



Government of **Western Australia**
Development Assessment Panels

LG Ref: PA19/759
DAP Ref: DAP/18/01419
Enquiries: (08) 6551 9919

Mr Nik Hidding
Peter Webb & Associates
PO Box 920, Subiaco WA 6904

Dear Mr Hidding

METRO EAST JDAP - SHIRE OF SERPENTINE JARRAHDAL - DAP APPLICATION - PA19/759 - DETERMINATION

Property Location:	Lot 104 (3) Larsen Road, Byford
Application Details:	Service station, car wash, vehicle service/tyre centre, showroom/restricted retail and carpark (Caltex)
Amendment Details:	Minor design change to Service Station (rural design); enhanced design for Car Wash including fixed (pitched) roof; internal car park and access modifications; and deletion of Condition 13

Thank you for your Form 2.1 Development Assessment Panel (DAP) application and plans submitted to the Shire of Serpentine Jarrahdale on 2 August 2019 for the above-mentioned development.

The application was considered by the Metro East JDAP at its meeting held on 1 October 2019, where in accordance with the provisions of the Shire of Serpentine Jarrahdale Town Planning Scheme No. 2, it was resolved to **approve** the application as per the attached notice of determination.

Should the applicant not be satisfied by this decision, an application may be made to amend or cancel this planning approval in accordance with regulation 17 and 17A of the *Planning and Development (Development Assessment Panels) Regulations 2011*.

Please also be advised that there is a right of review by the State Administrative Tribunal in accordance with Part 14 of the *Planning and Development Act 2005*. Such an application must be made within 28 days of the determination, in accordance with the *State Administrative Tribunal Act 2004*.

Should you have any queries with respect to the conditions of approval, please contact Ms Heather O'Brien on behalf of the Shire of Serpentine Jarrahdale on 9526 1130.

Yours sincerely,

DAP Secretariat

9 October 2019

Encl. DAP Determination Notice
Approved Plans

Cc: Ms Heather O'Brien
Shire of Serpentine Jarrahdale



Planning and Development Act 2005

Shire of Serpentine Jarrahdale Town Planning Scheme No. 2

Metro East Joint Development Assessment Panel

**Determination on Development Assessment Panel
Application for Planning Approval**

Property Location: Lot 104 (3) Larsen Road, Byford

Application Details: Service station, car wash, vehicle service/tyre centre, showroom/restricted retail and carpark (Caltex)

Amendment Details: Form 2.1 - Minor design change to Service Station (rural design); enhanced design for Car Wash including fixed (pitched) roof; internal car park and access modifications; and deletion of Condition 13

In accordance with regulation 8 of the *Planning and Development (Development Assessment Panels) Regulations 2011*, the above application for planning approval was **granted** on 1 October 2019, subject to the following:

1. **Accept** that the DAP Application reference DAP/18/01419 as detailed on the DAP Form 2 dated 26 July 2019 is appropriate for consideration in accordance with regulation 17 of the *Planning and Development (Development Assessment Panels) Regulations 2011*;
2. **Approve** the DAP Application reference DAP/18/01419 as detailed on the DAP Form 2 dated 26 July 2019 and accompanying plans in accordance with Clause 68 of Schedule 2 (Deemed Provisions) of the *Planning and Development (Local Planning Schemes) Regulations 2015* and the provisions of the Shire of Serpentine Jarrahdale Town Planning Scheme No.2, for the proposed minor amendment to the Service station, car wash, vehicle service/tyre centre, showroom/restricted retail and car park at Lot 104, 3 Larsen Road, Byford, subject to:

New Conditions

19. Prior to issue of a Building Permit, a Schedule of Colours and materials shall be submitted to and approved by the Shire of Serpentine Jarrahdale. Once approved, the development shall be constructed and maintained in accordance with the approved schedule.
20. Prior to commencement of works, an amended site plan shall be submitted to and approved by the Shire of Serpentine Jarrahdale demonstrating how traffic shall flow through the site safely. Once approved, the development shall be carried out in accordance with the approved site plan.



Amended Condition

1. The development is to be carried out in compliance with the plans and documentation listed below and endorsed with the Shire of Serpentine Jarrahdale stamp, except where amended by other conditions of this consent

Plans and Specifications	1 – 1809-F01 2 – TP02 – Revision A 3 – TP03 – Revision N 4 – A1.10 Revision P6 5 – TP05 – Revision B 6 – A1.20 Revision P5 7 – A2.10 Revision P3 8 –TP08 Revision B 9 – A2.20 Revision P4 10 –Traffic Impact Assessment November 2018
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All other conditions, footnotes and advice notes remain as per the DAPs' original decision dated 11 December 2018.

Where an approval has so lapsed, no development shall be carried out without further approval having first been sought and obtained, unless the applicant has applied and obtained Development Assessment Panel approval to extend the approval term under regulation 17(1)(a) of the *Planning and Development (Development Assessment Panels) Regulations 2011*.

**DEVELOPMENT
ASSESSMENT PANEL**

APPROVED
01-Oct-2019



Photo ①

Photo ②

Photo ③



LOCATION SKETCH
NOT TO SCALE



Surface Material

- (G) Grass / Garden
- (C) Concrete
- (A) Asphalt

Symbol Legend

- Power Pole
- Electrical Cable Box
- Stop Valve
- Drainage MH
- Hydrant (Ground)
- Tektra Pit
- Tektra Pitter
- Tektra Marker
- Pole / Post
- Sign (One Pole)
- Natural Surface
- Road Level
- Driveway Level
- Bush
- Tree

Linestyle Legend

- Contour Major 1.0m Intervals
- Contour Minor 0.2m Intervals
- Central Boundary
- Keft Line
- Road Centreline
- Track
- Footpath
- Fence
- Gate
- Overhead Power Lines
- Building
- Eaves Line
- Edge of Concrete
- Bush
- DBVD Sewer
- DBVD Water

Control Point Schedule

Point	Easting	Northing	Elevation	Description
9001	68031.372	234568.127	52.34	Deck Spike in Bitumen
9002	68062.818	234667.247	52.33	Deck Spike in Concrete
9003	68168.828	234667.969	55.47	Deck Spike in Concrete
9004	68140.278	234617.974	55.33	Deck Spike in Bitumen
WUN31	68157.385	234568.700	54.95	SSM

Scale @A1 1:400

18019-1.0-27022018-PCG94-F01.dwg

VER.	DATE	BY	AMENDMENTS	FILE SOURCE
1.0	28.02.2018	SF	Issued for Information	18019-1.0-27022018-PCG94-F

Notes:

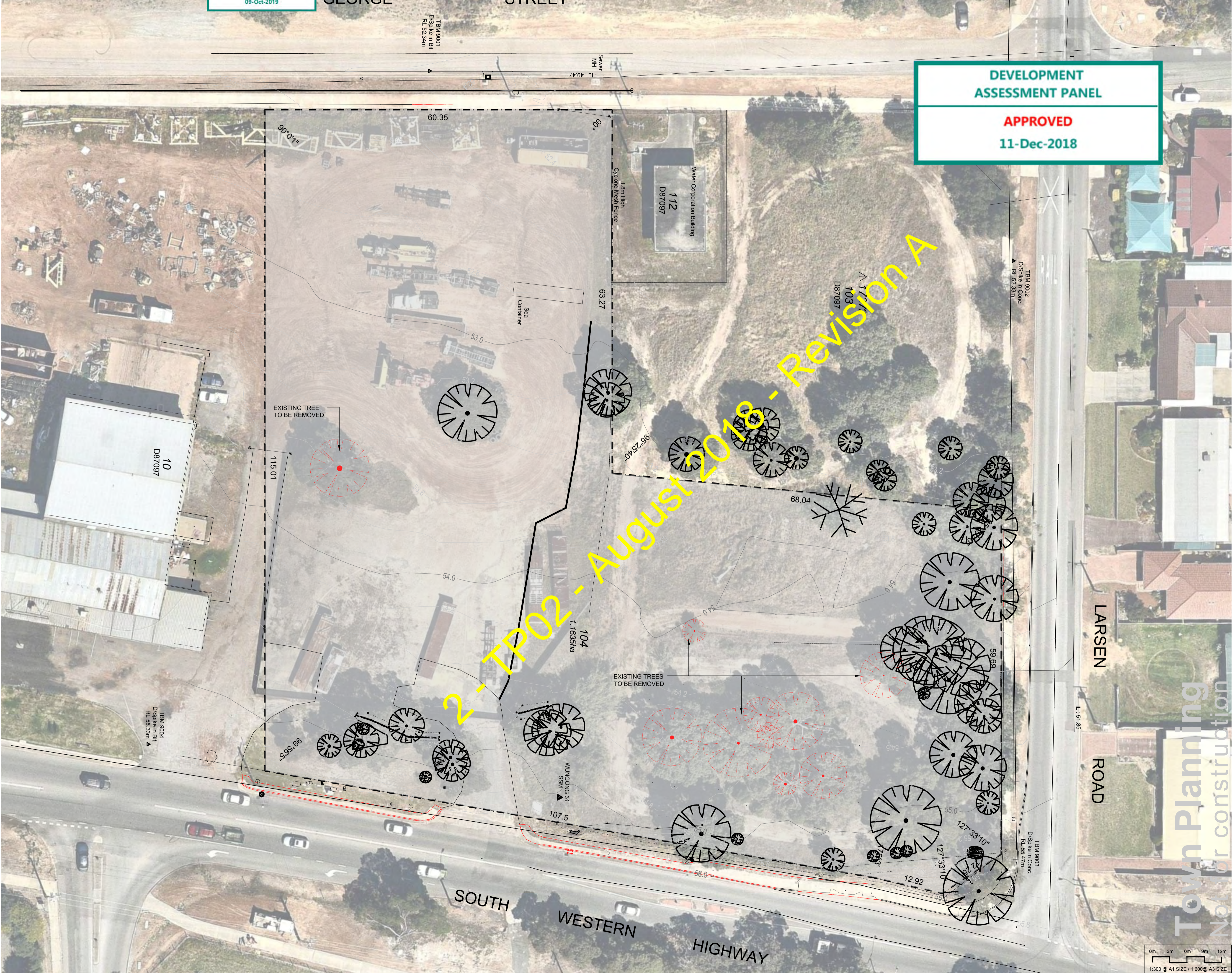
- Boundary plotted from Landgate SCDB digital data only.
- True position of boundary is subject to a re-establishment survey.
- Heights established from SSM WUN31 via GPS connection.
- Dimensions, Areas and Offsets subject to re-establishment survey.
- Sewer & water data plotted from Dial Before You Dig only.



JOB NO: 18019	TITLE: FEATURE SURVEY	DATUM	N
PROJECT: LOT 104 ON P169930 3 LARSEN ROAD BYFORD, WA, 6122 C/T 1834-126		VERT: AHD HORIZ: PCG94 SCALE: 1:400	
SURVEYOR: JB		DWG NO: 18019-F01	
DATE OF SURVEY: 27.02.2018	DRAWN BY: SF	APPROVED BY: NRW	VER: 1.0
SHEET NO: 1 OF 1			A1

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DEVELOPMENT
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APPROVED
11-Dec-2018



A	TREES TO BE REMOVED SHOWN	JS	08-11-18
O	PLANNING ISSUE	JP	08-05-18
P1	PRELIMINARY ISSUE	KM	10-04-18
REV	AMENDMENT DETAILS	BY	DATE



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RBP No. DP-AD1689

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PROJECT
PROPOSED MIXED USE
DEVELOPMENT

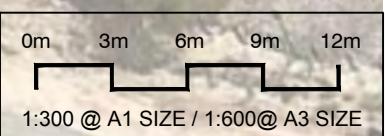
PROJECT ADDRESS
3 LARSEN ROAD

BYFORD WA 6122

DRAWING TITLE
EXISTING CONDITIONS PLAN &
DEMOLITION PLAN

CLIENT
PROCON DEVELOPMENTS PTY LTD

DATE AUG.'18	SCALE @ A1 1:300	NORTH	
DRAWN KM	CHECKED AB		
ISSUE PLANNING			
PROJECT No. 15316	DRAWING No. TP02	REVISION No. A	SHEET 02 of 18



Town Planning
Now for construction

DEVELOPMENT
ASSESSMENT PANEL
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09-Oct-2019

AREA SCHEDULE:

TOTAL SITE AREA -	11,630m ²
ROADHOUSE -	425m ²
QM'S STORE -	25m ²
BIN AREA -	25m ²
VEHICLE SERVICE STORE -	430m ²
RESTRICTED RETAIL -	675m ²
CAR WASH (PLANT & AUTO) -	95m ²
TOTAL AREA:	1,675m²
LANDSCAPE AREA -	3,116.5 m ² (26.8%)
CAR SPACES PROVIDED -	78 cars

LEGEND:

- EXISTING TREE RETAINED
40 No.
- EXIST. TREE REMOVED
11 No.
- NEW TREE ADDED
(REFER LANDSCAPE PLAN
AND TREE SURVEY REPORT)
- MRWA PLANNING
CONCEPT OVERLAY

ALL AREAS ARE APPROXIMATE AND
SUBJECT TO FINAL SURVEY

N	SITE LAYOUT REVISED	KM	24-07-19
M	AUTO CAR WASH & BIN AREA REVISED. NO. OF CAR PARKING REVISED	JS	09-11-18
L	TIMBER BATTEN ADDED	JS	08-11-18
K	PARKING AREA REVISED	KM	30-10-18
J	CAR CANOPY, SERVICE CENTRE & CAR WASH REVISED	KM	23-10-18
H	CAR WASH & SERVICE CENTRE REVISED.	KM	19-10-18
G	PARKING REVISED.	KM	24-08-18
F	TENANCIES & PARKING REVISED.	KM	22-08-18
E	FUEL SHOP & CANOPY REVISED.	KM	13-08-18
D	SITE ACCESS & CAR WASH REVISED.	KM	17-07-18
C	CAR CANOPY & CAR WASH REVISED.	KM	12-07-18
B	TRUCK CANOPY DELETED. CAR CANOPY REVISED.	JS	06-07-18
A	SITE KERB TO SOUTH WESTERN HIGHWAY AMENDED	JP	09-05-18
Q	PLANNING ISSUE	JP	08-05-18
P2	CARWASH LAYOUT REVISED	JS	17-04-18
P1	PRELIMINARY ISSUE	KM	10-04-18
REV	AMENDMENT DETAILS	BY	DATE

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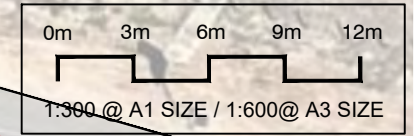
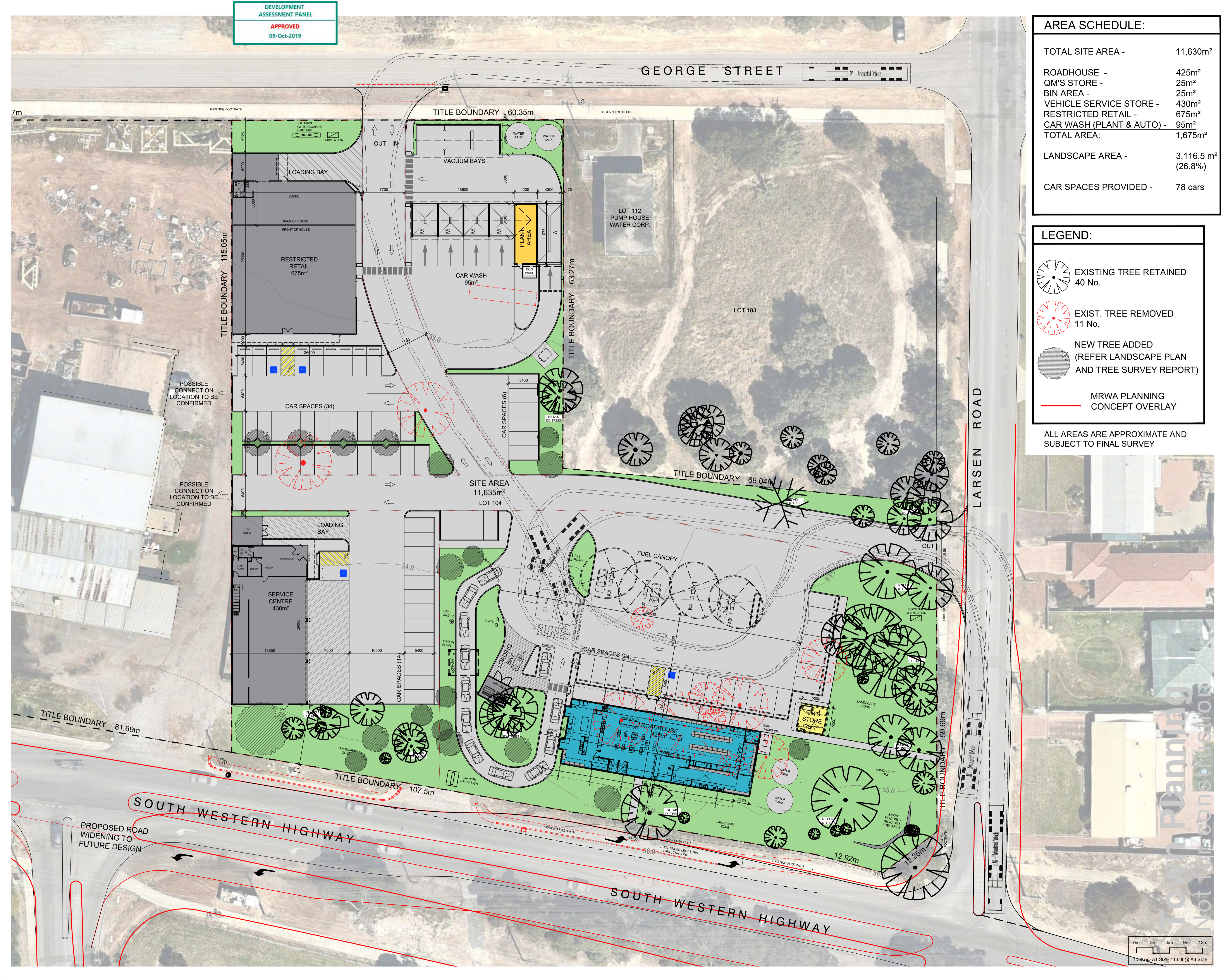
PROJECT
PROPOSED MIXED USE DEVELOPMENT

PROJECT ADDRESS
**3 LARSEN ROAD
BYFORD WA 6122**

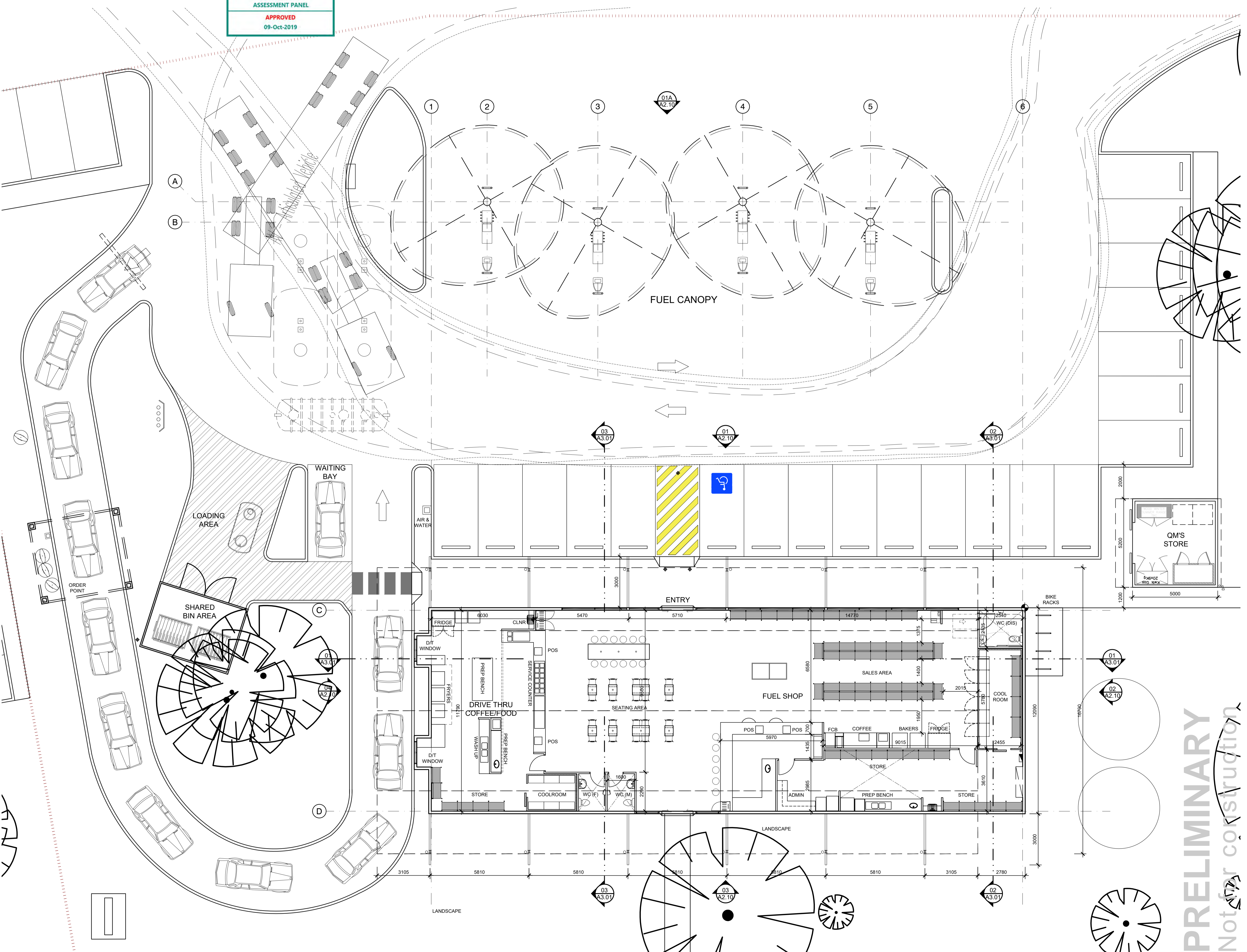
DRAWING TITLE
PROPOSED SITE PLAN

CLIENT
PROCON DEVELOPMENTS PTY LTD

DATE	SCALE @ A1	NORTH
APR.'18	1:300	
DRAWN	CHECKED	
KM	AB	
ISSUE		
PLANNING		
PROJECT No.	DRAWING No.	REVISION No.
15316	TP03	N
		SHEET
		03 of 18



DEVELOPMENT
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09-Oct-2019



P6	MINOR CHANGE TO D/T LANE	AB	24-06-19
P5	RE-DESIGN OF DRIVE THRU & BUILDING	KM	18-06-19
P4	INTERNAL LAYOUT REVISED	KM	12-06-19
P3	INTERNAL LAYOUT REVISED	KM	22-03-19
P2	BUILDING EXTERNAL WALL TYPES AMENDED	JP	08-03-19
P1	PRELIMINARY ISSUE	JS	05-03-19
REV	AMENDMENT DETAILS	BY	DATE



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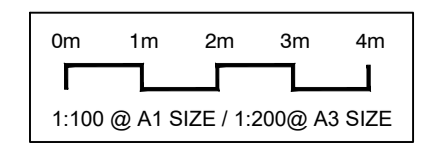
DRAWING TITLE
FUEL SHOP - FLOOR PLAN

CLIENT
PROCON DEVELOPMENTS PTY LTD

DATE	SCALE @ A1	NORTH
FEB '19	1:100	
DRAWN	CHECKED	
JS	AB	
ISSUE		
PRELIMINARY		

PROJECT No.	DRAWING No.	REVISION No.	SHEET
15316	A1.10	P6	of

01 FUEL SHOP - FLOOR PLAN
SCALE 1:100

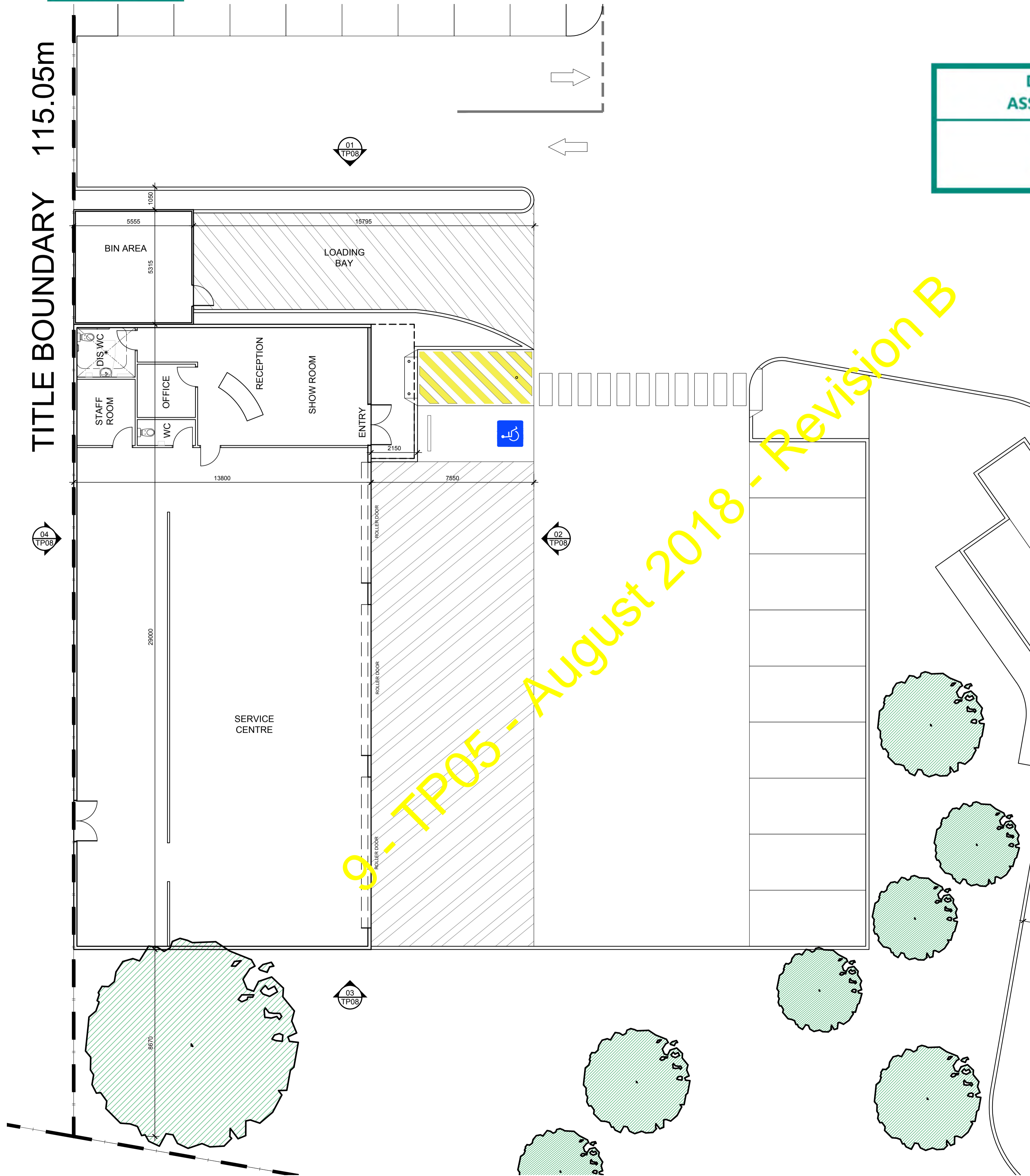


PRELIMINARY
Not for construction

DEVELOPMENT ASSESSMENT PANEL
APPROVED
 09-Oct-2019

DEVELOPMENT ASSESSMENT PANEL
APPROVED
 11-Dec-2018

TITLE BOUNDARY 115.05m



B	PLAN REVISED TO SUIT TP03 REV.L	JS	08-11-18
A	PLAN REVISED TO SUIT TP03 REV.G	KM	24-08-18
O	PLANNING ISSUE	JP	08-05-18
P2	CARWASH LAYOUT REVISED	JS	17-04-18
P1	PRELIMINARY ISSUE	KM	10-04-18
REV	AMENDMENT DETAILS	BY	DATE



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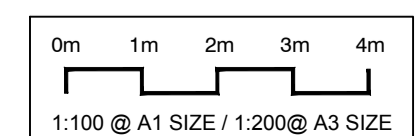
PROJECT ADDRESS
3 LARSEN ROAD

BYFORD WA 6122

DRAWING TITLE
PROPOSED FLOOR PLAN - SERVICE CENTRE

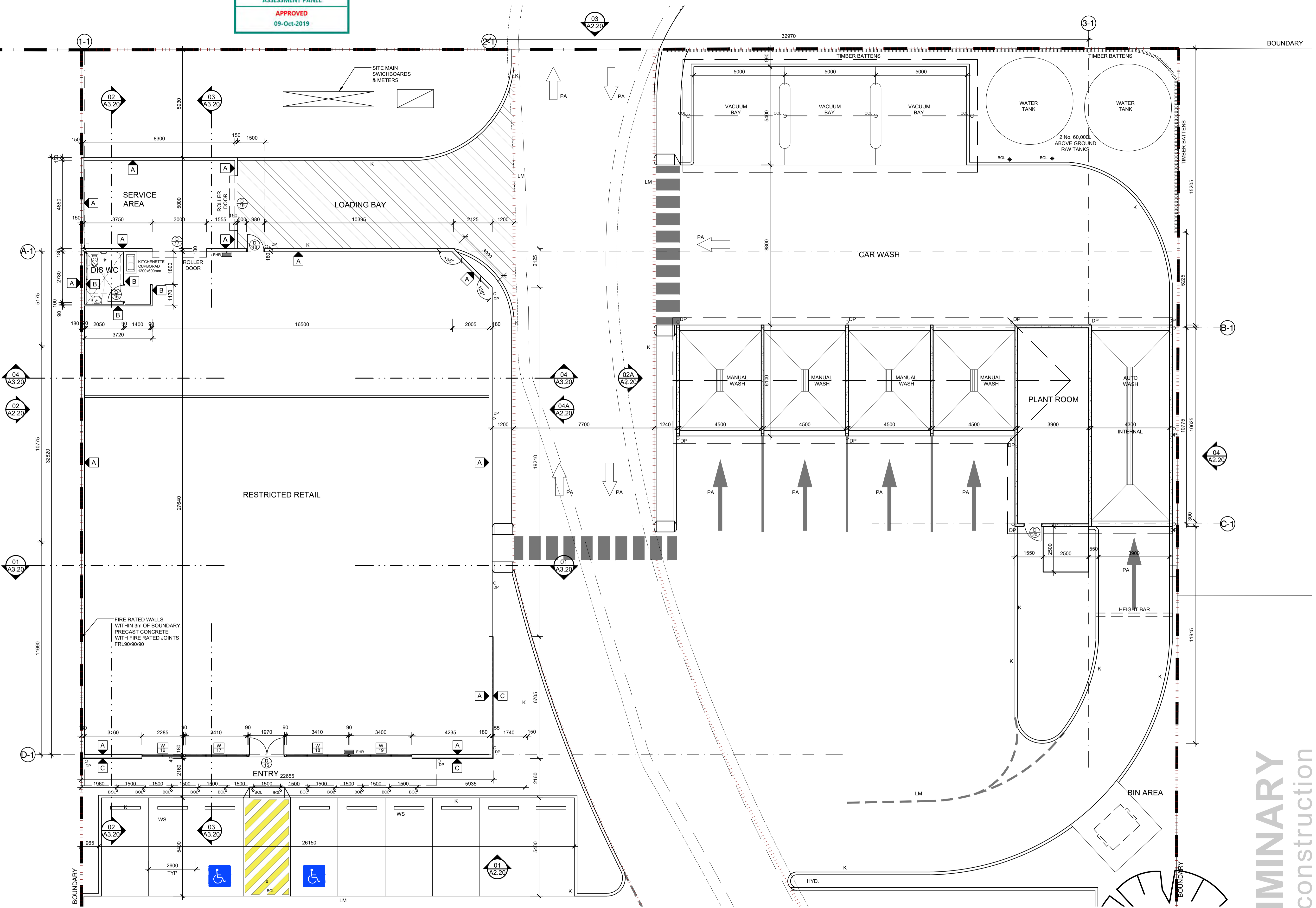
CLIENT
PROCON DEVELOPMENTS PTY LTD

DATE AUG '18	SCALE @ A1 1:100	NORTH	
DRAWN KM	CHECKED AB		
ISSUE PLANNING			
PROJECT No. 15316	DRAWING No. TP05	REVISION No. B	SHEET 09 of 18



