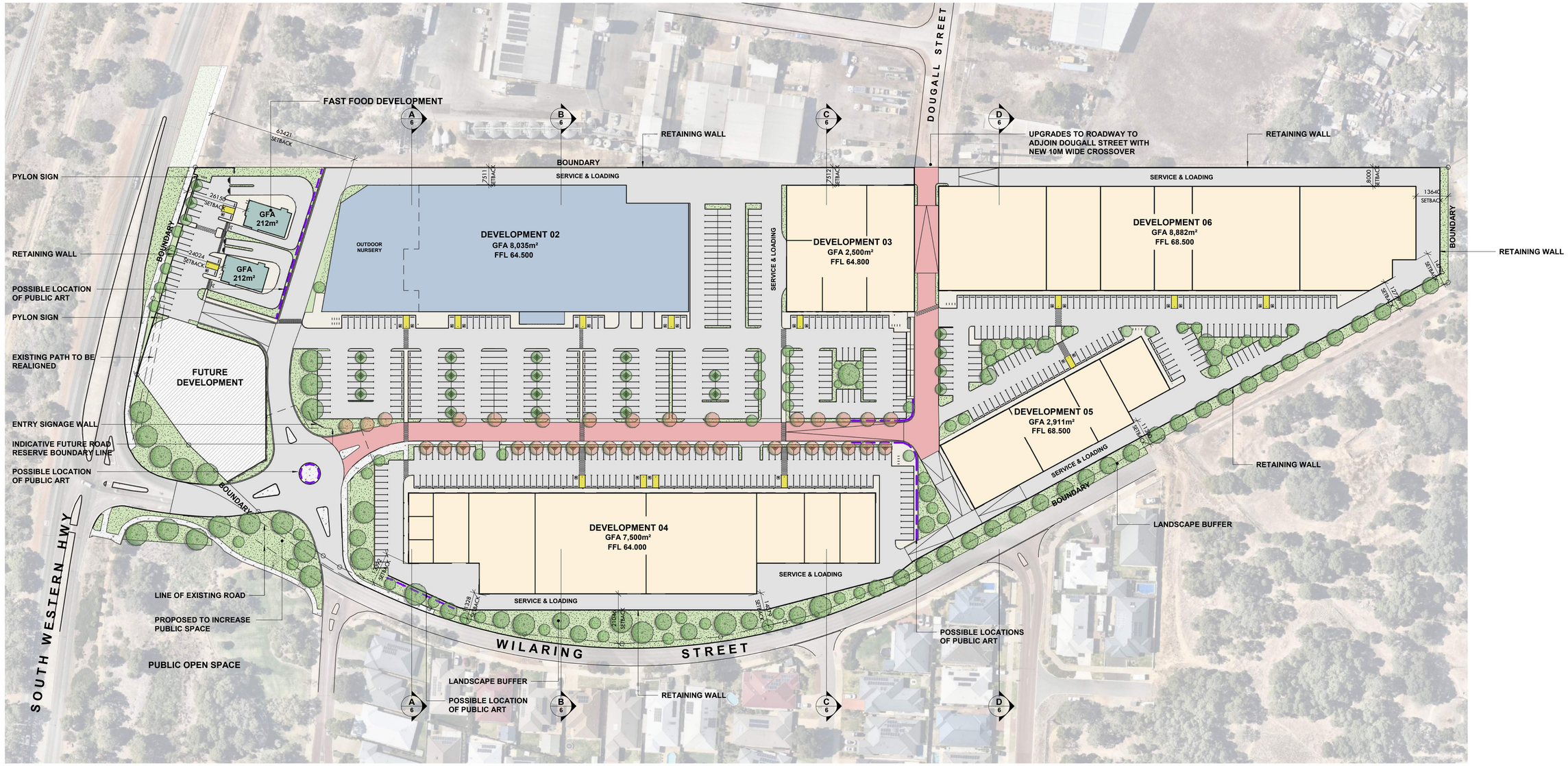


SITE PLAN - PROPOSED DEVELOPMENT

SCALE:1 : 750

AREA SCHEDULE (GFA)

NAME	AREA
FAST FOOD 1	212m²
FAST FOOD 2	212m²
DEVELOPMENT 2	8,035m²
DEVELOPMENT 3	2,950m²
DEVELOPMENT 4	7,500m²
DEVELOPMENT 5	2,911m²
DEVELOPMENT 6	8,882m²
TOTAL	**30,702m²**

TENANCY AREA SCHEDULE (NLA)

NAME	AREA
DEVELOPMENT 1	
FAST FOOD 1	201m²
FAST FOOD 2	201m²
TOTAL	**402m²**
DEVELOPMENT 2	
TENANCY 1	**7,918m²**
DEVELOPMENT 3	
TENANCY 2	450m²
TENANCY 3	1,357m²
TENANCY 4	1,070m²
TOTAL	**2,877m²**

TENANCY AREA SCHEDULE (NLA)

DEVELOPMENT 5	
TENANCY 15	1,000m²
TENANCY 16	800m²
TENANCY 17	516m²
TENANCY 18	510m²
TOTAL	**2,826m²**
DEVELOPMENT 6	
TENANCY 19	2,006m²
TENANCY 20	1,011m²
TENANCY 21	1,011m²
TENANCY 22	710m²
TENANCY 23	2,011m²
TENANCY 24	2,011m²
TOTAL	**8,760m²**

TENANCY AREA SCHEDULE (NLA)

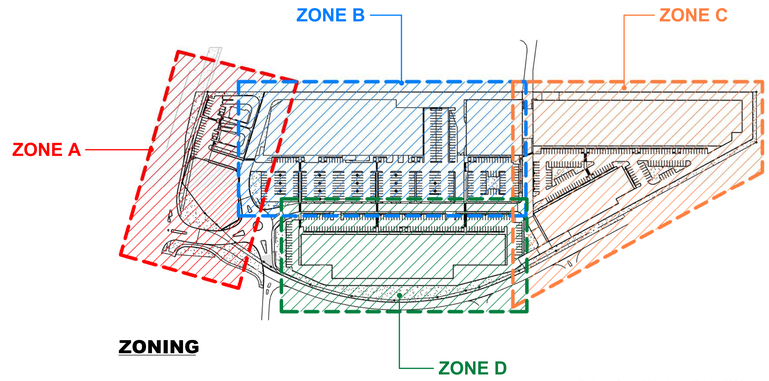
DEVELOPMENT 4	
TENANCY 5	100m²
TENANCY 6	100m²
TENANCY 7	100m²
TENANCY 8	439m²
TENANCY 9	1,131m²
TENANCY 10	1,999m²
TENANCY 11	1,986m²
TENANCY 12	592m²
TENANCY 13	441m²
TENANCY 14	441m²
TOTAL	**7,329m²**
SITE TOTAL NLA	**30,112m²**

PARKING SCEHDULE

ZONE A	26
ZONE B	350
ZONE C	158
ZONE D	167
TOTAL	**701**

SITE SUMMARY

EXISTING SITE AREA	82,517m²
WILARING ROAD RESERVE AREA	2,248m²
FUTURE SITE AREA	80,182m²
LANDSCAPE AREA - SUBJECT SITE	7,710m²
OVERALL LANDSCAPE AREA PECENTAGE	**(9.6%)**
NEW PUBLIC OPEN SPACE LANDSCAPING	359m²
LANDSCAPE AREA - WILARING STREET UPGRADES	2,083m²
TOTAL LANDSCAPE AREA OUTSIDE SUBJECT LOT	**2,436m²**



ZONING

Ordinary Council Meeting - 17 June 2024

PRELIMINARY

meyer shircore architects

BYFORD COMMERCIAL

LOCATION : SOUTH WESTERN HIGHWAY

FOR : ACCORD

Member Australian Institute of Architects

0 7.5 15 22.5 30 37.5 75

DATE: MAY 2024 PROJECT NUMBER

REVISION: SK001B **24-9318**

SHEET: 3

SCALE: As indicated @B1

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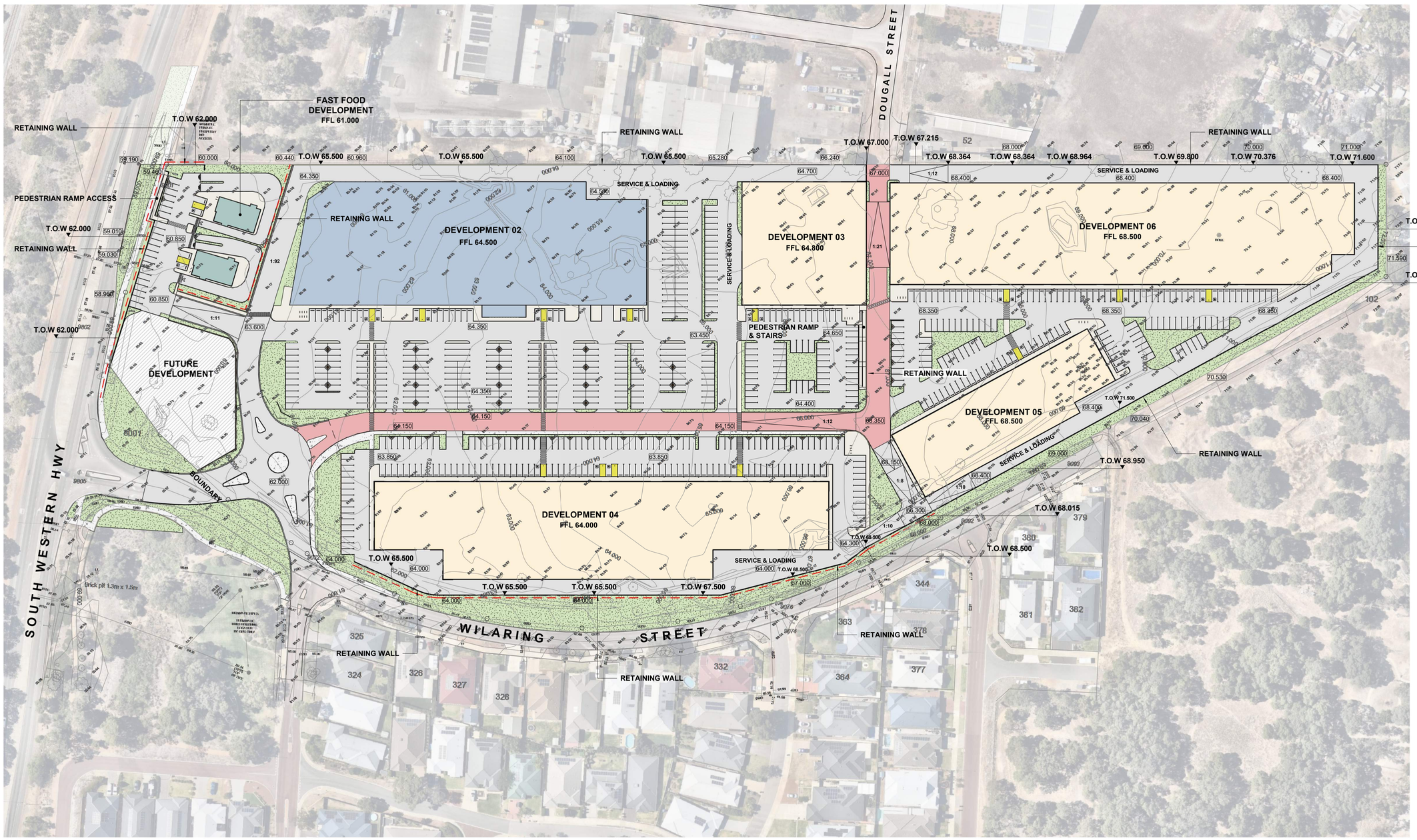
t: 08 9381 8511 e: msa@meyershircore.com.au



NOTE:

RED DASH INDICATES RETAINING WALL VISIBLE TO SOUTH WESTERN HIGHWAY & WILARING STREET TO BE AN EARTH TONE COLOUR AS PER EXAMPLE IMAGE BELOW

SITE PLAN - RETAINING & LEVELS

SCALE: 1 : 750

Ordinary Council Meeting - 17 June 2024

PRELIMINARY

meyer shircore architects

BYFORD COMMERCIAL

LOCATION : SOUTH WESTERN HIGHWAY

FOR : ACCORD

Member Australian Institute of Architects

0 7.5 15 22.5 30 37.5 75

DATE: MAY 2024
REVISION: SK001B
SHEET: 4
SCALE: 1 : 750 @B1

PROJECT NUMBER
24-9318

Suite 2, Ground Floor 437 Roberts Road, Subiaco WA 6008
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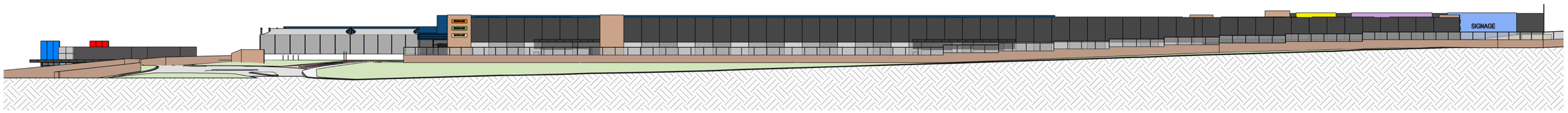


WILARING ELEVATION PART 1

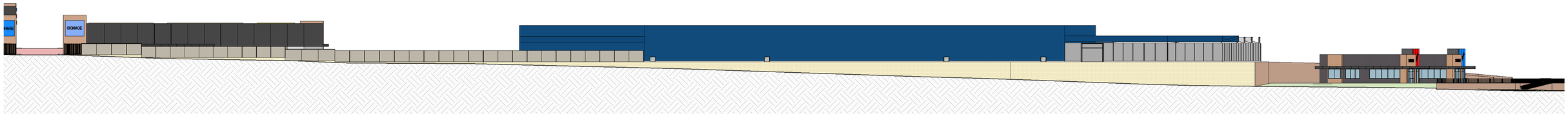
SCALE:1 : 350

WILARING ELEVATION PART 2

SCALE:1 : 350

REAR SITE ELEVATION PART 1

SCALE:1 : 350



REAR SITE ELEVATION PART 2

SCALE:1 : 350

Ordinary Council Meeting - 17 June 2024

PRELIMINARY

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BYFORD COMMERCIAL

LOCATION : SOUTH WESTERN HIGHWAY

FOR : ACCORD

Member Australian Institute of Architects

DATE: MAY 2024

REVISION: SK001B

SHEET: 5

SCALE: 1 : 350 @B1

PROJECT NUMBER

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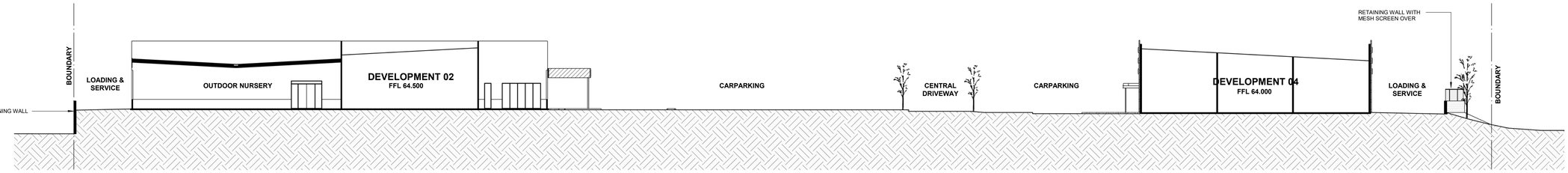
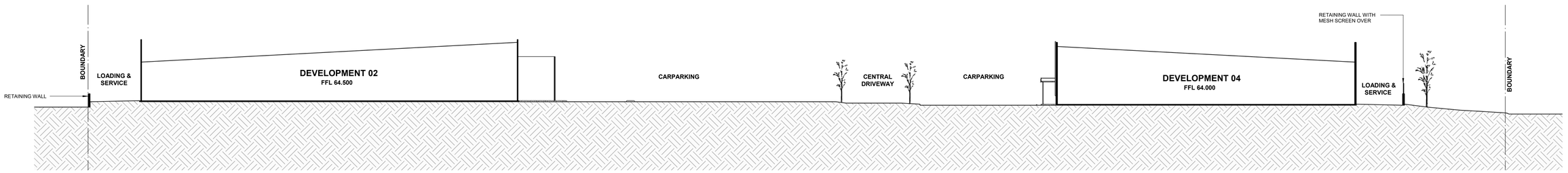


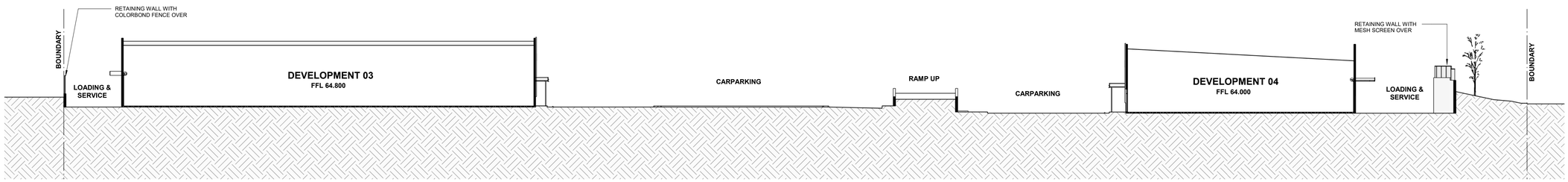
SECTION A

SCALE: 1 : 250



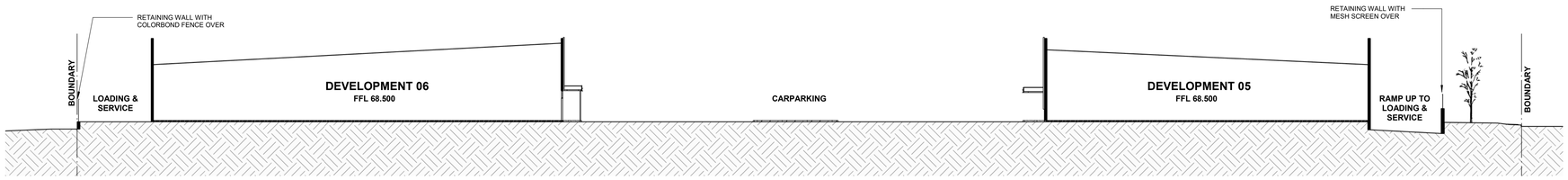
SECTION B

SCALE: 1 : 250



SECTION C

SCALE: 1 : 250



SECTION D

SCALE: 1 : 250

Ordinary Council Meeting - 17 June 2024

PRELIMINARY

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BYFORD COMMERCIAL

LOCATION : SOUTH WESTERN HIGHWAY

FOR : ACCORD

Member Australian Institute of Architects

0 2.5 5 7.5 10 12.5 25

DATE: MAY 2024 PROJECT NUMBER

REVISION: SK001B **24-9318**

SHEET: 6

SCALE: 1 : 250 @B1

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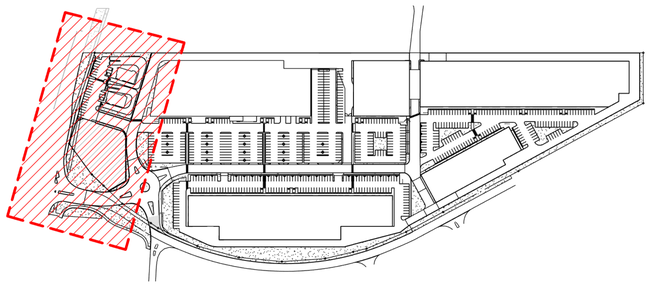
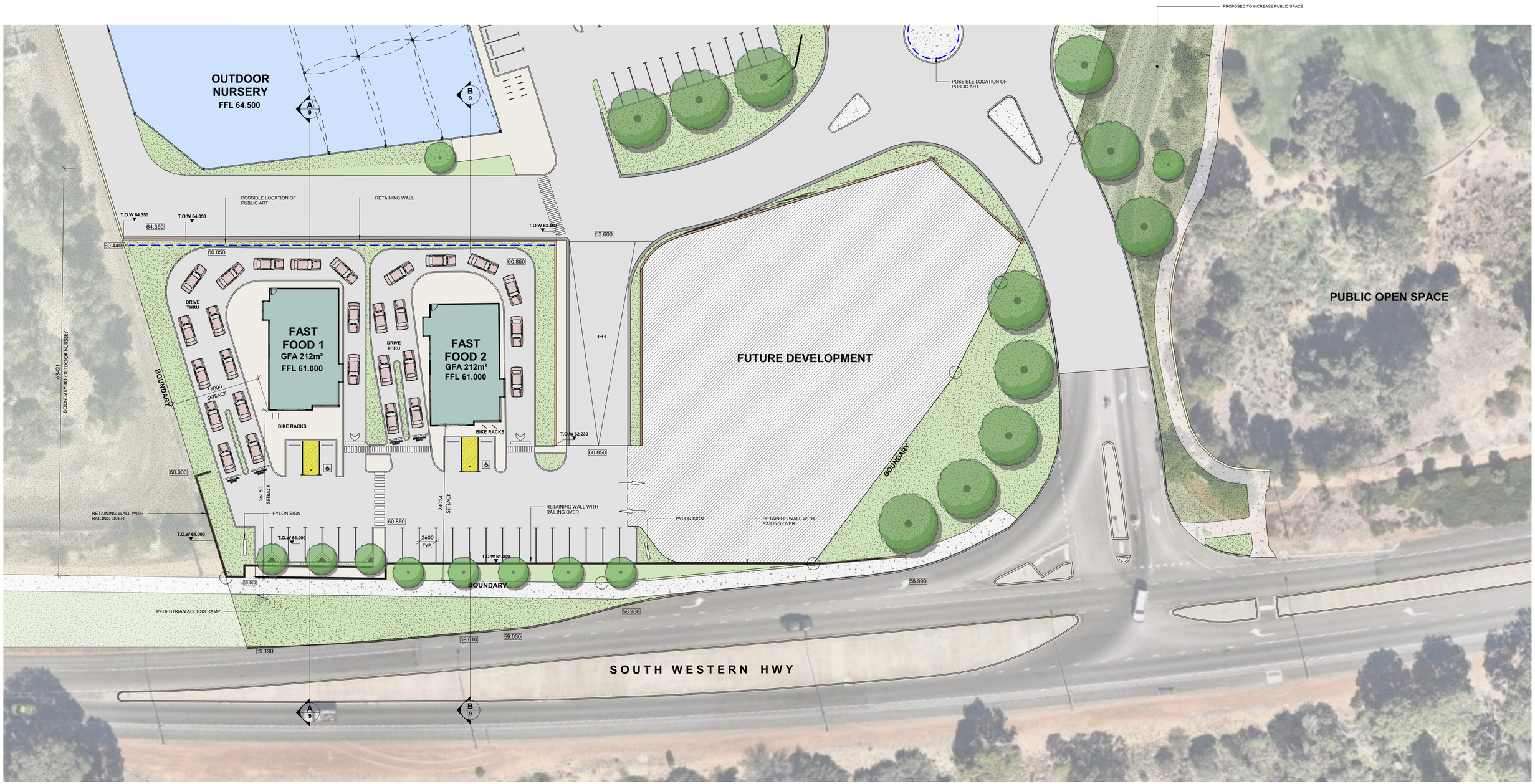


ZONE A

AREA SCHEDULE (GFA) - ZONE A	
NAME	AREA
FAST FOOD 1	212m²
FAST FOOD 2	212m²
TOTAL	**424m²**

TENANCY AREA SCHEDULE (NLA) ZONE A	
NAME	AREA
FAST FOOD 1	201m²
FAST FOOD 2	201m²
TOTAL	402m²



ZONE A - SITE PLAN

SCALE: 1 : 250

PRELIMINARY

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BYFORD COMMERCIAL

LOCATION : SOUTH WESTERN HIGHWAY

FOR : ACCORD

0 2.5 5 7.5 10 12.5 25

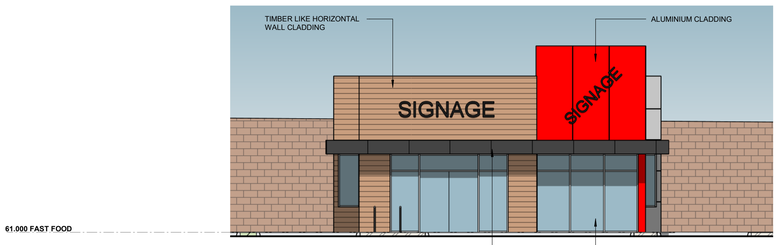
DATE: MAY 2024 PROJECT NUMBER **24-9318**

REVISION: SK0018

SHEET: 7

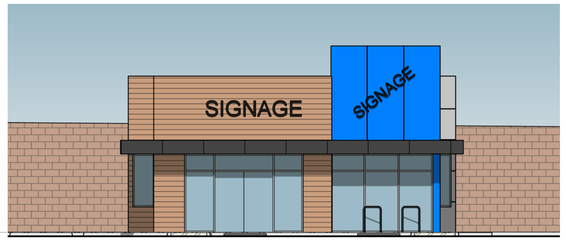
SCALE: As indicated @B1

SOUTH WESTERN HIGHWAY STREET VIEW



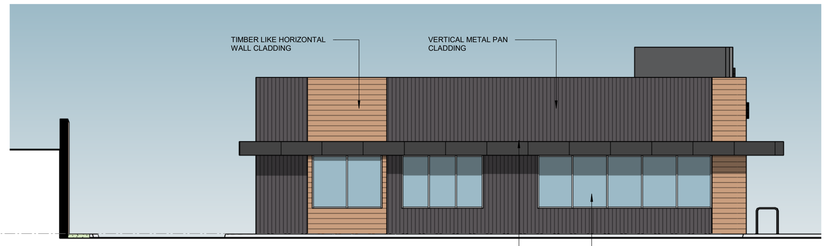
FF1 - WEST ELEVATION

SCALE: 1 : 100



FF2 - WEST ELEVATION

SCALE: 1 : 100

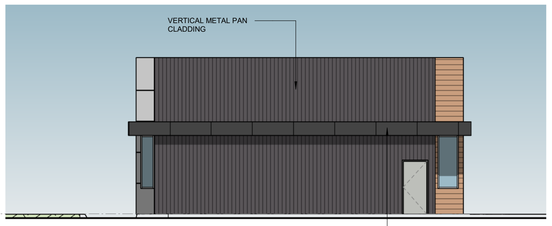


FF1 - NORTH ELEVATION

SCALE: 1 : 100

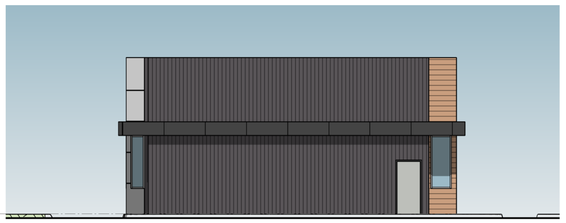
FF2 - NORTH ELEVATION

SCALE: 1 : 100



FF1 - EAST ELEVATION

SCALE: 1 : 100



FF2 - EAST ELEVATION

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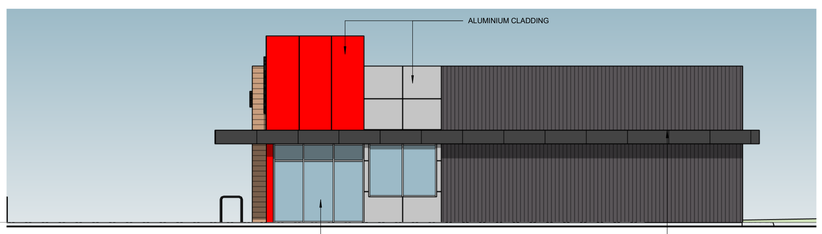
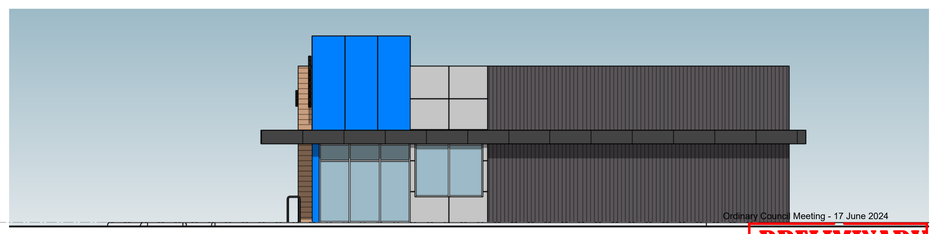


FF1 - SOUTH ELEVATION

SCALE: 1 : 100



FF2 - SOUTH ELEVATION

SCALE: 1 : 100

PRELIMINARY

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LOCATION : SOUTH WESTERN HIGHWAY

FOR : ACCORD

Member Australian Institute of Architects

0 1 2 3 4 5 10

DATE: MAY 2024

REVISION: SK001B

SHEET: 8

SCALE: 1 : 100 @B1

PROJECT NUMBER **24-9318**

ACN 115 189 216
Suite 2, Ground Floor 437 Roberts Road, Subiaco WA 6008
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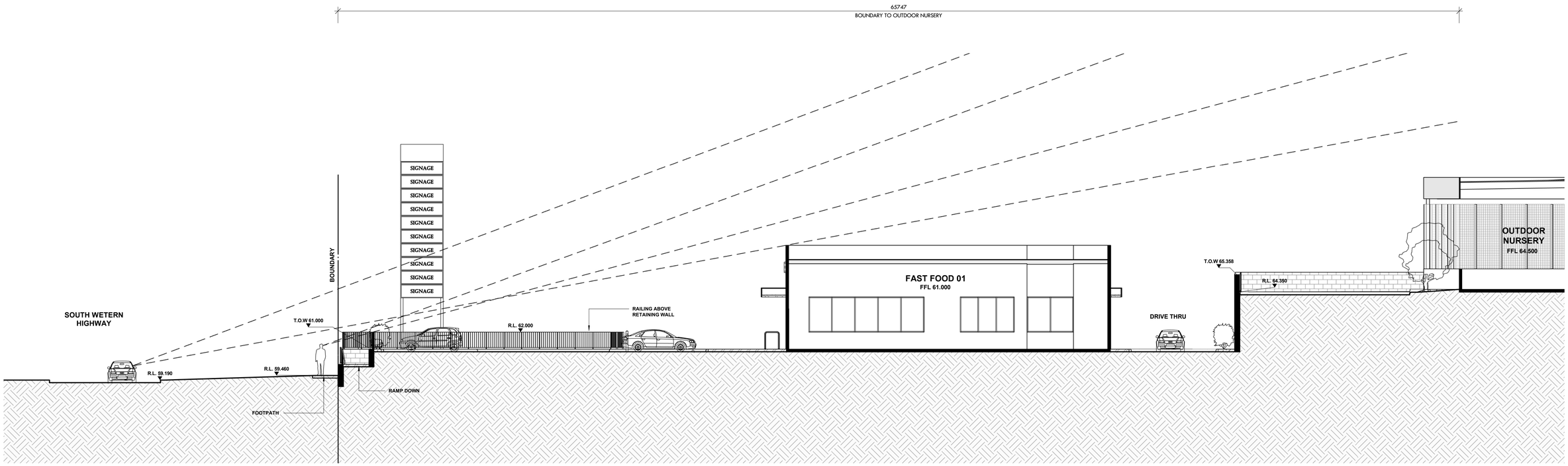
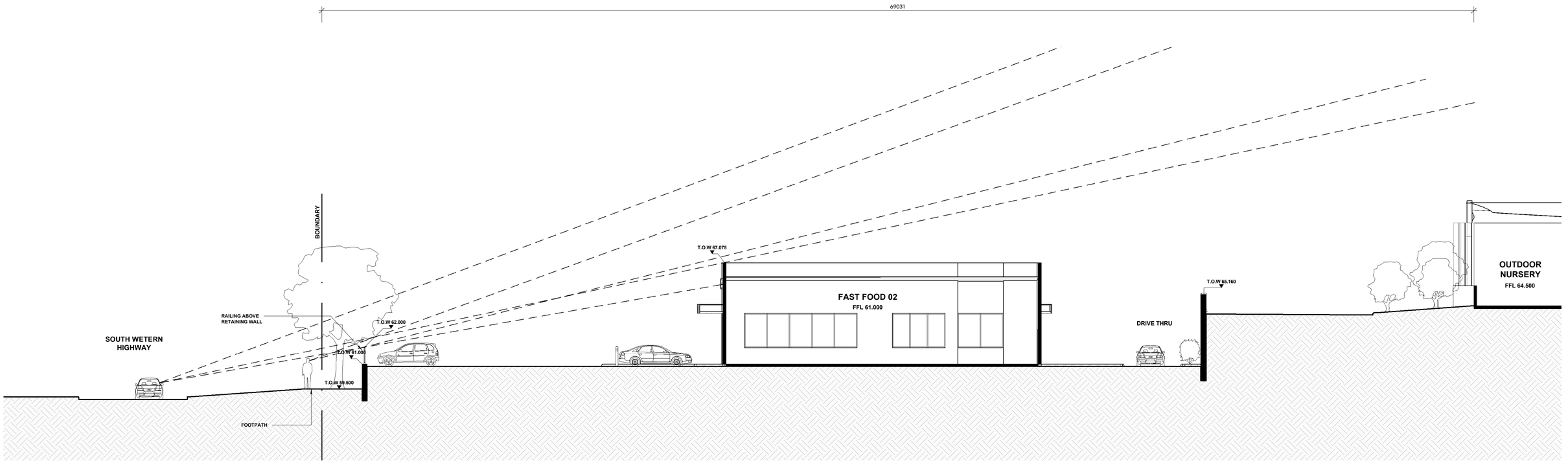


SECTION A

SCALE: 1 : 100



SECTION B

SCALE: 1 : 100

Ordinary Council Meeting - 17 June 2024

PRELIMINARY

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BYFORD COMMERCIAL

LOCATION : SOUTH WESTERN HIGHWAY

FOR : ACCORD

Member Australian Institute of Architects

0 1 2 3 4 5 10

DATE: MAY 2024 PROJECT NUMBER

REVISION: SK001B **24-9318**

SHEET: 9

SCALE: 1 : 100 @B1

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PS ref: 6771

2 April 2024

Department of Planning, Lands and Heritage
Locked Bag 2506
Perth WA 6001

Attention: Ryan Shaw, Principal Planning Officer

Dear Ryan,

SAT APPEAL – BYFORD MIXED COMMERCIAL CENTRE - RESPONSE TO s31 CONDITIONS
LOT 806 SOUTH WESTERN HIGHWAY, BYFORD

Planning Solutions acts on behalf of Accord Property, the proponent of the approved mixed commercial centre development at Lot 806 South Western Highway, Byford (**subject site**). Approval for the aforementioned development was granted by the Outer Metro Joint Development Assessment Panel (**JDAP**) on 14 November 2023. An appeal against the determination was lodged with the State Administrative Tribunal (**SAT**) on 4 December 2023.

We refer to mediation on the above matter held 12 February and 25 March 2024, as well as ongoing discussions. In response to the matters raised, we are pleased to submit this submission and the following additional information detailing our response to all contended conditions of approval:

1. Amended development plans (refer **Attachment 1**).
2. Stormwater Technical Note (refer **Attachment 2**)
3. Revised Transport Impact Assessment (refer **Attachment 3**).
4. Transport Technical Note and Swept Path Plans (refer **Attachment 4**).

AMENDMENTS TO THE DEVELOPMENT PLANS

In response to mediation, the development plans have been amended as follows:

- Amend the colour of the retaining walls along South Western Highway and portion of Wilaring Street to include a darker earthy tone. A legend detailing the various retaining wall colours, as well as locations of public art have now been included.
- Provide a new mesh fence along the Wilaring Street retaining wall. The fence will be semi-permeable and allow vertical landscaping.
- Amend the 'Development 2' building to reflect the design requirements of the future tenant. This includes the following amendments:
  - Inclusion of an outdoor nursery area within the western portion of the building.
  - Replace the walls of the south western portion of the building with finger proof mesh which is visually permeable. The roof has also been replaced with shade sails.
  - Provide new nursery entrance on the south side of the building.
- Amend the materiality of the Fast Food Outlet buildings along South Western Highway with a more refined rural texture and tones. This includes:

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URBAN & REGIONAL PLANNING
PS
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(08) 9227 7970
GPO Box 2709
Cloisters Square PO 6850
admin@planningsolutions.com.au
www.planningsolutions.com.au
ACN 143 573 184 ABN 23 143 573 184
Planning Solutions (Aust) Pty Ltd

- Timber look horizontal wall cladding to replace CFC cladding.
- More refined elevations to demonstrate the overall built form.

- Updated suite of perspective drawings to further articulate the proposed development.

Refer **Attachment 1,** revised development plans.

RESPONSE TO CONTENDED CONDITIONS OF APPROVAL

A response to the contended conditions of approval is provided in **Table 1** below. Additional justification for selected conditions is provided further in this submission.

Table 1 – Response to contended conditions.

Condition	Approved Condition	Requested Changes to Condition
1b(i).	Amended elevations of the western facades of the 'Fast Food 01' and 'Fast Food 02' buildings to the west of site. This amended elevation should include amended design elements, materials and colours, that reflect the rural tones of the locality.	**Remove condition.** Amended development plans provided. Refer additional justification below.
1b(ii).	Amended elevations of the western face of 'Development 02' building. This amended elevation should include amended design elements, materials and colours, that reflect the rural tones of the locality.	**Remove condition.** Amended development plans demonstrate the design of this façade. It was recognised this building façade is setback from the street and will be partially obscured by other development on the site.
1b(iii).	Amended development plans shall be provided including staggering and rendering treatments to the retaining wall on the west boundary of the site, to the satisfaction of the Shire of Serpentine Jarrahdale.	**Remove condition.** Amended development plans provided. Refer additional justification below.
1b(iv)	A screening fence on top of the retaining wall to the south of site. This screening fence shall provide a visual screen to the rear of the 'Development 04' and 'Development 05' buildings. The screening fence should include a mixture of wooden cladding, metal cladding and creeper vegetation, or other design to the satisfaction of the Shire of Serpentine Jarrahdale.	**Remove condition.** Amended development plans provided. Refer additional justification below.
1b(v).	Amended elevations of the southern facades of the 'Development 04' and 'Development 05' buildings. This shall include elements of wooden panelling, face brick and metal cladding to the top of the building, or other design to the satisfaction of the Shire of Serpentine Jarrahdale.	**Remove condition.** Amended development plans provided. Refer additional justification below.
1b(vi).	Amended elevation plans of the showroom buildings shall be provided to include more windows on all showroom tenancies, in order to achieve passive visual surveillance within the site.	**Remove condition and amend condition 1e as follows:** *Prior to lodgement of a Building Permit, a Lighting **and Safety** Plan is to be submitted to and approved by the Shire of Serpentine Jarrahdale. The Lighting **and Safety** Plan shall demonstrate the provision of lighting to all access ways, car parking areas, the exterior entrances to all buildings and the extent to which light from all external light sources is cast. The Lighting **and Safety** Plan must demonstrate lighting not causing an adverse amenity impact on the surrounding area **and demonstrate the overall safety and security of the site**. Once approved, lighting is to be installed and maintained in accordance with the Plan.* Refer additional justification below.
1b (viii).	Amended site plan should be provided to realign the existing footpath on the western lot boundary.	**Remove condition.**

	The realigned footpath shall be located outside of the site, in the South Western Highway road reserve, to the satisfaction of Main Roads Western Australia and the Shire of Serpentine Jarrahdale.	Approved development plans demonstrate the proposed footpath within the road reserve. Condition is redundant.
1c.	Prior to lodgement of a Building Permit, an amended Stormwater Management Plan must be submitted to and approved by the Shire of Serpentine Jarrahdale. The Stormwater Management Plan must be developed in accordance with Local Planning Policy 2.4: Water Sensitive Urban Design Guidelines. This must include the following: i. Details of suitable treatment and filtration of captured stormwater onsite prior to its release into the South Western Highway drainage system.	**Amend condition as follows:** *Prior to lodgement of a Building Permit, an amended Stormwater Management Plan must be submitted to and approved by the Shire of Serpentine Jarrahdale* ***on advice from Main Road Western Australia****.* ~~*The Stormwater Management Plan must be developed in accordance with Local Planning Policy 2.4: Water Sensitive Urban Design Guidelines. This must include the following:*~~ ~~*i. Details of suitable treatment and filtration of captured stormwater onsite prior to its release into the South Western Highway drainage system.*~~ Refer additional justification below.
1i(iv).	All trees shall have a minimum height of two meters of the establishment in the area between Wilaring Street and the southern walls of the adjoining showrooms, and suitable to the location given proximity to the public road of Wilaring Street and associated verge area.	**Remove portion of condition.** An overall forward planting regime is proposed as part of this development. An updated landscaping plan will be provided as part of the condition, with the portion of the condition requiring 2m high trees unreasonable and unnecessary in order to achieve the landscaping outcome proposed.
1k.	Prior to the issue of a Building Permit, a Parking Management Plan shall be provided detailing the proposed installation and location of directional signage and disabled bays and EV charging bays (minimum of four) to the satisfaction of the Shire of Serpentine Jarrahdale.	**Remove requirement for EV charging bays in condition.** Agreed to remove condition with an amended advice note stating that EV bays are encouraged and if provided, contemplated in the Parking Management Plan.
1l.	Prior to the issue of a Building Permit, an amended Stormwater Management Plan shall be submitted to an approved by the Shire of Serpemtine Jarrahdale. This must include the following: i. Details of how water will be treated for contaminents when within the proposed stormwater management system, including the addition of drainage swales internal to the site; ii. A maintenance schedule to detail any recommended upgrades or maintenance necessary to the South Western Highway drainage system, to ensure the stormwater can be discharged effectively from site as proposed within the Stormwater Management Plan; and iii. Details of how the capacity of the proposed stormwater management system will be suitable to account for repeated storm events and how it will be cleaned and drained.	**Remove and amalgamate into condition 1C.** Refer above and additional justification below.
1m.	Prior to occupancy of individual tenancies, a Signage Strategy shall be prepared and submitted to the Shire of Serpentine Jarrahdale. The Signage Strategy shall comply with the requirements of Local Planning Policy 4.11 - Advertising to the satisfaction of the Shire of Serpentine Jarrahdale.	**Condition to be amended as follows:** *Prior to occupancy of individual tenancies, a Signage Strategy shall be prepared and submitted to and approved by the Shire of Serpentine Jarrahdale.*
1o.	Prior to issue of a Building Occupancy Permit, the applicant shall prepare a Section 195 Easement in Gross covering: i. the through-road being available and accessible to the public at large without restriction and at all times; and	**Condition to be amended as follows:** *Prior to issue of a* ~~*Building*~~ ***Occupancy*** *Permit, the applicant shall prepare a Section 195 Easement in Gross covering:*

	ii. the road at the front of the subject land connecting to the northern property, being available and accessible to the public at large for connectivity without restriction and at all times, to facilitate future development of that land consistent with the adopted structure plan. This Easement in Gross is to be prepared by the Shire's Solicitors at the cost of the applicant, and provide for public access at all times along the driveway.	*i. the through-road being available and accessible to the public at large without restriction and at all times; and* *ii. the road at the front of the subject land connecting to the northern property, being available and accessible to the public at large for connectivity without restriction and at all times, to facilitate future development of that land consistent with the adopted structure plan. This Easement in Gross is to be prepared by the Shire's Solicitors at the cost of the applicant, and provide for public access at all times along the driveway.*
1p.	Prior to lodgement of a Building Permit, detailed plans being submitted to and approved by the Shire of Serpentine Jarrahdale and Main Road Western Australia, depicting the following: i. The full realignment and construction of Wilaring Street and associated roundabout; and ii. A central island treatment and acceleration lane north bound at the of South Western Highway and Wilaring Street intersection. Once approved, the works shall be undertaken prior to occupancy.	**Remove condition.** Supplementary transport technical information provided. Refer additional justification below.
1q.	Prior to issue of a Building Permit, the applicant subdivides undertaking a subdivision application of the subject site in order to construct and to excise the road reserve requirements for the realigned Wilaring Street and associated infrastructure. to be available as a public road in perpetuity, to the satisfaction of the Shire. The road reserve shall then be ceded to the Shire of Serpentine Jarrahdale.	**Condition to be amended as follows:** *Prior to issue of a ~~Building~~ Occupancy Permit, the applicant subdivides ~~undertaking a subdivision application of~~ the subject site ~~in order to construct and~~ to excise the road reserve ~~requirements~~ for the realigned Wilaring Street and associated infrastructure~~. to be available as a public road in perpetuity, to the satisfaction of the Shire~~. The road reserve shall then be ceded to the Shire of Serpentine Jarrahdale.* Whilst we support the intent of the condition, the current condition trigger does not provide the proponent an acceptable amount of time to undertake the subdivision of the site. The subdivision of the realigned Wilaring Street from the subject site and delivering on the works does require substantial investment, time and coordination with the overall development. It is recommended that the condition requiring the subdivision be undertaken and completed prior to occupancy, rather than building permit.
1s.	Pursuant to clause 26 of the Metropolitan Region Scheme, this approval is deemed to be an approval under clause 24(1) of the Metropolitan Region Scheme.	**Remove condition.** Approval under the MRS was captured under the Department of Planning, Lands and Heritage Responsible Authority Report.

ADDITIONAL JUSTIFICATION

Condition 1b(i) – Design of Fast Food Outlet Buildings to be removed

Following discussions with the Shire, we understand that the intent of condition 1b(i) is to prevent the approved fast food outlet buildings being "*unadorned concrete boxes*". Whilst this is supported, we note that as currently worded, the condition would be difficult to satisfy as tenants are unknown.

It was acknowledged that the design provides a level of flexibility to allow for branding / signage which will be specific to a future tenant. The signage will then be controlled via the signage strategy condition to ensure the finalised signage is controlled at detailed design.

Accordingly, we have amended the development plans to further refine the built form and materiality of the buildings, in accordance with the intent of the condition. Specifically, the plans have been amended to:

- Timber like horizontal wall cladding to replace CFC cladding.
- Amend the colour of the retaining walls along South Western Highway to include a darker earthy tone.

These subtle changes mean the proposed development takes into consideration the local context and material palette to ensure an outcome which is more cohesive with the locality. Refer **Figure 1** below, demonstrating the amendments.

Figure 1 - Perspective image of fast food outlet 1 and 2.

Any future amendments to the fast food outlets to accommodate a future tenant beyond signage / branding would require an amendment to development approval or a new development application. The Shire at that point in time would reassess any modification and will need to consider any changes on their merits.

Therefore, taking into consideration the above mentioned changes, we request **Condition 1b (i) be removed.**

Condition 1b(iii) – Design of Retaining Walls to be removed

In response to condition 1b(ii), we have amended the materiality of retaining walls along the western boundary to include more earthy toned coloured limestone blocks. This is in accordance with the advice of the Shire, who sought to have the retaining walls complement other development in the area, with a focus on rammed earth blocks or coloured limestone. The retaining walls fronting Wilaring Street have also been modified to detail the change in colour, which will compliment to overall built form of the development. Refer **Figure 1 above and Figure 2** below, demonstrating the change in colour of the retaining.

Figure 2 - Perspective image of fast food outlet 1 and 2 demonstrating new retaining wall.

All other retaining walls are to remain as approved. For legibility, the development plans have been amended to include a legend detailing the colours used for the retaining walls as well as indicative public art locations.

Therefore, taking into consideration the above mentioned changes, we request **Condition 1b (iii) be removed.**

Condition 1b(iv) and (v) – Southern Elevation Refinement

As demonstrated during the development application process, the majority of the southern elevation will not be visible from Wilaring Street. This has been achieved through retention of trees, significant pre-planting along the boundary, as well as changes in the topography of the land.

Notwithstanding, to further strengthen and refine this elevation, we have amended visible portions of the retaining wall, in a manner consistent with the proposed amendments along South Western Highway.

In response to condition 1b(v), we have amended the development plans to provide visually permeable mesh fencing along this boundary. The proposed fencing will allow vertical landscaping, further improving the significant landscaping in this locality.

Refer **Figure 3 -5** below, demonstrating the change in materiality of the retaining wall and proposed fence.

Figure 3 - Perspective image of Development 04 viewed from Wilaring Street.

Figure 4 - Perspective image of Development 04 viewed from Wilaring Street.

Figure 5 - Perspective image of Development 04 viewed from Wilaring Street.

Taking into consideration the above mentioned changes and additional information we request **Condition 1b(iv) and (v) be removed**.

Condition 1b(vi) – Glazing and Passive Surveillance

We understand that the intent of condition 1b(vi) is to provide passive surveillance between the car parking and individual tenancies of the proposed development. We note that additional glazing does not automatically provide passive surveillance. It is likely future tenants will cover up windows with signage or with product placement if more glazing was to be provided. The design of each of the tenancies will also come down to individual tenant requirements, which will impact the floor plan signage and orientation of the development.

We consider the proposed condition is not necessary, as the proposed development will deliver significant passive surveillance between car parking areas, access aisles, pedestrian access and individual tenancies. To provide further analysis of this and information to support the safety of the development, it is recommended further information be provided on this within Condition 1e as follows:

> *Prior to lodgement of a Building Permit, a Lighting **and Safety** Plan is to be submitted to and approved by the Shire of Serpentine Jarrahdale. The Lighting **and Safety** Plan shall demonstrate the provision of lighting to all access ways, car parking areas, the exterior entrances to all buildings and the extent to which light from all external light sources is cast. The Lighting **and Safety** Plan must demonstrate lighting not causing an adverse amenity impact on the surrounding area **and demonstrate the overall safety and security of the site**. Once approved, lighting is to be installed and maintained in accordance with the Plan.*

The amended condition grants the decision maker certainty that passive surveillance and the general security of the development will be considered through a dedicated lighting and safety plan which will provide specific and site appropriate design measures. It is therefore respectfully requested **Condition 1b(vi) be deleted and Condition 1e update as above.**

Condition 1c and 1l – Provision of additional stormwater management materials

Conditions 1c and 1l require the provision of a Stormwater Management Plan. Whilst we support the intent of a condition as stormwater solution will be refined and documented as part of the normal design process, we request that it be simplified.

Foremost, as condition 1l duplicates condition 1c, with the matters listed as part of the condition (water quality, the systems operation and ongoing maintenance liabilities) addressed by a stormwater management plan provided in Condition C, we request it be **deleted**.

In respect to condition 1c, the outcomes of the design and what impact this has on the development is yet to be resolved. As such, the wording of the condition needs to be simplified such that the intent of the development, whilst incorporating best practices, can be achieved. The recommended considerations identified in the current condition will likely result in the overall design of the development being impacted and requiring change. This does not make the condition final and certain.

Notwithstanding, an additional technical note was provided which provides additional information on soil condition, discharge, response to Main Roads, and design considerations. Refer **Attachment 2**.

Ultimately, the condition should be worded to allow the necessary updates to the stormwater management which occurs at detailed design. This will then need to be approved by the Shire prior to Building Permit.

Accordingly, we request the condition be amended as follows:

> *Prior to lodgement of a Building Permit, an amended Stormwater Management Plan must be submitted to and approved by the Shire of Serpentine Jarrahdale* ***on advice from Main Roads Western Australia.*** ~~*The Stormwater Management Plan must be developed in accordance with Local Planning Policy 2.4: Water Sensitive Urban Design Guidelines. This must include the following:*~~
>
> ~~*i. Details of suitable treatment and filtration of captured stormwater onsite prior to its release into the South Western Highway drainage system.*~~

Condition 1p – Main Roads requirements

Following development approval and the initial mediation meeting, additional transport analysis and investigations was undertaken in respect to the development, including a revised Transport Impact Assessment (**TIA**). Refer **Attachment 3**.

The revised TIA addresses part ii of Condition 1p which requires amendments to South Western Highway, including the central island treatments and the provision of acceleration lane north bound at the of South Western Highway and Wilaring Street intersection.

The revised TIA concludes that the proposed acceleration lane **is not required** as it will not have any impact to queueing for vehicles egressing the development as it relates to the second phase of movement. Further, as South Western Highway has a maximum speed limit of 60km/h as it passes the site, an acceleration lane is not required under MRWA policy.

Following the second mediation meeting, an additional transport technical note and swept path plans were prepared confirming that the design of the approved internal roundabout **currently accommodates** a 19m semi-trailer. Refer **Attachment 4**.Accordingly, as the matters of the condition have now been suitably addressed, Condition 1p is redundant and is respectfully requested to be **deleted.**

CONCLUSION

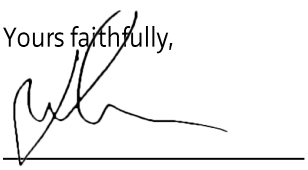
We trust the information provided above, and enclosed, addresses the relevant contended conditions of approval, in accordance with the discussions following mediation.

The proposed amendments to the development plans and additional transport and stormwater information further refine and strengthen the approved development, in accordance with the intent of the conditions.

Accordingly, we respectfully request that the application be reassessed in accordance with the above information and favourably reconsidered.

Should you have any queries or require further clarification in regard to the above matter please do not hesitate to contact the writer.

Yours faithfully,



JOSH WATSON
SENIOR ASSOCIATE

240402 6771 Ltr to DPLH - Section 31.docx

CC: Shire of Serpentine Jarrahdale
Attention: Andrew Trosic – Director of Development Services
Via email: atrosic@sjshire.wa.gov.au

ATTACHMENT 1
REVISED DEVELOPMENT PLANS

HISTORICAL CONTEXT

_ Byford is a growing suburb with an impressive history, which has been thoughtfully incorporated into several design elements throughout this development at Byford.

_ In 1915, the first Hoffman Kiln was built at the Byford State Brickworks site, producing 250,000 bricks a week to help build the City of Perth.

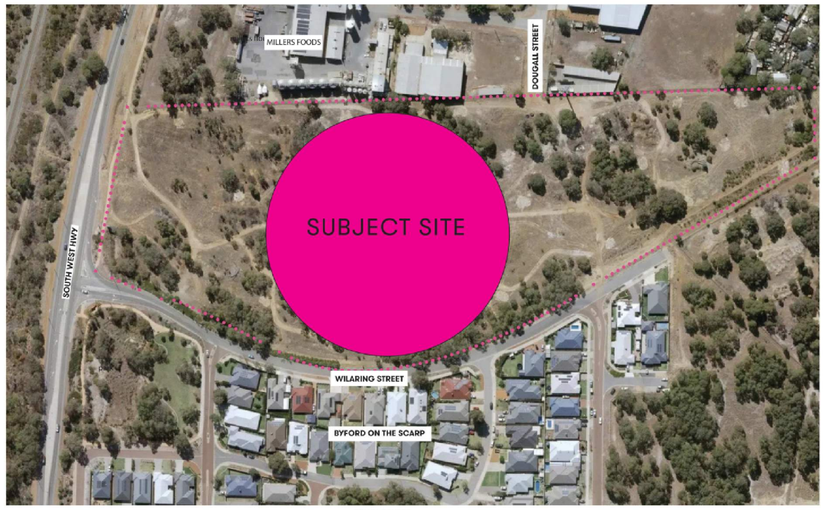
_ South Western Highway is an impressive piece of artwork representing people hard at work in the Brickworks in the 1920's, and features original bricks from the site.

