the importance of this guideline, as most of the existing views are retained from exterior viewpoints).

- significant positive beneficial visual effects in relation to Landscape Character (change in function and appearance, but essentially retaining existing views and existing skyline profile of Buckland Hill Ridgeline as seen from off-site viewpoints), Scenic Integrity and Scenic Quality objectives would be achieved (moderate alteration and Moderate Scenic Quality), Horizon and Panorama (objectives achieved from all viewpoints except Viewpoints 12 and 18), Key Landscape Features, (views to all desired features are well maintained), Overlooking (guideline generally achieved but MB4 and MB6 would require greater setbacks), Overshadowing (objectives achieved).
- development designs suggested for the Leighton Site would potentially create an attractive open park-like appearance at the intersection of the Stirling Highway and McCabe Street, providing enhanced views and compatibility in relation to Fremantle Foreshore and the pedestrian railway bridge. However, compared to Scenario 2, this effect could be considerably reduced by the requirement to provide adequate car parking areas for the townhouses/offices developed, unless that parking is provided under the buildings.
- the internal site design and amenity of the five sites in Scenario 3 would be considerably reduced as compared with Scenario 2. Enhancement through landscaping and tree planting is certainly possible, but the areas are quite crowded with buildings to the point where car parking would either have to be provided under the buildings or the overall size of buildings would have to be reduced. Amenity benefits to residents of the new development and to existing residents in the surrounding community would be relatively low.
- many of the adverse visual effects of Scenario 3 could potentially be overcome if standard single dwelling residential allotments were to be developed rather than with multi-dwelling residential. Although such a scenario has not been modeled and developed into photomontages, the result of Scenario 3 would indicate that standard two-storey housing would have as many or more visual benefits as 3-4 level multi-dwelling townhouses and apartment buildings, but would result in greater internal and public streetscape visual/landscape benefits than would multi-dwelling development.

8.2 Concluding Remarks

The visual assessment of the three structure plan or development scenarios for Development Area 18 has provided comparisons of the visual effects of each scenario in terms of a range of Visual Performance Standards (guidelines) and from ten different viewpoints in the surrounding landscape, representative of a range of private residential and public vantage points.

The results quite clearly indicated that of the three scenarios analysed, Scenario 1, which incorporates the current structure plan proposals for the One Steel Site and the Tasker Site, would be the least desirable outcome from the standpoint of visual effects and overlooking.

Scenario 2 overcomes many of the drawbacks of Scenario 1 through the utilization of three high-rise towers that assist in greatly reducing the overall density of building footprints on the site and increasing the openness and landscape amenity of the sites internally as well as in the public domain. Scenario 2 offers significant streetscape amenity advantages and also protects most existing views to key landscape features, as well as creates new views and connectivity between the DA18 area and Leighton Foreshore. Scenario 2 offers the potential for a visually interesting and exciting structure plan; however, the dramatic change in building heights within the surrounding low-rise residential neighborhoods would present a complete change in landscape character to the local neighborhoods and the broader landscape, as well as potentially greater overshadowing effects.

Scenario 3 satisfies more of the Visual Performance Standards than do Scenarios 1 and 2 by keeping most built forms within the current skyline profile of the area and by almost completely maintaining most existing views to key

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landscape features. Scenario 3 also minimises potential problems with overlooking and overshadowing of adjacent residential properties. However, Scenario 3 would result in higher overall density of building footprints than would Scenario 1 or Scenario 2. This would not only potentially place a squeeze on the site for car parking space (most likely requiring underground parking), but would greatly reduce the internal visual/landscape amenity of each of the five development sites assessed. In addition, Scenario 3 would not likely be the most detrimental scenario to public streetscape amenity along McCabe Street or the Stirling Highway. Some new views and connectivity would be created between DA18 and Leighton Foreshore, however, this would be diminished compared to Scenario 2.

As it stands, both Scenario 2 and Scenario 3 offer many positive benefits worth further consideration and both offer potential adverse visual and amenity affects that may require caution and design improvements. Here, it is obvious that Scenario 3 would probably best satisfy what appears to be the dominant community opinion regarding the maintenance of low building heights and the retention of views. However, the Scenario 3 approach would also create the much higher footprint density described above, which adds little to the internal amenity of the sites for those who may live there and which creates little other streetscape or public open space benefits in the area. Due to this anomaly, Scenic Spectrums does not make a recommendation as to whether Scenario 2 or Scenario 3 would be preferable. We can only state relatively categorically that Scenario 1 would not produce an overall desirable result.

Two additional observations are made:

1. The series of photomontages produced would provide an excellent opportunity to further explore public perceptions regarding the alternative structure plan scenarios in a much more objective way than the usual method of simply reviewing public submissions, which the content of which is usually highly unstructured, often quite emotional and sometimes politically driven. A scenic perception survey could be established in a manner that tests representative community groups according to their locality of residence as well as by set socio-economic characteristics. Such a test could solicit responses from existing residents in surrounding neighborhoods, as well as from people who might represent typical prospective residents of the development area. Questions would be posed and analysed using objective formats and procedures. People would be reacting to a combination of plans and visual images from known vantage points. Photomontages from all three scenarios could be assessed. Ratings of perceived scenic quality, acceptability of alteration and other visual factors, as well as descriptive, qualitative responses, could be gathered. This would provide Council with a more objective basis for decision making, while also providing valuable insights regarding potential future projects in other areas.
2. It has been mentioned in this report that Perth metropolitan residents generally appear to be more averse to high-rise development than perhaps residents in the cities of Melbourne and Sydney. Although it may be true that as communities become more used to having high-rise developments and a "bigger city look", it should also be noted that most high-rise development in Melbourne and Sydney is likely to be built within existing CBD areas or within larger industrial areas that are undergoing redevelopment to commercial/residential precincts (e.g., Melbourne's Docklands Precinct), while very few if any such developments would be located in smaller industrial areas sandwiched between relatively recent up-market single dwelling residential areas (as is the case for DA18 and the surrounding project area).

8.3 Recommendations

Given the results of this investigation, Scenario 3 would most likely meet the approval of adjacent residents and satisfy other established strategic policies and planning/design guidelines for the general area. Scenic Spectrums would encourage Council, however, to give full consideration to the positive and negative implications of Scenario 2, Scenario 3 and an additional Scenario 4, which could consist entirely of two-storey single dwelling and/or mixed residential allotments (dual occupancy, multi-dwelling or lower-scale townhouses and apartments). Although Scenario 4 has not been modeled in this investigation, it is clear that it would have all the positive visual benefits of

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Scenario 3, while it would be likely to have greater internal and public streetscape visual/landscape amenity than Scenario 3.

[End Main Text]

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* Note: Formal references have not been found for some of the references cited in the text of this report, however, the title and dates of those reports have been included in the text where possible.

**Prepared by Scenic Spectrums Pty Ltd
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