Town Planning
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DEVELOPMENT
ASSESSMENT PANEL
APPROVED
09-Oct-2019



P5	CAR WASH ROOF REVISED	KM	05-07-19
P4	ROADWAY REVISED	KM	18-06-19
P3	RESTRICTED RETAIL AND CAR WASH PEDESTRIAN ACCESS REVISED	KM	30-04-19
P2	RESTRICTED RETAIL BUILDING, CAR PARKING & KERBS MOVED 1m WEST	KM	23-04-19
P1	PRELIMINARY ISSUE	FR	08-03-19
REV	AMENDMENT DETAILS	BY	DATE



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DRAWING TITLE
CAR WASH & RESTRICTED RETAIL - FLOOR PLAN

CLIENT
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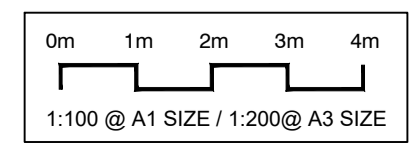
DATE FEB '19	SCALE @ A1 1:100	NORTH
DRAWN JWS	CHECKED AB	
ISSUE PRELIMINARY	PROJECT No. 15316	

REVISION No. A1.20	REVISION No. P5	SHEET of
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01 RETAIL & CAR WASH - FLOOR PLAN
SCALE 1:100

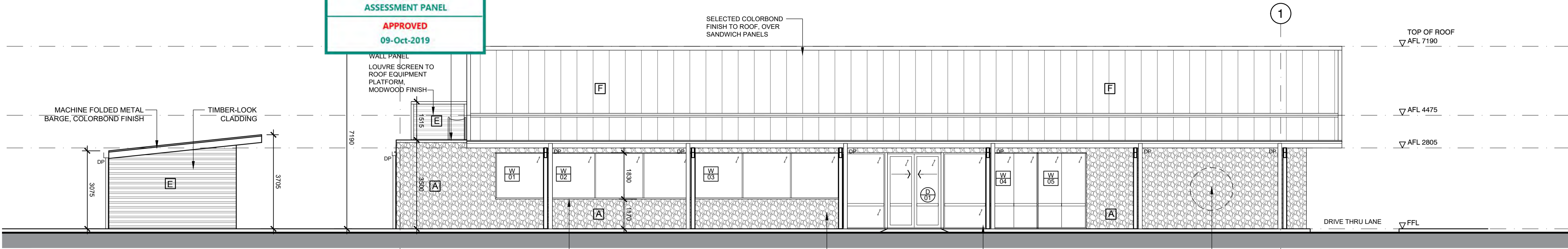
WALL TYPE SCHEDULE

A	150mm THICK PRECAST CONCRETE WALL PANEL TO STRUCTURAL ENGINEERS DETAIL. SELECTED PAINT FINISH.
B	- SELECTED PAINT / TILE FINISH - 8mm THICK FIBRE CEMENT SHEETING - 92mm NOMINAL STEEL STUD - 8mm THICK FIBRE CEMENT SHEETING - SELECTED PAINT / TILE FINISH
C	STAKED STONE CLADDING

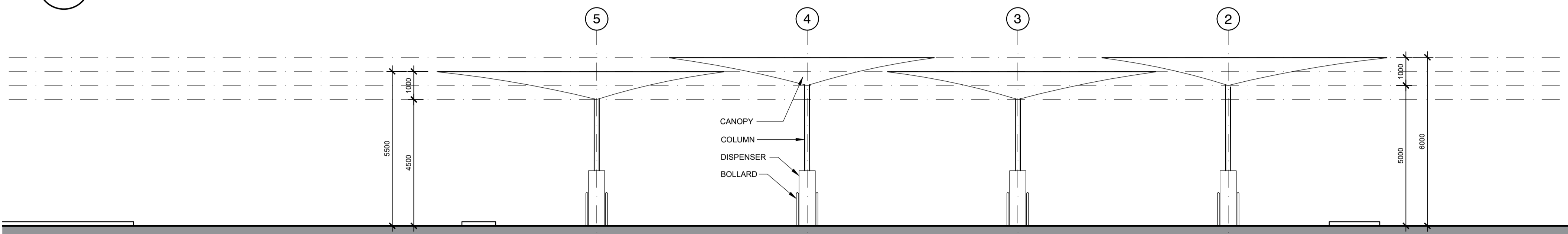


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DEVELOPMENT ASSESSMENT PANEL
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01 WEST ELEVATION - FUEL SHOP/DT REST.
 SCALE 1:100



01A WEST ELEVATION - FUEL CANOPY
 SCALE 1:100

EXTERNAL COLOUR SCHEDULE

	A	STONE-LOOK TILES
	B	SPLITFACE BLOCKWORK, 'PEARL' FINISH
	C	CEMINTEL CLADDING 'TEAK' COLOUR: TEAK
	D	TEXTURED PAINT 'DULUX SILKWORT'
	E	MODWOOD CLADDING, COLOUR BLACK BEAN
	F	COLORBOND FINISH ROOF COLOUR: BLACK
	G	PAINT FINISH, DULUX 'NATURAL STONE'
	J	TIMBER LOOK COLUMN

FINISHES TO BE CONFIRMED

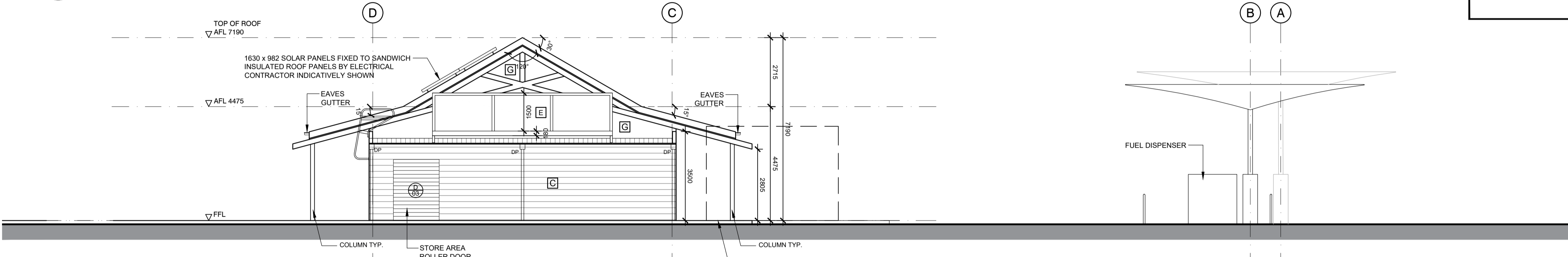
P3	PRELIMINARY ISSUE	KM	05-07-19
P2	PRELIMINARY ISSUE	KM	26-03-19
P1	PRELIMINARY ISSUE	KM	22-03-19
REV	AMENDMENT DETAILS	BY	DATE



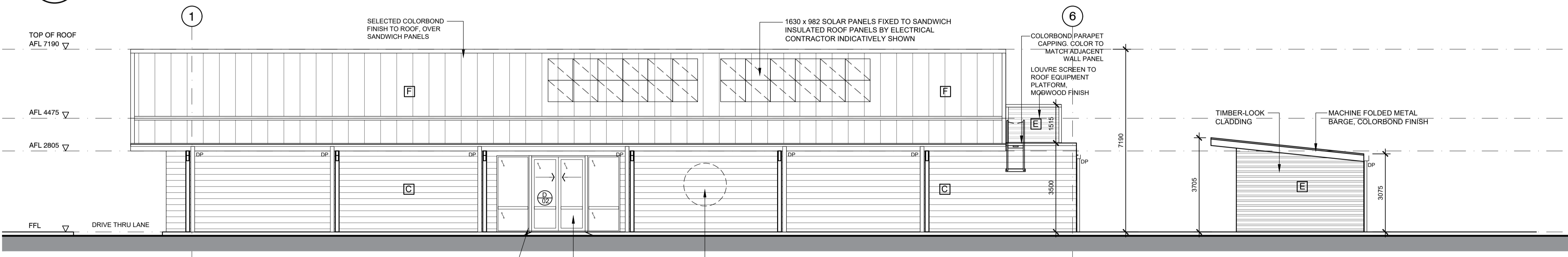
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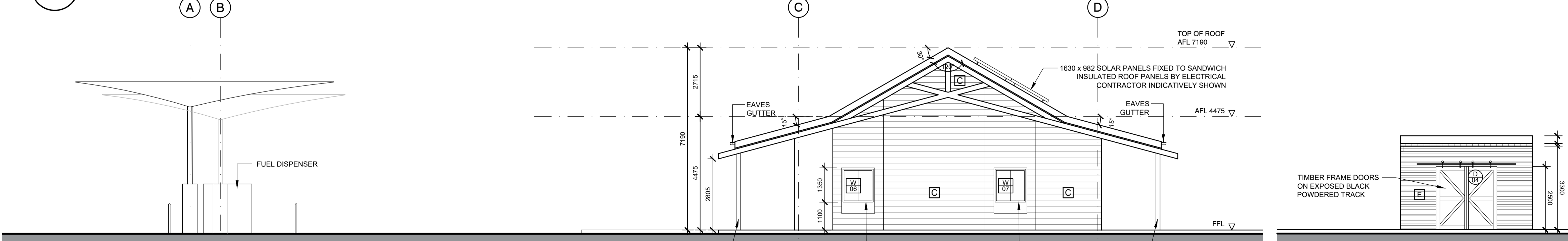
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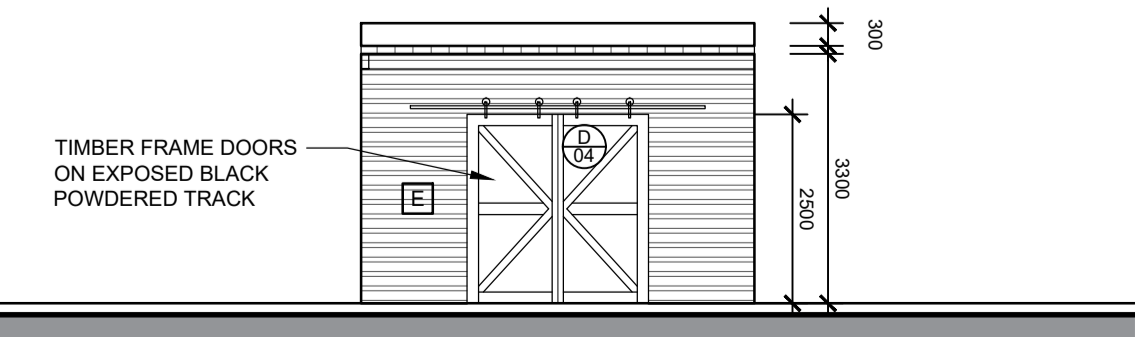
02 NORTH ELEVATION - FUEL SHOP & CANOPY (LARSEN RD)
 SCALE 1:100



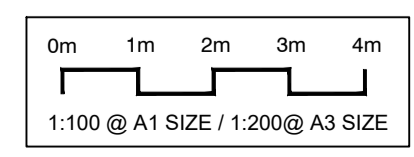
03 EAST ELEVATION - FUEL SHOP/DT REST. (STH WESTERN HWY)
 SCALE 1:100



04 SOUTH ELEVATION - FUEL CANOPY & DT REST.
 SCALE 1:100



05 SOUTH ELEVATION - QM'S STORE
 SCALE 1:100



PRELIMINARY Not for construction

PROJECT PROPOSED MIXED USE DEVELOPMENT

PROJECT ADDRESS 3 LARSEN ROAD

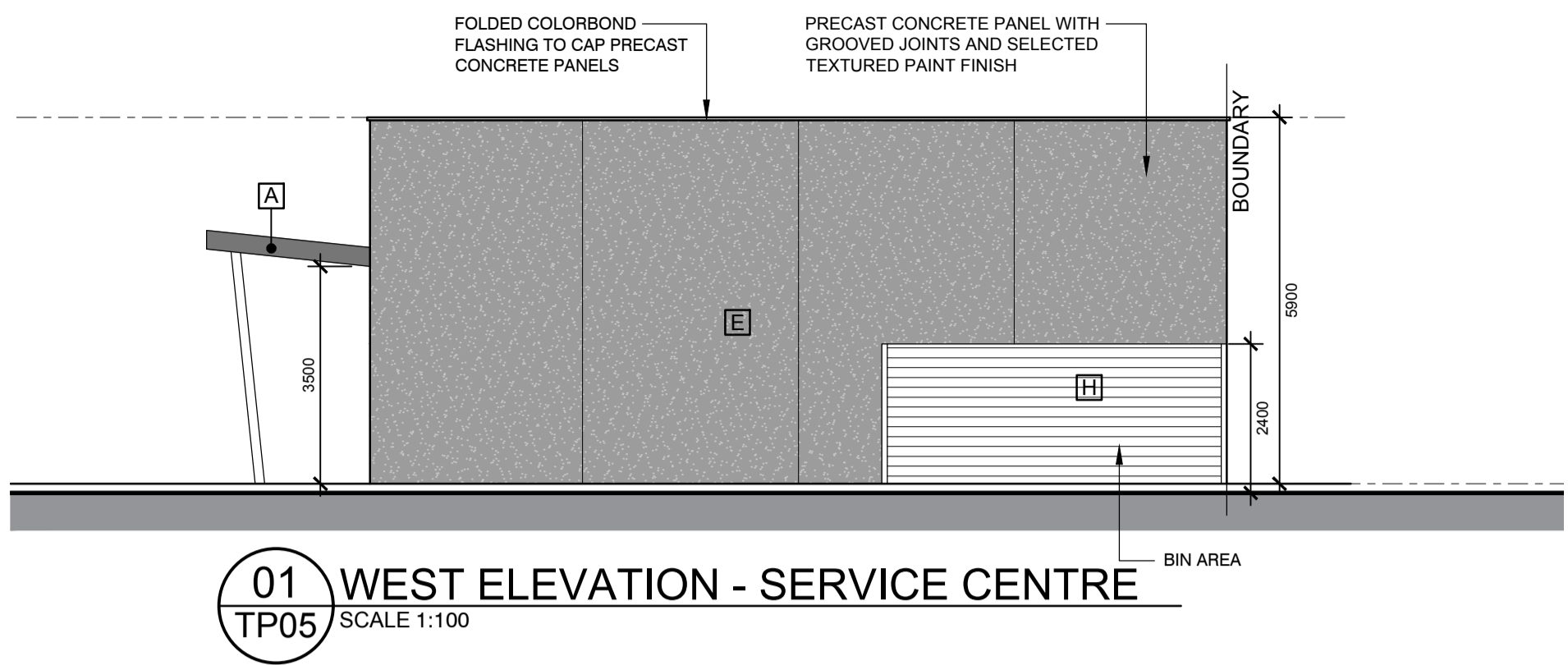
BYFORD WA 6122

DRAWING TITLE FUEL SHOP & CANOPY - ELEVATIONS

CLIENT PROCON DEVELOPMENTS

DATE	SCALE @ A1	NORTH
MAR.'19	1:100	
DRAWN	CHECKED	
KM	AB	
ISSUE	PRELIMINARY	
PROJECT No.	DRAWING No.	REVISION No.
15316	A2.10	P3
		of

DEVELOPMENT ASSESSMENT PANEL
APPROVED
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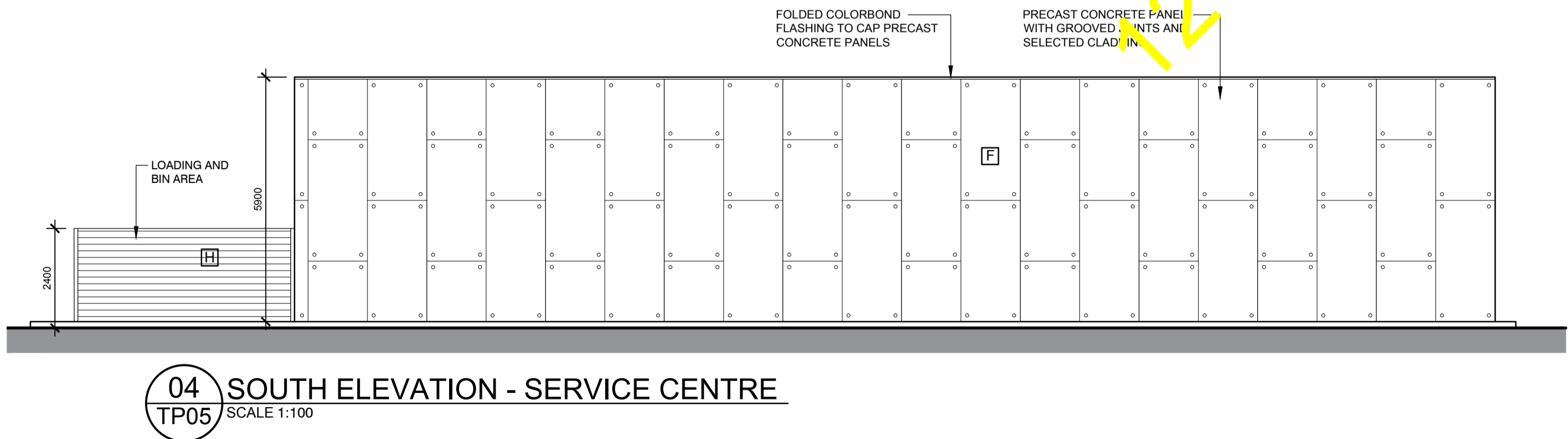
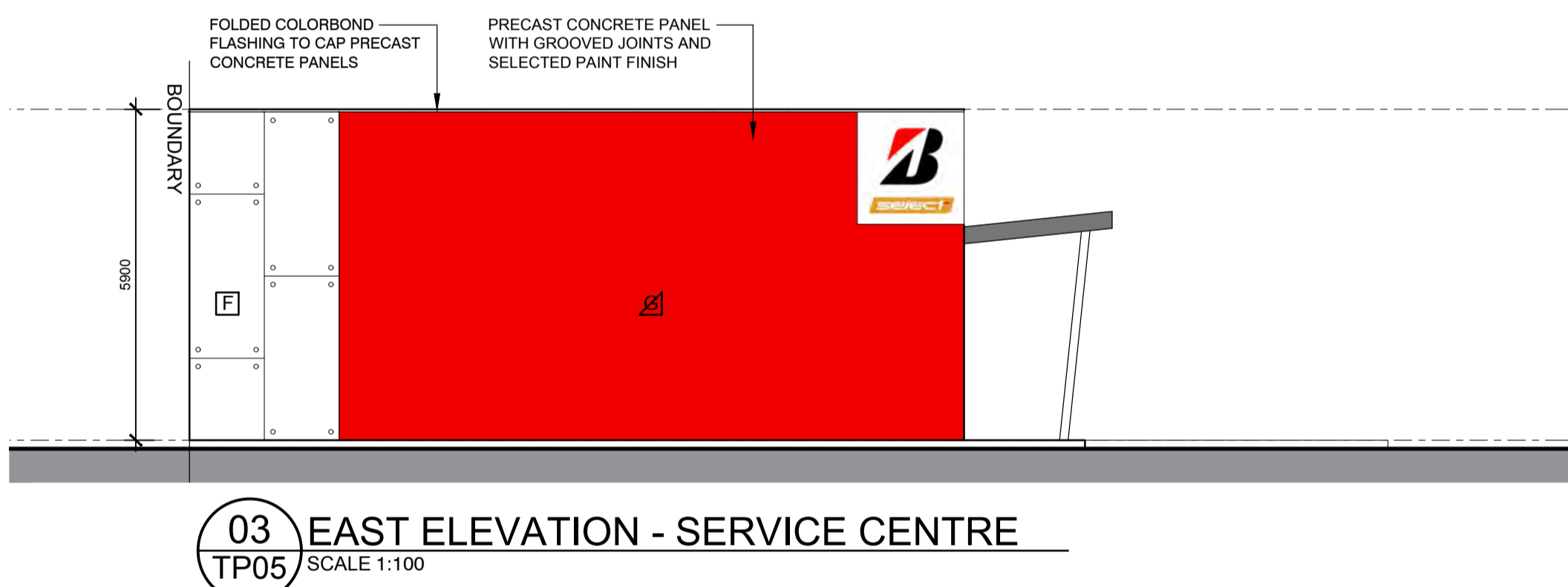
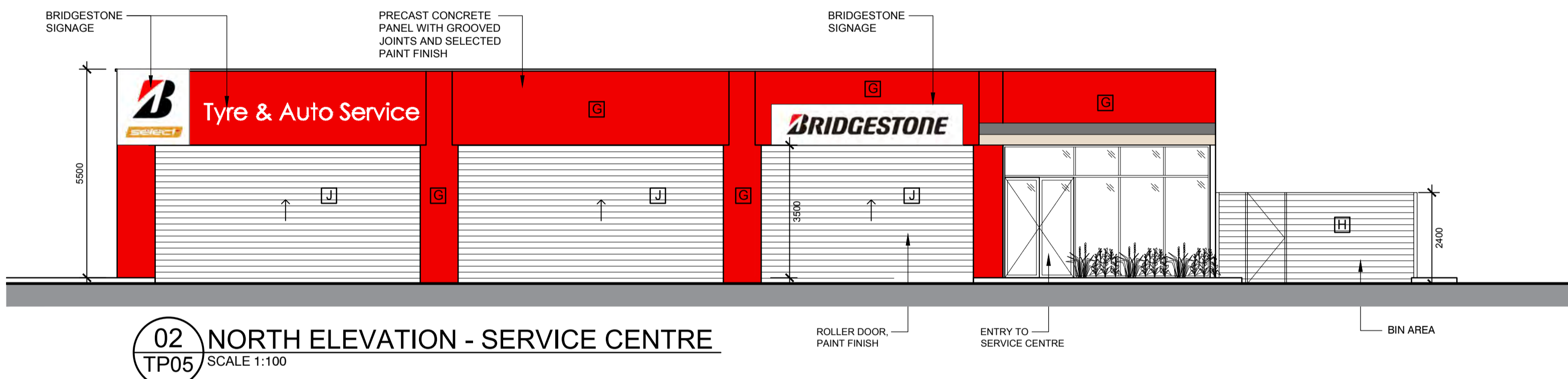


EXTERNAL COLOUR SCHEDULE

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- [A] PAINT FINISH, DULUX 'CHARCOAL'
- [B] METAL CLADDING, PAINT FINISH COLORBOND 'SURFMIST'
- [C] PAINT FINISH DULUX 'ZEUS WHITE' GLOSS
- [D] METAL CLADDING, PAINT FINISH COLORBOND 'SILKWORT'
- [E] PAINT FINISH DULUX 'SILKWORT'
- [F] METAL CLADDING, PAINT FINISH COLORBOND 'SILKWORT'
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P2 - TP08 - August 2018 - Revision B

REV	AMENDMENT DETAILS	BY	DATE
B	PLAN REVISED TO SUIT TP03 REV.L	JS	08-11-18
A	PLAN REVISED TO SUIT TP03 REV.G	KM	24-08-18
O	PLANNING ISSUE	JP	08-05-18
P2	CAR WASH REVISED, STAINLESS STEEL WIRE ADDED	JS	17-04-18
P1	PRELIMINARY ISSUE	KM	05-04-18



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PROJECT
PROPOSED MIXED USE DEVELOPMENT

PROJECT ADDRESS
3 LARSEN ROAD

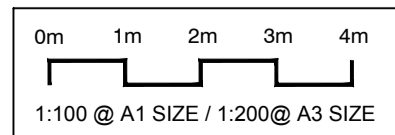
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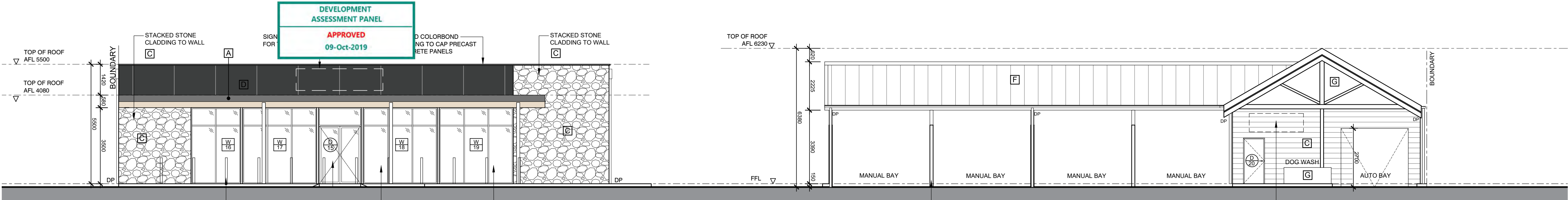
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CLIENT
PROCON DEVELOPMENTS

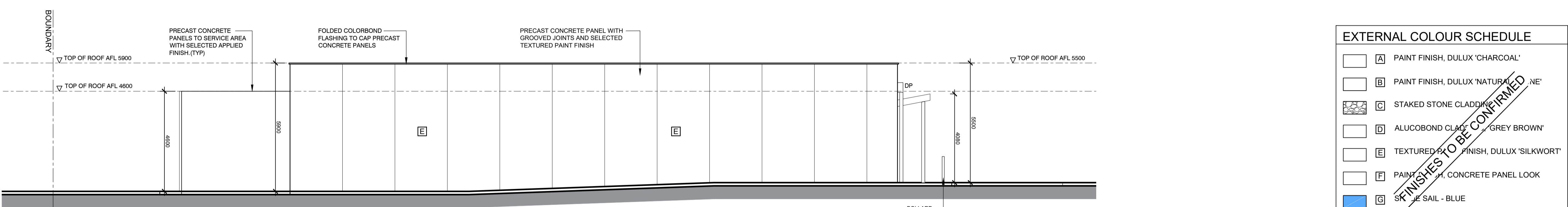
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ISSUE PLANNING			
PROJECT No. 15316	DRAWING No. TP08	REVISION No. B	SHEET 12 of 18

Town Planning
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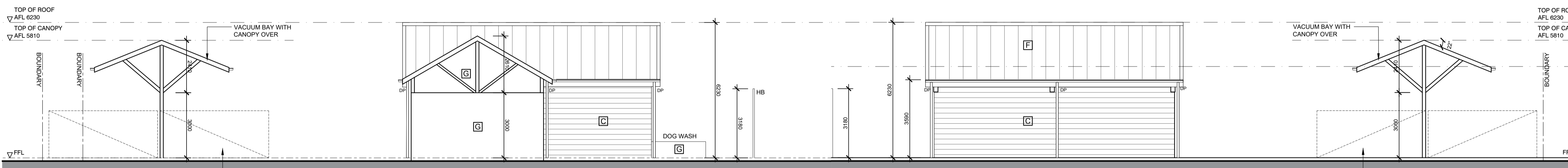
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SCALE 1:100



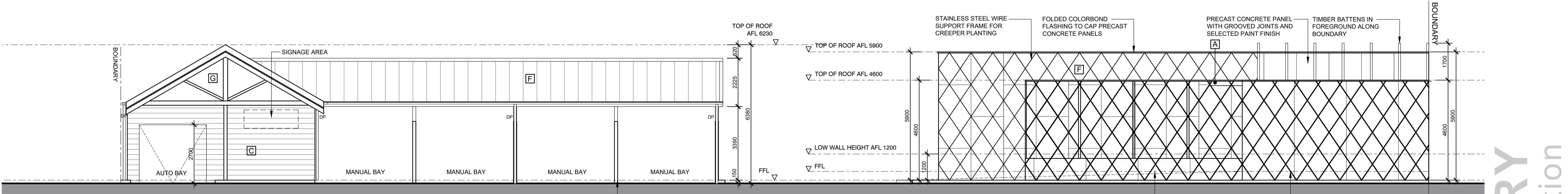
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SCALE 1:100

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[B]	PAINT FINISH, DULUX 'NATURAL GREY'
[C]	STACKED STONE CLADDING
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[F]	PAINT FINISH, CONCRETE PANEL LOOK
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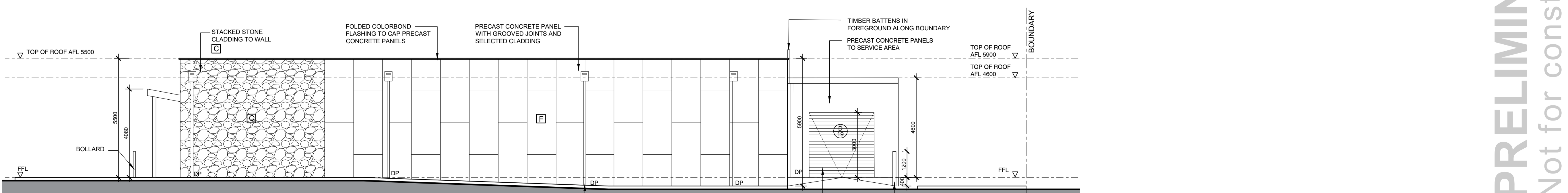
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P4	CAR WASH ROOF REVISED	KM	05-07-19
P3	RESTRICTED RETAIL AND CAR WASH PEDESTRIAN ACCESS REVISED	KM	30-04-19
P2	RESTRICTED RETAIL BUILDING, CAR PARKING & KERBS MOVED 1m WEST	KM	23-04-19
P1	PRELIMINARY ISSUE	FR	08-03-19



04 NORTH ELEVATION - CAR WASH
SCALE 1:100



03 WEST ELEVATION - CAR WASH/RETAIL TENANCY (GEORGE ST)
SCALE 1:100



04A NORTH ELEVATION - RETAIL TENANCY
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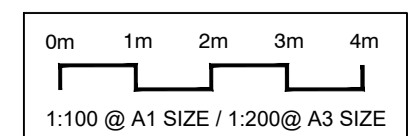
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3 LARSEN ROAD

BYFORD WA 6122

DRAWING TITLE
CAR WASH & RESTRICTED RETAIL - ELEVATIONS

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PROPOSED MIXED USE DEVELOPMENT (SERVICE STATION + CONVENIENCE STORE +
DRIVE-THRU COFFEE | VEHICLE SERVICE STORE | COMMERCIAL TENANCIES | SELF
SERVICE + AUTOMATIC CAR WASH)

LOT 104 (SN3) LARSEN RD, (CNR SOUTH WESTERN HIGHWAY) BYFORD

TRANSPORT IMPACT ASSESSMENT



Final 3-0

Prepared by i3 consultants WA for
Peter Webb & Associates | Procon

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Transport Impact Assessment

Proposed Mixed Use Development (Service Station + Convenience Store + Drive-Thru Coffee | Vehicle Service Store | Commercial Tenancies | Self Service + Automatic Car Wash), Lot 104
Prepared for Peter Webb & Associates | Procon



Project details

Project Proposed Mixed Use Development (Service Station + Convenience Store + Drive-Thru Coffee | Vehicle Service Store | Commercial Tenancies | Self Service + Automatic Car Wash)
Location Lot 104 (SN3) Larsen Rd, (Cnr South Western Highway) Byford
Project ID 02904
Client Peter Webb & Associates | Procon
Description A Transport Impact Statement for a proposed Mixed-Use Development (Service Station + Convenience Store + Drive-Thru Coffee | Vehicle Service Store | Commercial Tenancies | Self Service + Automatic Car Wash) on Lot 104 at 3 Larsen Rd on the southwest corner of South Western Hwy within the Shire of Serpentine-Jarrahdale suburb of Byford prepared in accordance with the WAPC 2016 Transport Impact Assessment Guidelines.

Document control

Author David Wilkins TMIEAust
Status Final 3-0
File name 02904 Lot 104 SWH_Larsen_George Service TIA (F3-0)

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Revision status comments: D1-0 incomplete report issued for review of background information by client. D2-0 includes revised access and land uses: issued for review by client. F1-0 Final Issue with SIDRA data and completed WAPC checklist. F1-0 Section 14 amended to reflect changed parking bay numbers. F2-0 completely revised to reflect revised layout with no access to or from South Western Hwy, dualling of South Western Hwy including right and left turn lanes into Larsen Rd, largest vehicle restricted to 19 m ST and associated internal layout changes. D3-0 revised and updated to reflect revised plans and comments from the October JDAP process. F3-0 issued as Final with no changes other than adding cover image. This is not an approved document unless certified here.