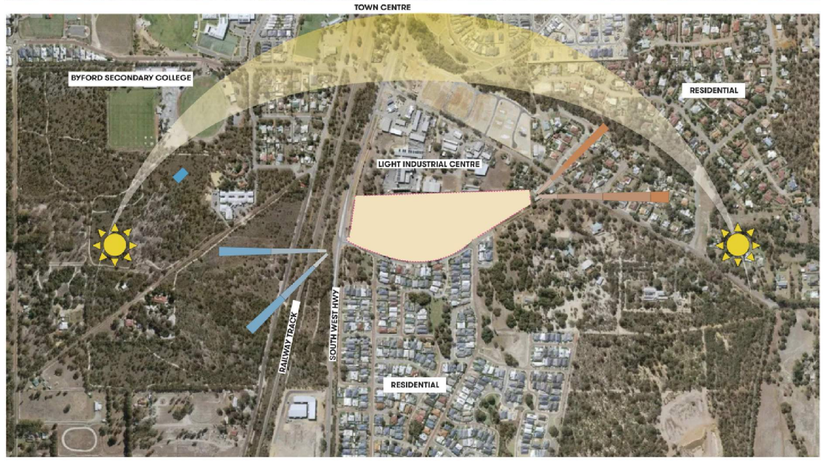
Local Brickworks

Local History

BUILT FORM CONTEXT

CONTEXT





LEGEND

SUN PATH

WIND CONDITIONS

30-40 Km/h
20-30 Km/h
10-20 Km/h
00-10 Km/h

MATERIAL PALETTE

PRELIMINARY

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BYFORD COMMERCIAL

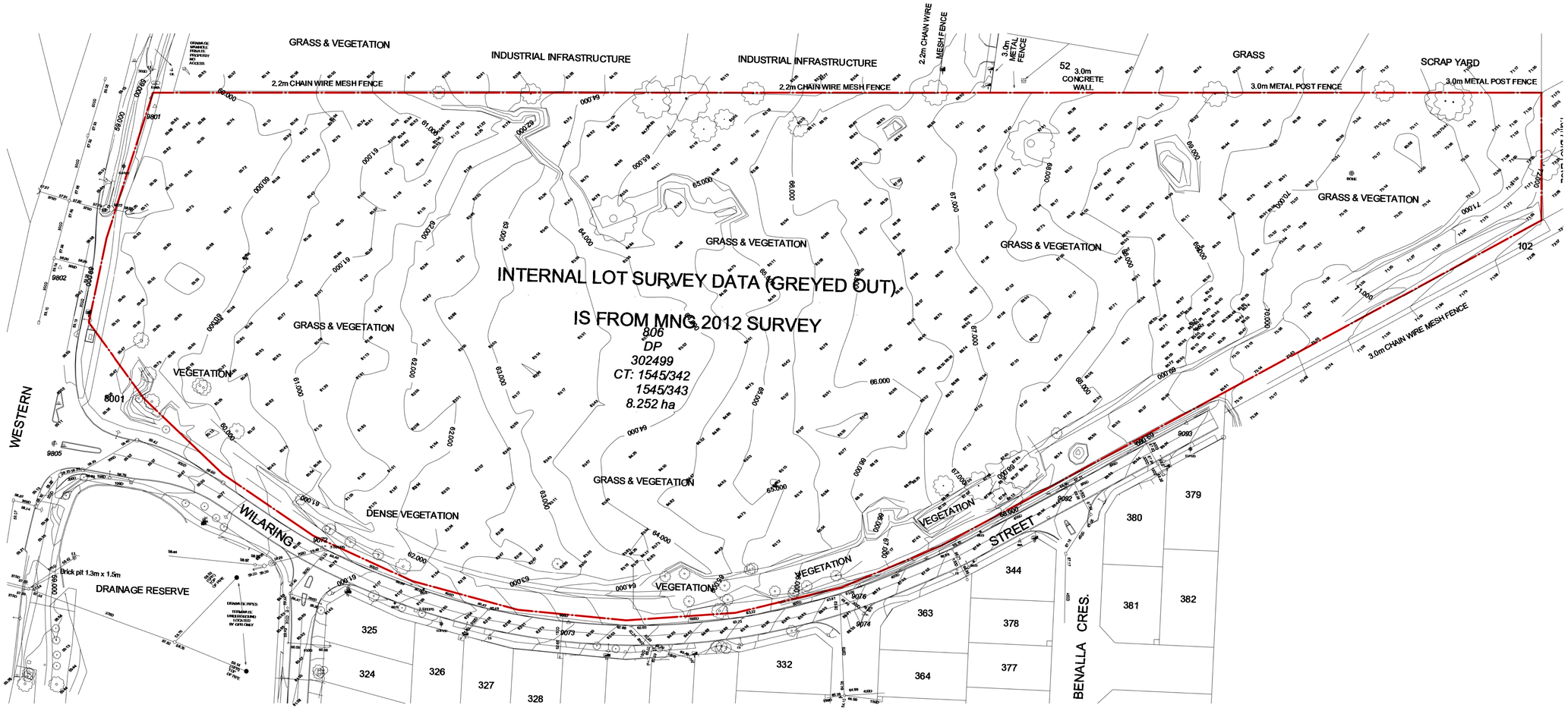
LOCATION : SOUTH WESTERN HIGHWAY
FOR : ACCORD

Member Australian Institute of Architects

DATE: FEB 2024
REVISION: SK001
SHEET: 1
SCALE: @B1

PROJECT NUMBER
24-9318

Suite 2, Ground Floor 437 Roberts Road, Subiaco WA 6008
PO Box 1294 Subiaco WA 6904
t: 08 9381 8511 e: msa@meyershircore.com.au



EXISTING SITE SURVEY

SCALE:1 : 750

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PRELIMINARY

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BYFORD COMMERCIAL

LOCATION : SOUTH WESTERN HIGHWAY

FOR : ACCORD

Member Australian Institute of Architects

0 7.5 15 22.5 30 37.5 75

DATE: FEB 2024 PROJECT NUMBER

REVISION: SK001 **24-9318**

SHEET: 2

SCALE: 1 : 750 @B1

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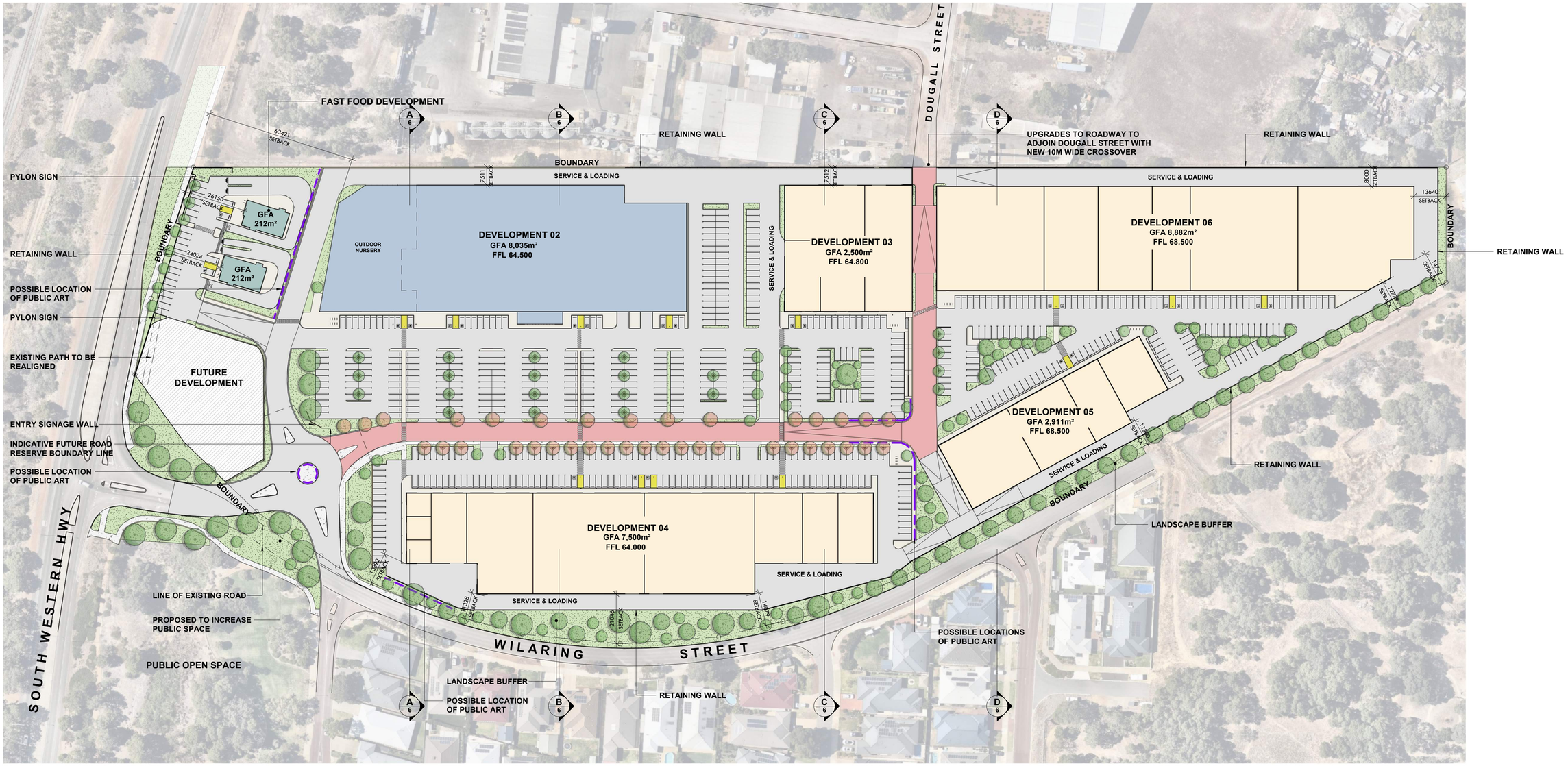


SITE PLAN - PROPOSED DEVELOPMENT

SCALE:1 : 750

AREA SCHEDULE (GFA)

NAME	AREA
FAST FOOD 1	212m²
FAST FOOD 2	212m²
DEVELOPMENT 2	8,035m²
DEVELOPMENT 3	2,950m²
DEVELOPMENT 4	7,500m²
DEVELOPMENT 5	2,911m²
DEVELOPMENT 6	8,882m²
TOTAL	**30,702m²**

TENANCY AREA SCHEDULE (NLA)

NAME	AREA
DEVELOPMENT 1	
FAST FOOD 1	201m²
FAST FOOD 2	201m²
TOTAL	**402m²**
DEVELOPMENT 2	
TENANCY 1	**7,918m²**
DEVELOPMENT 3	
TENANCY 2	450m²
TENANCY 3	1,357m²
TENANCY 4	1,070m²
TOTAL	**2,877m²**

TENANCY AREA SCHEDULE (NLA)

DEVELOPMENT 5	
TENANCY 15	1,000m²
TENANCY 16	800m²
TENANCY 17	516m²
TENANCY 18	510m²
TOTAL	**2,826m²**
DEVELOPMENT 6	
TENANCY 19	2,006m²
TENANCY 20	1,011m²
TENANCY 21	1,011m²
TENANCY 22	710m²
TENANCY 23	2,011m²
TENANCY 24	2,011m²
TOTAL	**8,760m²**

TENANCY AREA SCHEDULE (NLA)

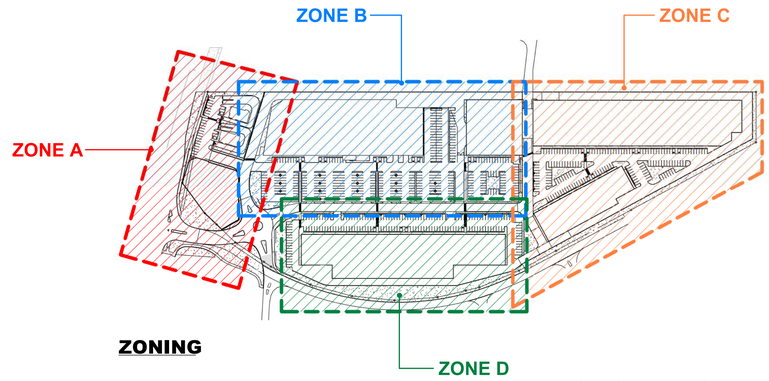
DEVELOPMENT 4	
TENANCY 5	100m²
TENANCY 6	100m²
TENANCY 7	100m²
TENANCY 8	439m²
TENANCY 9	1,131m²
TENANCY 10	1,999m²
TENANCY 11	1,986m²
TENANCY 12	592m²
TENANCY 13	441m²
TENANCY 14	441m²
TOTAL	**7,329m²**
SITE TOTAL NLA	**30,112m²**

PARKING SCEHDULE

ZONE A	26
ZONE B	350
ZONE C	158
ZONE D	167
TOTAL	**701**

SITE SUMMARY

EXISTING SITE AREA	82,517m²
WILARING ROAD RESERVE AREA	2,248m²
FUTURE SITE AREA	80,182m²
LANDSCAPE AREA - SUBJECT SITE	7,710m²
OVERALL LANDSCAPE AREA PECENTAGE	**(9.6%)**
NEW PUBLIC OPEN SPACE LANDSCAPING	359m²
LANDSCAPE AREA - WILARING STREET UPGRADES	2,083m²
TOTAL LANDSCAPE AREA OUTSIDE SUBJECT LOT	**2,436m²**



ZONING

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PRELIMINARY

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BYFORD COMMERCIAL

LOCATION : SOUTH WESTERN HIGHWAY

FOR : ACCORD

Member Australian Institute of Architects

0 7.5 15 22.5 30 37.5 75

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SHEET: 3

SCALE: As indicated @B1

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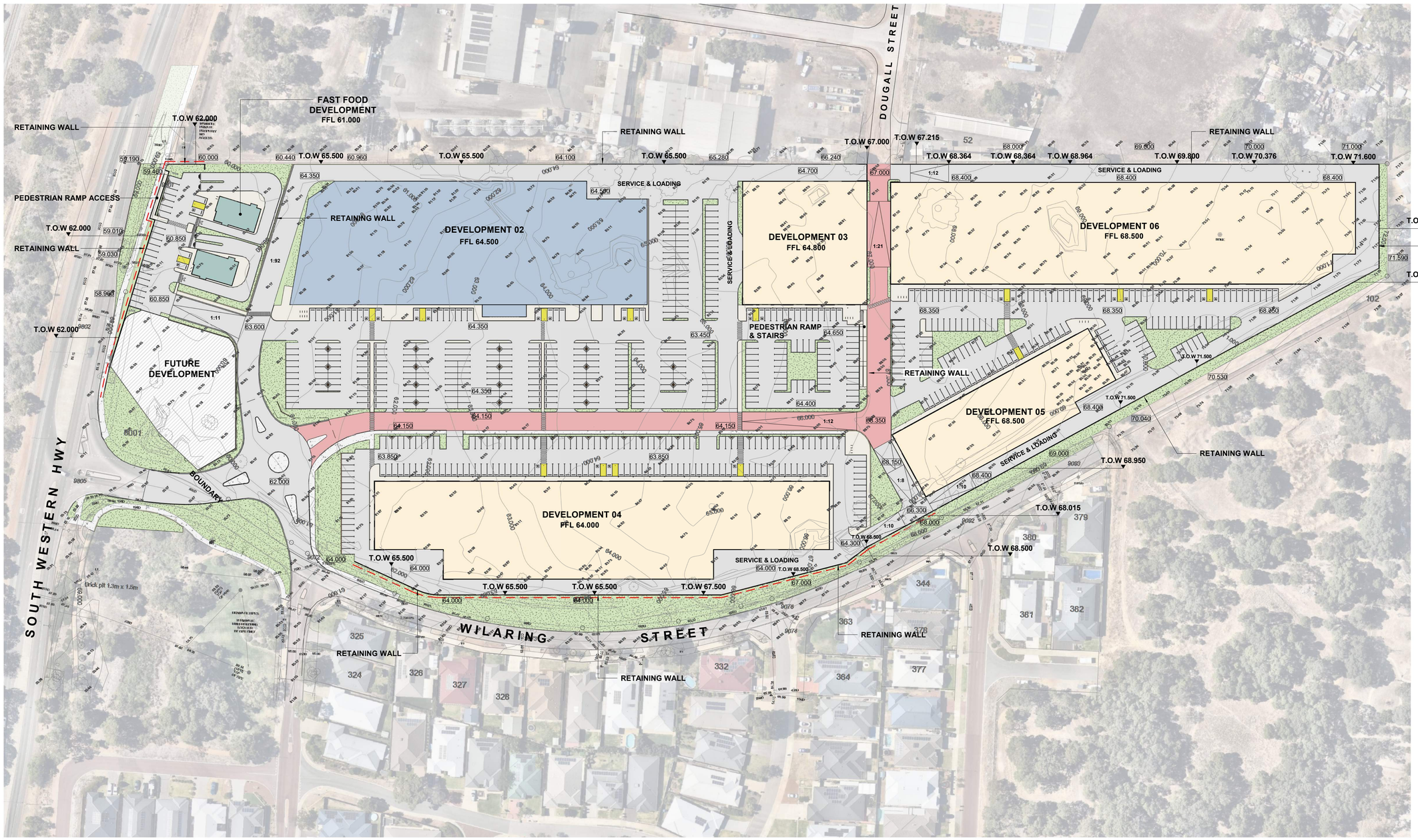

NOTE:

RED DASH INDICATES RETAINING WALL VISIBLE TO SOUTH WESTERN HIGHWAY & WILARING STREET TO BE AN EARTH TONE COLOUR AS PER EXAMPLE IMAGE BELOW

SITE PLAN - RETAINING & LEVELS

SCALE:1 : 750

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PRELIMINARY

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SHEET: 4

SCALE: 1 : 750 @B1

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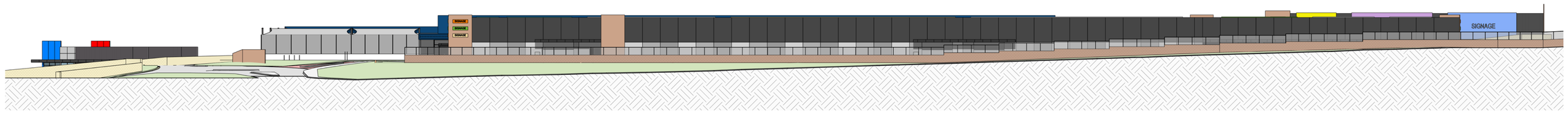
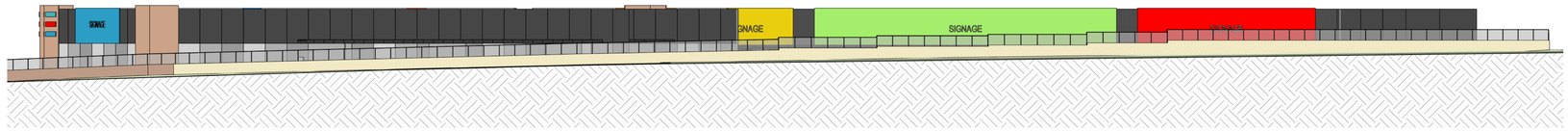


WILARING ELEVATION PART 1

SCALE:1 : 350

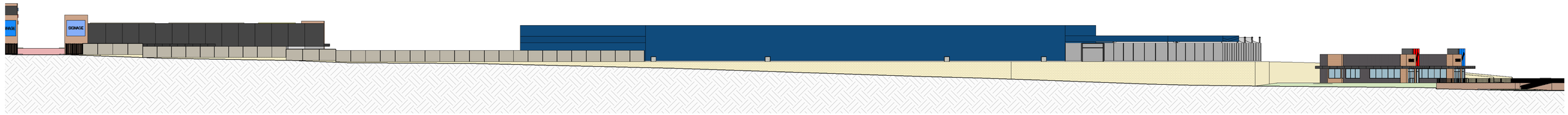


WILARING ELEVATION PART 2

SCALE:1 : 350

REAR SITE ELEVATION PART 1

SCALE:1 : 350



REAR SITE ELEVATION PART 2

SCALE:1 : 350

PRELIMINARY

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LOCATION : SOUTH WESTERN HIGHWAY

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SHEET: 5

SCALE: 1 : 350 @B1

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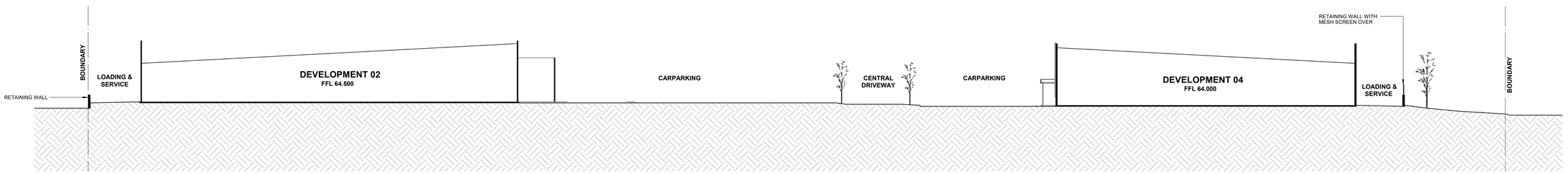
SECTION A
SCALE:1 : 250



SECTION B
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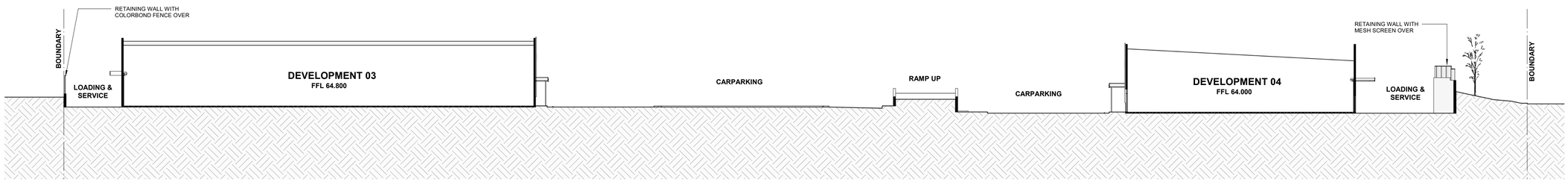

SECTION C
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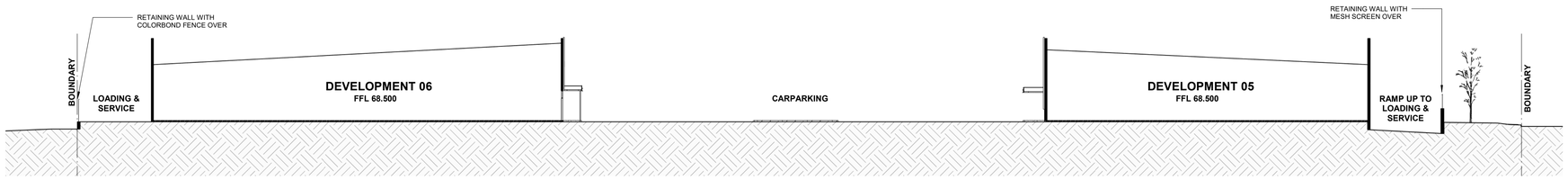

SECTION D
SCALE:1 : 250

Ordinary Council Meeting - 17 June 2024

PRELIMINARY

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BYFORD COMMERCIAL
LOCATION : SOUTH WESTERN HIGHWAY
FOR : ACCORD

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REVISION: SK001
SHEET: 6
SCALE: 1 : 250 @B1

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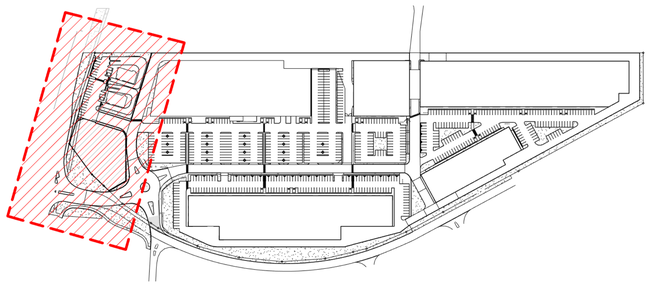
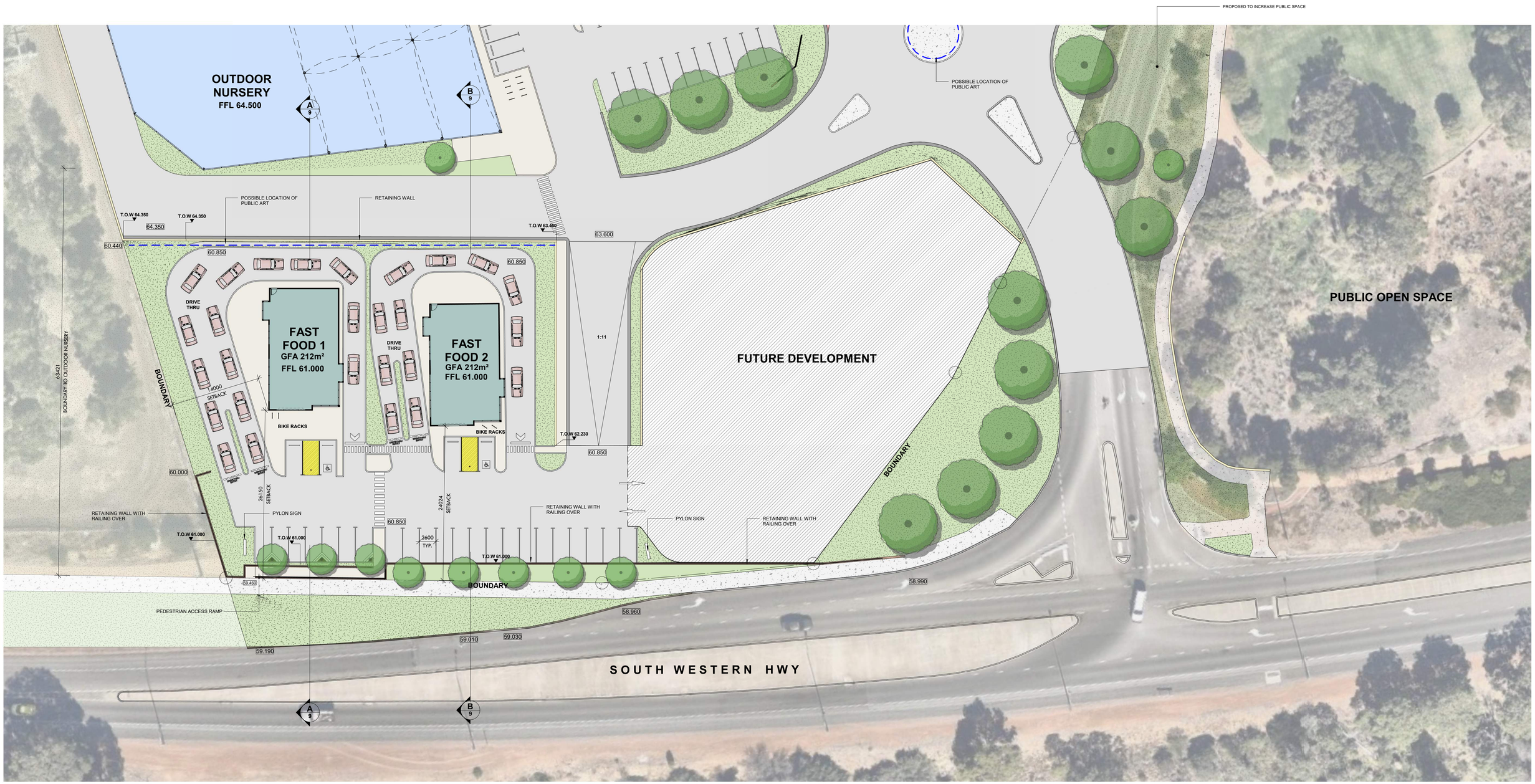


ZONE A

AREA SCHEDULE (GFA) - ZONE A	
NAME	AREA
FAST FOOD 1	212m²
FAST FOOD 2	212m²
TOTAL	**424m²**

TENANCY AREA SCHEDULE (NLA) ZONE A	
NAME	AREA
FAST FOOD 1	201m²
FAST FOOD 2	201m²
TOTAL	402m²



ZONE A - SITE PLAN

SCALE:1 : 250

Ordinary Council Meeting - 17 June 2024

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REVISION: SK001 **24-9318**

SHEET: 7

SCALE: As indicated @B1

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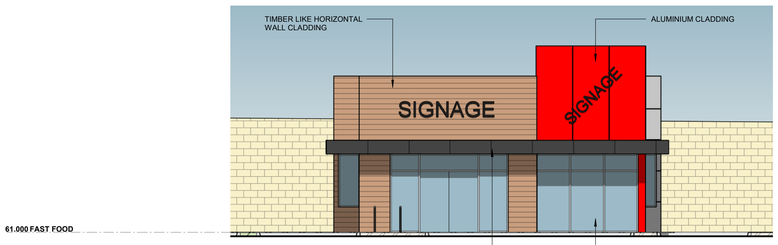
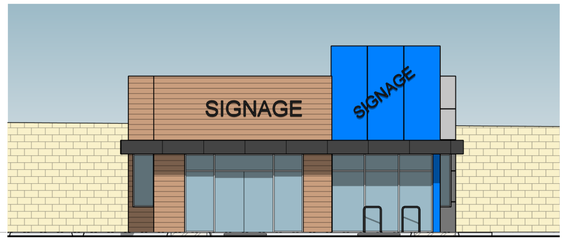
SOUTH WESTERN HIGHWAY STREET VIEW



FF1 - WEST ELEVATION

SCALE: 1 : 100



FF2 - WEST ELEVATION

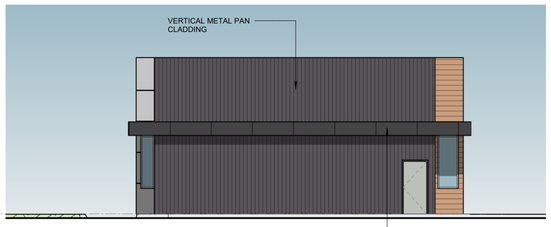
SCALE: 1 : 100

FF1 - NORTH ELEVATION

SCALE: 1 : 100

FF2 - NORTH ELEVATION

SCALE: 1 : 100



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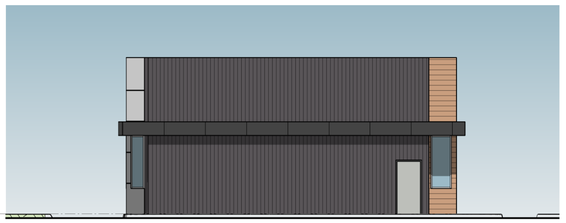

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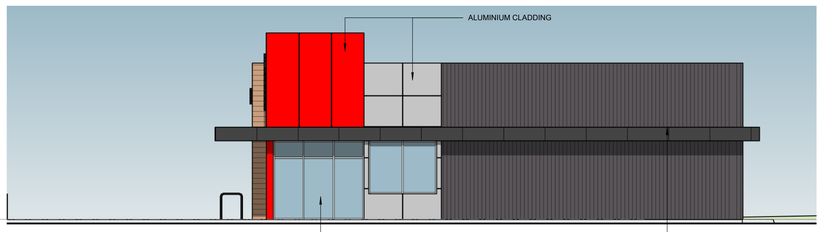
SCALE: 1 : 100



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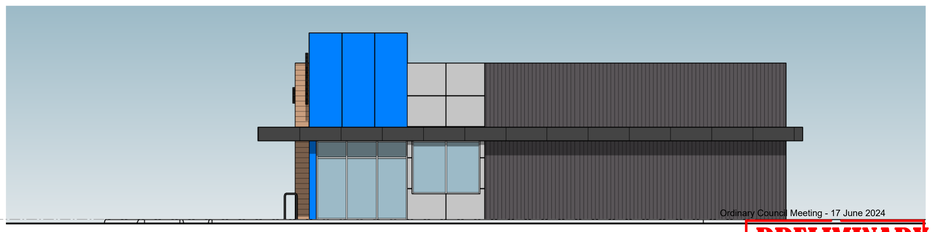

FF2 - SOUTH ELEVATION

SCALE: 1 : 100

PRELIMINARY

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BYFORD COMMERCIAL

LOCATION : SOUTH WESTERN HIGHWAY

FOR : ACCORD

Member Australian Institute of Architects

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REVISION: SK001 **24-9318**

SHEET: 8

SCALE: 1 : 100 @B1

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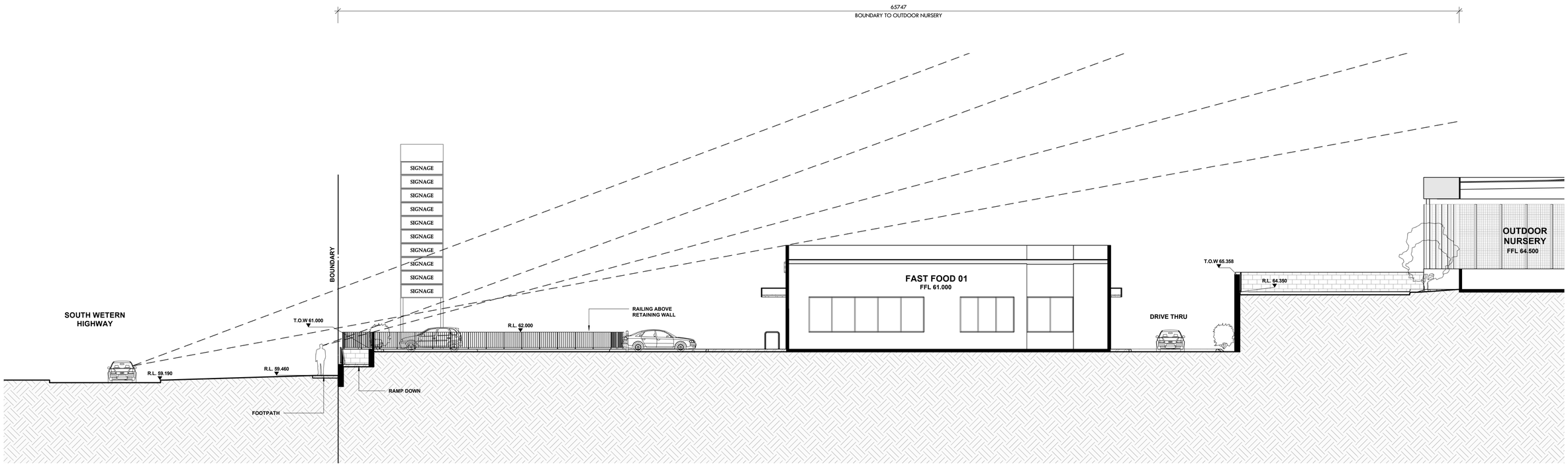
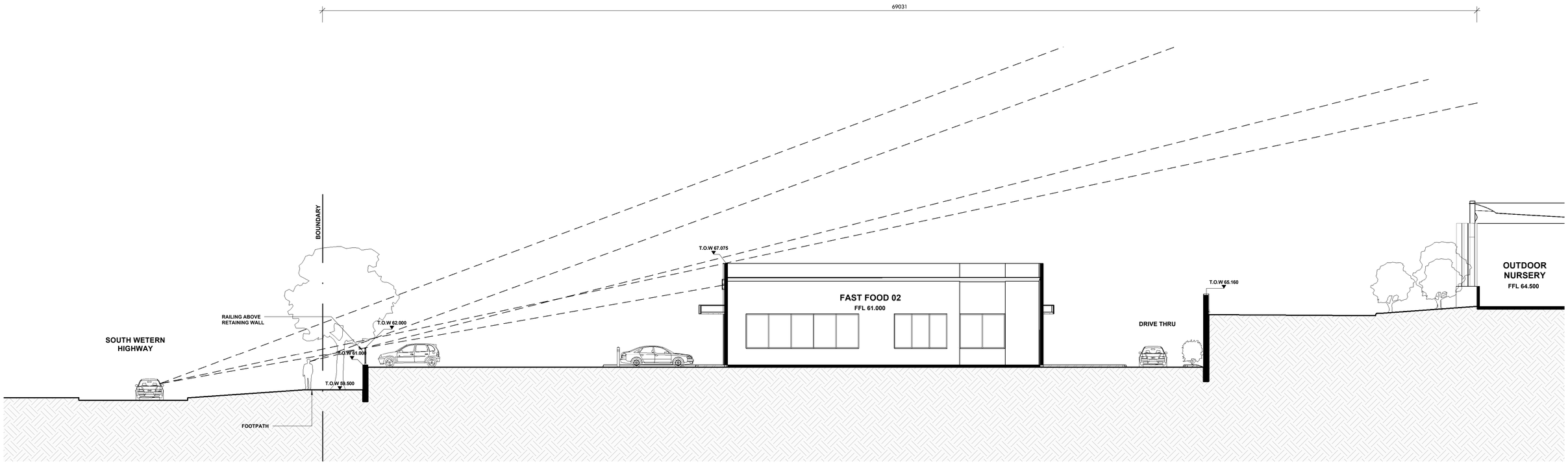


SECTION A

SCALE: 1 : 100



SECTION B

SCALE: 1 : 100

Ordinary Council Meeting - 17 June 2024

PRELIMINARY

meyer shircore architects

BYFORD COMMERCIAL

LOCATION : SOUTH WESTERN HIGHWAY

FOR : ACCORD

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DATE: FEB 2024 PROJECT NUMBER

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SHEET: 9

SCALE: 1 : 100 @B1

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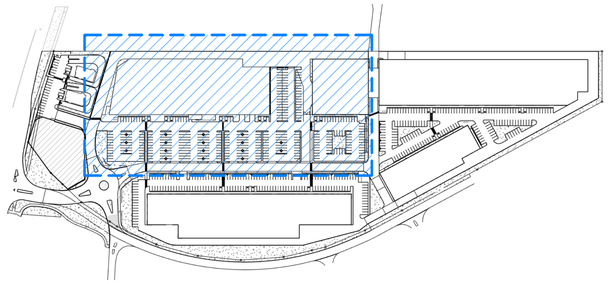

ZONE B

AREA SCHEDULE (GFA) - ZONE B	
NAME	AREA
DEVELOPMENT 2	8,035m²
DEVELOPMENT 3	2,950m²
TOTAL	**10,985m²**

TENANCY AREA SCHEDULE (NLA) ZONE B	
NAME	AREA
TENANCY 1	7,918m²
TOTAL	**7,918m²**
TENANCY 2	450m²
TENANCY 3	1,357m²
TENANCY 4	1,070m²
TOTAL	**2,877m²**
GRAND TOTAL	**10,795m²**

ZONE B SITE PLAN

SCALE:1 : 300

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SHEET: 10

SCALE: As indicated @B1

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ZONE B - DEVELOPMENT 2 PLAN

SCALE:1 : 250

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SHEET: 11

SCALE: 1 : 250 @B1

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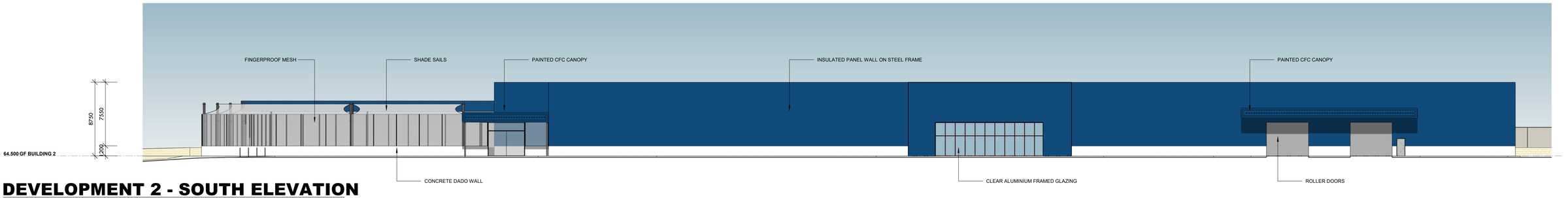
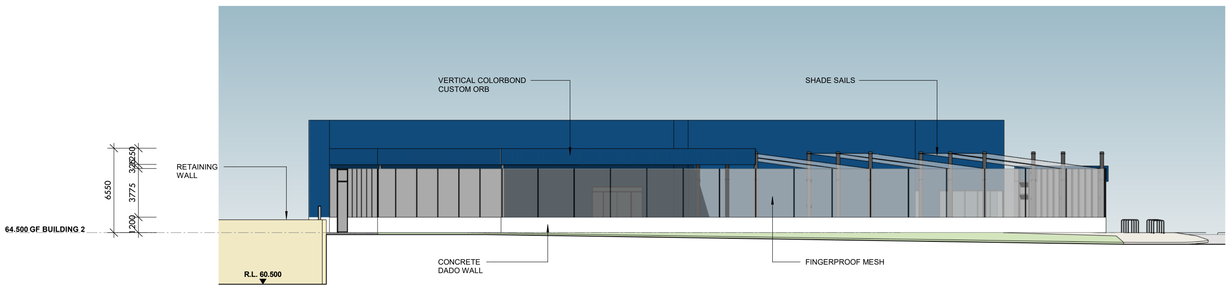


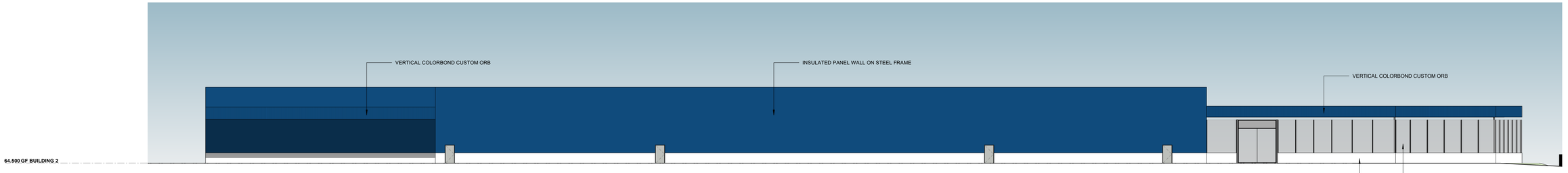
DEVELOPMENT 2 - SOUTH ELEVATION

SCALE: 1 : 200



DEVELOPMENT 2 - WEST ELEVATION

SCALE: 1 : 200



DEVELOPMENT 2 - NORTH ELEVATION

SCALE: 1 : 200

DEVELOPMENT 2 - EAST ELEVATION

SCALE: 1 : 200

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SHEET: 12

SCALE: 1 : 200 @B1

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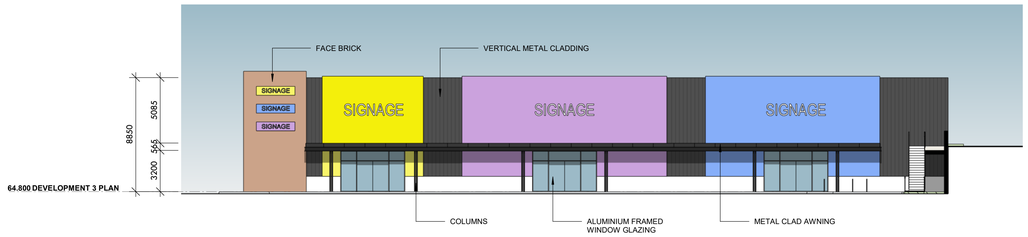
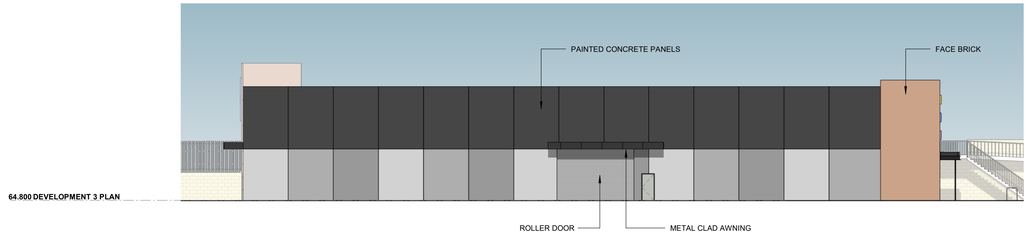
ZONE B - DEVELOPMENT 3 PLAN

SCALE: 1 : 200



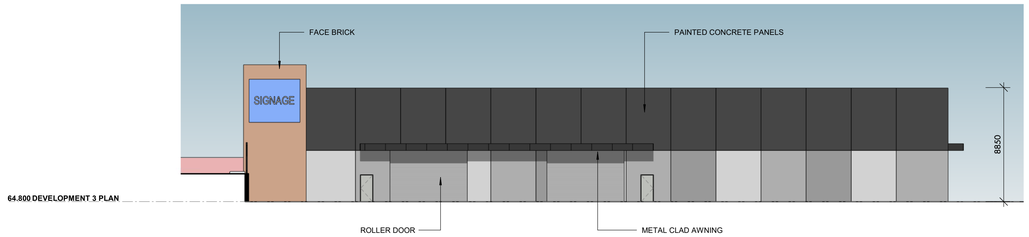
DEVELOPMENT 3 - SOUTH ELEVATION

SCALE: 1 : 200



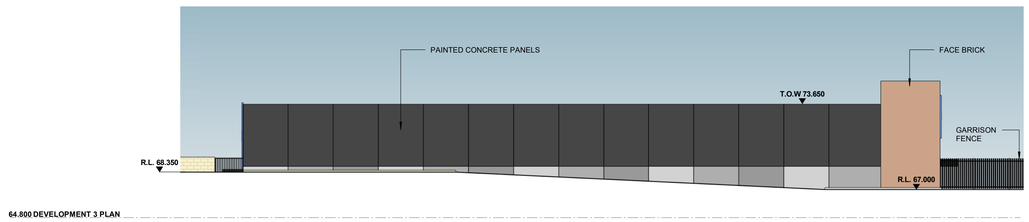
DEVELOPMENT 3 - WEST ELEVATION

SCALE: 1 : 200



DEVELOPMENT 3 - NORTH ELEVATION

SCALE: 1 : 200



DEVELOPMENT 3 - EAST ELEVATION

SCALE: 1 : 200

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SHEET: 13

SCALE: 1 : 200 @B1

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ZONE C - SITE PLAN

SCALE:1 : 300

ZONE C

AREA SCHEDULE (GFA) - ZONE C

NAME	AREA
DEVELOPMENT 5	2,911m²
DEVELOPMENT 6	8,882m²
TOTAL	**11,793m²**

TENANCY AREA SCHEDULE (NLA) ZONE C

NAME	AREA
DEVELOPMENT 5	
TENANCY 15	1,000m²
TENANCY 16	800m²
TENANCY 17	516m²
TENANCY 18	510m²
TOTAL	**2,826m²**

TENANCY AREA SCHEDULE (NLA) ZONE C

NAME	AREA
DEVELOPMENT 6	
TENANCY 19	2,006m²
TENANCY 20	1,011m²
TENANCY 21	1,011m²
TENANCY 22	710m²
TENANCY 23	2,011m²
TENANCY 24	2,011m²
TOTAL	**8,760m²**

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SHEET: 14

SCALE: As indicated @B1

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DEVELOPMENT 5 PLAN

SCALE: 1 : 200

8350 | 676 | 97404 | 2000 | 5500

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SHEET: 15

SCALE: 1 : 200 @B1

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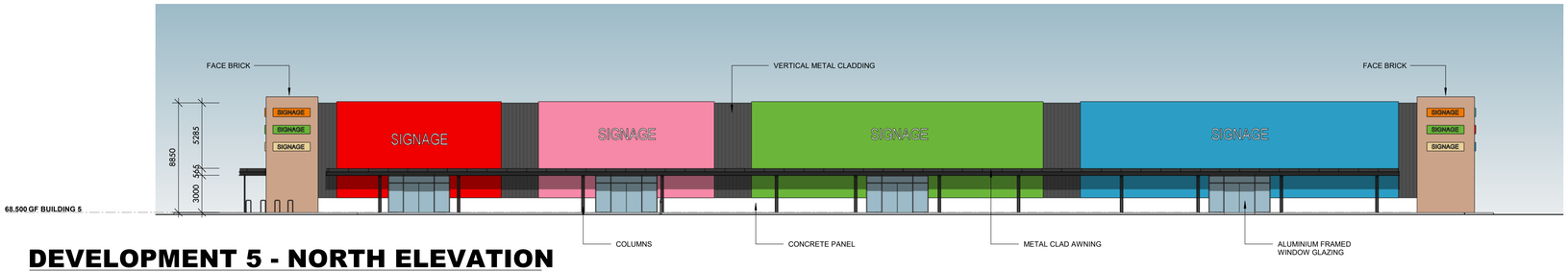
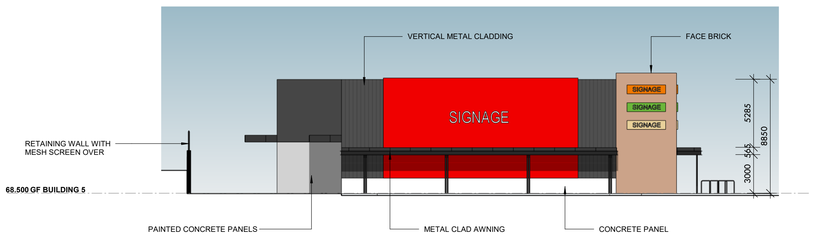


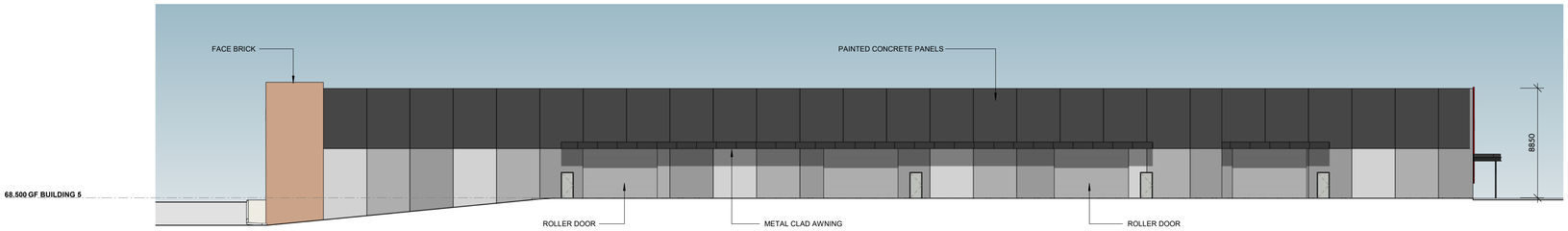
DEVELOPMENT 5 - NORTH ELEVATION

SCALE: 1 : 200



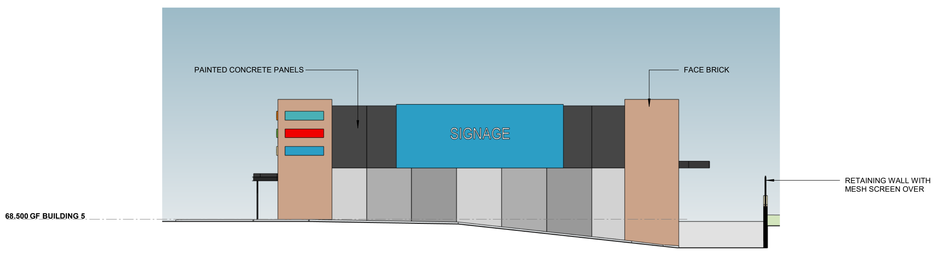
DEVELOPMENT 5 - EAST ELEVATION

SCALE: 1 : 200



DEVELOPMENT 5 - SOUTH ELEVATION

SCALE: 1 : 200



DEVELOPMENT 5 - WEST ELEVATION

SCALE: 1 : 200

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SHEET: 16

SCALE: 1 : 200 @B1

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DEVELOPMENT 6 PLAN

SCALE:1 : 250

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SHEET:	17		
SCALE:	1 : 250 @B1		

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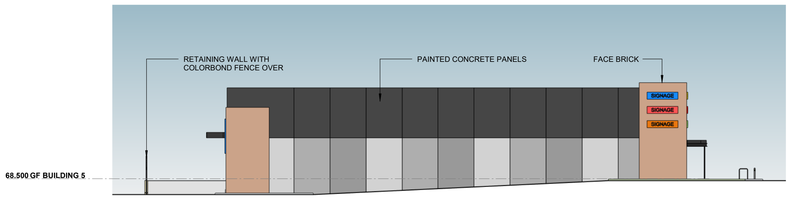
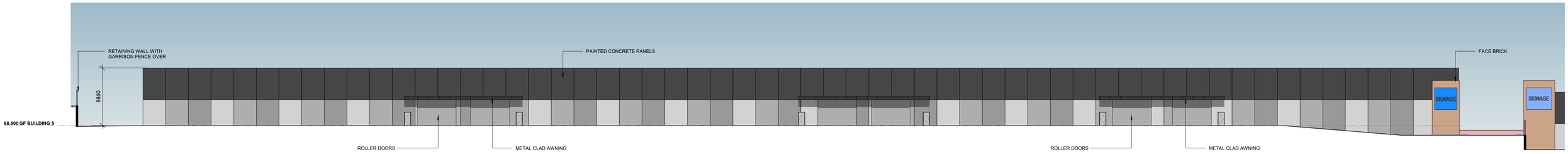
DEVELOPMENT 6 - SOUTH ELEVATION

SCALE:1 : 250



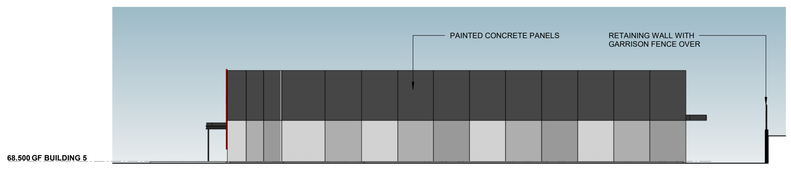
DEVELOPMENT 6 - WEST ELEVATION

SCALE:1 : 250



DEVELOPMENT 6 - NORTH ELEVATION

SCALE:1 : 250



DEVELOPMENT 6 - EAST ELEVATION

SCALE:1 : 250

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SHEET: 18

SCALE: 1 : 250 @B1

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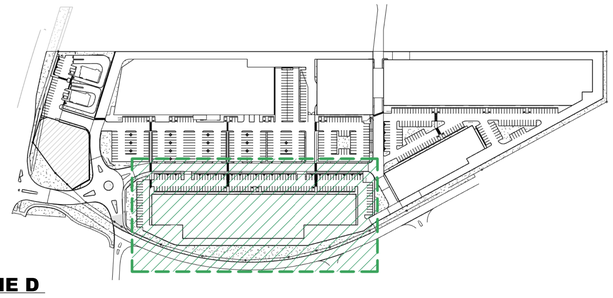

ZONE D

AREA SCHEDULE (GFA) - ZONE D	
NAME	AREA
DEVELOPMENT 4	7,500m²

TENANCY AREA SCHEDULE (NLA) ZONE D	
NAME	AREA
TENANCY 5	100m²
TENANCY 6	100m²
TENANCY 7	100m²
TENANCY 8	439m²
TENANCY 9	1,131m²
TENANCY 10	1,999m²
TENANCY 11	1,986m²
TENANCY 12	592m²
TENANCY 13	441m²
TENANCY 14	441m²
TOTAL	**7,329m²**

ZONE D - SITE PLAN

SCALE:1 : 250

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SHEET: 19

SCALE: As indicated @B1

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DEVELOPMENT 4 PLAN

SCALE:1 : 250

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SHEET: 20

SCALE: 1 : 250 @B1

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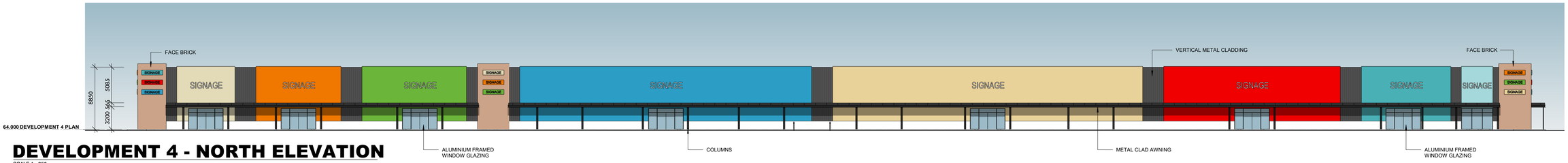
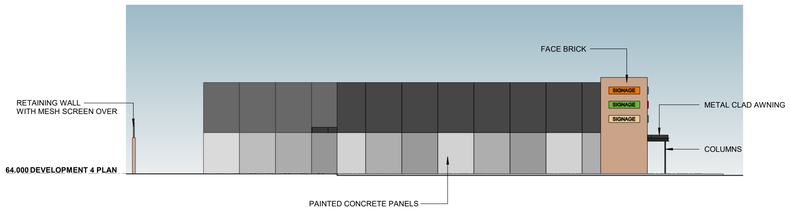


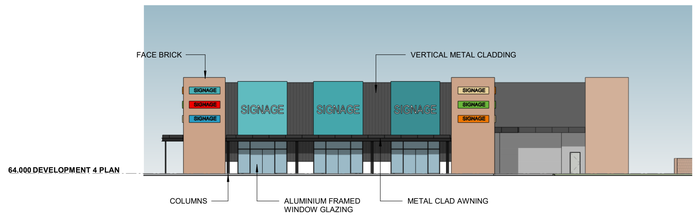
DEVELOPMENT 4 - NORTH ELEVATION

SCALE:1 : 250



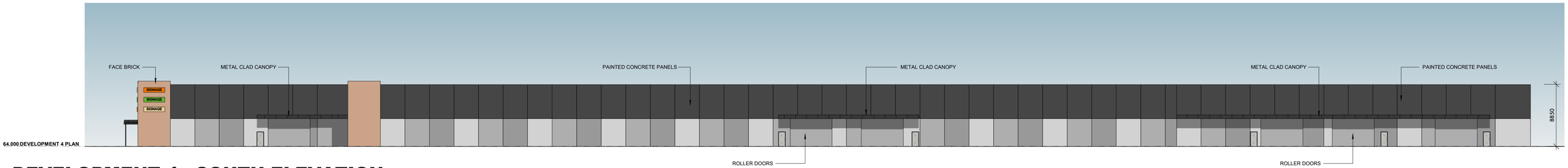
DEVELOPMENT 4 - EAST ELEVATION

SCALE:1 : 250



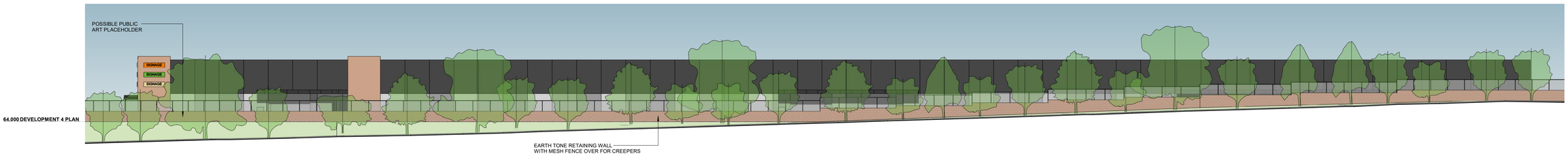
DEVELOPMENT 4 - WEST ELEVATION

SCALE:1 : 250



DEVELOPMENT 4 - SOUTH ELEVATION

SCALE:1 : 250



SOUTH ELEVATION - WILARING STREET

SCALE:1 : 250

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SHEET: 21

SCALE: 1 : 250 @B1

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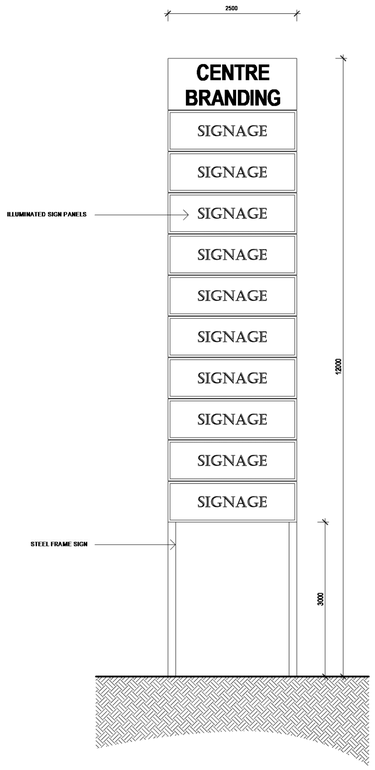
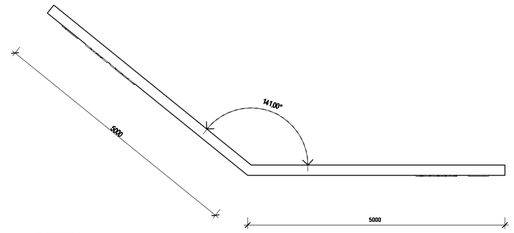
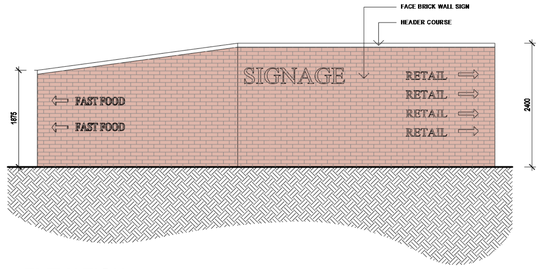
SIGNAGE LOCATION PLAN
SCALE: 1 : 500



PYLON SIGNS
SCALE: 1 : 50



PLAN



ELEVATION

ENTRY SIGN - PLAN & ELEVATION
SCALE: 1 : 50

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SHEET: 22
SCALE: As indicated @B1

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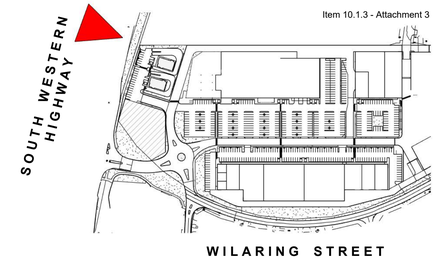

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SHEET: 23

SCALE: 1 : 3000 @B1

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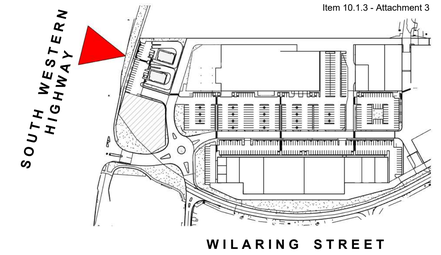

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DATE: FEB 2024
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SHEET: 24
SCALE: 1 : 3000 @B1

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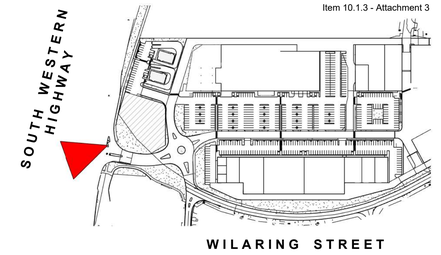

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SHEET: 25
SCALE: 1 : 3000 @B1

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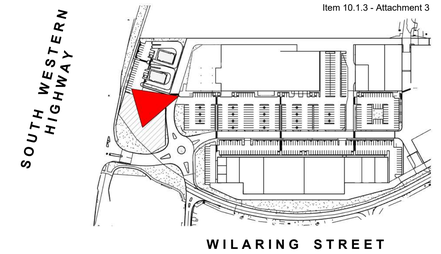

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SHEET: 26

SCALE: 1 : 3000 @B1

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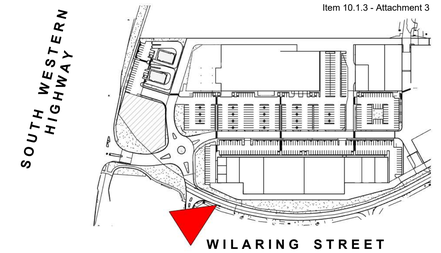

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SHEET: 27

SCALE: 1 : 3000 @B1

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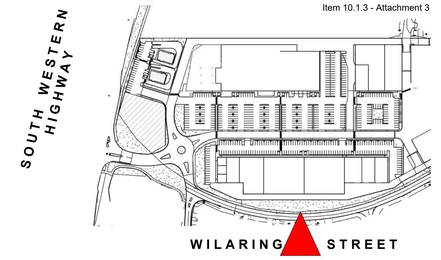

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BYFORD COMMERCIAL

LOCATION : SOUTH WESTERN HIGHWAY

FOR : ACCORD

Member Australian Institute of Architects

DATE: FEB 2024

REVISION: SK001

SHEET: 28

SCALE: 1 : 3000 @B1

PROJECT NUMBER

24-9318

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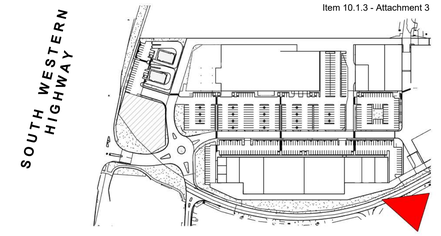

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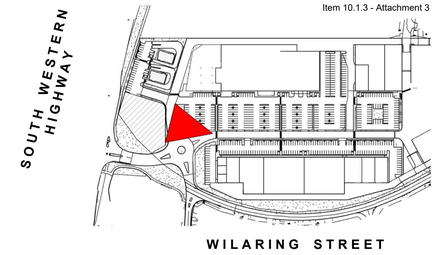

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ATTACHMENT 2
STORMWATER TECHNICAL NOTE

Porter Consulting Engineers
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SECONDARY TECHNICAL NOTE

Project:	Lot 806 South Western Highway, Byford	**Date Issued:**	25 March 2024
Subject:	Stormwater Discharge to Main Roads Network	**Job Number:**	21-11-154
Engineer:	Shane Highman	**Revision:**	A

This Secondary Technical Note summarises the various discussions regarding DA conditions 1C and 1L and provides guidance on the resolution of the ultimate condition.

1.0 Condition History

The Porter Consulting Engineers Stormwater Management Plan (R59.22 Rev C) was included in the DA submission. JDAP approval included two stormwater conditions (1C and 1L). Advice from Main Roads confirmed stormwater discharge into their South Western Highway reserve was not permitted.

A mediation meeting was held on the 12th of February 2024 and a Technical Note was provided by Porter Consulting Engineers (R14C.24) as presented in Attachment 1. Subsequent advice was received from Main Roads on the 19th of March 2024, this is presented in Attachment 2.

A secondary mediation meeting was held on the 25th of March. The outcomes of this meeting included:

1. Porter Consulting Engineers provide a Secondary Technical Note as an initial response to the 19 March comments and
2. A general agreement to consolidate conditions 1C and 1L into one.

2.0 Main Roads 19 March Comments

The comments received from Main Roads on the 19th of March are presented in Attachment 2 and are copied below. The dot points have been numbered for referencing purposes.

1. *The developer is allowed to discharge into MRWA drainage network if the soil within the proposed development will be of a clay and/or silt nature. Provided that the developer has designed their detention system to retain at least 1% Annual Exceedance Probability (AEP) on site.*
2. *The land is currently undeveloped natural site and the developer needs to maintain predevelopment flow rates up to 1% AEP.*
3. *Galt Geotechnical Report needs to be provided to support the statements regarding poor soil permeability.*
4. *A gross pollutant trap or filtration system is required before discharge into the MRWA drainage network.*
5. *Additional information below to be provided for further review.*
    a. *To verify the modelling, fully detailed Drains results needs to be included as an appendix for MRWA review. The Technical Note only provides snippets of the modelling and key information, making it difficult to review.*
    b. *The developer should advise in the report which hydrological model/s been adopted, including inputs, to confirm appropriateness for the catchment. Eg. Time Area Method, Initial Loss / Continuing Loss (IL/CL) etc.*
    c. *For all modelling, a wide-ranging ensemble of storm durations should be analysed. For confidence, from 5 mins to several hours. The report needs to demonstrate that's been undertaken. The critical storm duration could differ considerably from pre to post development, due to the significant change in hardstand area, and the need for stormwater detention. From the Technical Note additional clarification is required as to the basis on which the storm durations have been selected.*

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3.0 Initial Response to 19 March Comments

Point 1 confirms discharge is permitted into the South Western Highway reserve if the site comprises of clay and or silt. Presented in Attachment 3 is the Galt Geotechnical Investigation for this site. The following comments are noted.

A. Section 7.2 of this report (Site Conditions – Subsurface Conditions) confirms clayey gravel, gravel and gravelly sandy clay was found at depths to 5m across the site. These have medium to high plastic fines as typically expected for a clayey site.
B. Section 8.1.1 (Geotechnical Assessment – Stormwater Disposal) confirms the hydraulic conductivity of the soils is very low and recommend the site is modelled as impermeable in the stormwater design and management.

Based on this, it has been assumed Main Roads will permit stormwater to be discharged into their South Western Highway network.

Point 1 also confirms the detention system is to be sized about the 1%AEP. This is confirmed.

Point 2 notes predevelopment flows need to be maintained up to the 1% AEP. The final stormwater solution will be resolved at detailed design stage however it is confirmed post development flows will not exceed the 1%AEP pre development flows. Discharge direct into the South Western Highway network will be further restricted to ensure this infrastructure's capacity is not exceeded.

Point 3 requires the sharing of the Galt Geotechnical Report. This is presented in Attachment 3.

Point 4 references the design requiring water quality improvement mechanisms prior to discharge into Main Roads network. The intent is for the development to include water quality improvement mechanisms however the specifics will be resolved at detailed design stage.

Point 5a requires the Main Roads review of the DRAINS analysis as referenced in the Porter Consulting Engineers Technical Note (Attachment 1). Due to time constraints, this review will be completed as part of the detailed design approval process.

Point 5b references technical aspects of the DRAINS analysis. This will be summarised and data presented for review as part of the detailed design approval process.

Point 5C references the modelling of various DRAINS design events. This will be summarised and data presented for review as part of the detailed design approval process.

4.0 Detailed Design Stage

As part of the detailed design approval documentation, Porter Consulting Engineers will be providing an amended Stormwater Management Plan. This will address various aspects including:

1. Define the site and its geotechnical conditions
2. Describe the development and summarise design considerations
3. Define the governing stormwater design requirements. Reference to the DA Stormwater Management Plan and two Technical Notes will be made.
4. Summarise the proposed drainage infrastructure and its compliance with the design requirements.
5. Provide supporting drainage calculations, modelling and design plans.
6. Provide advice on maintenance requirements to ensure correct operation.

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5.0 Consolidated DA Condition

It is recommended the two DA conditions (1C and 1L) are consolidated into a single standard condition. The various discussions and technical notes have provided clear guidance on the design requirements and these will be followed as part of the detailed design process.

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Attachment 1 – Technical Note (R14C.24)

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TECHNICAL NOTE

Project:	Lot 806 South Western Highway, Byford	**Date Issued:**	26 Feb 2024
Subject:	Stormwater Discharge to Main Roads Network	**Job Number:**	21-11-154
Engineer:	Shane Highman	**Revision:**	C

A meeting was held with Main Roads on the 12th of February 2024. The purpose of the meeting was to resolve the specifics of the relevant DA conditions for the above site. The purpose of this technical note is to provide a project background, outline the stormwater design criteria and provide confirmation of the flow that our site can discharge direct into the Main Roads existing network.

1.0 Development History

Over the years, Lot 806 South Western Highway (the site) has had various planning approvals. As per the normal planning process, these approvals were supported by various documents. The most recent approval included an endorsed Local Water Management Strategy (LWMS), this speaks about maintaining predevelopment flows and providing on site detention to manage the critical design event. The endorsed outcomes of the LWMS reflect a standard approach to the development of a clay site (inability to lose water via infiltration), namely including a mixture of detention and flow off site.

A Stormwater Management Plan (SMP) was presented as part of the DA for the Bulky Goods approval. As the sites conditions have not changed, the SMP follows the same strategy as the LWMS, on site detention with flow off site. The only difference being the SMP significantly reduces the post development flows which results in more on site detention. The net result of the SMP is the post development flows being approximately one eighth of the existing pre-development flows.

2.0 Stormwater Management Plan

A SMP was presented as part of the DA application. This is tabled in Attachment 1 however in summary, the overall strategy for the site is:

1. Collect runoff from the buildings via down pipe connections
2. Collect runoff from the paved area via standard road inlet pits
3. Convey runoff to a series of detention tanks across the site
4. Provide flow restrictors on the outlet of each of the detention tank such that the combined outlet flow aligns with value noted in the SMP

As per the normal development process, this SMP will be refined during detailed design stage and approvals obtained as part of the building permit. This will capture the detail of each sub-subcatchment and wrap up the overall strategy to confirm compliance with the endorsed DA.

The SMP as presented in Attachment 1 has not been updated to reflect the outcomes of this Technical Note as the SMP will be refined as part of the detailed design process.

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3.0 Site Background

The site naturally falls from the east down to the west. In its current predevelopment conditions, runoff from the site flows into the South Western Highway road reserve. Based on the lay of the land, it is estimated that the sites predevelopment flows are in the order of 413 l/s for the 10% AEP storm.

This runoff is collected via an existing open drain and headwall in the eastern verge and conveyed under the highway via a below ground pipe network.

It is understood this part of South Western Highway has experienced flooding. The drainage strategy for this site is to provide more on site detention and further restrict flows to mitigate the risk of flooding on the Highway.

4.0 South Western Highway Infrastructure

Figure 1 below is an extract of the feature survey completed by MNG dated May 2022. Pipes A and B convey flow under the Highway. The upstream end of Pipe A collects water from the eastern verge and the downstream end of Pipe B discharges the water into the western verge and away from this area.

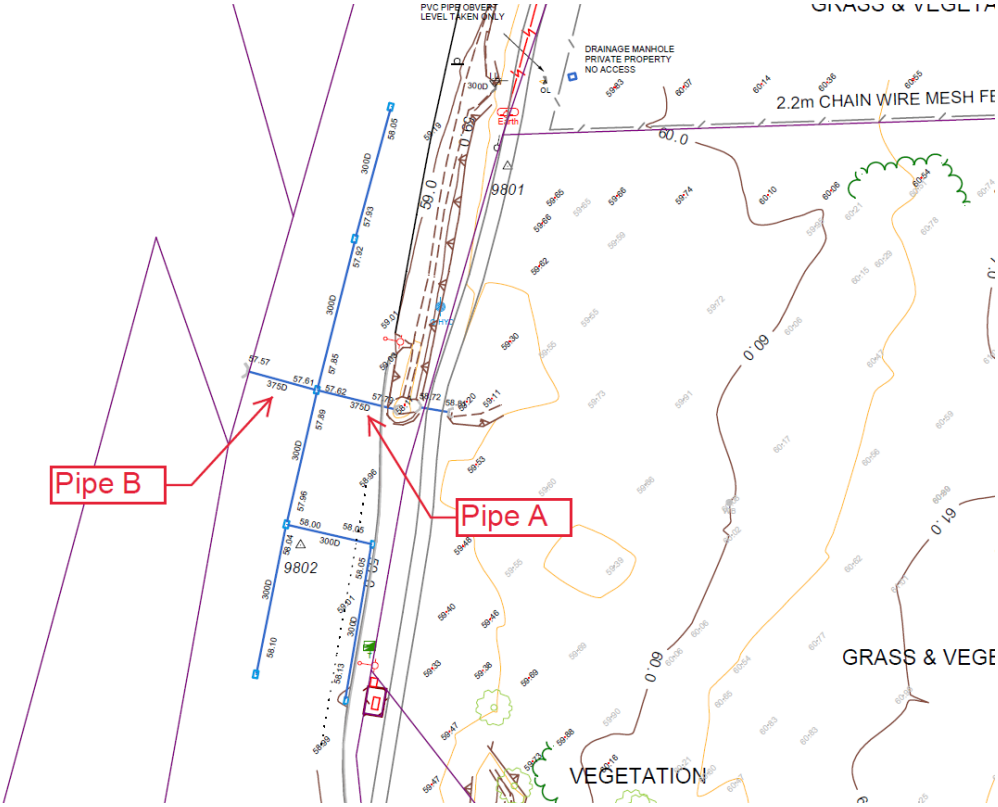

Figure 1 – Feature Survey

5.0 South Western Highway Catchment

The above pipe network has a direct catchment as shown below in Figure 2. Parts of this catchment flow into the side entry pits (shown in red) and parts flow into the eastern verge (shown in blue).

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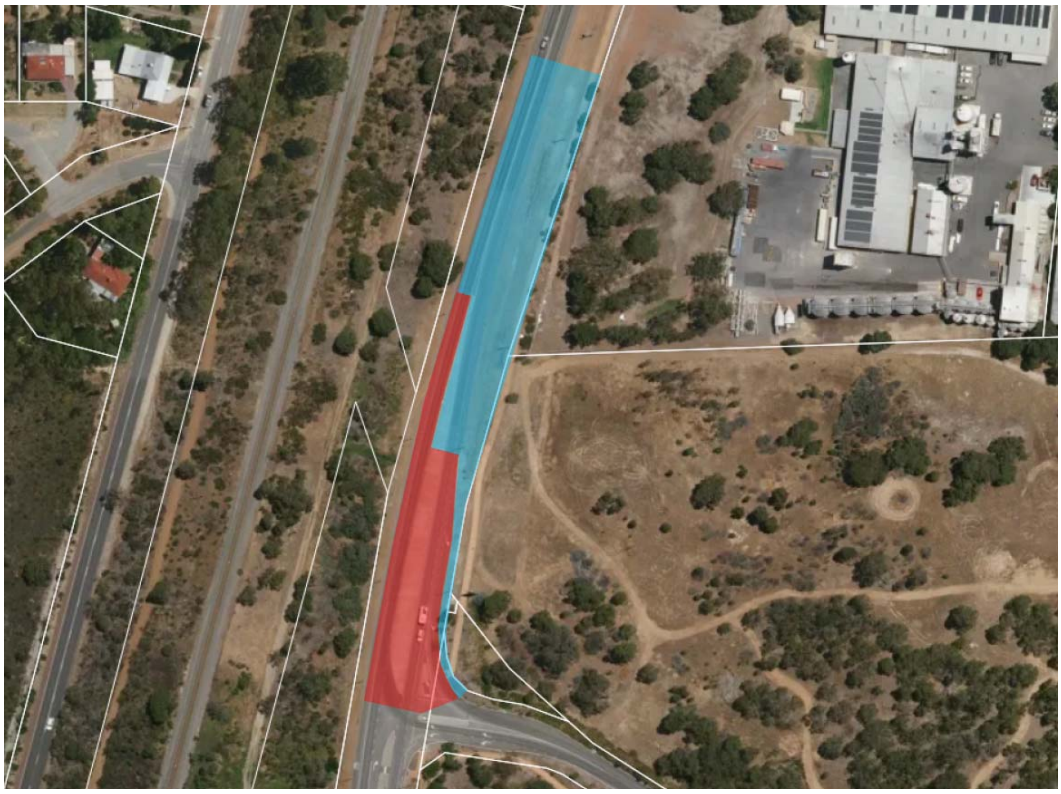

Figure 2 – Drainage Catchment

The total catchment = 8,150m^2 with the red portion being 3,650m^2 and the blue being 4,500m^2.

6.0 Existing Pipe Analysis

The feature survey provided all details of the South Western Highway pipe network including diameters, lengths, inverts and ground and lid levels. This data was compiled and using the catchment areas above, the network was modelled in DRAINS 2023.

As part of the modelling, the following criteria were used:

- 1% AEP, 6 minute storm event
- Runoff co-efficients of 0.95 for the paved area and 0.8 for the verge
- 20% blocked
- Minimum 150mm freeboard to pavement levels.

Figure 3 below shows the output from the DRAINS 2023 analysis.

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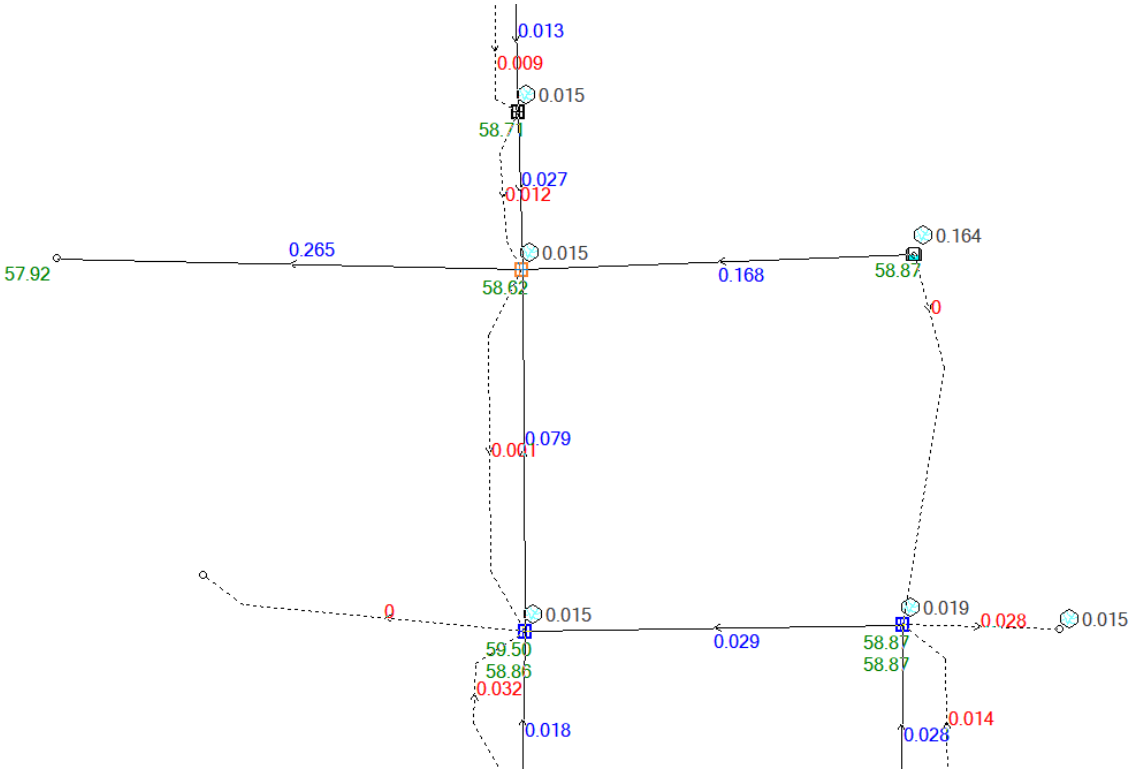

Figure 3 – DRAINS 2023 Analysis Output – 1% AEP 6 Minutes

Based on the DRAINS 2023 analysis, Pipe A has a capacity of 168 l/s and Pipe B has a capacity of 265l/s. The HGL at the upstream end of Pipe A is 58.87m, this gives a 160mm freeboard to the road pavement level.

The maximum capacity of piped network under the highway is 168 l/s.

7.0 Existing Pipe Spare Capacity

Figure 4 below shows the DRAINS 2023 analysis for the 1% AEP 30 minute event.

The 30 minute event was selected as the critical duration storm for our site will be somewhere between 30 minutes and 60 minutes. The shorter duration was selected as this has a higher intensity.

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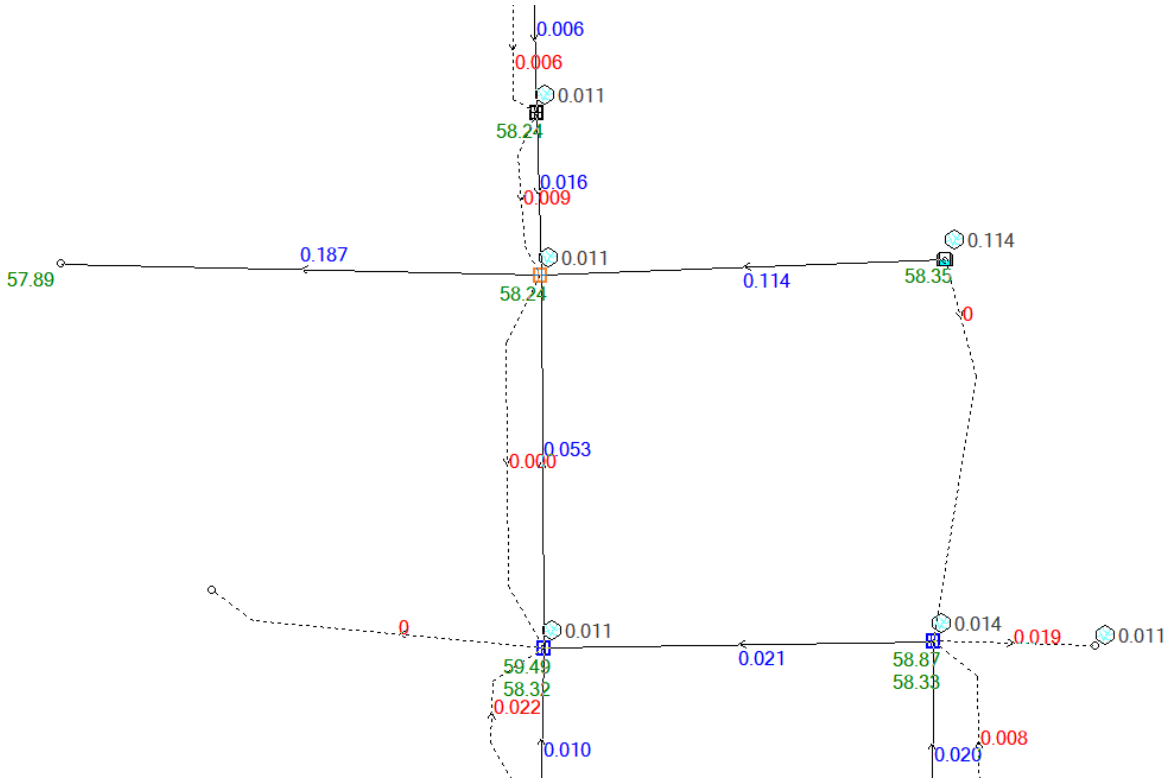

Figure 4 – DRAINS 2023 Analysis Output – 1% AEP 30 Minutes

Pipe A conveys 114 l/s with a HGL of 58.35m (680mm freeboard to the road level).

Based on the analysis, Pipe A can convey up to 168 l/s (Figure 3). During the critical duration storm, Pipe A has a spare capacity of 54 l/s (168-114).

Checking Pipe B for the 30 minute event, it conveys 187 l/s. Adding in 54 l/s gives a flow of 241 l/s. From Figure 3, this can convey 265 l/s.

Based on the analysis, the existing Highway drainage network has a 54 l/s spare capacity.

8.0 Flow from the Site Direct into the Highway Verge

The site currently discharges flow in its predevelopment form (circa 413 l/s) into the South Western Highway verge.

Based on the analysis, the site can discharge 54 l/s into the South Western Highway network without compromising on its capacity.

9.0 On Lot Detention

At the request of Main Roads, on site detention will be designed about the 1% AEP storm as well as being compliant with the Shire of Serpentine Jarrahdale's design requirements. The form of the on site detention (location, configuration and types) will be resolved at detailed design stage and account for the 54 l/s discharge direct into the South Western Highway drainage network.

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10.0 Works in the Highway Verge

The existing South Western Highway footpath has been illegally constructed within the site. This needs to be shifted, at the developers expense, into the South Western Highway verge to enable construction to commence on site.

This relocated path will clash with the existing open drain and headwall within the eastern verge. To enable the path construction, a chamber needs to be fitted at the upstream end of Pipe A and a new pipe run north within the verge such that a new headwall can be placed to align with the ultimate verge levels and profile.

A drainage lot connection pit will be established within the site (along the Highway frontage) and this will connect via below ground pipework into the above chamber. Flow into this chamber will be restricted to 54 l/s.

Attachment 1 – Stormwater Management Plan

LOT 806 SOUTH WESTERN HIGHWAY, BYFORD STORMWATER MANAGEMENT PLAN

PREPARED FOR ACCORD PROPERTY PTY LTD

Porter
Consulting Engineers

REPORT PREPARED FOR

ACCORD PROPERTY

Prepared by	**Porter Consulting Engineers**
Postal address	PO Box 1036 Canning Bridge WA 6153
Phone	(08) 9315 9955
Email	office@portereng.com.au

Date	12 September 2022
Our reference	R059.22
Job Number	21-11-154
Checked	SCH

HISTORY AND STATUS OF THE DOCUMENT

Revision	Date issued	Author	Issued to	Revision type
Rev A	6-9-22	Shane Highman	Planning Solutions	Initial Review
Rev B	7-9-22	Shane Highman	Project Team	Review
Rev C	12-9-22	Shane Highman	Project Team	DA Submission

CONTENTS

1.0 INTRODUCTION

Porter Consulting Engineers has been engaged to prepare a stormwater management plan for the proposed commercial development on Lot 806 South Western Highway in Byford.

The site is located within the Shire of Serpentine-Jarrahdale and is about 1km south of the existing Byford retail and commercial zone. The site is located north of Wilaring Street, has frontage to South Western Highway and rear access off Dougall Street. The sites' location is shown in **Figure 1** below.

Figure 1 – Lot 806 South Western Highway, Byford (bound in red)

2.0 DEVELOPMENT LAYOUT

The development layout is presented in **Appendix A**. The development includes various large format retail and bulky goods stores, fast food restaurants, circulating traffic lanes, parking areas and landscaping.

The existing Wilaring Street is being realigned to direct traffic into this commercial precinct at the request of the Shire of Serpentine Jarrahdale. The realignment includes the construction of a new roundabout and then connecting back onto Diamantina Boulevard and Wilaring Street. This new entry and realignment works will be formalised in road reserve.

3.0 THE EXISTING SITE

The site is approximately 8.2ha in size. A feature survey of the site is presented in **Appendix B**. The site is relatively slender and falls consistently from the east (RL72m) down to the west (RL59m). The land continues to fall as you progress west across the Highway and onwards. **Figure 2** shows the site with the existing ground contours, fall arrows are shown in red.

Figure 2 – Lay of the Land

The geotechnical site investigation[1] found deep clayey soil profiles throughout the site with a very low infiltration rate. On site disposal of stormwater is not appropriate.

Groundwater was not encountered during the geotechnical investigation. Based on a previous geotechnical investigation, it is expected groundwater will be deep and well below any earthworks. Perched groundwater is expected during the winter months due to the shallow clay soil. Shallow subsoil management is required.

South Western Highway has an informal road side drain that collects road runoff as well as stormwater from the land to the east, including this site. There is an existing pipe under South Western Highway that conveys the stormwater away to the receiving infrastructure.

There is an existing footpath parallel to South Western Highway, this is located within the site and will be relocated back into the road reserve as part of the development works.

[1] Galt Geotechnical Investigation, J2201016 001 Rev 0, *March 2022*

4.0 EXISTING SOUTH WESTERN HIGHWAY

South Western Highway is a Main Roads controlled road. The majority of the Highway has a sealed pavement with shoulders leading to an open style drainage system. The intersections are sealed, kerbed and include a "pit and pipe" drainage system. **Figure 3** shows the existing South Western Highway.

Figure 3 – South Western Highway

The section of highway adjacent to the site is split in separate drainage catchments. The exact extent of these will be resolved at detailed design stage however **Figure 4** shows the approximate catchments based on a visual inspection and pipes based on survey information.

Figure 4 – Drainage Catchments

The blue catchment is adjacent to the site. Runoff from the blue catchment is conveyed under the highway via the green east-west pipe. Runoff from the site and other land parcels upstream of this blue catchment also flows through this east-west pipe.

Once on the western side of the Highway, the stormwater flows south parallel to the rail (green arrows), under the rail line via a large culvert and then west and away.

5.0 EARTHWORKS

Due to the lay of the land and configuration of the development, cutting, filling and retaining is required. Concept building and road levels are documented on the development layout as presented in **Appendix A**.

Galts geotechnical report provides guidance regarding shaping of the earthworks and other design considerations. The geotechnical report also provides guidance to the contractor regarding works methodology. The outcomes of the geotechnical report will feed into the design, timing and construction of the development.

6.0 STORMWATER STRATEGY

The ground conditions do not permit onsite soakage therefore the development will use the existing culvert outlet under South Western Highway.

The development has a considerable pavement and building catchment which will generate larger post development stormwater flows. As typically expected with these types of developments, the maximum off site flow will be capped to the existing predevelopment rate. Reducing the intensity of post development flows will be achieved via large buffer tanks and low flow restrictors.

The road realignment works will be contained within road reserve and as such, this portion of the site will connect directly into the Shire's existing street drainage system.

7.0 PROPOSED STORMWATER SYSTEM

As typical with any built form development, this project will include down pipe connections that will join into the carpark drainage network. This carpark network will drain into the buffer tanks. The tanks will have a low flow outlet that will ultimately discharge into the existing piped culvert under South Western Highway.

Due to the need to shift the Shire's footpath back into the South Western Highway road reserve, it is expected minor reshaping within the Highway verge will be required along with additional drainage pipes. The sites drainage connection into the existing pipe will be incorporated into these verge works.

As noted previously, subsoil drainage will be required along the perimeter of the site and potentially internally to managed the perched ground water. The specifics of this will be resolved at detailed design stage and will be based on the recommendations in Galts geotechnical investigation.

Stormwater collected from the realigned entry will be connected directly into the Shire's street drainage network. This additional area is insignificant and will not impact on the operation of this infrastructure.

The above is summarized and presented in the Stormwater Management Plan (**Appendix C**).

8.0 STORMWATER CALCULATIONS

The sites runoff will flow out and away via the green east-west pipe in the blue catchment as illustrated in **Figure 4**. The capacity of this green pipe is approximately 120 l/s. The blue catchment is in the order of 6,000m^2 and will generate approximately 60 l/s for the 30 minute 10% AEP event.

The developed site will be commercial in nature and as such, commercial design standards are applicable. The predevelopment flows from the site for the 60 minute 10% AEP event are in the order of 413 l/s (c=0.6, i=30mm/hr). Limiting the sites outflow to align with the remaining 60 l/s in the green pipe will significantly lessen the sites existing impact on the receiving infrastructure.

The buffer tanks will need to be sized and outflow control devices designed to limit post development flow to 60 l/s. This lower flow will result in additional on site detention.

Due the lay of the land, length of the site and staged release of the development, it is expected the site will be split into several drainage zones. Each zone will have its own stormwater system, buffer tank, low flow outlet. Notional drainage zones have been shown in **Attachment 3**. The low flow outlet will connect into a central drainage pipe that will join onto the South Western Highway pipe.

The Stormwater drainage calculations are tabled on the Stormwater Management Plan with the key items summarised below.

- Catchment Area = 8.03ha
- Detention Volume = 1,530m^3
- Equivalent Rainfall Depth = 19mm
- Post Development Outflow = 60 l/s

9.0 STORMWATER TREATMENT

Where possible, water sensitive urban design principles will be adopted however it is expected this will be minimal due to the type of development and site conditions.

Due to the buffer tank requirements, it is expected physical structures will be constructed to manage gross pollutants. These structures include progressive silt traps, baffles and potentially GPT's subject to the proposed maintenance regime.

Additional stormwater treatment operations may be required pending the tenancy of the various buildings across the site. The specifics of this will be resolved at building license stage.

10.0 CONCLUSION

The sites drainage arrangements will be designed to comply with commercial development requirements and based on the sites constraints. On site drainage facilities will be provided with an oversized detention system to limit post development flows. The post development flows align with the capacity of the existing pipe under South Western Highway.

A subsoil drainage network will be provided to manage the perched ground water from winter rains.

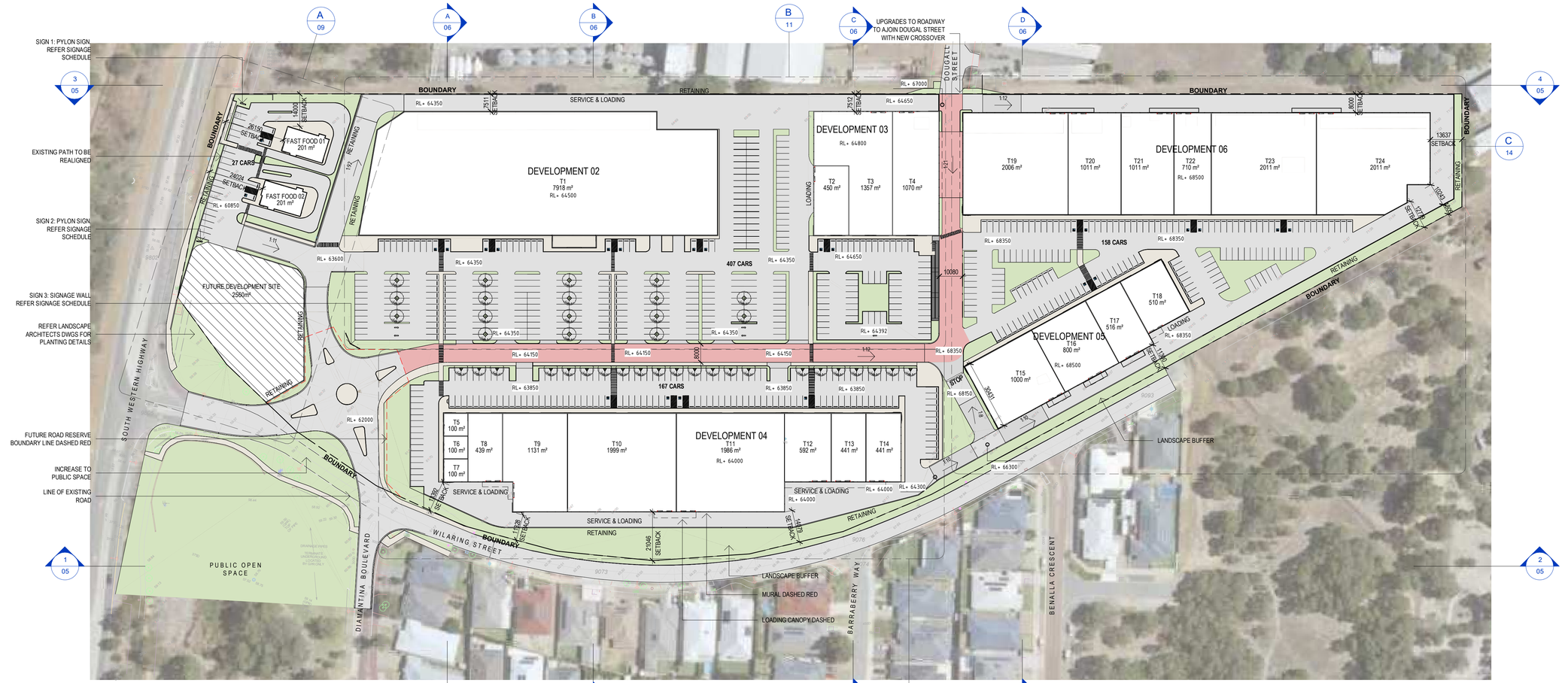
The realigned Wilaring Street entrance will be formalised into road reserve with its street drainage connected directly into the Shire's existing infrastructure.

APPENDIX A - Development Layout

DA ISSUE

ISSUED FOR DEVELOPMENT APPROVAL

Rev.	Amendment	Date
A	PRELIMINARY	03.08.22
B	DA REVIEW	10.08.22
C	DA REVIEW	24.08.22
D	DA ISSUE	31.08.22



SITE & ZONING PLAN

1 : 1000

AREA SCHEDULE (GLA)	
NAME	AREA
1. FAST FOOD 1	213 m²
2. FAST FOOD 2	214 m²
FUTURE DEVELOPMENT 2	8035 m²
FUTURE DEVELOPMENT 3	2948 m²
FUTURE DEVELOPMENT 4	7489 m²
FUTURE DEVELOPMENT 5	2871 m²
FUTURE DEVELOPMENT 6	8883 m²
	30652 m²

TENANCY AREA SCHEDULE (NLA)	
NAME	AREA
FUTURE DEVELOPMENT 1 - FAST FOOD	
FAST FOOD 01	201 m²
FAST FOOD 02	201 m²
	402 m²
FUTURE DEVELOPMENT 2 - BULKY GOODS	
T1	7918 m²
	7918 m²
FUTURE DEVELOPMENT 3 - BULKY GOODS	
T2	450 m²
T3	1357 m²
T4	1070 m²
	2877 m²

TENANCY AREA SCHEDULE (NLA)	
NAME	AREA
FUTURE DEVELOPMENT 4 - BULKY GOODS	
T5	100 m²
T6	100 m²
T7	100 m²
T8	439 m²
T9	1131 m²
T10	1999 m²
T11	1986 m²
T12	592 m²
T13	441 m²
T14	441 m²
	7329 m²

TENANCY AREA SCHEDULE (NLA)	
NAME	AREA
FUTURE DEVELOPMENT 5 - BULKY GOODS	
T15	1000 m²
T16	800 m²
T17	516 m²
T18	510 m²
	2826 m²
FUTURE DEVELOPMENT 6 - BULKY GOODS	
T19	2006 m²
T20	1011 m²
T21	1011 m²
T22	710 m²
T23	2011 m²
T24	2011 m²
	8760 m²
GRAND TOTAL	30114 m²

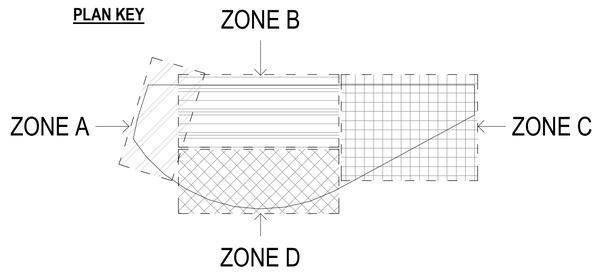
PARKING SCHEDULE

ZONE A	27
ZONE B	407
ZONE C	158
ZONE D	167
TOTAL	**759**

SITE SUMMARY

EXISTING SITE AREA (INCL. DEVELOPMENT SITE)	82517m²
WILARING ROAD RESERVE AREA	2248m²
FUTURE SITE AREA (INCL. DEVELOPMENT SITE)	80182m²
LANDSCAPE AREA - SUBJECT SITE (EXCL. DEVELOPMENT SITE)	7360m²
LANDSCAPE AREA - WILARING STREET UPGRADES	350m²
OVERALL LANDSCAPE AREA	**7710m² (9.6%)**
NEW PUBLIC OPEN SPACE LANDSCAPING	353m²

PLAN KEY



BROWN FALCONER
9/300 Rokeby Road, Subiaco, Western Australia 6004
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ACCORD

ACCORD BYFORD

Ordinary Council Meeting - 17 June 2024

SITE & ZONING PLAN

Scale	As indicated		
Drawn	BFG	Checked	MJ
Date	31.08.22		
Job No.	2021034		
Dwg No.	**3424 04**	Rev:	**D** A1 SHEET

APPENDIX B - Feature Survey

SURVEY CONTROL

Point	Easting	Northing	Elevation
9072	67991.430	232598.952	60.645
9073	68086.770	232573.429	62.933
9074	68199.959	232580.460	66.582
9076	68197.922	232591.073	66.438
9092	68275.641	232631.234	
9093	68321.032	232657.663	69.319
9558	67987.908	232513.100	61.331
9805	67887.653	232635.783	59.150
9801	67921.735	232766.104	59.663
9802	67887.329	232703.220	59.404
9803	67866.025	232546.090	59.707
9804	68232.324	232841.758	66.101

This survey has been completed to CLASS 2/3 Accuracy
Hard Stand Areas are to Class 2 Accuracy
Horizontal Accuracy ± 20mm
Vertical Accuracy ± 20mm
Soft Areas are to Class 3 Accuracy
Horizontal Accuracy ± 30mm
Vertical Accuracy ± 50mm
This note is an integral part of this plan.

Existing boundaries have been extracted from Landgate's Spatial Cadastral Database, which is only a model of the cadastre. The depicted boundary locations are a graphical representation only and as they have not been re-established by survey. MNG does not guarantee the accuracy of boundaries shown hereon. Re-establishment of lot boundaries by a Licensed Surveyor is recommended for any works on or about a boundary.
This note is an integral part of this plan.

Surface features and levels have been surveyed to meet the requested scope of works accuracy. The surface may be contoured from a digital model generated by spot heights. For clarity on hard copy some level information is not shown, refer to 3D digital file. Above ground indicators (markers) of underground services are located where visible.
Third parties utilising this information should confirm the capture accuracies meet requirements prior to use.
This note is an integral part of this plan.

Rev.	Description	Drawn	Date	Checked
A	Initial Issue	TGM	27/05/2022	MAD

SCALE 1:1000 @ A1

0 10 20 30 40 50 100

ALL DISTANCES ARE IN METRES

For a true to scale reproduction of this plan, plot it to A1 with the Paging Scaling set to None.

The contents of this plan are current and correct as of the date stated within the revision panel. All consultants and persons wishing to utilise this data should satisfy themselves of this plans currency by contacting the McMullen Nolan Group.

Surveyor:- TGM/PK
Survey Date:- 26/05/2022
Precal/Cad:- SCDB

ISO 9001 - AS/NZS 4801 - ISO45001
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N

The boundaries shown on this plan were not re-established as part of this survey, therefore this plan does not guarantee their accuracy. Existing easements, encumbrance or interest are not depicted and a title search is recommended to obtain this information. Re-establishment of the cadastral boundaries is recommended for any proposed works on or near existing boundaries.

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LOT 806 SOUTH WESTERN HIGHWAY BYFORD
DETAIL AND DRAINAGE AS-CONSTRUCTED SURVEY

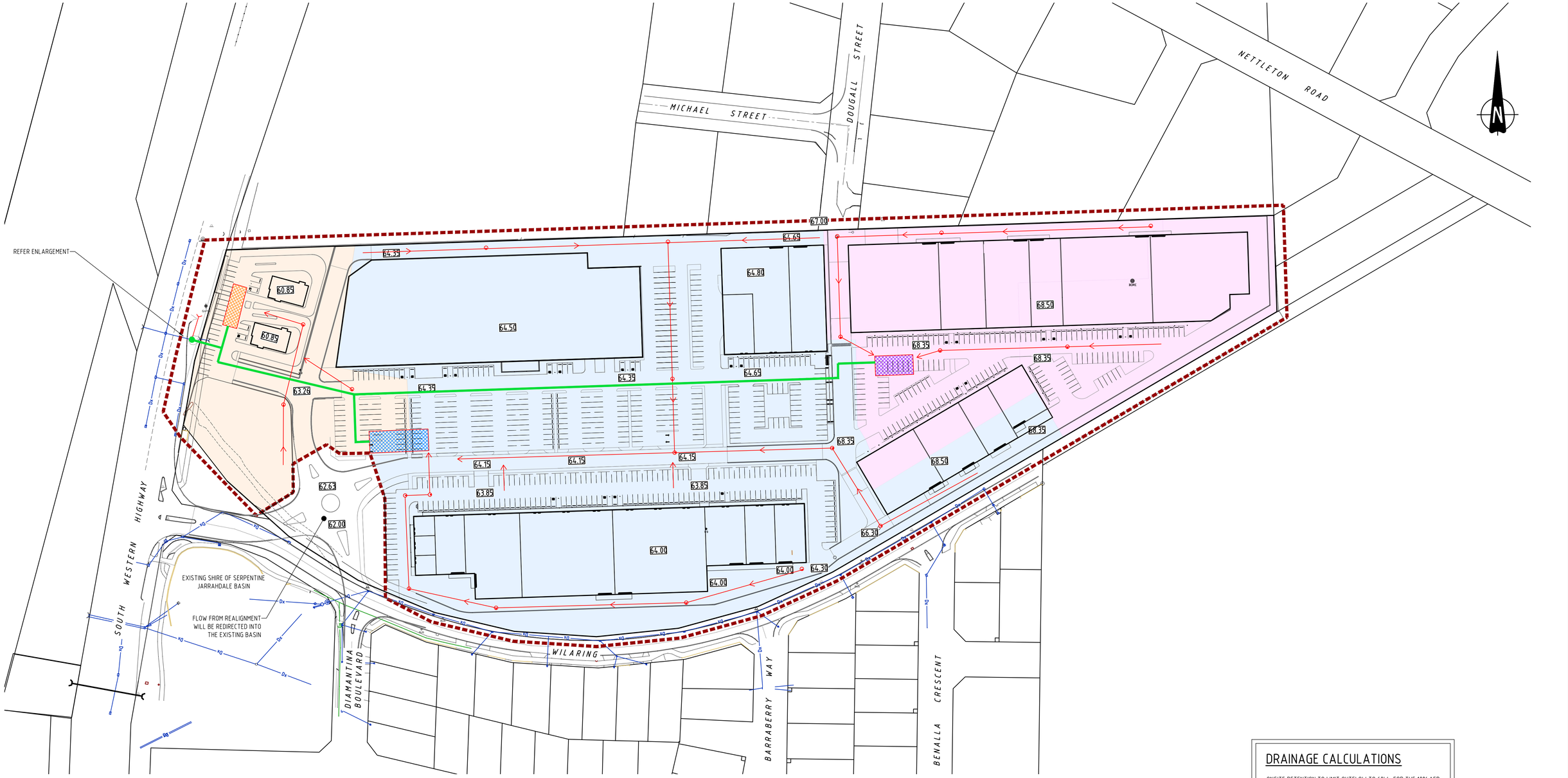
CLIENT:

PORTER CONSULTING ENGINEERS

Project Mngr.	MARK DOBSON	Datum	PCG94 / AHD

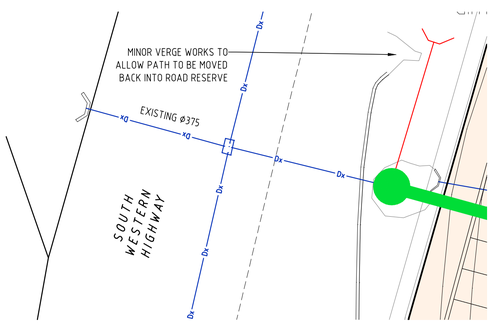
104950 - DE - 003 - A
Job Number | Type | Plan Number | Revision

APPENDIX C - Stormwater Management Plan



LEGEND

- NOTIONAL DRAINAGE PIT
- NOTIONAL DRAINAGE PIPE
- NOTIONAL DRAINAGE OUTFALL PIPE
- Dx — EXISTING DRAINAGE PIPE
- 62.00 — PROPOSED RL



ENLARGEMENT

SCALE 1:250

CATCHMENT	AREA (ha)	% OF SITE	POST DEVELOPMENT OUTFLOW	POST DEVELOPMENT STORAGE
1	2.16	27%	16 l/s	413m³
2	3.90	49%	30 l/s	750m³
3	1.97	24%	14 l/s	367m³
TOTAL	8.03	100%	60 l/s	1530m³

DRAINAGE CALCULATIONS

ONSITE RETENTION TO LIMIT OUTFLOW TO 60l/s FOR THE 10% AEP
CHECK ON EQUIVALENT STORAGE DEPTH ACROSS THE SITE

DESIGN SUMMARY

AEP	10%	
DESIGN STORM DURATION	30	MINUTES
RAINFALL INTENSITY	46.9	mm/hr
AREA	8.03	ha
COEFFICIENT	0.95	
INFILTRATION RATE	0	m/ DAY

STORAGE

DESIGN FLOW	910	l/s
OUTFLOW	60	l/s
DETENTION FLOW	850	l/s
DURATION	30	MINUTES
DETENTION VOLUME	1530	m³
SITE AREA	8.03	ha
DETENTION VOLUME	1530	m³
EQUIVALENT RAINFALL DEPTH	19	mm

NOTE:
SUBSOIL DRAINAGE NETWORK NOT SHOWN

DIAL BEFORE YOU DIG www.1100.com.au

Ordinary Council Meeting - 17 June 2024

1:1000 0 10 20 40 60
Half Size 1:2000 - SCALE (m)

PROJECT:
LOT 806 SOUTH WESTERN HIGHWAY BYFORD

No.	DATE	REVISION	BY
C	12-9-2022	MINOR CHANGES MADE	MEG
B	7-9-2022	SITE LAYOUT UPDATED	MEG
A	5-9-2022	ISSUED FOR APPROVAL	MEG

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TUSMO Pty Ltd ACN 070 097 148 as trustee for the Consulting Engineering Unit Trust trading as Porter Consulting Engineers ABN 78 636 396 385

ACCORD

DRAWING: **STORMWATER MANAGEMENT PLAN**

STATUS: **FOR APPROVAL**

SCALE	1:1000
DATE	SEPT 2022
DESIGN	SCH
DRAWN	MEG
CHECK	
DRAWING No.	21-11-154/810
REV No.	C
ORIGINAL DRAWING SIZE	A1
FILE NAME	S:\ACTIVE PROJECTS\21-11-154\ACAD\2111154-810.dwg
APP'D	

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Attachment 2 – Main Roads Comments – 19th of March 2024

ACCORD DR179/2023 | MAIN ROADS **DRAFT PRELIMINARY** COMMENTS, DATED 19 MARCH 2024

DRAINAGE / STORMWATER

- The developer is allowed to discharge into MRWA drainage network if the soil within the proposed development will be of a clay and/or silt nature. Provided that the developer has designed their detention system to retain at least 1% Annual Exceedance Probability (AEP) on site.
- The land is currently undeveloped natural site and the developer needs to maintain predevelopment flow rates up to 1% AEP.
- Galt Geotechnical Report needs to be provided to support the statements regarding poor soil permeability.
- A gross pollutant trap or filtration system is required before discharge into the MRWA drainage network.
- Additional information below to be provided for further review.
    - To verify the modelling, fully detailed Drains results needs to be included as an appendix for MRWA review. The Technical Note only provides snippets of the modelling and key information, making it difficult to review.
    - The developer should advise in the report which hydrological model/s been adopted, including inputs, to confirm appropriateness for the catchment. Eg. Time Area Method, Initial Loss / Continuing Loss (IL/CL) etc.
    - For all modelling, a wide-ranging ensemble of storm durations should be analysed. For confidence, from 5 mins to several hours. The report needs to demonstrate that's been undertaken. The critical storm duration could differ considerably from pre to post development, due to the significant change in hardstand area, and the need for stormwater detention. From the Technical Note additional clarification is required as to the basis on which the storm durations have been selected.

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Attachment 3 – Galt Geotechnical Investigation

Report on

GEOTECHNICAL STUDY
PROPOSED COMMERCIAL AND INDUSTRIAL DEVELOPMENT
LOT 806 SOUTH WESTERN HIGHWAY
BYFORD

Submitted to:
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OSBORNE PARK WA 6017
T: +61 (8) 6272-0200

J2201016 001 R Rev0

03 March 2022

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TABLES

TABLES (ATTACHED)

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1. INTRODUCTION

This report presents the outcomes of the geotechnical study conducted by Galt Geotechnics (Galt) for the proposed commercial and industrial development at Lot 806 South-western Highway in Byford ("the site"). The location of the site relative to the surrounding area is shown on Figure 1.

2. SITE DESCRIPTION AND PROPOSED DEVELOPMENT

The site is irregular in shape and covers a plan area of 8.25 hectares. About a third of the site is moderately to dense vegetated with trees while the balance of the site is relatively open with a network of unsealed tracks. Some open areas are present, particularly through the centre of the site.

During the fieldwork, a crane was operating on a mobile tower in a cleared area of the site near Douglas Street. Near this area, we noted some small stockpiles with vegetation and scattered household rubbish (e.g. metal scraps and damaged whitegoods).

The supplied survey plan indicates that site levels fall from about RL 72 m AHD to the east to about RL 59 m AHD in the west.

The supplied concept plan indicates the development will include:

- Various industrial type structures for bulky goods and self storage.
- A commercial precinct to the west including fast food restaurants and a service station.
- Light vehicle carparks and access roads through the centre of the site.

Due to the slope of the site, we understand that the site will require significant cut to the east (as deep as 3 m) and significant filling to the west (up to 3 m). Retaining walls up to 4 m in retained height will be required.

3. PREVIOUS GEOTECHNICAL STUDY

Brown Geotechnical (Brown) conducted a geotechnical investigation for the site in June 2012 (refer report referenced 12062 dated July 2012). We note that:

- Investigation included excavation of test pits with a 5 tonne mini-excavator at 15 locations (TH01 to TH15) to refusal at depths ranging from 0.5 m to 1.8 m.
- The subsurface profile was reported as clayey sand with medium to high plasticity fines over gravelly clayey sand. Refusal may have occurred on ferricrete.
- Groundwater seepage occurred in 3 of the 15 test pits at depths ranging from 0.8 m to 1.0 m.

Geotechnical data from this report has been considered in our assessment of the site.

4. OBJECTIVES

The objectives of the study were to:

- assess subsurface soil, rock and groundwater conditions across the site;
- assess the excavatability of the subsurface soils/rock, particularly in the areas of significant cut;
- assess the suitability of in-situ materials in cut areas for re-use as fill around the site (i.e. particularly for lot fill, retaining wall backfill and pavement subgrades);
- provide recommendations on suitable footing systems for the proposed development;
- provide allowable bearing pressures and settlement estimates for shallow foundations;
- provide a site classification(s) in accordance with AS 2870-2011 “Residential Slabs and Footings”;
- provide recommendations and geotechnical design parameters for earth retaining structures;
- assess the appropriate site subsoil class for the site in accordance with AS 1170.4-2007;
- recommend appropriate site preparation procedures including compaction criteria;
- provide drainage control stormwater disposal advice; and
- provide a subgrade California bearing ratio (CBR) value for pavement thickness design by others, including recommendations for subgrade improvement of reactive clayey soils.

5. FIELDWORK

The fieldwork was carried out on 7 and 8 February 2022 and comprised:

- A walkover and inspection of the site.
- Excavation of test pits at 22 locations (TP01 to TP24, excluding TP10, TP14 and TP25 which were omitted) to depths ranging from 2.5 m to 5.0 m.
- Dynamic cone penetrometer (DCP) tests adjacent to each test pit. Shallow refusal occurred in all tests within the top 0.3 m, excluding TP12 (at 0.55 m) and TP18 (at 0.9 m).
- Collection of representative samples for inspection and laboratory testing.

Note: Access to TP10, TP14 and TP25 was not possible due to a total fire ban.

General

The fieldwork was conducted in general accordance with AS1726 (2017) “Geotechnical Site Investigations”.

Test locations were selected and positioned by a geotechnical engineer from Galt. The engineer conducted the walkover survey, drilled the boreholes, logged the materials encountered in the boreholes, performed the field tests, collected the samples and re-instated the boreholes.

Photographs of the site taken during our investigation are presented in Appendix A.

Test Pits

Test pits were excavated using a 30 tonne Volvo EC300DL excavator equipped with a 0.73 m wide rock bucket supplied by Allwest Plant Hire and operated by ANH Contracting.

Test pit reports are presented in Appendix B, along with a list of notes and abbreviations and the method of soil description used in the reports.

6. LABORATORY TESTING

Laboratory testing was conducted by Western Geotechnical and Laboratory Services (WGLS) in their NATA accredited laboratory. The testing comprised determination of the following:

- particle size distribution on 8 samples;
- Atterberg limits and linear shrinkage on 8 samples;
- dry density-moisture content relationship using Modified compactive effort on 4 samples; and
- soaked California bearing ratio (CBR) on 4 samples.

The laboratory test results along with the test methods followed are presented in Appendix C and are summarised in Table 1.

Table 1: Summary of Laboratory Test Results

Test Name	Sample Depth (m)	Soil Class AS1726 (2017)	% Gravel	% Sand	% Fines	LL (%)	PI (%)	LS (%)	MMDD (t/m^3)	OMC (%)	CBR (%)	CBR Swell (%)
TP02	1.0 – 1.5	Clayey GRAVEL (GC)	69	17	14	50	25	8.0	1.89	15.5	20	0.5
TP03	0.6 – 1.6	GRAVEL (GP-GM)	66	28	6	17	4	1.5				
TP05	1.3 – 2.2	Clayey GRAVEL (GC)	47	24	29	59	33	11.0				
TP05	2.2 – 3.0	Clayey GRAVEL (GC)	55	21	24	54	32	10.0	1.89	15.0	3.5	1.0
TP11	0.1 – 0.6	Clayey SAND (SC)	19	64	17	40	22	8.0				
TP16	0.3 – 1.0	Gravelly Clayey SAND (SC)	38	46	16	35	16	7.0	2.03	12.0	25	0.0
TP16	1.0 – 1.9	Gravelly Sandy CLAY (CH)	31	34	35	56	32	10.0	1.80	17.5	9	0.5
TP17	0.9 – 1.5	GRAVEL (GP)	75	20	5	22	10	3.0				

LL – Liquid Limit **PI**: – Plasticity Index **LS** – Linear Shrinkage **NP** – non-plastic

MMDD – modified maximum dry density **NO –** Not obtainable **OMC –** optimum moisture content

CBR – California bearing ratio:

- 92% MMDD, 6.75 kg surcharge, 4 day soak (TP05 2.2-3.0 m & TP16 1.0-1.9 m)
- 95% MMDD, 6.75 kg surcharge, 4 day soak (TP02 & TP16 0.3 – 1.0 m)

7. SITE CONDITIONS

7.1 Geology

The Armadale sheet of the 1:50,000 scale Environmental Geology series map indicates that the area is underlain by *"GRAVELLY SANDY CLAY – variable, with lenses of silty and gravel, quartz sand, subangular with eolian rounded component; heavy minerals common; gravel rounded, of colluvial origin."*

The investigation found deep clayey soil profiles that are relatively consistent with the geological mapping.

7.2 Subsurface Conditions

The subsurface conditions vary in the upper profile, however are relatively consistent with depth. The typical soil profile can be summarised as follows:

- Clayey GRAVEL (GC)/GRAVEL (GP): fine to coarse grained, orange-brown, with medium to high plasticity fines, with fine to coarse grained sand, dry, possible fill in areas, extending from surface to depths ranging from 1.3 m to 2.8 m; overlying

- Clayey GRAVEL (GC)/Gravelly Sandy CLAY (CH): high plasticity, variably cemented fine to coarse gravel, grey mottled orange becoming grey mottled red, with fine to coarse grained sand, variably indurated at depth, moist, extending to the maximum investigated depth of 5.0 m.

Note: The near surface soils vary from a mixture of BOULDERS/GRAVEL, Clayey SAND, Sandy CLAY and possible FILL: GRAVEL. Refer to individual test reports in Appendix B for further information.

7.3 Groundwater

We do not have groundwater information for the site. However, from our experience in the area, shallow perched groundwater develops on the clayey soil strata during winter and following significant rain events.

Groundwater was not encountered in the test pits to the maximum investigated depth of 5.0 m.

We understand that seepage occurred in the granular soils in the upper profile of some of the test pits excavated during the Brown investigation in 2012 (depth of seepage not noted). Brown noted that the investigation was carried out after a week of heavy rainfall and that, given the low permeability of the in-situ clayey soils, it is likely that the groundwater encountered was stormwater runoff that infiltrated the upper gravels and perched on the clayey soils. We agree with this assessment.

8. GEOTECHNICAL ASSESSMENT

8.1 Suitability for Development and Construction Risks

We consider that the site is geotechnically capable of being suitably earthworked for the proposed commercial and industrial development.

We note the current bulk earthworks concepts involve:

- significant cut to fill (up to 4 m);
- significant re-use of in-situ soils as structural fill; and
- construction of high retaining walls.

Given that the site comprises high plasticity, expansive clayey soils, we note that there are significant risks associated with earthworking the site. These risks must be carefully considered in the earthworks design and during construction. These are discussed below.

Wet Weather Earthworking of Clayey Fill

Due to the low permeability of the clayey soils, stormwater runoff may pond on the surface or in excavations. This may cause difficulties during construction including:

- heaving and rutting of saturated clayey soils when trafficked; and
- softening of clayey soils when water is allowed to pond for significant periods of time.

One of the best measures for reducing this risk is to ensure earthworks are conducted during the summer months, although earthworks in summer may have issues with dust control.

Other mitigating measures that can be used are as follows:

- Limit exposure of the clayey subgrade during earthworks (i.e. perform earthworks in stages).
- Perform earthworks from high elevations to low elevations to ensure that storm-water runoff is not directed towards completed earthworks.
- Grade the foundation and each lift of fill to promote positive surface water run-off and limit ponding.
- If rainfall is expected, seal the surface of clayey subgrade and/or clayey stockpiles by rolling with a smooth drum roller.
- Trim any soft clayey material after rainfall events as required and dispose as unsuitable.
- Avoid trafficking of clayey surfaces while wet.
- Use tracked earthmoving plant on clayey subgrades instead of tyred plant wherever possible.
- Place suitable imported track material (e.g. crushed limestone, recycled roadbase, lateritic gravel etc.) for tyred plant.
- Construct working platforms (using track material as noted above) and possibly geogrid over soft zones.
- Use quicklime/hydrated lime to dry back clayey soils.
- Use a dedicated stabiliser for moisture conditioning and stabilisation works.

Moisture Conditioning and Compacting Clayey Fill

Clayey fill requires careful moisture conditioning as close to optimum moisture content (OMC) as possible to ensure adequate compaction and to reduce shrink-swell related movements. Due to the low permeability of the clayey materials, it is often necessary to moisture condition and cure clayey fill in stockpiles over a period of days to achieve a uniform moisture content in the fill.

Further to the above, over-compaction of clayey soils is also not desirable (> 95% MMDD) as it induces significant suction in the material and increases the risk of long term swell.

We recommend that moisture conditioning and compaction procedures are trialled and approved prior to use to address the risks noted above.

High Retaining Walls

It must be understood that high retaining walls (>2 m in retained height) are settlement sensitive and there are significant risks associated with unacceptable movements when founded on clayey soils. To reduce these risks, we require that:

- Bedding sand is not used below the retaining walls. Lean mix concrete must be used to reduce the risk of moisture ingress below the wall.
- Lean mix concrete must be used to backfill up to the underside of any drains installed behind the retaining walls. This is to prevent stormwater run-off collecting in the retaining wall backfill and saturating/softening the clayey soils.
- Retaining walls must be designed to accommodate differential shrink-swell movements equivalent of "Class M" (i.e. 40 mm).

Settlement of Thick Fill

We note that allowance will need to be made for the long-term settlement in thick fill areas under self weight. We recommend that additional allowance is made for settlements equivalent of the order of 0.5% of the thickness fill where structures are proposed.

8.2 Site Classification

We have assessed the site classification in accordance with AS2870 (2011) "Residential Slabs and Footings". We consider that a site classification of "Class M" applies to the site due to the thickness of high plasticity clayey soil within the design soil suction zone.

We consider that the site class can be improved to Class S where a minimum 0.6 m thickness of inert granular soil (in-situ and fill) is present above the clayey soils.

The site classification recommendations assume that the site preparation guidelines in Section 8.4 are followed.

We refer you to the CSIRO's pamphlet BTF18-2011: Foundation Maintenance and Footing Performance: A Homeowner's Guide. This provides practical advice to reduce the risk of future heave moments. A copy of this pamphlet is presented in Appendix D, CSIRO Pamphlet.

Note: Footing and slab details in AS 2870-2011 are for single or double storey residential structures or lightly loaded commercial structures supported on shallow footings with a maximum bearing pressure of 100 kPa. This must be taken into account by the structural designers.

8.3 Site Subsoil Class

We consider that a site subsoil class of "Ce" is appropriate for the site in accordance with AS1170.4 "Earthquake Design Actions in Australia".

8.4 Site Preparation

The following site preparation is required prior to construction of footings, slabs and pavements:

- Remove any stockpiles and any rubbish from the site where present.
- Remove topsoil and vegetation, including grubbing out of roots. The required depth of the strip varies across the site, however we expect on average a 0.15 m deep strip should be adequate. Holes formed by the removal of trees will require compaction of the base and reinstatement with engineered fill (excluding areas where bulk excavation extends below the base of the tree roots).
- Perform bulk excavation as required using safely battered slopes in accordance with Section 8.7. Where possible separate and stockpile better quality gravelly soil from the more clayey expansive soils (refer to Section 8.6)
- Scarify, moisture condition and compact the base of the excavation to a minimum depth of 0.3 m to achieve the minimum required density outlined in Section 8.5.
- Place and compact approved clayey fill as required in layers no greater than 0.2 m loose thickness.
- Shape the final surface of the clayey fill to drain. We recommend a minimum grade of 1%.
- Place and compact approved granular fill in layers no greater than 0.3 m loose thickness.
- Each fill layer must be placed and compacted to the minimum required density outlined in Section 8.5.
- Excavate to the underside of slabs and footings and compact the exposed bases to a minimum depth of 0.3 m to achieve the minimum required density outlined in 8.5.

Note: Proper selection and re-use of site derived gravelly and clayey materials during the earthworks as recommended above will require a high level of geotechnical support and testing during the earthworks.

8.5 Compaction

Imported granular fill and site derived granular fill (< 20% fines) must be moisture conditioned within 2% of optimum moisture content (OMC) and compacted to a minimum dry density ratio (DDR) of Modified Maximum Dry Density (MMDD) as determined in accordance with AS1289.5.2.1.

Compaction testing of site derived gravelly fill must be undertaken with a nuclear density gauge (NDG) in accordance with AS1289.5.8.1.

Where clean sand fill is used as imported sand fill (< 5% fines, < 15% gravel), a Perth sand penetrometer (PSP) may be used for compaction control. The following blow counts may be assumed to correlate to a DDR of 95% MMDD:

- 0 – 0.15 m: SET
- 0.15 – 0.45 m: 8 blows
- 0.45 – 0.75 m: 10 blows
- 0.75 – 1.05 m: 12 blows

Where the above blow counts cannot be achieved, a site-specific PSP correlation should be carried out to determine the PSP blow count correlating to a DDR of 95% MMDD.

Clayey soils (>20% fines) must be moisture conditioned within 2% of OMC and compacted to a DDR between 92% MMDD and 95% MMDD. Over compaction of clayey soils (above 95% MMDD) must be avoided as it can induce significant suction in the material and lead to greater long term swell.

Compaction testing of site derived clayey fill must be undertaken with a nuclear density gauge (NDG) in accordance with AS1289.5.8.1.

Over-excavation and replacement of loose/soft materials must be done where the minimum dry density ratio cannot be achieved.

Approved fill must be placed and compacted as follows:

- Clayey fill (clayey soils with fines content > 20%) must be placed and compacted in layers no greater than 0.2 m loose thickness.
- Granular fill (approved imported granular fill or site derived granular soils with fines content < 20%) must be placed and compacted in layers no greater than 0.3 m loose thickness.

Each layer must be compacted by suitable compaction equipment, and carefully controlled to ensure even compaction over the full area and depth of each layer.

Large compaction equipment (self-propelled vibrating rollers, etc.) must not be used within 2 m behind retaining walls. Hand compaction plant must be used in this instance.

Testing Frequency

After compaction, verify that the required level of compaction has been achieved by testing at the base of excavations and through the full depth of any fill to a minimum depth of 0.3 m. The frequency of testing should be as follows:

- on each lift of fill at a rate of 1 test per 500 m^3 of fill;
- at each spread footing location;
- at 5 m centres along gravity retaining wall footings and strip footings (where present); and
- at 10 m centres below on-ground slabs and pavements.

8.6 Approved Fill

Imported granular fill must comply with the material requirements as stated in AS 3798-2007, "Guidelines on Earthworks for Commercial and Residential Developments".

The in-situ clayey soils are considered suitable for re-use as General Fill. However, we note that clayey gravel and gravel with lower fines content will be easier to suitably moisture condition and compact than the high plasticity gravelly sandy clay at depth. Generally, the better quality granular material (< 20% fines) can be found in the upper profile, and we recommend these materials are separately stockpiled to the more reactive clayey materials (> 20% high plasticity fines) found at depth. We recommend that re-use of the more reactive clayey materials is avoided where possible or is limited to re-use as deep fill where required. The better quality granular fill should be used in the upper profile as a capping layer over the reactive clayey materials.

Proper selection and re-use of site derived gravelly and clayey materials during the earthworks as recommended above will require a high level of geotechnical support and testing during the earthworks.

Topsoil is not considered suitable for re-use as structural fill and must only be used in non-structural applications or removed off site for disposal.

Where doubt exists, a geotechnical engineer must be engaged to inspect and approve the use of potential fill materials.

8.7 Excavations and Slopes

Test pits were excavated using a 30 tonne Volvo EC300DL equipped with a 0.73 m wide rock bucket. Test pit excavations generally:

- Extended through the upper 1.0 m to 1.5 m of gravel/clayey gravel at a slow rate.
- Extended through the lower clayey gravel/gravelly sandy clay at a slow to moderate rate.

We consider that a large excavator (30 tonne or larger) with a rock bucket is suitable for excavation into the in-situ clayey soils to depths of up to 5 m.

A bulldozer equipped with a single tine ripper (say D8 or larger) would increase the productivity of bulk excavation.

We require that excavations above the water table are battered back to the following slope angles:

Granular soils (GRAVEL)

- 1V:2H for temporary slopes and 1V:3H for permanent slopes.

Cohesive soils (Clayey GRAVEL/Gravelly Sandy CLAY minimum 20% fines)

- 1V:1H for temporary slopes and 1V:2H for permanent slopes.

Even at these slope angles erosion and rilling may occur.

Surcharges (such as plant and soil stockpiles) must not be placed at or near the crest of excavations.

A geotechnical engineer must be consulted where there is any doubt regarding the stability or safety of unsupported excavations.

8.8 Shallow Footings

Shallow pad and strip footings may be founded in the in-situ soils to support the proposed commercial and industrial developments. Table 2 and Table 3 give allowable bearing pressures and estimated settlements for pad footings and strip footings with a minimum embedment of 0.5 m. These values assume that the site preparation procedures in Section 8.4 are followed.

Table 2: Pad Footing Allowable Bearing Pressures and Estimated Settlements

Minimum Footing Embedment (m)	Minimum Footing Dimension (m)	Allowable Bearing Pressure (kPa)	Estimated Settlement (mm)
0.5	0.5	150	< 5
	1.0	150	5 – 10
	2.0	150	10 – 15
	3.0	150	15 – 20

Table 3: Strip Footing Allowable Bearing Pressures and Estimated Settlements

Minimum Footing Embedment (m)	Minimum Footing Dimension (m)	Allowable Bearing Pressure (kPa)	Estimated Settlement (mm)
0.5	0.5	130	5 – 10
	1.0	130	10 – 15
	2.0	130	20 – 25

Allowable bearing pressures for footings of intermediate plan dimensions to those tabulated can be interpolated. Footings that have a plan dimension either smaller or larger than those covered by tables above will need to be considered individually along with other embedment depths. Footings carrying significant eccentric loading, such as below retaining walls, must be assessed separately.

The allowable working bearing pressures are considered to be upper limits for shallow footings to limit total and differential settlements as well as the risk of long-term settlement which may occur under high bearing pressures.

The settlement of the proposed structure will depend upon a number of factors including the applied pressures, footings size and base preparation. The estimates of settlement provided above assume that the site preparation measures in Section 8.4 have been completed. The estimated settlements are for the working bearing pressure values shown. Differential settlements of up to 75% of the total estimated settlement values are likely between footings of similar sizes, loads and elevations.

About 50% of the settlement is expected to occur during construction.

All footing excavations must be checked by a competent person prior to blinding.

8.9 Retaining Structures

Retaining structures must be designed in accordance with AS4678 (2002) "Earth-Retaining Structures". For the design of retaining structures, the following parameters are considered appropriate.

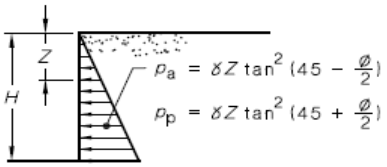
Table 4: Design parameters for Retaining Structures

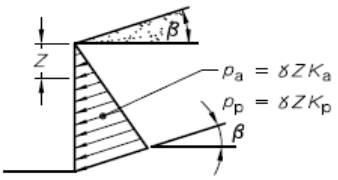
Material Type	γ_b (kN/m^3)	ϕ' (°)	c' (kPa)	ϕ_u (°)	c_u (kPa)
Imported Granular Fill	18	34	0	-	-
Clayey GRAVEL/Gravelly Sandy CLAY (compacted in-situ or site derived fill)	16	25	5	0	50

γ_b – bulk unit weight (t/m^3) ϕ' – effective soil friction angle c' – effective cohesion
ϕ_u – undrained soil friction angle c_u – undrained cohesion

The undrained strength parameters indicated above should be used for analysis of short term stability, or stability under sudden loading of clayey soils. The effective strength parameters should be used for analysis of free-draining granular soils and the long term stability of clayey soils. The formulae for active and passive pressures are shown below for cohesionless soil and cohesive soil[1].

[1] refer Figure E2, AS4678-2002 Earth-retaining structures



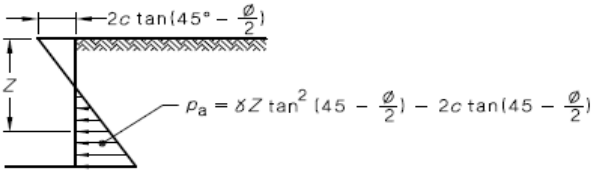


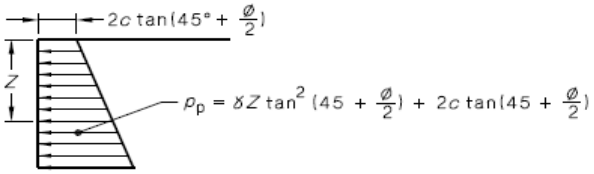
$$K_a = \frac{\cos\beta - \sqrt{\cos^2\beta - \cos^2\phi}}{\cos\beta + \sqrt{\cos^2\beta - \cos^2\phi}}$$

$$K_p = \frac{\cos\beta + \sqrt{\cos^2\beta - \cos^2\phi}}{\cos\beta - \sqrt{\cos^2\beta - \cos^2\phi}}$$

$$K_a = \frac{1}{K_p}$$

(a) Granular soil





(b) Cohesive soil

Unless a suitable drainage layer is placed behind the wall such that a build-up of pore pressure is prevented, the retaining wall must be designed to accommodate water pressure behind the wall (10 kPa per metre height).

Free-draining, granular backfill must be used for at least 300 mm width behind retaining walls, incorporating a separator geotextile (Bidim A24, or similar, or heavier) between the granular backfill and any clayey backfill used behind the wall (although we recommend against using clay backfill if it can be avoided). A slotted drain (wrapped in a geotextile) should be used at the base of the granular backfill to collect seepage and direct it to a collection point (or collecting at a sump which must be fitted with an automatic pump system to ensure that it remains dry).