Digitally signed by David Wilkins
Date: 2018.11.09 12:06:03 +08'00'

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Transport Impact Assessment
 Proposed Mixed Use Development (Service Station + Convenience Store + Drive Thru Coffee + Vehicle Serv
 Commercial Tenancies | Self Service + Automatic Car Wash), Lot 104
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Transport Impact Assessment

Proposed Mixed Use Development (Service Station + Convenience Store + Drive-Thru Coffee | Vehicle Serv
Commercial Tenancies | Self Service + Automatic Car Wash), Lot 104
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ABOUT THE AUTHOR

David Wilkins is an RTA NSW Certified Level 3 Lead Auditor (RSA-08-0178) and Main Roads Western Australia (MRWA) accredited Senior Road Safety Auditor (SRSA 0101). In addition to this, David is an MRWA accredited Crash Investigation Team Leader and Roadworks Traffic Manager (MRWA-RTM-10-RTM20). David has undertaken 104 road safety audits in the last five years and 236 road safety audits since 2001 across the full range of stages from feasibility through to pre-opening, including roadworks, existing roads, schools and mine sites.

David's specialist skills are in the management and development of transport infrastructure and planning, particularly with respect to road safety engineering, roadworks traffic management, traffic engineering, crash investigation, road safety audits, alternative transport systems (TravelSmart, shared paths, cycle facilities), transport statements, transport assessments, parking demand management, local area traffic management, speed management, accessible environments and innovation.

David specialises in undertaking and preparing traffic impact assessments in accordance with either the WAPC document 'Transport Impact Assessment Guidelines' (1) or Austroads 'Guide to Traffic Management Part 12: Traffic Impacts of Developments' (2) and has personally prepared over 160 of these in the last 10 years.



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1 INTRODUCTION & BACKGROUND

This Transport Impact Assessment report has been prepared for Peter Webb & Associates | Procon (the applicant) by David Wilkins from i3 consultants WA (the consultant) in accordance with the WAPC publication Transport Impact Assessment Guidelines (1). These guidelines indicate that a Transport Impact Assessment (TIA) is required for developments that are likely to generate more than 100 vehicle trips in the development’s peak hour and therefore would have a high impact on the surrounding land uses and transport networks, as shown in Figure 1 below.

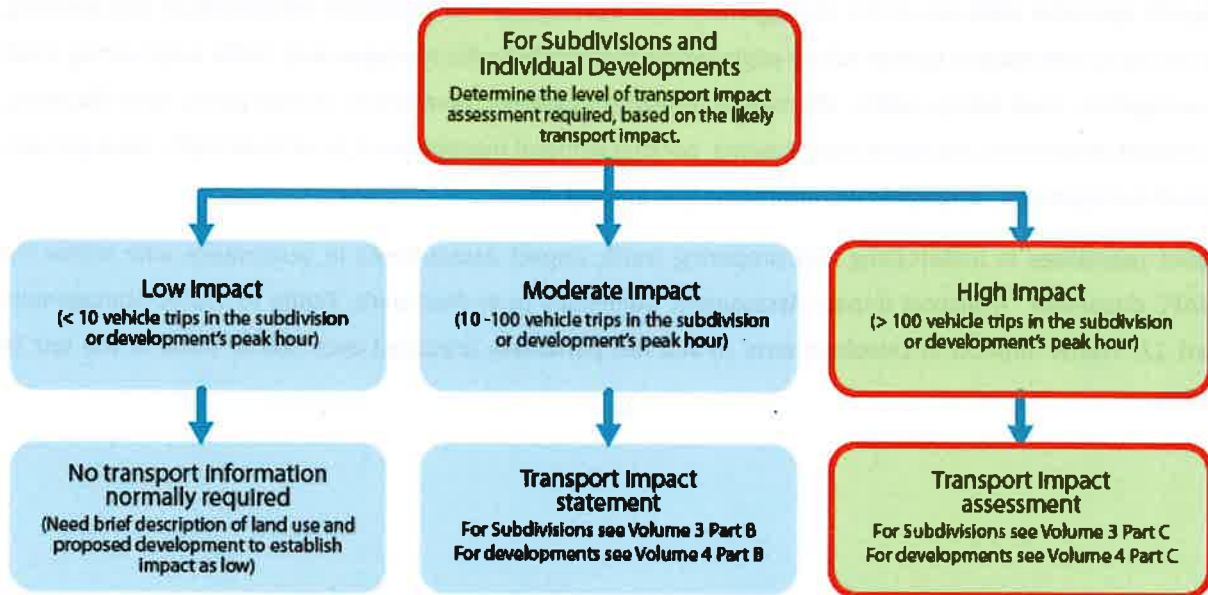


Figure 1 - Level of TIA required (Figure 2: WAPC Guidelines Vol 4)

Preliminary assessments indicate that this mixed-use development is likely to generate around 200 trips during its peak hour, mainly due to service station, drive-thru coffee and car wash land uses. More specific trip generation details are included in Section 7.

The location of the subject site in the context of the road and public transport network, 400 m (5-minute walk) and 800 m (10-minute walk) radii is shown in Figure 2 on the following page.

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Proposed Mixed Use Development (Service Station + Convenience Store + Drive-Thru Coffee | Vehicle Serv
 Commercial Tenancies | Self Service + Automatic Car Wash), Lot 104
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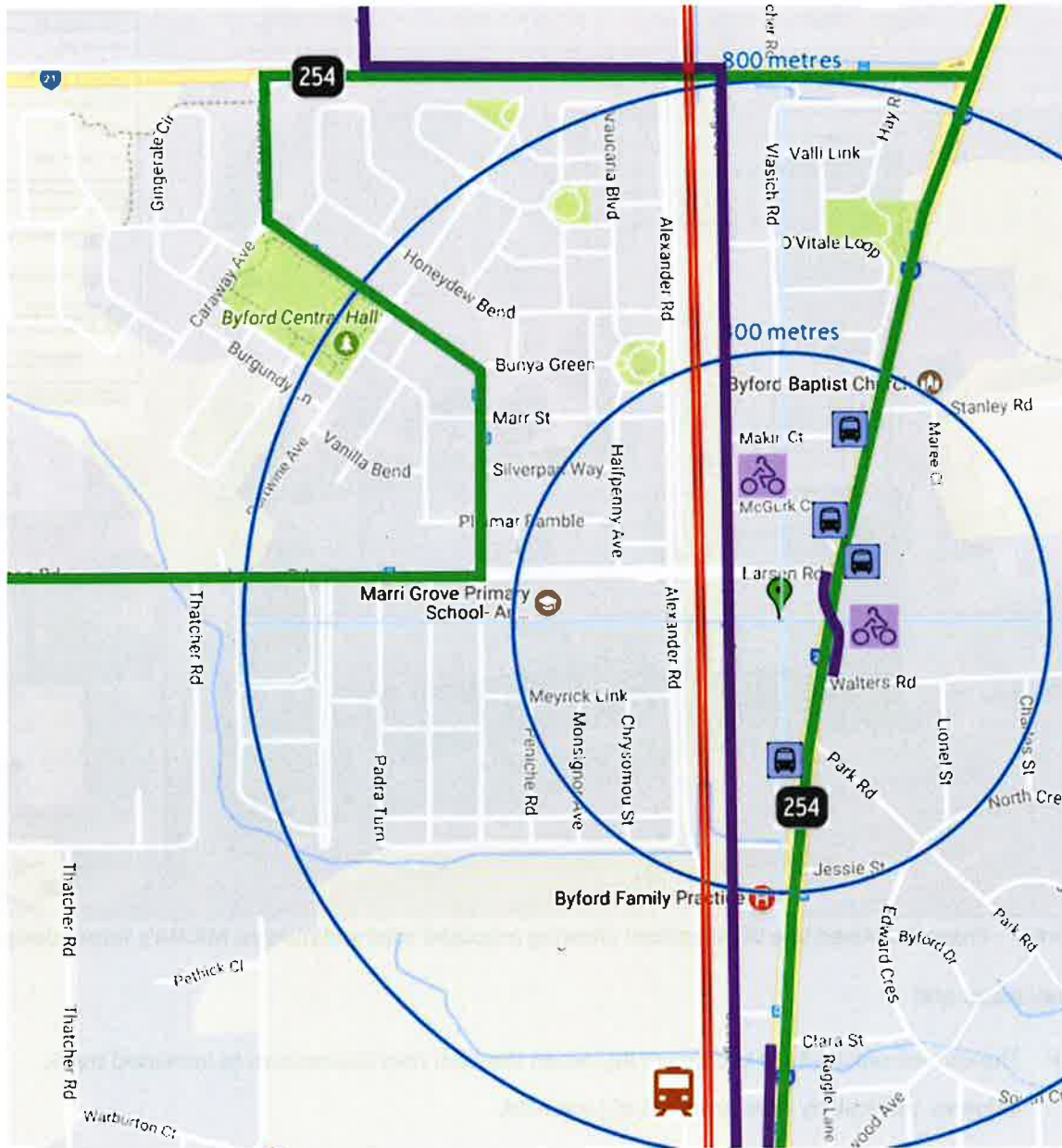


Figure 2 – Site location , road network, bus, train, cycle routes & 400 m/ 800 m walk/ cycle radii

The proposed Mixed-Use Development consists of an 8 fuelling point Service Station with a Convenience Store + Drive thru coffee, a Self Service Car wash with 4 manual bays and 1 automatic bay, a vehicle service store and two commercial tenancies, as described in Table 1 below and shown in Figure 3 on the following page.

Land Use	GLA (m ²)	Number	Fuel Points
Restricted Retail	630	1	
Vehicle Service Centre	400	1	
Self Service Car Wash	132	5	
Service Station + Convenience Store + Drive-Thru Coffee	400	1	8

Table 1 – Proposed Land Use Schedule

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Proposed Mixed Use Development (Service Station + Convenience Store + Drive Thru Coffee/Vehicle Serv
 Commercial Tenancies | Self Service + Automatic Car Wash), Lot 104
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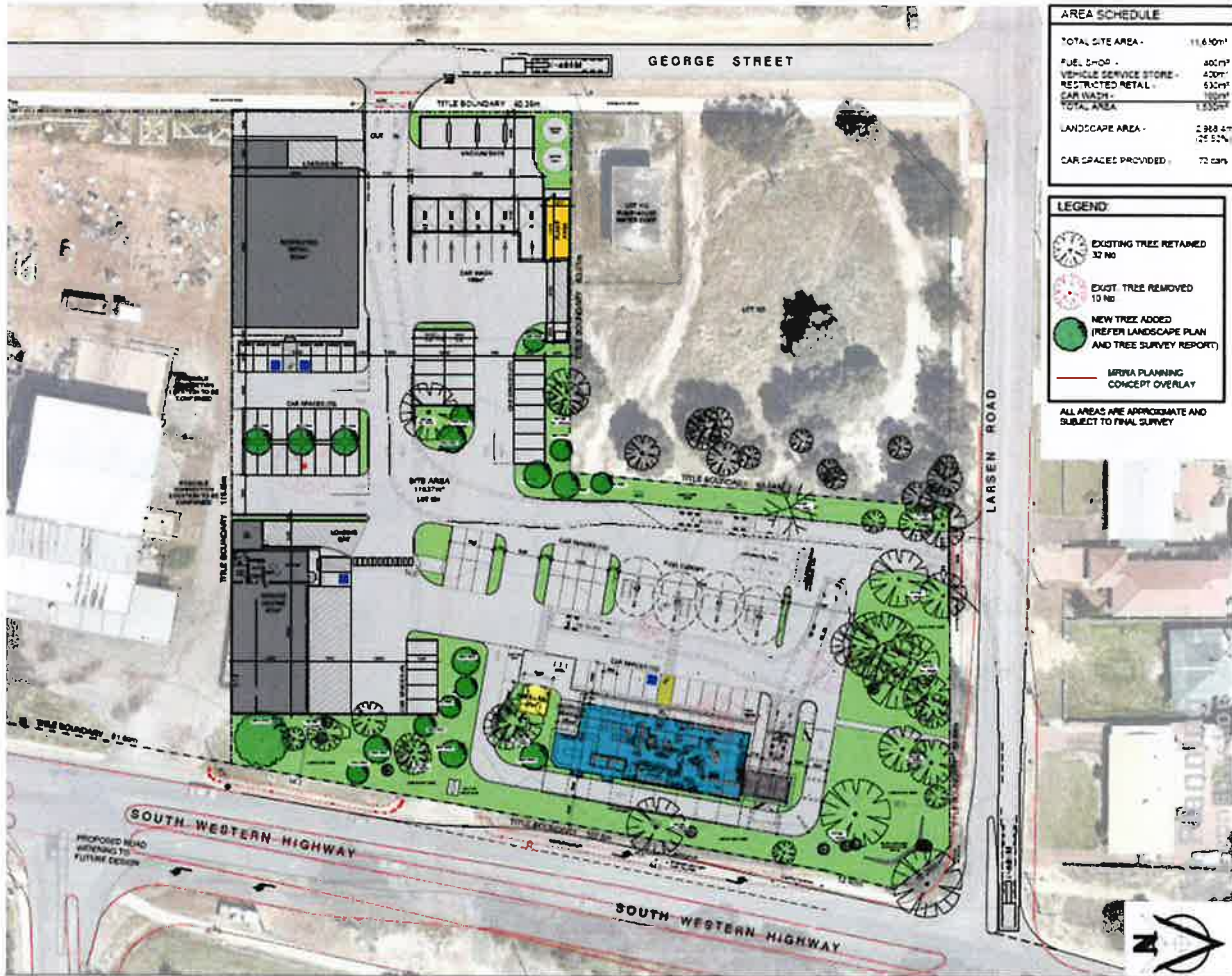


Figure 3 – Proposed Mixed Use Development showing proposed road widening to MRWA’s future designs

The key issues are:

- The current sensitivity of the Larsen Rd/ South Western Hwy intersection to increased traffic volumes, particularly right turns out of Larsen Rd;
- The proposed closure of Larsen Rd at the railway level crossing just west of the subject site; and
- Accessibility by the 19 m ST fuel tanker.

In addition to the above, the Shire of Serpentine-Jarrahdale has identified its key concerns since issue of the previous version (F-2) of this TIA. These are listed and addressed in **Section 15** of this TIA.

Transport Impact Assessment

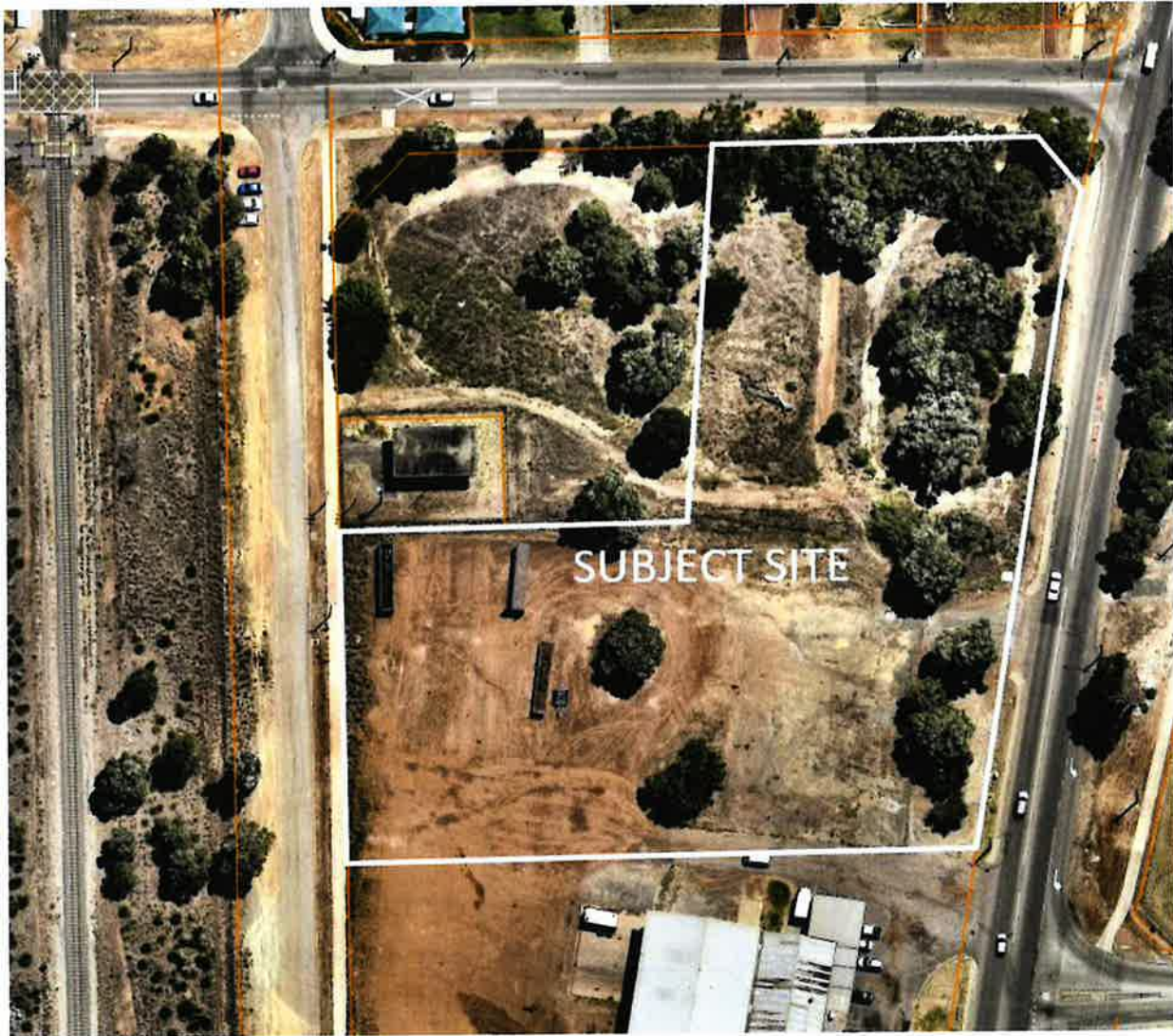
Proposed Mixed Use Development (Service Station + Convenience Store + Drive-Thru Coffee + Vehicle Servicing + Commercial Tenancies | Self Service + Automatic Car Wash), Lot 104 (Section 171)
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2 EXISTING SITUATION

2.1 EXISTING SITE

The existing site is a cleared brownfield site as shown in Photograph 1 and Photograph 2 below.



Photograph 1 – Existing site conditions



Photograph 2 – Panoramic view of subject site from George St (Western Boundary)

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Transport Impact Assessment
 Proposed Mixed Use Development (Service Station + Convenience Store + Commercial Tenancies | Self Service + Automatic Car Wash), Lot 104
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2.2 EXISTING ROAD NETWORK AND HIERARCHY

A schematic representation of the existing road network, including Functional Hierarchy and traffic control on the main intersections, is provided as Figure 4 below. This shows that the site can currently be accessed from all directions and from Larsen Rd, South Western Highway and George St. It should be noted however that there are proposals to change the road network and controls, including relocating (i.e. closing) the Larsen Rd railway level crossing and this will impact on these access routes. Refer Section 4.2 for more details.



Figure 4 – Functional Hierarchy, traffic control, subject site access points and access routes



The road classifications shown in Figure 4 on the previous page are defined in the Main Roads Functional Road Hierarchy as follows:

Primary Distributor (South Western Highway) (Managed by Main Roads WA)

These provide for major regional and inter-regional traffic movement and carry large volumes of generally fast-moving traffic. Some are strategic freight routes, and all are State roads.

Regional Distributor (Soldiers Rd, Nettleton Rd) (Managed by Main Roads WA)

These carry traffic between regional industrial, commercial and urban areas and generally connect to Primary Distributors. These are likely to carry larger volumes of generally fast-moving traffic than Local Distributors and be heavy truck routes.

District Distributor A (Thomas Rd) Managed by Local Government

These carry traffic between industrial, commercial and residential areas and generally connect to Primary Distributors. These are likely to be truck routes and provide only limited access to adjoining property.

Local Distributors (Larsen Rd, Walters Rd, Abernethy Rd, Beenyup Rd, Briggs Rd) Managed by Local Government

Carry traffic within a cell and link District/ Regional Distributors at the boundary to access roads. The route of the Local Distributor discourages through traffic so that the cell formed by the grid of Regional/District Distributors only carries traffic belonging to or serving the area. In Built Up Areas, these roads should accommodate buses, but discourage trucks.

Access Roads Managed by Local Government

Provide access to abutting properties with amenity, safety and aesthetic aspects having priority over the vehicle movement function. In Built Up Areas, these roads are bicycle and pedestrian friendly.

Based on the assessed road hierarchy and access routes, the key roads and intersection, in terms of impact of the proposed development, are Larsen Rd and South Western Hwy and its intersection.

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2.3 EXISTING RESTRICTED ACCESS VEHICLE NETWORK

South Western Highway is classified as RAV Network 2, 3 and 4 and connects with other roads classified as RAV Network 2, 3 and 4 including Thomas Road to the north. RAV Networks 2, 3 and 4 all permit access by various heavy vehicle combinations up to 27.5m long. Larsen Rd and George St are not part of the RAV Network and hence the largest design vehicle that is permitted to use these roads and access the site, is the 19 m Semi Trailer.

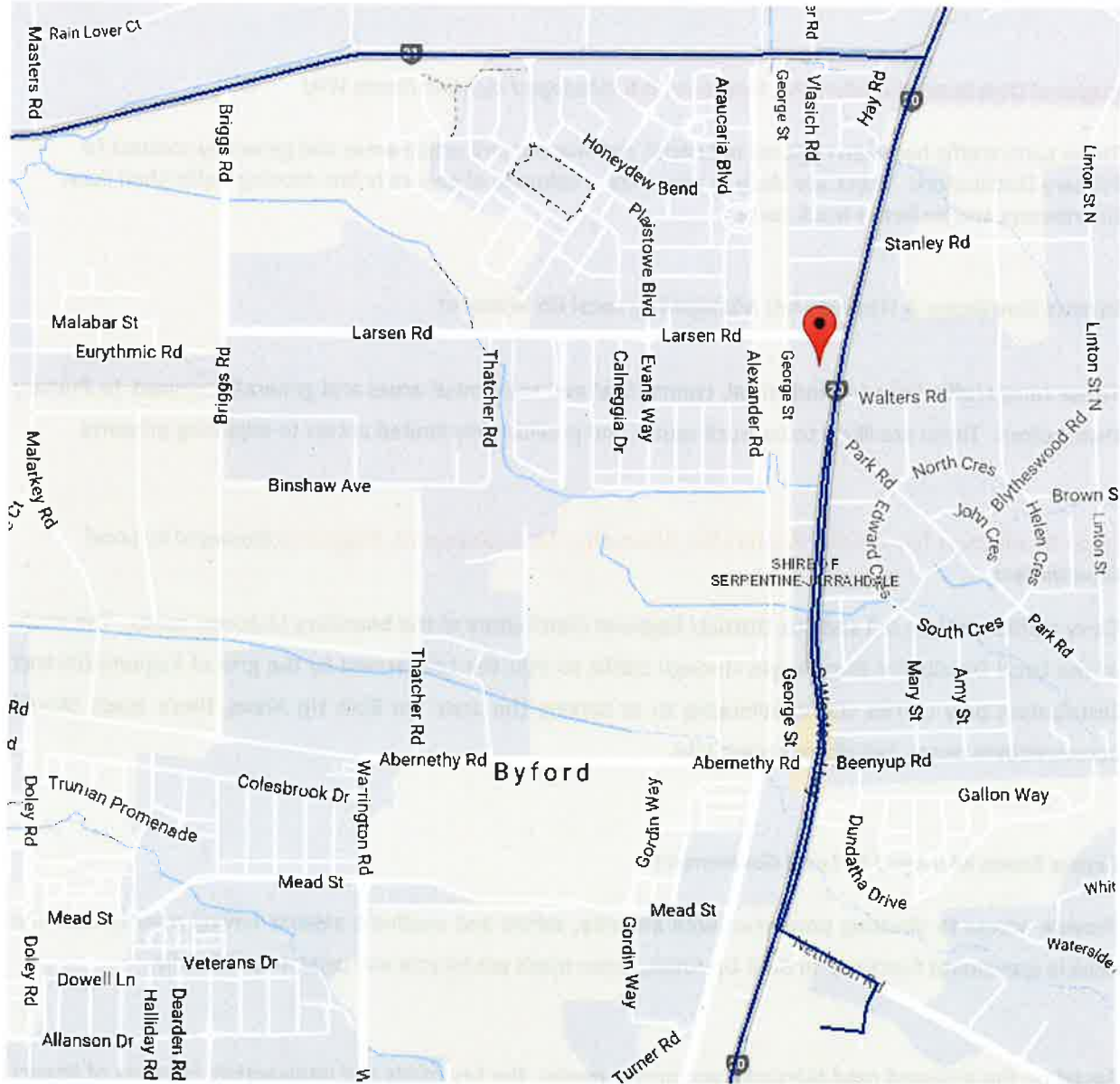


Figure 5 – RAV access routes in vicinity of the subject site ()

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2.4 KEY ROADS & INTERSECTIONS

2.4.1 South Western Highway

South Western Highway is a major north-south road connecting Byford with Bunbury and Busselton and other areas in the southwest of the state with Perth, via either Albany Highway or Tonkin Hwy.

South Western Highway is designated as National Highway 1 and is located on the eastern boundary of the subject site. It consists of single sealed and kerbed carriageway with one lane in each direction although this changes to a median separated dual carriageway with two lanes in each direction just south of the subject site, i.e. between Park Road and Nettleton Rd. South Western Highway is classified as a "Primary Distributor" road under the Main Roads Functional Hierarchy (3) and is subject to a posted speed limit of 60 km/h and a variable speed limit of 50 km/h between Abernethy Rd and Larsen Rd*. The 50 km/h variable speed limit signs at the northern end are shown in Photograph 3 below. A typical cross section in the vicinity of the subject site is shown in Photograph 4 on the following page, along with the latest available traffic volume data for South Western Highway south of Thomas Rd, i.e. Figure 6 (Mon-Fri) and Figure 7 (Sat). The traffic volumes are taken from SCATS data obtained from the traffic signals at South Western Hwy/ Thomas Rd (TCS 876) as they are more up-to-date than the latest midblock counts undertaken in September 2016 and include weekend data.

There is a short section of cycle path that travels between Larson Rd and Walters Rd that starts on the west (development) side and finishes on the east side via a refuge island as shown in Figure 2 on page 9 and Photograph 4 on the following page.



Photograph 3 – Looking south on South Western Hwy to 50 km/h variable speed limit signs before Larsen Rd

* The 50km/h speed limit operates between 7.30 am and 10 pm seven days a week. The 60 km/h applies outside these hours.

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Photograph 4 – Looking south on South Western Hwy south of Larsen Rd (subject site on right)



Figure 6 – Mon-Fri hourly traffic volume data for South Western Hwy south of Thomas Rd (March 2018)

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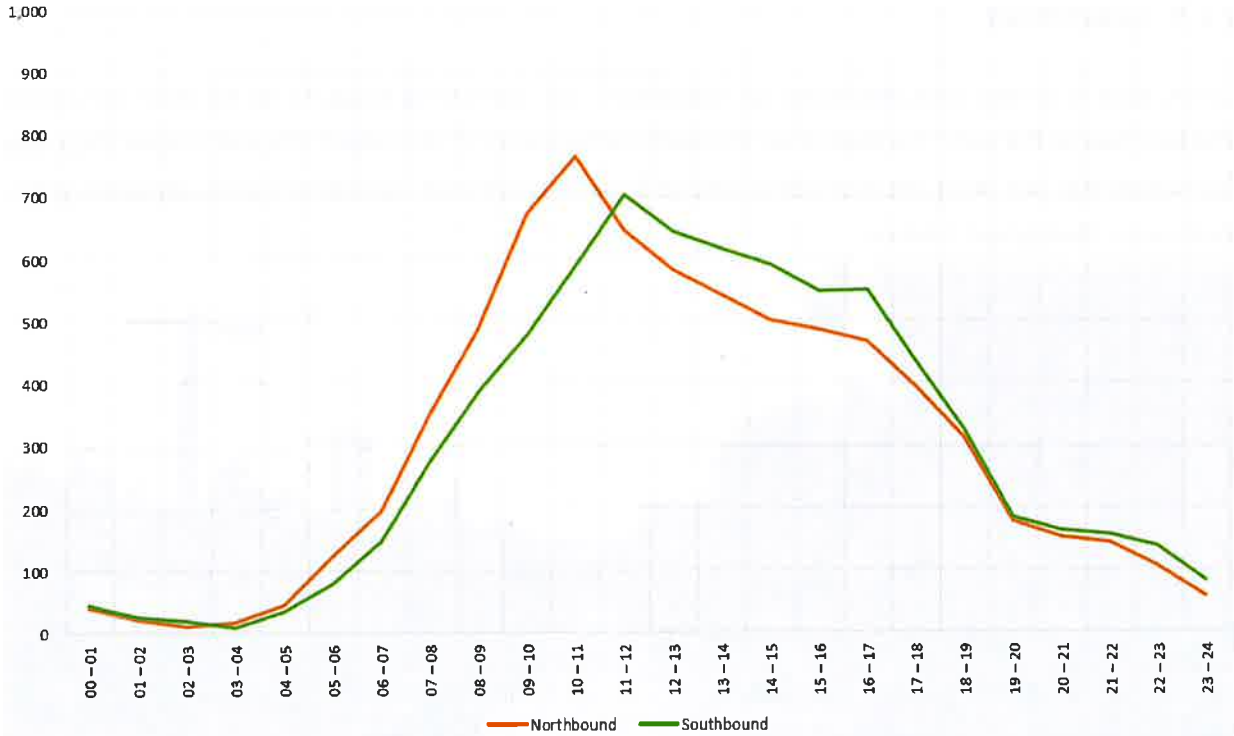


Figure 7 – Saturday hourly traffic volume data for South Western Hwy south of Thomas Rd (March 2018)

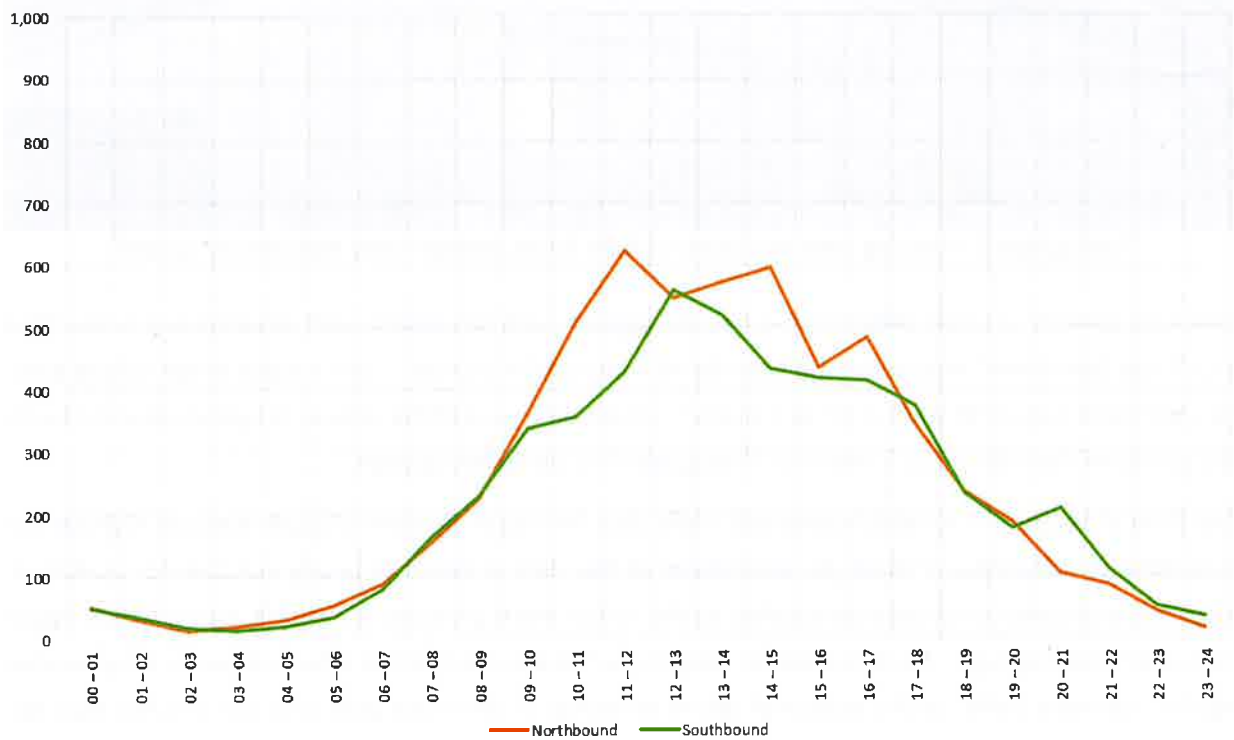


Figure 8 – Sunday hourly traffic volume data for South Western Hwy south of Thomas Rd (March 2018)

Existing midweek PM and Saturday mid-day peak hour turning volumes are included in **Section 2.3**.

Refer **Section 4.3** for proposed changes to South Western Highway.

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 Proposed Mixed Use Development (Service Station + Convenience Store + Café + Mini Market + Service Station + Self Service + Automatic Car Wash), Lot 104
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2.4.2 Larsen Road

Larsen Road is an east-west distributor (or connector) road connecting Briggs Rd to the west with South Western Hwy to the east. It is located on the northern boundary of the subject site and crosses the single line railway that runs along the west side of George St via an active level crossing with lights and boom gates, as shown in Photograph 5 below.



Photograph 5 – Looking west on Larsen Rd from South Western Hwy (subject site on left)

Larsen Rd consists of single sealed and kerbed carriageway with one lane in each direction and is classified as a "Local Distributor" road under the Main Roads Functional Hierarchy (3). It is subject to the default built-up area speed limit of 50 km/h and has a 40 km/h school zone west of the railway. A typical cross section in the vicinity of the subject site is shown in Photograph 6 on the following page.

The Shire of Serpentine-Jarrahdale provided traffic data for Larsen Rd west of South Western Highway for June 2014 on November 7th2018. An assessment of this data in terms of hourly volumes for weekdays, Saturdays and Sundays has been undertaken by the author and is provided as Figure 9, Figure 10 and Figure 11 on the following page. This data does not support the Shire's view that the school on Larsen Rd generates significantly more traffic on this section of Larsen Rd during its afternoon peak hour (i.e. 3-4 PM) than the adopted road network PM peak hour of 4-5 PM. The 4-5 PM peak hour was selected by the author based on the recorded March 2018 South Western Hwy peak hour.

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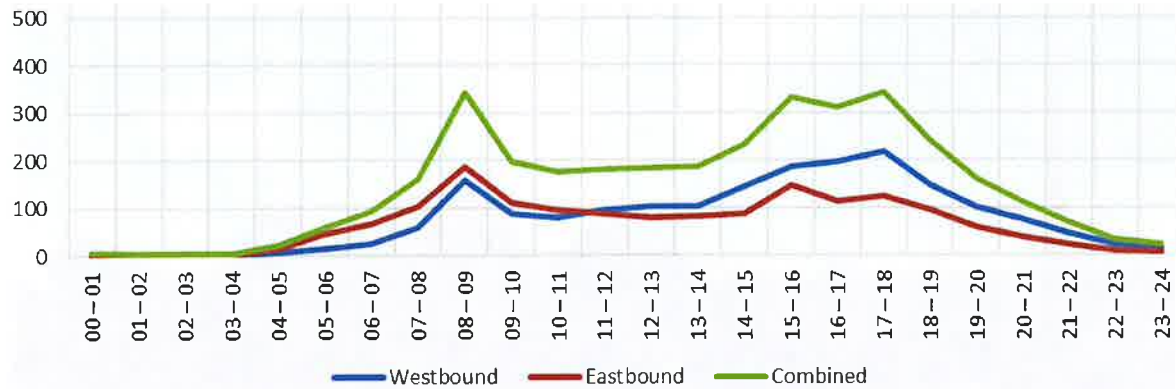


Figure 9 – Larsen Rd west of South Western Hwy Midweek volumes June 2014

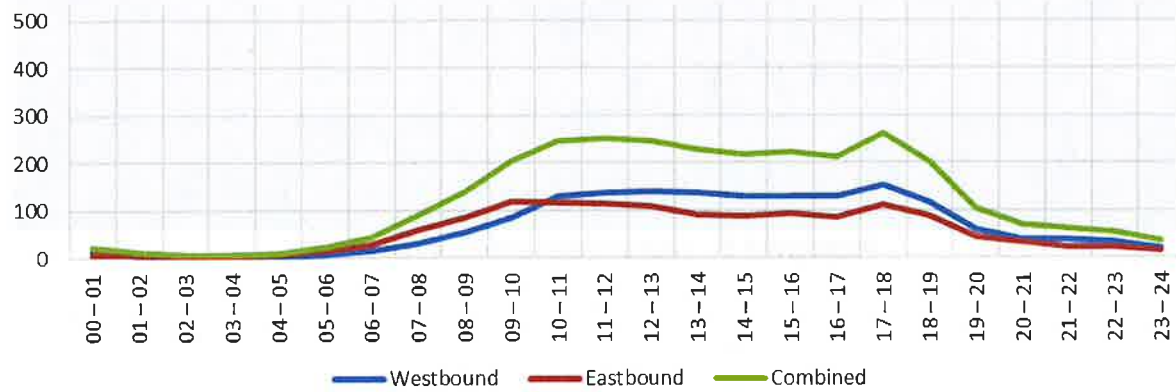


Figure 10 – Larsen Rd west of South Western Hwy Saturday volumes June 2014

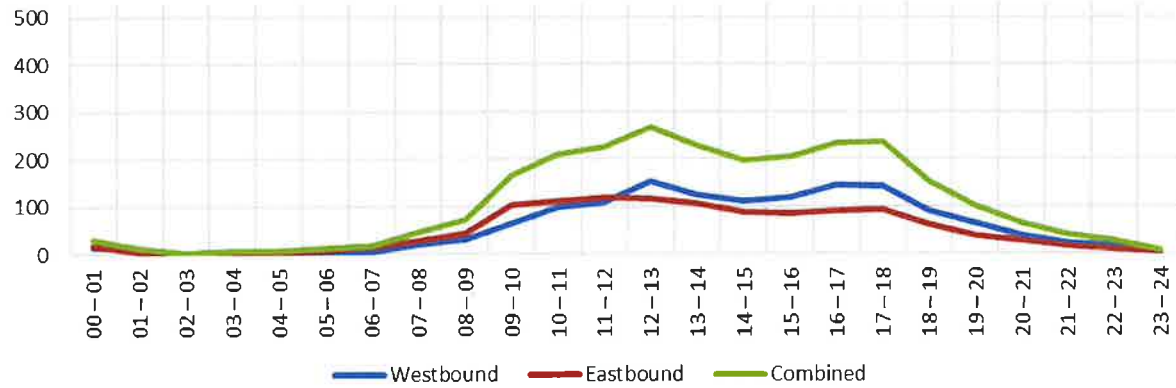


Figure 11 – Larsen Rd west of South Western Hwy Sunday volumes June 2014

More up-to-date (i.e. 2018) midweek PM and Saturday mid-day peak hour volumes are included in **Section 2.5**.

There are no existing or proposed designated cycle paths along Larsen Rd (refer **Section 14**). Cyclist were observed to use the road and the paths on either side.

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Photograph 6 – Typical cross section of Larsen Rd



2.4.3 George Street

George St is a north-south local access road that currently terminates approximately 250 m south of Larsen Rd and is located on the western boundary of the subject site. It is proposed to construct George St for the full length of its road reserve sometime in the future (refer Sections 4.2 and 4.4).

George St consists of a single sealed carriageway for approximately 250 m south of Larsen Rd where it then becomes an unsealed road with pedestrian but not vehicular access to the south. It has a kerb on the east (development) side and is classified as an "Access Road" under the Main Roads Functional Hierarchy (3). It is subject to the default built-up area speed limit of 50 km/h. A typical cross section in the vicinity of the subject site is shown in Photograph 7 below.

Existing midweek PM and Saturday mid-day peak hour volumes (low due to lack of existing development south of Larsen Rd) are shown in Section 2.3.

There is an existing cycle path along the east (development) side of George St (refer Section 14).

Local Planning Policy No 53: George Street Construction Costs allows for "the contribution of funding for the construction of George Street from Pitman Way to Larsen Road in a coordinated manner by detailing the costs, method of apportionment and method of collecting contributions."

Lot 104 Larsen Road (the subject site) has an indicated percentage of construction cost liability of 10.22% based on a 61.1 m frontage to George St.

Refer Section 4.4 for proposed changes to George St.



Photograph 7 – Typical cross section of George St

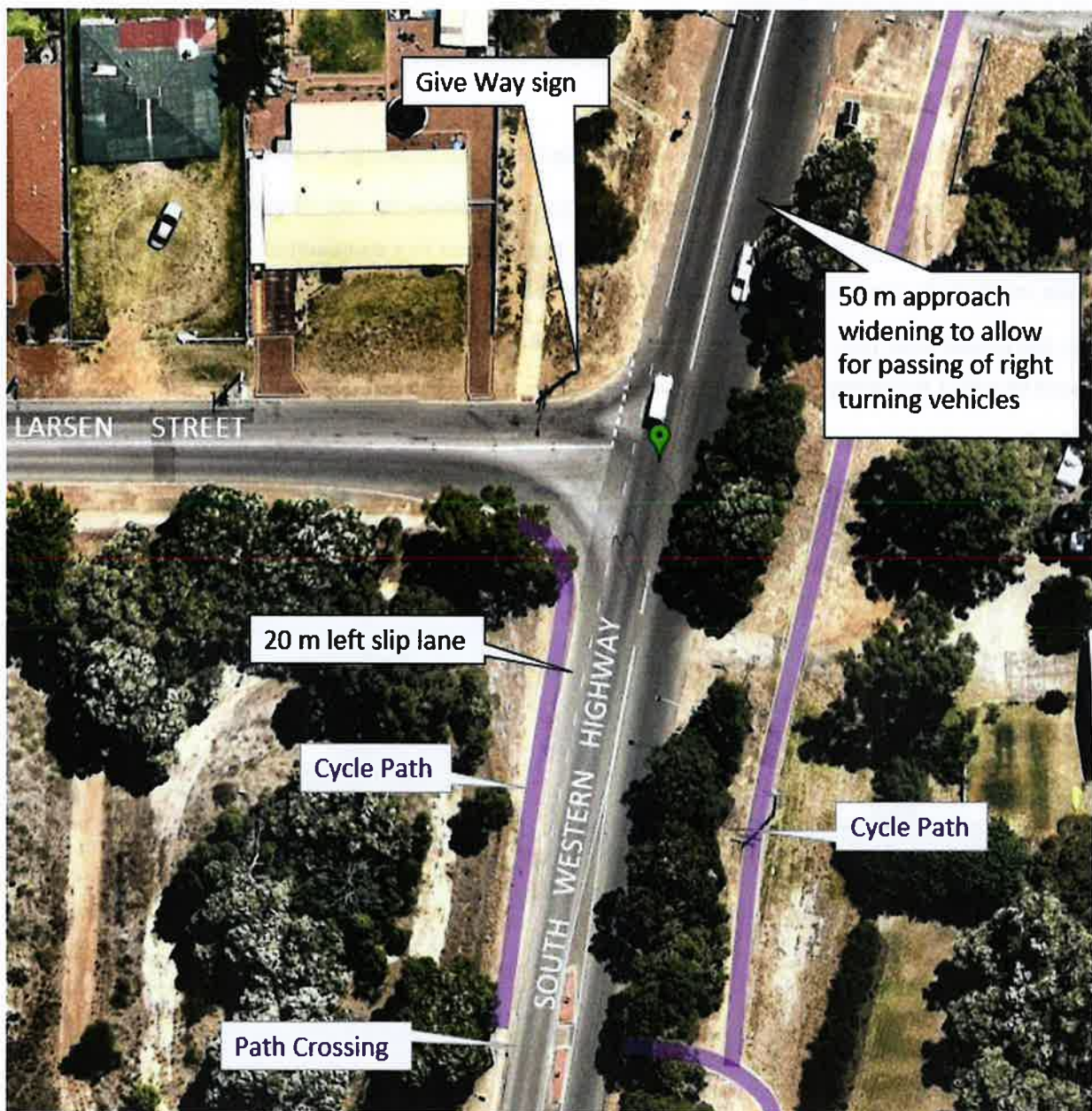
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2.4.4 Key intersection 1 (K11): Larson Rd/ South Western Hwy

This intersection has been identified as a Key intersection as the majority of traffic likely to be generated by the proposed development will perform right turn movements at this intersection.

The layout of this Give Way controlled 'T' intersection is best described through the annotated aerial photograph dated 14 February 2018 provided as Photograph 8 below. A street view of the Larsen Rd approach to South Western Hwy is provided as Photograph 9 on the following page. Existing midweek PM and Saturday mid-day peak hour turning and through volumes are included in **Section 2.3**.



Photograph 8 – Layout of Key intersection 1 as at 14 February 2018

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Proposed Mixed Use Development (Service Station + Convenience Store + Drive Thru Coffee + Vehicle Servicing + Commercial Tenancies + Self Service + Automatic Car Wash), Lot 104 (part of Lot 103 & 104) on the corner of Larsen Rd & South Western Hwy
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Photograph 9 – Larsen Rd approach to South Western Hwy (peak hour conditions)

As shown in Photograph 9 above, drivers currently find it difficult to turn right into South Western Hwy during peak times. This is described and assessed in more detail in **Section 9**.

Refer **Section 4.3** for proposals to upgrade this intersection as part of the South Western Highway upgrade proposal.

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2.4.5 Secondary intersection 1 (Si1): Larson Rd/ George St

This intersection has been identified as a Secondary intersection as it may experience a high proportion of right turning volumes associated with the development compared to existing volumes.

The layout of this Give Way controlled '4-way' intersection is best described through the annotated aerial photograph dated 14 February 2018 provided as Photograph 10 below. A street view of the railway level crossing is shown in Photograph 5 on page 18. Existing midweek PM and Saturday mid-day peak hour turning and through volumes are included in Section 2.3.



Photograph 10 – Layout of Secondary intersection 1 as at 14 February 2018

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2.5 EXISTING PEAK HOUR TRAFFIC VOLUMES

Peak hour traffic volumes around the site and through the identified Key and Secondary intersections were compiled by the author for a Thursday (4 PM – 5 PM) and a Saturday (11 AM – 12 noon) in March 2018 with adjustments made for the Easter Holiday traffic. The assessment of this data in the draft report indicated that the key intersection of Larsen Rd and South Western Hwy was very sensitive to any increases in right turning traffic and it was therefore determined that further detailed traffic turning surveys for a weekday between 1 and 2 PM and 4 and 5 PM as well as a Saturday between 12 noon and 1 PM in April was warranted. Video surveys were undertaken by i3 on 13th and 14th April 2017 in order to develop the existing (2018) traffic volume diagrams provided as Figure 12 below and Figure 13 and Figure 14 on the following page.

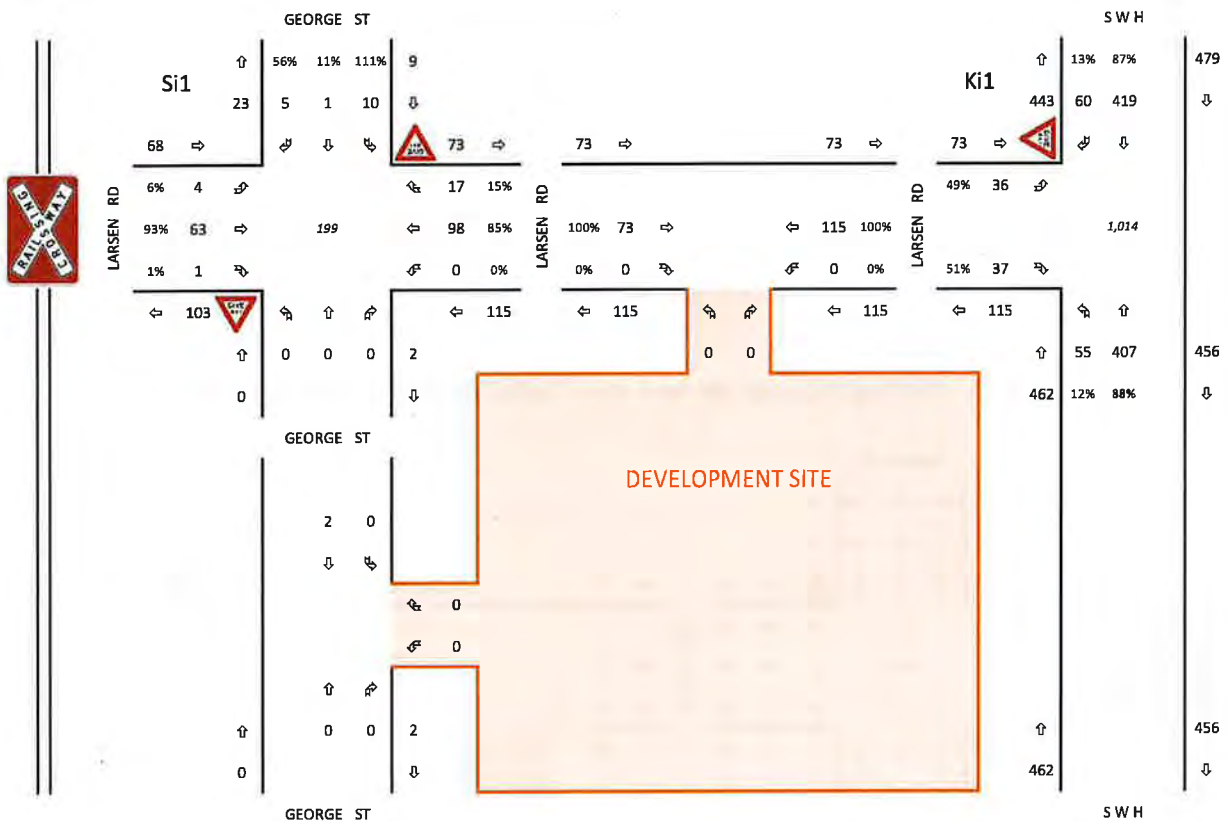


Figure 12 – Existing midweek PM Peak Hour Traffic Volumes (1-2 PM April 2018)

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Figure 13 – Existing midweek PM Peak Hour Traffic Volumes (4-5 PM April 2018)

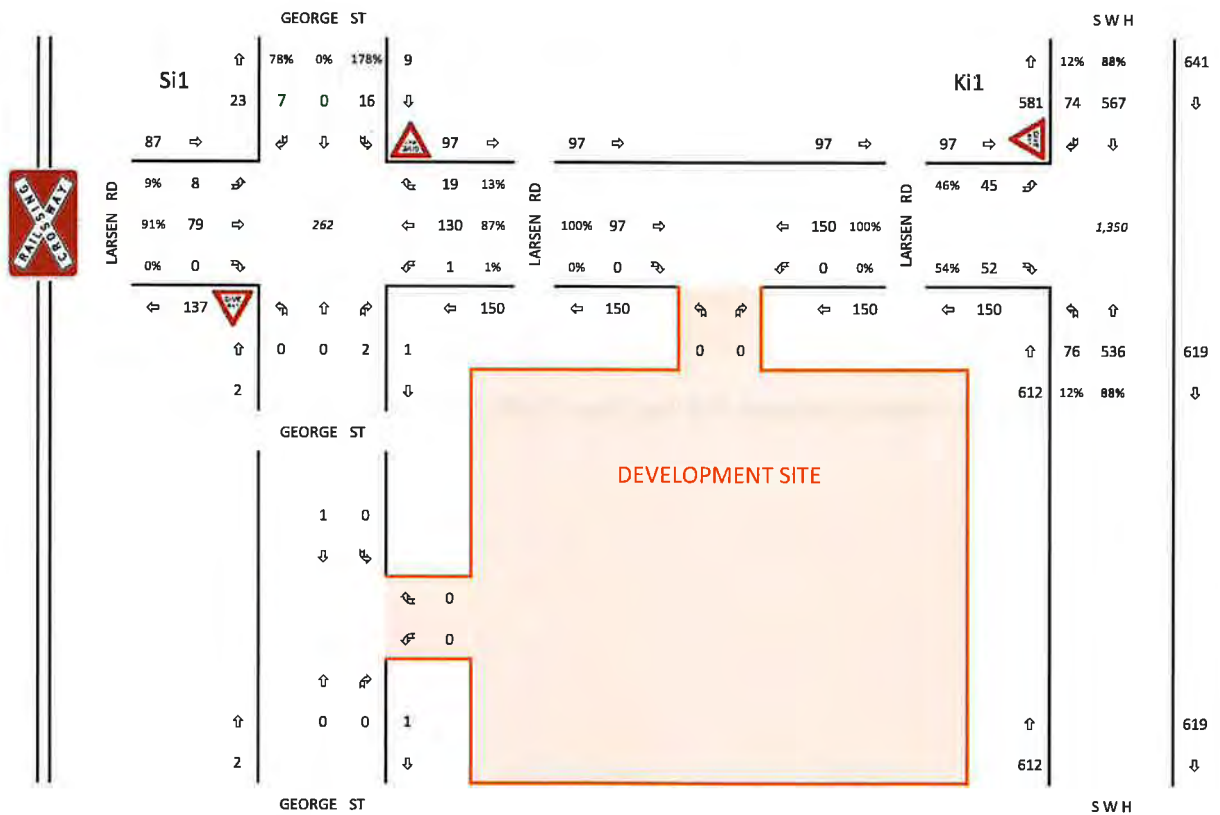


Figure 14 – Existing Saturday mid-day Peak Hour Traffic Volumes (12 noon – 1 PM April 2018)



3 DEVELOPMENT PROPOSAL

It is proposed to demolish all existing buildings on site and construct 4 buildings with parking and service areas throughout as shown in Figure 3 on page 10. The site will comprise of 630 m² Gross Floor Area of Restricted Retail, 400 m² Gross Floor Area of Vehicle Service Centre, a self-service car wash with 4 manual wash bays and 1 automatic wash bay and an 8 fuel-point service station with a Convenience Store + Drive-Thru Coffee. The car park comprises of 71 standard bays, 3 ACROD bays, 1 waiting bay and 3 loading bays.

The proposed development will not have fuel facilities for large vehicles. As such, the largest vehicles expected to access and egress the site is the 19 m Semi Trailer Fuel Tanker servicing the site at intervals of 2-3 times per week for a maximum duration of 1 hour for each service. The 12.5 m Heavy Rigid Vehicle will be the typical delivery and service vehicle for waste collection and stock deliveries to all tenancies.

It is proposed to provide full vehicular access off Larsen Rd and George St, i.e. no direct access off South Western Highway, in accordance with the agreed Main Roads WA/ Shire of Serpentine-Jarrahdale Access Strategy, as discussed in **Section 4.3**.

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4 DEVELOPMENT + TRANSPORT PROPOSALS

4.1 PROPOSED DEVELOPMENTS

There is a current proposal for a Service Station and takeaway food outlet on Lots 30 & 31 (SN 801 & 803) on the west side of South Western Hwy approximately 250 m south of the subject site, as shown in Figure 15 below.

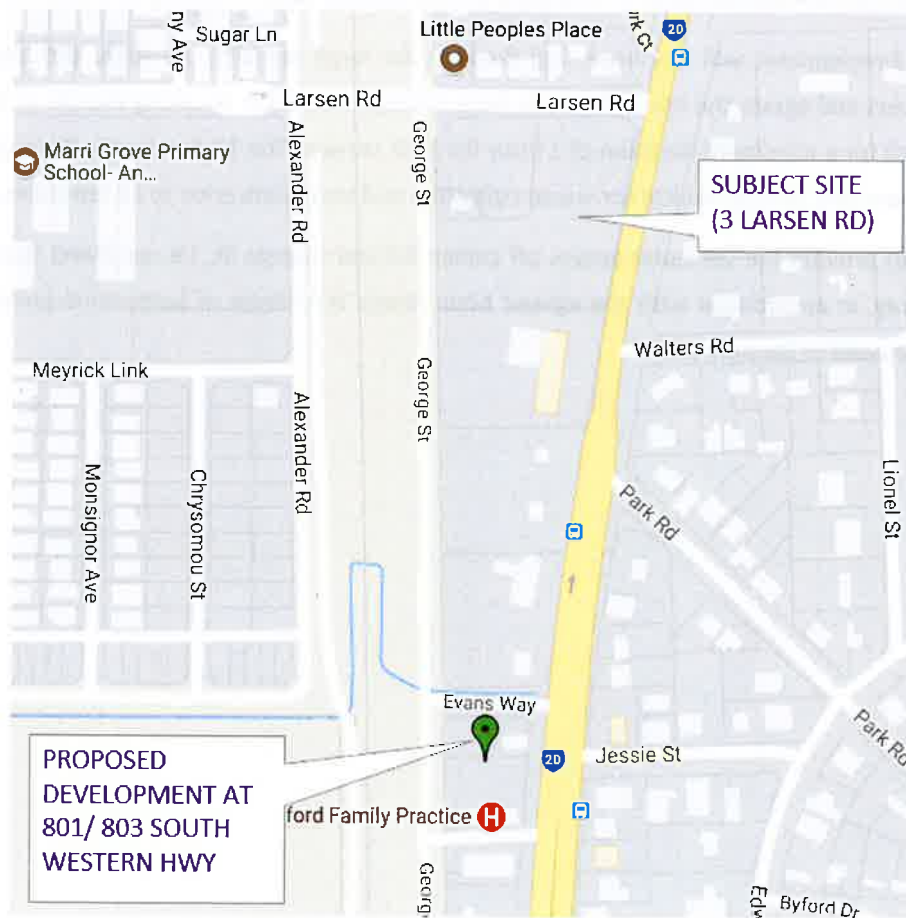


Figure 15 – Proposed development in vicinity of subject site

A Transport Impact Assessment report was prepared by Transcore for this development (Report No t17.170-3). The TIA for the subject site at 3 Larson Rd, i.e. this TIA, considers the cumulative traffic impacts associated with the proposed development at 801 and 803 based on the findings within the Transcore TIA.

An Aldi supermarket is nearing completion at 845 South Western Hwy which is approximately 900 m south of the subject site. Trip generation associated with this has been accommodated by applying 1% per annum growth on George St and Larsen Rd. Increased traffic on South Western Hwy is included in the 1% per annum growth applied to this road.

Refer Sections 4.2 and 4.3 for details regarding proposed changes to the road network and public transport network respectively.

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4.2 PROPOSED ROAD NETWORK CHANGES

A review of various planning documents and discussions with the Shire of Serpentine Jarrahdale’s planning officer on 9th March 2018 has revealed that there are a number of proposed changes to the road and public transport network that need to be considered as part of this traffic impact assessment report. A summary of these changes has been prepared by the author and is provided as Figure 16 below. In addition to the network changes, there are proposals to upgrade South Western Hwy north of Park Rd, including upgrading the Larsen Rd intersection and proposals to upgrade George St. Refer Sections 4.3 and 4.4 respectively for more details.

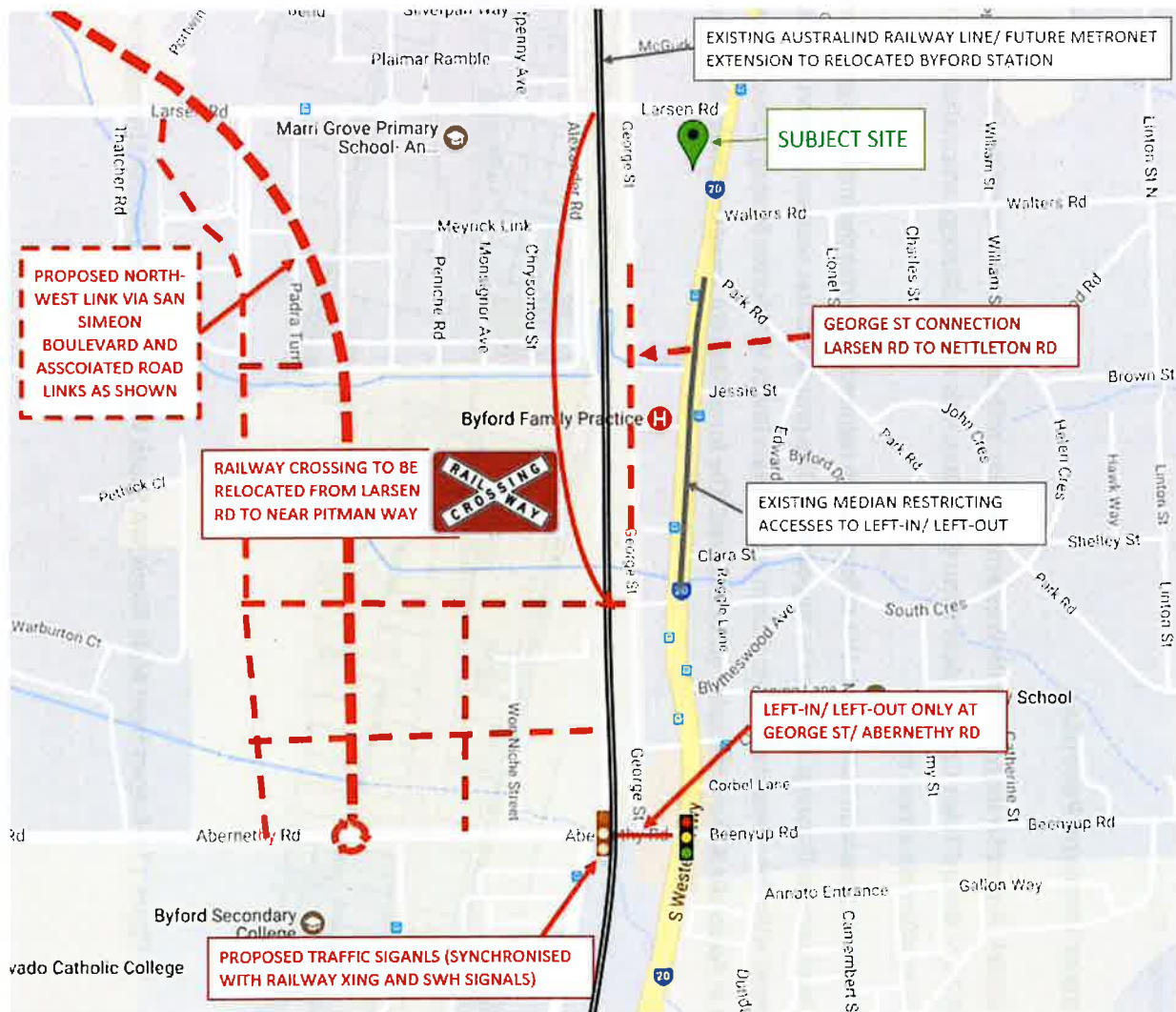


Figure 16 – Summary of road and public transport network proposals in vicinity of the subject site

It is important to note that all of the above are subject to approval and change and that there are no firm dates for implementation. The biggest impact on the subject site is considered to be the proposal to relocate the railway level crossing on Larsen Rd further south, which will necessitate the full construction of George St as well as the closure of Larsen Rd on both sides of the railway, effectively changing the existing 4-way intersection with Larsen Rd as the through road (S11) to a 'T' intersection with George St as the through road.

4.3 SOUTH WESTERN HIGHWAY UPGRADE PROPOSAL

Main Roads WA has an agreed Vehicle Access Strategy for South Western Highway with the Shire of Serpentine-Jarrahdale, as confirmed in its formal submission to Local Planning Policy No 31 (LPP 31) – Byford Town Centre – Built Form Guidelines. This Access Strategy articulates that “no vehicle access is available from South Western Highway where there is an alternate access point.”

The proponent has held extensive discussions with Main Roads WA officers which resulted in altering the initial design to remove all direct vehicular access off South Western Highway, as per the Development Drawings included in Appendix A. The proponent has secured support for the development subject to upgrading the intersection at Larsen Rd consistent with the conceptual layout shown on the Main Roads WA Access Strategy drawings as shown in the extract provided as Figure 17. The Development Drawings in Appendix A show the same outlines in red. The formal MRWA approval conditions are reproduced on the following page.

SOUTH WESTERN HIGHWAY ACCESS STRATEGY



Figure 17 – Extract from Main Roads WA South Western Highway Access Strategy drawing



Main Roads WA Approval Conditions (sourced from Metro East JDAP Agenda 17 October 2018)

“Main Roads advises that it has no objection subject to the following conditions being imposed:

1. Redundant crossover on South Western Highway shall be removed and the verge reinstated at the applicant's cost. The applicant is to advise Main Roads when this has been completed.
2. Modifications to South Western Highway must be in accordance with Main Roads Supplement to Austroads Guide to Road Design - Part 4 and Part 4A dated 18 September 2018 and consistent with future widening to South Western Highway as depicted on Main Roads Plan 2012-0002 dated approved 4 April 2012 and overlayed on Draft Master Plan Revision P3 dated 22 August 2018 (both attached). In particular:
 - a. Left and right turn auxiliary lanes from South Western Highway onto Larsen Road, as depicted on Drawing No. TP03.1 Revision dated 14 September 2018 (reproduced as Figure 18 on the following page) must be designed in accordance with Main Roads Supplement to Austroads - Part 4, Section 5 and Appendix A.6 Auxiliary Lane Turn Treatments.
 - b. The median on Larsen Road, as depicted on Drawing No. TP03.1 Revision dated 14 September 2018 (attached) must be as per Main Road Supplement to Austroads - Part 4A, Section 6.