Compaction plant can augment the lateral earth pressure acting on retaining walls. Hand operated compaction equipment is recommended within 2 m of any retaining walls to minimise compaction pressures.

It is important to note that some ground movement is to be expected behind any soil retaining system, including gravity retaining walls, sheet pile walls and shored and strutted excavations.

8.10 Pavement Subgrades

Based on the laboratory test results, we recommend that flexible pavements are designed based on a subgrade design CBR of 5% assuming a suitably compacted clayey subgrade in well drained conditions. It is important that clayey subgrades are maintained at an equilibrium moisture content and are not allowed to excessively dry out prior to pavement construction. We suggest a subgrade design moisture content of 80% to 100% of Modified OMC is assumed for the clayey subgrade in the pavement design.

The subgrade design CBR may be improved to 10% where a minimum 0.3 m thick layer of approved granular fill (minimum 4 day soaked CBR of 10%, maximum CBR swell 0.5%) is present below the pavements. We consider approved granular fill may comprise either selected site derived gravelly fill or imported sand fill.

Subsoil drainage is recommended where over-excavation of clayey subgrades and replacement with granular fill is required to prevent subsurface water entering the formation.

8.11 Stormwater Disposal

The subsurface profile generally comprises shallow clayey soils across most of the site. We consider the hydraulic conductivity of the in-situ clayey soils is very low and therefore recommend they are modelled as impermeable in the stormwater design and management. Stormwater runoff will need to be collected by a network of closed drains and disposed of into the local drainage network, subject to the owner's regulations.

We further recommend that:

- Clayey soil horizons are shaped to promote positive water run-off away from pavements and structures.
- Site levels are raised with approved granular fill above any clayey soil horizons.
- Subsoil drains are used to direct subsurface water away from pavements and structures where required.

9. CLOSURE

We draw your attention to Appendix E of this report, "Understanding Your Report". The information provided within is intended to inform you as to what your realistic expectations of this report should be. Guidance is also provided on how to minimise risks associated with groundworks for this project. This information is provided not to reduce the level of responsibility accepted by Galt, but to ensure that all parties who rely on this report are aware of the responsibilities each assumes in so doing.

GALT GEOTECHNICS PTY LTD

Harry Chambers

Geotechnical/Pavement Engineer

Rick Piovesan CPEng

Geotechnical Engineer

\\galtgeo.local\OsbornePark\Data\Jobs\2022\J2201016 - Porter St SWH Byford\03 Correspondence\J2201016 001 R Rev0.docx

Tables

Galt Geotechnics Pty Ltd

www.galtgeo.com.au
50 Edward Street OSBORNE PARK WA 6017

ABN: 64 625 054 729

Table A1: Summary of Test Pits

Test Reference	Test Depth (m)	Stratigraphy
TP01	5.0	BOULDERS over GRAVEL over Clayey GRAVEL/Gravelly Sandy CLAY
TP02	5.0	Possible FILL: GRAVEL over Clayey GRAVEL/Gravelly Sandy CLAY
TP03	5.0	BOULDERS over GRAVEL over Clayey GRAVEL/Gravelly Sandy CLAY
TP04	4.0	BOULDERS over GRAVEL over Clayey GRAVEL/Gravelly Sandy CLAY
TP05	4.0	Sandy CLAY over Clayey GRAVEL and possible extremely weathered rock
TP06	4.0	Boulders over Clayey GRAVEL over GRAVEL and Clayey GRAVEL/Gravelly Sandy CLAY
TP07	4.0	GRAVEL over Clayey GRAVEL/Gravelly Sandy CLAY
TP08	2.5	Clayey GRAVEL
TP09	2.5	Clayey SAND over GRAVEL over Clayey GRAVEL/Gravelly Sandy CLAY
TP11	4.0	Clayey SAND over GRAVEL over Clayey GRAVEL/Gravelly Sandy CLAY
TP12	4.0	Clayey SAND over GRAVEL over Clayey GRAVEL/Gravelly Sandy CLAY
TP13	4.0	Clayey GRAVEL/Gravelly Sandy CLAY
TP15	4.0	Clayey GRAVEL/Gravelly Sandy CLAY
TP16	4.0	Sandy CLAY over Gravelly Clayey SAND over Gravelly Sandy CLAY
TP17	4.0	Possible FILL: Clayey SAND over Possible FILL: Sandy GRAVEL over GRAVEL over Clayey GRAVEL/Sandy CLAY
TP18	2.5	Possibly FILL: Clayey SAND over GRAVEL over Clayey GRAVEL/Gravelly Sandy CLAY
TP19	2.5	Clayey GRAVEL/Gravelly Sandy CLAY
TP20	2.5	Clayey GRAVEL/Gravelly Sandy CLAY
TP21	2.5	Clayey GRAVEL/Gravelly Sandy CLAY
TP22	2.5	Sandy CLAY over Clayey GRAVEL/Gravelly Sandy CLAY
TP23	3.7	Clayey GRAVEL/Gravelly Sandy CLAY
TP24	2.5	Clayey SAND/Sandy CLAY over Clayey GRAVEL/Gravelly Sandy CLAY

Notes: 1 The target depth of excavation was achieved at all test locations

2. Groundwater was not encountered in any of the test pits.

Figures

Galt Geotechnics Pty Ltd

www.galtgeo.com.au
50 Edward Street OSBORNE PARK WA 6017

ABN: 64 625 054 729

406,400 406,600 406,800

6,433,800 6,433,600

SOUTH WESTERN HWY
NETTLETON RD
DOUGALL ST
MICHAEL ST
WILARING ST
MALBA WAY
BENALLA CRESCENT
BARRABERRY WAY
COWARA WAY
GADDARA CNR
KARANGI CIR
DIAMANTINA BVD
WILARING STREET
BOULEVARD

VEHICLE ACCESS (ROAD INTERFACE TO BE CONSIDER FURTHER)
FAST FOODS 01 40 SEATS
BULKY GOODS 01 10,740m²
BULKY GOODS 02 2690m²
BULKY GOODS 03 7050m²
BULKY GOODS 05 8550m²
BULKY GOODS 06 2430m²
SELF STORAGE 3020m²
SERVICE STATION
COMMERICAL 120m²
826CARS
PUBLIC OPEN SPACE
LANDSCAPE BUFFER
8.25 ha

TP01 TP02 TP03 TP04 TP05 TP06 TP07 TP08 TP09 TP10 TP11 TP12 TP13 TP15 TP16 TP17 TP18 TP19 TP20 TP21 TP22 TP23 TP24
TH01 TH02 TH03 TH04 TH05 TH06 TH07 TH08 TH09 TH10 TH11 TH12 TH13 TH14 TH15

58 60 62 64 66 68 70 72 74

Legend

Site Boundary

Galt Investigation - February 2022

Test Pit

Brown Geotechnical Investigation – July 2012

Test Pit

N

0 30 60 90 120 150
Meters

NOTES
Aerial Imagery and Cadastre sourced from Landgate/SLIP

SCALE	1:2,000	(A3)
DRAWN	DAC	
DATE DRAWN	8/02/2022	
CHECKED	AQ	
DATE CHECKED	8/02/2022	
PROJECTION	GDA 1994 MGA Zone 50	

Galt Geotechnics Pty Ltd
ACN : 138 490 865
Tel : +61 (0)8 6272-0200
Address : 50 Edward Street
Osborne Park WA 6017

CLIENT	**PORTER CONSULTING ENGINEERS**
PROJECT	PROPOSED INDUSTRIAL AND COMMERCIAL
LOCATION	LOT 806 SOUTH WESTERN HIGHWAY BYFORD
TITLE	SITE & LOCATION PLAN

Job No	Fig No	Rev
J2201016	FIGURE 1	**A**

Appendix A: Site Photographs

Galt Geotechnics Pty Ltd

www.galtgeo.com.au
50 Edward Street OSBORNE PARK WA 6017

ABN: 64 625 054 729

Photograph 1: View of site from near the eastern boundary (near TP02) looking north-west

Photograph 2: View of test pit excavation (TP07) on eastern part of site

Photograph 3: View of central open area of the site covered in tall grass

Photograph 4: View of test pit excavation (TP21) c

Photograph 5: View of crane on the site working on a mobile tower near Douglas Street

Photograph 6: View of rubbish and stockpiles near TENT Council Meeting - 17 June 2024

Appendix B: Test Pit Reports

Galt Geotechnics Pty Ltd

www.galtgeo.com.au
50 Edward Street OSBORNE PARK WA 6017

ABN: 64 625 054 729

METHOD OF SOIL DESCRIPTION
BOREHOLE AND TEST PIT REPORTS

GRAPHIC LOG & SOIL CLASSIFICATION SYMBOLS

Graphic	USCS	Soil Name
		FILL (various types)
		COBBLES / BOULDERS
	GP	GRAVEL (poorly graded)
	GW	GRAVEL (well graded)
	GC	Clayey GRAVEL
	GM	Silty GRAVEL
	SP	SAND (poorly graded)
	SW	SAND (well graded)
	SC	Clayey SAND

Graphic	USCS	Soil Name
	SM	Silty SAND
	ML	SILT (low liquid limit)
	MH	SILT (high liquid limit)
	CL	CLAY (low plasticity)
	CI	CLAY (medium plasticity)
	CH	CLAY (high plasticity)
	OL	Organic SILT (low liquid limit)
	OH	Organic SILT (high liquid limit)
	Pt	PEAT

NOTE: Dual classification given for soils with a fines content between 5% and 12%.

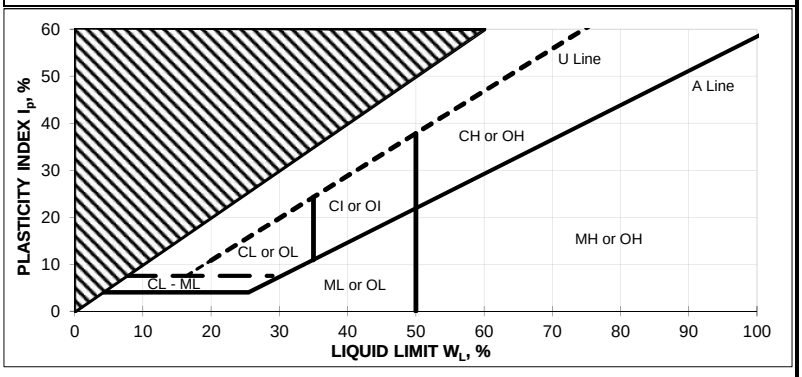
SOIL CLASSIFICATION AND INFERRED STRATIGRAPHY

Soil descriptions are based on AS1726-2017. Material properties are assessed in the field by visual/tactile methods in combination with field and laboratory testing techniques (where used).

NOTE: AS 1726-2017 defines a fine grained soil where the total dry mass of fine fractions (<0.075 mm particle size) exceeds 35%.

PARTICLE SIZE		
Soil Name		**Particle Size (mm)**
BOULDERS		>200
COBBLES		63 to 200
GRAVEL	Coarse	19 to 63
	Medium	6.7 to 19
	Fine	2.3 to 6.7
SAND	Coarse	0.6 to 2.36
	Medium	0.21 to 0.6
	Fine	0.075 to 0.21
FINES	SILT	0.002 to 0.075
	CLAY	<0.002

PLASTICITY - MODIFIED CASAGRANDE CHART - AS1726-2017



RESISTANCE TO EXCAVATION		
Symbol	**Term**	**Description**
VE	Very easy	All resistances are relative to the selected method of excavation
E	Easy	
F	Firm	
H	Hard	
VH	Very hard	

MOISTURE CONDITION	
Symbol	**Term**
D	Dry
M	Moist
W	Wet

CEMENTATION	
Cementation	**Description**
Weakly cemented	Soil may be easily disaggregated by hand in air or water
Moderately cemented	Effort is required to disaggregate the soil by hand in air or water

CONSISTENCY		
Symbol	**Term**	**Undrained Shear Strength (kPa)**
VS	Very Soft	0 to 12
S	Soft	12 to 25
F	Firm	25 to 50
St	Stiff	50 to 100
VSt	Very Stiff	100 to 200
H	Hard	>200

ORGANIC SOILS	
Material	**Organic Content % of dry mass**
Inorganic soil	<2%
Organic soil	2% to 25%
Peat	>25%

DENSITY		
Symbol	**Term**	**Density Index (%)**
VL	Very Loose	<15
L	Loose	15 to 35
MD	Medium Dense	35 to 65
D	Dense	65 to 85
VD	Very Dense	>85

EXPLANATORY NOTES TO BE READ WITH BOREHOLE AND TEST PIT REPORTS

METHOD OF DRILLING OR EXCAVATION

AC	Air Core	E	Excavator	PQ3	PQ3 Core Barrel
AD/T	Auger Drilling with TC-Bit	EH	Excavator with Hammer	PT	Push Tube
AD/V	Auger Drilling with V-Bit	HA	Hand Auger	R	Ripper
AT	Air Track	HMLC	HMLC Core Barrel	RR	Rock Roller
B	Bulldozer Blade	HQ3	HQ3 Core Barrel	SON	Sonic Rig
BH	Backhoe Bucket	N	Natural Exposure	SPT	Driven SPT
CT	Cable Tool	NMLC	NMLC Core Barrel	WB	Washbore
DT	Diatube	PP	Push Probe	X	Existing Excavation

SUPPORT

T	Timbering

PENETRATION EFFORT (RELATIVE TO THE EQUIPMENT USED)

VE	Very Easy	E	Easy	F	Firm
H	Hard	VH	Very Hard		

WATER

►	Water Inflow	▼	Water Level
◄	Water Loss (complete)		
◁	Water Loss (partial)		

SAMPLING AND TESTING

B	Bulk Disturbed Sample	P	Piston Sample
BLK	Block Sample	PBT	Plate Bearing Test
C	Core Sample	U	Undisturbed Push-in Sample
CBR	CBR Mould Sample		U50: 50 mm diameter
D	Small Disturbed Sample	SPT	Standard Penetration Test
ES	Environmental Soil Sample		Example: 3, 4, 5 N=9
EW	Environmental Water Sample		3,4,5: Blows per 150 mm
G	Gas Sample		N=9: Blows per 300 mm after
HP	Hand Penetrometer		150 mm seating interval
LB	Large Bulk Disturbed Sample	VS	Vane Shear; P = Peak
M	Mazier Type Sample		R = Remoulded (kPa)
MC	Moisture Content Sample	W	Water Sample

ROCK CORE RECOVERY

TCR = Total Core Recovery (%) $= \frac{CRL}{TCL} \times 100$

RQD = Rock Quality Designation (%) $= \frac{ALC>100}{TCL} \times 100$

TCL	Length of Core Run
CRL	Length of Core Recovered
ALC>100	Total Length of Axial Lengths of Core Greater than 100 mm Long

TEST PIT: TP01

Sheet 1 OF 1

Job Number:	J2201016	**Contractor:**	ANH Contracting	**Date:**	03/02/2022
Client:	Porter Consulting Engineers	**Machine:**	Volvo EC300DL	**Logged:**	AQ
Project:	Proposed Commercial and Industrial Development	**Operator:**	Neil	**Checked Date:**	25/02/2022
Location:	Lot 806 South Western Highway, Byford	**Bucket:**	730 mm tooth	**Checked By:**	HWC
		Width:	1 m **Length:** 3.5 m		

Excavation					Sampling		Field Material Description					
METHOD	EXCAVATION RESISTANCE	WATER	DEPTH (metres)	*DEPTH* RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	SOIL CLASS	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
E	VH		0.0					GP	MIXTURE OF BOULDERS (approximately 60%) and SOIL (approximately 40%); GRAVEL: fine to coarse grained, sub-rounded to sub-angular, orange, with plastic fines, trace sand			Density not assessed
	H		0.5					GP	GRAVEL: fine to coarse grained, sub-rounded to sub-angular, orange, with plastic fines, trace sand Grading to:			
			1.0									
			1.5					GC	Clayey GRAVEL: fine to coarse grained, sub-rounded to sub-angular, orange, medium plasticity fines, with sand	D		
			2.0									
	F		2.5						Clayey GRAVEL/Gravelly Sandy CLAY high plasticity, fine to coarse grained variably cemented gravel, grey mottled orange, with fine to coarse grained sand			
			3.0									
			3.5					GC-CH		M		
			4.0									
			4.5									
			5.0						Hole terminated at 5.00 m Target depth Groundwater not encountered			
			5.5									

Sketch & Other Observations

Comments:

See Explanatory Notes and Method of Soil Description sheets for details of abbreviations and basis of descriptions

TEST PIT: TP02

Sheet 1 OF 1

Job Number:	J2201016	**Contractor:**	ANH Contracting	**Date:**	03/02/2022
Client:	Porter Consulting Engineers	**Machine:**	Volvo EC300DL	**Logged:**	AQ
Project:	Proposed Commercial and Industrial Development	**Operator:**	Neil	**Checked Date:**	25/02/2022
Location:	Lot 806 South Western Highway, Byford	**Bucket:**	730 mm tooth	**Checked By:**	HWC
		Width:	1 m **Length:** 3.5 m		

Excavation					Sampling		Field Material Description					
METHOD	EXCAVATION RESISTANCE	WATER	DEPTH (metres)	*DEPTH* RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	SOIL CLASS	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
E	F		0.0		B(TP02-01)			GP	Possible FILL: GRAVEL, fine to coarse grained, sub-rounded, orange, trace sand, trace fines, rootlets to 0.1 m	D	D	Test pit dug between two access tracks
			0.5									
			1.0		B(TP02-02)			GC	Clayey GRAVEL: fine to coarse grained, sub-rounded to sub-angular, orange, medium to high plasticity fines, with sand			
			1.5									
			2.0									
			2.5					GC-CH	Clayey GRAVEL/Gravelly Sandy CLAY: high plasticity, fine to coarse grained variably cemented gravel, grey mottled red, with fine to coarse grained sand	M		
			3.0									
			3.5									
			4.0									
			4.5									
			5.0						Hole terminated at 5.00 m Target depth Groundwater not encountered			
			5.5									

Sketch & Other Observations

Comments:

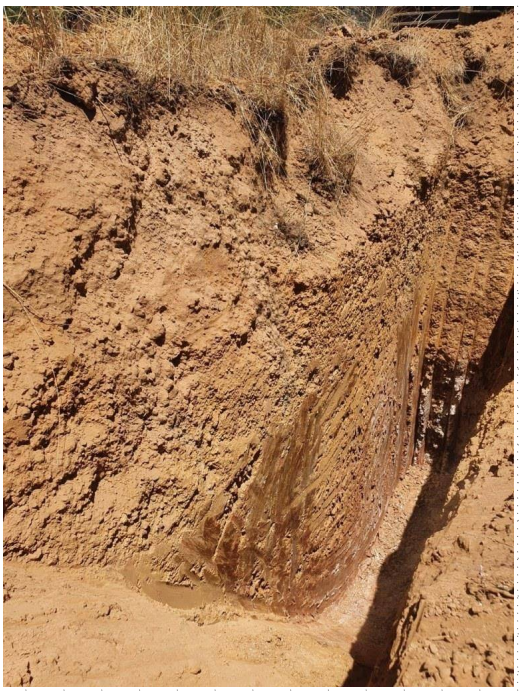
See Explanatory Notes and Method of Soil Description sheets for details of abbreviations and basis of descriptions

TEST PIT: TP03

Job Number:	J2201016	**Contractor:**	ANH Contracting	**Date:**	03/02/2022
Client:	Porter Consulting Engineers	**Machine:**	Volvo EC300DL	**Logged:**	AQ
Project:	Proposed Commercial and Industrial Development	**Operator:**	Neil	**Checked Date:**	25/02/2022
Location:	Lot 806 South Western Highway, Byford	**Bucket:**	730 mm tooth	**Checked By:**	HWC
		Width:	1 m **Length:** 3.5 m		

Excavation					Sampling		Field Material Description				
METHOD	EXCAVATION RESISTANCE	WATER	DEPTH (metres)	*DEPTH* RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	SOIL CLASS	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
E	VH		0.0					GP	MIXTURE OF BOULDERS (approximately 60%) and SOIL (approximately 40%); GRAVEL: fine to coarse grained, sub-rounded to sub-angular, orange, with plastic fines, trace sand		D - VD	
	H		0.5		B(TP03-01)			GP-GM	GRAVEL: fine to coarse grained, sub-rounded to sub-angular, orange, with low plasticity fines, with fine to coarse grained sand Grading to:	D		
	F		1.5					GC	Clayey GRAVEL: fine to coarse grained, sub-rounded to sub-angular, orange, medium plasticity fines, with sand			
			2.0					GC-CH	Clayey GRAVEL/Gravelly Sandy CLAY: high plasticity, fine to coarse grained variably cemented gravel, grey mottled orange, with fine to coarse grained sand	M		
			5.0						Hole terminated at 5.00 m Target depth Groundwater not encountered			
			5.5									

Sketch & Other Observations



Comments:

See Explanatory Notes and Method of Soil Description sheets for details of abbreviations and basis of descriptions

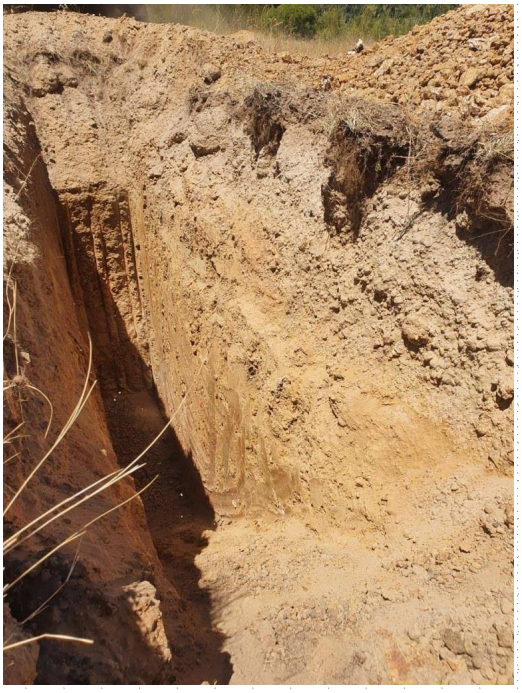
TEST PIT: TP04

Sheet 1 OF 1

Job Number:	J2201016	**Contractor:**	ANH Contracting	**Date:**	03/02/2022
Client:	Porter Consulting Engineers	**Machine:**	Volvo EC300DL	**Logged:**	AQ
Project:	Proposed Commercial and Industrial Development	**Operator:**	Neil	**Checked Date:**	25/02/2022
Location:	Lot 806 South Western Highway, Byford	**Bucket:**	730 mm tooth	**Checked By:**	HWC
		Width:	1 m **Length:** 3.5 m		

Excavation					Sampling		Field Material Description					
METHOD	EXCAVATION RESISTANCE	WATER	DEPTH (metres)	*DEPTH* RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	SOIL CLASS	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
E	VH		0.0					GP	MIXTURE OF BOULDERS (30%) and SOIL (70%); Sandy GRAVEL: fine to coarse grained, sub-rounded, orange and grey, trace fines			Density not assessed
	H		0.5									
			1.0					GP	GRAVEL: fine to coarse grained, sub-rounded to sub-angular, orange, with plastic fines, trace sand Grading to:	D		
			1.5									
			2.0					GC	Clayey GRAVEL: fine to coarse grained, sub-rounded to sub-angular, orange, medium plasticity fines, with sand			
	F		2.5									
			3.0					GC-CH	Clayey GRAVEL/ Gravelly Sandy CLAY: high plasticity, fine to coarse grained variably cemented gravel, grey mottled red, with fine to coarse grained sand	M		
			3.5									
			4.0						Hole terminated at 4.00 m Target depth Groundwater not encountered			
			4.5									
			5.0									
			5.5									

Sketch & Other Observations



Comments:

See Explanatory Notes and Method of Soil Description sheets for details of abbreviations and basis of descriptions

TEST PIT: TP05

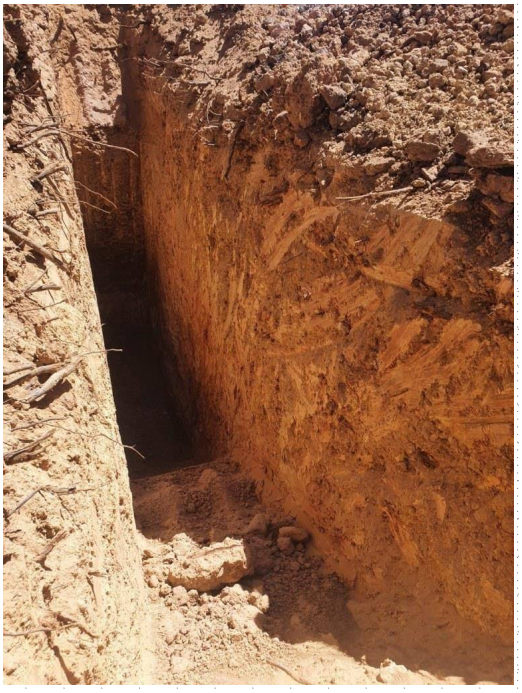
Job Number: J2201016
Client: Porter Consulting Engineers
Project: Proposed Commercial and Industrial Development
Location: Lot 806 South Western Highway, Byford

Contractor: ANH Contracting
Machine: Volvo EC300DL
Operator: Neil
Bucket: 730 mm tooth
Width: 1 m **Length:** 3.5 m

Date: 03/02/2022
Logged: AQ
Checked Date: 25/02/2022
Checked By: HWC

Excavation					Sampling		Field Material Description					
METHOD	EXCAVATION RESISTANCE	WATER	DEPTH (metres)	*DEPTH* RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	SOIL CLASS	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
E	E		0.0					CI	Sandy CLAY: medium plasticity, orange mottled brown/red, approximately 40% sand, trace gravel, roots to 0.5 m	M		Density not assessed
	H		0.5		B(TP05-01)			GC	Clayey GRAVEL: fine to coarse grained, sub-rounded to sub-angular, orange mottled brown, medium plasticity, trace sand	D		
			1.0									
			1.5		B(TP05-02)				Clayey GRAVEL: fine to coarse grained, grey mottled orange, with about 20-30% high plasticity fines, with fine to coarse grained sand			
			2.0		B(TP05-03)				Possible extremely weathered rock			
			2.5					GC		M		
			3.0									
			3.5									
			4.0						Hole terminated at 4.00 m Target depth Groundwater not encountered			
			4.5									
			5.0									
			5.5									

Sketch & Other Observations



Comments:

See Explanatory Notes and Method of Soil Description sheets for details of abbreviations and basis of descriptions

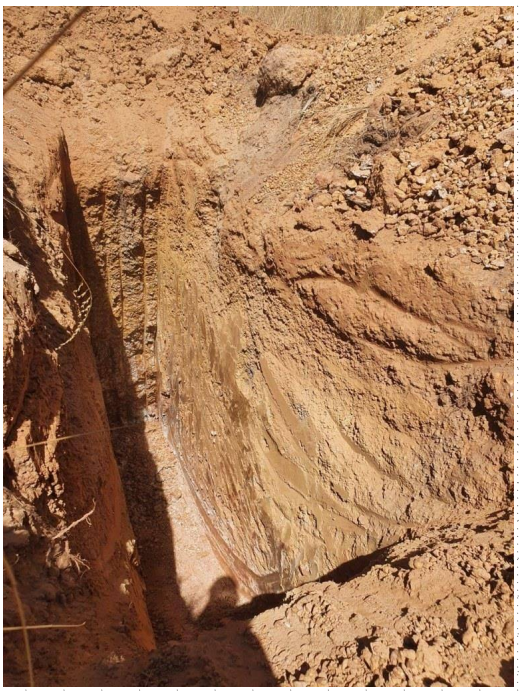
TEST PIT: TP06

Sheet 1 OF 1

Job Number:	J2201016	**Contractor:**	ANH Contracting	**Date:**	03/02/2022
Client:	Porter Consulting Engineers	**Machine:**	Volvo EC300DL	**Logged:**	AQ
Project:	Proposed Commercial and Industrial Development	**Operator:**	Neil	**Checked Date:**	25/02/2022
Location:	Lot 806 South Western Highway, Byford	**Bucket:**	730 mm tooth	**Checked By:**	HWC
		Width: 1 m	**Length:** 3.5 m		

Excavation					Sampling		Field Material Description					
METHOD	EXCAVATION RESISTANCE	WATER	DEPTH (metres)	*DEPTH* RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	SOIL CLASS	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
E	VH		0.0					GP	MIXTURE OF BOULDERS (approximately 60%) and SOIL (approximately 40%); GRAVEL: fine to coarse grained, sub-rounded to sub-angular, orange, with low plasticity, trace sand	D	MD - D	
			0.5					GC	Clayey GRAVEL: fine to coarse grained, sub-rounded to sub-angular, orange, medium plasticity fines, with sand			
			1.0									
	F		1.5					GP	GRAVEL: fine to coarse grained, sub-rounded to sub-angular, orange, with plastic fines, trace sand Grading to:			
			2.0									
			2.5					GC-CH	Clayey GRAVEL / Gravelly Sandy CLAY: high plasticity, fine to coarse grained variably cemented gravel, grey mottled red, with fine to coarse grained sand	M		
			3.0									
			3.5									
			4.0						Hole terminated at 4.00 m Target depth Groundwater not encountered			
			4.5									
			5.0									
			5.5									

Sketch & Other Observations



Comments:

See Explanatory Notes and Method of Soil Description sheets for details of abbreviations and basis of descriptions

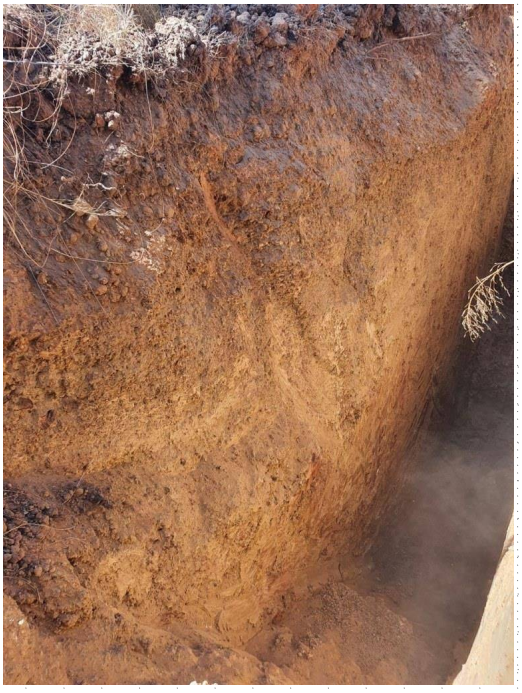
TEST PIT: TP07

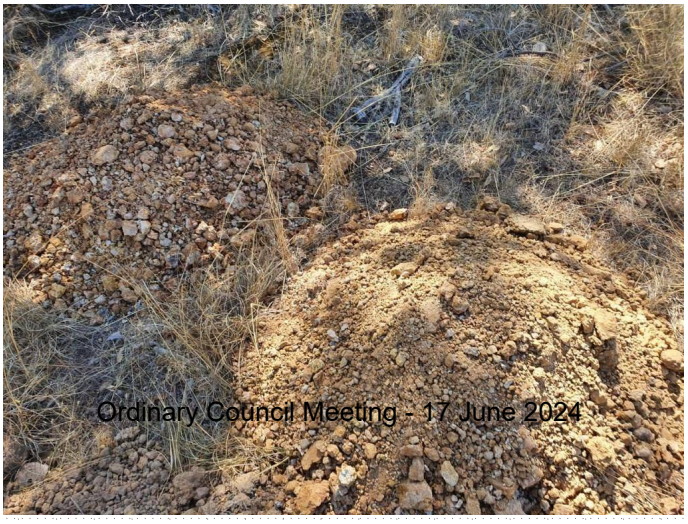
Sheet 1 OF 1

Job Number:	J2201016	**Contractor:**	ANH Contracting	**Date:**	03/02/2022
Client:	Porter Consulting Engineers	**Machine:**	Volvo EC300DL	**Logged:**	AQ
Project:	Proposed Commercial and Industrial Development	**Operator:**	Neil	**Checked Date:**	25/02/2022
Location:	Lot 806 South Western Highway, Byford	**Bucket:**	730 mm tooth	**Checked By:**	HWC
		Width:	1 m **Length:** 3.5 m		

Excavation					Sampling		Field Material Description					
METHOD	EXCAVATION RESISTANCE	WATER	DEPTH (metres)	*DEPTH* RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	SOIL CLASS	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
E	VH		0.0 – 0.5					GP-GC	GRAVEL: fine to coarse grained, sub-rounded to sub-angular, orange-brown, with low plasticity fines, with sand, roots to 0.1 m	D	VD	
	F		1.0 – 2.5					GC-CH	Clayey GRAVEL / Gravelly Sandy CLAY: high plasticity, fine to coarse grained variably cemented gravel, grey mottled orange, with fine to coarse grained sand Orange-brown, with plasticity fines, with sand Grey mottled red	M		
			4.0 – 5.5						Hole terminated at 4.00 m Target depth Groundwater not encountered			

Sketch & Other Observations





Comments:

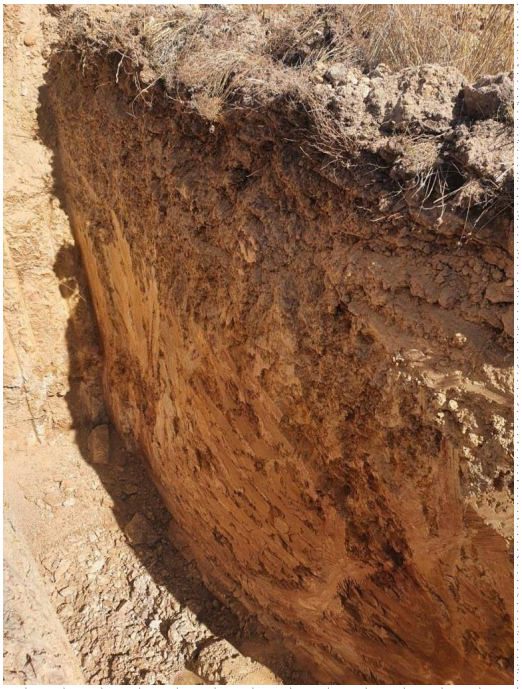
See Explanatory Notes and Method of Soil Description sheets for details of abbreviations and basis of descriptions

TEST PIT: TP08

Job Number:	J2201016	**Contractor:**	ANH Contracting	**Date:**	03/02/2022
Client:	Porter Consulting Engineers	**Machine:**	Volvo EC300DL	**Logged:**	AQ
Project:	Proposed Commercial and Industrial Development	**Operator:**	Neil	**Checked Date:**	25/02/2022
Location:	Lot 806 South Western Highway, Byford	**Bucket:**	730 mm tooth	**Checked By:**	HWC
		Width:	1 m **Length:** 3.5 m		

Excavation					Sampling		Field Material Description					
METHOD	EXCAVATION RESISTANCE	WATER	DEPTH (metres)	*DEPTH* RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	SOIL CLASS	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
E	E		0.0					SP-SC	TOPSOIL: SAND, fine to coarse grained, sub-rounded to sub-angular, dark brown, trace to with fines, rootlets to 0.2 m			Density not assessed
	H		0.5					GC	Clayey GRAVEL: fine to coarse grained, sub-angular to sub-rounded, orange mottled brown, medium plasticity fines, trace sand	D		
	F		1.0					GC-CH	Clayey GRAVEL / Gravelly Sandy CLAY: high plasticity, fine to coarse grained variably cemented gravel, grey mottled red, with fine to coarse grained sand	M		
	E		1.5					GC-CH	Becoming pale grey mottled red, low to medium plasticity			
			2.0									
			2.5						Hole terminated at 2.50 m Target depth Groundwater not encountered			
			3.0									
			3.5									
			4.0									
			4.5									
			5.0									
			5.5									

Sketch & Other Observations



Comments:

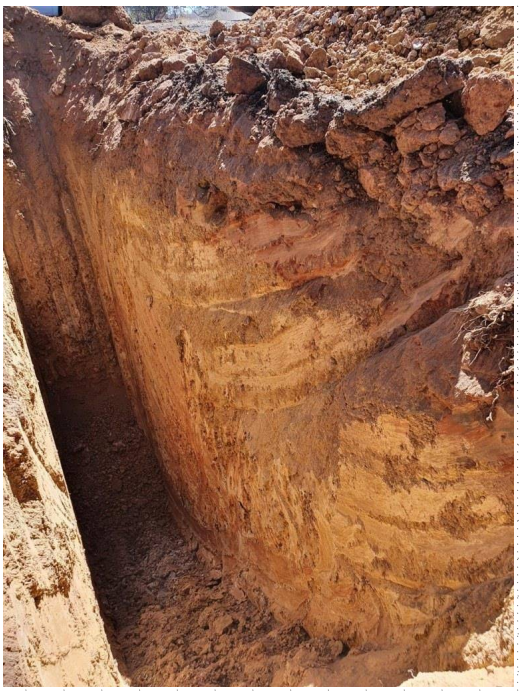
See Explanatory Notes and Method of Soil Description sheets for details of abbreviations and basis of descriptions

TEST PIT: TP09

Job Number:	J2201016	**Contractor:**	ANH Contracting	**Date:**	03/02/2022
Client:	Porter Consulting Engineers	**Machine:**	Volvo EC300DL	**Logged:**	AQ
Project:	Proposed Commercial and Industrial Development	**Operator:**	Neil	**Checked Date:**	25/02/2022
Location:	Lot 806 South Western Highway, Byford	**Bucket:**	730 mm tooth	**Checked By:**	HWC
		Width:	1 m **Length:** 3.5 m		

Excavation					Sampling		Field Material Description					
METHOD	EXCAVATION RESISTANCE	WATER	DEPTH (metres)	*DEPTH* RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	SOIL CLASS	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
E	VH		0.0					SC	Clayey SAND: fine grained, red mottled grey, medium plasticity, desiccated			Density not assessed
	H		0.5					GP-GC	GRAVEL: fine to coarse grained, sub-rounded to sub-angular, orange-brown, with low plasticity fines, with sand	D		
	F		1.0					GC-CH	Clayey GRAVEL / Gravelly Sandy CLAY: high plasticity, fine to coarse grained variably cemented gravel, grey mottled orange, with fine to coarse grained sand	M		
			2.0						Grey mottled red			
			2.5						Hole terminated at 2.50 m Target depth Groundwater not encountered			
			3.0									
			3.5									
			4.0									
			4.5									
			5.0									
			5.5									

Sketch & Other Observations



Comments:

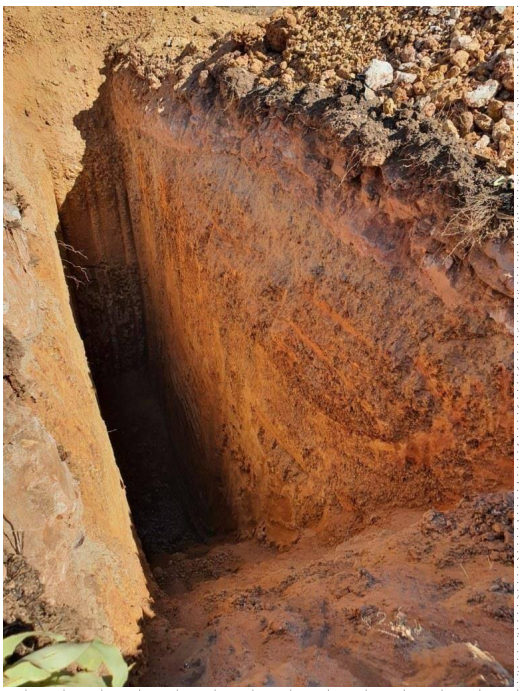
See Explanatory Notes and Method of Soil Description sheets for details of abbreviations and basis of descriptions

TEST PIT: TP11

Job Number:	J2201016	**Contractor:**	ANH Contracting	**Date:**	03/02/2022
Client:	Porter Consulting Engineers	**Machine:**	Volvo EC300DL	**Logged:**	AQ
Project:	Proposed Commercial and Industrial Development	**Operator:**	Neil	**Checked Date:**	25/02/2022
Location:	Lot 806 South Western Highway, Byford	**Bucket:**	730 mm tooth	**Checked By:**	HWC
		Width:	1 m **Length:** 3.5 m		

Excavation					Sampling		Field Material Description					
METHOD	EXCAVATION RESISTANCE	WATER	DEPTH (metres)	*DEPTH* RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	SOIL CLASS	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
E	H		0.0		B(TP11-01)			SC	Clayey SAND: fine to coarse grained, red mottled grey, with medium plasticity fines, with gravel desiccated	D	D - VD	
			0.5		B(TP11-02)			GP-GC	GRAVEL: fine to coarse grained, sub-rounded to sub-angular, orange-brown, with low plasticity fines, with sand			
	F		1.0									
			1.5					GC-CH	Clayey GRAVEL / Gravelly Sandy CLAY: high plasticity, fine to coarse grained variably cemented gravel, grey mottled orange, with fine to coarse grained sand	M		
	F-E		2.0						Grey mottled red-grey			
			2.5									
			3.0									
			3.5									
			4.0						Hole terminated at 4.00 m Target depth Groundwater not encountered			
			4.5									
			5.0									
			5.5									

Sketch & Other Observations



Comments:

See Explanatory Notes and Method of Soil Description sheets for details of abbreviations and basis of descriptions

TEST PIT: TP12

Sheet 1 OF 1

Job Number:	J2201016	**Contractor:**	ANH Contracting	**Date:**	03/02/2022
Client:	Porter Consulting Engineers	**Machine:**	Volvo EC300DL	**Logged:**	AQ
Project:	Proposed Commercial and Industrial Development	**Operator:**	Neil	**Checked Date:**	25/02/2022
Location:	Lot 806 South Western Highway, Byford	**Bucket:**	730 mm tooth	**Checked By:**	HWC
		Width: 1 m	**Length:** 3.5 m		

Excavation					Sampling		Field Material Description					
METHOD	EXCAVATION RESISTANCE	WATER	DEPTH (metres)	*DEPTH* RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	SOIL CLASS	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
E	H		0.0					SC	Clayey SAND: fine grained, red mottled grey, medium plasticity, desiccated	D	VD	Density not assessed
			0.5					GP	GRAVEL: fine to coarse grained, sub-rounded to sub-angular, orange-brown, with plastic fines, with sand		D	
	F		1.0									
			1.5						Clayey GRAVEL / Gravelly Sandy CLAY: high plasticity, fine to coarse grained variably cemented gravel, grey mottled red, with fine to coarse grained sand			
			2.0									
			2.5					GC-CH	Red-grey	M		
	F-E		3.0									
			3.5									
			4.0						Hole terminated at 4.00 m Target depth Groundwater not encountered			
			4.5									
			5.0									
			5.5									

Sketch & Other Observations

Comments:

See Explanatory Notes and Method of Soil Description sheets for details of abbreviations and basis of descriptions

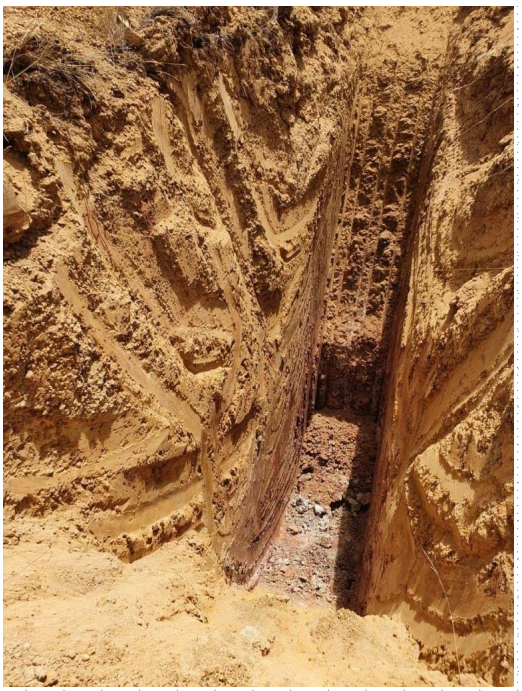
TEST PIT: TP13

Sheet 1 OF 1

Job Number:	J2201016	**Contractor:**	ANH Contracting	**Date:**	03/02/2022
Client:	Porter Consulting Engineers	**Machine:**	Volvo EC300DL	**Logged:**	AQ
Project:	Proposed Commercial and Industrial Development	**Operator:**	Neil	**Checked Date:**	25/02/2022
Location:	Lot 806 South Western Highway, Byford	**Bucket:**	730 mm tooth	**Checked By:**	HWC
		Width:	1 m **Length:** 3.5 m		

Excavation					Sampling		Field Material Description					
METHOD	EXCAVATION RESISTANCE	WATER	DEPTH (metres)	*DEPTH* RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	SOIL CLASS	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
E	VH		0.0–0.5					GC	Clayey GRAVEL: fine to coarse grained, sub-angular to sub-rounded, orange mottled brown, medium plasticity fines, trace sand	D		Density not assessed
	F		0.5–2.0					GC-CH	Clayey GRAVEL / Gravelly Sandy CLAY: high plasticity, fine to coarse grained variably cemented gravel, grey mottled orange, with fine to coarse grained sand	M		
	F-E		2.0–4.0					GC-CH	Grey mottled red	M		
			4.0						Hole terminated at 4.00 m Target depth Groundwater not encountered			

Sketch & Other Observations



Comments:

See Explanatory Notes and Method of Soil Description sheets for details of abbreviations and basis of descriptions

TEST PIT: TP15

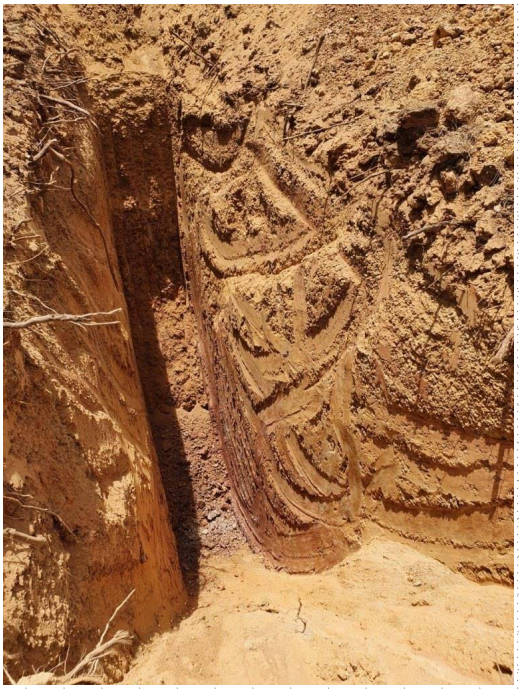
Job Number: J2201016
Client: Porter Consulting Engineers
Project: Proposed Commercial and Industrial Development
Location: Lot 806 South Western Highway, Byford

Contractor: ANH Contracting
Machine: Volvo EC300DL
Operator: Neil
Bucket: 730 mm tooth
Width: 1 m **Length:** 3.5 m

Date: 03/02/2022
Logged: AQ
Checked Date: 25/02/2022
Checked By: HWC

Excavation					Sampling		Field Material Description					
METHOD	EXCAVATION RESISTANCE	WATER	DEPTH (metres)	*DEPTH* RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	SOIL CLASS	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
E	VH		0.0–0.5					GC	Clayey GRAVEL: fine to coarse grained, sub-angular to sub-rounded, orange mottled brown, medium plasticity fines, trace sand	D	VD	Density not assessed
	F		0.5–2.5					GC-CH	Clayey GRAVEL / Gravelly Sandy CLAY: high plasticity, fine to coarse grained variably cemented gravel, grey mottle orange, with fine to coarse grained sand Grey mottled red	M		
			4.0						Hole terminated at 4.00 m Target depth Groundwater not encountered			

Sketch & Other Observations



Comments:

See Explanatory Notes and Method of Soil Description sheets for details of abbreviations and basis of descriptions

TEST PIT: TP16

Sheet 1 OF 1

Job Number:	J2201016	**Contractor:**	ANH Contracting	**Date:**	03/02/2022
Client:	Porter Consulting Engineers	**Machine:**	Volvo EC300DL	**Logged:**	AQ
Project:	Proposed Commercial and Industrial Development	**Operator:**	Neil	**Checked Date:**	25/02/2022
Location:	Lot 806 South Western Highway, Byford	**Bucket:**	730 mm tooth	**Checked By:**	HWC
		Width:	1 m **Length:** 3.5 m		

Excavation					Sampling		Field Material Description					
METHOD	EXCAVATION RESISTANCE	WATER	DEPTH (metres)	*DEPTH* RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	SOIL CLASS	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
E	VH		0.0					CI	Sandy CLAY: medium plasticity, orange, fine to medium grained, sub-rounded gravel, with sand	M		Density not assessed
	H		0.5		B(TP16-01)			SC	Gravelly Clayey SAND: fine to coarse grained, orange, with fine to coarse grained gravel, with medium plasticity fines	D		
			1.0		B(TP16-02)				Gravelly Sandy CLAY: high plasticity, grey mottled orange, with fine to coarse grained sand, with fine to coarse grained gravel			
	F		1.5									
			2.0						Grey mottled red			
			2.5					GC-CH		M		
			3.0									
			3.5									
			4.0						Hole terminated at 4.00 m Target depth Groundwater not encountered			
			4.5									
			5.0									
			5.5									

Sketch & Other Observations

Comments:

See Explanatory Notes and Method of Soil Description sheets for details of abbreviations and basis of descriptions

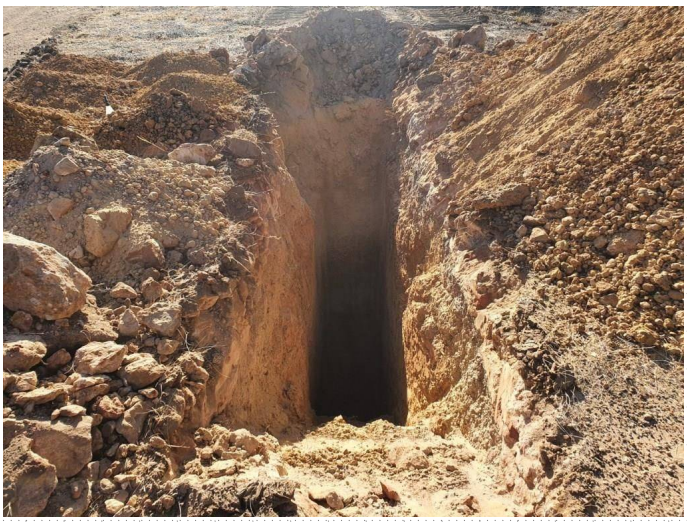
TEST PIT: TP17

Sheet 1 OF 1

Job Number:	J2201016	**Contractor:**	ANH Contracting	**Date:**	03/02/2022
Client:	Porter Consulting Engineers	**Machine:**	Volvo EC300DL	**Logged:**	AQ
Project:	Proposed Commercial and Industrial Development	**Operator:**	Neil	**Checked Date:**	25/02/2022
Location:	Lot 806 South Western Highway, Byford	**Bucket:**	730 mm tooth	**Checked By:**	HWC
		Width:	1 m **Length:** 3.5 m		

Excavation					Sampling		Field Material Description					
METHOD	EXCAVATION RESISTANCE	WATER	DEPTH (metres)	*DEPTH* RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	SOIL CLASS	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
E	VH		0.0					SC	Possible FILL: Clayey SAND, fine grained, red mottled grey, medium plasticity, desiccated			Density not assessed
	H		0.5		B(TP17-01)			GW	Possible FILL: Sandy GRAVEL, fine to coarse grained, sub-rounded, orange-brown, fine to coarse grained sand, trace fines			
	VH		1.0		B(TP17-02)			GP-GC	GRAVEL: fine to coarse grained, sub-rounded to sub-angular, lateritic, orange, with low plasticity fines, trace sand, with boulders/cobbles	D		
	F		1.5					GC-CH	Clayey GRAVEL / Gravelly Sandy CLAY: high plasticity, fine to coarse grained variably cemented gravel, grey mottled orange, with fine to coarse grained sand	M		
			2.0									
			2.5									
			3.0									
			3.5									
			4.0						Hole terminated at 4.00 m Target depth Groundwater not encountered			
			4.5									
			5.0									
			5.5									

Sketch & Other Observations



Comments:

See Explanatory Notes and Method of Soil Description sheets for details of abbreviations and basis of descriptions

TEST PIT: TP18

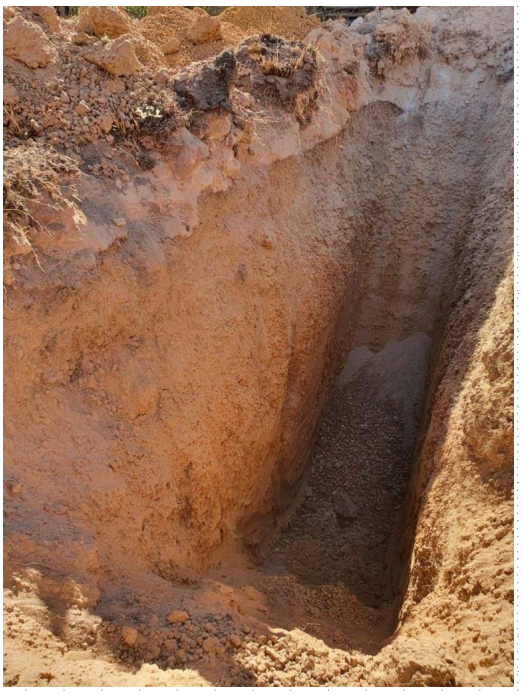
Job Number: J2201016
Client: Porter Consulting Engineers
Project: Proposed Commercial and Industrial Development
Location: Lot 806 South Western Highway, Byford

Contractor: ANH Contracting
Machine: Volvo EC300DL
Operator: Neil
Bucket: 730 mm tooth
Width: 1 m **Length:** 3.5 m

Date: 03/02/2022
Logged: AQ
Checked Date: 25/02/2022
Checked By: HWC

Excavation					Sampling		Field Material Description					
METHOD	EXCAVATION RESISTANCE	WATER	DEPTH (metres)	*DEPTH* RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	SOIL CLASS	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
E	H		0.0					SC	Possible FILL: Clayey SAND, fine grained, red mottled grey, medium plasticity, desiccated	D	VD	Density not assessed
			0.5					GP-GC	GRAVEL: fine to coarse grained, sub-rounded to sub-angular, orange-brown, with low plasticity fines, with sand		D / VD	
			1.0									
			1.5									
	F		2.0					GC-CH	Clayey GRAVEL / Gravelly Sandy CLAY: high plasticity, fine to coarse grained variably cemented gravel, grey mottled orange, with fine to coarse grained sand	M		
			2.5						Hole terminated at 2.50 m Target depth Groundwater not encountered			
			3.0									
			3.5									
			4.0									
			4.5									
			5.0									
			5.5									

Sketch & Other Observations



Comments:

See Explanatory Notes and Method of Soil Description sheets for details of abbreviations and basis of descriptions

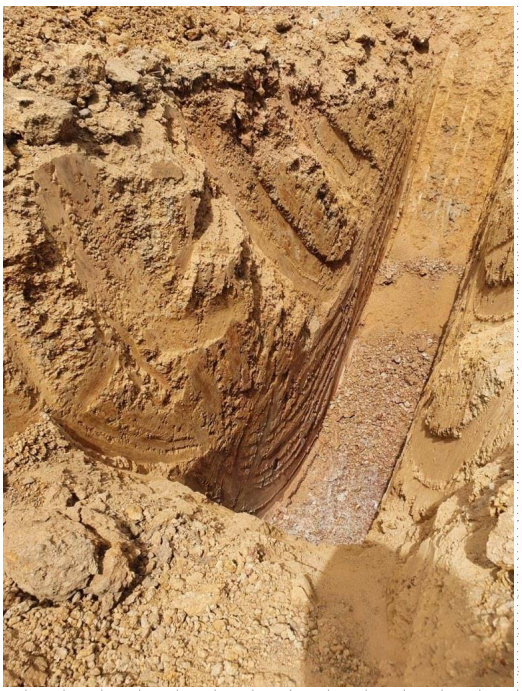
TEST PIT: TP19

Sheet 1 OF 1

Job Number:	J2201016	**Contractor:**	ANH Contracting	**Date:**	03/02/2022
Client:	Porter Consulting Engineers	**Machine:**	Volvo EC300DL	**Logged:**	AQ
Project:	Proposed Commercial and Industrial Development	**Operator:**	Neil	**Checked Date:**	25/02/2022
Location:	Lot 806 South Western Highway, Byford	**Bucket:**	730 mm tooth	**Checked By:**	HWC
		Width:	1 m **Length:** 3.5 m		

Excavation					Sampling		Field Material Description					
METHOD	EXCAVATION RESISTANCE	WATER	DEPTH (metres)	*DEPTH* RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	SOIL CLASS	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
E	F		0.0					GC	Clayey GRAVEL: fine to coarse grained, sub-rounded to sub-angular, orange, medium plasticity fines, with sand	D		Density not assessed
			0.5					GC-CH	Clayey GRAVEL/ Gravelly Sandy CLAY: high plasticity, fine to coarse grained variably cemented gravel, grey mottled orange, with fine to coarse grained sand	M		
			1.0						Red-grey			
			1.5									
			2.0									
			2.5						Hole terminated at 2.50 m Target depth Groundwater not encountered			
			3.0									
			3.5									
			4.0									
			4.5									
			5.0									
			5.5									

Sketch & Other Observations



Comments:

See Explanatory Notes and Method of Soil Description sheets for details of abbreviations and basis of descriptions

TEST PIT: TP20

Sheet 1 OF 1

Job Number:	J2201016	**Contractor:**	ANH Contracting	**Date:**	03/02/2022
Client:	Porter Consulting Engineers	**Machine:**	Volvo EC300DL	**Logged:**	AQ
Project:	Proposed Commercial and Industrial Development	**Operator:**	Neil	**Checked Date:**	25/02/2022
Location:	Lot 806 South Western Highway, Byford	**Bucket:**	730 mm tooth	**Checked By:**	HWC
		Width:	1 m **Length:** 3.5 m		

Excavation					Sampling		Field Material Description					
METHOD	EXCAVATION RESISTANCE	WATER	DEPTH (metres)	*DEPTH* RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	SOIL CLASS	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
E	H		0.0					GC	Clayey GRAVEL: fine to coarse grained, sub-rounded to sub-angular, orange, medium plasticity fines, with sand	D		Density not assessed
	F		0.5					GC-CH	Clayey GRAVEL / Gravelly Sandy CLAY: high plasticity, fine to coarse grained variably cemented gravel, grey mottled orange, with fine to coarse grained sand	M		
			1.0						Grey mottled red			
			1.5									
			2.0									
			2.5						Hole terminated at 2.50 m Target depth Groundwater not encountered			
			3.0									
			3.5									
			4.0									
			4.5									
			5.0									
			5.5									

Sketch & Other Observations

Comments:

See Explanatory Notes and Method of Soil Description sheets for details of abbreviations and basis of descriptions

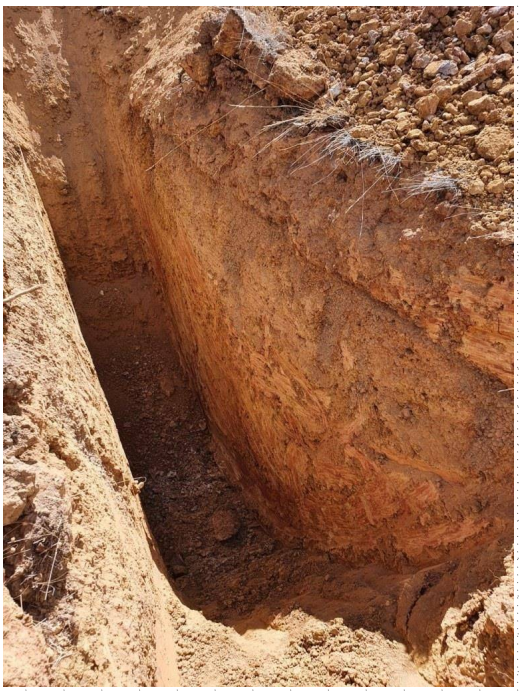
TEST PIT: TP21

Sheet 1 OF 1

Job Number:	J2201016	**Contractor:**	ANH Contracting	**Date:**	03/02/2022
Client:	Porter Consulting Engineers	**Machine:**	Volvo EC300DL	**Logged:**	AQ
Project:	Proposed Commercial and Industrial Development	**Operator:**	Neil	**Checked Date:**	25/02/2022
Location:	Lot 806 South Western Highway, Byford	**Bucket:**	730 mm tooth	**Checked By:**	HWC
		Width: 1 m	**Length:** 3.5 m		

Excavation					Sampling		Field Material Description					
METHOD	EXCAVATION RESISTANCE	WATER	DEPTH (metres)	*DEPTH* RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	SOIL CLASS	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
E	H		0.0					GC	Clayey GRAVEL: fine to coarse grained, sub-angular to sub-rounded, orange mottled brown, medium plasticity fines, trace sand Grading to"	D		Density not assessed
			1.0					GC-CH	Clayey GRAVEL / Gravelly Sandy CLAY: high plasticity, fine to coarse grained variably cemented gravel, grey mottled orange, with fine to coarse grained sand	M		
	F		2.5						Grey mottled red Hole terminated at 2.50 m Target depth Groundwater not encountered			
			5.5									

Sketch & Other Observations



Comments:

See Explanatory Notes and Method of Soil Description sheets for details of abbreviations and basis of descriptions

TEST PIT: TP22

Sheet 1 OF 1

Job Number:	J2201016	**Contractor:**	ANH Contracting	**Date:**	03/02/2022
Client:	Porter Consulting Engineers	**Machine:**	Volvo EC300DL	**Logged:**	AQ
Project:	Proposed Commercial and Industrial Development	**Operator:**	Neil	**Checked Date:**	25/02/2022
Location:	Lot 806 South Western Highway, Byford	**Bucket:**	730 mm tooth	**Checked By:**	HWC
		Width:	1 m **Length:** 3.5 m		

Excavation					Sampling		Field Material Description				
METHOD	EXCAVATION RESISTANCE	WATER	DEPTH (metres)	*DEPTH* RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	SOIL CLASS	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
E	H		0.0		B(TP22-01)			CI	Sandy CLAY: medium plasticity, orange mottled red, approximately 50% sand, with gravel, roots to 0.5 m	D		Density not assessed
			0.5					GC	Clayey GRAVEL: fine to coarse grained, sub-angular to sub-rounded, orange mottled brown, medium plasticity fines, trace sand Grading to"			
	F		1.0					GC-CH	Clayey GRAVEL / Gravelly Sandy CLAY: high plasticity, fine to coarse grained variably cemented gravel, grey mottled orange, with fine to coarse grained sand	M		
			2.5						Hole terminated at 2.50 m Target depth Groundwater not encountered			
			3.0									
			3.5									
			4.0									
			4.5									
			5.0									
			5.5									

Sketch & Other Observations

Comments:

See Explanatory Notes and Method of Soil Description sheets for details of abbreviations and basis of descriptions

TEST PIT: TP23

Job Number: J2201016
Client: Porter Consulting Engineers
Project: Proposed Commercial and Industrial Development
Location: Lot 806 South Western Highway, Byford

Contractor: ANH Contracting
Machine: Volvo EC300DL
Operator: Neil
Bucket: 730 mm tooth
Width: 1 m **Length:** 3.5 m

Date: 03/02/2022
Logged: AQ
Checked Date: 25/02/2022
Checked By: HWC

Excavation					Sampling		Field Material Description					
METHOD	EXCAVATION RESISTANCE	WATER	DEPTH (metres)	*DEPTH* RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	SOIL CLASS	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
E	H		0.0					GC	Clayey GRAVEL: fine to coarse grained, sub-angular to sub-rounded, orange mottled brown, medium plasticity fines, trace sand Grading to:	D		Density not assessed
	F		0.5						Clayey GRAVEL / Gravelly Sandy CLAY: high plasticity, fine to coarse grained variably cemented gravel, grey mottled orange, with fine to coarse grained sand			
	F-E		1.0					GC-CH	Low plasticity, grey/white	M		
			1.5									
			2.0									
			2.5									
			3.0									
			3.5									
			4.0						Hole terminated at 3.70 m Target depth Groundwater not encountered			
			4.5									
			5.0									
			5.5									

Sketch & Other Observations

Comments:

See Explanatory Notes and Method of Soil Description sheets for details of abbreviations and basis of descriptions

TEST PIT: TP24

Job Number:	J2201016	**Contractor:**	ANH Contracting	**Date:**	03/02/2022
Client:	Porter Consulting Engineers	**Machine:**	Volvo EC300DL	**Logged:**	AQ
Project:	Proposed Commercial and Industrial Development	**Operator:**	Neil	**Checked Date:**	25/02/2022
Location:	Lot 806 South Western Highway, Byford	**Bucket:**	730 mm tooth	**Checked By:**	HWC
		Width:	1 m **Length:** 3.5 m		