Advertising Signage

3. The type of signs, size, content and location must comply with all relevant by-laws and planning schemes made by Council.
4. The signs and sign structures are to be placed on private property and shall not over hang or encroach upon the road reserve.
5. For the signs that are illuminated, it must be of a low-level not exceeding 300cd/m², not flash, pulsate or chase.
6. The device shall not contain fluorescent, reflective or retro reflective colours or materials.

In accordance with the above conditions, the proponent has confirmed that these conditions will be met during the detailed design stage and in discussion with Main Roads WA. This TIA includes assessment of the development with the intersection upgraded in accordance with the above stated conditions.

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Proposed Mixed Use Development (Service Station + Convenience Store + Drive-Thru Coffee Vehicle Service Store | Self Service + Automatic Car Wash), Lot 104 (SN3) Larsen Rd, (Cnr South Western Highway) Byford

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10.1.2 - Attachment 3
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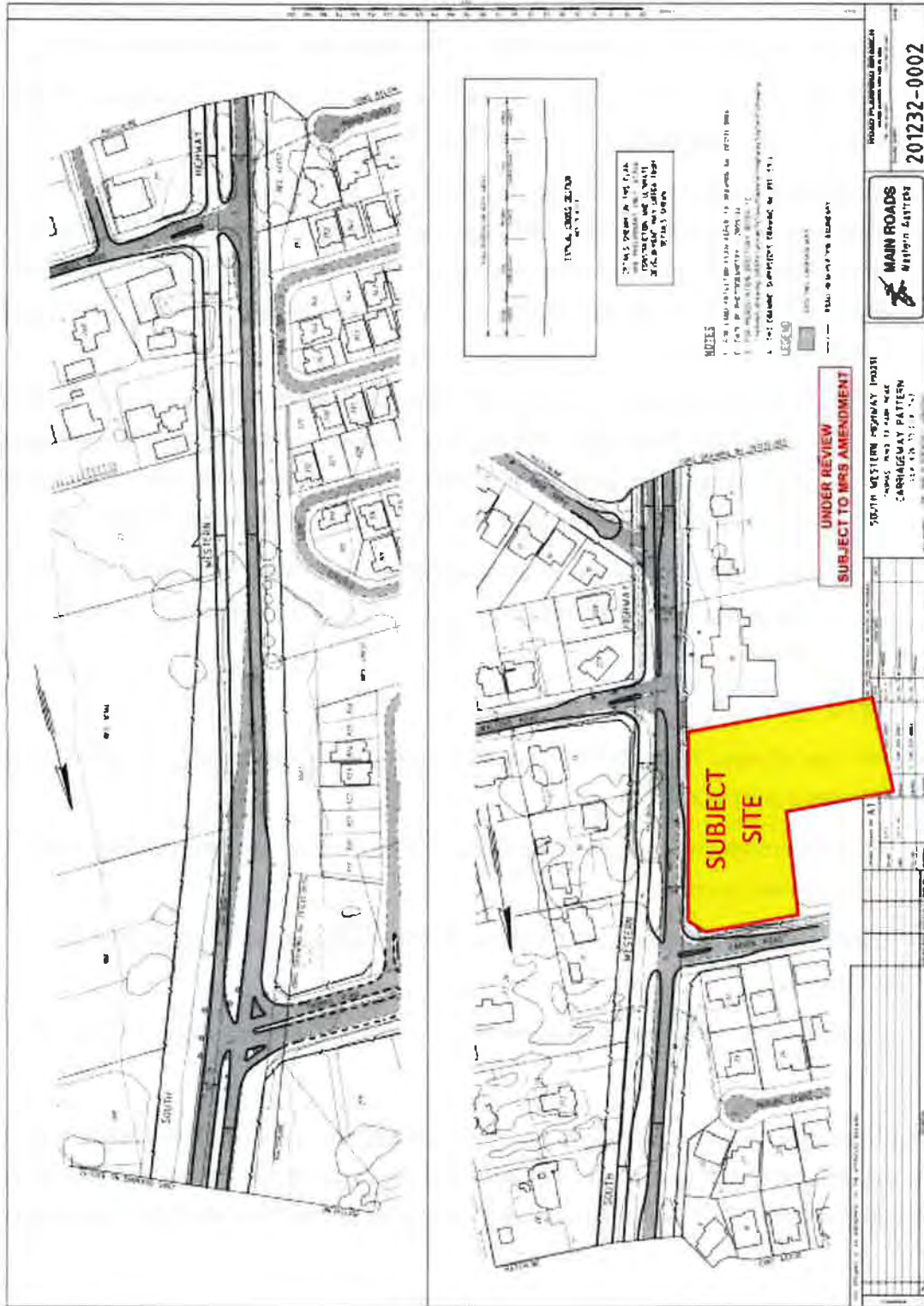


Figure 18 – Main Roads WA Drawing No. TP03.1 Revision dated 14 September 2018 (with 'Subject Site' overlaid)



4.4 GEORGE STREET UPGRADE PROPOSAL

The Shire of Serpentine-Jarrahdale has advised, in an email dated 25 October 2018, that:

“George Street is planned to be the high street in Byford by the shire. Main roads recent access policy has been to discourage direct access to the highway and to favour access off George Street. Whilst George St is not line marked the shire does not consider it safe to have service vehicles sweeping across the total George street pavement when entering and exiting the development. George St is intended to be passenger vehicle and pedestrian in nature. Service Vehicles entering and exiting the development should be lane compliant when making turning manoeuvres on George St.”

The above statement is not consistent with providing the required access for the adopted design vehicles as there are many properties between South Western Highway and George St that only have frontages to these streets. Main Roads WA has indicated that the Shire has agreed to restricting access off South Western Hwy which in turn requires that the majority of properties between George St and South Western Hwy will only have vehicular access off George Street. Many of these properties are zoned commercial and have a requirement for servicing by heavy vehicles up to the standard 19 m semi-trailer. To require that commercial vehicular access is provided off George St is not consistent with the statement that “George St is intended to be passenger vehicle and pedestrian in nature”. It will be regularly used by commercial vehicles and requires to be designed in accordance with this function. The alternative is to provide commercial vehicular access off South Western Highway.

The Shire’s statement that it “does not consider it safe to have service vehicles sweeping across the total George street pavement when entering and exiting the development” and that “Service Vehicles entering and exiting the development should be lane compliant when making turning manoeuvres on George St.” is not consistent with currently approved developments along George St, as shown in Photograph 11 on the following page.

The practice of allowing service vehicles to enter and leave access driveways within the boundaries of the roadway, i.e. kerb lines, is permitted in Section 3.4.1(a) of Australian Standard AS 2890.2 (4), i.e.:

“On a minor public road, vehicles shall be able to enter and leave the access driveway without infringing the boundaries of the roadway. Local authorities may place further limits and controls on the extent to which movement across the centre-line of the roadway is allowed.”

Refer further comment and assessment regarding the access to and from the site in **Section 15**.

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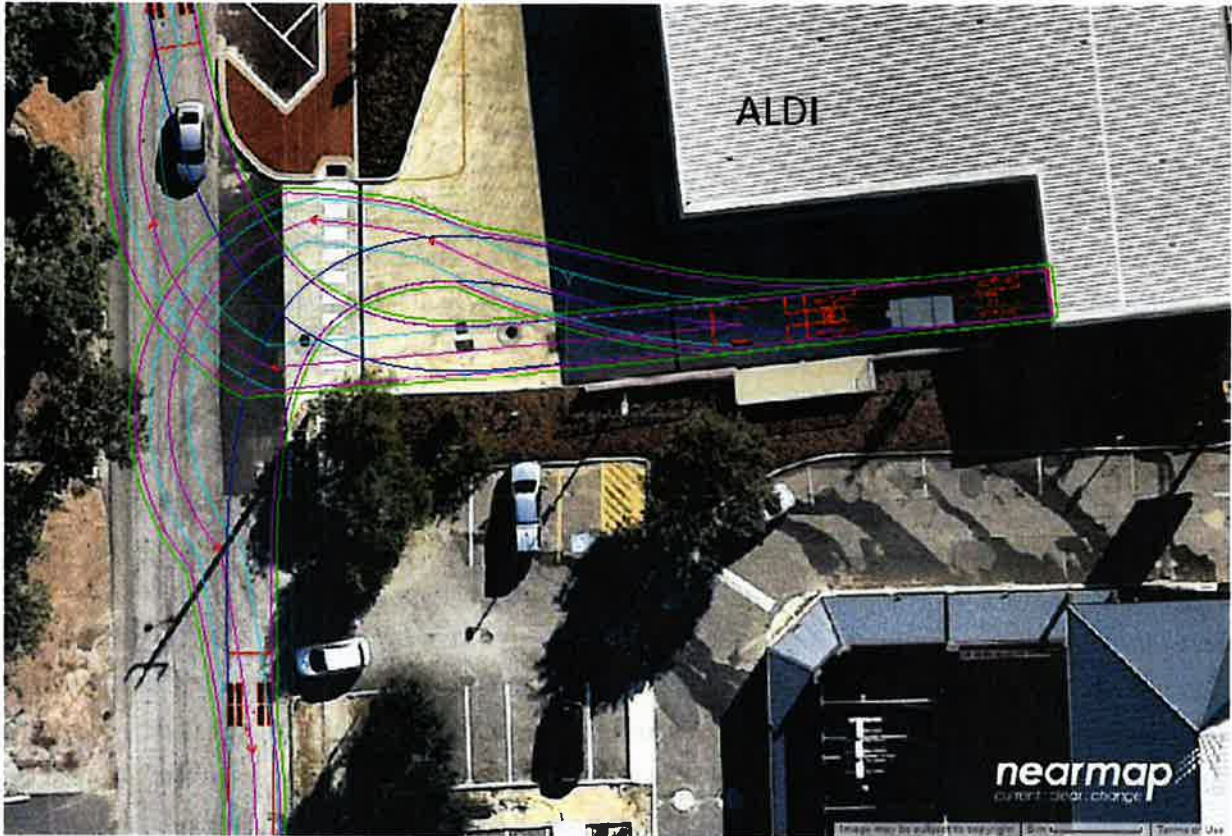
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Photograph 11 – Recently approved Aldi service area off George Street showing swept path of 19 m ST leaving the site and turning left or right into George St



4.5 PROPOSED PUBLIC TRANSPORT NETWORK

Planning work is underway to extend the Armadale Line approximately eight kilometres south to Byford.

This early planning and research takes into account a range of considerations, such as station location, precinct development opportunities, connections, constructability and community impact.

The METRONET Office is working closely with the Shire of Serpentine-Jarrahdale on developing a number of viable options for a transport solution which provides opportunities for urban development, however at this point there is no confirmed or preferred location for the station.

The intent of thorough planning is to identify the best location and alignment of the extension so that it supports plans for growth in the area, as well as creating an employment hub and boosting residential development.

Details on the construction method and timeframe will be developed during the planning phase. It is estimated the project business case and Project Definition Plan will be completed in late 2018.

The rail proposals are driven by population numbers, as shown in the following extract from the Perth and Peel @ 3.5 Million and Beyond publication.



Figure 19 – Public Transport Rail Network @3.5 Million and Beyond (showing Byford as No 5)



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5 INTEGRATION WITH SURROUNDING AREA

Figure 2 on page 9, Figure 4 on page 12 and Figure 5 on page 14 all indicate that the proposed development is well connected to public transport, freight, cycling and walking facilities.

The provision of services such as the Service Station, Convenience Store, Drive-Thru Coffee, Car Wash, Vehicle Service Store and Retail are likely to be well patronised by passing traffic on South Western Highway (up to 70%) which in turn will reduce the overall impact of the development in terms of increased traffic volumes.

Byford is a town within the Shire of Serpentine-Jarrahdale community halls, two state schools, clubs, sporting oval, trotting complex, a range of shops and businesses, a flour mill, and farms in the surrounding rural areas.

In 1977, the local government responsibilities for Byford were transferred from the Shire of Armadale-Kelmscott (now the City of Armadale) to the Shire of Serpentine-Jarrahdale. Recently, Byford has become an extension of the Perth metropolitan area, connected to the Kwinana Freeway by Thomas Road, and has experienced a substantial rise in population. Historically, Byford's rural land supported sheep, beef and dairy cattle, orchards, and a vineyard (Sunrays, owned by the Vlasich family) but in recent decades there has been an increase in hobby farms geared to equine pursuits, and more recently housing estates with generous lot sizes.



6 ASSESSMENT YEARS AND TIME PERIODS

The WAPC Transport Impact Assessment Guidelines recommends that the appropriate assessment years include the year of opening of the development and 10 years after opening.

The subject site is expected to be fully developed and operational by 2020 and hence it is reasonable to adopt a 2020 'Operating Year' and 2030 'Horizon Year' (10 years later).

A review of historical traffic volume data for South Western Highway (Figure 20 below) has indicated that a Compound Annual Traffic Growth Rate (CATGR) of 1% is appropriate for this road up to the 'Horizon Year' of 2030 although there is a possibility of a reduction in this growth rate due to the provision of the Metronet rail extension to Byford, including a new train station (refer Section 4.3).

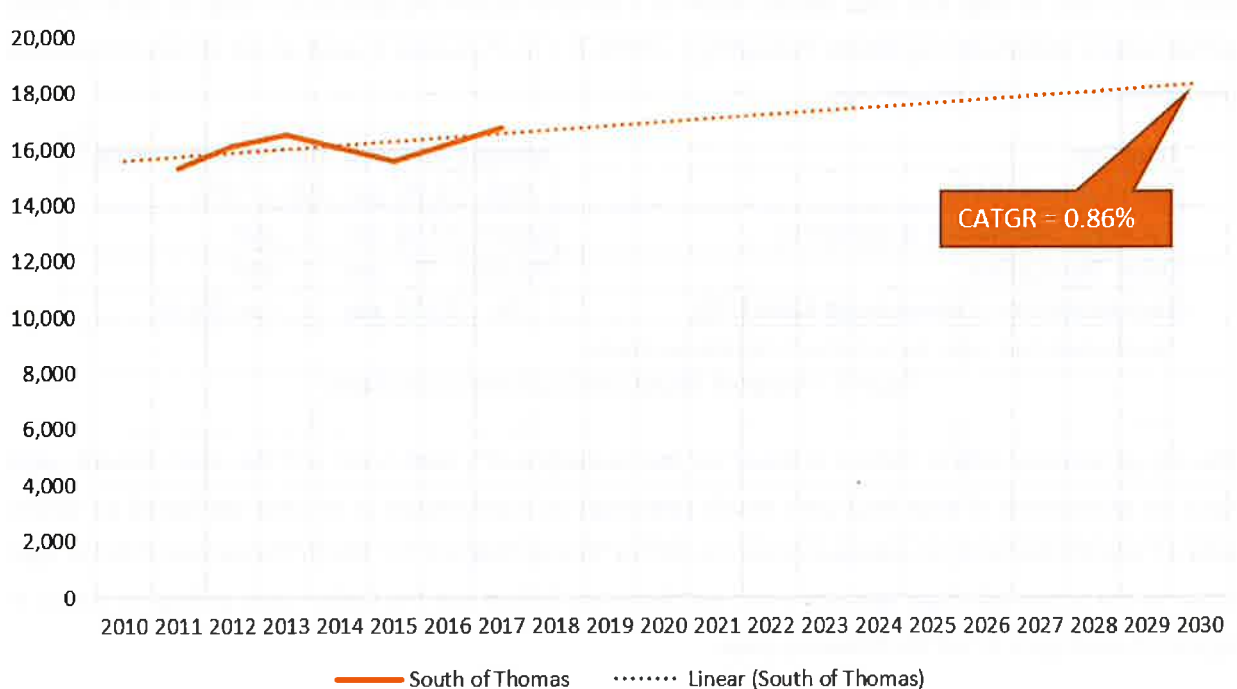


Figure 20 – Existing and forecast Annual Daily Traffic volumes on South Western Hwy past the subject site

Note that the above determination considers that South Western Hwy remains as a single lane in each direction mid-block and hence traffic volumes are constrained to around 20,000 vehicles per day (or 1,000 vehicles per lane per hour).



7 DEVELOPMENT GENERATION AND DISTRIBUTION

It is not considered appropriate to use standard trip generation rates for each element within developments with different land uses and then add these up as there can be significant differences in each land use’s peak traffic generation times and days as well as a high likelihood of ‘shared trips’, i.e. a single trip to or from two or more different land uses.

Trip generation data for each of the proposed land uses, including source notes, are shown in Table 2 below. RMS refers to updated data to the Roads and Traffic Authority NSW document Guide to Traffic Generating Developments provided by the RTA’s subsequent authority, i.e.: Roads and Maritime Services Guide to Traffic Generating Developments’ Updated traffic surveys (4). ITE refers to the Institution of Transport Engineers (USA) (5) and SpackC refers to Spack Consulting, an open source trip generation service based on ITE and additional traffic surveys and data. Bitzios refers to a comprehensive trip generation study of 10 drive-thru coffee outlets undertaken by Bitzios Consulting in 2016. A mix of sources is used as not all sources contain trip generation data for all land uses.

Land Use	Source	Adopted Trip Generation Rate*
Business Park (RMS)	RMS	0.78 per 100 m ² GFA
Car Wash (standalone automated)	SpackC	17.00 per 1 stall
Drive-Thru Coffee	Bitzios	70 per 1 site
Service Station + Convenience Store (ITE)	ITE	13.51 per 1 Fuel Point

*Development Peak - Refer Hourly Profiles for Road Network Peaks

Table 2 – Adopted Mixed Use Trip Generation Rates

The trip generation data in Table 2 is based on the development’s peak hour, not the road network peak hour. An assessment of each land use’s hourly patronage as a percentage of its peak use based on survey data of local similar land use developments (i.e. Caltex Service Station/ Car Wash/ Convenience store/ Tyre Store on the corner of South Western Hwy/ Nettleton Rd, Byford and the Coffee Club, Byford) is shown in Figure 21 and Figure 22 on the following page.

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Proposed Mixed Use Development (Service Station + Convenience Store + Drive-Thru Coffee | Vehicle Serv
 Commercial Tenancies | Self Service + Automatic Car Wash), Lot 104

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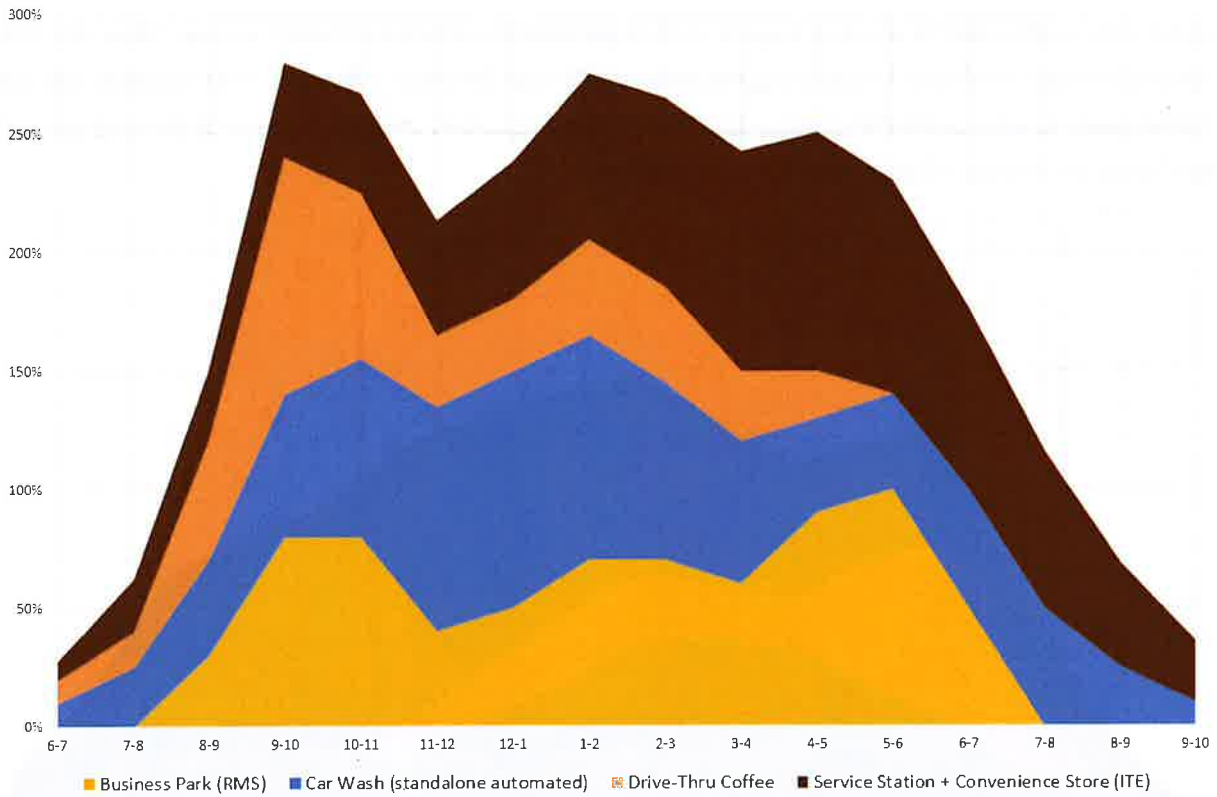


Figure 21 – Assessed weekday mixed-use development cumulative hourly trip generation profile

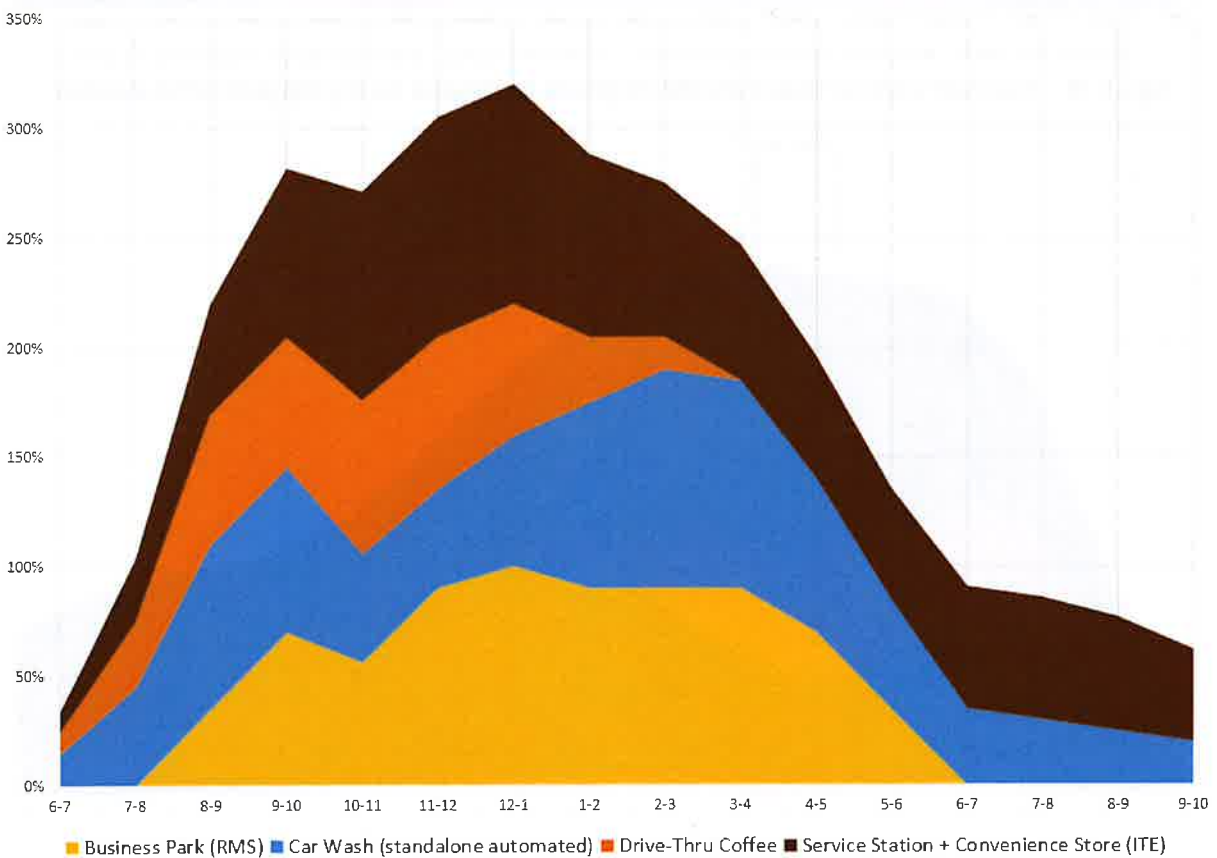


Figure 22 – Assessed Saturday mixed-use development cumulative hourly trip generation profile

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Proposed Mixed Use Development (Service Station + Convenience Store, Drive-Thru Coffee, ATM, Mini-Service Station, Self-Service Car Wash, Car Wash, Commercial Tenancies | Self Service + Automatic Car Wash), Lot 104
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Applying the profiles on the previous page to the trip generation indicated in Table 2 on page 38 results in an assessed forecast maximum hourly trip generation of **190** trips between 1 PM and 2 PM midweek and **209** trips between 12 noon and 1 PM on Saturdays. Full hourly assessment volumes, along with the road network peak hours, are shown in Figure 23 and Figure 24 below.

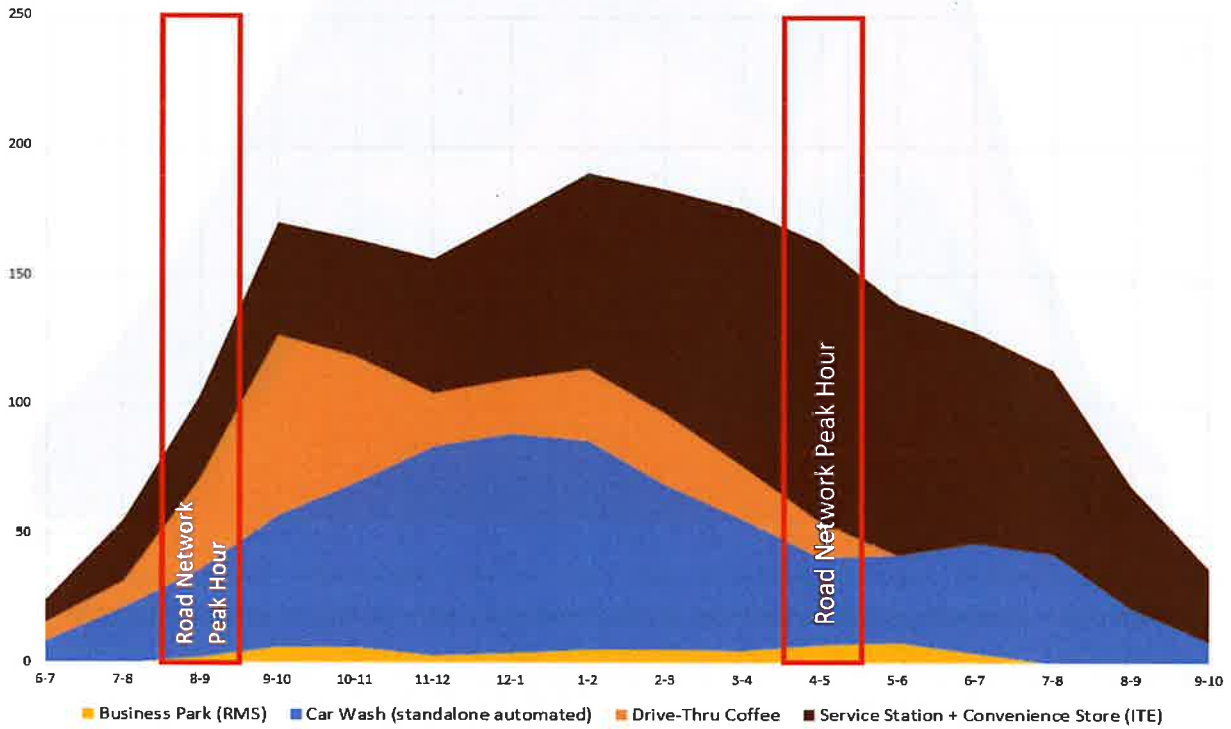


Figure 23 – Assessed weekday mixed-use development cumulative hourly trip generation volumes

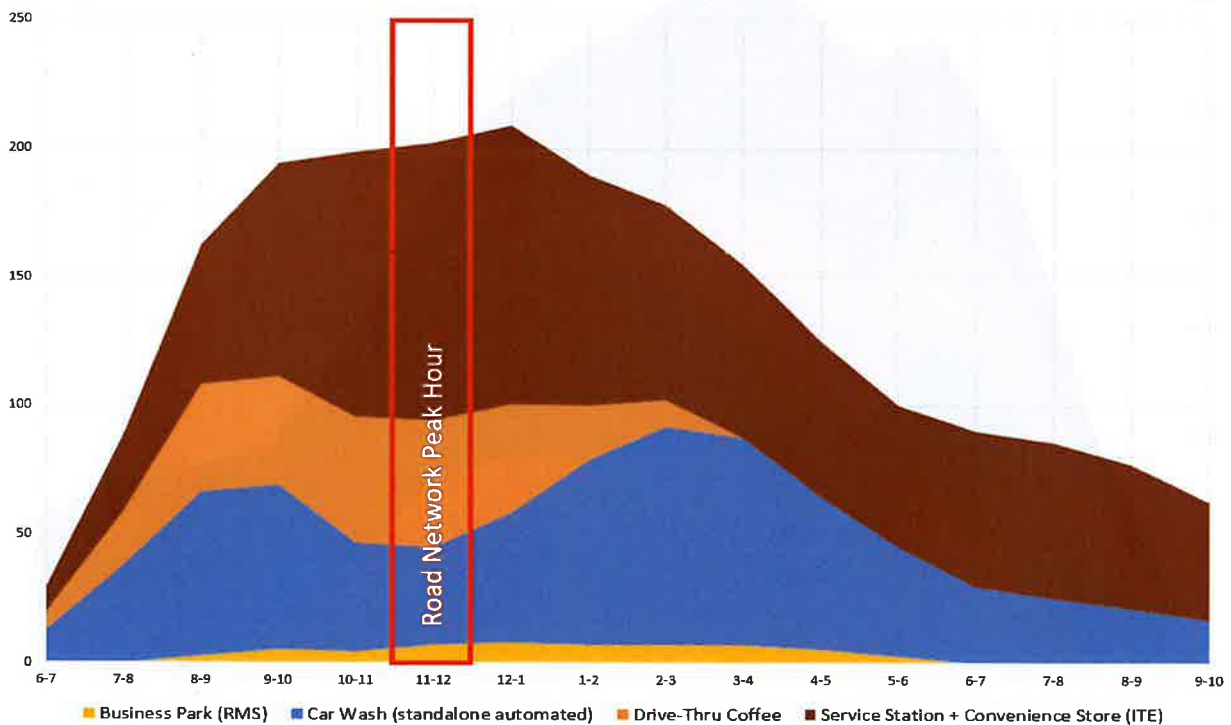


Figure 24 – Assessed weekend mixed-use development cumulative hourly trip generation volumes

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Proposed Mixed Use Development (Service Station + Convenience Store + Drive-Thru Coffee + Vehicle Serv
Commercial Tenancies | Self Service + Automatic Car Wash), Lot 104
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In order to add value to the forecast data, the author undertook detailed surveys of traffic into and out of the existing Caltex Service St/ Convenience Store/ Car Wash and Tyre Outlet/ Repair Centre with additional commercial tenancies on the corner of South Western Hwy and Nettleton Rd which is located approximately 1.5 kms south of the subject site, as shown in Photograph 12 below.



Photograph 12 – Existing similar development on South Western Hwy 1.5 km south of subject site

A survey of all traffic in and out of this development site (including the car wash at the rear and the adjacent tyre shop) between 2 PM and 3 PM on Saturday 14th April indicated that 61 vehicles entered the site and 65 vehicles left the site during this time, a total of 126 vehicles. Using the adopted trip generation rates and hourly profiles in this TIA report, the forecast trip generation (minus the drive-thru coffee land use) would be 167 trips. On this basis, the adopted rates are a conservative estimate and hence appropriate.