Excavation					Sampling		Field Material Description					
METHOD	EXCAVATION RESISTANCE	WATER	DEPTH (metres)	*DEPTH* RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	SOIL CLASS	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
E	F		0.0		B(TP24-01)			SC / CL	Clayey SAND/Sandy CLAY: fine grained, low plasticity fines, red, with gravel, rootlets to 0.1 m	D		Density not assessed
			0.5					GC	Clayey GRAVEL: fine to coarse grained, sub-angular to sub-rounded, orange mottled brown, medium plasticity fines, trace sand Grading to:			
			1.0					GC-CH	Clayey GRAVEL / Gravelly Sandy CLAY: high plasticity, fine to coarse grained variably cemented gravel, grey mottled orange, with fine to coarse grained sand	M		
			1.5									
			2.0						Grey mottled red			
			2.5						Hole terminated at 2.50 m Target depth Groundwater not encountered			
			3.0									
			3.5									
			4.0									
			4.5									
			5.0									
			5.5									

Sketch & Other Observations

Comments:

See Explanatory Notes and Method of Soil Description sheets for details of abbreviations and basis of descriptions

Appendix C: Laboratory Test Results

Galt Geotechnics Pty Ltd

www.galtgeo.com.au
50 Edward Street OSBORNE PARK WA 6017

ABN: 64 625 054 729

WESTERN GEOTECHNICAL & Laboratory Services

SOIL | AGGREGATE | CONCRETE | CRUSHING

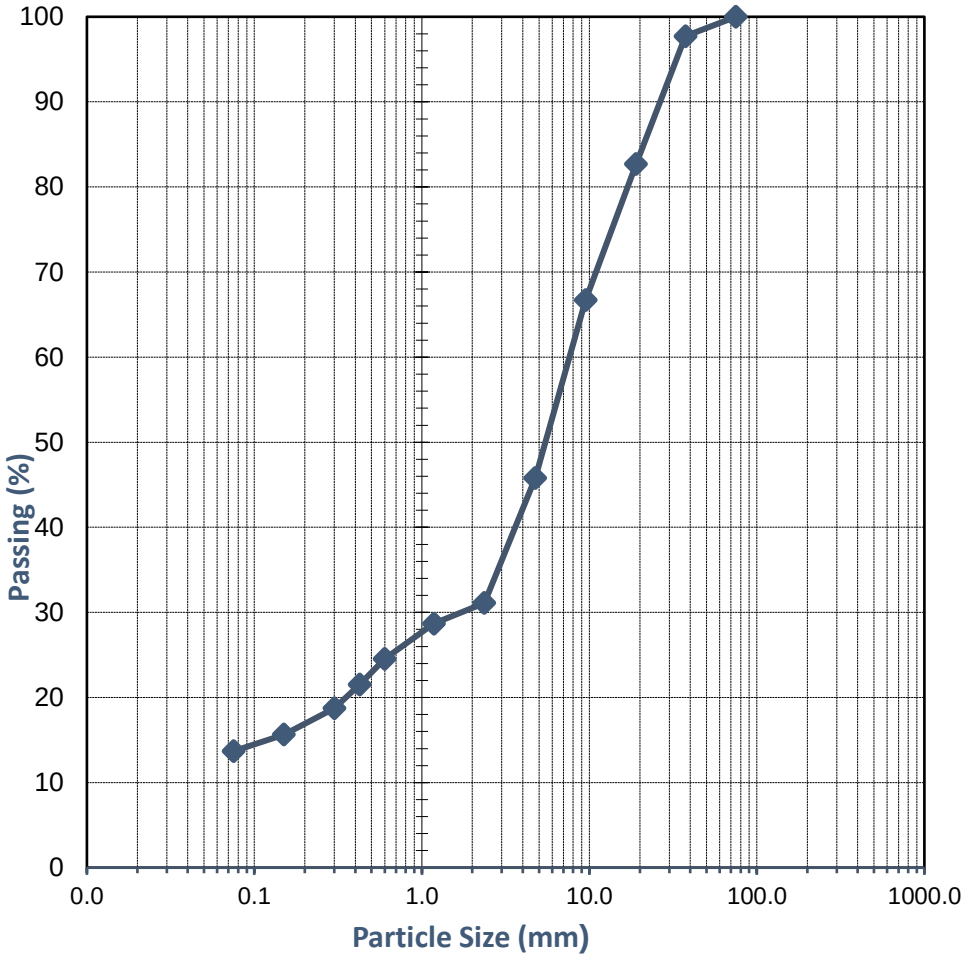
TEST REPORT - AS 1289.3.6.1

Client:	Porter Consulting Engineers	*Ticket No.*	S5428
Client Address:	-	*Report No.*	WG22.2122_1_PSD
Project:	Proposed Commercial and Industrial Development	*Sample No.*	WG22.2122
Location:	Lot 806 South Western Highway, Byford	*Date Sampled:*	Not Specified
Sample Identification:	TP02 (1.0-1.5)m	*Date Tested:*	10/02 - 11/02/2022

TEST RESULTS - Particle Size Distribution of Soil

Sampling Method: Sampled by Client, Tested as Received

Sieve Size (mm)	Percent Passing Sieve (%)
150.0	
100.0	
75.0	100
37.5	98
19.0	83
9.5	67
4.75	46
2.36	31
1.18	29
0.600	25
0.425	22
0.300	19
0.150	16
0.075	14



Comments:

Ordinary Council Meeting - 17 June 2024

Approved Signatory: Cody O'Neill

Name: Cody O'Neill

Date: 11/February/2022

NATA WORLD RECOGNISED ACCREDITATION

Accreditation No. 20599
Accredited for compliance with ISO/IEC 17025 - Testing

WESTERN GEOTECHNICAL & Laboratory Services

SOIL | AGGREGATE | CONCRETE | CRUSHING

TEST REPORT - AS 1289.3.1.1, 3.2.1, 3.3.1 & 3.4.1

Client:	Porter Consulting Engineers	*Ticket No.*	S5428
Client Address:	-	*Report No.*	WG22.2122_1_PI
Project:	Proposed Commercial and Industrial Development	*Sample No.*	WG22.2122
Location:	Lot 806 South Western Highway, Byford	*Date Sampled:*	Not Specified
Sample Identification:	TP02 (1.0-1.5)m	*Date Tested:*	11/02/2022

TEST RESULTS - Consistency Limits (Casagrande)

Sampling Method:	**Sampled by Client, Tested as Received**
History of Sample:	**Oven Dried <50°C**
Method of Preparation:	**Dry Sieved**

AS 1289.3.1.1	**Liquid Limit (%)**	**50**
AS 1289.3.2.1	**Plastic Limit (%)**	**25**
AS 1289.3.3.1	**Plasticity Index (%)**	**25**
AS 1289.3.4.1	**Linear Shrinkage (%)**	**8.0**
AS 1289.3.4.1	**Length of Mould (mm)**	**250**
AS 1289.3.4.1	**Condition of Dry Specimen:**	**-**

Comments:

Ordinary Council Meeting - 17 June 2024

Approved Signatory: Coneill

Name: Cody O'Neill

Date: 14/February/2022

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WESTERN GEOTECHNICAL & Laboratory Services

SOIL | AGGREGATE | CONCRETE | CRUSHING

TEST REPORT - AS 1289.5.2.1

Client:	Porter Consulting Engineers	*Ticket No.*	S5428
Client Address:	-	*Report No.*	WG22.2122_1_MMDD
Project:	Proposed Commercial and Industrial Development	*Sample No.*	WG22.2122
Location:	Lot 806 South Western Highway, Byford	*Date Sampled:*	Not Specified
Sample Identification:	TP02 (1.0-1.5)m	*Date Tested:*	11-02-2022

TEST RESULTS - Modified Maximum Dry Density

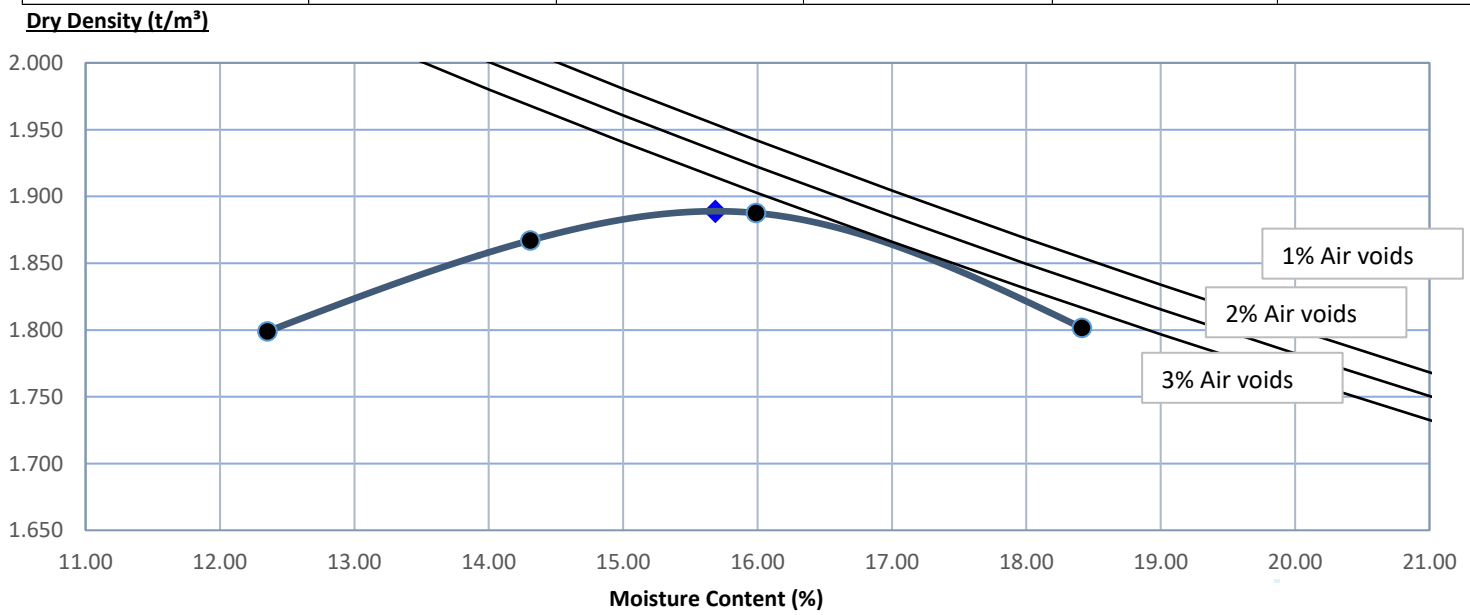
Sampling Method: Sampled by Client, Tested as Received

Sample Curing Time: 24 hours

Method used to Determine Liquid Limit: Visual / Tactile Assessment by Competent Technician

Material + 19.0mm (%): 18 **Material + 37.5mm (%)** -

Moisture Content (%)	12.4	14.3	16.0	18.4	
Dry Density (t/m³)	1.799	1.867	1.888	1.802	



Modified Maximum Dry Density (t/m³) **1.89**

Optimum Moisture Content (%) **15.5**

Comments: *The above air void lines are derived from a calculated apparent particle density of 2.858 t/m³*

Approved Signatory:

Name: Brooke Elliott

Date: 14-February-2022

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WESTERN GEOTECHNICAL & Laboratory Services

SOIL | AGGREGATE | CONCRETE | CRUSHING

TEST REPORT - AS 1289.6.1.1

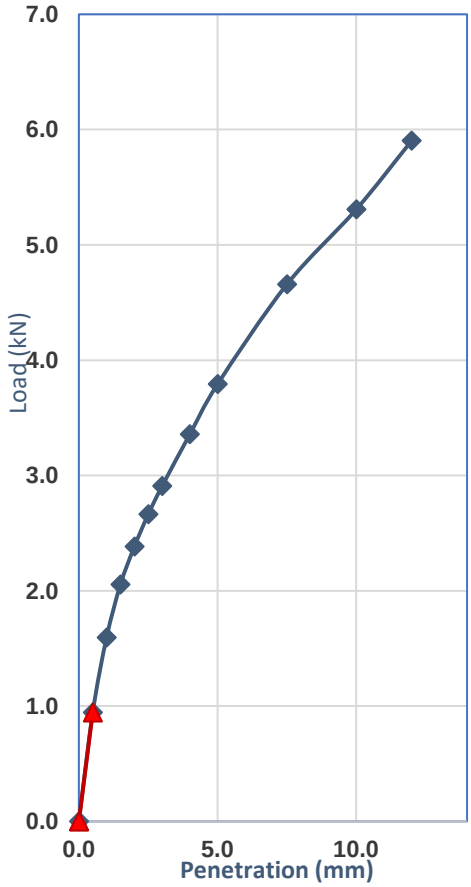
Client:	Porter Consulting Engineers	*Ticket No.*	S5428
Client Address:	-	*Report No.*	WG22.2122_1_SCBR
Project:	Proposed Commercial and Industrial Development	*Sample No.*	WG22.2122
Location:	Lot 806 South Western Highway, Byford	*Date Sampled:*	Not Specified
Sample Identification:	TP02 (1.0-1.5)m	*Date Tested:*	11/02 - 18/02/2022

TEST RESULTS - CALIFORNIA BEARING RATIO

Sample Description: Silty Sandy Gravel with Clay

Sampling Method: Sampled by Client, Tested as Received

Load Penetration Curve



Compaction Details			
Compaction Method	AS 1289.5.2.1	Hammer Type	Modified
Plasticity Determined by	Estimated	Curing Time (Hours)	24.0
% Retained 19.0mm	18	Excluded/Replaced	Excluded
Maximum Dry Density (t/m^3)	1.89	Optimum Moisture (%)	15.5
Target Dry Density Ratio (%)	95	Target Moisture Ratio (%)	100

Specimen Conditions At Compaction			
Dry Density (t/m3)	1.80	Moisture Content (%)	16.2
Density Ratio (%)	95.0	Moisture Ratio (%)	103.0

Specimen Conditions After Soak			
Soaked or Unsoaked	Soaked	Soaking Period (days)	4
Surcharges Applied (kg)	6.75	Measured Swell (%)	0.5
Dry Density (t/m³)	1.79	Dry Density Ratio (%)	94.5
Moisture Content (%)	19.7	Moisture Ratio (%)	125.5

Specimen Conditions After Test			
Top 30mm Moisture (%)	18.8	Remaining Depth (%)	18.1

Correction applied to Penetration: 0mm

Determined at a Penetration of: 2.5mm

California Bearing Ratio (CBR): 20%

Comments:

Approved Signatory:

Name: Brooke Elliott

Date: 21-February-2022

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WESTERN GEOTECHNICAL & Laboratory Services

SOIL | AGGREGATE | CONCRETE | CRUSHING

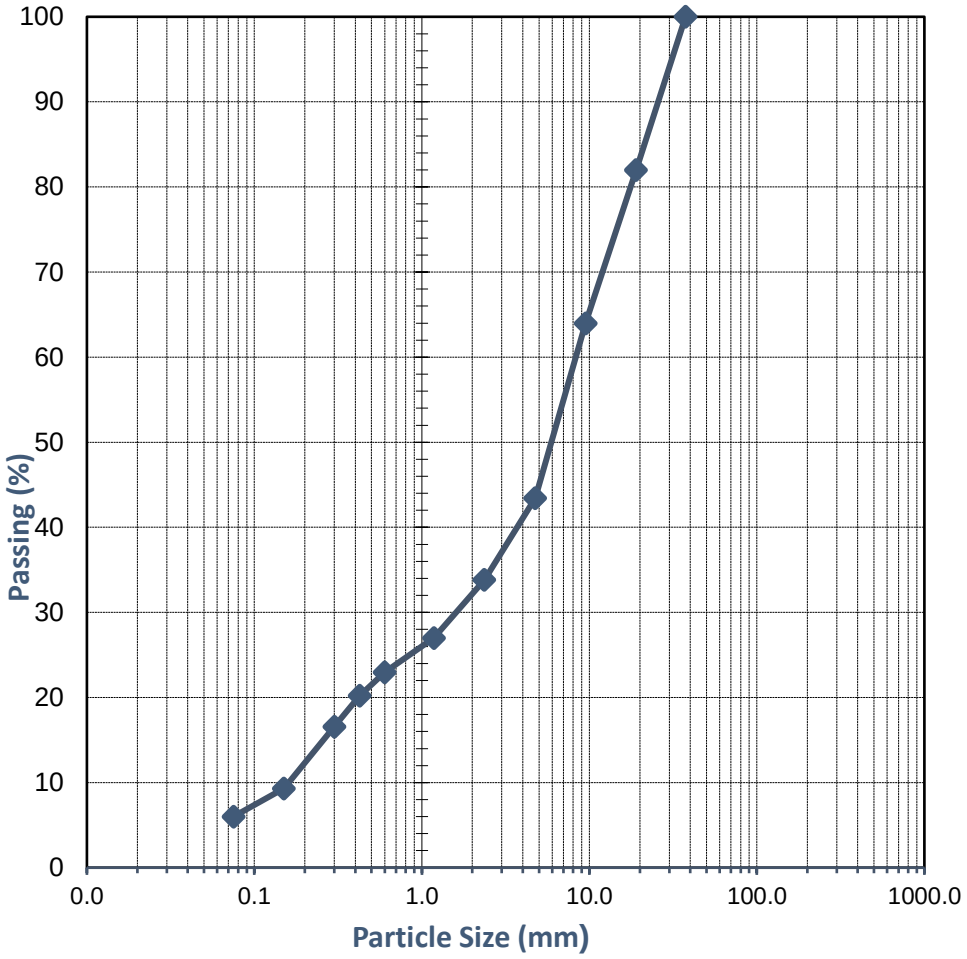
TEST REPORT - AS 1289.3.6.1

Client:	Porter Consulting Engineers	*Ticket No.*	S5428
Client Address:	-	*Report No.*	WG22.2123_1_PSD
Project:	Proposed Commercial and Industrial Development	*Sample No.*	WG22.2123
Location:	Lot 806 South Western Highway, Byford	*Date Sampled:*	Not Specified
Sample Identification:	TP03 (0.6-1.6)m	*Date Tested:*	10/02 - 11/02/2022

TEST RESULTS - Particle Size Distribution of Soil

Sampling Method: Sampled by Client, Tested as Received

Sieve Size (mm)	Percent Passing Sieve (%)
150.0	
100.0	
75.0	
37.5	100
19.0	82
9.5	64
4.75	43
2.36	34
1.18	27
0.600	23
0.425	20
0.300	17
0.150	9
0.075	6



Comments:

Approved Signatory: Cody O'Neill

Name: Cody O'Neill

Date: 11/February/2022

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WESTERN GEOTECHNICAL & Laboratory Services

SOIL | AGGREGATE | CONCRETE | CRUSHING

TEST REPORT - AS 1289.3.1.2, 3.2.1, 3.3.1 & 3.4.1

Client:	Porter Consulting Engineers	*Ticket No.*	S5428
Client Address:	-	*Report No.*	WG22.2123_1_PI
Project:	Proposed Commercial and Industrial Development	*Sample No.*	WG22.2123
Location:	Lot 806 South Western Highway, Byford	*Date Sampled:*	Not specified
Sample Identification:	TP03 (0.6-1.6)m	*Date Tested:*	11/02/2022

TEST RESULTS - Consistency Limits (Casagrande)

Sampling Method:	**Sampled by Client, Tested as Received**
History of Sample:	**Oven Dried <50°C**
Method of Preparation:	**Dry Sieved**

AS 1289.3.1.2	**Liquid Limit (%)**	**17**
AS 1289.3.2.1	**Plastic Limit (%)**	**13**
AS 1289.3.3.1	**Plasticity Index (%)**	**4**
AS 1289.3.4.1	**Linear Shrinkage (%)**	**1.5**
AS 1289.3.4.1	**Length of Mould (mm)**	**250**
AS 1289.3.4.1	**Condition of Dry Specimen**	**-**

Comments:

Ordinary Council Meeting - 17 June 2024

Approved Signatory:

Name: Cody O'Neill

Date: 14/February/2022

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WESTERN GEOTECHNICAL & Laboratory Services

SOIL | AGGREGATE | CONCRETE | CRUSHING

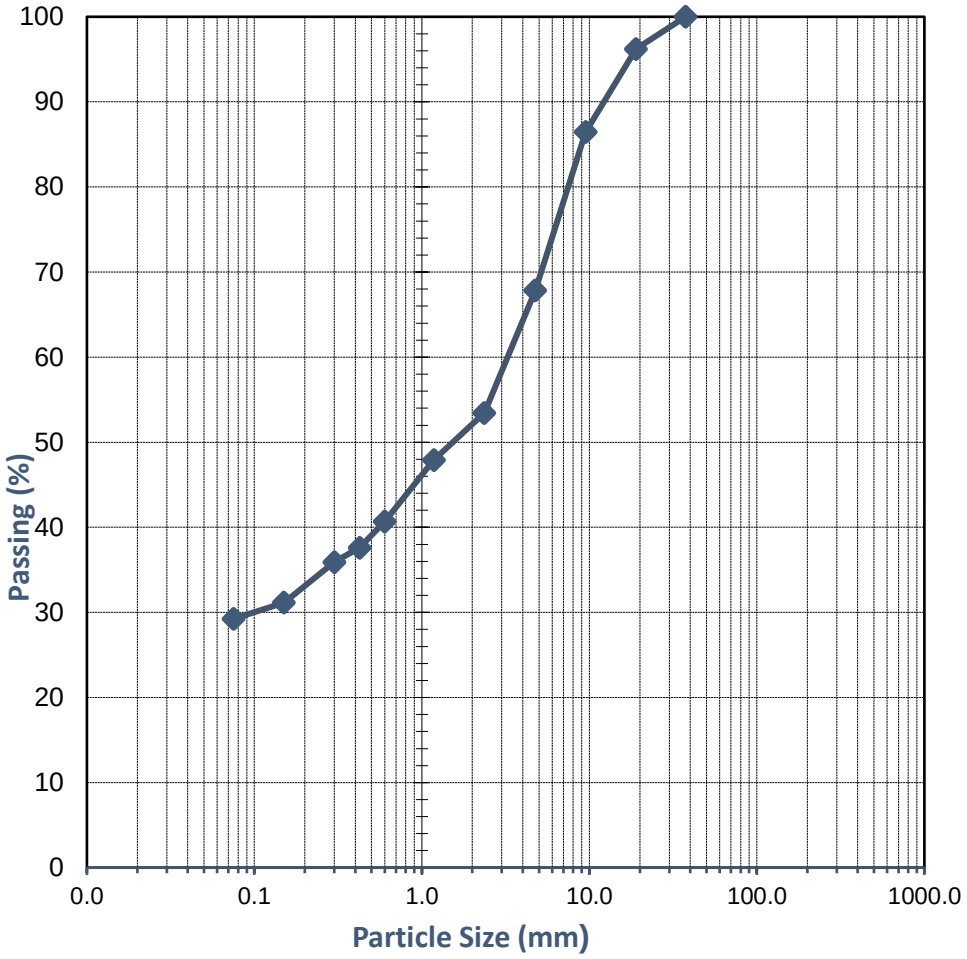
TEST REPORT - AS 1289.3.6.1

Client:	Porter Consulting Engineers	*Ticket No.*	S5428
Client Address:	-	*Report No.*	WG22.2124_1_PSD
Project:	Proposed Commercial and Industrial Development	*Sample No.*	WG22.2124
Location:	Lot 806 South Western Highway, Byford	*Date Sampled:*	Not Specified
Sample Identification:	TP05 (1.3-2.2)m	*Date Tested:*	10/02 - 11/02/2022

TEST RESULTS - Particle Size Distribution of Soil

Sampling Method: Sampled by Client, Tested as Received

Sieve Size (mm)	Percent Passing Sieve (%)
150.0	
100.0	
75.0	
37.5	100
19.0	96
9.5	86
4.75	68
2.36	53
1.18	48
0.600	41
0.425	38
0.300	36
0.150	31
0.075	29



Comments:

Ordinary Council Meeting - 17 June 2024

Approved Signatory: Cody O'Neill

Name: Cody O'Neill

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Accreditation No. 20599
Accredited for compliance with ISO/IEC 17025 - Testing

WESTERN GEOTECHNICAL & Laboratory Services

SOIL | AGGREGATE | CONCRETE | CRUSHING

TEST REPORT - AS 1289.3.1.1, 3.2.1, 3.3.1 & 3.4.1

Client:	Porter Consulting Engineers	*Ticket No.*	S5428
Client Address:	-	*Report No.*	WG22.2124_1_PI
Project:	Proposed Commercial and Industrial Development	*Sample No.*	WG22.2124
Location:	Lot 806 South Western Highway, Byford	*Date Sampled:*	Not Specified
Sample Identification:	TP05 (1.3-2.2)m	*Date Tested:*	11/02/2022

TEST RESULTS - Consistency Limits (Casagrande)

Sampling Method:	**Sampled by Client, Tested as Received**
History of Sample:	**Oven Dried <50°C**
Method of Preparation:	**Dry Sieved**

AS 1289.3.1.1	**Liquid Limit (%)**	**59**
AS 1289.3.2.1	**Plastic Limit (%)**	**26**
AS 1289.3.3.1	**Plasticity Index (%)**	**33**
AS 1289.3.4.1	**Linear Shrinkage (%)**	**11.0**
AS 1289.3.4.1	**Length of Mould (mm)**	**250**
AS 1289.3.4.1	**Condition of Dry Specimen:**	**-**

Comments:

Ordinary Council Meeting - 17 June 2024

Approved Signatory:

Name: Cody O'Neill

Date: 14/February/2022

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WESTERN GEOTECHNICAL & Laboratory Services

SOIL | AGGREGATE | CONCRETE | CRUSHING

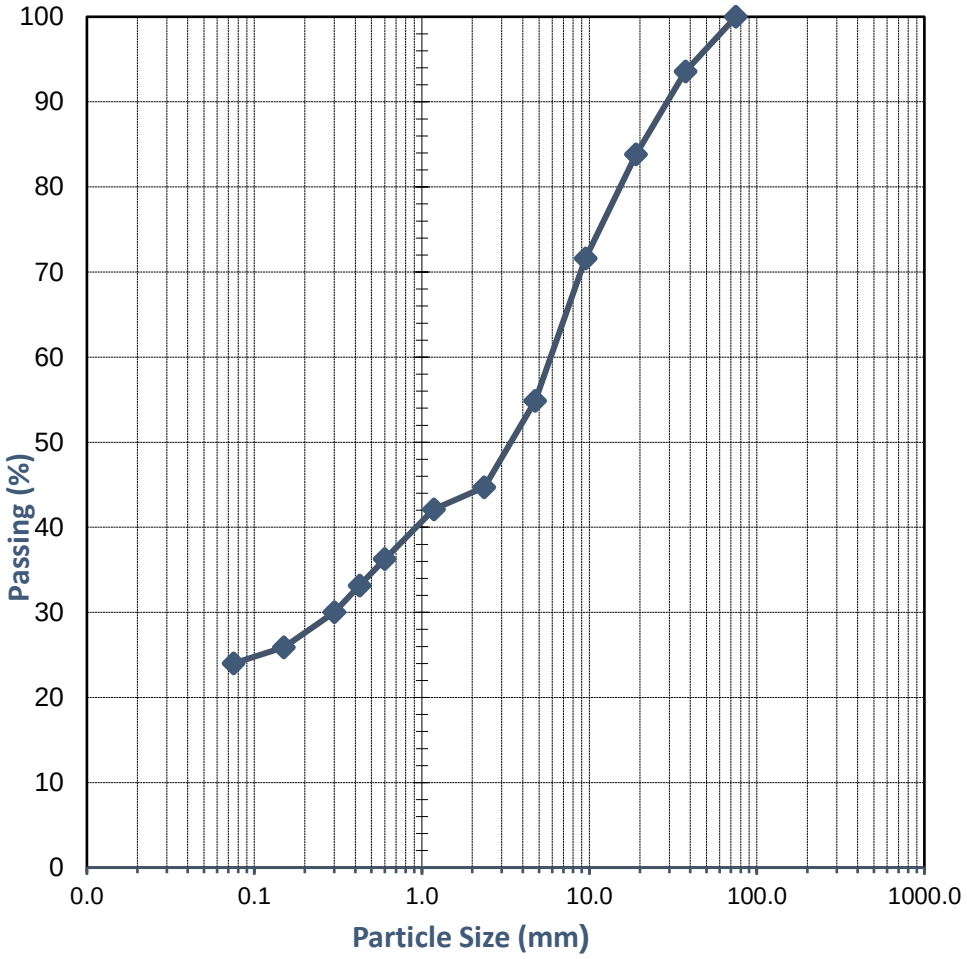
TEST REPORT - AS 1289.3.6.1

Client:	Porter Consulting Engineers	*Ticket No.*	S5428
Client Address:	-	*Report No.*	WG22.2125_1_PSD
Project:	Proposed Commercial and Industrial Development	*Sample No.*	WG22.2125
Location:	Lot 806 South Western Highway, Byford	*Date Sampled:*	Not Specified
Sample Identification:	TP05 (2.2-3.0)m	*Date Tested:*	10/02 - 11/02/2022

TEST RESULTS - Particle Size Distribution of Soil

Sampling Method: Sampled by Client, Tested as Received

Sieve Size (mm)	Percent Passing Sieve (%)
150.0	
100.0	
75.0	100
37.5	94
19.0	84
9.5	72
4.75	55
2.36	45
1.18	42
0.600	36
0.425	33
0.300	30
0.150	26
0.075	24



Comments:

Ordinary Council Meeting - 17 June 2024

Approved Signatory: Cody O'Neill

Name: Cody O'Neill

Date: 11/February/2022

NATA WORLD RECOGNISED ACCREDITATION

Accreditation No. 20599
Accredited for compliance with ISO/IEC 17025 - Testing

WESTERN GEOTECHNICAL & Laboratory Services

SOIL | AGGREGATE | CONCRETE | CRUSHING

TEST REPORT - AS 1289.3.1.1, 3.2.1, 3.3.1 & 3.4.1

Client:	Porter Consulting Engineers	*Ticket No.*	S5428
Client Address:	-	*Report No.*	WG22.2125_1_PI
Project:	Proposed Commercial and Industrial Development	*Sample No.*	WG22.2125
Location:	Lot 806 South Western Highway, Byford	*Date Sampled:*	Not Specified
Sample Identification:	TP05 (2.2-3.0)m	*Date Tested:*	11/02/2022

TEST RESULTS - Consistency Limits (Casagrande)

Sampling Method:	**Sampled by Client, Tested as Received**
History of Sample:	**Oven Dried <50°C**
Method of Preparation:	**Dry Sieved**

AS 1289.3.1.1	**Liquid Limit (%)**	**54**
AS 1289.3.2.1	**Plastic Limit (%)**	**22**
AS 1289.3.3.1	**Plasticity Index (%)**	**32**
AS 1289.3.4.1	**Linear Shrinkage (%)**	**10.0**
AS 1289.3.4.1	**Length of Mould (mm)**	**250**
AS 1289.3.4.1	**Condition of Dry Specimen:**	**-**

Comments:

Ordinary Council Meeting - 17 June 2024

Approved Signatory:

Name: Cody O'Neill

Date: 14/February/2022

NATA WORLD RECOGNISED ACCREDITATION

Accreditation No. 20599
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WESTERN GEOTECHNICAL & Laboratory Services

SOIL | AGGREGATE | CONCRETE | CRUSHING

TEST REPORT - AS 1289.5.2.1

Client:	Porter Consulting Engineers	*Ticket No.*	S5428
Client Address:	-	*Report No.*	WG22.2125_1_MMDD
Project:	Proposed Commercial and Industrial Development	*Sample No.*	WG22.2125
Location:	Lot 806 South Western Highway, Byford	*Date Sampled:*	Not Specified
Sample Identification:	TP05 (2.2-3.0)m	*Date Tested:*	11-02-2022

TEST RESULTS - Modified Maximum Dry Density

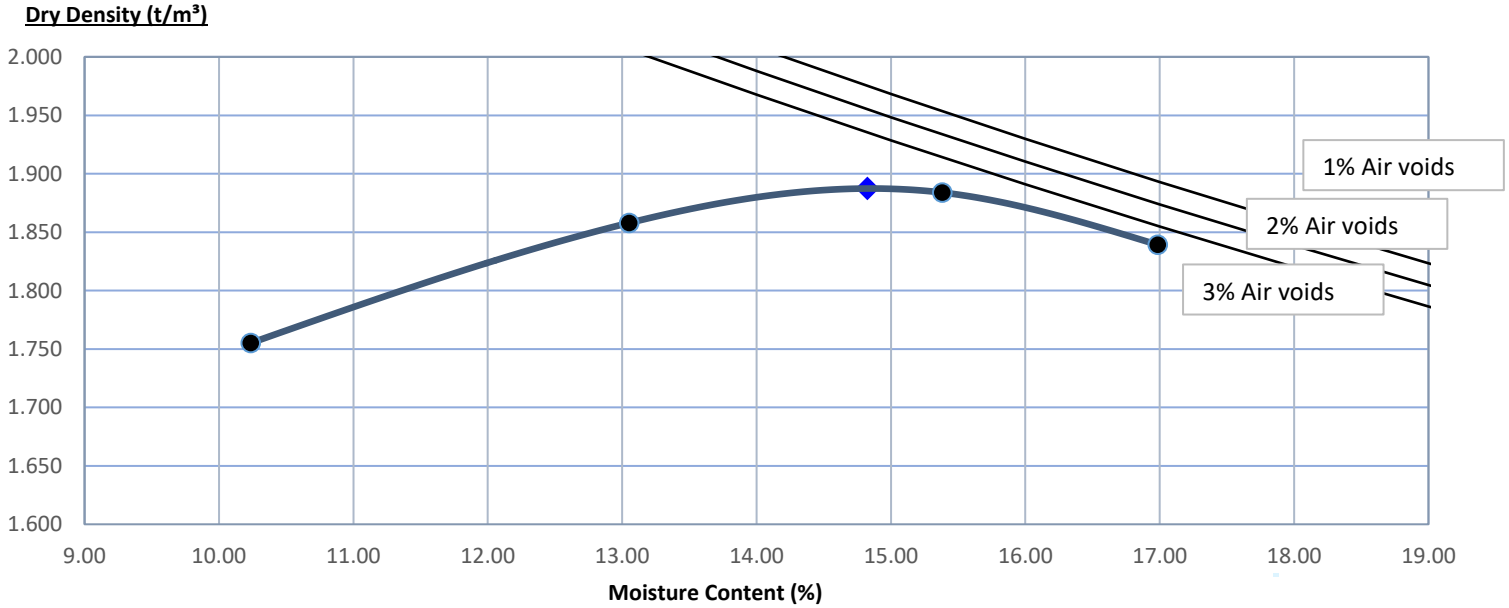
Sampling Method: Sampled by Client, Tested as Received

Sample Curing Time: 24 hours

Method used to Determine Liquid Limit: Visual / Tactile Assessment by Competent Technician

Material + 19.0mm (%): 14 **Material + 37.5mm (%)** -

Moisture Content (%)	**10.2**	**13.1**	**15.4**	**17.0**	
Dry Density (t/m³)	**1.755**	**1.858**	**1.884**	**1.839**	



Modified Maximum Dry Density (t/m³) **1.89**

Optimum Moisture Content (%) **15.0**

Comments: *The above air void lines are derived from a calculated apparent particle density of 2.833 t/m³*

Approved Signatory:

Name: Brooke Elliott

Date: 14-February-2022

Accreditation No. 20599
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WESTERN GEOTECHNICAL & Laboratory Services

SOIL | AGGREGATE | CONCRETE | CRUSHING

TEST REPORT - AS 1289.6.1.1

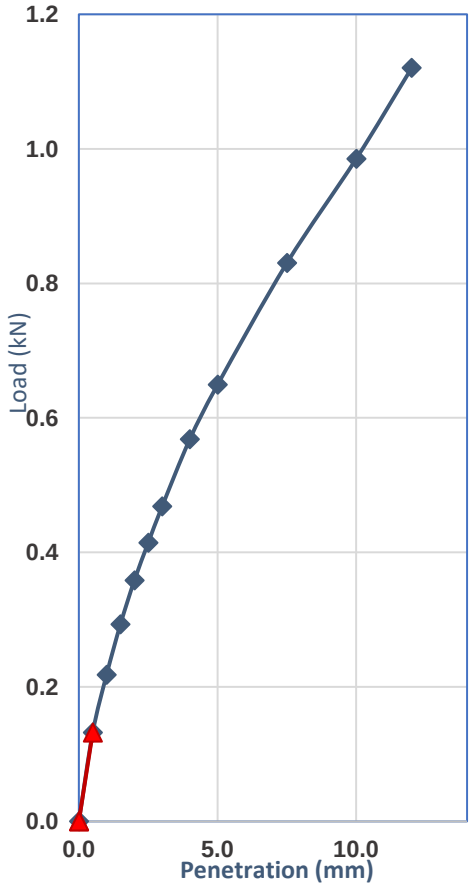
Client:	Porter Consulting Engineers	*Ticket No.*	S5428
Client Address:	-	*Report No.*	WG22.2125_1_SCBR
Project:	Proposed Commercial and Industrial Development	*Sample No.*	WG22.2125
Location:	Lot 806 South Western Highway, Byford	*Date Sampled:*	Not Specified
Sample Identification:	TP05 (2.2-3.0)m	*Date Tested:*	11/02 - 18/02/2022

TEST RESULTS - CALIFORNIA BEARING RATIO

Sample Description: Silty Gravel wit Clay

Sampling Method: Sampled by Client, Tested as Received

Load Penetration Curve



Compaction Details			
Compaction Method	AS 1289.5.2.1	Hammer Type	Modified
Plasticity Determined by	Estimated	Curing Time (Hours)	4.0
% Retained 19.0mm	14	Excluded/Replaced	Excluded
Maximum Dry Density (t/m^3)	1.89	Optimum Moisture (%)	15.0
Target Dry Density Ratio (%)	92	Target Moisture Ratio (%)	100

Specimen Conditions At Compaction			
Dry Density (t/m3)	1.74	Moisture Content (%)	14.4
Density Ratio (%)	92.5	Moisture Ratio (%)	97.5

Specimen Conditions After Soak			
Soaked or Unsoaked	Soaked	Soaking Period (days)	4
Surcharges Applied (kg)	6.75	Measured Swell (%)	1.0
Dry Density (t/m³)	1.72	Dry Density Ratio (%)	91.5
Moisture Content (%)	22.3	Moisture Ratio (%)	150.5

Specimen Conditions After Test			
Top 30mm Moisture (%)	25.9	Remaining Depth (%)	22.2

Correction applied to Penetration: 0mm

Determined at a Penetration of: 5.0mm

California Bearing Ratio (CBR): 3.5%

Comments:

Ordinary Council Meeting - 17 June 2024

Approved Signatory:

Name: Brooke Elliott

Date: 21-February-2022

NATA WORLD RECOGNISED ACCREDITATION

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WESTERN GEOTECHNICAL & Laboratory Services

SOIL | AGGREGATE | CONCRETE | CRUSHING

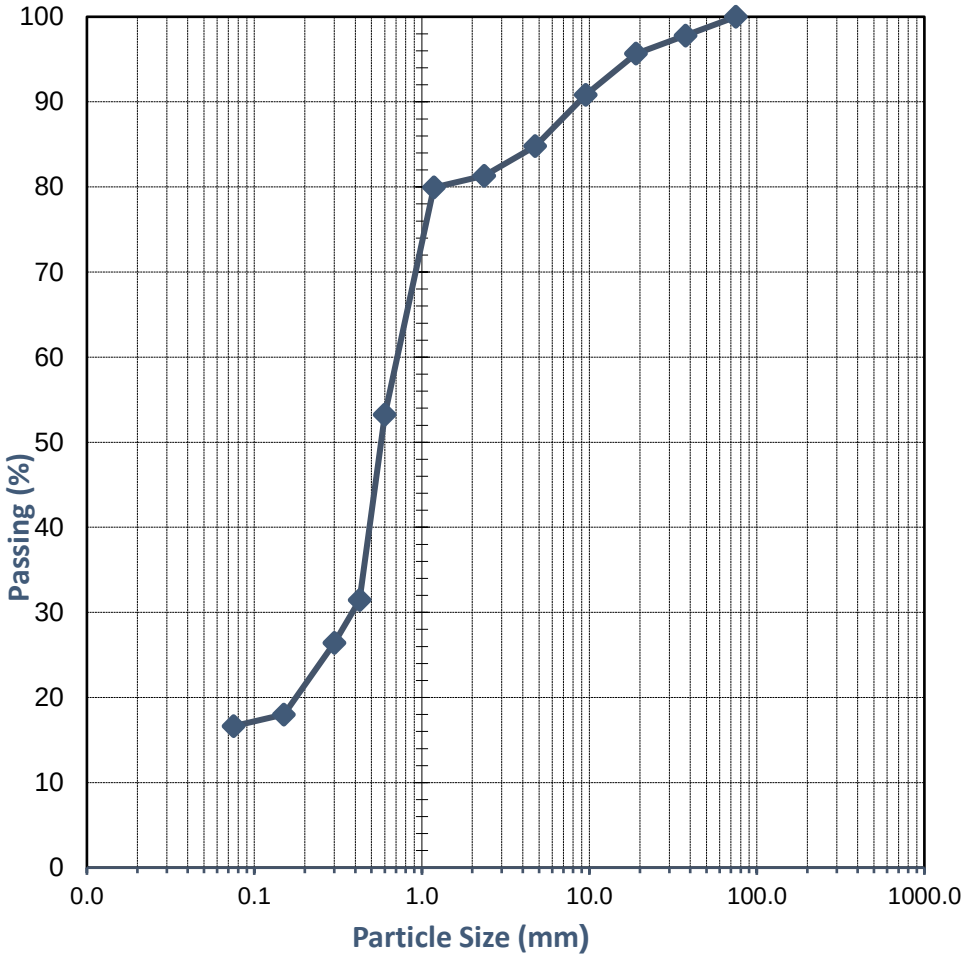
TEST REPORT - AS 1289.3.6.1

Client:	Porter Consulting Engineers	*Ticket No.*	S5428
Client Address:	-	*Report No.*	WG22.2126_1_PSD
Project:	Proposed Commercial and Industrial Development	*Sample No.*	WG22.2126
Location:	Lot 806 South Western Highway, Byford	*Date Sampled:*	Not Specified
Sample Identification:	TP11 (0.1-0.6)m	*Date Tested:*	10/02 - 11/02/2022

TEST RESULTS - Particle Size Distribution of Soil

Sampling Method: Sampled by Client, Tested as Received

Sieve Size (mm)	Percent Passing Sieve (%)
150.0	
100.0	
75.0	100
37.5	98
19.0	96
9.5	91
4.75	85
2.36	81
1.18	80
0.600	53
0.425	31
0.300	26
0.150	18
0.075	17



Comments:

Ordinary Council Meeting - 17 June 2024

Approved Signatory: Cody O'Neill

Name: Cody O'Neill

Date: 11/February/2022

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WESTERN GEOTECHNICAL & Laboratory Services

SOIL | AGGREGATE | CONCRETE | CRUSHING

TEST REPORT - AS 1289.3.1.1, 3.2.1, 3.3.1 & 3.4.1

Client:	Porter Consulting Engineers	*Ticket No.*	S5428
Client Address:	-	*Report No.*	WG22.2126_1_PI
Project:	Proposed Commercial and Industrial Development	*Sample No.*	WG22.2126
Location:	Lot 806 South Western Highway, Byford	*Date Sampled:*	Not Specified
Sample Identification:	TP11 (0.1-0.6)m	*Date Tested:*	11/02/2022

TEST RESULTS - Consistency Limits (Casagrande)

Sampling Method:	**Sampled by Client, Tested as Received**
History of Sample:	**Oven Dried <50°C**
Method of Preparation:	**Dry Sieved**

AS 1289.3.1.1	**Liquid Limit (%)**	**40**
AS 1289.3.2.1	**Plastic Limit (%)**	**18**
AS 1289.3.3.1	**Plasticity Index (%)**	**22**
AS 1289.3.4.1	**Linear Shrinkage (%)**	**8.0**
AS 1289.3.4.1	**Length of Mould (mm)**	**125**
AS 1289.3.4.1	**Condition of Dry Specimen:**	**-**

Comments:

Ordinary Council Meeting - 17 June 2024

Approved Signatory:

Name: Cody O'Neill

Date: 14/February/2022

NATA WORLD RECOGNISED ACCREDITATION

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WESTERN GEOTECHNICAL & Laboratory Services

SOIL | AGGREGATE | CONCRETE | CRUSHING

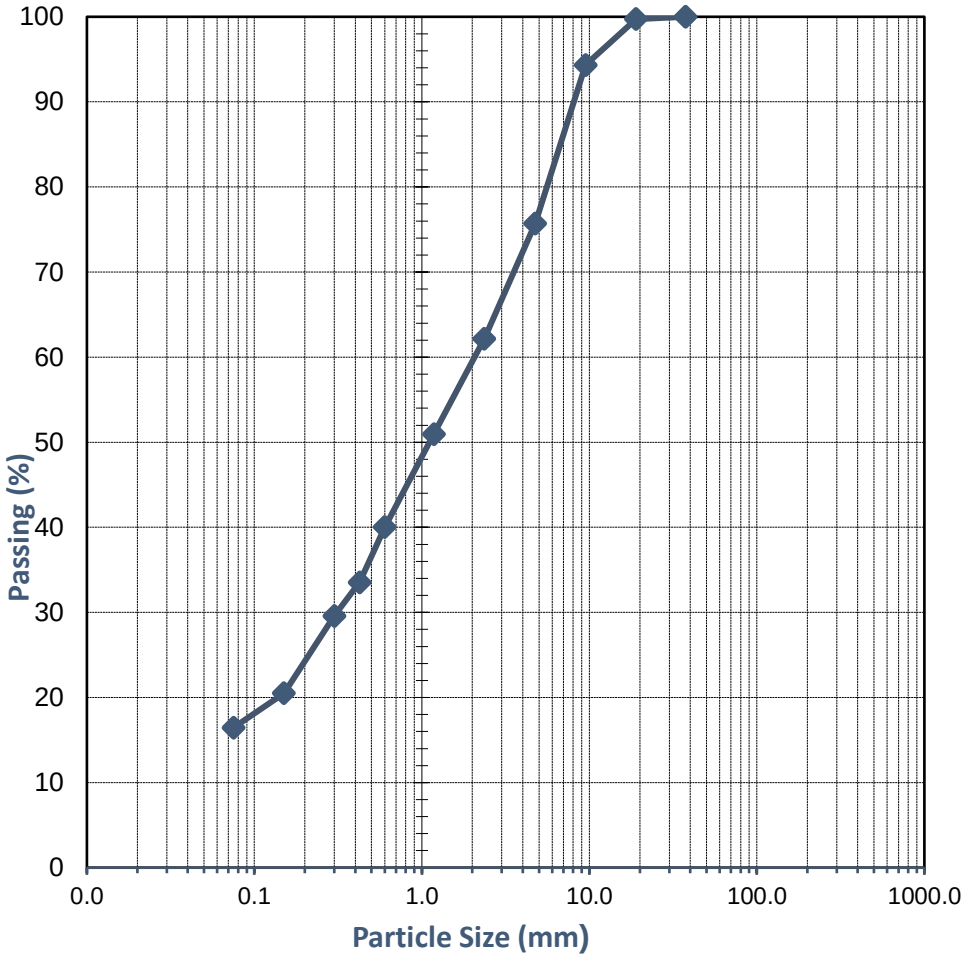
TEST REPORT - AS 1289.3.6.1

Client:	Porter Consulting Engineers	*Ticket No.*	S5428
Client Address:	-	*Report No.*	WG22.2127_1_PSD
Project:	Proposed Commercial and Industrial Development	*Sample No.*	WG22.2127
Location:	Lot 806 South Western Highway, Byford	*Date Sampled:*	Not Specified
Sample Identification:	TP16 (0.3-1.0)m	*Date Tested:*	10/02 - 11/02/2022

TEST RESULTS - Particle Size Distribution of Soil

Sampling Method: Sampled by Client, Tested as Received

Sieve Size (mm)	Percent Passing Sieve (%)
150.0	
100.0	
75.0	
37.5	100
19.0	100
9.5	94
4.75	76
2.36	62
1.18	51
0.600	40
0.425	34
0.300	30
0.150	21
0.075	16



Comments:

Ordinary Council Meeting - 17 June 2024

Approved Signatory: Cody O'Neill

Name: Cody O'Neill

Date: 11/February/2022

Accreditation No. 20599
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WESTERN GEOTECHNICAL & Laboratory Services

SOIL | AGGREGATE | CONCRETE | CRUSHING

TEST REPORT - AS 1289.3.1.1, 3.2.1, 3.3.1 & 3.4.1

Client:	Porter Consulting Engineers	*Ticket No.*	S5428
Client Address:	-	*Report No.*	WG22.2127_1_PI
Project:	Proposed Commercial and Industrial Development	*Sample No.*	WG22.2127
Location:	Lot 806 South Western Highway, Byford	*Date Sampled:*	Not Specified
Sample Identification:	TP16 (0.3-1.0)m	*Date Tested:*	11/02/2022

TEST RESULTS - Consistency Limits (Casagrande)

Sampling Method:	**Sampled by Client, Tested as Received**
History of Sample:	**Oven Dried <50°C**
Method of Preparation:	**Dry Sieved**

AS 1289.3.1.1	**Liquid Limit (%)**	**35**
AS 1289.3.2.1	**Plastic Limit (%)**	**19**
AS 1289.3.3.1	**Plasticity Index (%)**	**16**
AS 1289.3.4.1	**Linear Shrinkage (%)**	**7.0**
AS 1289.3.4.1	**Length of Mould (mm)**	**250**
AS 1289.3.4.1	**Condition of Dry Specimen:**	**-**

Comments:

Ordinary Council Meeting - 17 June 2024

Approved Signatory: Coneill

Name: Cody O'Neill

Date: 14/February/2022

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WESTERN GEOTECHNICAL & Laboratory Services

SOIL | AGGREGATE | CONCRETE | CRUSHING

TEST REPORT - AS 1289.5.2.1

Client:	Porter Consulting Engineers	*Ticket No.*	S5428
Client Address:	-	*Report No.*	WG22.2127_1_MMDD
Project:	Proposed Commercial and Industrial Development	*Sample No.*	WG22.2127
Location:	Lot 806 South Western Highway, Byford	*Date Sampled:*	Not Specified
Sample Identification:	TP16 (0.3-1.0)m	*Date Tested:*	11-02-2022

TEST RESULTS - Modified Maximum Dry Density

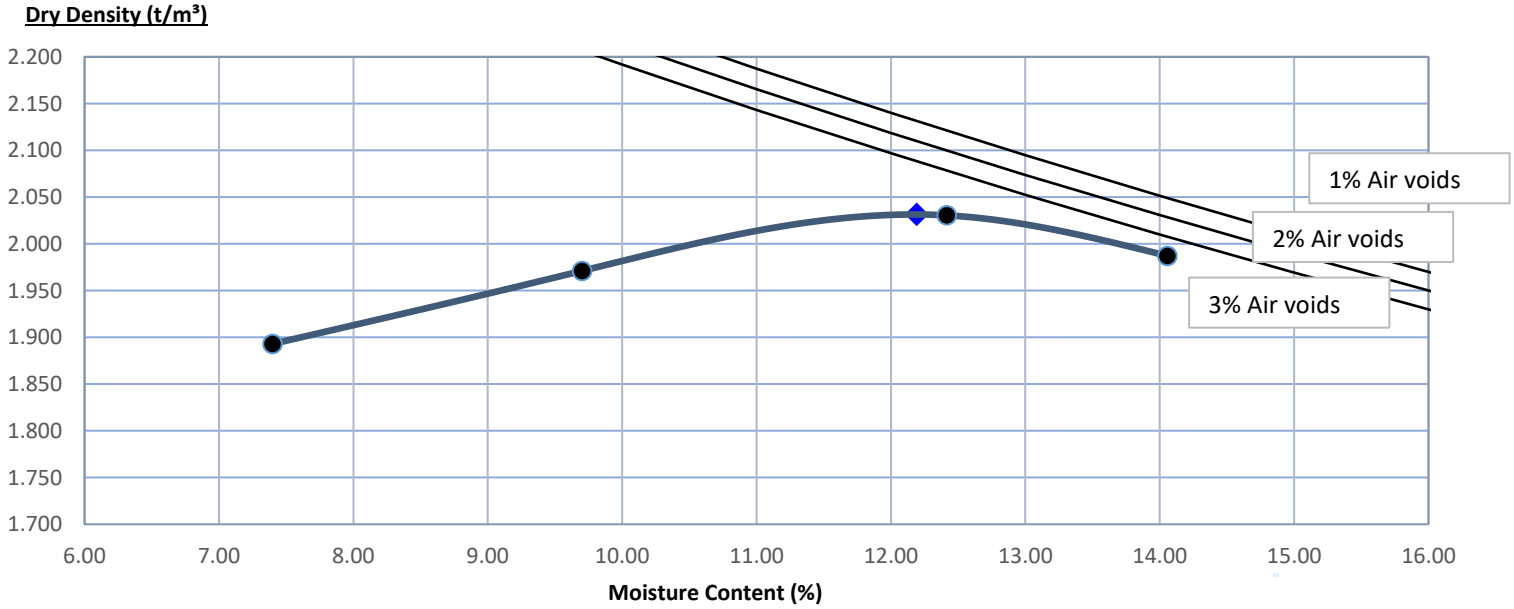
Sampling Method: Sampled by Client, Tested as Received

Sample Curing Time: 24 hours

Method used to Determine Liquid Limit: Visual / Tactile Assessment by Competent Technician

Material + 19.0mm (%): 0 **Material + 37.5mm (%)** -

Moisture Content (%)	**7.4**	**9.7**	**12.4**	**14.1**	
Dry Density (t/m³)	**1.893**	**1.971**	**2.030**	**1.987**	



Modified Maximum Dry Density (t/m³) **2.03**

Optimum Moisture Content (%) **12.0**

Comments: *The above air void lines are derived from a calculated apparent particle density of 2.919 t/m³*

Approved Signatory:

Name: Brooke Elliott

Date: 14-February-2022

Accreditation No. 20599
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WESTERN GEOTECHNICAL & Laboratory Services

SOIL | AGGREGATE | CONCRETE | CRUSHING

TEST REPORT - AS 1289.6.1.1

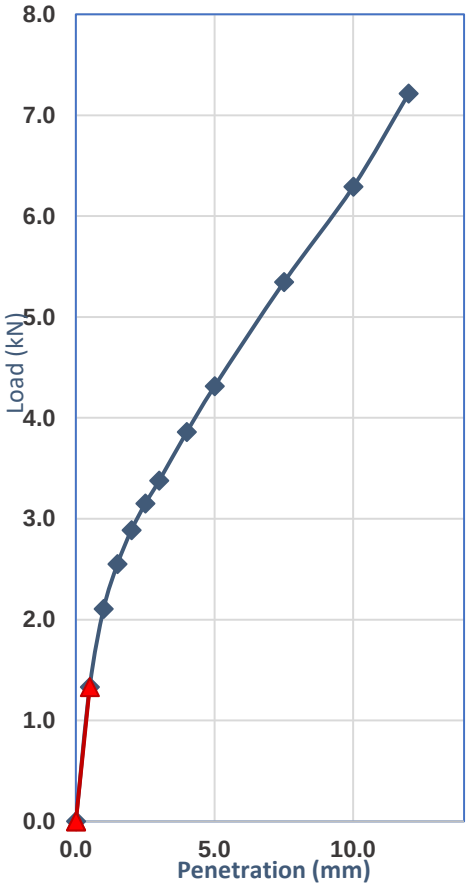
Client:	Porter Consulting Engineers	*Ticket No.*	S5428
Client Address:	-	*Report No.*	WG22.2127_1_SCBR
Project:	Proposed Commercial and Industrial Development	*Sample No.*	WG22.2127
Location:	Lot 806 South Western Highway, Byford	*Date Sampled:*	Not Specified
Sample Identification:	TP16 (0.3-1.0)m	*Date Tested:*	11/02 - 18/02/2022

TEST RESULTS - CALIFORNIA BEARING RATIO

Sample Description: Silty Sandy Gravel

Sampling Method: Sampled by Client, Tested as Received

Load Penetration Curve



Compaction Details			
Compaction Method	AS 1289.5.2.1	Hammer Type	Modified
Plasticity Determined by	Estimated	Curing Time (Hours)	24.0
% Retained 19.0mm	0	Excluded/Replaced	Excluded
Maximum Dry Density (t/m^3)	2.03	Optimum Moisture (%)	12.0
Target Dry Density Ratio (%)	95	Target Moisture Ratio (%)	100

Specimen Conditions At Compaction			
Dry Density (t/m3)	1.94	Moisture Content (%)	11.8
Density Ratio (%)	95.5	Moisture Ratio (%)	96.5

Specimen Conditions After Soak			
Soaked or Unsoaked	Soaked	Soaking Period (days)	4
Surcharges Applied (kg)	6.75	Measured Swell (%)	0.0
Dry Density (t/m³)	1.93	Dry Density Ratio (%)	95.0
Moisture Content (%)	14.1	Moisture Ratio (%)	115.0

Specimen Conditions After Test			
Top 30mm Moisture (%)	13.4	Remaining Depth (%)	13.6

Correction applied to Penetration: 0mm

Determined at a Penetration of: 2.5mm

California Bearing Ratio (CBR): 25%

Comments:

Ordinary Council Meeting - 17 June 2024

Approved Signatory:

Name: Brooke Elliott

Date: 21-February-2022

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WESTERN GEOTECHNICAL & Laboratory Services

SOIL | AGGREGATE | CONCRETE | CRUSHING

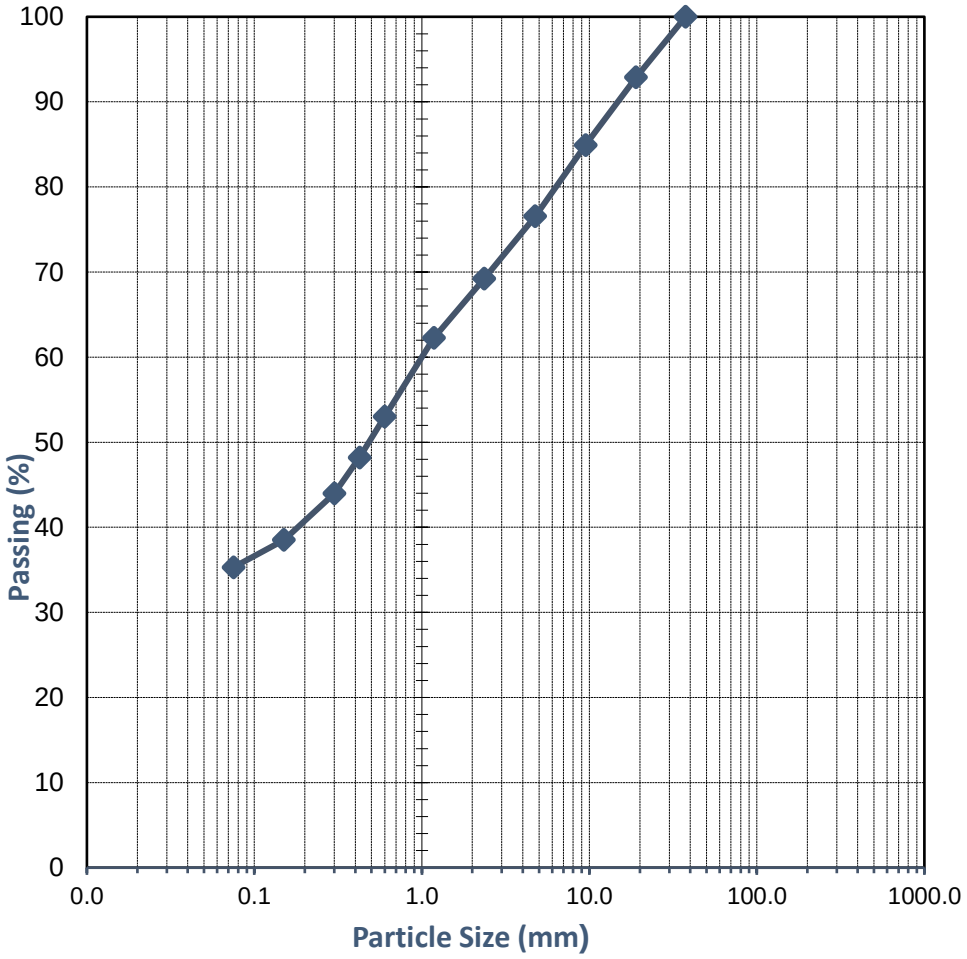
TEST REPORT - AS 1289.3.6.1

Client:	Porter Consulting Engineers	*Ticket No.*	S5428
Client Address:	-	*Report No.*	WG22.2128_1_PSD
Project:	Proposed Commercial and Industrial Development	*Sample No.*	WG22.2128
Location:	Lot 806 South Western Highway, Byford	*Date Sampled:*	Not Specified
Sample Identification:	TP16 (1.0-1.9)m	*Date Tested:*	10/02 - 11/02/2022

TEST RESULTS - Particle Size Distribution of Soil

Sampling Method: Sampled by Client, Tested as Received

Sieve Size (mm)	Percent Passing Sieve (%)
150.0	
100.0	
75.0	
37.5	100
19.0	93
9.5	85
4.75	77
2.36	69
1.18	62
0.600	53
0.425	48
0.300	44
0.150	39
0.075	35



Comments:

Ordinary Council Meeting - 17 June 2024

Approved Signatory: Cody O'Neill

Name: Cody O'Neill

Date: 11/February/2022

Accreditation No. 20599
Accredited for compliance with ISO/IEC 17025 - Testing

WESTERN GEOTECHNICAL & Laboratory Services

SOIL | AGGREGATE | CONCRETE | CRUSHING

TEST REPORT - AS 1289.3.1.1, 3.2.1, 3.3.1 & 3.4.1

Client:	Porter Consulting Engineers	*Ticket No.*	S5428
Client Address:	-	*Report No.*	WG22.2128_1_PI
Project:	Proposed Commercial and Industrial Development	*Sample No.*	WG22.2128
Location:	Lot 806 South Western Highway, Byford	*Date Sampled:*	Not Specified
Sample Identification:	TP16 (1.0-1.9)m	*Date Tested:*	11/02/2022

TEST RESULTS - Consistency Limits (Casagrande)

Sampling Method:	**Sampled by Client, Tested as Received**
History of Sample:	**Oven Dried <50°C**
Method of Preparation:	**Dry Sieved**

AS 1289.3.1.1	**Liquid Limit (%)**	**56**
AS 1289.3.2.1	**Plastic Limit (%)**	**24**
AS 1289.3.3.1	**Plasticity Index (%)**	**32**
AS 1289.3.4.1	**Linear Shrinkage (%)**	**10.0**
AS 1289.3.4.1	**Length of Mould (mm)**	**250**
AS 1289.3.4.1	**Condition of Dry Specimen:**	**0.0**

Comments:

Ordinary Council Meeting - 17 June 2024

Approved Signatory: Coneill

Name: Cody O'Neill

Date: 14/February/2022

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WESTERN GEOTECHNICAL & Laboratory Services

SOIL | AGGREGATE | CONCRETE | CRUSHING

TEST REPORT - AS 1289.5.2.1

Client:	Porter Consulting Engineers	*Ticket No.*	S5428
Client Address:	-	*Report No.*	WG22.2128_1_MMDD
Project:	Proposed Commercial and Industrial Development	*Sample No.*	WG22.2128
Location:	Lot 806 South Western Highway, Byford	*Date Sampled:*	Not Specified
Sample Identification:	TP16 (1.0-1.9)m	*Date Tested:*	11-02-2022