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 Proposed Mixed Use Development (Service Station + Convenience Store + Drive Thru Coffee + Mobile Serv
 Commercial Tenancies | Self Service + Automatic Car Wash), Lot 104
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8 DESIGN TRAFFIC FLOWS

The assessment in **Section 7** has indicated that the midweek development and road network peak hours are separated by 2-3 hours and have significantly different volumes. The Saturday development and road network peak hours are only an hour apart. Based on this it is considered appropriate to model and assess the following three peak hours:

- Midweek 1 PM- 2 PM (Development peak hour);
- Midweek 4 PM- 5 PM (Road Network peak hour); and
- Saturday 12 noon – 1 PM (Combined Development and Road Network maximum volumes).

The assessed trip generation, distribution (IN/ OUT split) and assignment for each of these peak hours is shown in Figure 25 below, and Figure 26 and Figure 27 on the following page.



Figure 25 – Forecast 1 PM – 2 PM midweek Trip Generation, Distribution and Assignment

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Proposed Mixed Use Development (Service Station + Convenience Store + Drive Thru Coffee + Vehicle Servicing + Commercial Tenancies | Self Service + Automatic Car Wash), Lot 104 (Northern Road, George Street, SWH)
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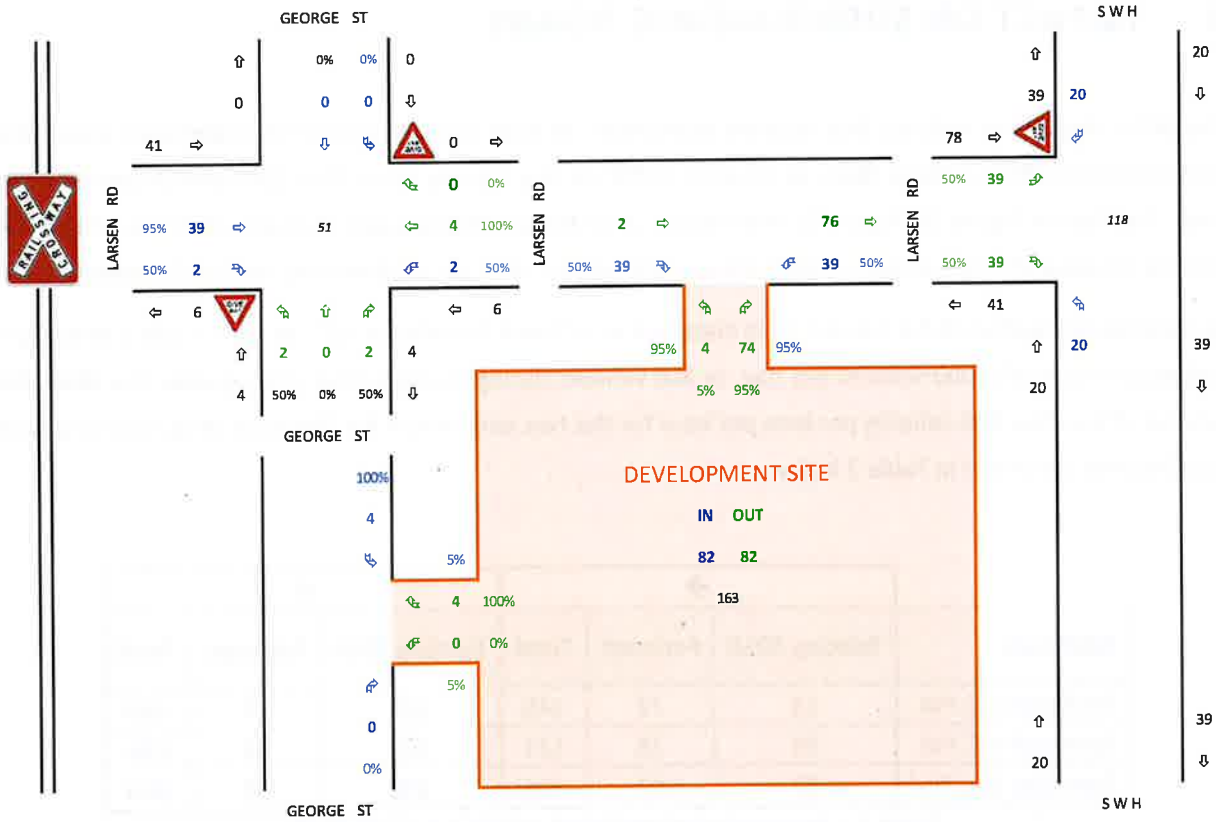


Figure 26 – Forecast 4 PM – 5 PM midweek Trip Generation, Distribution and Assignment

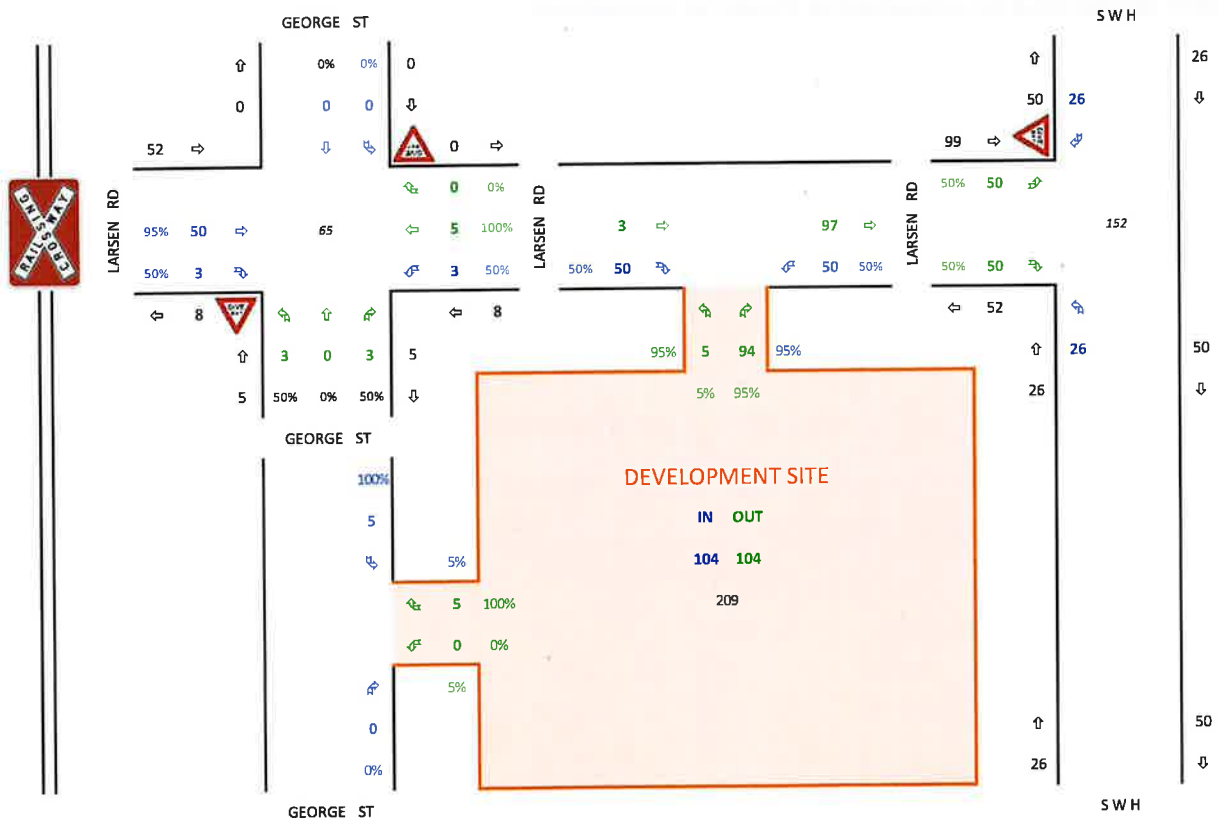


Figure 27 – Forecast 12 noon 1 PM Saturday Trip Generation, Distribution and Assignment

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9 IMPACT ON SURROUNDING ROADS

The WAPC Guidelines indicate that detailed assessment of road sections should be undertaken where the development traffic would be likely to increase traffic on any lane by more than 100 vehicles per lane per hour. The data in Figure 25, Figure 26 and Figure 27 on the preceding pages indicates that this will be the case for eastbound traffic on Larsen Rd between the subject site’s access driveway and South Western Hwy.

As indicated in Section 2.2.2, Larsen Rd is classified as a “Local Distributor Rd”, as such it has a maximum desirable volume of 6,000 vehicles per day, or 600 vehicles during its peak hour. This equates to a desirable volume of less than 300 vehicles per lane per hour for the two-lane Larsen Rd. The total peak hour volume is less than this, as shown in Table 3 below.

Midblock	→			←		
	Existing 2018	Forecast	Total	Existing 2018	Forecast	Total
Midweek 1-2 PM	73	72	145	115	45	160
Midweek 4-5 PM	95	76	171	193	39	232
Saturday 12-1 PM	97	97	194	150	50	200

Table 3 – Assessed total mid-block volumes on Larsen Rd

Refer Section 10.2 for assessment of impact on intersections.

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10 IMPACT ON INTERSECTIONS

10.1 ASSESSED INTERSECTIONS AND TIMES

The WAPC Guidelines recommend that all intersections where flows are likely to increase by 10% should be assessed in detail. An assessment of increased flows through both of the assessed intersections has been undertaken and is shown in Table 4 and Table 5 below.

Ki1	Midweek		Saturday
	1 PM - 2 PM	4 PM - 5 PM	12 noon - 1 PM
Existing	1,014	1,585	1,350
Additional	122	118	152
Impact	12.0%	7.5%	11.2%

Table 4 – Assessed volume impacts at Ki1: Larsen Rd/ South Western Hwy

Si1	Midweek		Saturday
	1 PM - 2 PM	4 PM - 5 PM	12 noon - 1 PM
Existing	199	334	262
Additional	75	51	65
Impact	37.8%	15.2%	24.8%

Table 5 – Assessed volume impacts at Si1: Larsen Rd/ George St

Based on the above, and the fact that the intersections are separated by approximately 150 m, it has been determined that detailed intersection performance modelling and assessment within a network model for each of the three assessment times is warranted.

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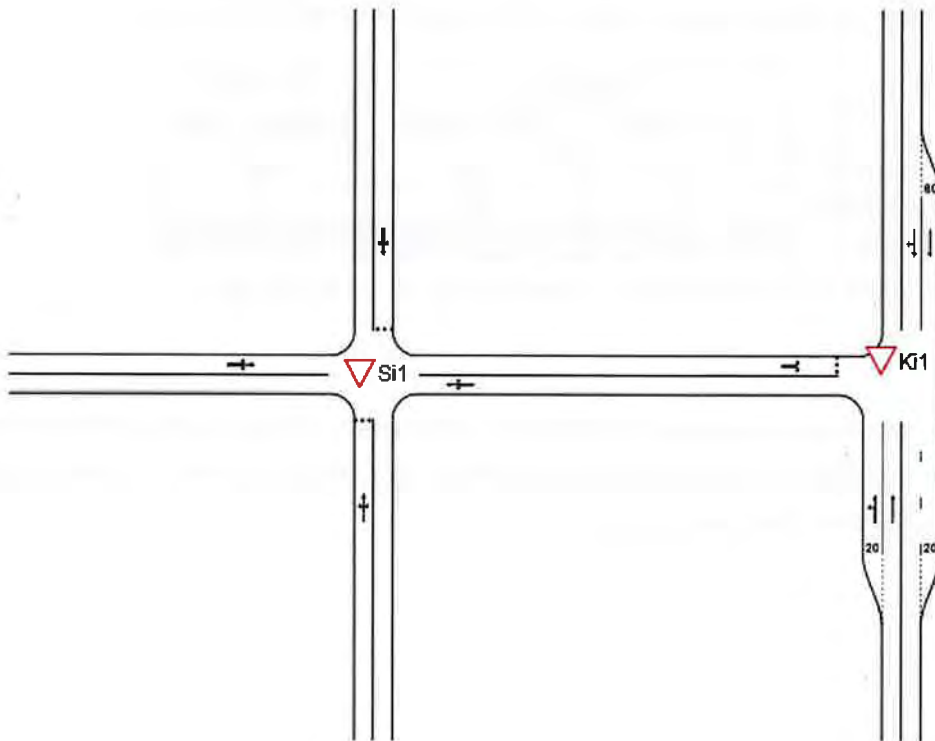
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10.2 NETWORK MODELLING

The existing traffic data has been used to develop a network model within SIDRA Intersection 6.1.

SIDRA Intersection is a “Signalised (and unsignalised) Intersection Design and Research Aid”. The SIDRA Intersection software (older versions known as SIDRA and aaSIDRA) is an advanced lane-based micro-analytical tool for the design and evaluation of individual intersections and networks of intersections including modelling of separate Movement Classes (Light Vehicles, Heavy Vehicles, Buses, Bicycles, Large Trucks, Light Rail / Trams etc...). It provides estimates of capacity, level of service and a wide range of performance measures including delay, queue length and stops for vehicles and pedestrians, as well as fuel consumption, pollutant emissions and operating cost.

The SIDRA Intersection Network model is shown in Figure 28 below.



SITES IN NETWORK	
Site ID	Site Name
▼Ki1	Ki1: Larsen Rd/ South West Hwy Existing PM
▼Si1	Si1: Larsen Rd/ George St Existing PM

SIDRA INTERSECTION 6.1 | Copyright © 2000-2015 Akcelik and Associates Pty Ltd | sidrasolutions.com
 Organisation: I3 CONSULTANTS WA | Created: Wednesday, 11 April 2018 20:05:57
 Project: D:\Users\David\Documents\3\36 2015_17 Projects\WIP\Peter Webb & Associates (029)\09204 Lot 104 SWH_Larsen Rd Byford TIS\Technical \SIDRA\09204 SN3 Larsen Rd Byford.sip6

Figure 28 – SIDRA Intersection 6.1 Si1 & Ki1 network model layout

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Proposed Mixed Use Development (Service Station + Convenience Store + Drive-Thru Coffee | Vehicle Serv
Commercial Tenancies | Self Service + Automatic Car Wash), Lot 104

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An explanation of the various intersection performance criteria assessed and reported within this TIA is provided as Table 6 below.

SIDRA v/c & colour code	LOS	Average Delay per vehicle (d) in seconds				v/c Range	Performance Comments
		Unsignalised intersections	Roundabouts	Signalised intersections	All (RTA)		
< 0.6	A	$d \leq 10$	$d \leq 10$	$d \leq 10$	$d \leq 14.5$	≤ 0.44	Good operation and plenty of spare capacity <i>Stable free flow conditions where drivers are able to select desired speeds and to easily manoeuvre within the traffic stream.</i>
	B	$10 < d \leq 15$	$10 < d \leq 20$	$10 < d \leq 20$	$14.5 < d \leq 28.5$		
	C	$15 < d \leq 25$	$20 < d \leq 35$	$20 < d \leq 35$	$28.5 < d \leq 42.5$	0.45 - 0.64	Acceptable delays and spare capacity <i>Stable flow but most drivers are restricted to some extent in their ability to select their desired speed and to manoeuvre within the traffic stream.</i>
0.6 - 0.7							Acceptable delays (Expected typical peak hour conditions) <i>Close to the limit of stable flow. All drivers are restricted in their ability to select their desired speed and to manoeuvre within the traffic stream. Small increases in traffic flow may cause operational problems.</i>
0.7 - 0.8	D	$25 < d \leq 35$	$35 < d \leq 50$	$35 < d \leq 55$	$42.5 < d \leq 56.5$	0.65 - 0.84	Near capacity and sensitive to disturbances in flows <i>Traffic volumes are close to capacity and there is virtually no freedom to select desired speeds. Flow is unstable and minor disturbances within the traffic stream will cause breakdown leading to long queues and delays.</i>
0.8 - 0.9							
0.9 - 1.0	E	$35 < d \leq 50$	$50 < d \leq 70$	$55 < d \leq 80$	$56.5 < d \leq 70.5$	0.85 - 1.04	
> 1.0	F	$50 < d$	$70 < d$	$80 < d$	$70.5 < d$	> 1.25	At Capacity - Requires other control mode and/or additional lanes <i>In the zone of forced flow where the amount of traffic approaching the point under consideration exceeds that which can pass. Flow breakdown occurs and extensive queues and delays result.</i>

Table 6 – Assessed intersection performance criteria

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10.2.1 Existing Performance

The existing Degree of Saturation of the two intersections during the midweek and Saturday road network peak hours is shown in Figure 29 below. Assessment of other intersection performance criteria is included in the SIDRA Intersection summary tables in **Appendix B**.

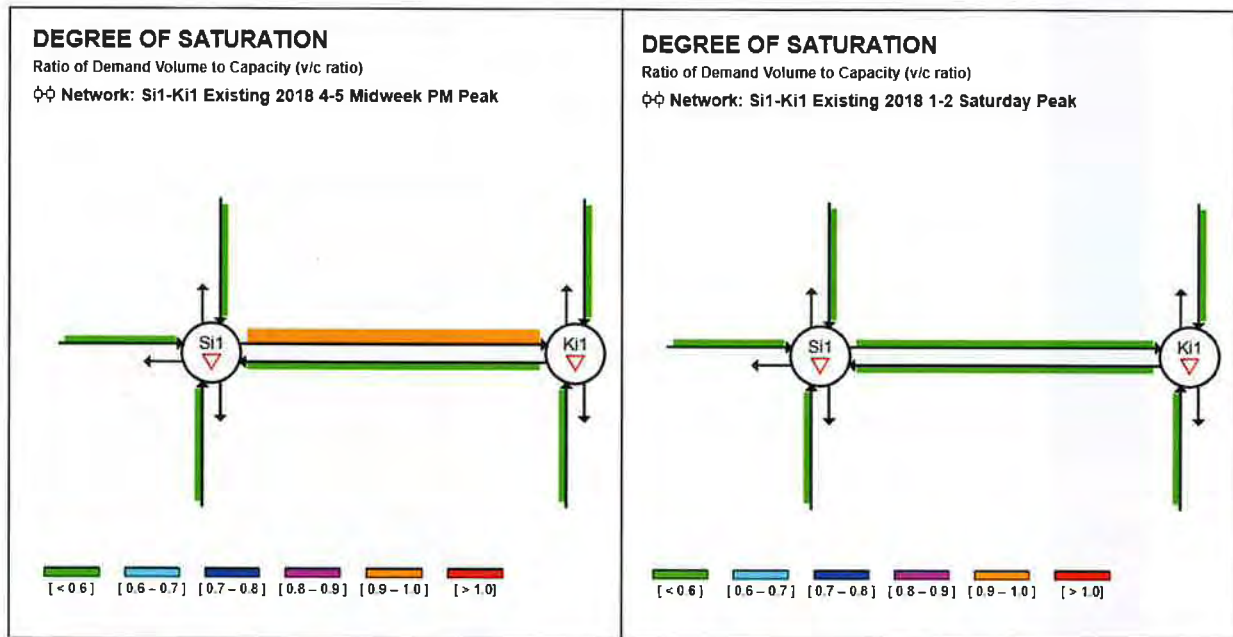


Figure 29 – Existing (2018) Level of Service of Si1 and Ki1 during midweek PM and Saturday peak hours

Figure 29 indicates that both intersections currently perform with no delays to through movements on South Western Hwy and good operation of the Larsen Rd/ George St intersection with plenty of spare capacity. The Larsen Rd approach to South Western Hwy operates with acceptable delays and spare capacity during the Saturday peak hour but approaches capacity and is sensitive to disturbances in flows during the midweek afternoon peak hour. Any increased traffic flows through the intersection is therefore likely to result in capacity concerns.

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Proposed Mixed Use Development (Service Station + Convenience Store + Drive-Thru Coffee + Vehicle Servicing + Commercial Tenancies | Self Service + Automatic Car Wash), Lot 104

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10.2.2 Forecast 2020 Performance

The forecast Degree of Saturation of the two intersections during the midweek and Saturday road network and development peak hours is shown in Figure 30 below. Assessment of other intersection performance criteria is included in the SIDRA Intersection summary tables in **Appendix B**.

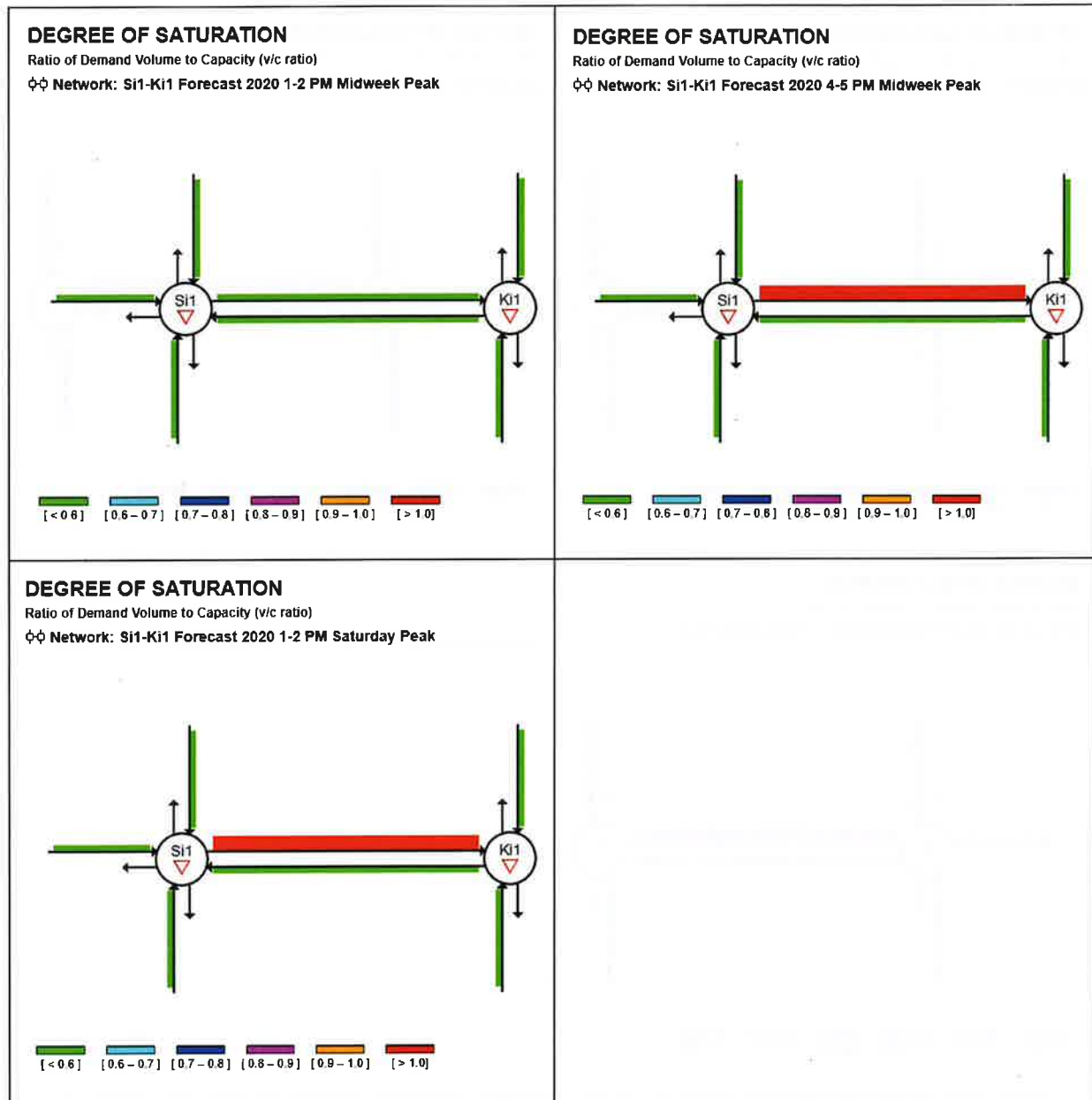


Figure 30 – Forecast 2020 Level of Service of Si1 and Ki1 during midweek PM and Saturday peak hours

Figure 30 indicates that the Larsen Rd approach to South Western Hwy is forecast to experience unacceptable delays during the midweek afternoon and Saturday road network peak hours. If not addressed, it is likely that drivers will avoid accessing the subject site and local and through traffic will experience significant delays resulting in frustrated drivers taking smaller gaps in traffic resulting in a poor safety performance.

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10.2.3 Forecast 2030 Performance

The forecast Degree of Saturation of the two intersections during the midweek and Saturday road network and development peak hours is shown in Figure 31 below. Assessment of other intersection performance criteria is included in the SIDRA Intersection summary tables in **Appendix B**.

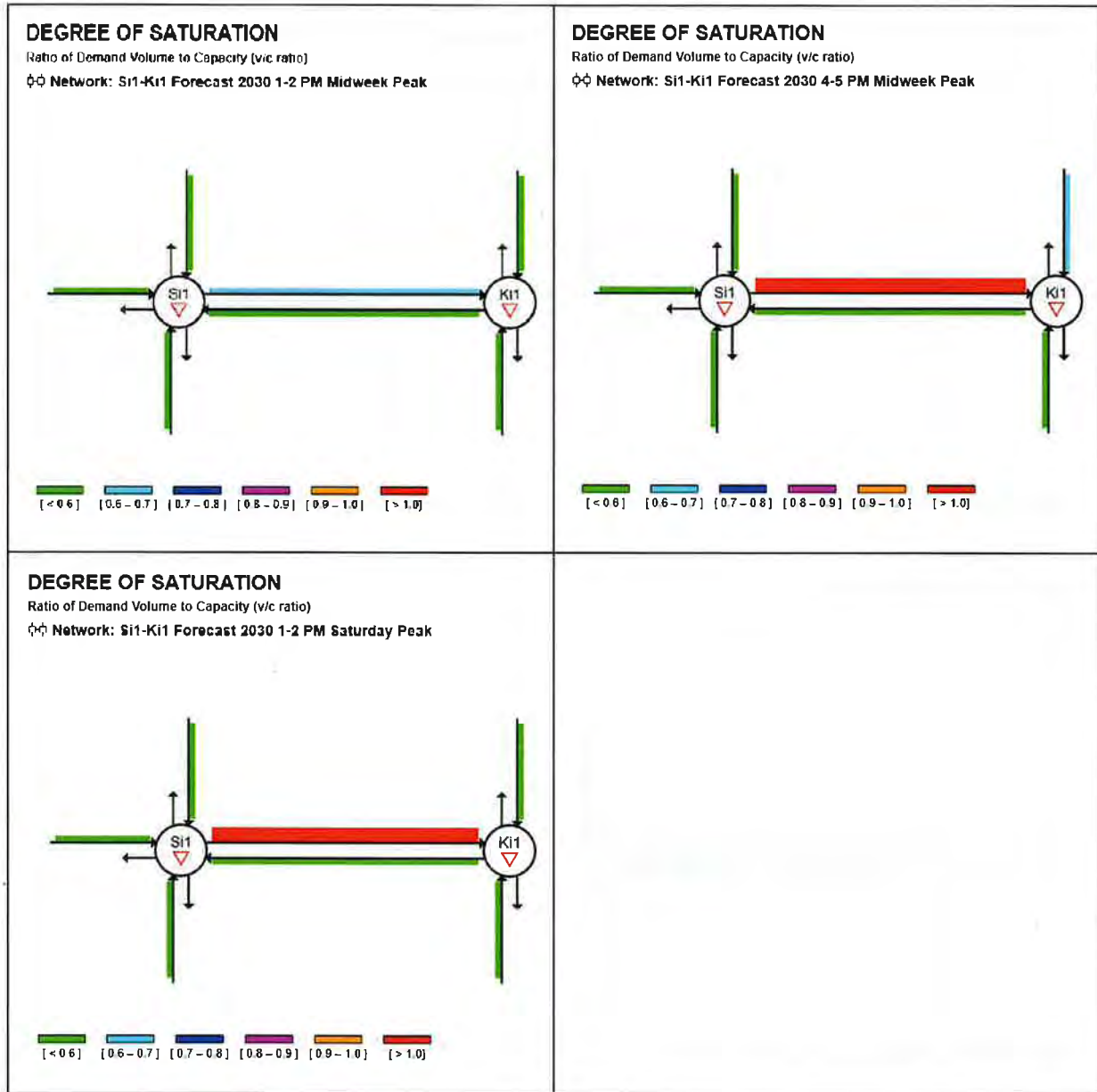


Figure 31 – Forecast 2030 Level of Service of Si1 and Ki1 during midweek PM and Saturday peak hours

Figure 31 indicates that the Larsen Rd approach to South Western Hwy is forecast to experience unacceptable delays during the midweek afternoon and Saturday road network peak hours. If not addressed, it is likely that drivers will avoid accessing the subject site and local and through traffic will experience significant delays resulting in frustrated drivers taking smaller gaps in traffic resulting in a poor safety performance.



10.2.4 Remedial Measure

The previous sections have indicated that there are likely to be unacceptable delays on the Larsen Rd approach to South Western Highway as a result of the current sensitivity to increased traffic (refer Figure 29 on page 48).

Given the uncertainty with timing of the road closure, this TIA needs to identify and assess a suitable remedial measure that would address this concern without the closure of Larsen Rd.

The option of extending the existing dual lane dual carriageway on South Western Hwy south of Park Rd to just north of Larson Rd, including a median break and auxiliary right turn lane similar to that provided at Pitam Way (as shown in Photograph 13 on the following page) has been examined. The Development Drawings in **Appendix A** show two variants of this, one with a single lane Larsen Rd approach and the other with a dual lane, i.e. left and right turn lane, approach. For the purpose of this assessment these two layouts have been called Option 1 and Option 2. These two options have been assessed in SIDRA for the busiest period, i.e. 4-5 PM mid-week, and are forecast to operate at good levels, i.e., Degree of Saturation less than 0.6, as shown in Figure 32 and Figure 33 on page 53.

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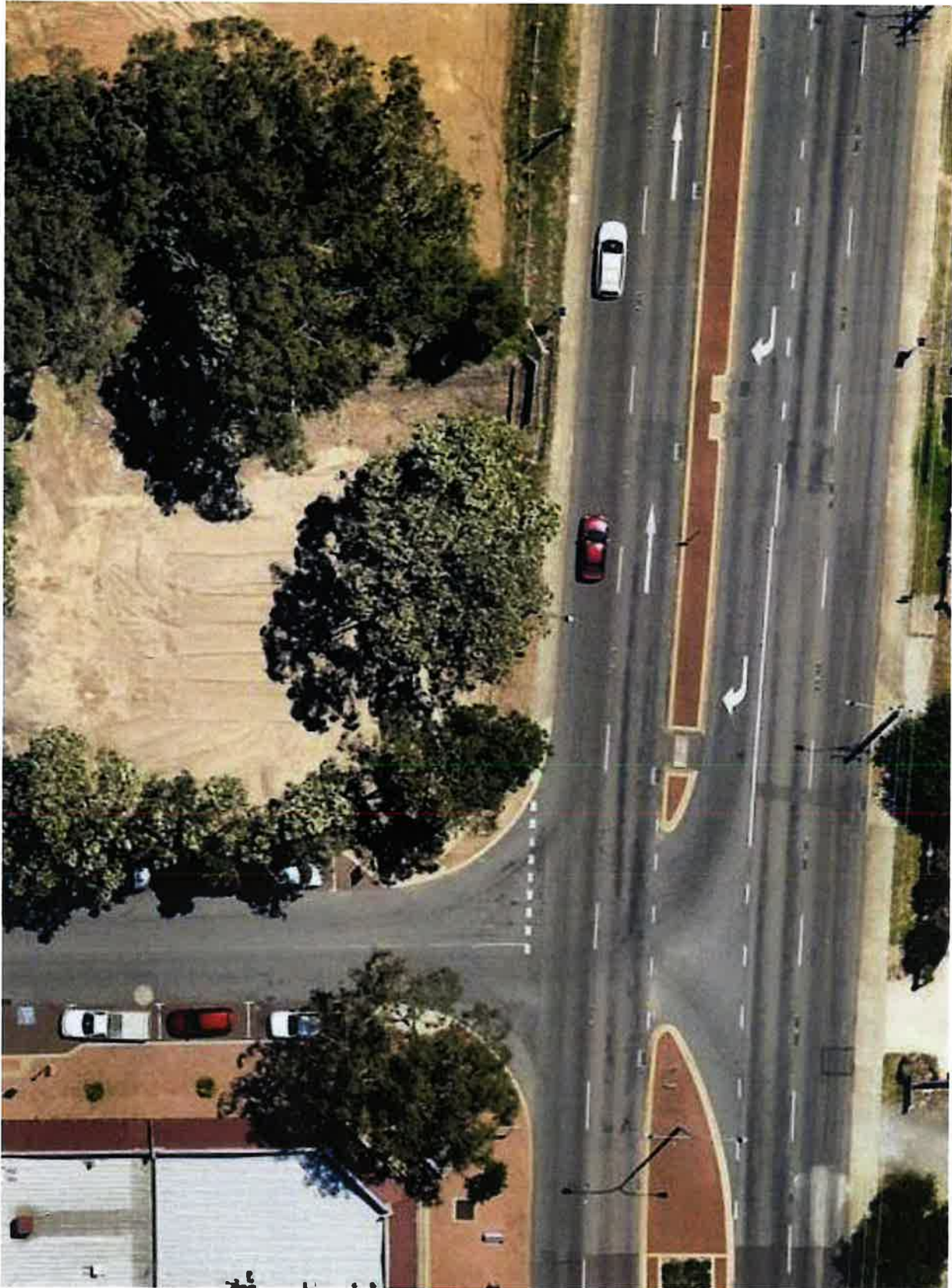
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Photograph 13 – Example of dual lane dual carriageway with median break (Pitman/ SWH)

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DEGREE OF SATURATION

Ratio of Demand Volume to Capacity (v/c ratio)

☉☉ Network: Option 1 2030 4-5 PM Midweek Peak

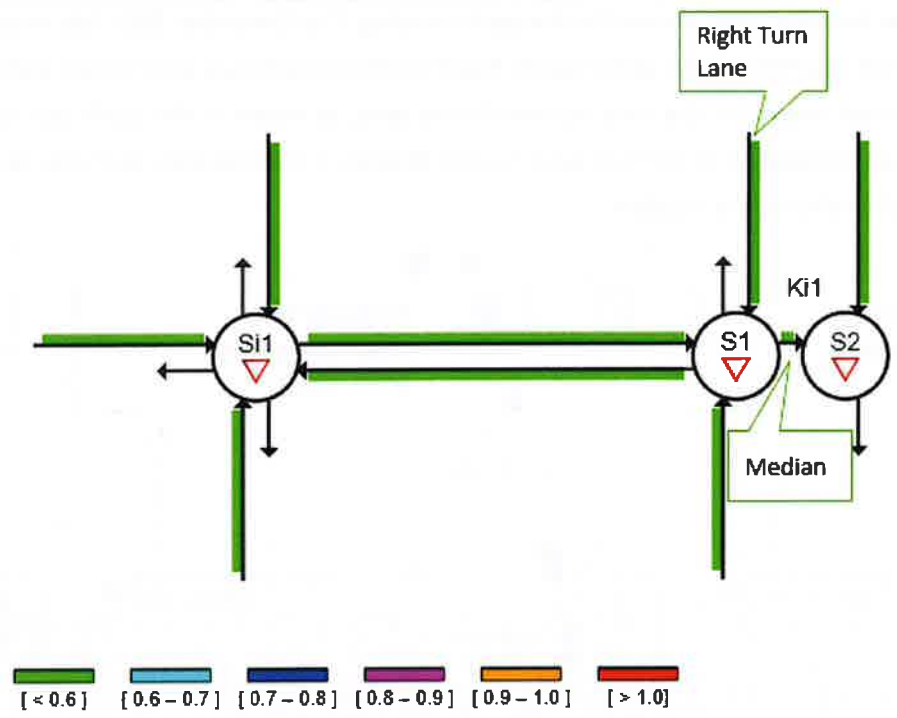


Figure 32 – Forecast 2030 Level of Service with Option 1 layout

DEGREE OF SATURATION

Ratio of Demand Volume to Capacity (v/c ratio)

☉☉ Network: Option 2 2030 4-5 PM Midweek Peak

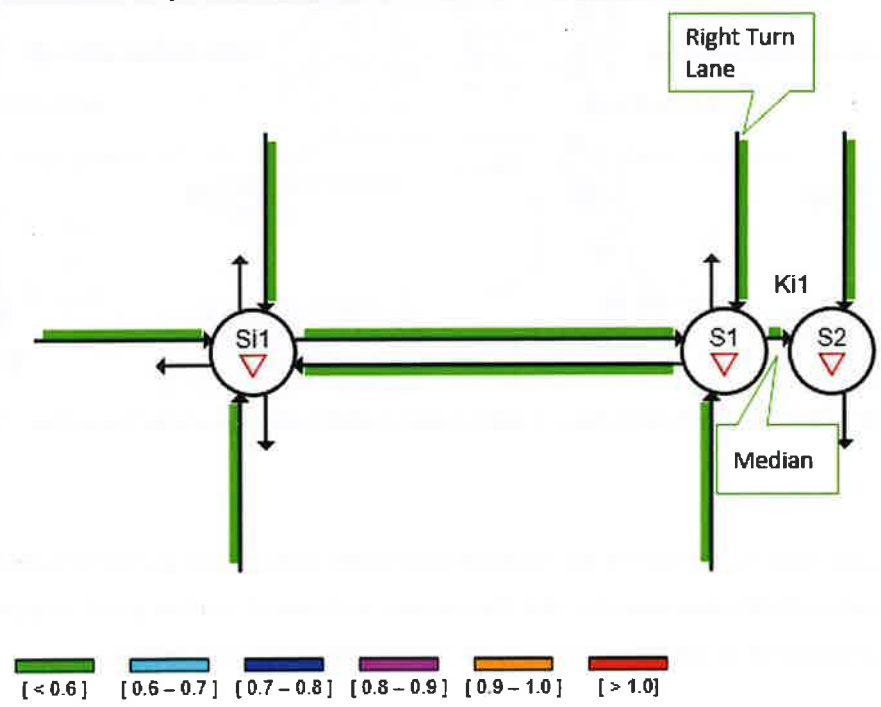


Figure 33 – Forecast 2030 Level of Service with Option 2 layout

11 ROAD SAFETY

A review of the five-year crash record for the period ending 31st December 2017 has revealed that there have been five (5) reported crashes at the Larsen Road/ South Western Hwy intersection and that this is fairly typical of the crash record for the road network in this area, as shown in the crash plot map provided as Figure 34 below. It should be noted that each marker denotes a crash location and may represent a single crash or several crashes at this location.

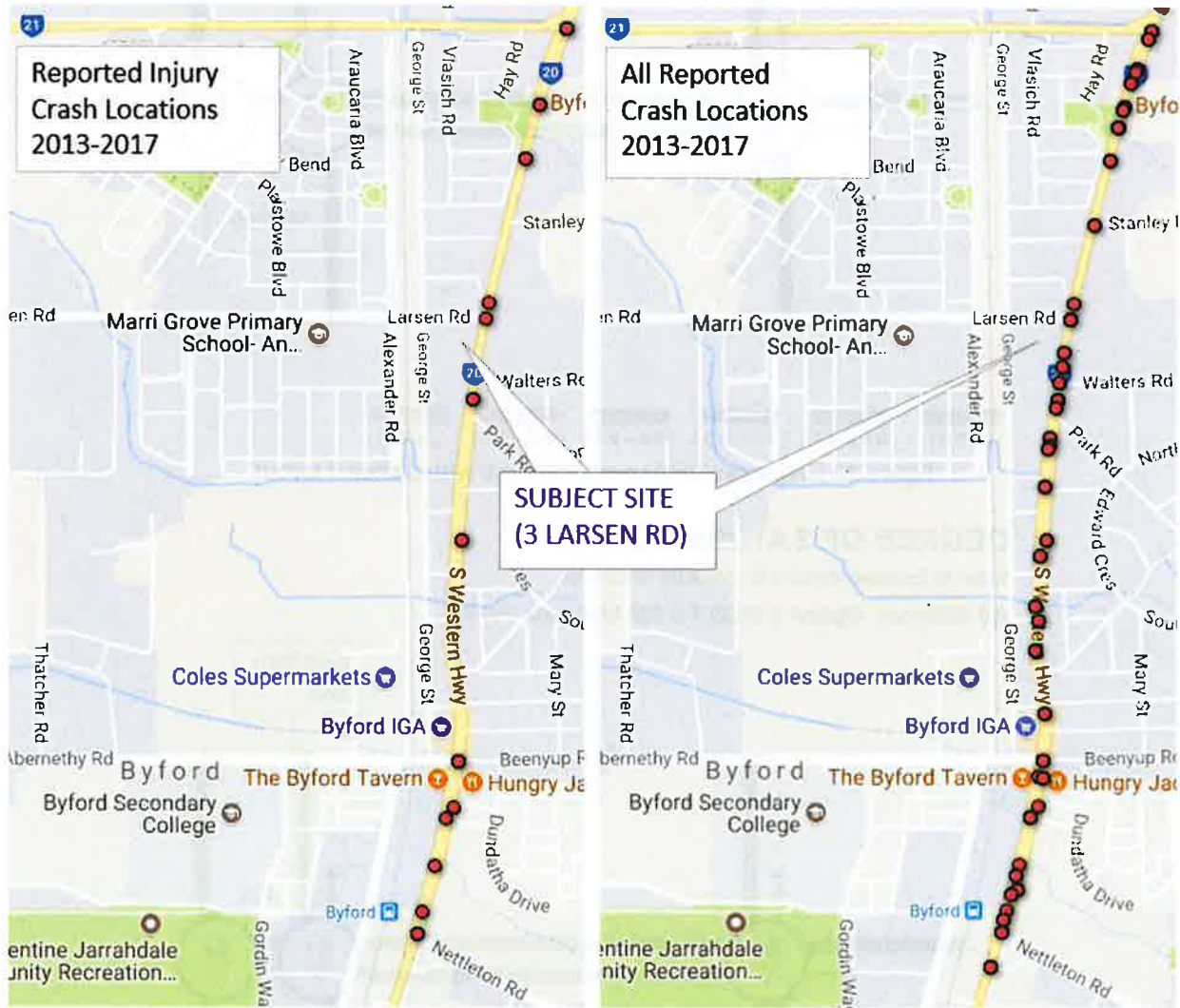


Figure 34 – South Western Hwy Crash Location plot map: 5 years to December 2017

Analysis of the crash data for the Larsen Rd/ South Western Hwy intersection using the MRWA Crash Analysis and Reporting System (CARS) has revealed that the number and type of crashes at this intersection is too low to allow for an assessment of the crash record to be undertaken within the system.

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Proposed Mixed Use Development (Service Station + Convenience Store + Drive-Thru Coffee + Vehicle Serv
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Prior to undertaking the crash review, the author, who is a MRWA accredited Senior Road Safety Auditor and Crash Investigation Team Leader, inspected the site and observed that sight lines are good in all directions but that there may be potential for some drivers to take smaller gaps in traffic that they normally would when there is a steady stream of traffic on South Western Hwy. The implementation of the variable 50 km/s speed limit assists in keeping impact forces low in the event of a crash, which is reflected in the crash severity data (i.e. 5 crashes, 0 Fatal, 0 Hospital, 1 Medical and 4 Property Damage Only). The medical injury resulted from a single car travelling south on South Western Hwy running off the road to the left out-of-control and hitting an electricity pole.

Subsequent crash analysis has revealed that there have not been more than 1 type of crash at the intersection in the five-year reporting period, as shown in the crash plot generated by CARS provided as Figure 35 below.

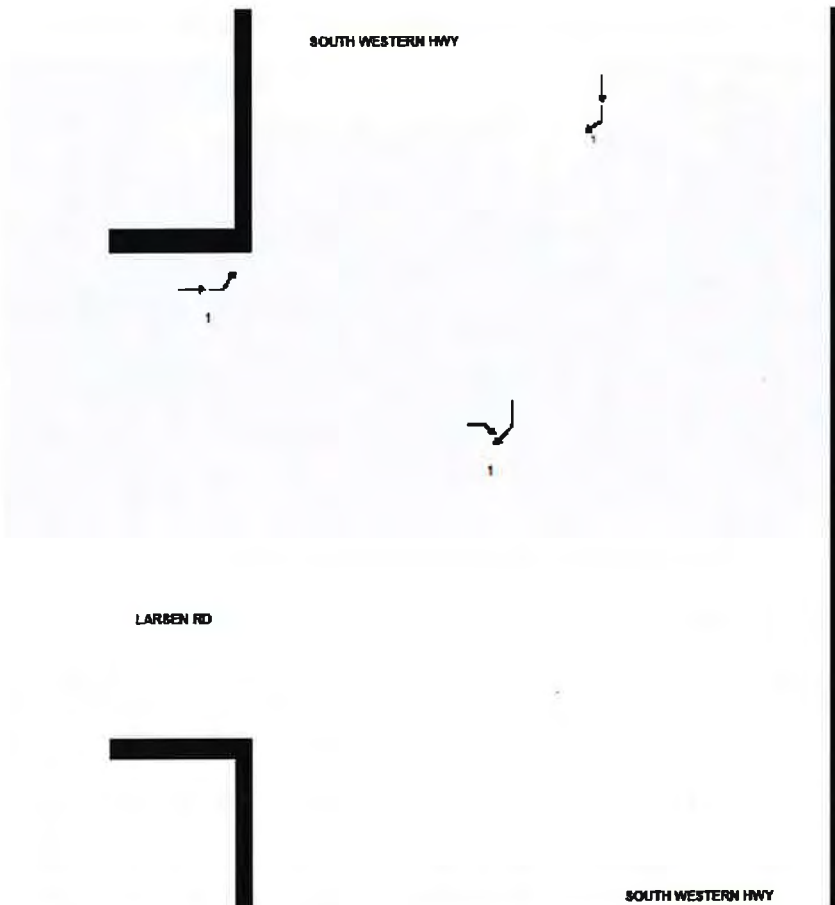


Figure 35 – Larsen Rd/ South Western Hwy Crash Plot (run-off road crashes not shown)

This road safety assessment has not identified any existing deficiency with the layout and control of South Western Hwy, Larsen Rd, George St or any of their intersections that warrants attention or raises concern with the proposed development. It is acknowledged however, that closing Larsen Rd at the railway level crossing will result in a significant reduction in traffic volumes on Larsen Rd at South Western Hwy which will result in reduced delays and the associated likelihood of drivers taking risks with identifying gaps in traffic.

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12 PUBLIC TRANSPORT ACCESS

12.1 EXISTING TRAIN NETWORK

The closest metropolitan train station to the subject site is at Armadale, approximately 6.5 kms north.





As indicated in Section 4.3, it is intended to extend the Pert-Armadale line south to Byford, although at this stage the exact location of the new Byford Train station is yet to be determined.

A single line railway currently extends south from Armadale to Bunbury and is used by the Australind service. Passengers can board and alight at the existing Byford train station at the southern end of Byford near Nettleton Road but only if they give prior notice, otherwise the Australind train does not stop here. The existing train station is little more than a small platform, as shown in Photograph 14 below.



Photograph 14 – Existing Byford train station

The Australind Timetable is provided as Table 7 below.

Perth to Bunbury			Australind		
From Perth	103	105	From Bunbury	102	108
	Daily AM	Daily PM		Daily AM	Daily PM
Perth Station  Dep	9:30	5:56	Bunbury Passenger Terminal  Dep	6:00	2:45
Armadale Station Dep	9:56	6:26	Brunswick Junction* Dep	6:17	3:02
Byford* Dep	10:07	6:36	Harvey* Dep	6:32	3:17
Mundijong* Dep	10:14	6:43	Cookernup** Dep	6:39	3:24
Serpentine* Dep	10:21	6:50	Yarloop** Dep	6:46	3:29
North Dandalup** Dep	10:32	7:01	Waroona* Dep	6:56	3:38
Pinjarra* Dep	10:42	7:11	Pinjarra* Dep	7:12	3:55
Waroona* Dep	11:00	7:29	North Dandalup** Dep	7:22	4:07
Yarloop** Dep	11:11	7:40	Serpentine* Dep	7:34	4:18
Cookernup** Dep	11:15	7:44	Mundijong* Dep	7:42	4:24
Harvey* Dep	11:21	7:50	Byford* Dep	7:49	4:32
Brunswick Junction* Dep	11:36	8:06	Armadale Station Arr	7:55	4:39
Bunbury Passenger Terminal  Arr	11:55	8:25	Perth Station  Arr	8:30	5:15

* Trains only stop at intermediate stations if advance bookings are made.

Table 7 – Australind Timetable

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Proposed Mixed Use Development (Service Station + Convenience Store + Drive Thru Coffee + Vehicle Servicing + Commercial Tenancies | Self Service + Automatic Car Wash), Lot 104 (500m²)
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12.2 EXISTING BUS NETWORK

There are two bus stops on either side of South Western Hwy that are within a 2-minute walk of the site. Each bus stop has a shelter, seat and tactile pavers and is serviced by Transport Bus Routes 251, 252 and 253, which run between Armadale Train Station to the north and Mundijong and Jarrahdale to the south via Byford. The location of the two bus stops, as well as photographs, are shown in Figure 36 below. The timetable is shown in Table 8 on the following page.

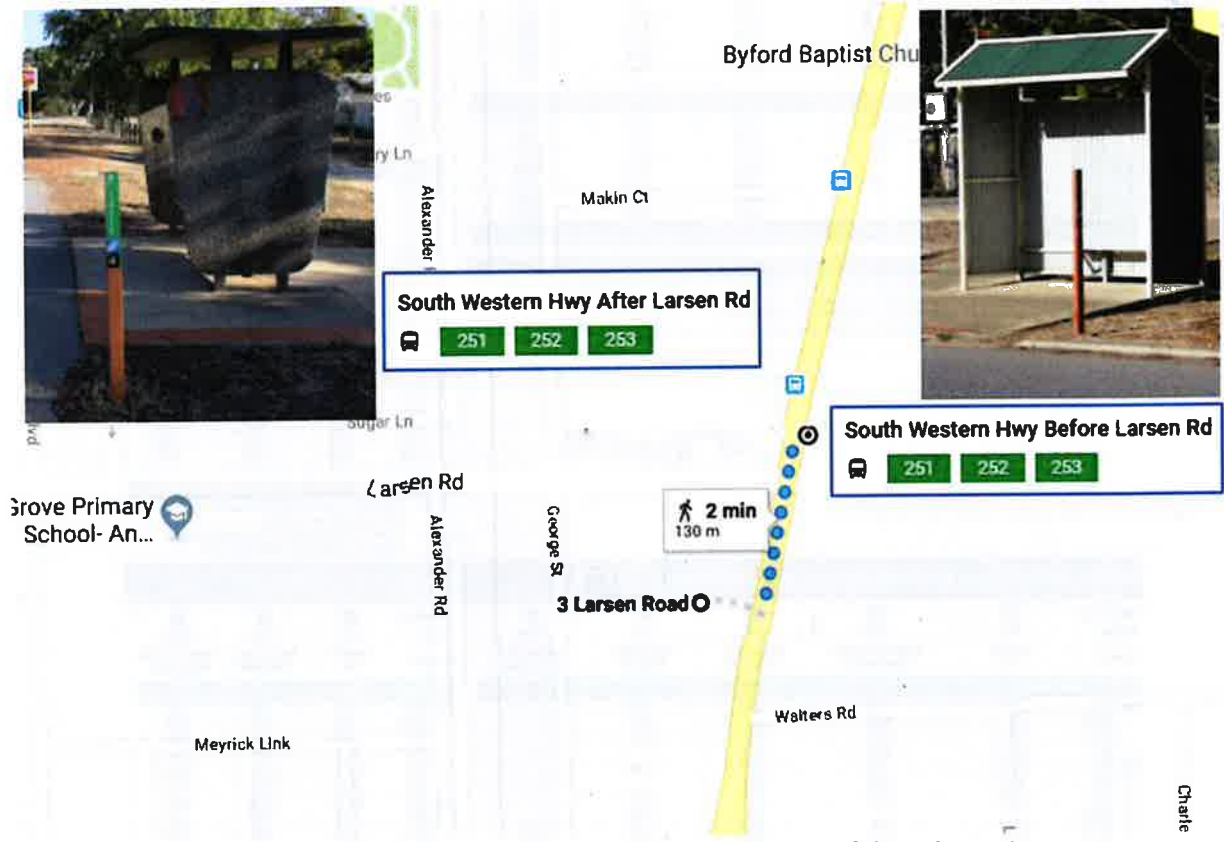


Figure 36 – Existing bus stops within a 2-minute walk of the subject site

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Route 251, 252, 253 - To Armadale						Route 254 - To Armadale			
Timed Stops	27109	23912	27650	13705	13792	Timed Stops	26510	26511	13792
Stop No.	Kingsbury Dr / Jacaranda Av	Peterson Rd / Whitby St	Benalla Cr / Limpet Wy	South Western Hwy / Blytheswood Av	Armadale Stn	Stop No.	Clifton St / South Western Hwy	Ballaarra Av / Fawcett Rd	Armadale Stn
Monday to Friday						Monday to Friday			
am 251*	-	-	* 6:15	6:19	6:33	am 254	5:50	5:58	6:17
253	6:23	6:36	6:45	6:49	7:03	254	6:18	6:28	6:48
251*	-	-	* 7:15	7:19	7:33	254	6:48	6:58	7:17
252	-	7:38	7:48	7:53	8:07	254	7:03	7:13	7:32
253 S	7:33	7:48	7:59	8:08	8:23	254	7:15	7:25	7:48
253 H	7:40	7:55	8:04	8:08	8:23	254	7:50	8:00	8:22
252 B	-	8:09	8:20	8:30	8:46	254	8:07	8:17	8:40
252	-	8:57	9:06	9:10	9:24	254	8:40	8:50	9:10
251*	-	-	* 9:36	9:40	9:54	254	9:10	9:20	9:39
252	-	10:27	10:36	10:40	10:54	254	9:56	10:06	10:24
251*	-	-	* 11:36	11:40	11:54	254	10:56	11:06	11:24
pm 252	-	1:27	1:36	1:40	1:54	254	11:56	12:06	12:24
252 A	-	3:14	3:26	3:30	3:48	pm 254	12:56	1:06	1:24
252 H	-	3:18	3:26	3:30	3:48	254	1:56	2:06	2:24
252	-	5:08	5:16	5:20	5:34	254 A	3:10	3:30	3:55
252	-	6:28	6:36	6:40	6:54	254 S	3:33	3:45	4:06
						254	3:50	4:00	4:19
						254	5:00	5:09	5:26
						254	5:45	5:54	6:11
						254	6:45	6:54	7:11
Saturday						Saturday			
am 253	6:59	7:12	7:20	7:24	7:39	am 254	6:42	6:50	7:09
252	-	8:12	8:20	8:24	8:39	254	7:42	7:50	8:09
251*	-	-	* 10:20	10:24	10:39	254	8:42	8:50	9:09
pm 251*	-	-	* 12:20	12:24	12:39	254	9:42	9:50	10:09
252	-	2:12	2:20	2:24	2:39	254	10:42	10:50	11:11
251*	-	-	* 4:20	4:24	4:36	254	11:42	11:50	12:11
251*	-	-	* 5:53	5:57	6:09	pm 254	12:42	12:50	1:11
						254	1:42	1:50	2:09
						254	2:42	2:50	3:09
						254	3:42	3:50	4:09
						254	4:42	4:50	5:09
No Sunday & Public Holidays service						Sunday and Public Holidays			
Legend						Legend			
251* Time shown in Benalla Cr / Limpet Wy column is for timing point 25727 - Clondyke Dr after Burgess Dr.						254 A Operates on school days only and deviates via Byford Secondary College.			
252 A Operates on school days only and deviates via Serpentine Jarradale Grammar School.						254 S Departs from Serpentine Jarradale Grammar School at 3:25pm on school days only.			
252 B Operates on school days only and deviates via Byford Secondary College.									
253 S Operates on school days only and deviates via Serpentine Jarradale Grammar School and Byford Secondary College.									
H Operates on school holidays only.									

Route 251, 252, 253 - To Mundijong & Jarradale						Route 254 - To Byford			
Timed Stops	13792	13718	25727	13765	27708	Timed Stops	13792	26512	26510
Stop No.	Armadale Stn	South Western Hwy / Blytheswood Av	Clondyke Dr / Burgess Dr	Peterson Rd / Whitby St	Kingsbury Dr / Jacaranda Av	Stop No.	Armadale Stn	Ballaarra Av / Fawcett Rd	Clifton St / South Western Hwy
Monday to Friday						Monday to Friday			
am 252	7:11	7:20	7:24	7:36	-	am 254	7:12	7:28	7:42
252 A	8:12	8:23	8:27	8:41	-	254 S	7:53	8:14	8:30
252	9:56	10:06	10:10	10:21	-	254	8:27	8:44	8:58
251	10:56	11:06	11:14	-	-	254	9:25	9:41	9:54
pm 252	12:55	1:05	1:09	1:20	-	254	10:26	10:42	10:54
251	1:56	2:06	2:14	-	-	254	11:26	11:42	11:54
252	2:40	2:51	2:55	3:06	-	pm 254	12:25	12:42	12:54
252 B	-	-	3:24	3:38	-	254	1:25	1:42	1:54
253 B	3:05	3:17	3:28	3:40	3:59	254	2:26	2:43	3:00
253 S	3:40	3:52	3:56	4:06	4:23	254 A	3:10	3:29	3:45
252 E	4:11	4:23	4:27	4:40	-	254	3:40	3:58	4:13
252	4:40	4:51	4:55	5:06	-	254	4:25	4:43	4:58
253	5:13	5:25	5:29	5:37	5:52	254	5:13	5:30	5:43
252	5:54	6:05	6:09	6:20	-	254	5:28	5:44	5:58
						254	5:43	5:59	6:13
						254	5:58	6:14	6:27
						254	6:14	6:30	6:43
						254	6:29	6:44	6:57
						254	6:44	6:59	7:12
						254	7:14	7:29	7:42
Saturday						Saturday			
am 252	7:43	7:53	7:57	8:07	-	am 254	8:13	8:28	8:40
251	9:56	10:06	10:12	-	-	254	9:11	9:26	9:39
251	11:56	12:06	12:12	-	-	254	10:11	10:26	10:39
pm 252	1:41	1:51	1:55	2:09	-	254	11:11	11:26	11:40
251	3:41	3:51	3:57	-	-	pm 254	12:11	12:26	12:40
253	4:41	4:51	4:55	5:04	5:20	254	1:11	1:26	1:40
252	5:41	5:51	5:55	6:09	-	254	2:11	2:26	2:40
						254	3:11	3:26	3:40
						254	4:11	4:26	4:40
						254	5:11	5:26	5:39
						254	6:11	6:26	6:39
No Sunday & Public Holidays service						Sunday and Public Holidays			
Legend						Legend			
252 A Deviates via Serpentine Jarradale Grammar School on school days only.						254 A Departs from Armadale Senior High School at 3:05pm on school days only.			
252 B Operates on school days only and departs Byford Secondary College at 3:17pm.						254 S Extends to Serpentine Jarradale Grammar School on school days only.			
252 E Operates on school days only.									
253 D Departs from Armadale Senior High School at 3:00pm, then deviates via Byford Secondary College and Serpentine Jarradale Grammar School on school days only.									
253 S Deviates via Serpentine Jarradale Grammar School on school days only.									

Table 8 – Transperth Routes 251, 252 and 253 Timetables



13 PEDESTRIAN AND CYCLE ACCESS/ AMENITY

As indicated in Figure 2 on page 9 and shown in Photograph 8 on page 22, there is an existing cycle route along George St and a short section of cycle path with associated crossing facility on South Western Hwy between Larsen Rd and Walters Rd. There are good paths along Larsen Rd and George St but the path on the development side of South Western Hwy south of the ped/ cycle crossing island is substandard and, in some locations, presents a hazard to people using wheeled devices such as skateboards, gophers, wheelchairs and prams as it can direct these devices into the path of vehicles on South Western Highway, as shown in the example provided as Photograph 15 below.



Photograph 15 – Example of South Western Hwy path on west side sloping towards traffic

There is a lack of continuous tactile ground surface indicators on the informal ped/ cycle crossing on South Western Hwy south of Larsen Rd as shown in Photograph 16 on the following page.

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Photograph 16 – Existing ped/ cycle crossing on South Western Hwy south of Larsen Rd

A review of the paths around the recently developed Caltex Service Station on the corner of South Western Hwy and Nettleton Rd has revealed that paths and ramps in accordance with the latest standards have been provided to, from and around this site, as shown in the example provided as Photograph 17 below.



Photograph 17 – Caltex Service Station ped/ cycle facilities, South Western Hwy/ Nettleton Rd



14 PARKING AND SERVICING

As indicated in **Section 3**, it is proposed to provide a total of 71 standard car parking bays, 3 ACROD bays, 1 waiting bay and 3 loading bays on site.

The planning report assesses the statutory requirement and provision of parking bays. From a practical point of view, it is important to note that many of the trips to the site will be shared between the different land uses on the site, hence there is a high probability that each parking bay would be used for more than one land use trip. This was evidenced in the survey of the existing Caltex Service Station on the corner of South Western Hwy and Nettleton Rd.

The largest vehicle expected to service and the site is the 19 m Semi Trailer, as shown in Figure 37 below.

Australia & Oceania : AU-STRROADS 2013 (AU) : PM S 19M
Units: Meters

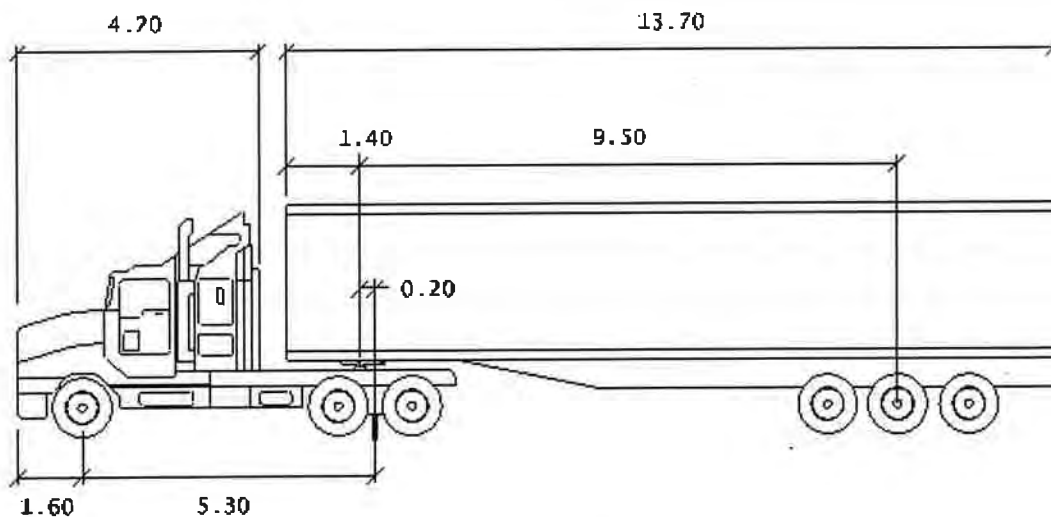


Figure 37 – 19 m Semi Trailer Design Vehicle

The assessed swept path of the above design vehicle, i.e. fuel tanker servicing the site, is shown in the Development Drawings included in **Appendix A**.



15 SITE SPECIFIC ISSUES

The Shire of Serpentine-Jarrahdale's Coordinator Subdivisions has provided a list of the Shire's concerns regarding the development proposal in the previously issued TIA (i.e. version 2.0) in an email dated 25th October 2018. In order to ensure that each of these issues is clearly addressed, this section reproduces those concerns and provides comment and assessment accordingly.

ISSUE 1: LARSEN RD/ SOUTH WESTERN HIGHWAY INTERSECTION

"The shire is concerned by the midweek peak level of saturation on Larsen Road. This indicates we currently have unacceptable delays. The traffic impact Assessment indicates that the development will approximately double the peak hour traffic on Larsen road. To address issues around Saturation in addition to the works shown on the drawing and agreed with MRWA the shire requires the left and right channelisation on Larsen road at the South Western highway intersection. This work is shown on MRWA drawing 022 which is referenced in the MRWA decision."

RESPONSE 1

The Development Drawings in **Appendix A** show it is proposed to provide a dual lane approach on Larsen Road (red outline). As indicated in **Section 4.3** the proponent has confirmed that the MRWA conditions will be met during the detailed design stage and in discussion with Main Roads WA. This TIA has assessed a single lane approach as Option 1 and the double lane approach as Option 2 as part of the assessment process. The proponent has indicated that Option 2, the dual lane approach, has been adopted and this has been included in the Development Drawings provided.