TEST RESULTS - Modified Maximum Dry Density

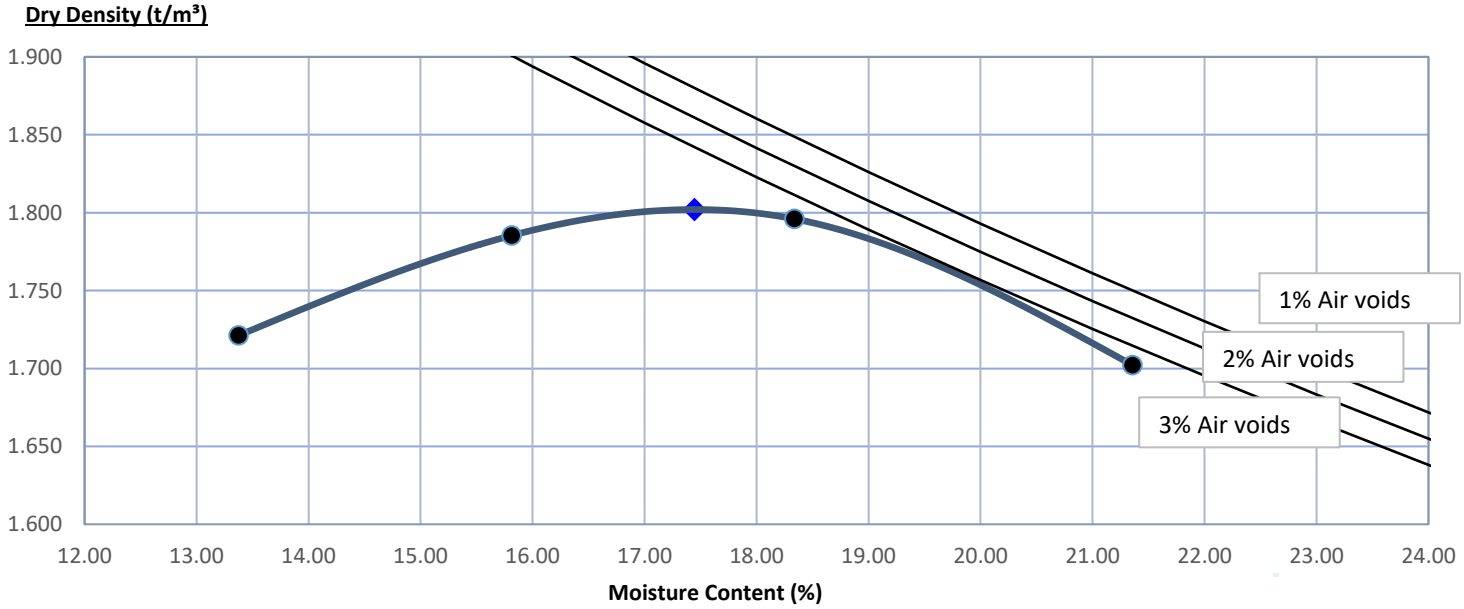
Sampling Method: Sampled by Client, Tested as Received

Sample Curing Time: 24 hours

Method used to Determine Liquid Limit: Visual / Tactile Assessment by Competent Technician

Material + 19.0mm (%): 5 **Material + 37.5mm (%)** -

Moisture Content (%)	**13.4**	**15.8**	**18.3**	**21.4**	
Dry Density (t/m³)	**1.721**	**1.785**	**1.796**	**1.702**	



Modified Maximum Dry Density (t/m³) **1.80**

Optimum Moisture Content (%) **17.5**

Comments: *The above air void lines are derived from a calculated apparent particle density of 2.84 t/m³*

Approved Signatory:

Name: Brooke Elliott

Date: 14-February-2022

Accreditation No. 20599
Accredited for compliance with ISO/IEC 17025 - Testing

WESTERN GEOTECHNICAL & Laboratory Services

SOIL | AGGREGATE | CONCRETE | CRUSHING

TEST REPORT - AS 1289.6.1.1

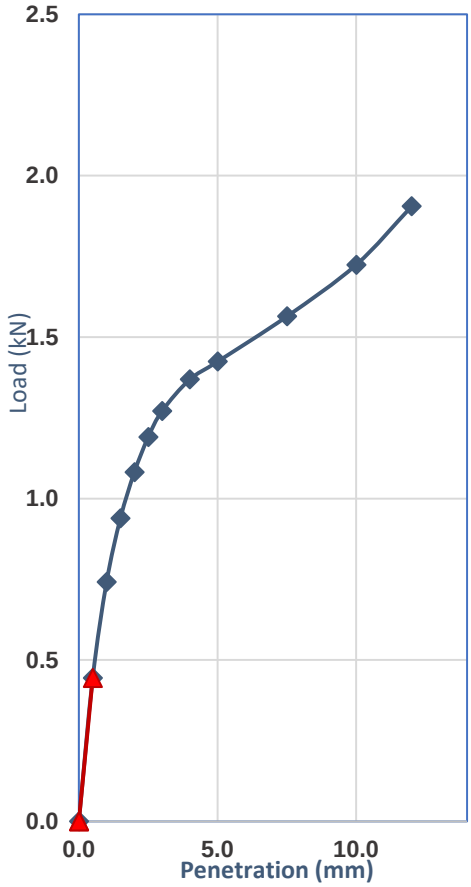
Client:	Porter Consulting Engineers	*Ticket No.*	S5428
Client Address:	-	*Report No.*	WG22.2128_1_SCBR
Project:	Proposed Commercial and Industrial Development	*Sample No.*	WG22.2128
Location:	Lot 806 South Western Highway, Byford	*Date Sampled:*	Not Specified
Sample Identification:	TP16 (1.0-1.9)m	*Date Tested:*	11/02 - 18/02/2022

TEST RESULTS - CALIFORNIA BEARING RATIO

Sample Description: Clayey Sand trace Gravel

Sampling Method: Sampled by Client, Tested as Received

Load Penetration Curve



Compaction Details			
Compaction Method	AS 1289.5.2.1	Hammer Type	Modified
Plasticity Determined by	Estimated	Curing Time (Hours)	4.0
% Retained 19.0mm	5	Excluded/Replaced	Excluded
Maximum Dry Density (t/m^3)	1.80	Optimum Moisture (%)	17.5
Target Dry Density Ratio (%)	92	Target Moisture Ratio (%)	100

Specimen Conditions At Compaction			
Dry Density (t/m3)	1.66	Moisture Content (%)	17.1
Density Ratio (%)	92.5	Moisture Ratio (%)	98.5

Specimen Conditions After Soak			
Soaked or Unsoaked	Soaked	Soaking Period (days)	4
Surcharges Applied (kg)	6.75	Measured Swell (%)	0.5
Dry Density (t/m³)	1.65	Dry Density Ratio (%)	91.5
Moisture Content (%)	20.7	Moisture Ratio (%)	119.0

Specimen Conditions After Test			
Top 30mm Moisture (%)	21.3	Remaining Depth (%)	21.6

Correction applied to Penetration: 0mm

Determined at a Penetration of: 2.5mm

California Bearing Ratio (CBR): 9%

Comments:

Approved Signatory:

Name: Brooke Elliott

Date: 21-February-2022

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WESTERN GEOTECHNICAL & Laboratory Services

SOIL | AGGREGATE | CONCRETE | CRUSHING

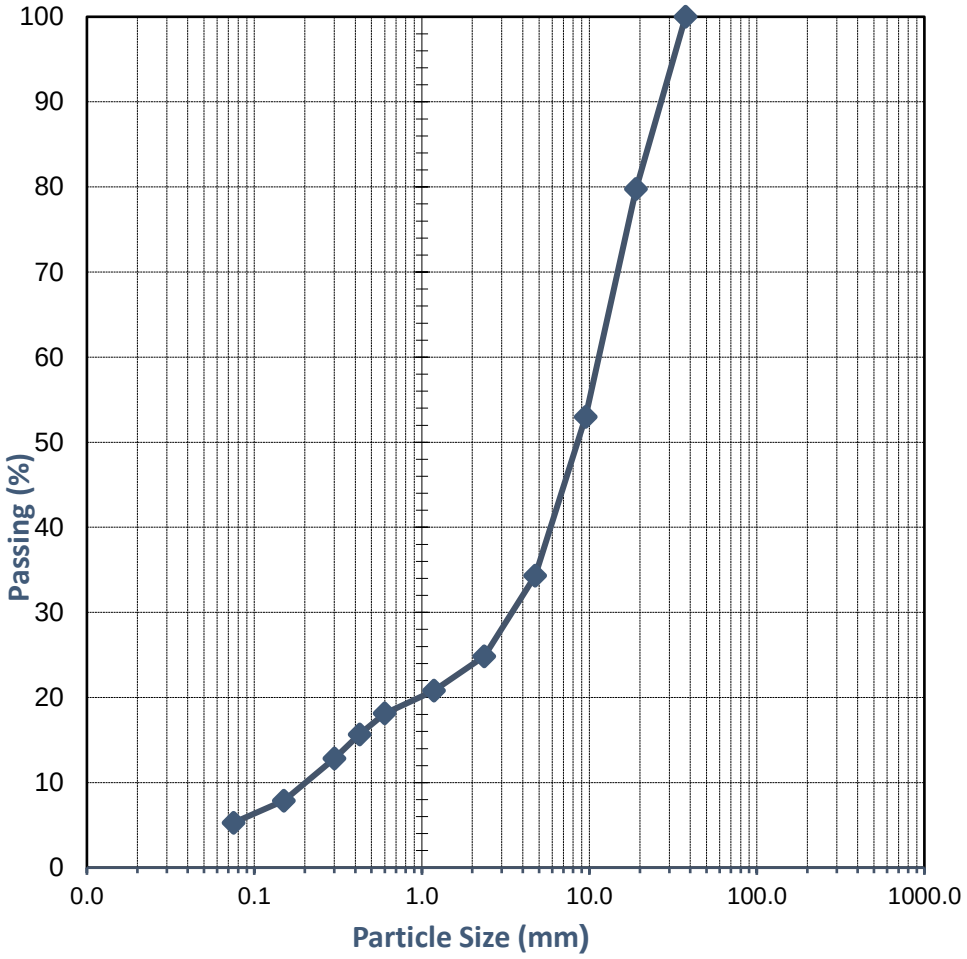
TEST REPORT - AS 1289.3.6.1

Client:	Porter Consulting Engineers	*Ticket No.*	S5428
Client Address:	-	*Report No.*	WG22.2129_1_PSD
Project:	Proposed Commercial and Industrial Development	*Sample No.*	WG22.2129
Location:	Lot 806 South Western Highway, Byford	*Date Sampled:*	Not Specified
Sample Identification:	TP17 (0.9-1.5)m	*Date Tested:*	10/02 - 11/02/2022

TEST RESULTS - Particle Size Distribution of Soil

Sampling Method: Sampled by Client, Tested as Received

Sieve Size (mm)	Percent Passing Sieve (%)
150.0	
100.0	
75.0	
37.5	100
19.0	80
9.5	53
4.75	34
2.36	25
1.18	21
0.600	18
0.425	16
0.300	13
0.150	8
0.075	5



Comments:

Ordinary Council Meeting - 17 June 2024

Approved Signatory:

Name: Cody O'Neill

Date: 11/February/2022

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WESTERN GEOTECHNICAL & Laboratory Services

SOIL | AGGREGATE | CONCRETE | CRUSHING

TEST REPORT - AS 1289.3.1.1, 3.2.1, 3.3.1 & 3.4.1

Client:	Porter Consulting Engineers	*Ticket No.*	S5428
Client Address:	-	*Report No.*	WG22.2129_1_PI
Project:	Proposed Commercial and Industrial Development	*Sample No.*	WG22.2129
Location:	Lot 806 South Western Highway, Byford	*Date Sampled:*	Not Specified
Sample Identification:	TP17 (0.9-1.5)m	*Date Tested:*	11/02/2022

TEST RESULTS - Consistency Limits (Casagrande)

Sampling Method:	**Sampled by Client, Tested as Received**
History of Sample:	**Oven Dried <50°C**
Method of Preparation:	**Dry Sieved**

AS 1289.3.1.1	**Liquid Limit (%)**	**22**
AS 1289.3.2.1	**Plastic Limit (%)**	**12**
AS 1289.3.3.1	**Plasticity Index (%)**	**10**
AS 1289.3.4.1	**Linear Shrinkage (%)**	**3.0**
AS 1289.3.4.1	**Length of Mould (mm)**	**250**
AS 1289.3.4.1	**Condition of Dry Specimen:**	**-**

Comments:

Ordinary Council Meeting - 17 June 2024

Approved Signatory:

Name: Cody O'Neill

Date: 14/February/2022

NATA WORLD RECOGNISED ACCREDITATION

Accreditation No. 20599
Accredited for compliance with ISO/IEC 17025 - Testing

Appendix D: CSIRO Pamphlet

Galt Geotechnics Pty Ltd

www.galtgeo.com.au
50 Edward Street OSBORNE PARK WA 6017

ABN: 64 625 054 729

Foundation Maintenance and Footing Performance:
A Homeowner's Guide

CSIRO PUBLISHING

BTF 18-2011 replaces Information Sheet 10/91

Buildings can and often do move. This movement can be up, down, lateral or rotational. The fundamental cause of movement in buildings can usually be related to one or more problems in the foundation soil. It is important for the homeowner to identify the soil type in order to ascertain the measures that should be put in place in order to ensure that problems in the foundation soil can be prevented, thus protecting against building movement.

This Building Technology File is designed to identify causes of soil-related building movement, and to suggest methods of prevention of resultant cracking in buildings.

Soil Types

The types of soils usually present under the topsoil in land zoned for residential buildings can be split into two approximate groups – granular and clay. Quite often, foundation soil is a mixture of both types. The general problems associated with soils having granular content are usually caused by erosion. Clay soils are subject to saturation and swell/shrink problems.

Classifications for a given area can generally be obtained by application to the local authority, but these are sometimes unreliable and if there is doubt, a geotechnical report should be commissioned. As most buildings suffering movement problems are founded on clay soils, there is an emphasis on classification of soils according to the amount of swell and shrinkage they experience with variations of water content. The table below is Table 2.1 from AS 2870-2011, the Residential Slab and Footing Code.

Causes of Movement

Settlement due to construction

There are two types of settlement that occur as a result of construction:

- Immediate settlement occurs when a building is first placed on its foundation soil, as a result of compaction of the soil under the weight of the structure. The cohesive quality of clay soil mitigates against this, but granular (particularly sandy) soil is susceptible.
- Consolidation settlement is a feature of clay soil and may take place because of the expulsion of moisture from the soil or because of the soil's lack of resistance to local compressive or shear stresses. This will usually take place during the first few months after construction, but has been known to take many years in exceptional cases.

These problems are the province of the builder and should be taken into consideration as part of the preparation of the site for construction. Building Technology File 19 (BTF 19) deals with these problems.

Erosion

All soils are prone to erosion, but sandy soil is particularly susceptible to being washed away. Even clay with a sand component of say 10% or more can suffer from erosion.

Saturation

This is particularly a problem in clay soils. Saturation creates a bog-like suspension of the soil that causes it to lose virtually all of its bearing capacity. To a lesser degree, sand is affected by saturation because saturated sand may undergo a reduction in volume, particularly imported sand fill for bedding and blinding layers. However, this usually occurs as immediate settlement and should normally be the province of the builder.

Seasonal swelling and shrinkage of soil

All clays react to the presence of water by slowly absorbing it, making the soil increase in volume (see table below). The degree of increase varies considerably between different clays, as does the degree of decrease during the subsequent drying out caused by fair weather periods. Because of the low absorption and expulsion rate, this phenomenon will not usually be noticeable unless there are prolonged rainy or dry periods, usually of weeks or months, depending on the land and soil characteristics.

The swelling of soil creates an upward force on the footings of the building, and shrinkage creates subsidence that takes away the support needed by the footing to retain equilibrium.

Shear failure

This phenomenon occurs when the foundation soil does not have sufficient strength to support the weight of the footing. There are two major post-construction causes:

- Significant load increase.
- Reduction of lateral support of the soil under the footing due to erosion or excavation.

In clay soil, shear failure can be caused by saturation of the soil adjacent to or under the footing.

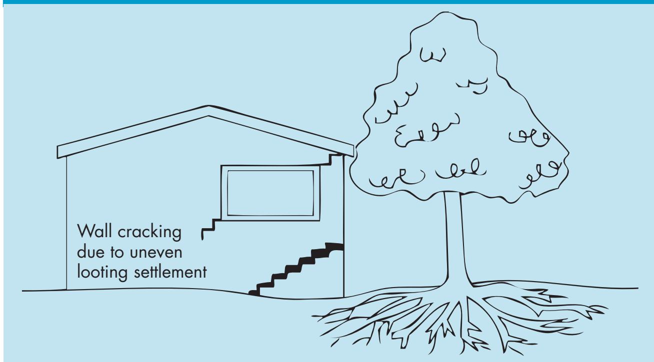
GENERAL DEFINITIONS OF SITE CLASSES

Class	Foundation
A	Most sand and rock sites with little or no ground movement from moisture changes
S	Slightly reactive clay sites, which may experience only slight ground movement from moisture changes
M	Moderately reactive clay or silt sites, which may experience moderate ground movement from moisture changes
H1	Highly reactive clay sites, which may experience high ground movement from moisture changes
H2	Highly reactive clay sites, which may experience very high ground movement from moisture changes
E	Extremely reactive sites, which may experience extreme ground movement from moisture changes

Notes

1. Where controlled fill has been used, the site may be classified A to E according to the type of fill used.
2. Filled sites. Class P is used for sites which include soft fills, such as clay or silt or loose sands; landslip; mine subsidence; collapsing soils; soil subject to erosion; reactive sites subject to abnormal moisture conditions or sites which cannot be classified otherwise.
3. Where deep-seated moisture changes exist on sites at depths of 3 m or greater, further classification is needed for Classes M to E (M-D, H1-D, H2-D and E-D).

Trees can cause shrinkage and damage



Tree root growth

Trees and shrubs that are allowed to grow in the vicinity of footings can cause foundation soil movement in two ways:

- Roots that grow under footings may increase in cross-sectional size, exerting upward pressure on footings.
- Roots in the vicinity of footings will absorb much of the moisture in the foundation soil, causing shrinkage or subsidence.

Unevenness of Movement

The types of ground movement described above usually occur unevenly throughout the building's foundation soil. Settlement due to construction tends to be uneven because of:

- Differing compaction of foundation soil prior to construction.
- Differing moisture content of foundation soil prior to construction.

Movement due to non-construction causes is usually more uneven still. Erosion can undermine a footing that traverses the flow or can create the conditions for shear failure by eroding soil adjacent to a footing that runs in the same direction as the flow.

Saturation of clay foundation soil may occur where subfloor walls create a dam that makes water pond. It can also occur wherever there is a source of water near footings in clay soil. This leads to a severe reduction in the strength of the soil which may create local shear failure.

Seasonal swelling and shrinkage of clay soil affects the perimeter of the building first, then gradually spreads to the interior. The swelling process will usually begin at the uphill extreme of the building, or on the weather side where the land is flat. Swelling gradually reaches the interior soil as absorption continues. Shrinkage usually begins where the sun's heat is greatest.

Effects of Uneven Soil Movement on Structures

Erosion and saturation

Erosion removes the support from under footings, tending to create subsidence of the part of the structure under which it occurs. Brickwork walls will resist the stress created by this removal of support by bridging the gap or cantilevering until the bricks or the mortar bedding fail. Older masonry has little resistance. Evidence of failure varies according to circumstances and symptoms may include:

- Step cracking in the mortar beds in the body of the wall or above/below openings such as doors or windows.
- Vertical cracking in the bricks (usually but not necessarily in line with the vertical beds or perpends).

Isolated piers affected by erosion or saturation of foundations will eventually lose contact with the bearers they support and may tilt or fall over. The floors that have lost this support will become bouncy, sometimes rattling ornaments etc.

Seasonal swelling/shrinkage in clay

Swelling foundation soil due to rainy periods first lifts the most exposed extremities of the footing system, then the remainder of the perimeter footings while gradually permeating inside the building footprint to lift internal footings. This swelling first tends to create a dish effect, because the external footings are pushed higher than the internal ones.

The first noticeable symptom may be that the floor appears slightly dished. This is often accompanied by some doors binding on the floor or the door head, together with some cracking of cornice mitres. In buildings with timber flooring supported by bearers and joists, the floor can be bouncy. Externally there may be visible dishing of the hip or ridge lines.

As the moisture absorption process completes its journey to the innermost areas of the building, the internal footings will rise. If the spread of moisture is roughly even, it may be that the symptoms will temporarily disappear, but it is more likely that swelling will be uneven, creating a difference rather than a disappearance in symptoms. In buildings with timber flooring supported by bearers and joists, the isolated piers will rise more easily than the strip footings or piers under walls, creating noticeable doming of flooring.

As the weather pattern changes and the soil begins to dry out, the external footings will be first affected, beginning with the locations where the sun's effect is strongest. This has the effect of lowering the external footings. The doming is accentuated and cracking reduces or disappears where it occurred because of dishing, but other cracks open up. The roof lines may become convex.

Doming and dishing are also affected by weather in other ways. In areas where warm, wet summers and cooler dry winters prevail, water migration tends to be toward the interior and doming will be accentuated, whereas where summers are dry and winters are cold and wet, migration tends to be toward the exterior and the underlying propensity is toward dishing.

Movement caused by tree roots

In general, growing roots will exert an upward pressure on footings, whereas soil subject to drying because of tree or shrub roots will tend to remove support from under footings by inducing shrinkage.

Complications caused by the structure itself

Most forces that the soil causes to be exerted on structures are vertical – i.e. either up or down. However, because these forces are seldom spread evenly around the footings, and because the building resists uneven movement because of its rigidity, forces are exerted from one part of the building to another. The net result of all these forces is usually rotational. This resultant force often complicates the diagnosis because the visible symptoms do not simply reflect the original cause. A common symptom is binding of doors on the vertical member of the frame.

Effects on full masonry structures

Brickwork will resist cracking where it can. It will attempt to span areas that lose support because of subsided foundations or raised points. It is therefore usual to see cracking at weak points, such as openings for windows or doors.

In the event of construction settlement, cracking will usually remain unchanged after the process of settlement has ceased.

With local shear or erosion, cracking will usually continue to develop until the original cause has been remedied, or until the subsidence has completely neutralised the affected portion of footing and the structure has stabilised on other footings that remain effective.

In the case of swell/shrink effects, the brickwork will in some cases return to its original position after completion of a cycle, however it is more likely that the rotational effect will not be exactly reversed, and it is also usual that brickwork will settle in its new position and will resist the forces trying to return it to its original position. This means that in a case where swelling takes place after construction and cracking occurs, the cracking is likely to at least partly remain after the shrink segment of the cycle is complete. Thus, each time the cycle is repeated, the likelihood is that the cracking will become wider until the sections of brickwork become virtually independent.

With repeated cycles, once the cracking is established, if there is no other complication, it is normal for the incidence of cracking to stabilise, as the building has the articulation it needs to cope with the problem. This is by no means always the case, however, and monitoring of cracks in walls and floors should always be treated seriously.

Upheaval caused by growth of tree roots under footings is not a simple vertical shear stress. There is a tendency for the root to also exert lateral forces that attempt to separate sections of brickwork after initial cracking has occurred.

The normal structural arrangement is that the inner leaf of brickwork in the external walls and at least some of the internal walls (depending on the roof type) comprise the load-bearing structure on which any upper floors, ceilings and the roof are supported. In these cases, it is internally visible cracking that should be the main focus of attention, however there are a few examples of dwellings whose external leaf of masonry plays some supporting role, so this should be checked if there is any doubt. In any case, externally visible cracking is important as a guide to stresses on the structure generally, and it should also be remembered that the external walls must be capable of supporting themselves.

Effects on framed structures
Timber or steel framed buildings are less likely to exhibit cracking due to swell/shrink than masonry buildings because of their flexibility. Also, the doming/dishing effects tend to be lower because of the lighter weight of walls. The main risks to framed buildings are encountered because of the isolated pier footings used under walls. Where erosion or saturation causes a footing to fall away, this can double the span which a wall must bridge. This additional stress can create cracking in wall linings, particularly where there is a weak point in the structure caused by a door or window opening. It is, however, unlikely that framed structures will be so stressed as to suffer serious damage without first exhibiting some or all of the above symptoms for a considerable period. The same warning period should apply in the case of upheaval. It should be noted, however, that where framed buildings are supported by strip footings there is only one leaf of brickwork and therefore the externally visible walls are the supporting structure for the building. In this case, the subfloor masonry walls can be expected to behave as full brickwork walls.

Effects on brick veneer structures
Because the load-bearing structure of a brick veneer building is the frame that makes up the interior leaf of the external walls plus perhaps the internal walls, depending on the type of roof, the building can be expected to behave as a framed structure, except that the external masonry will behave in a similar way to the external leaf of a full masonry structure.

Water Service and Drainage

Where a water service pipe, a sewer or stormwater drainage pipe is in the vicinity of a building, a water leak can cause erosion, swelling or saturation of susceptible soil. Even a minuscule leak can be enough to saturate a clay foundation. A leaking tap near a building can have the same effect. In addition, trenches containing pipes can become watercourses even though backfilled, particularly where broken rubble is used as fill. Water that runs along these trenches can be responsible for serious erosion, interstrata seepage into subfloor areas and saturation.

Pipe leakage and trench water flows also encourage tree and shrub roots to the source of water, complicating and exacerbating the problem. Poor roof plumbing can result in large volumes of rainwater being concentrated in a small area of soil:

- Incorrect falls in roof guttering may result in overflows, as may gutters blocked with leaves etc.
- Corroded guttering or downpipes can spill water to ground.
- Downpipes not positively connected to a proper stormwater collection system will direct a concentration of water to soil that is directly adjacent to footings, sometimes causing large-scale problems such as erosion, saturation and migration of water under the building.

Seriousness of Cracking

In general, most cracking found in masonry walls is a cosmetic nuisance only and can be kept in repair or even ignored. The table below is a reproduction of Table C1 of AS 2870-2011.

AS 2870-2011 also publishes figures relating to cracking in concrete floors, however because wall cracking will usually reach the critical point significantly earlier than cracking in slabs, this table is not reproduced here.

Prevention/Cure

Plumbing
Where building movement is caused by water service, roof plumbing, sewer or stormwater failure, the remedy is to repair the problem. It is prudent, however, to consider also rerouting pipes away from the building where possible, and relocating taps to positions where any leakage will not direct water to the building vicinity. Even where gully traps are present, there is sometimes sufficient spill to create erosion or saturation, particularly in modern installations using smaller diameter PVC fixtures. Indeed, some gully traps are not situated directly under the taps that are installed to charge them, with the result that water from the tap may enter the backfilled trench that houses the sewer piping. If the trench has been poorly backfilled, the water will either pond or flow along the bottom of the trench. As these trenches usually run alongside the footings and can be at a similar depth, it is not hard to see how any water that is thus directed into a trench can easily affect the foundation's ability to support footings or even gain entry to the subfloor area.

Ground drainage
In all soils there is the capacity for water to travel on the surface and below it. Surface water flows can be established by inspection during and after heavy or prolonged rain. If necessary, a grated drain system connected to the stormwater collection system is usually an easy solution.

It is, however, sometimes necessary when attempting to prevent water migration that testing be carried out to establish watertable height and subsoil water flows. This subject is referred to in BTF 19 and may properly be regarded as an area for an expert consultant.

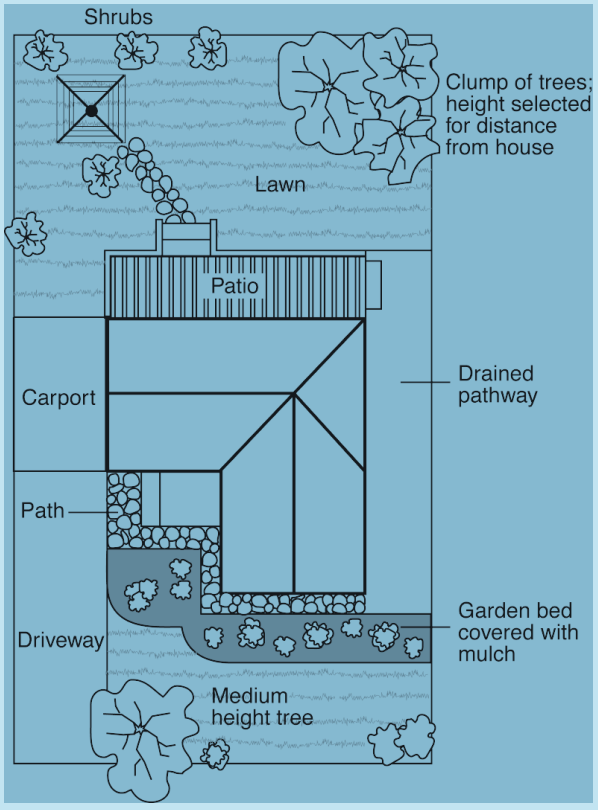
Protection of the building perimeter
It is essential to remember that the soil that affects footings extends well beyond the actual building line. Watering of garden plants, shrubs and trees causes some of the most serious water problems.

For this reason, particularly where problems exist or are likely to occur, it is recommended that an apron of paving be installed around as much of the building perimeter as necessary. This paving should

CLASSIFICATION OF DAMAGE WITH REFERENCE TO WALLS

Description of typical damage and required repair	Approximate crack width limit (see Note 3)	Damage category
Hairline cracks	<0.1 mm	0
Fine cracks which do not need repair	<1 mm	1
Cracks noticeable but easily filled. Doors and windows stick slightly.	<5 mm	2
Cracks can be repaired and possibly a small amount of wall will need to be replaced. Doors and windows stick. Service pipes can fracture. Weathertightness often impaired.	5–15 mm (or a number of cracks 3 mm or more in one group)	3
Extensive repair work involving breaking-out and replacing sections of walls, especially over doors and windows. Window and door frames distort. Walls lean or bulge noticeably, some loss of bearing in beams. Service pipes disrupted.	15–25 mm but also depends on number of cracks	4

Gardens for a reactive site



extend outwards a minimum of 900 mm (more in highly reactive soil) and should have a minimum fall away from the building of 1:60. The finished paving should be no less than 100 mm below brick vent bases.

It is prudent to relocate drainage pipes away from this paving, if possible, to avoid complications from future leakage. If this is not practical, earthenware pipes should be replaced by PVC and backfilling should be of the same soil type as the surrounding soil and compacted to the same density.

Except in areas where freezing of water is an issue, it is wise to remove taps in the building area and relocate them well away from the building – preferably not uphill from it (see BTF 19).

It may be desirable to install a grated drain at the outside edge of the paving on the uphill side of the building. If subsoil drainage is needed this can be installed under the surface drain.

Condensation

In buildings with a subfloor void such as where bearers and joists support flooring, insufficient ventilation creates ideal conditions for condensation, particularly where there is little clearance between the floor and the ground. Condensation adds to the moisture already present in the subfloor and significantly slows the process of drying out. Installation of an adequate subfloor ventilation system, either natural or mechanical, is desirable.

Warning: Although this Building Technology File deals with cracking in buildings, it should be said that subfloor moisture can result in the development of other problems, notably:

- Water that is transmitted into masonry, metal or timber building elements causes damage and/or decay to those elements.
- High subfloor humidity and moisture content create an ideal environment for various pests, including termites and spiders.
- Where high moisture levels are transmitted to the flooring and walls, an increase in the dust mite count can ensue within the living areas. Dust mites, as well as dampness in general, can be a health hazard to inhabitants, particularly those who are abnormally susceptible to respiratory ailments.

The garden

The ideal vegetation layout is to have lawn or plants that require only light watering immediately adjacent to the drainage or paving edge, then more demanding plants, shrubs and trees spread out in that order.

Overwatering due to misuse of automatic watering systems is a common cause of saturation and water migration under footings. If it is necessary to use these systems, it is important to remove garden beds to a completely safe distance from buildings.

Existing trees

Where a tree is causing a problem of soil drying or there is the existence or threat of upheaval of footings, if the offending roots are subsidiary and their removal will not significantly damage the tree, they should be severed and a concrete or metal barrier placed vertically in the soil to prevent future root growth in the direction of the building. If it is not possible to remove the relevant roots without damage to the tree, an application to remove the tree should be made to the local authority. A prudent plan is to transplant likely offenders before they become a problem.

Information on trees, plants and shrubs

State departments overseeing agriculture can give information regarding root patterns, volume of water needed and safe distance from buildings of most species. Botanic gardens are also sources of information. For information on plant roots and drains, see Building Technology File 17.

Excavation

Excavation around footings must be properly engineered. Soil supporting footings can only be safely excavated at an angle that allows the soil under the footing to remain stable. This angle is called the angle of repose (or friction) and varies significantly between soil types and conditions. Removal of soil within the angle of repose will cause subsidence.

Remediation

Where erosion has occurred that has washed away soil adjacent to footings, soil of the same classification should be introduced and compacted to the same density. Where footings have been undermined, augmentation or other specialist work may be required. Remediation of footings and foundations is generally the realm of a specialist consultant.

Where isolated footings rise and fall because of swell/shrink effect, the homeowner may be tempted to alleviate floor bounce by filling the gap that has appeared between the bearer and the pier with blocking. The danger here is that when the next swell segment of the cycle occurs, the extra blocking will push the floor up into an accentuated dome and may also cause local shear failure in the soil. If it is necessary to use blocking, it should be by a pair of fine wedges and monitoring should be carried out fortnightly.

This BTF was prepared by John Lewer FAIB, MIAMA, Partner, Construction Diagnosis.

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Appendix E: Understanding Your Report

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ABN: 64 625 054 729

UNDERSTANDING YOUR REPORT

GALT FORM PMP11 Rev3

1. EXPECTATIONS OF THE REPORT

This document has been prepared to clarify what is and is not provided in your report. It is intended to inform you of what your realistic expectations of this report should be and how to manage your risks associated with the conditions on site.

Geotechnical engineering and environmental science are less exact than other engineering and scientific disciplines. We include this information to help you understand where our responsibilities begin and end. You should read and understand this information. Please contact us if you do not understand the report or this explanation. We have extensive experience in a wide variety of projects and we can help you to manage your risk.

2. THIS REPORT RELATES TO PROJECT-SPECIFIC CONDITIONS

This report was developed for a unique set of project-specific conditions to meet the needs of the nominated client. It took into account the following:

- the project objectives as we understood them and as described in this report;
- the specific site mentioned in this report; and
- the current and proposed development at the site.

It should not be used for any purpose other than that indicated in the report. You should not rely on this report if any of the following conditions apply:

- the report was not written for you;
- the report was not written for the site specific to your development;
- the report was not written for your project (including a development at the correct site but other than that listed in the report); or
- the report was written before significant changes occurred at the site (such as a development or a change in ground conditions).

You should always inform us of changes in the proposed project (including minor changes) and request an assessment of their impact.

Where we are not informed of developments relevant to your report, we cannot be held responsible or liable for problems that may arise as a consequence.

Where design is to be carried out by others using information provided by us, we recommend that we be involved in the design process by being engaged for consultation with other members of the project team. Otherwise we cannot be able to review work produced by other members of the project team that relies on information provided in our report.

3. SOIL LOGS

Our reports often include logs of intrusive and non-intrusive investigation techniques. These logs are based on our interpretation of field data and laboratory results. The logs should only be read in conjunction with the report they were issued with and should not be re-drawn for inclusion in other documents not prepared by us.

4. THIRD PARTY RELIANCE

We have prepared this report for use by the client. This report must be regarded as confidential to the client and the client's professional advisors. We do not accept any responsibility for contents of this document from any party other than the nominated client. We take no responsibility for any damages suffered by a third party because of any decisions or actions they may make based on this report. Any reliance or decisions made by a third party based on this report are the responsibility of the third party and not of us.

5. CHANGE IN SUBSURFACE CONDITIONS

The recommendations in this report are based on the ground conditions that existed at the time when the study was undertaken. Changes in ground conditions can occur in numerous ways including anthropogenic events (such as construction or contaminating activities on or adjacent to the site) or natural events (such as floods, groundwater fluctuations or earthquakes). We should be consulted prior to use of this report so that we can comment on its reliability. It is important to note that where ground conditions have changed, additional sampling, testing or analysis may be required to fully assess the changed conditions.

6. SUBSURFACE CONDITIONS DURING CONSTRUCTION

Practical constraints mean that we cannot know every minute detail about the subsurface conditions at a particular site. We use professional judgement to form an opinion about the subsurface conditions at the site. Some variation to our evaluated conditions is likely and significant variation is possible. Accordingly, our report should not be considered as final as it is developed from professional judgement and opinion.

The most effective means of dealing with unanticipated ground conditions is to engage us for construction support. We can only finalise our recommendations by observing actual subsurface conditions encountered during construction. We cannot accept liability for a report's recommendations if we cannot observe construction.

7. ENVIRONMENTAL AND GEOTECHNICAL ISSUES

Unless specifically mentioned otherwise in our report, environmental considerations are not addressed in geotechnical reports. Similarly, geotechnical issues are not addressed in environmental reports. The investigation techniques used for geotechnical investigations can differ from those used for environmental investigations. It is the client's responsibility to satisfy themselves that geotechnical and environmental considerations have been taken into account for the site.

Geotechnical advice presented in a Galt Environmental report has been provided by Galt Geotechnics under a sub-contract agreement. Similarly, environmental advice presented in a Galt Geotechnics report has been provided by Galt Environmental under a sub-contract agreement.

Unless specifically noted otherwise, no parties shall draw any inferences about the applicability of the Western Australian state government landfill levy from the contents of this document.

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ATTACHMENT 3
REVISED TRANSPORT IMPACT ASSESSMENT

Engineering a better future for over 20 years!

Proposed Commercial Development

Lot 806 South Western Highway Byford

Revised Transport Impact Assessment

PREPARED FOR:
Accord Property
Ordinary Council Meeting - 17 June 2024
February 2024

Document history and status

Author	Revision	Approved by	Date approved	Revision type
M Rasouli	r01	B Bordbar	26/08/2022	Draft
M Rasouli	r01a	B Bordbar	15/09/2022	Final
M Rasouli	r01b	B Bordbar	13/12/2022	Revised Final
M Rasouli	r01c	B Bordbar	15/01/2022	2nd Revised Final
M Rasouli	r01d	B Bordbar	20/02/2024	3rd Revised Final

File name: t21.148.mr.r01d.docx

Author: Mohammad Rasouli

Project manager: Mohammad Rasouli

Client: Accord Property

Project: Lot 806 South Western Highway, Byford

Document revision: r01d

Project number: t21.148

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REPORT FIGURES

REPORT TABLES

1 Introduction

This revised Transport Impact Assessment (TIA) has been prepared by Transcore on behalf of Accord Property with regards to the proposed commercial / bulky goods retail development at Lot 806 South Western Highway, Byford.

Following the State Administrative Tribunal (SAT) on February 12, 2024, Transcore has been commissioned to update the January 2022 TIA to address condition 1.p.ii of the approval, which stipulates the need for a central island treatment and acceleration lane northbound at the intersection of South Western Highway (SWH) and Wilaring Street.

Accordingly, Transcore organised video traffic survey at the intersection of SWH and Wilaring Street on Wednesday 14th February 2024 and updated the November 2021 traffic counts at the intersection for the AM and PM peak hours. The original counts on Saturday mid-day (11:00-12:00) in October 2022 were also used to assess the critical Saturday mid-day peak hour.

The SIDRA intersection analysis was then updated for both the existing and post-development scenarios during the AM, PM and Saturday peak hours. Additionally, a sensitivity analysis was undertaken to evaluate the impact of incorporating an acceleration lane on SWH.

This Revised TIA report presents the findings and outcomes of the modelling and analysis.

The subject site is located at the north-east corner of the intersection of SWH and Wilaring Street in Byford as shown in **Figure 1**. The access/egress system proposed for the development has been established through close liaison with the Shire of Serpentine Jarrahdale.

Key issues that will be addressed in this report include the traffic generation and distribution of the proposed development, operation of the development proposed access system and nearby intersections (particularly SWH intersections with Wilaring Street and Nettleton Road).

The location of the subject site within the *Metropolitan Region Scheme* context is illustrated in **Figure 2**. Review of the *Metropolitan Regional Scheme* confirms that SWH in this vicinity is covered by an "Primary Regional Roads" Reservation. The subject site is zoned as *"urban"* in the *MRS*.

Figure 1: Location of the subject site

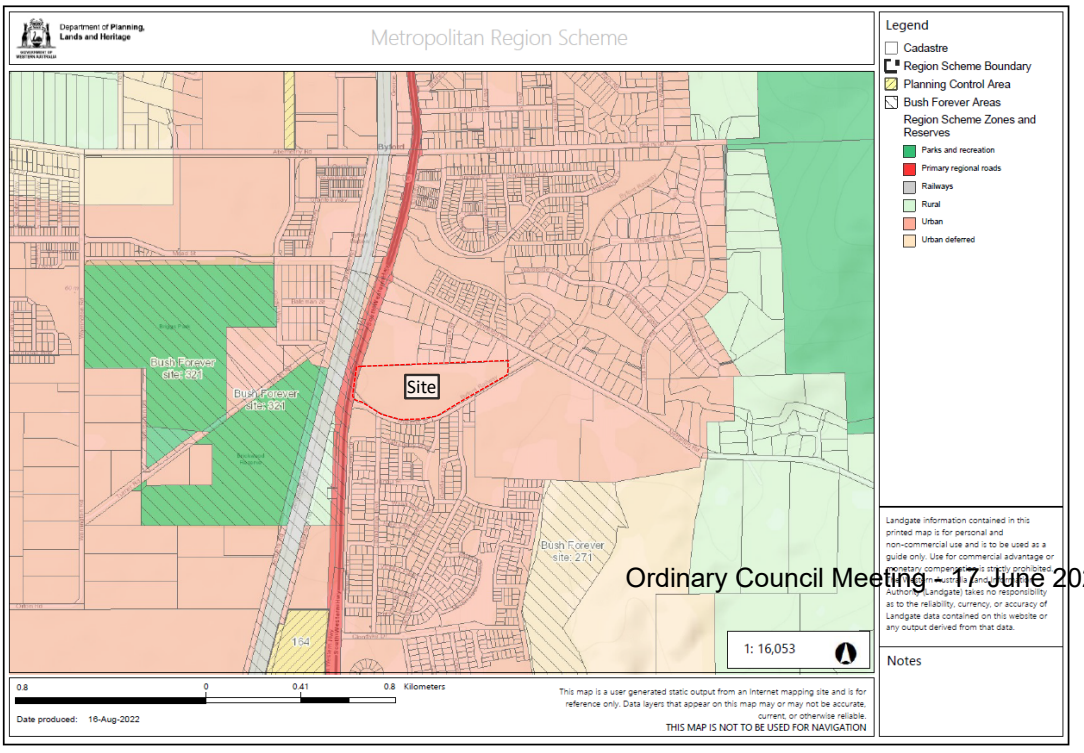


Figure 2. Site location within Metropolitan Region Scheme

2 Development Proposal

The development proposal is for a commercial / bulky goods retail development which comprises the land uses summarised in **Table 1**.

The proposed development plan has been prepared in consultation with the Shire of Serpentine-Jarrahdale. Preliminary consultation with Main Roads WA was also undertaken as part of the process with respect to the access/ egress to/ from SWH. According to the development plan, Wilaring Street is proposed to be diverted into the subject site and connected to Dougall Street to the north. It should be noted that the realigned Wilaring Street within the site would be an internal road which will have an easement. Also, the diverted Wilaring Street will connect to Diamantina Blvd via a roundabout as shown in the development plan provided in **Appendix A**. This arrangement has been mutually agreed by the Shire.

The proposed roundabout will be transferred into the Shire's possession / management in the future.

Two fast food outlets with drive through facilities are proposed at the north west corner of the development with a number of bulky goods and retail tenancies within the subject site.

A total of 759 parking bays are provided for the proposed development. The parking bays have been distributed around the internal access way which connects Wilaring Street to Dougal Street.

Table 1: Proposed Land uses

TENANCY AREA SCHEDULE (NLA)	
NAME	AREA
FUTURE DEVELOPMENT 1 - FAST FOOD	
FAST FOOD 01	201 m²
FAST FOOD 02	201 m²
	402 m²
FUTURE DEVELOPMENT 2 - BULKY GOODS	
T1	7918 m²
	7918 m²
FUTURE DEVELOPMENT 3 - BULKY GOODS	
T2	450 m²
T3	1357 m²
T4	1070 m²
	2877 m²
FUTURE DEVELOPMENT 4 - BULKY GOODS	
T5	100 m²
T6	100 m²
T7	100 m²
T8	439 m²
T9	1131 m²
T10	1999 m²
T11	1986 m²
T12	592 m²
T13	441 m²
T14	441 m²
	7329 m²
FUTURE DEVELOPMENT 5 - BULKY GOODS	
T15	1000 m²
T16	800 m²
T17	516 m²
T18	510 m²
	2826 m²
FUTURE DEVELOPMENT 6 - BULKY GOODS	
T19	2006 m²
T20	1011 m²
T21	[illegible] m²
T22	710 m²
T23	2011 m²
T24	2011 m²
	8760 m²
GRAND TOTAL	30114 m²

2.1 Vehicle Access

The proposed access/egress system intended to serve the development is shown in **Figure 3** and comprises the following elements:

- An internal roundabout intersection at realigned Wilaring Street;
- A connection to Dougall Street; and,
- A potential for future connection to the north from the road adjacent to the fast-food outlets.

The Dougall Street connection is intended for use by service vehicles and some local trips. Dougall Street will need to be extended and connected to the proposed development.

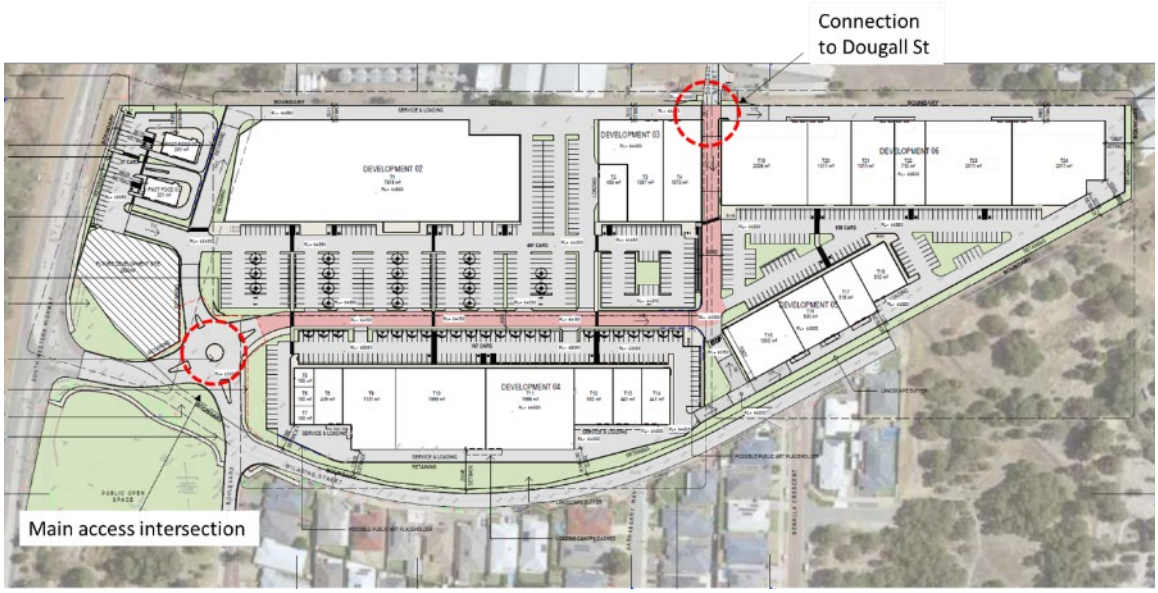


Figure 3. Proposed access/egress system

3 Existing Situation

3.1 Existing Road Network

The hierarchy of the existing roads in the vicinity of the subject site is shown in **Figure 4** in accordance with Main Roads WA Road Hierarchy.

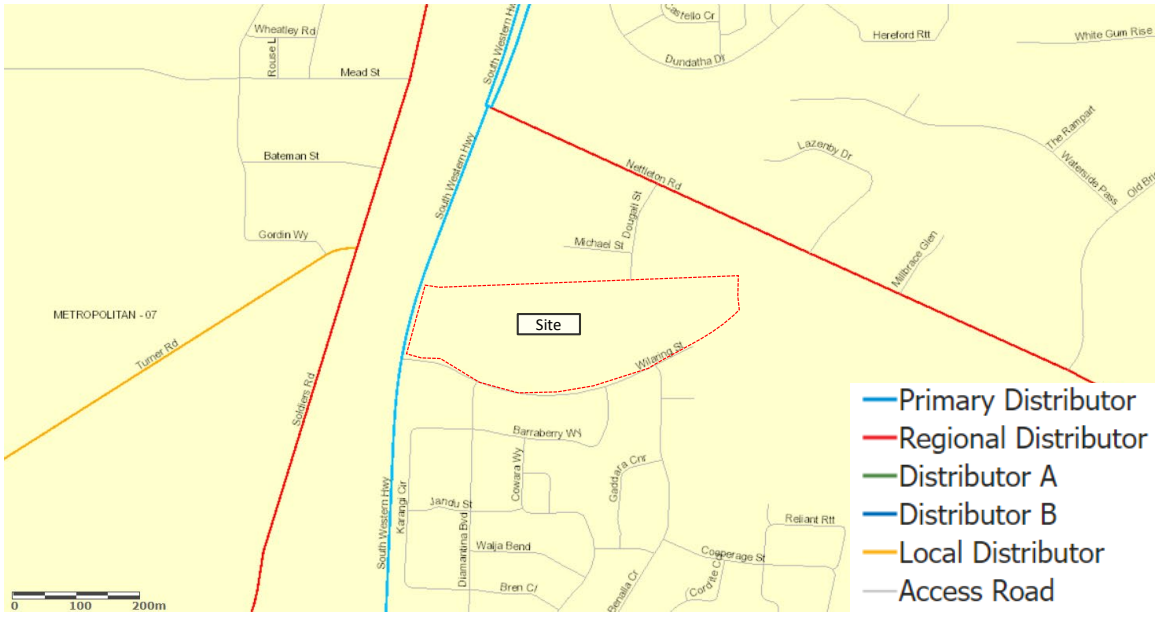


Figure 4: Existing road hierarchy

South Western Highway in this vicinity is currently an undivided single-carriageway road with posted speed limit of 60km/h. It is classified as a Primary Distributor under the Main Roads WA Road Hierarchy and Primary Regional Road under Metropolitan Regional Scheme (MRS). It is the major north-south transport route through Byford and is under care and control of Main Roads WA.

Wilaring Street is a kerbed and sealed road to the south of the subject site with approximately 7.4m seal width between kerbs in a 15.0m road reserve. It is classified as an Access Street under the Main Roads WA Road Hierarchy with the default built up speed limit of 50km/h. A concrete shared path is in place along the southern side of Wilaring Street. Currently Wilaring Street connects to SWH to the west at a channelised T-intersection. Wilaring Street to the east terminates just after Benalla Crescent.

The intersection of Wilaring Street with SWH is in the form of a priority-controlled T-intersection with turn lanes on SWH (refer **Figure 5**). The existing left and right turn lanes on SWH meet and exceed the requirements of Main Roads WA and Austroads Guidelines for posted speed limit of 60kmh (the Austroads requirement is 75m turn lane including taper).

Figure 5: Existing standard of the intersection of SWH/ Wilaring St

Nettleton Road is an existing part kerbed, sealed road which is located to the north of the subject site with approximately 6m seal width in a 20m road reserve. It is classified as an Access Street under the Main Roads WA Road Hierarchy with the posted speed limit of 60km/h. A concrete footpath is in place along the northern side of Nettleton Road.

The intersection of Nettleton Road with SWH is in the form of priority-controlled T-intersection (refer **Figure 6**). SWH has two lanes in each direction to the north of

Nettleton Road. To the south it entails one lane in each direction. The intersection of Nettleton Road with SWH does not entail a right turn lane on SWH but entails a substandard left turn lane.

The existing standard of the intersection does not provide the opportunity for two stages right turn movements for right turns from Nettleton Road onto SWH and therefore this existing situation and movement is observed to be problematic during the PM peak hour.

Figure 6: Existing standard of the intersection of SWH/Nettleton Rd

Dougall Street is currently constructed between Michael Street and Nettleton Road as a 6.0m sealed and un-kerbed road. The intersection of Dougall Street/ Nettleton Road is currently operating as a basic T-intersection with no turn lanes on Nettleton Road.

Diamantina Boulevard is an existing kerbed and sealed road south of the subject site with an approximately 7.2m seal width in an 18m road reserve. Footpaths are in place along the full length of this road. It is classified as an Access Street under the Main Roads WA Road Hierarchy with the default built up speed limit of 50km/h.

3.2 Existing Traffic Volumes on Roads

The latest traffic counts on SWH and Nettleton Road were sourced from Main Roads WA and are provided in **Figure 7**.

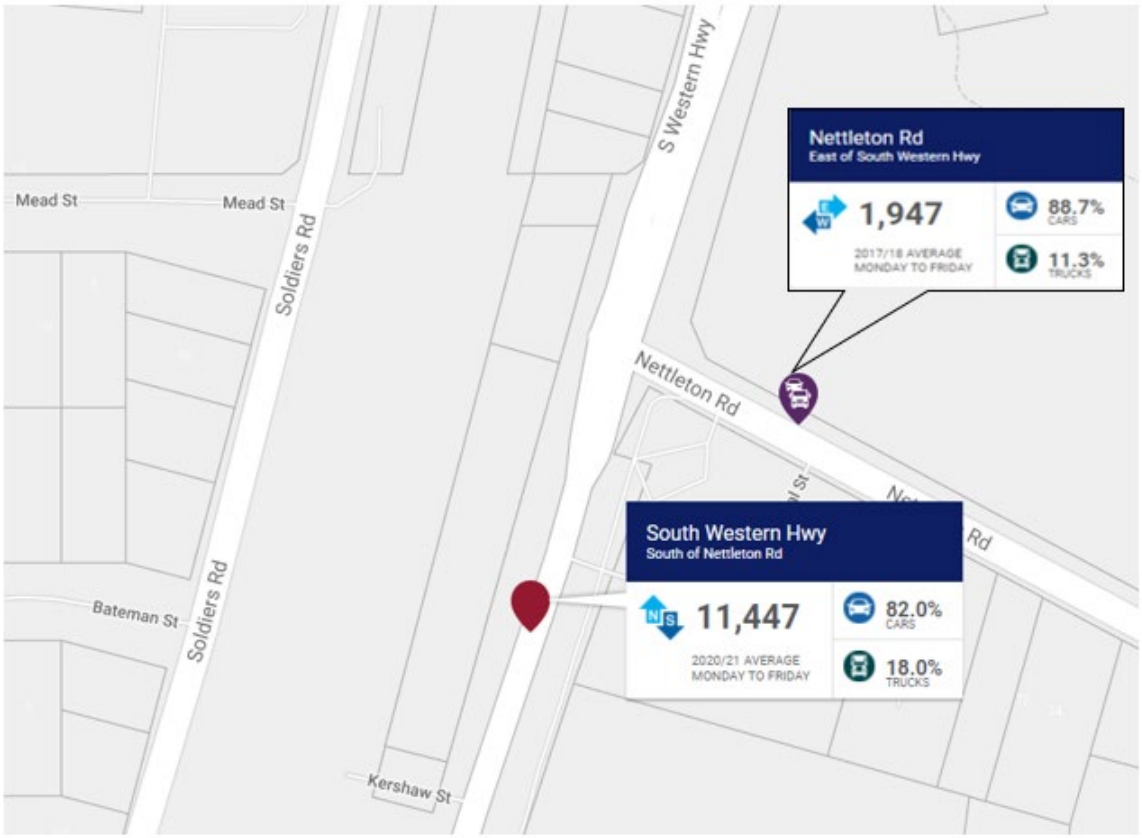


Figure 7: Daily traffic counts

Transcore also organised video traffic counts during the Wednesday 14th February 2024 and used the original counts on Saturday mid-day (11:00-12:00) in October 2022 for key nearby intersections. The updated peak hour traffic counts are illustrated in **Figure 8.**

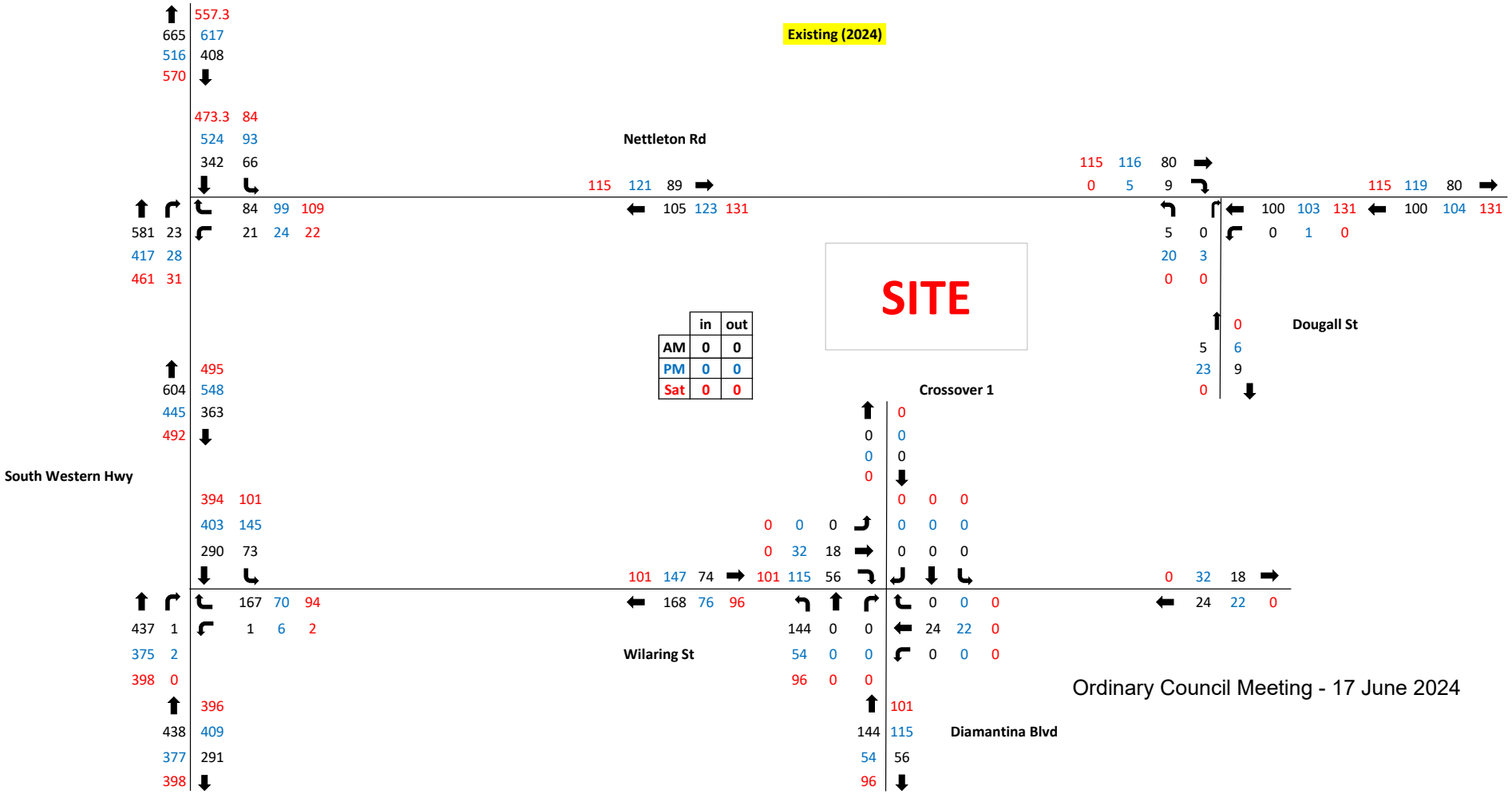


Figure 8: Existing traffic counts for AM, PM, and Saturday peak hours

3.3 Heavy Vehicles

Restricted Access Vehicle (RAV) Network routes are designated by Main Roads WA for access by large heavy vehicle combinations.

SWH, Douglas Street and Nettleton Road (between SWH and Douglas Street) form part of RAV Tandem Drive Network 4 as shown in **Figure 9**. The RAV Tandem Drive Network 4 classification permits a variety of prime mover and trailer combinations, such as B-doubles up to a maximum length of 27.5m.

Figure 9: Existing heavy vehicle road network classification (RAV)

3.4 Public Transport Access

Available nearby public transport services are shown in **Figure 10**. At present, the subject locality has convenient access to bus routes 251, 252 and 253 which travels along Wilaring Street with bus stops located on Wilaring Street after Diamantina Blvd.

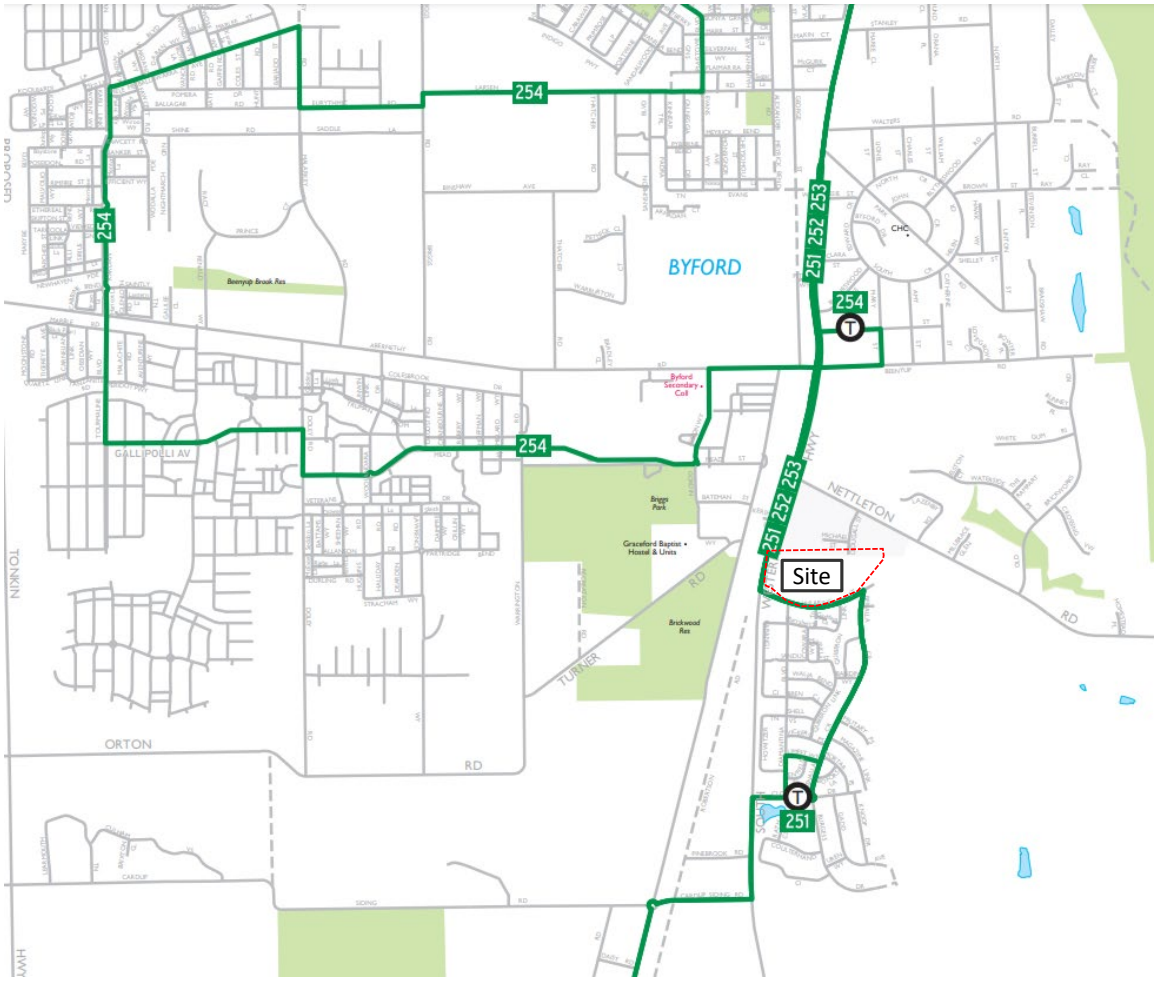


Figure 10: Existing bus routes (source: Transperth)

3.5 Pedestrian and Cyclist Facilities

Currently, shared paths are in place along the residential side of Wilaring Street and east side of SWH in the vicinity of the subject site, however the Department of Transport's Perth Bike Map series does not show these existing shared paths (refer **Figure 11**).

Pedestrian crossing facilities are also provided at the existing intersection of SWH/ Wilaring Street.

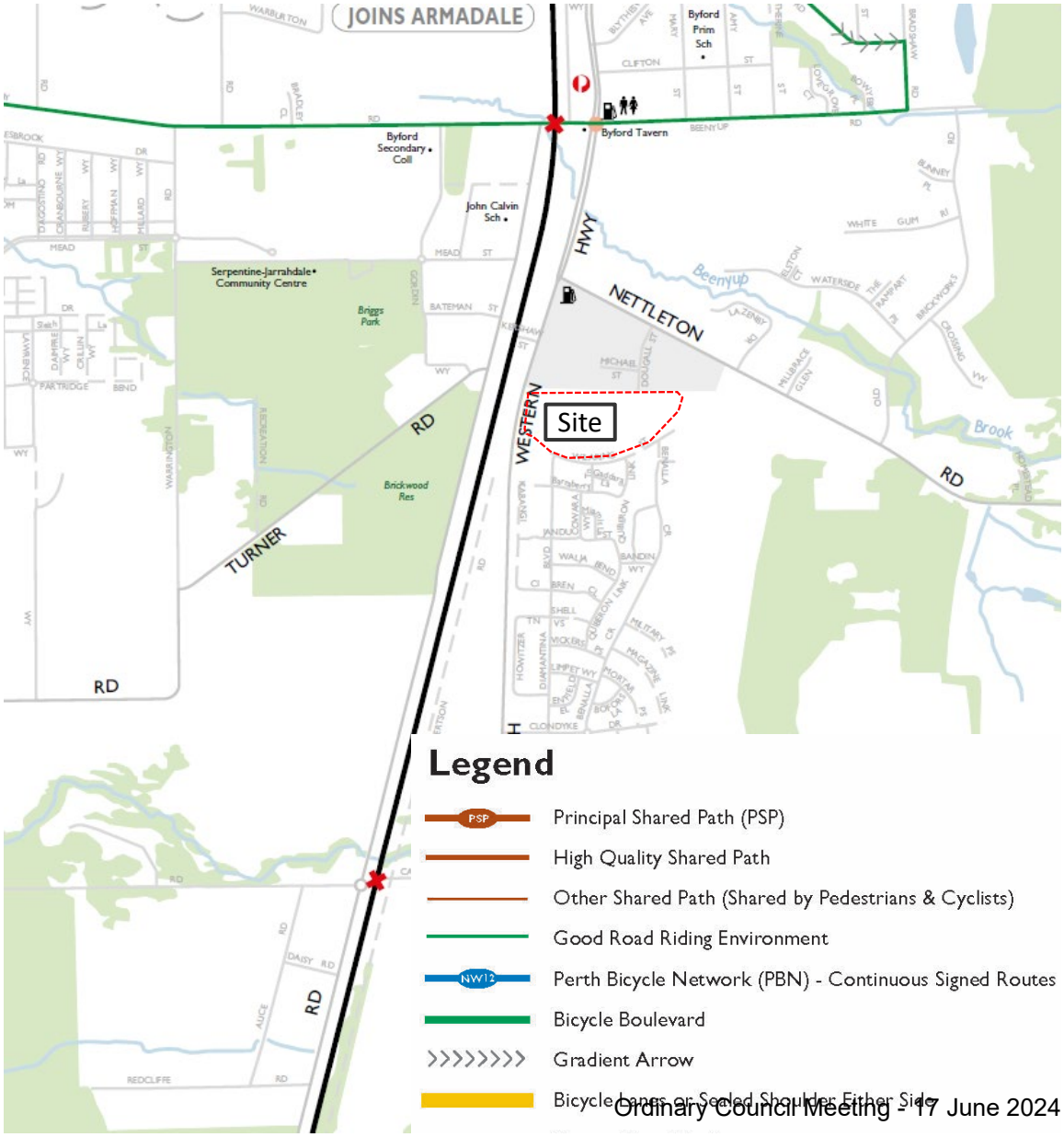


Figure 11: Bike Map

4 Changes to Surrounding Transport Networks

As part of this proposed development, Wilaring Street will be diverted into the subject site and connected to Dougall Street to the north. The diverted Wilaring Street would connect to Diamantina Blvd via a roundabout as shown in the development plan.

Dougal Street will need to be extended further south to connect to the proposed development.

One of the major future changes to the local road network is the planned extension of Tonkin Highway from Thomas Road to South Western Highway, southeast of Mundijong which entails construction of approximately 14 kilometres of four lane dual carriageway road.

5 Integration with Surrounding Area

The proposal entails a commercial development which integrates well with the existing and future surrounding land uses in the area.

As part of this development Wilaring Street will be diverted into the subject site and connected to Dougall Street to the north which will improve connectivity and traffic circulation in the locality.

6 Traffic Assessment

6.1 Assessment Period

The assessment year that is adopted for the analysis are 2025. It is understood that Tonkin Highway would be extended in near future and as a result the traffic volumes on SWH would reduce for the 10-year post development scenario. Therefore, due to the uncertainty about the future status and traffic volumes on SWH,10-year post development assessment is not undertaken in this instance.

6.2 Trip Generation and Distribution

TRMS NSW – Guide to Traffic Generating Developments Updated Traffic Surveys 04a (2013) was used to estimate the trip generation of the proposed bulky goods retail development component. For the proposed fast-food outlets, the trip rates from the Institute of Transport Engineers Trip Generation Manual were sourced.

Table 2 shows the trip generation of the proposed development. The passing trade and primary trips associated with the proposed development are also summarised in **Table 3**.

It should be noted that since bulky goods land uses typically generate minimal trips during weekday AM peak hour, adjustment factors have been applied in an attempt to realistically represent the actual traffic generation of these land uses during this period.

Due to the land use mix within the proposed development incidences of multi-purpose trips[1] (i.e., cross-trade) are anticipated. Accordingly, the applied cross-trade adjustment is calculated to result in a moderate overall reduction in trip generation of approximately 25% (In accordance with RTA NSW – Guide to Traffic Generating Developments) but only during the PM peak period and for overall daily trips.

Accordingly, it is estimated that the proposed development would generate a total of about 5,463 daily trips (both inbound and outbound) with about 119vph, 733vph and 1,072vph during the weekday AM, PM and Saturday midday peak hours respectively.

[1] *Multi-purpose trips are incidences where more than one shop/outlet are visited within the development (also referred to as "cross-trade")*

The distribution of traffic to and from the proposed development for year 2025 was established by considering the catchment area of the proposed development as well as the available access and egress routes to and from the site.

Consequently, the directional distribution of traffic to and from the site is assumed to be as follows:

- 70% of all traffic to/from north direction; and;
- 30% of all traffic to/from south direction.

Separate distributions were modelled for primary trips (non-passing trade) and pass-by trips. The distribution of the proposed development traffic is illustrated in **Figure 12** for the AM and PM peak hours. As evident the development is not expected to add significant traffic at the intersection of SWH/ Nettleton Road. This intersection would be used mainly by the development service vehicles to access/ egress the site via Dougall Street. The service vehicles generally would not visit the site during the road network peak hours.

Table 2: Weekday daily, morning, afternoon, and Saturday midday peak hours trip generation for the proposed land uses

Land use	Quantity	Daily Rate	Weekday-AM Peak	Sat-Midday Peak	Weekday-PM Peak	Cross Trade	Daily Trips	Weekday-AM trips	Sat-Midday trips	Weekday-PM trips	AM		Sat-Midday		PM	
											IN	OUT	IN	OUT	IN	OUT
Bulky goods	31009	0.17	0.0027	0.039	0.027	0.25	3954	84	907	628	42	42	454	453	314	314
Fast food outlet with drive through	397	5.069	0.088	0.553	0.352	0.25	1509	35	165	105	17	18	82	83	52	53
TOTAL TRAFFIC							**5463**	**119**	**1072**	**733**	**59**	**60**	**536**	**536**	**366**	**367**

Table 3: Passing trade and primary trip components of the trip generation

Passing Trade Component

		AM		Sat-Midday		PM	
	Daily Trips	IN	OUT	IN	OUT	IN	OUT
40%	1581	17	17	182	181	126	126
50%	755	9	9	41	41	26	26
	2336	**26**	**26**	**223**	**222**	**152**	**152**

Primary Trips Component

	AM		Sat-Midday		PM	
Daily Trips	IN	OUT	IN	OUT	IN	OUT
2373	25	25	272	272	188	188
754	8	9	41	42	26	27
3127	**33**	**34**	**313**	**314**	**214**	**215**

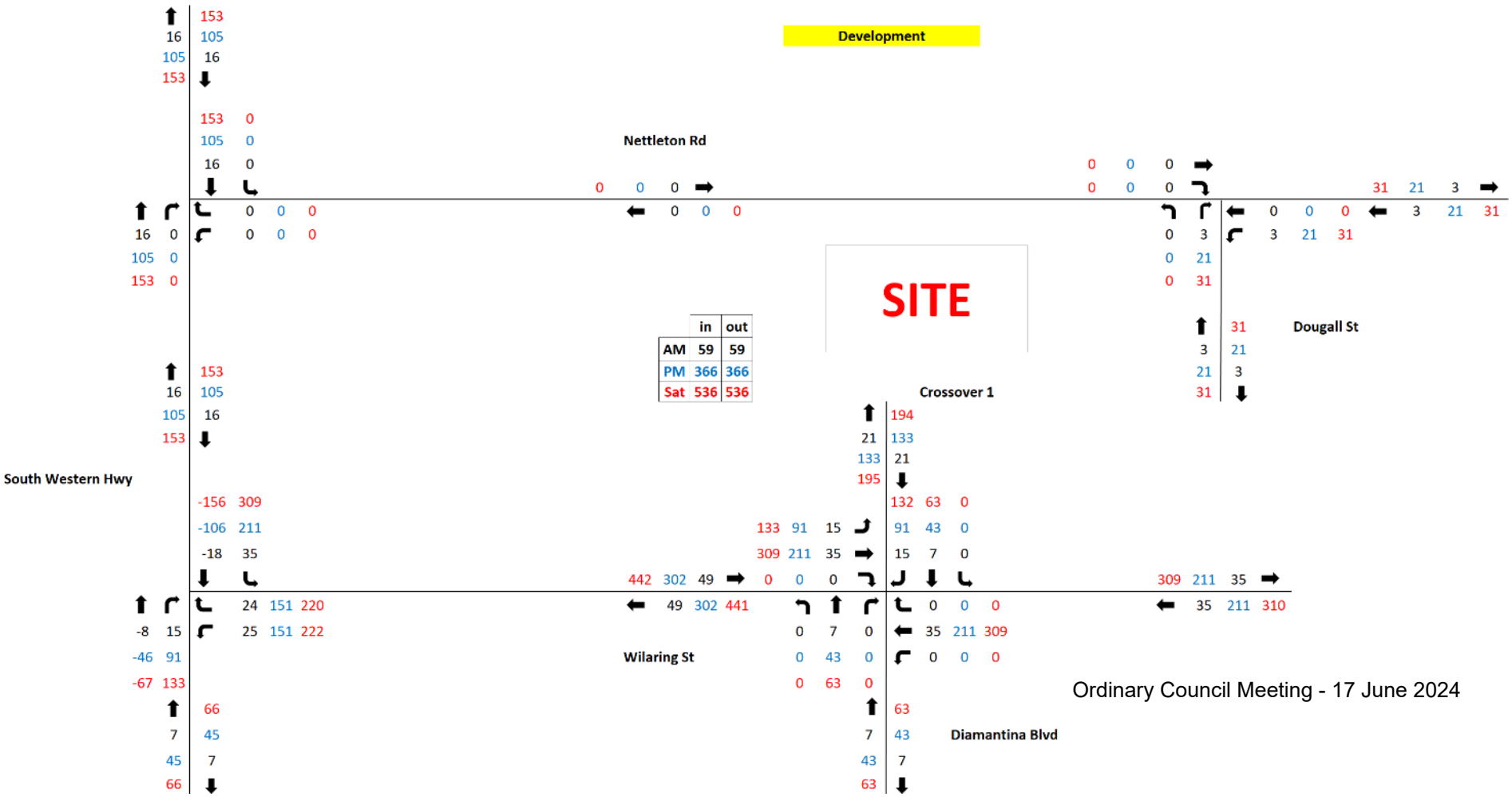


Figure 12: Development trip distribution during the AM, PM, and Saturday midday peak hours

6.3 Traffic Flow Forecasts

The existing peak hour traffic counts on surrounding roads and intersections were established by traffic counts sourced from Main Roads WA and video traffic counts undertaken by Transcore (refer **Figure 8**). The total post development traffic for the assessment year was calculated with the existing background traffic plus the development traffic.

The total projected traffic volumes for assessment year are presented in **Figure 13.**

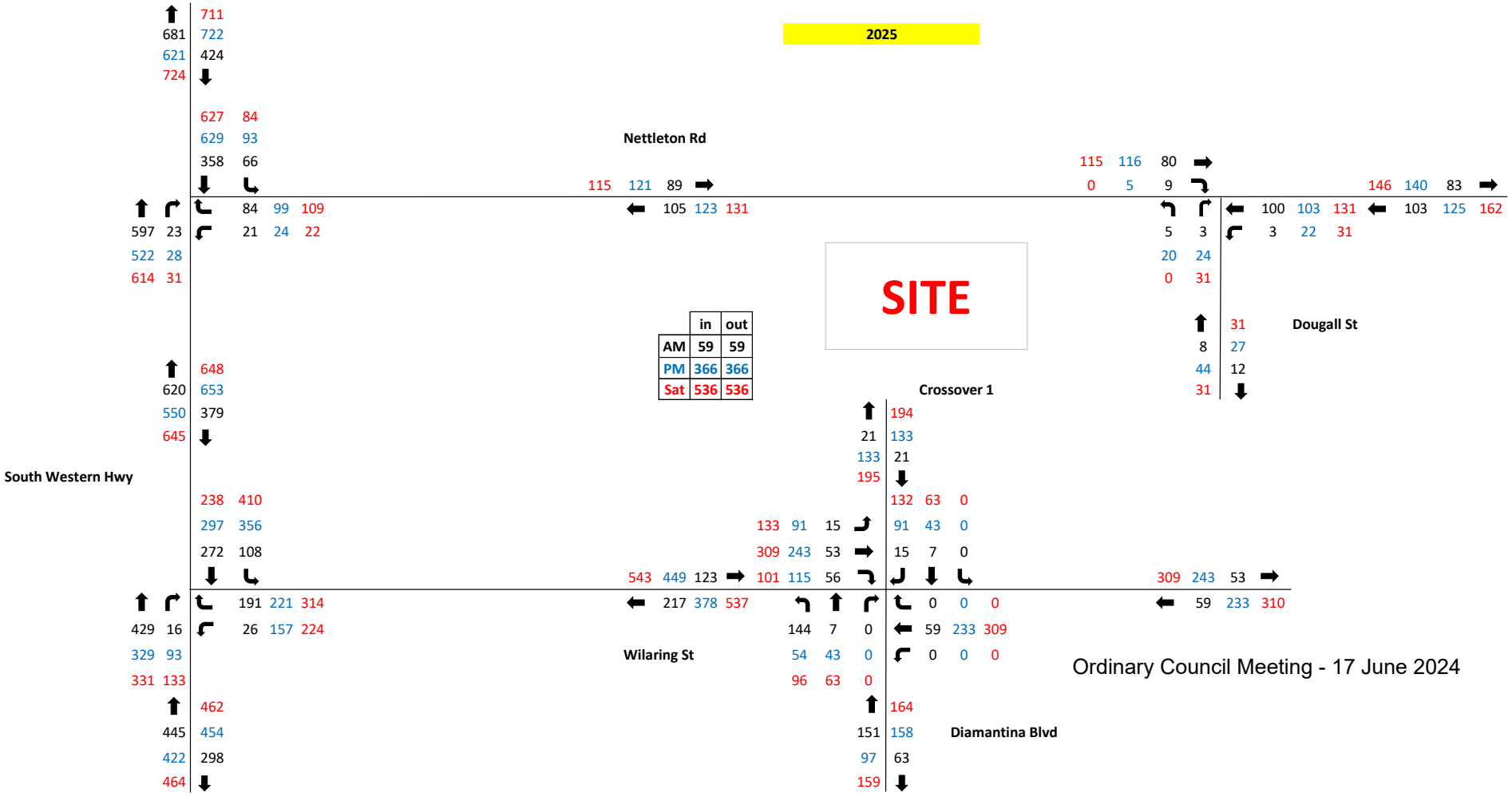


Figure 13: Total (2025) traffic – AM Weekday, PM Weekday and Saturday midday peak hours

6.4 Analysis of Local Intersections & Crossovers

Capacity network analysis was undertaken using the SIDRA computer software package for existing and post development scenarios. It should be noted that due to the recently announced funded Tonkin Highway extension project, the 10-year post development scenario assessment is not undertaken, as the existing traffic volumes on South Western Highway will be reduced because at least the regional traffic will be diverted to Tonkin Highway.

SIDRA is an intersection modelling tool commonly used 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 infrequent traffic flow up to one for saturated flow or capacity.
- Level of Service 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 service, 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.

Network SIDRA models (refer **Figure 14**) were developed to assess the proposed roundabout intersection and SWH/ Wilaring Street intersection as an integrated traffic network for 2025 modelling scenario under two different options (with and without an acceleration lane).

Separate isolated SIDRA models were also developed for the assessment of the intersection of SWH/ Nettleton Road and Nettleton Road/ Dougall Street.

The results of the SIDRA network analysis are summarised in **Appendix C**. The SIDRA intersection models were coded with reference to Main Roads WA Operation Modelling Guidelines. All relevant parameters such as heavy vehicle groups, PCU factors etc. were coded as per Main Roads WA Guidelines.

Figure 14: SIDRA network model

SWH/ WILARING STREET INTERSECTION

The SIDRA analysis results and site observations indicate that the intersection of SWH/ Wilaring Street presently operates satisfactorily and with good levels of service and with relatively low queues and delays during both weekday peak hours and Saturday midday peak hour.

The addition of the development-generated traffic to the intersection resulted in minor increases in overall queues and delays. No change in overall LoS for the intersection is reported and spare capacity remains available in the post-development stage (2025) under both options (with and without the acceleration lane). SIDRA analysis undertaken indicates that the current standard of the intersection of SWH/ Wilaring Street is able to accommodate the development traffic at the outset of the development (2025).

SIDRA analysis undertaken indicates that inclusion of the proposed acceleration lane would result in a slight improvement in the traffic operation for the second stage, specifically for the right turn movement from Wilaring Street to South Western Highway. However, the traffic operation for the first stage would remain unchanged, and the level of queues on Wilaring Street would be similar for both options (about 10m and 20m for AM and PM peak hours respectively and about 34.7m during the critical Saturday mid-day peak hour).

ROUNDABOUT INTERSECTION AT REALIGNED WILARING STREET/ DIAMANTINA BOULEVARD

SIDRA analysis indicates that the proposed roundabout intersection will operate satisfactorily in 2025 during assessed peak hours. All movements operate with good levels of service with minimal delays and queuing.

SWH/ NETTLETON ROAD

The SIDRA analysis results and site observations indicate that the intersection of SWH/ Nettleton Road presently experiences some level of congestion during the PM peak hour for the right turn movements out of Nettleton Road to SWH. With the Tonkin Highway extension and reduction of SWH traffic in this locality in near future the intersection would operate satisfactorily. It should be noted that the proposed development would not add significant traffic at this intersection during the road network peak hours as only development service vehicles will use this intersection with the majority outside the peak hours.

NETWORK OPERATION

Relevant SIDRA network outputs were reviewed for assessed peak hours to establish the operation of the proposed roundabout intersection and SWH/ Wilaring Street intersection as an integrated network for both options (with and without the acceleration lane).

As detailed in **Figure 15** there are no queue backs from the SWH/ Wilaring Street intersection to the proposed roundabout intersection on the realigned Wilaring Street during the critical Saturday midday peak hour. Similarly, no queue backs from the roundabout intersection to SWH intersection is reported.

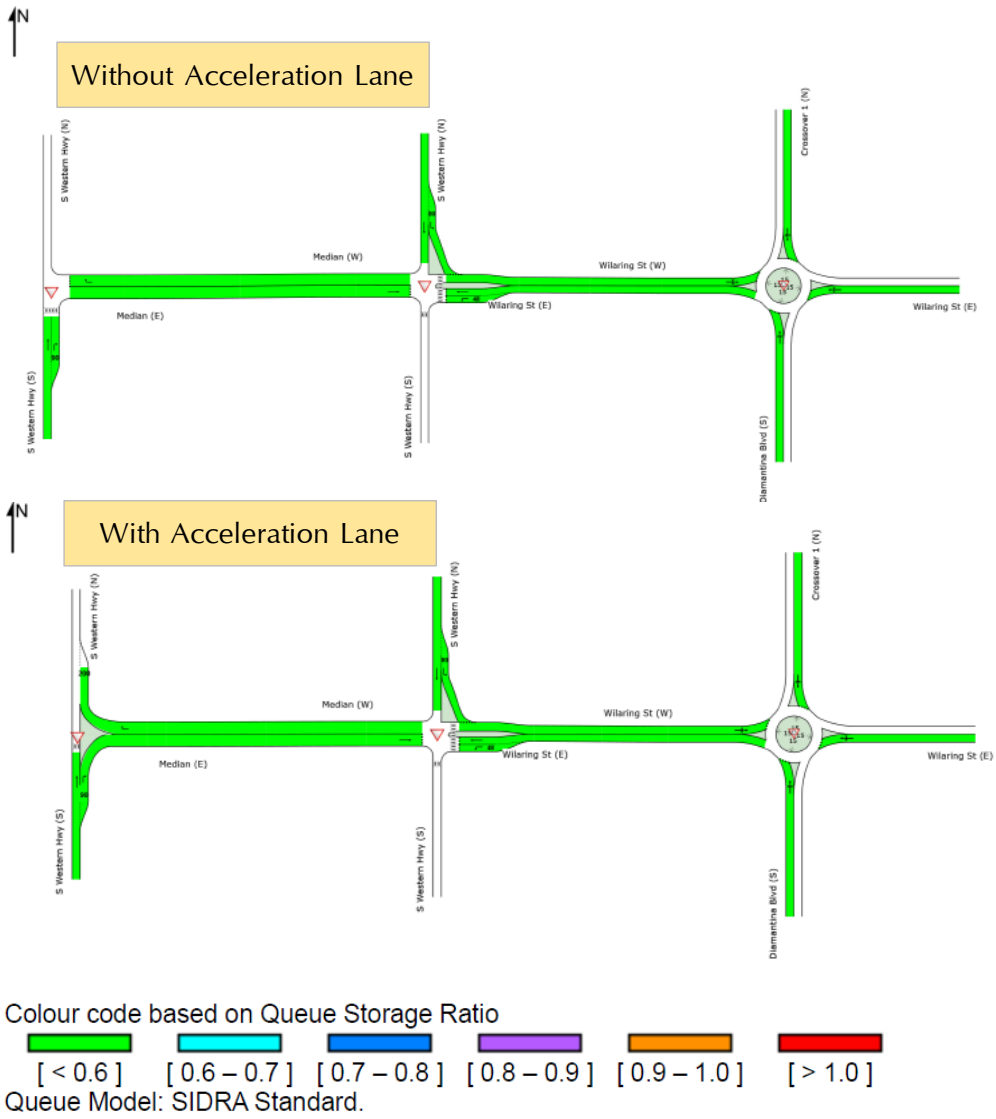


Figure 15: Saturday midday peak hour network analysis – queue storage ratio (2025)

6.5 Impact on Surrounding Roads

The WAPC *Transport Impact Assessment Guidelines* (2016) provides the following guidance on the assessment of traffic impacts:

"As a general guide, an increase in traffic of less than 10 percent of capacity would not normally be likely to have a material impact on any particular section of road, but increases over 10 percent may. All sections of road with an increase greater than 10 percent of capacity should therefore be included in the analysis. For ease of assessment, an increase of 100 vehicles per hour for any lane can be considered as equating to around 10 percent of capacity. Therefore, any section of road where development traffic would increase flows by more than 100 vehicles per hour for any lane should be included in the analysis."

The proposed development will not increase traffic flows near the quoted WAPC threshold on Nettleton Road, Douglas Road or Diamantina Blvd. The traffic increase on realigned Wilaring Street would be more than 100vph per lane during the PM peak hour. However, the result of the SIDRA Network analysis indicated that this section of Wilaring Street would be able to accommodate the development traffic satisfactorily.

6.6 Impact on Neighbouring Areas

Due to the location of the subject site, its accessibility via major regional roads, significant passing trade component and limited number of residential dwellings within the immediate vicinity, the traffic impact from the development in the area will be limited.

6.7 Traffic Noise and Vibration

It generally requires a doubling of traffic volumes on a road to produce a perceptible 3dB(A) increase in road noise. The proposed development will not increase traffic volumes or noise on surrounding roads near this level.

7 Parking

The proposed parking provision for the proposed commercial development is 759 bays.

It is considered that the proposed parking provision is adequate to meet the parking demand of the proposed development.

8 Provision for Heavy Vehicles

There are a number of service vehicles servicing the different land uses within the proposed development as outlined below:

Fast Food Outlets
The 8.8m service vehicles servicing the fast-food outlets 1 and 2 would be able to enter the site via the proposed roundabout intersection on Wilaring Street and exit back to SWH via Wilaring Street or Dougall Street/ Nettleton Road. Turn path analysis undertaken for 8.8m service vehicles (refer **Appendix C**) indicate satisfactory movements.

Bulky Goods
Bulky goods 1 located at the north-west corner of the site is expected to use larger service vehicles up to 19.0m semi-trailer. Therefore, turn paths have been undertaken for such vehicle for this tenancy. The other bulky goods stores would utilise 12.5m service vehicles for servicing.

The 19.0m service vehicle is expected to enter the site via the proposed roundabout intersection on Wilaring Street and exit back to SWH via Dougall Street.

The 12.5m service vehicles would be able to enter the site via the proposed roundabout intersection on Wilaring Street and exit back to SWH via Wilaring Street or Dougall Street/ Nettleton Road. It should be noted that most service vehicles are likely to be smaller than 12.5m trucks.

Turn path analysis undertaken for 19.0m semi-trailer and 12.5m service vehicle are presented in **Appendix C** and demonstrate satisfactory movements.

9 Public Transport Access

Details of the available public transport services in this locality are provided in section 3.4 of this report. At present, bus stop (Stop No: 27654) on bus route 251, 252 and 253 is located to the south-east of the subject site within walking distance to the development.

10 Pedestrian Access

Details of the pedestrian and cyclist facilities in this locality are provided in section 3.5 of the report.

11 Conclusions

This Revised Traffic Impact Assessment (TIA) has been prepared by Transcore on behalf of Accord Property for the proposed commercial/bulky goods retail development at Lot 806 South Western Highway, Byford.

Following the State Administrative Tribunal (SAT) meeting on February 12, 2024, Transcore was tasked with updating the January 2022 TIA to address condition 1.p.ii of the approval, which requires the inclusion of a central island treatment and acceleration lane northbound at the intersection of South Western Highway and Wilaring Street.

To fulfill this requirement, Transcore conducted a video traffic survey at the SWH and Wilaring Street intersection on February 14, 2024, and updated November 2021 traffic counts for the AM and PM peak hours. The original counts on Saturday mid-day in October 2022 were also used to assess the critical Saturday mid-day peak hour.

The SIDRA intersection analysis was updated for both the existing and post-development scenarios during the AM, PM and Saturday peak hours. Additionally, a sensitivity analysis was performed to evaluate the impact of incorporating an acceleration lane on South Western Highway.

It is important to note that the 10-year post-development scenario assessment was not conducted due to the recently announced funded Tonkin Highway extension project. This project is expected to divert regional traffic from South Western Highway to Tonkin Highway, resulting in reduced traffic volumes on South Western Highway.

Based on the SIDRA analysis results and site observations, the SWH/Wilaring Street intersection currently operates satisfactorily, with good levels of service and relatively low queues and delays during weekday peak hours and Saturday midday peak hour.

The addition of development-generated traffic to the intersection led to minor increases in overall queues and delays. However, there was no major change in the overall Level of Service (LoS) for the intersection, and spare capacity remains available in the post-development stage (2025) under both options (with and without the acceleration lane).

The SIDRA analysis indicates that the inclusion of the proposed acceleration lane would result in a slight improvement in traffic operations for the second stage, particularly for the right turn movement from Wilaring Street to South Western Highway. However, the traffic operations for the first stage would remain unchanged, and the level of queues on Wilaring Street would be similar for both options (approximately 10m and 20m for AM and PM peak hours respectively, and approximately 34.7m during the critical Saturday midday peak hour).

Overall, the comprehensive analysis and information provided in the TIA indicate that traffic-related issues should not hinder the approval of the proposed development.

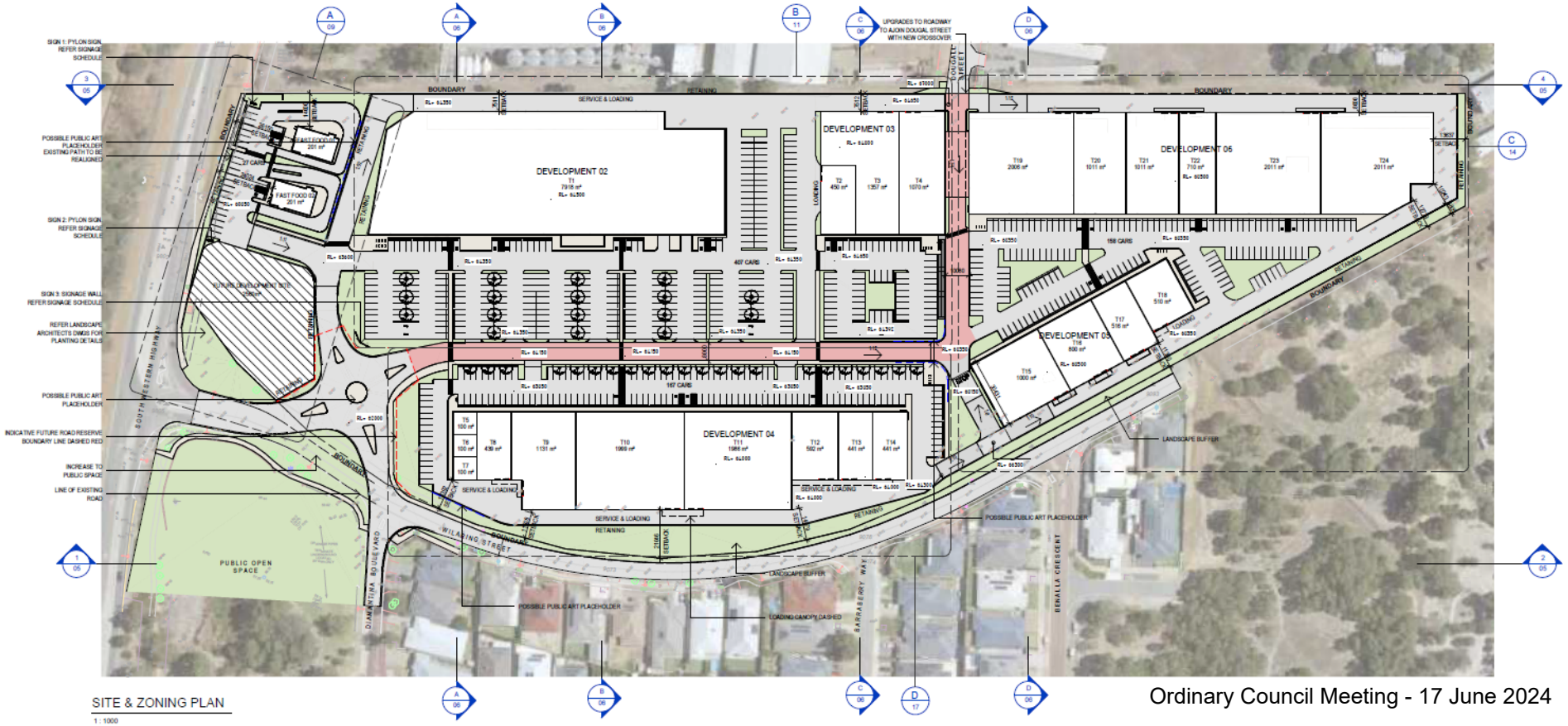
Appendix A

PROPOSED DEVELOPMENT

PRELIMINARY

BYFORD COMMERCIAL

SOUTH WESTERN HIGHWAY



SITE & ZONING PLAN

1 : 1000

DA ISSUE

ISSUED FOR DEVELOPMENT APPROVAL

Rev.	Amendment	Date
A	PRELIMINARY	03.08.22
B	DA REVIEW	10.08.22
C	DA REVIEW	24.08.22
D	DA ISSUE	31.08.22
E	DA ISSUE	09.09.22

Appendix B

INTERSECTION ANALYSIS – SIDRA RESULTS

Existing

MOVEMENT SUMMARY

Site: [S Western Hwy & Wilaring St - Sta 1 - Existing - AM (Site Folder: Existing)]

Network: N102 [AM (Network Folder: Existing)]

Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
East: Wilaring St (E)														
1	L2	1	2.0	1	2.0	0.001	6.6	LOS A	0.0	0.0	0.38	0.53	0.38	47.7
2	T1	176	2.0	176	2.0	0.237	8.1	LOS A	1.1	8.1	0.55	0.74	0.55	26.9
Approach		177	2.0	177	2.0	0.237	8.1	LOS A	1.1	8.1	0.55	0.74	0.55	27.3
North: S Western Hwy (N)														
3	L2	77	2.0	77	2.0	0.054	5.6	LOS A	0.2	1.7	0.01	0.54	0.01	48.9
4	T1	305	19.4	305	19.4	0.196	0.1	LOS A	0.0	0.0	0.00	0.00	0.00	59.9
Approach		382	15.9	382	15.9	0.196	1.2	LOS A	0.2	1.7	0.00	0.11	0.00	58.2
West: Median (W)														
5	T1	1	2.0	1	2.0	0.001	1.1	LOS A	0.0	0.0	0.36	0.17	0.36	33.5
Approach		1	2.0	1	2.0	0.001	1.1	LOS A	0.0	0.0	0.36	0.17	0.36	33.5
All Vehicles		560	11.5	560	11.5	0.237	3.4	NA	1.1	8.1	0.17	0.31	0.17	54.7

MOVEMENT SUMMARY

Site: [S Western Hwy & Wilaring St - Sta 2 - Existing - AM (Site Folder: Existing)]

Network: N102 [AM (Network Folder: Existing)]

Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: S Western Hwy (S)														
2	T1	460	21.5	460	21.5	0.301	0.1	LOS A	0.0	0.0	0.00	0.00	0.00	59.8
3	R2	1	2.0	1	2.0	0.001	5.5	LOS A	0.0	0.0	0.00	0.60	0.00	50.9
Approach		461	21.5	461	21.5	0.301	0.1	NA	0.0	0.0	0.00	0.00	0.00	59.8
East: Median (E)														
1	R2	176	2.0	176	2.0	0.154	1.4	LOS A	0.4	2.8	0.33	0.37	0.33	48.4
Approach		176	2.0	176	2.0	0.154	1.4	LOS A	0.4	2.8	0.33	0.37	0.33	48.4
All Vehicles		637	16.1	637	16.1	0.301	0.5	NA	0.4	2.8	0.09	0.10	0.09	57.6

MOVEMENT SUMMARY

Site: [S Western Hwy & Nettleton Rd - Existing - AM (Site Folder: Existing)]

Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: S Western Hwy (S)														
5	T1	581	21.5	612	21.5	0.399	0.4	LOS A	0.6	5.6	0.08	0.02	0.10	59.2
6	R2	23	13.6	24	13.6	0.399	10.5	LOS B	0.6	5.6	0.08	0.02	0.10	53.6
Approach		604	21.2	636	21.2	0.399	0.8	NA	0.6	5.6	0.08	0.02	0.10	59.0
East: Nettleton Rd(E)														
7	L2	21	14.1	22	14.1	0.022	7.4	LOS A	0.1	0.7	0.43	0.62	0.43	45.6
9	R2	84	14.1	88	14.1	0.509	36.0	LOS E	2.1	17.5	0.92	1.06	1.29	30.6
Approach		105	14.1	111	14.1	0.509	30.3	LOS D	2.1	17.5	0.82	0.98	1.12	32.8
North: S Western Hwy (N)														
10	L2	66	13.6	69	13.6	0.043	5.8	LOS A	0.0	0.0	0.00	0.57	0.00	48.5
11	T1	342	19.4	360	19.4	0.212	0.1	LOS A	0.0	0.0	0.00	0.00	0.00	59.9
Approach		408	18.5	429	18.5	0.212	1.0	NA	0.0	0.0	0.00	0.09	0.00	58.0
All Vehicles		1117	19.5	1176	19.5	0.509	3.6	NA	2.1	17.5	0.12	0.14	0.16	55.2

MOVEMENT SUMMARY

Site: [S Western Hwy & Wilaring St - Sta 1 - Existing - PM (Site Folder: Existing)]

Network: N102 [PM (Network Folder: Existing)]

Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
East: Wilaring St (E)														
1	L2	6	2.0	6	2.0	0.006	7.3	LOS A	0.0	0.2	0.46	0.60	0.46	47.3
2	T1	74	2.0	74	2.0	0.129	9.9	LOS A	0.5	3.9	0.60	0.80	0.60	24.1
Approach		80	2.0	80	2.0	0.129	9.6	LOS A	0.5	3.9	0.59	0.78	0.59	28.6
North: S Western Hwy (N)														
3	L2	153	2.0	153	2.0	0.108	5.6	LOS A	0.5	3.5	0.02	0.54	0.02	48.8
4	T1	424	19.4	424	19.4	0.272	0.1	LOS A	0.0	0.0	0.00	0.00	0.00	59.8
Approach		577	14.8	577	14.8	0.272	1.6	LOS A	0.5	3.9	0.01	0.14	0.01	57.5
West: Median (W)														
5	T1	2	2.0	2	2.0	0.002	1.7	LOS A	0.0	0.1	0.43	0.25	0.43	32.2
Approach		2	2.0	2	2.0	0.002	1.7	LOS A	0.0	0.1	0.43	0.25	0.43	32.2
All Vehicles		659	13.2	659	13.2	0.272	2.5	NA	0.5	3.9	0.08	0.22	0.08	56.2

MOVEMENT SUMMARY

Site: [S Western Hwy & Wilaring St - Sta 2 - Existing - PM (Site Folder: Existing)]

Network: N102 [PM (Network Folder: Existing)]

Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: S Western Hwy (S)														
2	T1	395	21.5	395	21.5	0.259	0.1	LOS A	0.0	0.0	0.00	0.00	0.00	59.8
3	R2	2	2.0	2	2.0	0.001	5.5	LOS A	0.0	0.0	0.00	0.60	0.00	50.9
Approach		397	21.4	397	21.4	0.259	0.1	NA	0.0	0.0	0.00	0.00	0.00	59.8
East: Median (E)														
1	R2	74	2.0	74	2.0	0.061	1.2	LOS A	0.1	1.1	0.28	0.29	0.28	48.7
Approach		74	2.0	74	2.0	0.061	1.2	LOS A	0.1	1.1	0.28	0.29	0.28	48.7
All Vehicles		471	18.4	471	18.4	0.259	0.3	NA	0.1	1.1	0.04	0.05	0.04	58.7

MOVEMENT SUMMARY

Site: [S Western Hwy & Nettleton Rd - Existing - PM (Site Folder: Existing)]

Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: S Western Hwy (S)														
5	T1	417	21.5	439	21.5	0.318	1.2	LOS A	0.9	8.8	0.17	0.04	0.21	57.9
6	R2	28	13.6	29	13.6	0.318	13.6	LOS B	0.9	8.8	0.17	0.04	0.21	52.3
Approach		445	21.0	468	21.0	0.318	2.0	NA	0.9	8.8	0.17	0.04	0.21	57.5
East: Nettleton Rd(E)														
7	L2	24	14.1	25	14.1	0.034	8.9	LOS A	0.1	1.0	0.54	0.72	0.54	44.6
9	R2	99	14.1	104	14.1	0.608	40.7	LOS E	2.7	22.7	0.93	1.12	1.47	29.0
Approach		123	14.1	129	14.1	0.608	34.5	LOS D	2.7	22.7	0.86	1.04	1.29	31.2
North: S Western Hwy (N)														
10	L2	93	13.6	98	13.6	0.061	5.8	LOS A	0.0	0.0	0.00	0.57	0.00	48.5
11	T1	524	19.4	552	19.4	0.325	0.1	LOS A	0.0	0.0	0.00	0.00	0.00	59.0
Approach		617	18.5	649	18.5	0.325	1.0	NA	0.0	0.0	0.00	0.09	0.00	58.1
All Vehicles		1185	19.0	1247	19.0	0.608	4.8	NA	2.7	22.7	0.15	0.17	0.21	53.8

MOVEMENT SUMMARY

Site: [S Western Hwy & Wilaring St - Sta 1 - Existing - Sat (Site Folder: Existing)]

Network: N101 [Sat (Network Folder: Existing)]

Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h]	HV] %	ARRIVAL FLOWS [Total veh/h]	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh]	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
East: Wilaring St (E)														
1	L2	2	2.0	2	2.0	0.002	7.2	LOS A	0.0	0.1	0.45	0.56	0.45	47.4
2	T1	99	2.0	99	2.0	0.165	9.5	LOS A	0.7	5.1	0.59	0.80	0.59	24.5
Approach		101	2.0	101	2.0	0.165	9.5	LOS A	0.7	5.1	0.59	0.79	0.59	25.9
North: S Western Hwy (N)														
3	L2	106	2.0	106	2.0	0.075	5.6	LOS A	0.3	2.4	0.01	0.54	0.01	48.9
4	T1	415	19.4	415	19.4	0.266	0.1	LOS A	0.0	0.0	0.00	0.00	0.00	59.8
Approach		521	15.8	521	15.8	0.266	1.2	LOS A	0.3	2.4	0.00	0.11	0.00	58.1
West: Median (W)														
5	T1	1	2.0	1	2.0	0.001	1.6	LOS A	0.0	0.0	0.43	0.23	0.43	32.4
Approach		1	2.0	1	2.0	0.001	1.6	LOS A	0.0	0.0	0.43	0.23	0.43	32.4
All Vehicles		623	13.6	623	13.6	0.266	2.6	NA	0.7	5.1	0.10	0.22	0.10	56.3

MOVEMENT SUMMARY

Site: [S Western Hwy & Wilaring St - Sta 2 - Existing - Sat (Site Folder: Existing)]

Network: N101 [Sat (Network Folder: Existing)]

Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h]	HV] %	ARRIVAL FLOWS [Total veh/h]	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh]	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: S Western Hwy (S)														
2	T1	419	21.5	419	21.5	0.274	0.1	LOS A	0.0	0.0	0.00	0.00	0.00	59.8
3	R2	1	2.0	1	2.0	0.001	5.5	LOS A	0.0	0.0	0.00	0.60	0.00	50.9
Approach		420	21.5	420	21.5	0.274	0.1	NA	0.0	0.0	0.00	0.00	0.00	59.8
East: Median (E)														
1	R2	99	2.0	99	2.0	0.084	1.3	LOS A	0.2	1.5	0.29	0.31	0.29	48.6
Approach		99	2.0	99	2.0	0.084	1.3	LOS A	0.2	1.5	0.29	0.31	0.29	48.6
All Vehicles		519	17.7	519	17.7	0.274	0.3	NA	0.2	1.5	0.06	0.06	0.06	58.4

MOVEMENT SUMMARY

Site: [S Western Hwy & Nettleton Rd - Existing - Sat (Site Folder: Existing)]

Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: S Western Hwy (S)														
5	T1	461	21.5	485	21.5	0.346	1.0	LOS A	0.9	9.0	0.15	0.04	0.20	58.1
6	R2	31	13.6	33	13.6	0.346	12.7	LOS B	0.9	9.0	0.15	0.04	0.20	52.6
Approach		492	21.0	518	21.0	0.346	1.7	NA	0.9	9.0	0.15	0.04	0.20	57.8
East: Nettleton Rd(E)														
7	L2	22	14.1	23	14.1	0.028	8.4	LOS A	0.1	0.9	0.51	0.68	0.51	45.0
9	R2	109	14.1	115	14.1	0.647	41.6	LOS E	3.0	25.4	0.94	1.14	1.56	28.8
Approach		131	14.1	138	14.1	0.647	36.0	LOS E	3.0	25.4	0.87	1.07	1.39	30.6
North: S Western Hwy (N)														
10	L2	84	13.6	88	13.6	0.055	5.8	LOS A	0.0	0.0	0.00	0.57	0.00	48.5
11	T1	473	19.4	498	19.4	0.293	0.1	LOS A	0.0	0.0	0.00	0.00	0.00	59.8
Approach		557	18.5	586	18.5	0.293	0.9	NA	0.0	0.0	0.00	0.09	0.00	58.1
All Vehicles		1180	19.1	1242	19.1	0.647	5.2	NA	3.0	25.4	0.16	0.18	0.24	53.5

2025 - Without Acceleration Lane

MOVEMENT SUMMARY

Site: [S Western Hwy & Wilaring St - Sta 1 - 2025 - AM (Site Folder: 2025 - Without Acceleration Lane)]

Network: N101 [AM (Network Folder: 2025 - Without Acceleration Lane)]

Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
East: Wilaring St (E)														
1	L2	27	2.0	27	2.0	0.023	6.2	LOS A	0.1	0.7	0.37	0.58	0.37	47.9
2	T1	201	2.0	201	2.0	0.274	8.0	LOS A	1.3	9.7	0.57	0.76	0.57	24.2
Approach		228	2.0	228	2.0	0.274	7.8	LOS A	1.3	9.7	0.54	0.74	0.55	31.6
North: S Western Hwy (N)														
3	L2	114	2.0	114	2.0	0.081	5.7	LOS A	0.3	2.6	0.07	0.52	0.07	49.8
4	T1	286	19.4	286	19.4	0.184	0.1	LOS A	0.0	0.0	0.00	0.00	0.00	59.9
Approach		400	14.5	400	14.5	0.184	1.7	LOS A	0.3	2.6	0.02	0.15	0.02	58.0
West: Median (W)														
5	T1	17	2.0	17	2.0	0.015	1.1	LOS A	0.1	0.4	0.35	0.21	0.35	14.9
Approach		17	2.0	17	2.0	0.015	1.1	LOS A	0.1	0.4	0.35	0.21	0.35	14.9
All Vehicles		645	9.7	645	9.7	0.274	3.8	NA	1.3	9.7	0.21	0.36	0.22	53.6

MOVEMENT SUMMARY

Site: [S Western Hwy & Wilaring St - Sta 2 - 2025 - AM (Site Folder: 2025 - Without Acceleration Lane)]

Network: N101 [AM (Network Folder: 2025 - Without Acceleration Lane)]

Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: S Western Hwy (S)														
2	T1	452	21.5	452	21.5	0.296	0.1	LOS A	0.0	0.0	0.00	0.00	0.00	59.8
3	R2	17	2.0	17	2.0	0.009	5.5	LOS A	0.0	0.0	0.00	0.60	0.00	50.9
Approach		468	20.8	468	20.8	0.296	0.3	NA	0.0	0.0	0.00	0.02	0.00	59.6
East: Median (E)														
1	R2	201	2.0	201	2.0	0.225	2.6	LOS A	0.8	5.8	0.47	0.51	0.47	47.0
Approach		201	2.0	201	2.0	0.225	2.6	LOS A	0.8	5.8	0.47	0.51	0.47	47.0
All Vehicles		669	15.2	669	15.2	0.296	1.0	NA	0.8	5.8	0.14	0.17	0.14	56.9

MOVEMENT SUMMARY

Site: [Wilaring St & Diamantina Blvd & Crossover 1 - 2025 - AM (Site Folder: 2025 - Without Acceleration Lane)]

Network: N101 [AM (Network Folder: 2025 - Without Acceleration Lane)]

Site Category: (None)
Roundabout

Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h]	HV] %	ARRIVAL FLOWS [Total veh/h]	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh]	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Diamantina Blvd (S)														
10	L2	152	2.0	152	2.0	0.133	4.2	LOS A	0.8	6.0	0.28	0.50	0.28	32.0
11	T1	7	2.0	7	2.0	0.133	7.0	LOS A	0.8	6.0	0.28	0.50	0.28	26.4
12	R2	5	2.0	5	2.0	0.133	8.5	LOS A	0.8	6.0	0.28	0.50	0.28	45.1
Approach		164	2.0	164	2.0	0.133	4.4	LOS A	0.8	6.0	0.28	0.50	0.28	32.4
East: Wilaring St (E)														
1	L2	5	2.0	5	2.0	0.061	4.6	LOS A	0.3	2.5	0.26	0.46	0.26	40.9
2	T1	62	2.0	62	2.0	0.061	4.9	LOS A	0.3	2.5	0.26	0.46	0.26	40.5
3	R2	5	2.0	5	2.0	0.061	9.0	LOS A	0.3	2.5	0.26	0.46	0.26	33.8
Approach		73	2.0	73	2.0	0.061	5.2	LOS A	0.3	2.5	0.26	0.46	0.26	39.9
North: Crossover 1 (N)														
4	L2	5	2.0	5	2.0	0.025	0.7	LOS A	0.1	1.0	0.30	0.13	0.30	32.5
5	T1	7	2.0	7	2.0	0.025	0.7	LOS A	0.1	1.0	0.30	0.13	0.30	24.8
6	R2	16	2.0	16	2.0	0.025	0.7	LOS A	0.1	1.0	0.30	0.13	0.30	18.4
Approach		28	2.0	28	2.0	0.025	0.7	LOS A	0.1	1.0	0.30	0.13	0.30	24.1
West: Wilaring St (W)														
7	L2	16	2.0	16	2.0	0.091	4.7	LOS A	0.5	4.0	0.11	0.54	0.11	26.4
8	T1	56	2.0	56	2.0	0.091	4.0	LOS A	0.5	4.0	0.11	0.54	0.11	43.8
9	R2	59	2.0	59	2.0	0.091	8.0	LOS A	0.5	4.0	0.11	0.54	0.11	33.6
Approach		131	2.0	131	2.0	0.091	5.9	LOS A	0.5	4.0	0.11	0.54	0.11	37.5
All Vehicles		396	2.0	396	2.0	0.133	4.8	LOS A	0.8	6.0	0.22	0.48	0.22	35.4

MOVEMENT SUMMARY

Site: [S Western Hwy & Nettleton Rd - 2025 - AM (Site Folder: 2025 - Without Acceleration Lane)]

Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: S Western Hwy (S)														
5	T1	597	21.5	628	21.5	0.410	0.4	LOS A	0.6	5.9	0.08	0.02	0.10	59.1
6	R2	23	13.6	24	13.6	0.410	10.9	LOS B	0.6	5.9	0.08	0.02	0.10	53.6
Approach		620	21.2	653	21.2	0.410	0.8	NA	0.6	5.9	0.08	0.02	0.10	58.9
East: Nettleton Rd(E)														
7	L2	21	14.1	22	14.1	0.023	7.5	LOS A	0.1	0.7	0.44	0.62	0.44	45.6
9	R2	84	14.1	88	14.1	0.552	40.4	LOS E	2.2	19.2	0.93	1.08	1.35	29.1
Approach		105	14.1	111	14.1	0.552	33.8	LOS D	2.2	19.2	0.83	0.99	1.17	31.5
North: S Western Hwy (N)														
10	L2	66	13.6	69	13.6	0.043	5.8	LOS A	0.0	0.0	0.00	0.57	0.00	48.5
11	T1	358	19.4	377	19.4	0.222	0.1	LOS A	0.0	0.0	0.00	0.00	0.00	59.9
Approach		424	18.5	446	18.5	0.222	0.9	NA	0.0	0.0	0.00	0.09	0.00	58.1
All Vehicles		1149	19.6	1209	19.6	0.552	3.9	NA	2.2	19.2	0.12	0.14	0.16	55.0

MOVEMENT SUMMARY

Site: [S Western Hwy & Wilaring St - Sta 1 - 2025 - PM (Site Folder: 2025 - Without Acceleration Lane)]

Network: N101 [PM (Network Folder: 2025 - Without Acceleration Lane)]

Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
East: Wilaring St (E)														
1	L2	165	2.0	165	2.0	0.143	6.5	LOS A	0.6	4.4	0.42	0.65	0.42	47.7
2	T1	233	2.0	233	2.0	0.447	13.3	LOS B	2.6	19.9	0.71	0.98	1.03	17.3
Approach		398	2.0	398	2.0	0.447	10.5	LOS B	2.6	19.9	0.59	0.84	0.77	36.4
North: S Western Hwy (N)														
3	L2	375	2.0	375	2.0	0.290	6.2	LOS A	1.5	11.0	0.25	0.54	0.25	48.6
4	T1	313	19.4	313	19.4	0.201	0.1	LOS A	0.0	0.0	0.00	0.00	0.00	59.9
Approach		687	9.9	687	9.9	0.290	3.4	LOS A	1.5	11.0	0.14	0.29	0.14	55.1
West: Median (W)														
5	T1	98	2.0	98	2.0	0.091	1.3	LOS A	0.3	2.5	0.38	0.28	0.38	14.5
Approach		98	2.0	98	2.0	0.091	1.3	LOS A	0.3	2.5	0.38	0.28	0.38	14.5
All Vehicles		1183	6.6	1183	6.6	0.447	5.6	NA	2.6	19.9	0.31	0.48	0.37	49.7

MOVEMENT SUMMARY

Site: [S Western Hwy & Wilaring St - Sta 2 - 2025 - PM (Site Folder: 2025 - Without Acceleration Lane)]

Network: N101 [PM (Network Folder: 2025 - Without Acceleration Lane)]

Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: S Western Hwy (S)														
2	T1	346	21.5	346	21.5	0.227	0.1	LOS A	0.0	0.0	0.00	0.00	0.00	59.8
3	R2	98	2.0	98	2.0	0.054	5.5	LOS A	0.0	0.0	0.00	0.60	0.00	50.9
Approach		444	17.2	444	17.2	0.227	1.3	NA	0.0	0.0	0.00	0.13	0.00	58.5
East: Median (E)														
1	R2	233	2.0	233	2.0	0.187	1.2	LOS A	0.5	3.6	0.28	0.31	0.28	48.6
Approach		233	2.0	233	2.0	0.187	1.2	LOS A	0.5	3.6	0.28	0.31	0.28	48.6
All Vehicles		677	12.0	677	12.0	0.227	1.2	NA	0.5	3.6	0.10	0.19	0.10	56.0

MOVEMENT SUMMARY

Site: [Wilaring St & Diamantina Blvd & Crossover 1 - 2025 - PM (Site Folder: 2025 - Without Acceleration Lane)]

Network: N101 [PM (Network Folder: 2025 - Without Acceleration Lane)]

Site Category: (None)
Roundabout

Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h]	HV] %	ARRIVAL FLOWS [Total veh/h]	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh]	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Diamantina Blvd (S)														
10	L2	57	2.0	57	2.0	0.118	6.0	LOS A	0.7	5.3	0.56	0.65	0.56	26.7
11	T1	45	2.0	45	2.0	0.118	8.8	LOS A	0.7	5.3	0.56	0.65	0.56	24.0
12	R2	5	2.0	5	2.0	0.118	10.3	LOS B	0.7	5.3	0.56	0.65	0.56	40.7
Approach		107	2.0	107	2.0	0.118	7.4	LOS A	0.7	5.3	0.56	0.65	0.56	26.2
East: Wilaring St (E)														
1	L2	5	2.0	5	2.0	0.258	6.1	LOS A	1.7	12.7	0.55	0.59	0.55	38.7
2	T1	245	2.0	245	2.0	0.258	6.4	LOS A	1.7	12.7	0.55	0.59	0.55	37.6
3	R2	5	2.0	5	2.0	0.258	10.5	LOS B	1.7	12.7	0.55	0.59	0.55	32.1
Approach		256	2.0	256	2.0	0.258	6.5	LOS A	1.7	12.7	0.55	0.59	0.55	37.4
North: Crossover 1 (N)														
4	L2	5	2.0	5	2.0	0.164	2.7	LOS A	1.0	7.5	0.59	0.45	0.59	30.7
5	T1	45	2.0	45	2.0	0.164	2.7	LOS A	1.0	7.5	0.59	0.45	0.59	23.2
6	R2	96	2.0	96	2.0	0.164	2.7	LOS A	1.0	7.5	0.59	0.45	0.59	17.0
Approach		146	2.0	146	2.0	0.164	2.7	LOS A	1.0	7.5	0.59	0.45	0.59	20.1
West: Wilaring St (W)														
7	L2	96	2.0	96	2.0	0.343	5.0	LOS A	2.8	21.1	0.29	0.50	0.29	26.0
8	T1	256	2.0	256	2.0	0.343	4.3	LOS A	2.8	21.1	0.29	0.50	0.29	43.5
9	R2	121	2.0	121	2.0	0.343	8.4	LOS A	2.8	21.1	0.29	0.50	0.29	33.3
Approach		473	2.0	473	2.0	0.343	5.5	LOS A	2.8	21.1	0.29	0.50	0.29	37.7
All Vehicles		982	2.0	982	2.0	0.343	5.6	LOS A	2.8	21.1	0.43	0.53	0.43	34.0

MOVEMENT SUMMARY

Site: [S Western Hwy & Nettleton Rd - 2025 - PM (Site Folder: 2025 - Without Acceleration Lane)]

Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: S Western Hwy (S)														
5	T1	522	21.5	549	21.5	0.399	1.8	LOS A	1.4	13.7	0.19	0.04	0.26	57.3
6	R2	28	13.6	29	13.6	0.399	17.8	LOS C	1.4	13.7	0.19	0.04	0.26	51.7
Approach		550	21.1	579	21.1	0.399	2.6	NA	1.4	13.7	0.19	0.04	0.26	57.0
East: Nettleton Rd(E)														
7	L2	24	14.1	25	14.1	0.041	10.2	LOS B	0.1	1.2	0.61	0.79	0.61	43.7
9	R2	99	14.1	104	14.1	1.058	185.1	LOS F	10.3	87.8	1.00	1.78	4.05	11.1
Approach		123	14.1	129	14.1	1.058	151.0	LOS F	10.3	87.8	0.92	1.59	3.38	13.1
North: S Western Hwy (N)														
10	L2	93	13.6	98	13.6	0.061	5.8	LOS A	0.0	0.0	0.00	0.57	0.00	48.5
11	T1	629	19.4	662	19.4	0.390	0.1	LOS A	0.0	0.0	0.00	0.00	0.00	59.7
Approach		722	18.7	760	18.7	0.390	0.9	NA	0.0	0.0	0.00	0.07	0.00	58.3
All Vehicles		1395	19.2	1468	19.2	1.058	14.8	NA	10.3	87.8	0.16	0.19	0.40	46.1

MOVEMENT SUMMARY

Site: [S Western Hwy & Wilaring St - Sta 1 - 2025 - Sat (Site Folder: 2025 - Without Acceleration Lane)]

Network: N101 [Sat (Network Folder: 2025 - Without Acceleration Lane)]

Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
East: Wilaring St (E)														
1	L2	236	2.0	236	2.0	0.189	6.3	LOS A	0.8	6.2	0.39	0.62	0.39	47.8
2	T1	331	2.0	331	2.0	0.627	16.3	LOS C	4.9	37.4	0.78	1.13	1.46	14.9
Approach		566	2.0	566	2.0	0.627	12.1	LOS B	4.9	37.4	0.62	0.92	1.01	34.5
North: S Western Hwy (N)														
3	L2	432	2.0	432	2.0	0.349	6.5	LOS A	1.8	13.9	0.33	0.56	0.33	48.2
4	T1	251	19.4	251	19.4	0.161	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	59.1
Approach		682	8.4	682	8.4	0.349	4.1	LOS A	1.8	13.9	0.21	0.36	0.21	53.9
West: Median (W)														
5	T1	140	2.0	140	2.0	0.122	1.0	LOS A	0.4	3.4	0.35	0.24	0.35	14.9
Approach		140	2.0	140	2.0	0.122	1.0	LOS A	0.4	3.4	0.35	0.24	0.35	14.9
All Vehicles		1388	5.1	1388	5.1	0.627	7.1	NA	4.9	37.4	0.39	0.57	0.55	46.3

MOVEMENT SUMMARY

Site: [S Western Hwy & Wilaring St - Sta 2 - 2025 - Sat (Site Folder: 2025 - Without Acceleration Lane)]

Network: N101 [Sat (Network Folder: 2025 - Without Acceleration Lane)]

Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: S Western Hwy (S)														
2	T1	348	21.5	348	21.5	0.228	0.1	LOS A	0.0	0.0	0.00	0.00	0.00	59.8
3	R2	140	2.0	140	2.0	0.078	5.5	LOS A	0.0	0.0	0.00	0.60	0.00	50.9
Approach		488	15.9	488	15.9	0.228	1.6	NA	0.0	0.0	0.00	0.17	0.00	58.1
East: Median (E)														
1	R2	331	2.0	331	2.0	0.266	1.2	LOS A	0.7	5.4	0.30	0.33	0.30	48.6
Approach		331	2.0	331	2.0	0.266	1.2	LOS A	0.7	5.4	0.30	0.33	0.30	48.6
All Vehicles		819	10.3	819	10.3	0.266	1.5	NA	0.7	5.4	0.12	0.24	0.12	55.1

MOVEMENT SUMMARY

Site: [Wilaring St & Diamantina Blvd & Crossover 1 - 2025 - Sat (Site Folder: 2025 - Without Acceleration Lane)]

Network: N101 [Sat (Network Folder: 2025 - Without Acceleration Lane)]

Site Category: (None)
Roundabout

Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Diamantina Blvd (S)														
10	L2	101	2.0	101	2.0	0.215	7.2	LOS A	1.4	10.4	0.68	0.74	0.68	24.6
11	T1	66	2.0	66	2.0	0.215	10.0	LOS A	1.4	10.4	0.68	0.74	0.68	22.8
12	R2	5	2.0	5	2.0	0.215	11.5	LOS B	1.4	10.4	0.68	0.74	0.68	39.0
Approach		173	2.0	173	2.0	0.215	8.4	LOS A	1.4	10.4	0.68	0.74	0.68	24.4
East: Wilaring St (E)														
1	L2	5	2.0	5	2.0	0.359	6.8	LOS A	2.5	19.3	0.64	0.66	0.64	38.0
2	T1	325	2.0	325	2.0	0.359	7.0	LOS A	2.5	19.3	0.64	0.66	0.64	36.6
3	R2	5	2.0	5	2.0	0.359	11.1	LOS B	2.5	19.3	0.64	0.66	0.64	31.5
Approach		336	2.0	336	2.0	0.359	7.1	LOS A	2.5	19.3	0.64	0.66	0.64	36.5
North: Crossover 1 (N)														
4	L2	5	2.0	5	2.0	0.252	3.4	LOS A	1.6	12.3	0.67	0.55	0.67	30.0
5	T1	66	2.0	66	2.0	0.252	3.4	LOS A	1.6	12.3	0.67	0.55	0.67	22.7
6	R2	139	2.0	139	2.0	0.252	3.4	LOS A	1.6	12.3	0.67	0.55	0.67	16.4
Approach		211	2.0	211	2.0	0.252	3.4	LOS A	1.6	12.3	0.67	0.55	0.67	19.3
West: Wilaring St (W)														
7	L2	140	2.0	140	2.0	0.431	5.3	LOS A	3.9	29.6	0.38	0.50	0.38	25.6
8	T1	325	2.0	325	2.0	0.431	4.6	LOS A	3.9	29.6	0.38	0.50	0.38	43.1
9	R2	106	2.0	106	2.0	0.431	8.6	LOS A	3.9	29.6	0.38	0.50	0.38	32.8
Approach		572	2.0	572	2.0	0.431	5.5	LOS A	3.9	29.6	0.38	0.50	0.38	37.3
All Vehicles		1291	2.0	1291	2.0	0.431	6.0	LOS A	3.9	29.6	0.54	0.58	0.54	32.7

MOVEMENT SUMMARY

Site: [S Western Hwy & Nettleton Rd - 2025 -Sat (Site Folder: 2025 - Without Acceleration Lane)]

Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: S Western Hwy (S)														
5	T1	614	21.5	646	21.5	0.463	1.8	LOS A	1.8	16.7	0.19	0.03	0.28	57.2
6	R2	31	13.6	33	13.6	0.463	18.8	LOS C	1.8	16.7	0.19	0.03	0.28	51.7
Approach		645	21.1	679	21.1	0.463	2.7	NA	1.8	16.7	0.19	0.03	0.28	57.0
East: Nettleton Rd(E)														
7	L2	22	14.1	23	14.1	0.038	10.1	LOS B	0.1	1.1	0.60	0.78	0.60	43.7
9	R2	109	14.1	115	14.1	1.467	504.3	LOS F	28.2	241.4	1.00	2.66	7.61	4.6
Approach		131	14.1	138	14.1	1.467	421.3	LOS F	28.2	241.4	0.93	2.34	6.43	5.5
North: S Western Hwy (N)														
10	L2	84	13.6	88	13.6	0.055	5.8	LOS A	0.0	0.0	0.00	0.57	0.00	48.5
11	T1	627	19.4	660	19.4	0.389	0.1	LOS A	0.0	0.0	0.00	0.00	0.00	59.7
Approach		711	18.7	748	18.7	0.389	0.8	NA	0.0	0.0	0.00	0.07	0.00	58.4
All Vehicles		1487	19.4	1565	19.4	1.467	38.7	NA	28.2	241.4	0.17	0.25	0.69	33.9

2025 - With Acceleration Lane

MOVEMENT SUMMARY

Site: [S Western Hwy & Wilaring St - Sta 1 - 2025 - AM (Site Folder: 2025 - With Acceleration Lane)]

Network: N101 [AM (Network Folder: 2025 - With Acceleration Lane)]

Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h]	HV %	ARRIVAL FLOWS [Total veh/h]	HV %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh]	Dist m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
East: Wilaring St (E)														
1	L2	27	2.0	27	2.0	0.023	6.2	LOS A	0.1	0.7	0.37	0.58	0.37	47.9
2	T1	201	2.0	201	2.0	0.274	8.0	LOS A	1.3	9.7	0.57	0.76	0.57	24.2
Approach		228	2.0	228	2.0	0.274	7.8	LOS A	1.3	9.7	0.54	0.74	0.55	31.6
North: S Western Hwy (N)														
3	L2	114	2.0	114	2.0	0.081	5.7	LOS A	0.3	2.6	0.07	0.52	0.07	49.8
4	T1	286	19.4	286	19.4	0.184	0.1	LOS A	0.0	0.0	0.00	0.00	0.00	59.9
Approach		400	14.5	400	14.5	0.184	1.7	LOS A	0.3	2.6	0.02	0.15	0.02	58.0
West: Median (W)														
5	T1	17	2.0	17	2.0	0.015	1.1	LOS A	0.1	0.4	0.35	0.21	0.35	14.9
Approach		17	2.0	17	2.0	0.015	1.1	LOS A	0.1	0.4	0.35	0.21	0.35	14.9
All Vehicles		645	9.7	645	9.7	0.274	3.8	NA	1.3	9.7	0.21	0.36	0.22	53.6

MOVEMENT SUMMARY

Site: [S Western Hwy & Wilaring St - Sta 2 - 2025 - AM (Site Folder: 2025 - With Acceleration Lane)]

Network: N101 [AM (Network Folder: 2025 - With Acceleration Lane)]

Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h]	HV %	ARRIVAL FLOWS [Total veh/h]	HV %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh]	Dist m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: S Western Hwy (S)														
2	T1	452	21.5	452	21.5	0.296	0.1	LOS A	0.0	0.0	0.00	0.00	0.00	59.8
3	R2	17	2.0	17	2.0	0.009	5.5	LOS A	0.0	0.0	0.00	0.60	0.00	50.9
Approach		468	20.8	468	20.8	0.296	0.3	NA	0.0	0.0	0.00	0.02	0.00	59.6
East: Median (E)														
1	R2	201	2.0	201	2.0	0.103	1.6	LOS A	0.0	0.0	0.00	0.11	0.00	20.4
Approach		201	2.0	201	2.0	0.103	1.6	NA	0.0	0.0	0.00	0.11	0.00	20.4
All Vehicles		669	15.2	669	15.2	0.296	0.7	NA	0.0	0.0	0.00	0.05	0.00	44.4

MOVEMENT SUMMARY

Site: [Wilaring St & Diamantina Blvd & Crossover 1 - 2025 - AM (Site Folder: 2025 - With Acceleration Lane)]

Network: N101 [AM (Network Folder: 2025 - With Acceleration Lane)]

Site Category: (None)
Roundabout

Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h]	HV] %	ARRIVAL FLOWS [Total veh/h]	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh]	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Diamantina Blvd (S)														
10	L2	152	2.0	152	2.0	0.133	4.2	LOS A	0.8	6.0	0.28	0.50	0.28	32.0
11	T1	7	2.0	7	2.0	0.133	7.0	LOS A	0.8	6.0	0.28	0.50	0.28	26.4
12	R2	5	2.0	5	2.0	0.133	8.5	LOS A	0.8	6.0	0.28	0.50	0.28	45.1
Approach		164	2.0	164	2.0	0.133	4.4	LOS A	0.8	6.0	0.28	0.50	0.28	32.4
East: Wilaring St (E)														
1	L2	5	2.0	5	2.0	0.061	4.6	LOS A	0.3	2.5	0.26	0.46	0.26	40.9
2	T1	62	2.0	62	2.0	0.061	4.9	LOS A	0.3	2.5	0.26	0.46	0.26	40.5
3	R2	5	2.0	5	2.0	0.061	9.0	LOS A	0.3	2.5	0.26	0.46	0.26	33.8
Approach		73	2.0	73	2.0	0.061	5.2	LOS A	0.3	2.5	0.26	0.46	0.26	39.9
North: Crossover 1 (N)														
4	L2	5	2.0	5	2.0	0.025	0.7	LOS A	0.1	1.0	0.30	0.13	0.30	32.5
5	T1	7	2.0	7	2.0	0.025	0.7	LOS A	0.1	1.0	0.30	0.13	0.30	24.8
6	R2	16	2.0	16	2.0	0.025	0.7	LOS A	0.1	1.0	0.30	0.13	0.30	18.4
Approach		28	2.0	28	2.0	0.025	0.7	LOS A	0.1	1.0	0.30	0.13	0.30	24.1
West: Wilaring St (W)														
7	L2	16	2.0	16	2.0	0.091	4.7	LOS A	0.5	4.0	0.11	0.54	0.11	26.4
8	T1	56	2.0	56	2.0	0.091	4.0	LOS A	0.5	4.0	0.11	0.54	0.11	43.8
9	R2	59	2.0	59	2.0	0.091	8.0	LOS A	0.5	4.0	0.11	0.54	0.11	33.6
Approach		131	2.0	131	2.0	0.091	5.9	LOS A	0.5	4.0	0.11	0.54	0.11	37.5
All Vehicles		396	2.0	396	2.0	0.133	4.8	LOS A	0.8	6.0	0.22	0.48	0.22	35.4

MOVEMENT SUMMARY

Site: [S Western Hwy & Nettleton Rd - 2025 - AM (Site Folder: 2025 - With Acceleration Lane)]

Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: S Western Hwy (S)														
5	T1	597	21.5	628	21.5	0.410	0.4	LOS A	0.6	5.9	0.08	0.02	0.10	59.1
6	R2	23	13.6	24	13.6	0.410	10.9	LOS B	0.6	5.9	0.08	0.02	0.10	53.6
Approach		620	21.2	653	21.2	0.410	0.8	NA	0.6	5.9	0.08	0.02	0.10	58.9
East: Nettleton Rd(E)														
7	L2	21	14.1	22	14.1	0.023	7.5	LOS A	0.1	0.7	0.44	0.62	0.44	45.6
9	R2	84	14.1	88	14.1	0.552	40.4	LOS E	2.2	19.2	0.93	1.08	1.35	29.1
Approach		105	14.1	111	14.1	0.552	33.8	LOS D	2.2	19.2	0.83	0.99	1.17	31.5
North: S Western Hwy (N)														
10	L2	66	13.6	69	13.6	0.043	5.8	LOS A	0.0	0.0	0.00	0.57	0.00	48.5
11	T1	358	19.4	377	19.4	0.222	0.1	LOS A	0.0	0.0	0.00	0.00	0.00	59.9
Approach		424	18.5	446	18.5	0.222	0.9	NA	0.0	0.0	0.00	0.09	0.00	58.1
All Vehicles		1149	19.6	1209	19.6	0.552	3.9	NA	2.2	19.2	0.12	0.14	0.16	55.0

MOVEMENT SUMMARY

Site: [S Western Hwy & Wilaring St - Sta 1 - 2025 - PM (Site Folder: 2025 - With Acceleration Lane)]

Network: N101 [PM (Network Folder: 2025 - With Acceleration Lane)]

Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
East: Wilaring St (E)														
1	L2	165	2.0	165	2.0	0.143	6.5	LOS A	0.6	4.4	0.42	0.65	0.42	47.7
2	T1	233	2.0	233	2.0	0.447	13.3	LOS B	2.6	19.9	0.71	0.98	1.03	17.3
Approach		398	2.0	398	2.0	0.447	10.5	LOS B	2.6	19.9	0.59	0.84	0.77	36.4
North: S Western Hwy (N)														
3	L2	375	2.0	375	2.0	0.290	6.2	LOS A	1.5	11.0	0.25	0.54	0.25	48.6
4	T1	313	19.4	313	19.4	0.201	0.1	LOS A	0.0	0.0	0.00	0.00	0.00	59.2
Approach		687	9.9	687	9.9	0.290	3.4	LOS A	1.5	11.0	0.14	0.29	0.14	55.1
West: Median (W)														
5	T1	98	2.0	98	2.0	0.091	1.3	LOS A	0.3	2.5	0.38	0.28	0.38	14.5
Approach		98	2.0	98	2.0	0.091	1.3	LOS A	0.3	2.5	0.38	0.28	0.38	14.5
All Vehicles		1183	6.6	1183	6.6	0.447	5.6	NA	2.6	19.9	0.31	0.48	0.37	49.7

MOVEMENT SUMMARY

Site: [S Western Hwy & Wilaring St - Sta 2 - 2025 - PM (Site Folder: 2025 - With Acceleration Lane)]

Network: N101 [PM (Network Folder: 2025 - With Acceleration Lane)]

Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: S Western Hwy (S)														
2	T1	346	21.5	346	21.5	0.227	0.1	LOS A	0.0	0.0	0.00	0.00	0.00	59.8
3	R2	98	2.0	98	2.0	0.054	5.5	LOS A	0.0	0.0	0.00	0.60	0.00	50.9
Approach		444	17.2	444	17.2	0.227	1.3	NA	0.0	0.0	0.00	0.13	0.00	58.5
East: Median (E)														
1	R2	233	2.0	233	2.0	0.119	1.2	LOS A	0.0	0.0	0.00	0.11	0.00	20.4
Approach		233	2.0	233	2.0	0.119	1.2	NA	0.0	0.0	0.00	0.11	0.00	20.4
All Vehicles		677	12.0	677	12.0	0.227	1.3	NA	0.0	0.0	0.00	0.12	0.00	41.2

MOVEMENT SUMMARY

Site: [Wilaring St & Diamantina Blvd & Crossover 1 - 2025 - PM (Site Folder: 2025 - With Acceleration Lane)]

Network: N101 [PM (Network Folder: 2025 - With Acceleration Lane)]

Site Category: (None)
Roundabout

Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Diamantina Blvd (S)														
10	L2	57	2.0	57	2.0	0.118	6.0	LOS A	0.7	5.3	0.56	0.65	0.56	26.7
11	T1	45	2.0	45	2.0	0.118	8.8	LOS A	0.7	5.3	0.56	0.65	0.56	24.0
12	R2	5	2.0	5	2.0	0.118	10.3	LOS B	0.7	5.3	0.56	0.65	0.56	40.7
Approach		107	2.0	107	2.0	0.118	7.4	LOS A	0.7	5.3	0.56	0.65	0.56	26.2
East: Wilaring St (E)														
1	L2	5	2.0	5	2.0	0.258	6.1	LOS A	1.7	12.7	0.55	0.59	0.55	38.7
2	T1	245	2.0	245	2.0	0.258	6.4	LOS A	1.7	12.7	0.55	0.59	0.55	37.6
3	R2	5	2.0	5	2.0	0.258	10.5	LOS B	1.7	12.7	0.55	0.59	0.55	32.1
Approach		256	2.0	256	2.0	0.258	6.5	LOS A	1.7	12.7	0.55	0.59	0.55	37.4
North: Crossover 1 (N)														
4	L2	5	2.0	5	2.0	0.164	2.7	LOS A	1.0	7.5	0.59	0.45	0.59	30.7
5	T1	45	2.0	45	2.0	0.164	2.7	LOS A	1.0	7.5	0.59	0.45	0.59	23.2
6	R2	96	2.0	96	2.0	0.164	2.7	LOS A	1.0	7.5	0.59	0.45	0.59	17.2
Approach		146	2.0	146	2.0	0.164	2.7	LOS A	1.0	7.5	0.59	0.45	0.59	20.1
West: Wilaring St (W)														
7	L2	96	2.0	96	2.0	0.343	5.0	LOS A	2.8	21.1	0.29	0.50	0.29	26.0
8	T1	256	2.0	256	2.0	0.343	4.3	LOS A	2.8	21.1	0.29	0.50	0.29	43.5
9	R2	121	2.0	121	2.0	0.343	8.4	LOS A	2.8	21.1	0.29	0.50	0.29	33.3
Approach		473	2.0	473	2.0	0.343	5.5	LOS A	2.8	21.1	0.29	0.50	0.29	37.7
All Vehicles		982	2.0	982	2.0	0.343	5.6	LOS A	2.8	21.1	0.43	0.53	0.43	34.0

MOVEMENT SUMMARY

Site: [S Western Hwy & Nettleton Rd - 2025 - PM (Site Folder: 2025 - With Acceleration Lane)]

Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: S Western Hwy (S)														
5	T1	522	21.5	549	21.5	0.399	1.8	LOS A	1.4	13.7	0.19	0.04	0.26	57.3
6	R2	28	13.6	29	13.6	0.399	17.8	LOS C	1.4	13.7	0.19	0.04	0.26	51.7
Approach		550	21.1	579	21.1	0.399	2.6	NA	1.4	13.7	0.19	0.04	0.26	57.0
East: Nettleton Rd(E)														
7	L2	24	14.1	25	14.1	0.041	10.2	LOS B	0.1	1.2	0.61	0.79	0.61	43.7
9	R2	99	14.1	104	14.1	1.058	185.1	LOS F	10.3	87.8	1.00	1.78	4.05	11.1
Approach		123	14.1	129	14.1	1.058	151.0	LOS F	10.3	87.8	0.92	1.59	3.38	13.1
North: S Western Hwy (N)														
10	L2	93	13.6	98	13.6	0.061	5.8	LOS A	0.0	0.0	0.00	0.57	0.00	48.5
11	T1	629	19.4	662	19.4	0.390	0.1	LOS A	0.0	0.0	0.00	0.00	0.00	59.7
Approach		722	18.7	760	18.7	0.390	0.9	NA	0.0	0.0	0.00	0.07	0.00	58.3
All Vehicles		1395	19.2	1468	19.2	1.058	14.8	NA	10.3	87.8	0.16	0.19	0.40	46.1

MOVEMENT SUMMARY

Site: [S Western Hwy & Wilaring St - Sta 1 - 2025 - Sat (Site Folder: 2025 - With Acceleration Lane)]

Network: N101 [Sat (Network Folder: 2025 - With Acceleration Lane)]

Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
East: Wilaring St (E)														
1	L2	236	2.0	236	2.0	0.189	6.3	LOS A	0.8	6.2	0.39	0.62	0.39	47.8
2	T1	331	2.0	331	2.0	0.627	16.3	LOS C	4.9	37.4	0.78	1.13	1.46	14.9
Approach		566	2.0	566	2.0	0.627	12.1	LOS B	4.9	37.4	0.62	0.92	1.01	34.5
North: S Western Hwy (N)														
3	L2	432	2.0	432	2.0	0.349	6.5	LOS A	1.8	13.9	0.33	0.56	0.33	48.2
4	T1	251	19.4	251	19.4	0.161	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	53.2
Approach		682	8.4	682	8.4	0.349	4.1	LOS A	1.8	13.9	0.21	0.36	0.21	53.9
West: Median (W)														
5	T1	140	2.0	140	2.0	0.122	1.0	LOS A	0.4	3.4	0.35	0.24	0.35	14.9
Approach		140	2.0	140	2.0	0.122	1.0	LOS A	0.4	3.4	0.35	0.24	0.35	14.9
All Vehicles		1388	5.1	1388	5.1	0.627	7.1	NA	4.9	37.4	0.39	0.57	0.55	46.3

MOVEMENT SUMMARY

Site: [S Western Hwy & Wilaring St - Sta 2 - 2025 - Sat (Site Folder: 2025 - With Acceleration Lane)]

Network: N101 [Sat (Network Folder: 2025 - With Acceleration Lane)]

Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: S Western Hwy (S)														
2	T1	348	21.5	348	21.5	0.228	0.1	LOS A	0.0	0.0	0.00	0.00	0.00	59.8
3	R2	140	2.0	140	2.0	0.078	5.5	LOS A	0.0	0.0	0.00	0.60	0.00	50.9
Approach		488	15.9	488	15.9	0.228	1.6	NA	0.0	0.0	0.00	0.17	0.00	58.1
East: Median (E)														
1	R2	331	2.0	331	2.0	0.169	1.3	LOS A	0.0	0.0	0.00	0.10	0.00	20.4
Approach		331	2.0	331	2.0	0.169	1.3	NA	0.0	0.0	0.00	0.10	0.00	20.4
All Vehicles		819	10.3	819	10.3	0.228	1.5	NA	0.0	0.0	0.00	0.14	0.00	38.3

MOVEMENT SUMMARY

Site: [Wilaring St & Diamantina Blvd & Crossover 1 - 2025 - Sat (Site Folder: 2025 - With Acceleration Lane)]

Network: N101 [Sat (Network Folder: 2025 - With Acceleration Lane)]

Site Category: (None)
Roundabout

Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h]	HV] %	ARRIVAL FLOWS [Total veh/h]	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh]	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Diamantina Blvd (S)														
10	L2	101	2.0	101	2.0	0.215	7.2	LOS A	1.4	10.4	0.68	0.74	0.68	24.6
11	T1	66	2.0	66	2.0	0.215	10.0	LOS A	1.4	10.4	0.68	0.74	0.68	22.8
12	R2	5	2.0	5	2.0	0.215	11.5	LOS B	1.4	10.4	0.68	0.74	0.68	39.0
Approach		173	2.0	173	2.0	0.215	8.4	LOS A	1.4	10.4	0.68	0.74	0.68	24.4
East: Wilaring St (E)														
1	L2	5	2.0	5	2.0	0.359	6.8	LOS A	2.5	19.3	0.64	0.66	0.64	38.0
2	T1	325	2.0	325	2.0	0.359	7.0	LOS A	2.5	19.3	0.64	0.66	0.64	36.6
3	R2	5	2.0	5	2.0	0.359	11.1	LOS B	2.5	19.3	0.64	0.66	0.64	31.5
Approach		336	2.0	336	2.0	0.359	7.1	LOS A	2.5	19.3	0.64	0.66	0.64	36.5
North: Crossover 1 (N)														
4	L2	5	2.0	5	2.0	0.252	3.4	LOS A	1.6	12.3	0.67	0.55	0.67	30.0
5	T1	66	2.0	66	2.0	0.252	3.4	LOS A	1.6	12.3	0.67	0.55	0.67	22.7
6	R2	139	2.0	139	2.0	0.252	3.4	LOS A	1.6	12.3	0.67	0.55	0.67	16.4
Approach		211	2.0	211	2.0	0.252	3.4	LOS A	1.6	12.3	0.67	0.55	0.67	19.3
West: Wilaring St (W)														
7	L2	140	2.0	140	2.0	0.431	5.3	LOS A	3.9	29.6	0.38	0.50	0.38	25.6
8	T1	325	2.0	325	2.0	0.431	4.6	LOS A	3.9	29.6	0.38	0.50	0.38	43.1
9	R2	106	2.0	106	2.0	0.431	8.6	LOS A	3.9	29.6	0.38	0.50	0.38	32.8
Approach		572	2.0	572	2.0	0.431	5.5	LOS A	3.9	29.6	0.38	0.50	0.38	37.3
All Vehicles		1291	2.0	1291	2.0	0.431	6.0	LOS A	3.9	29.6	0.54	0.58	0.54	32.7

MOVEMENT SUMMARY

Site: [S Western Hwy & Nettleton Rd - 2025 -Sat (Site Folder: 2025 - With Acceleration Lane)]

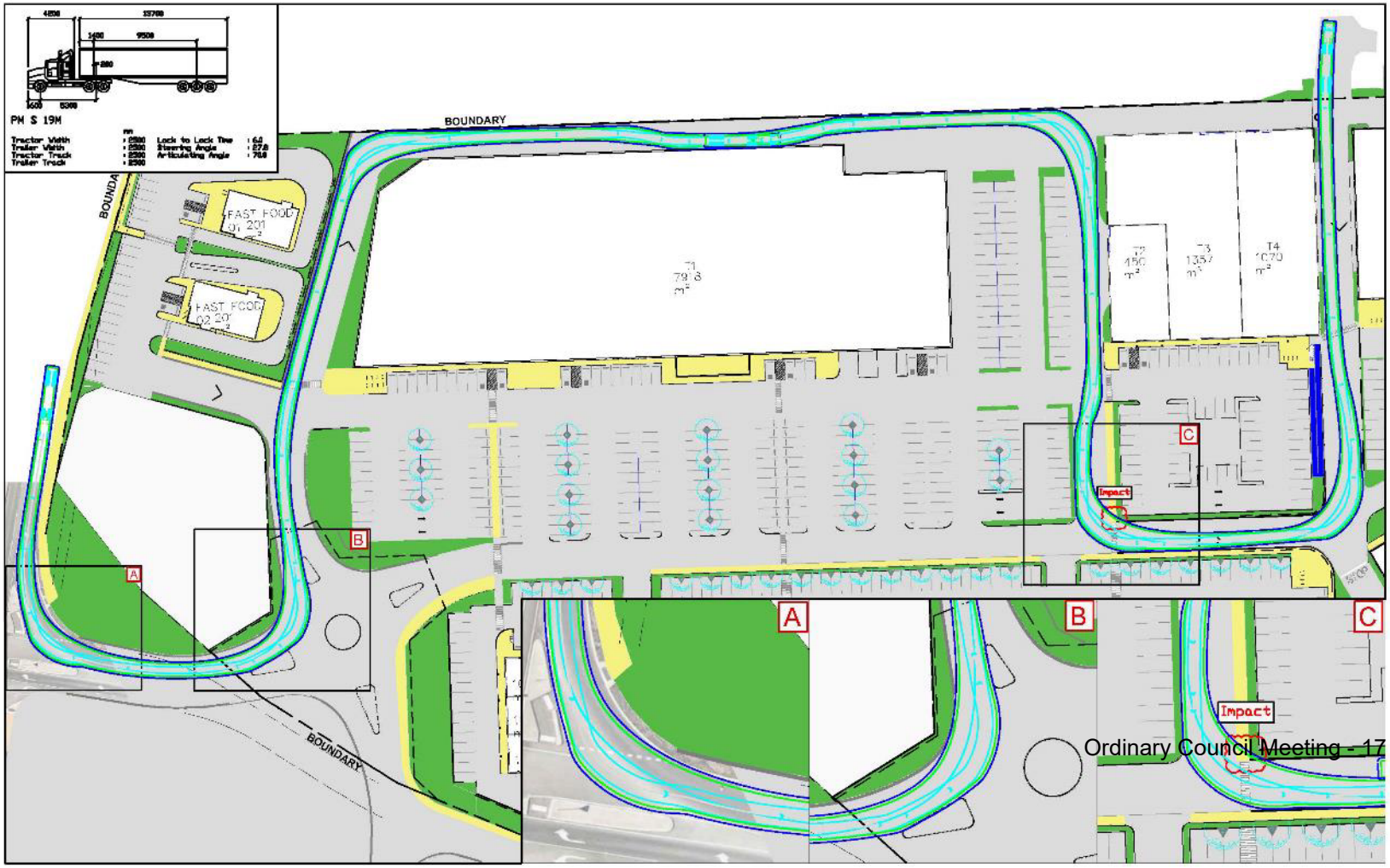
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: S Western Hwy (S)														
5	T1	614	21.5	646	21.5	0.463	1.8	LOS A	1.8	16.7	0.19	0.03	0.28	57.2
6	R2	31	13.6	33	13.6	0.463	18.8	LOS C	1.8	16.7	0.19	0.03	0.28	51.7
Approach		645	21.1	679	21.1	0.463	2.7	NA	1.8	16.7	0.19	0.03	0.28	57.0
East: Nettleton Rd(E)														
7	L2	22	14.1	23	14.1	0.038	10.1	LOS B	0.1	1.1	0.60	0.78	0.60	43.7
9	R2	109	14.1	115	14.1	1.467	504.3	LOS F	28.2	241.4	1.00	2.66	7.61	4.6
Approach		131	14.1	138	14.1	1.467	421.3	LOS F	28.2	241.4	0.93	2.34	6.43	5.5
North: S Western Hwy (N)														
10	L2	84	13.6	88	13.6	0.055	5.8	LOS A	0.0	0.0	0.00	0.57	0.00	48.5
11	T1	627	19.4	660	19.4	0.389	0.1	LOS A	0.0	0.0	0.00	0.00	0.00	59.7
Approach		711	18.7	748	18.7	0.389	0.8	NA	0.0	0.0	0.00	0.07	0.00	58.4
All Vehicles		1487	19.4	1565	19.4	1.467	38.7	NA	28.2	241.4	0.17	0.25	0.69	33.9

Appendix C

TURN PATH ANALYSIS

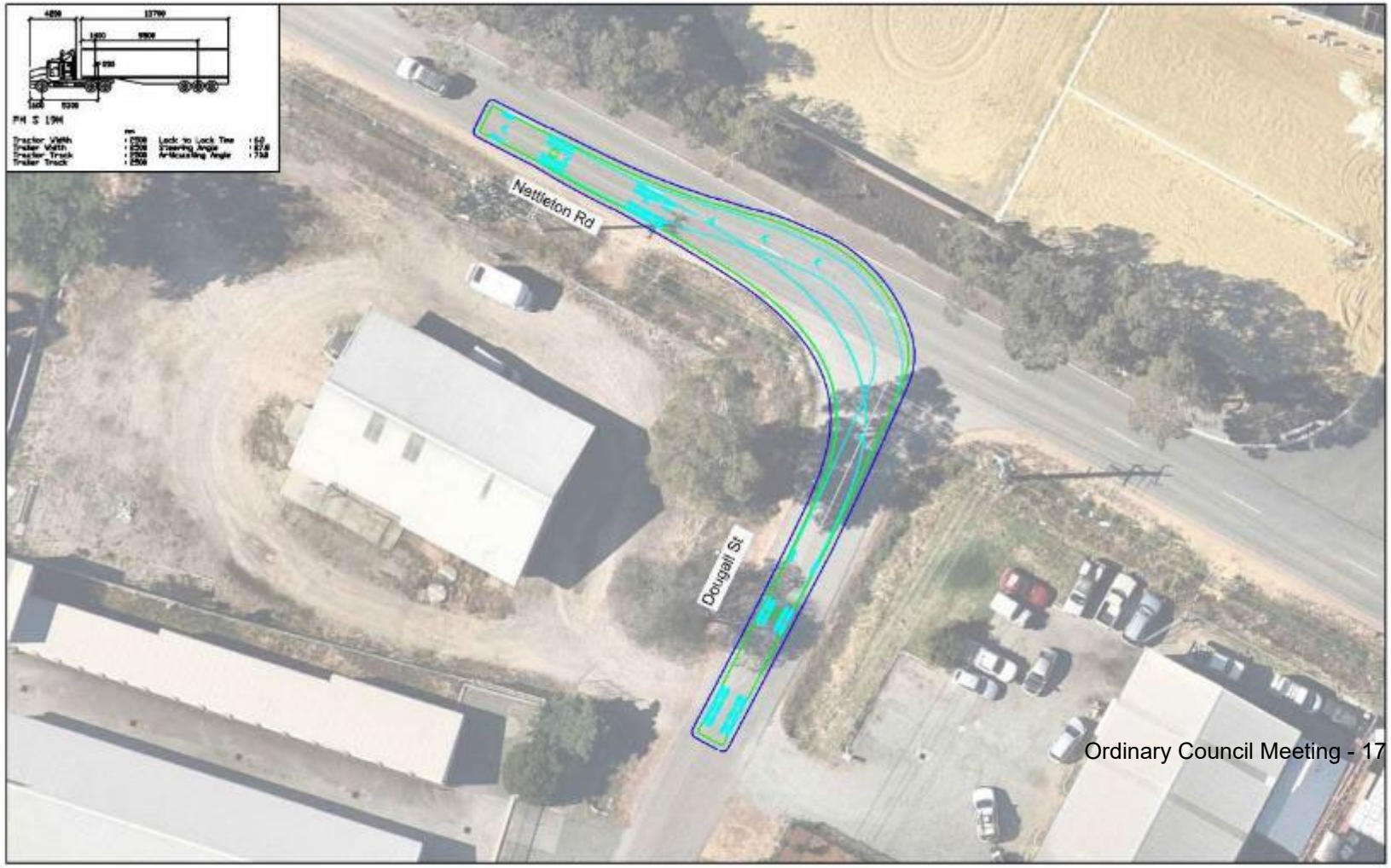


Lot 806 South Western Highway, Byford
19 m Service Vehicle
Service vehicle entry/exit Development 02

LEGEND
Vehicle Body
Wheel Path
500mm Clearance

t21.148.sk49
10/1/2023
Scale: 1:900 @ A3

transcore



Lot 806 South Western Highway, Byford
19 m Service Vehicle
Service vehicle left onto Nettleton Rd from Dougall St

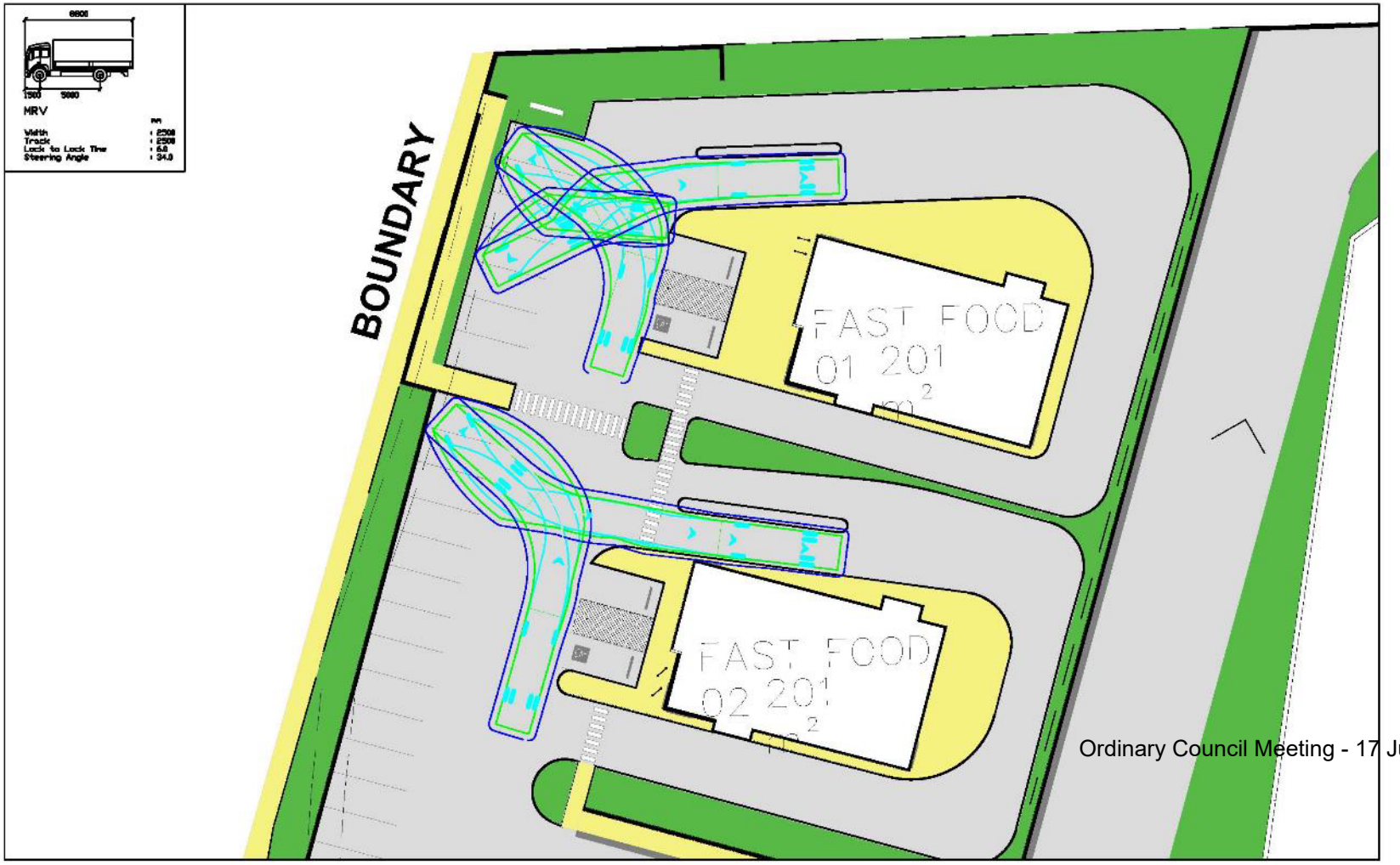
LEGEND
Vehicle Body
Wheel Path
500mm Clearance

t21.148.sk13b
9/1/2023
Scale: 1:300 @ A3

Lot 806 South Western Highway, Byford
19 m Service Vehicle (15 m Radius)
Service vehicle right onto South Western Hwy from Nettleton Rd

LEGEND
Vehicle Body
Wheel Path
500mm Clearance

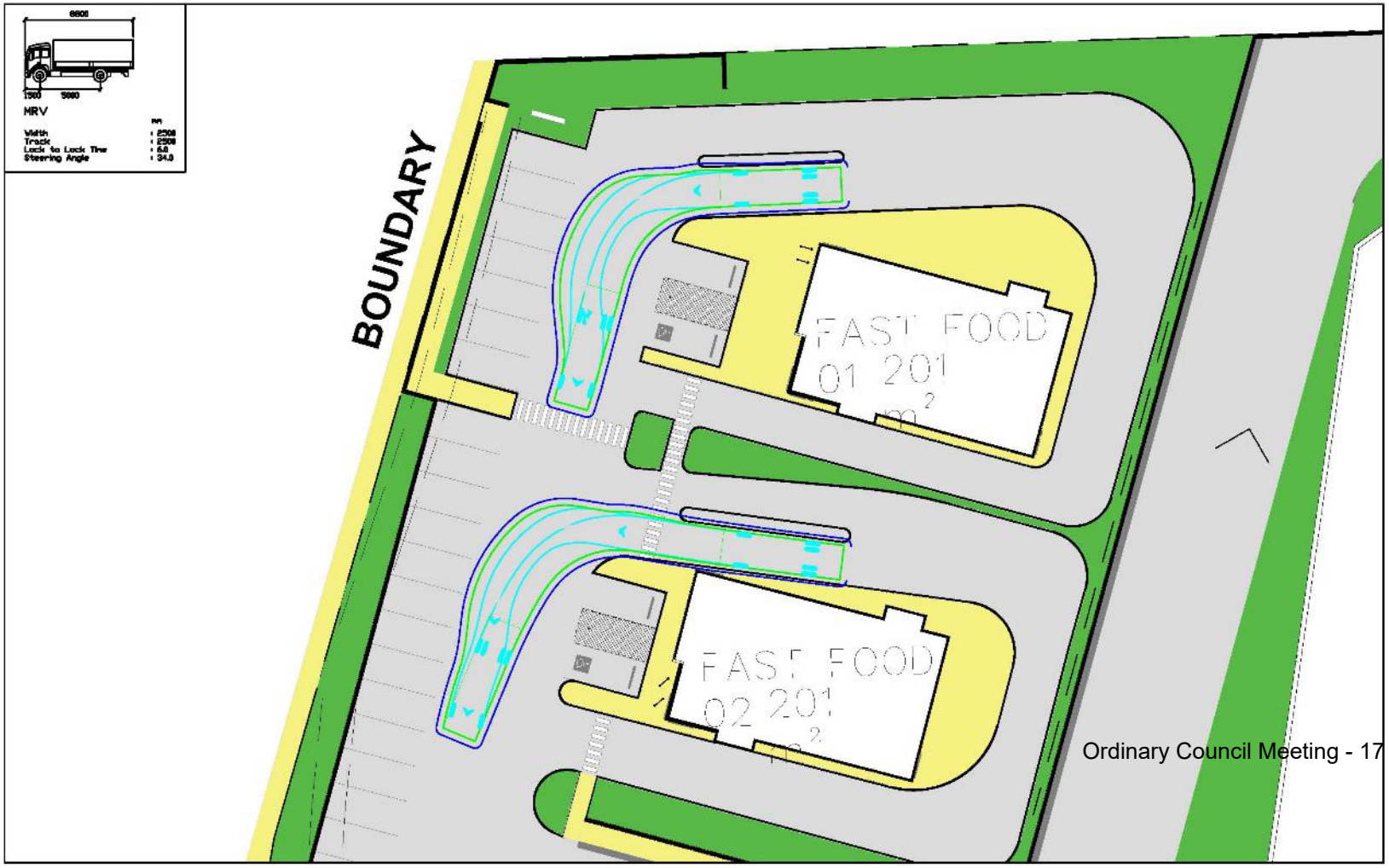
t21.148.sk18b
9/1/2023
Scale: 1:400 @ A3



Lot 806 South Western Highway, Byford
8.8 m Service Vehicle
Service vehicle entry Fast Food (reverse in)

LEGEND
Vehicle Body
Wheel Path
500mm Clearance

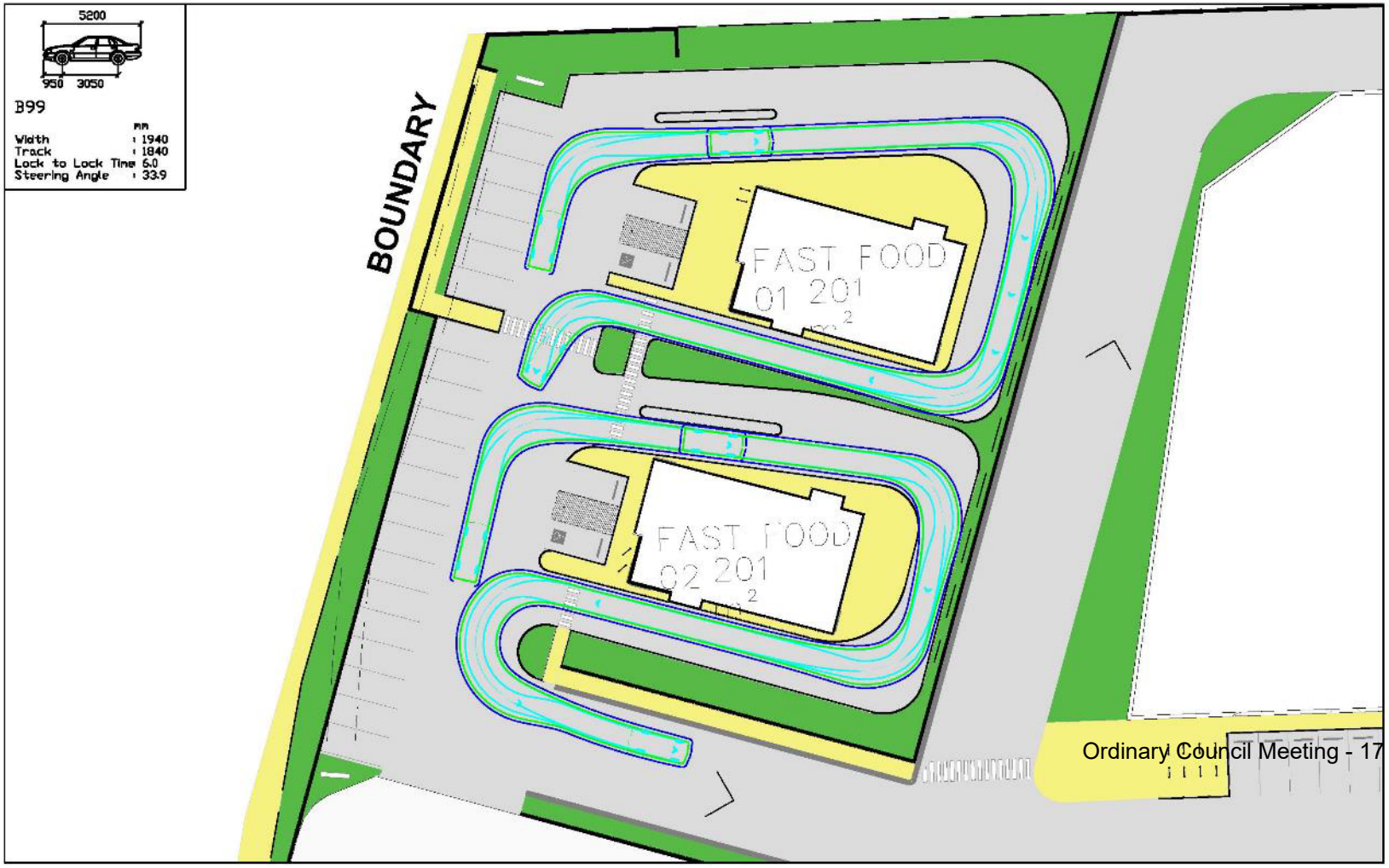
t21.148.sk50
9/1/2023
Scale: 1:250 @ A3



Lot 806 South Western Highway, Byford
8.8 m Service Vehicle
Service vehicle exit Fast Food

LEGEND
Vehicle Body
Wheel Path
500mm Clearance

t21.148.sk51
9/1/2023
Scale: 1:250 @ A3



Lot 806 South Western Highway, Byford
B99 Passenger Car
Passenger car entry/exit Fast Food drive through

LEGEND
Vehicle Body
Wheel Path
500mm Clearance

t21.148.sk53
9/1/2023
Scale: 1:300 @ A3

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Lot 806 South Western Highway, Byford
12.5 m Service Vehicle
Service vehicle entry Development 04

LEGEND
Vehicle Body
Wheel Path
500mm Clearance

t21.148.sk54
9/1/2023
Scale: 1:650 @ A3

transcore

Lot 806 South Western Highway, Byford
12.5 m Service Vehicle
Service vehicle exit Development 04

LEGEND
Vehicle Body
Wheel Path
500mm Clearance

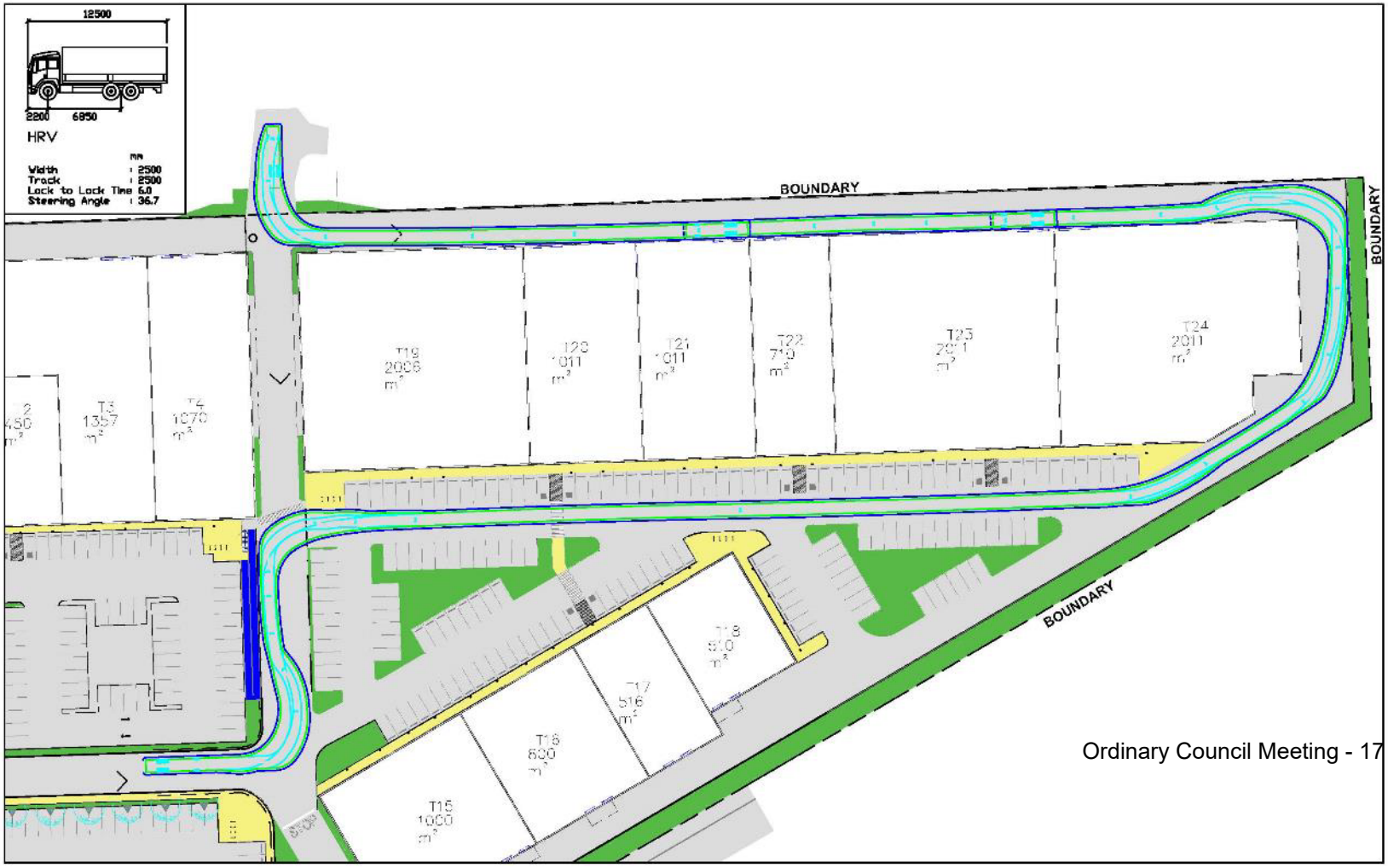
t21.148.sk55
9/1/2023
Scale: 1:600 @ A3

Lot 806 South Western Highway, Byford
12.5 m Service Vehicle
Service vehicle entry/exit Development 05

LEGEND
Vehicle Body
Wheel Path
500mm Clearance

t21.148.sk56
9/1/2023
Scale: 1:700 @ A3

transcore



Lot 806 South Western Highway, Byford
12.5 m Service Vehicle
Service vehicle entry/exit Development 06

LEGEND
Vehicle Body
Wheel Path
500mm Clearance

t21.148.sk57
9/1/2023
Scale: 1:700 @ A3

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ATTACHMENT 4
TRANSPORT TECHNICAL NOTE AND SWEPT PATH PLAN

Engineering a better future for over 20 years!

Technical Note: No 2 **Date:** 27/03/2024
Project No: t21.148
Project: Lot 806 South Western Hwy, Byford (DR 179/2023)
Subject: Additional turn paths for the roundabout intersection

1 Introduction

Following the second SAT Mediation session held on March 25th, 2024, regarding the aforementioned matter, the applicant was requested to provide additional turn path analysis specifically for a 19m semi-trailer (as-of-right vehicle) at the proposed roundabout intersection on the realigned Wilaring Street.

The purpose of this request was to assess the suitability of the proposed roundabout to accommodate larger vehicles, such as a 19m semi-trailer, within the turning paths at the intersection to ensure that the design can adequately cater for various types of vehicles that may utilise the intersection.

It should be noted that the proposed roundabout shown in the development plan is indicative and is subject to detailed design. However, in order to acknowledge Main Roads WA request and to ensure adequate space is provided for the proposed roundabout additional turn path analysis were undertaken.

2 Turn path analysis

The relevant turn paths for the 19m semi-trailer are provided in **Appendix A**.

The tun path analysis was undertaken for all relevant movements at the roundabout intersection.

The results of the turn path analysis indicate that the proposed roundabout can accommodate the movements of the 19m semi-trailer satisfactorily. This implies that sufficient space is available to design a suitable roundabout to facilitate the movements of vehicles up to a 19m semi-trailer.

The findings of the turn path analysis provide assurance that a satisfactory roundabout can be designed at the proposed location to effectively accommodate the turning requirements of the Design Vehicle which in this case is a 19m semi-trailer (as-of-right vehicle).

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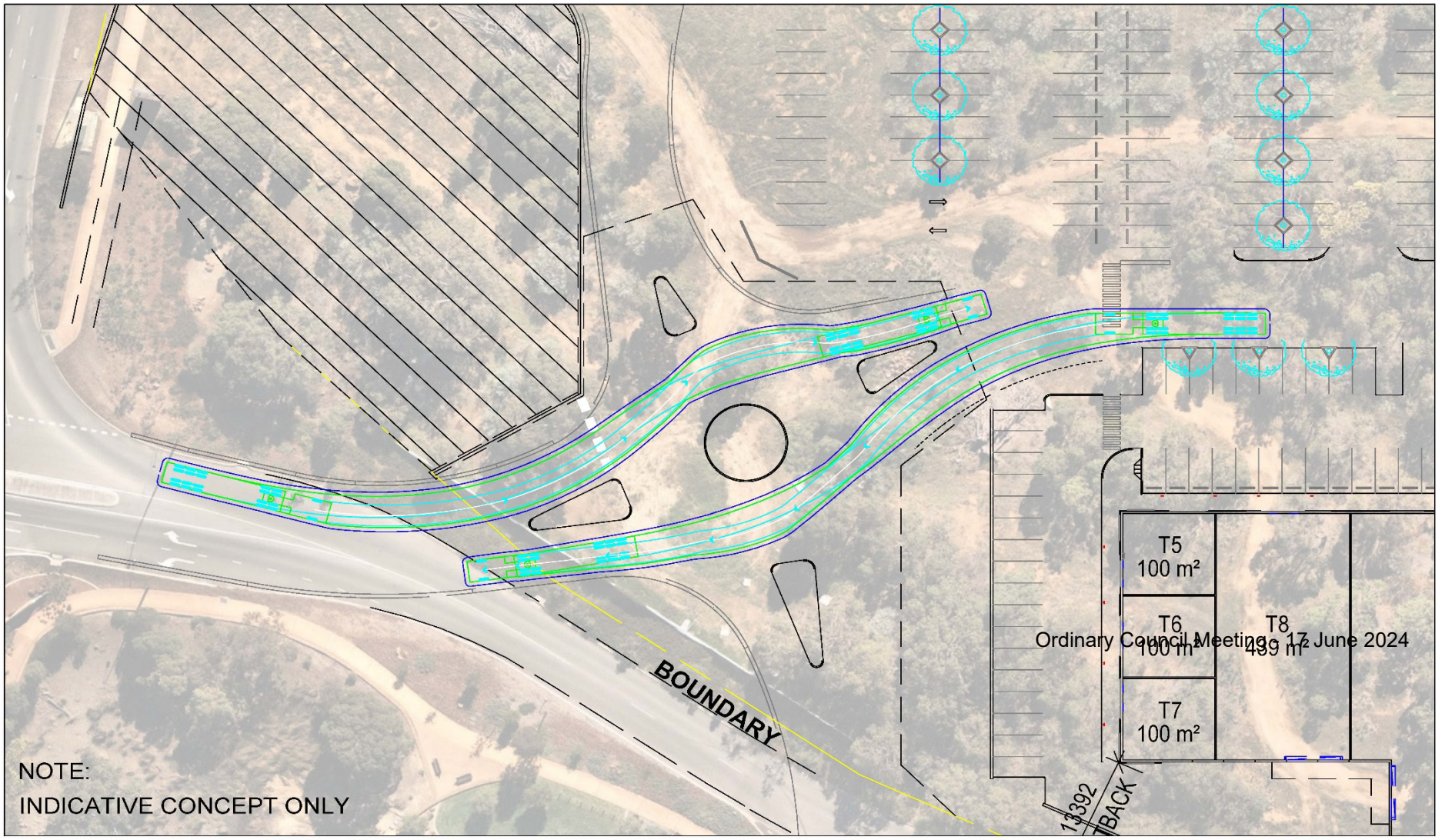
APPENDIX A

TURN PATH ANALYSIS



Lot 806 South Western Highway, Byford
Austroads 2013: 19m Semi Trailer
Through movements at roundabout

LEGEND
Vehicle Body
Wheel Path
500mm Clearance

t21.148.sk63
27/03/2024
Scale: 1:400 @ A3

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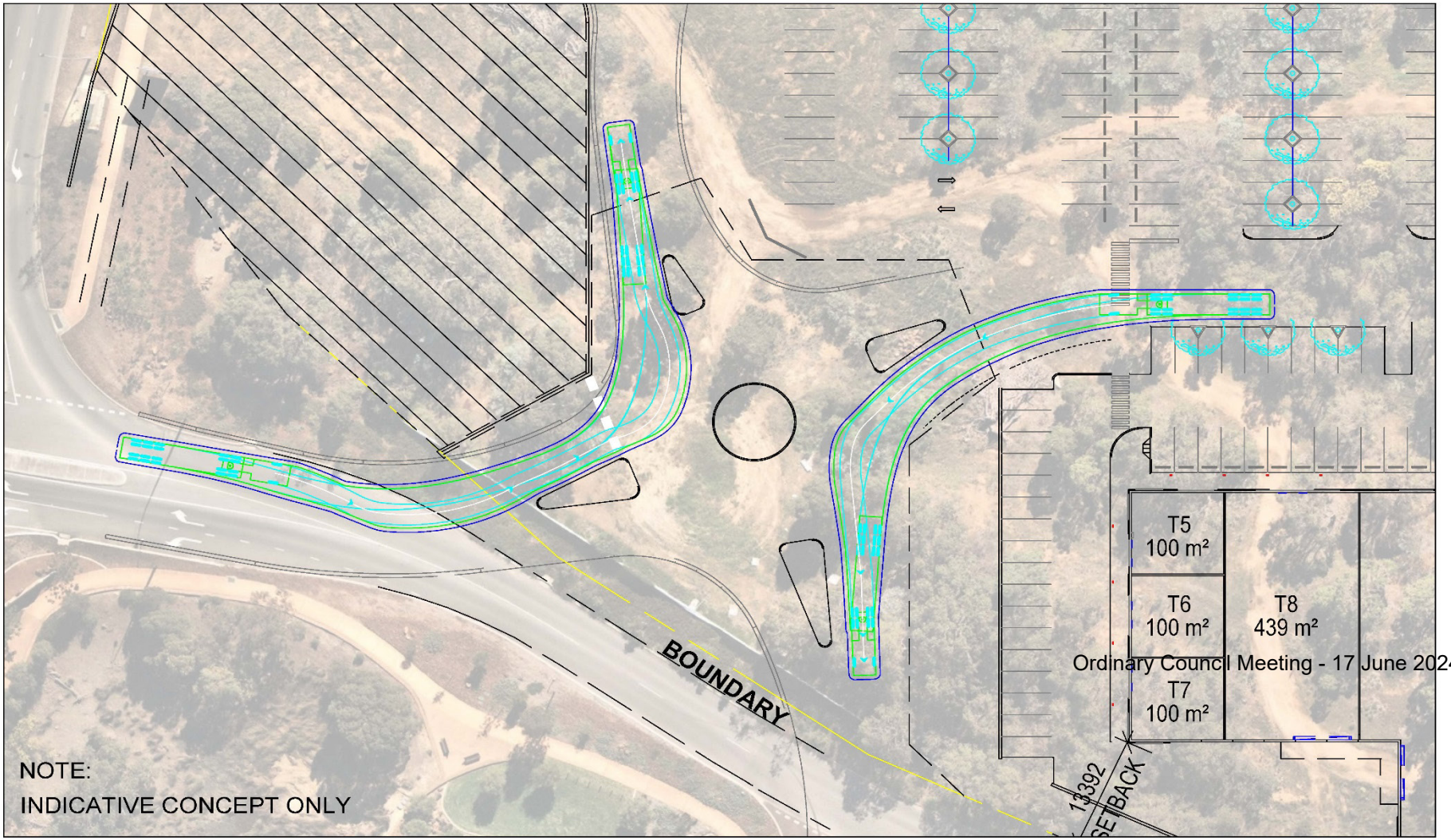

Lot 806 South Western Highway, Byford
Austroads 2013: 19m Semi Trailer
Left turns at roundabout

LEGEND
Vehicle Body
Wheel Path
500mm Clearance

t21.148.sk64
27/03/2024
Scale: 1:400 @ A3

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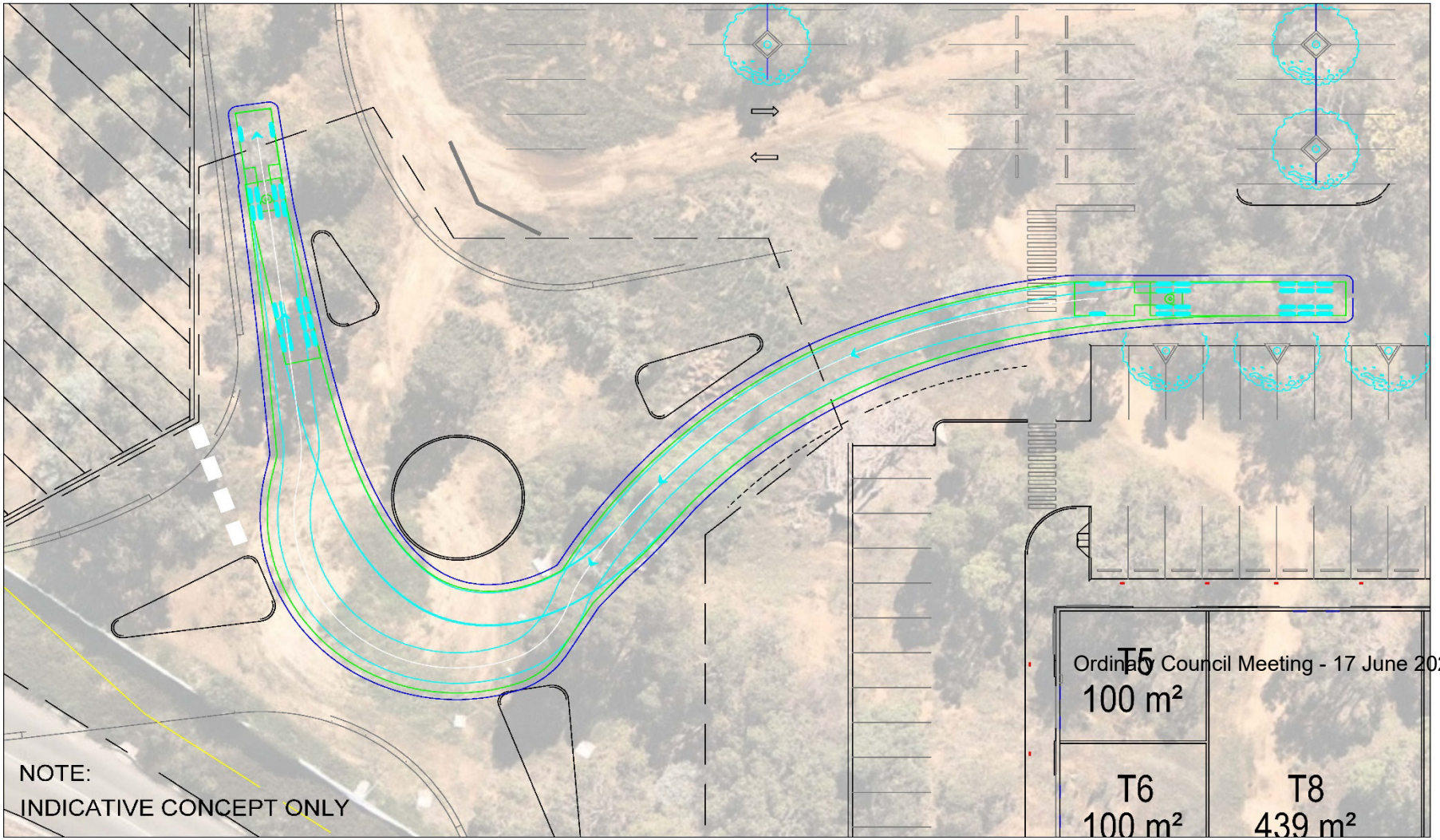
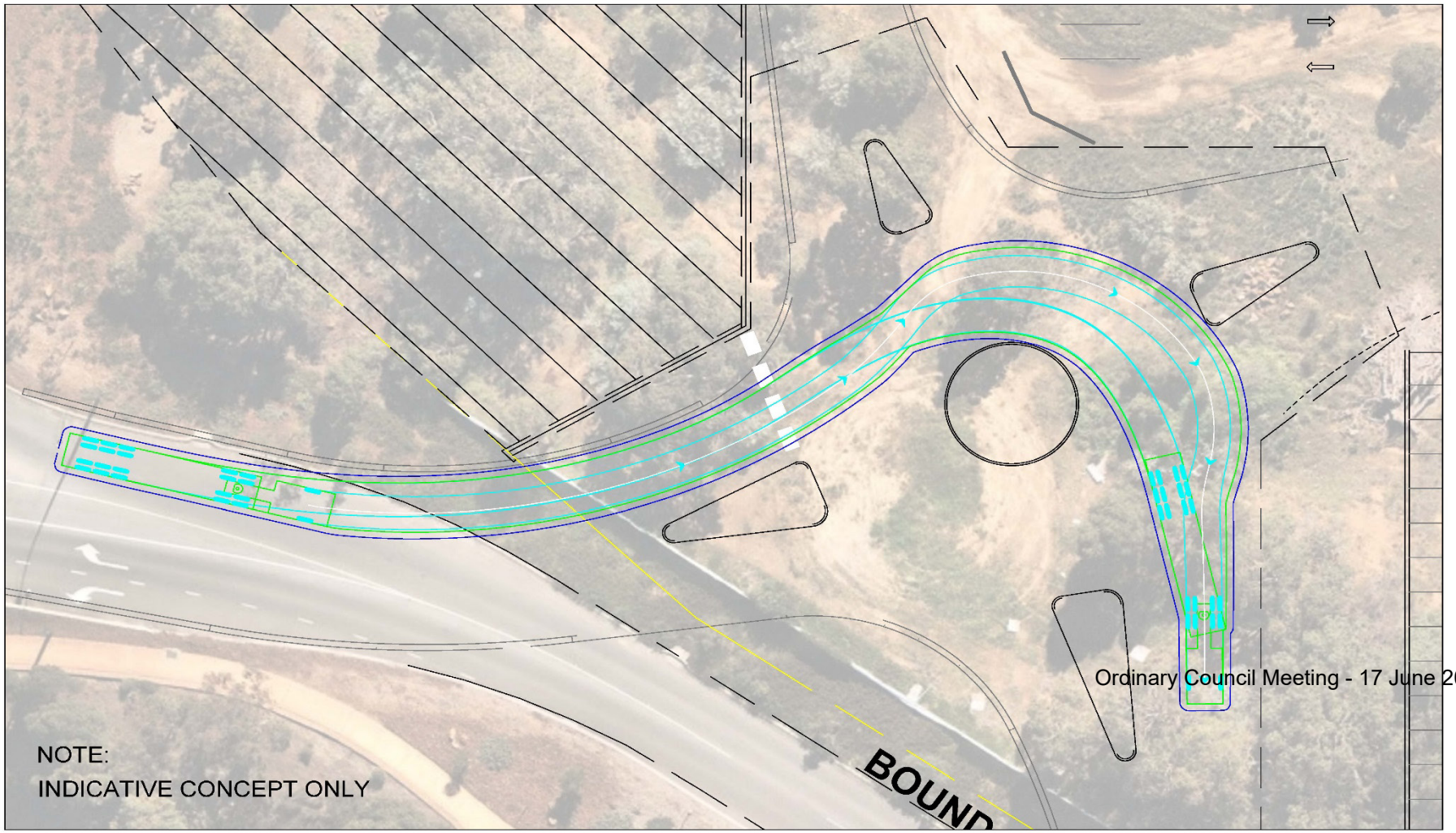


Lot 806 South Western Highway, Byford
Austroads 2013: 19m Semi Trailer
Right turn at roundabout

LEGEND
Vehicle Body
Wheel Path
500mm Clearance

t21.148.sk65
27/03/2024
Scale: 1:250 @ A3

transcore



Lot 806 South Western Highway, Byford
Austroads 2013: 19m Semi Trailer
Right turn at roundabout

LEGEND
Vehicle Body
Wheel Path
500mm Clearance

t21.148.sk66
27/03/2024
Scale: 1:250 @ A3

transcore