ISSUE 2: DEVELOPMENT ACCESS FROM LARSEN ROAD

“Larsen Road is a local distributor Road. While it is preferred to not have large vehicles on Local Distributor roads they can host 19m semi-trailers. It is unclear from the traffic impact assessment if it is proposed to have service facilities for large vehicles or if the 19m semi-trailers entering and exiting the site are purely service vehicles. The shire generally has adopted a policy of not supporting high-flo diesel or services for 19m semi-trailers on the south western highway in the Byford town site.

Concerning the service vehicle access the shire will not accept vehicles departing their lane to enter and exit the site. It is not considered safe at this location with proximity to the highway intersection and access driveways opposite creating an environment where uncertainty in decision making could occur. The shire also notes Larsen road has centre line road markings and therefore it is against the road traffic code for vehicles to not be lane compliant whilst performing turning manoeuvres.

The shire would like to see some assessment of the vehicle stacking on Larsen road related to the entry into the development to determine the necessary access arrangements. Noting there is around 90 vehicles per hour entering in the Saturday peak and plus 200 vehicles on Larsen road according to the 2014 count”.

RESPONSE 2

As indicated in **Section 3**, the proposed development will not have fuel facilities for large vehicles. As such, the largest vehicles expected to access and egress the site is the 19 m Semi Trailer (19 m ST) Fuel Tanker servicing the site. The 19 m ST is the design vehicle that all roads and intersections are designed for as it is the largest vehicle that is permitted to use all public roads without a permit. This also ensures that other large vehicles such as those associated with removalists, waste collection and emergency services can negotiate the road network.

The statement that “Concerning the service vehicle access, the shire will not accept vehicles departing their lane to enter and exit the site” is not consistent with currently approved developments along similar Local Distributor roads, as shown in Figure 38 and Photograph 18 on the following page. It is also not consistent with the Shire’s reasoning, i.e. “It is not considered safe at this location with proximity to the highway intersection and access driveways opposite creating an environment where uncertainty in decision making could occur.” The development access off Larsen Rd is the only access on this side of the road between the Highway and George St hence it will be very clear to other drivers where an indicating vehicle will be turning off Larsen Rd to access the site. The proposed access is located midway between the two intersections to minimise influence on movements at either of these intersections. It is also located as far away from the South Western Hwy intersection as is physically possible.

The Shire’s statement that “Larsen road has centre line road markings and therefore it is against the road traffic code for vehicles to not be lane compliant whilst performing turning manoeuvres” is incorrect. Section 116 of the Road Traffic Code states that “a driver shall not permit any portion of the vehicle to travel on,

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over, or to the right of, the dividing line except for the purpose of making a right turn or a U turn, where permissible.” This is consistent with statements within AS 2890.1 that require left turns to be undertaken from the kerb lane but allow for the full width of the roadway to be used. The examples provided below show centre line road markings on Abernethy Road and the approved development that requires service vehicles to cross this line.

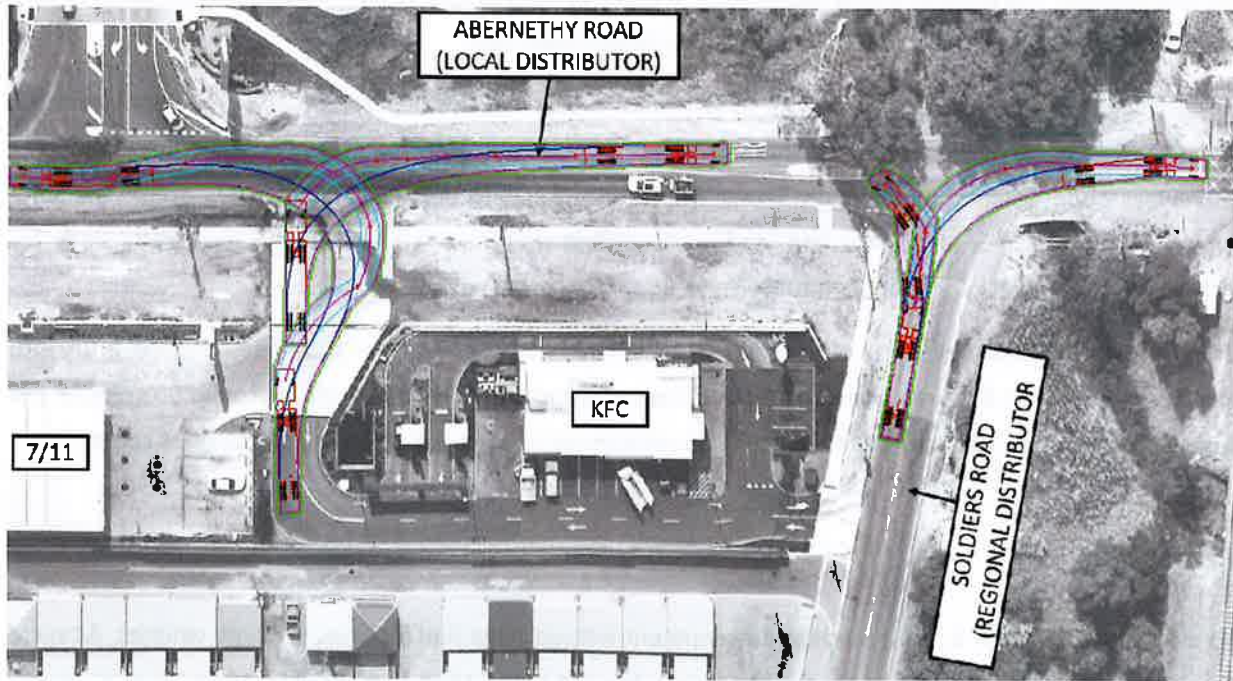


Figure 38 – 19 m ST swept paths out of Soldiers Rd and KFC/ 7eleven into Abernethy Rd



Photograph 18 – Looking west along Abernethy Rd (Local Distributor) to KFC/ 7eleven development on left

The practice of allowing service vehicles to enter and leave access driveways within the boundaries of the roadway, i.e. kerb lines, is permitted in Section 3.4.1(a) of Australian Standard AS 2890.2 (4), i.e.: “On a minor

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public road, vehicles shall be able to enter and leave the access driveway without infringing the boundaries of the roadway. Local authorities may place further limits and controls on the extent to which movement across the centre-line of the roadway is allowed.”

The shire has indicated that it would “like to see some assessment of the vehicle stacking on Larsen road related to the entry into the development to determine the necessary access arrangements. Noting there is around 90 vehicles per hour entering in the Saturday peak and plus 200 vehicles on Larsen road according to the 2014 count”.

200 vehicles per hour is not a lot for a Local Distributor Rd and does not warrant assessment. Nevertheless, an assessment has been carried out as requested based on the forecast 2030 volumes and is shown in Figure 39 below and in Figure 40 and Figure 41 on the following page. Average and 95%ile back of queue lengths do not exceed more than 1 vehicle for any movement in any peak hour.

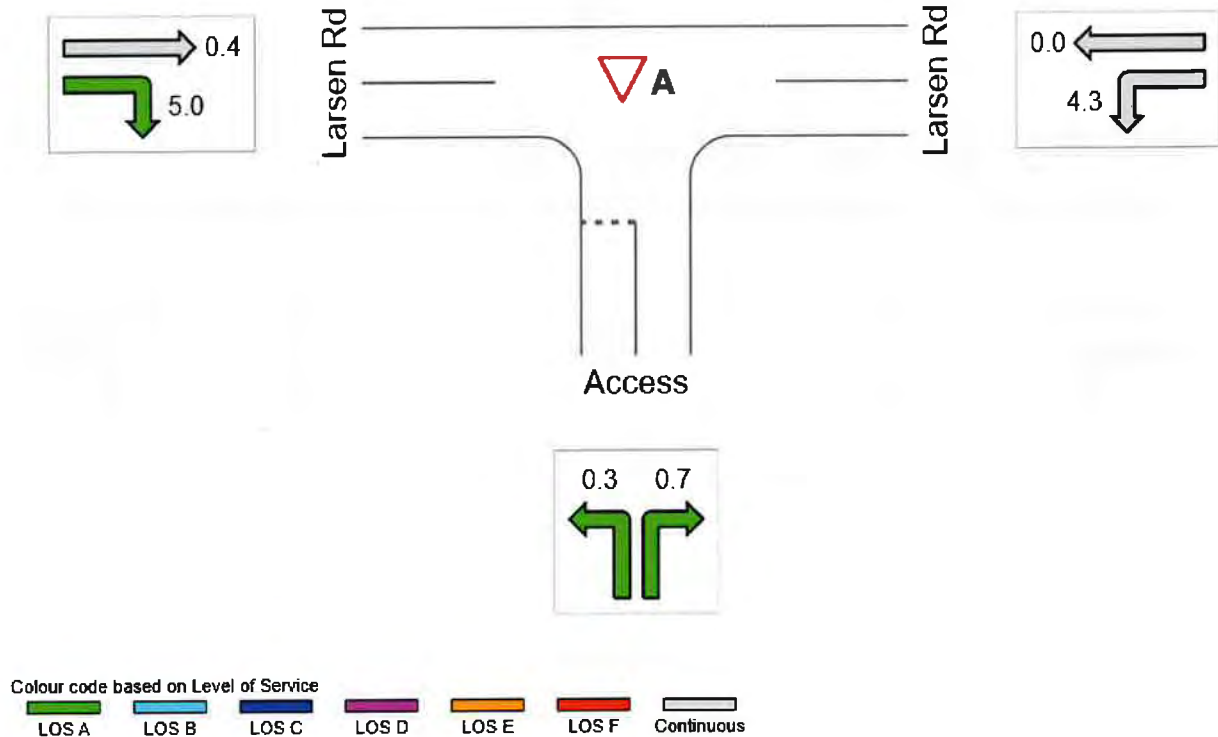


Figure 39 – Forecast Average Delay and Level of Service Larsen Rd Access 2030 Midweek 1-2 PM

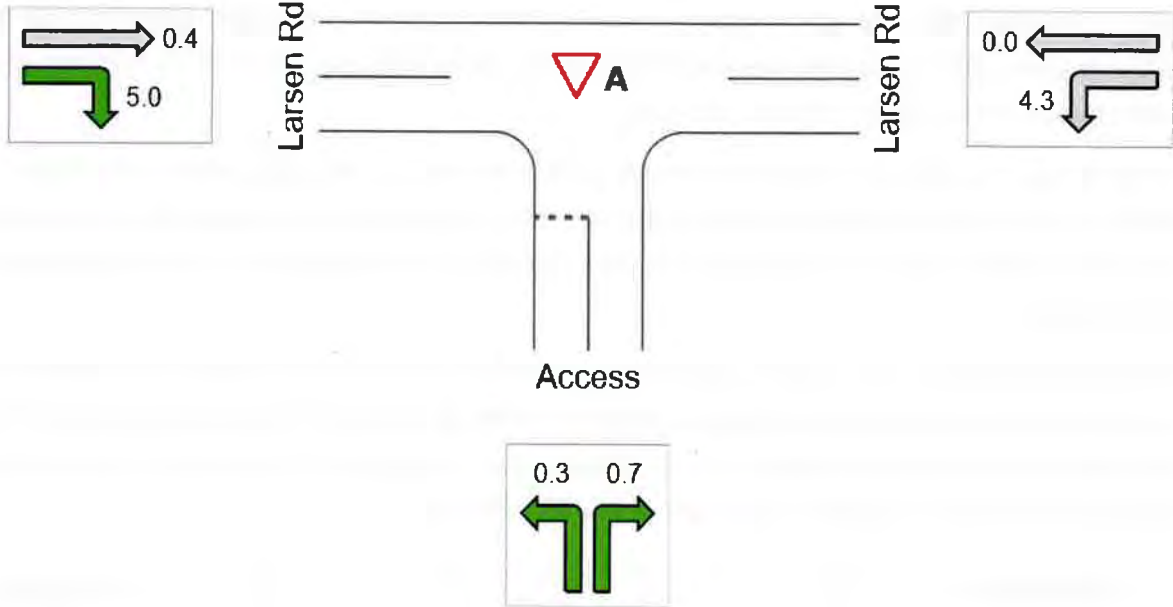
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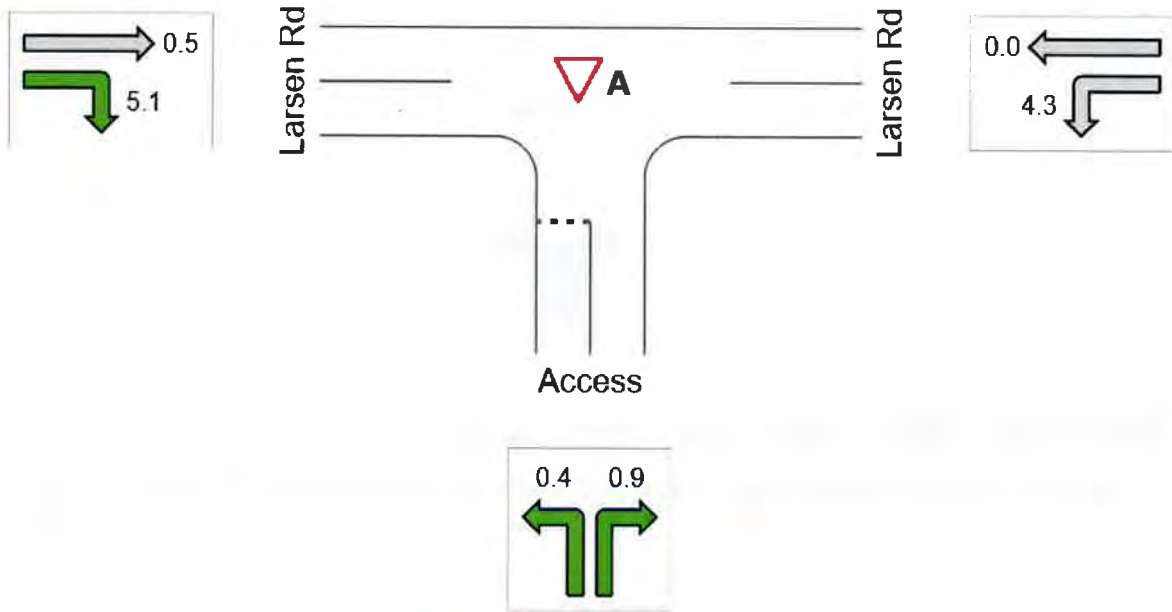
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Colour code based on Level of Service
 LOS A (Green) LOS B (Light Blue) LOS C (Dark Blue) LOS D (Purple) LOS E (Orange) LOS F (Red) Continuous (Grey)

Figure 40 – Forecast Average Delay and Level of Service Larsen Rd Access 2030 Midweek 4-5 PM



Colour code based on Level of Service
 LOS A (Green) LOS B (Light Blue) LOS C (Dark Blue) LOS D (Purple) LOS E (Orange) LOS F (Red) Continuous (Grey)

Figure 41 – Forecast Average Delay and Level of Service Larsen Rd Access 2030 Sat 12-1 PM



ISSUE 3: LARSEN RD/ GEORGE ST INTERSECTION

“This intersection is a four way line marked intersection with priority to east – west traffic movements. The intersection is located 25m east of a rail level crossing. The TIA indicates that service vehicles will be moving through the Larsen road George Street intersection. No Swept path analysis of the service vehicle movements at this intersection have been presented. It will be necessary for all vehicles to remain lane compliant and to the left of the centre line at this intersection. Widening and upgrade works as necessary to support service vehicles using this intersection.”

RESPONSE 3

It is the Shire’s and Main Roads WA’s directive that servicing of all lots between George St and South Western Hwy must be via George St. It is therefore incumbent on the Shire to ensure that its road network supports these movements and/ or seek contributions for upgrades where required. As indicated in **Section 2.4.3**, the Shire has adopted Local Planning Policy No 53: George Street Construction Costs which allows for “the contribution of funding for the construction of George Street from Pitman Way to Larsen Road in a coordinated manner by detailing the costs, method of apportionment and method of collecting contributions.”

Swept paths were not included in the TIA for this intersection as the largest service vehicle is the 19 m Semi Trailer which is the design vehicle for all intersections. Nevertheless, an assessment of the swept path of the 19 m ST turning into and out of George St is provided as Figure 42 below.

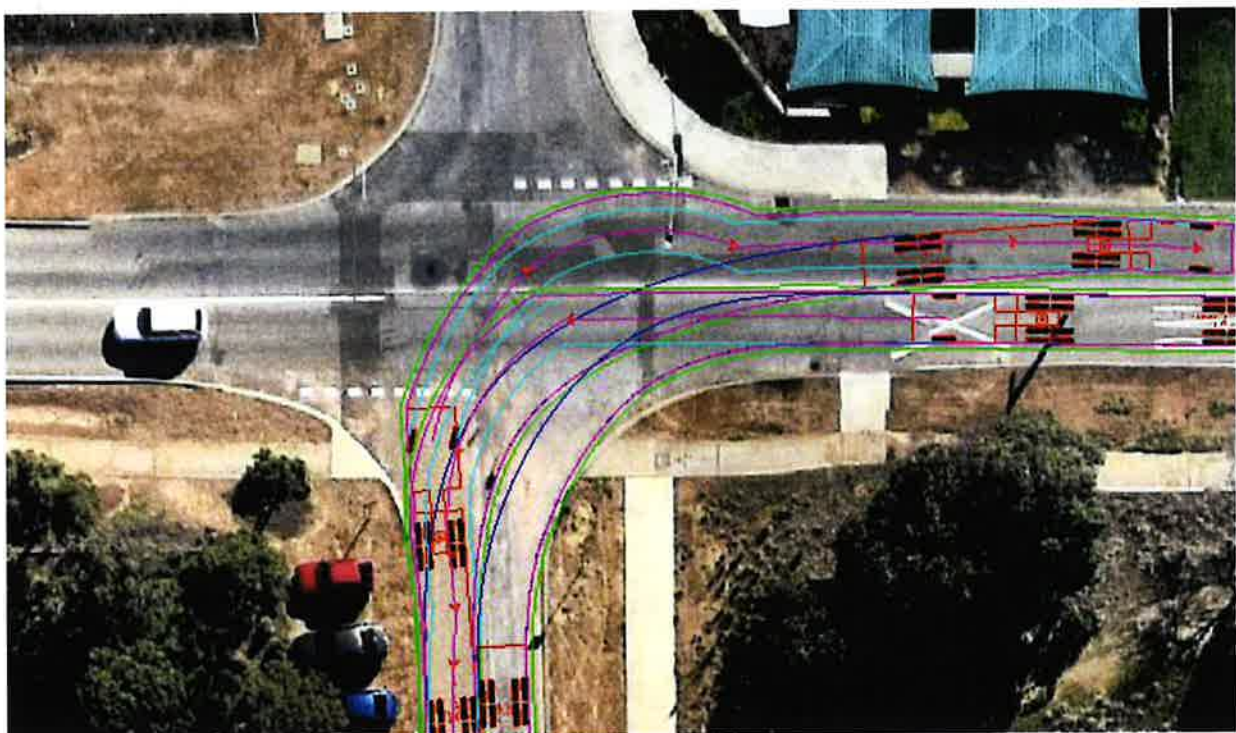


Figure 42 – Assessed swept path of 19 m ST turning right into and out of George St at Larsen St

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The Shire’s statement that “It will be necessary for all vehicles to remain lane compliant and to the left of the centre line at this intersection.” Is not consistent with WAPC Operational Policy Liveable Neighbourhoods (7) which states, in Section R58 of Element 2, that “At intersections, turning vehicles must be accommodated using Standards Association of Australia Design Vehicles and turning templates, to enable turns to be made in a single forward movement as follows:for turns between neighbourhood connector (i.e. Larsen Rd)...and an access street (i.e. George St), the design heavy rigid vehicle, using any part of the pavement.”

The assessment shown in Figure 42 is for the larger 19 m ST Design Vehicle as this is the largest service vehicle for all properties along George St and this larger vehicle has been shown to be able to complete all turn movements using any part of the pavement.





ISSUE 4: GEORGE ST ACCESS DRIVEWAYS

“George Street is planned to be the high street in Byford by the shire. Main roads recent access policy has been to discourage direct access to the highway and to favour access off George Street. Whilst George St is not line marked the shire does not consider it safe to have service vehicles sweeping across the total George street pavement when entering and exiting the development. George St is intended to be passenger vehicle and pedestrian in nature. Service Vehicles entering and existing the development should be lane complaint when making turning manoeuvres on George St.”

RESPONSE 4

Refer assessment in **Section 4.4.**

The Shire refers to Main Roads access policy. This access policy has been agreed with the Shire.

Subsequent to undertaking this assessment, the author requested and received from the Shire the latest “Movement Network Plan”, provided as Figure 43 on the following page. Whilst this shows the intention for George St to be part of the Town Centre and hence a “High Street in Byford” it does not include the section of George St north of the indicated Town Centre which includes the section of George St adjacent to the development site.

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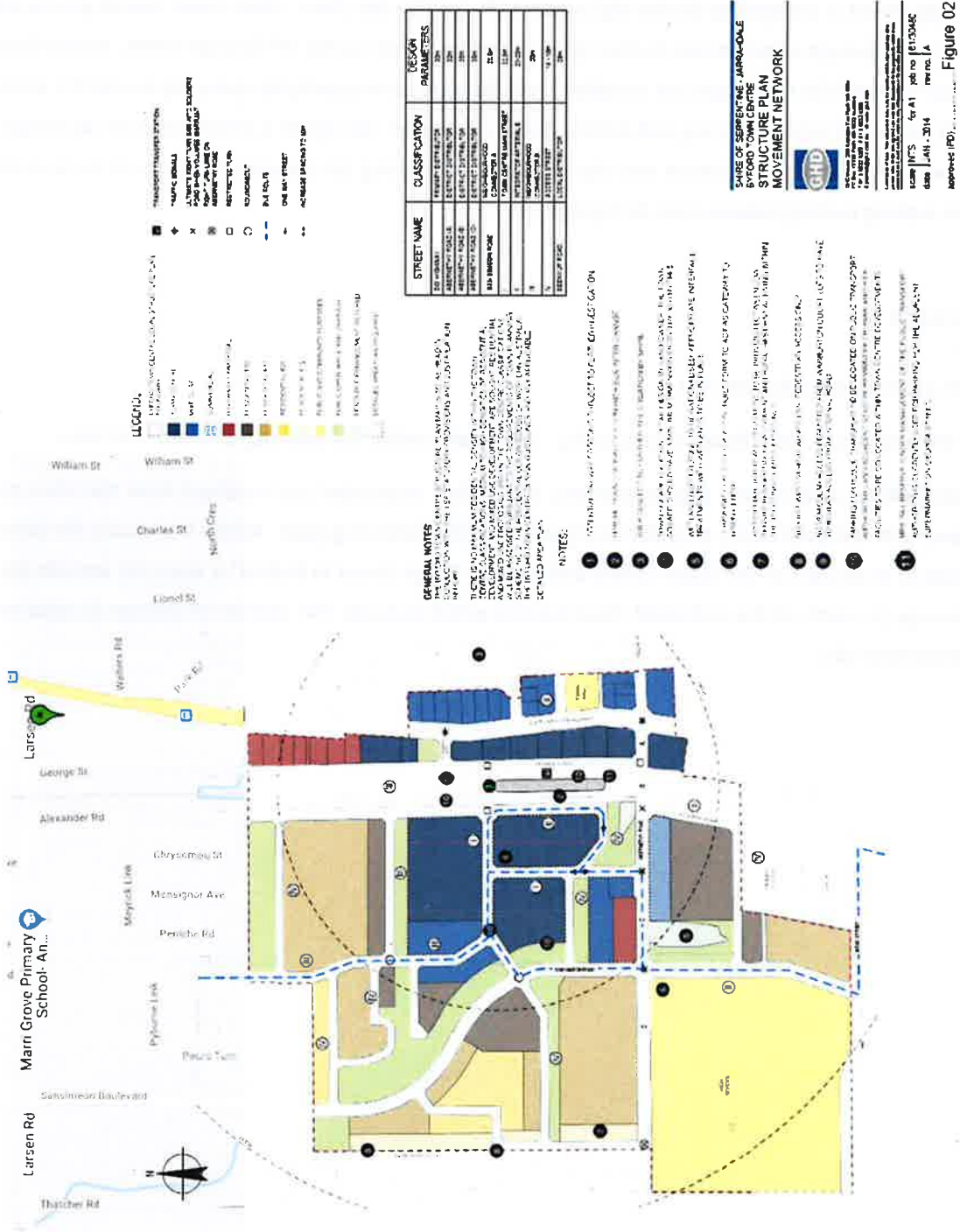


Figure 43 – SoSJ Byford Town Centre 'Movement Network Plan' with development site show as Final 3-0

ISSUE 5: LOADING BAY ORIENTATION AND ACCESS ARRANGEMENTS

“The loading bays currently proposed running parallel to George St require vehicles entering and exiting the loading area to drive across the main access driveway and to reverse onto the access driveway. The shire considers the current proposed loading bay arrangements to be unsafe. The loading bays should be reconfigured to eliminate reversing of large vehicles where interaction with the public is possible. Vehicles entering and exiting the loading bays should be able to do so without moving across the driveway intersection. As an example of a preferred arrangement on George St please see below an aerial of the Aldi development. Aldi have separated the loading from the customer with an additional George St Access.”

RESPONSE 5

It appears that the Shire’s officer may not be using the correct terminology for the elements of an off-street parking area as the development plans never showed a requirement for vehicles “to reverse onto the access driveway”. For clarification, the terminology used in this TIA is the same as that used in the Australian Standards, as shown in Figure 44 below.

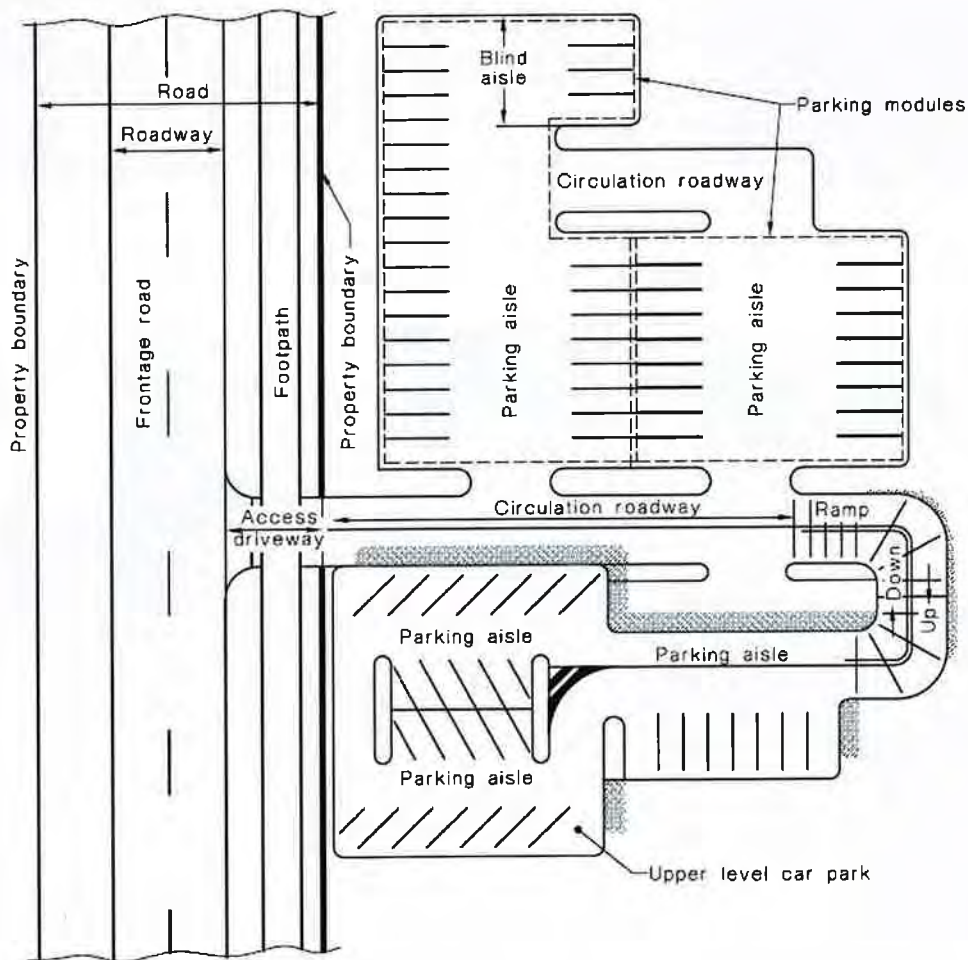


Figure 44 – Off-street car park elements and definitions

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The development drawings have been amended since issue of the last version of the TIA (F2.0).

As indicated in **Section 3**, the 12.5 m Heavy Rigid Vehicles will be the typical delivery and service vehicle for waste collection and stock deliveries to all tenancies. An assessment of the swept paths of the 12.5 m HRV accessing and egressing each Loading Bay is shown in Figure 45 and Figure 46 below.

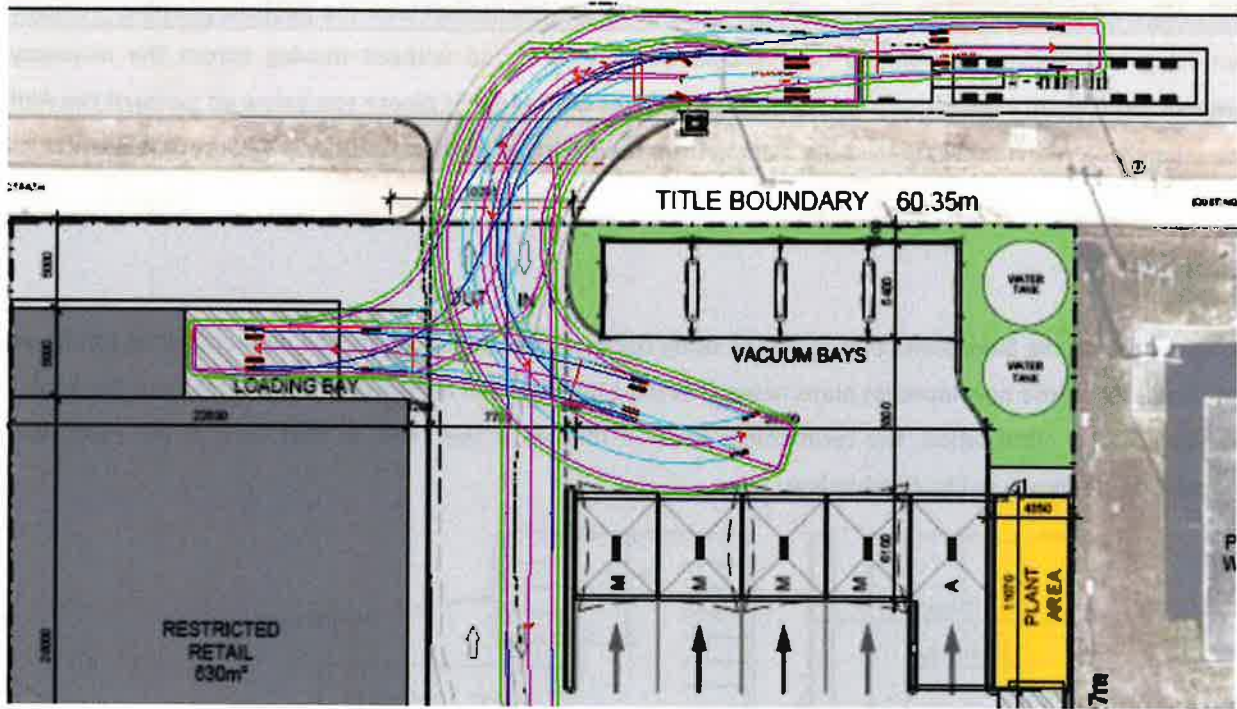


Figure 45 – Assessed swept path of 12.5 m HRV reversing into Restricted Retail Loading Bay and driving forward out onto George St (in colour – black outline is swept path of 19 m ST Fuel Tanker) – also shows swept path of 12.5 m HRV from George St to Loading Zone assessed in below



Figure 46 - Assessed swept path of 12.5 m HRV reversing into Restricted Retail Loading Bay and driving forward out onto George St (in colour – black outline is swept path of 19 m ST Fuel Tanker)

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PEAK HOUR TRAFFIC ON LARSEN RD

An assessment of the turning volume data collected on Wednesday 22nd August 2018 provided to the author by the Shire on 25th October 2018 has indicated maximum 'peak hour' volumes through this intersection occur between 3.15 and 4.15 PM as shown in Figure 47 below.

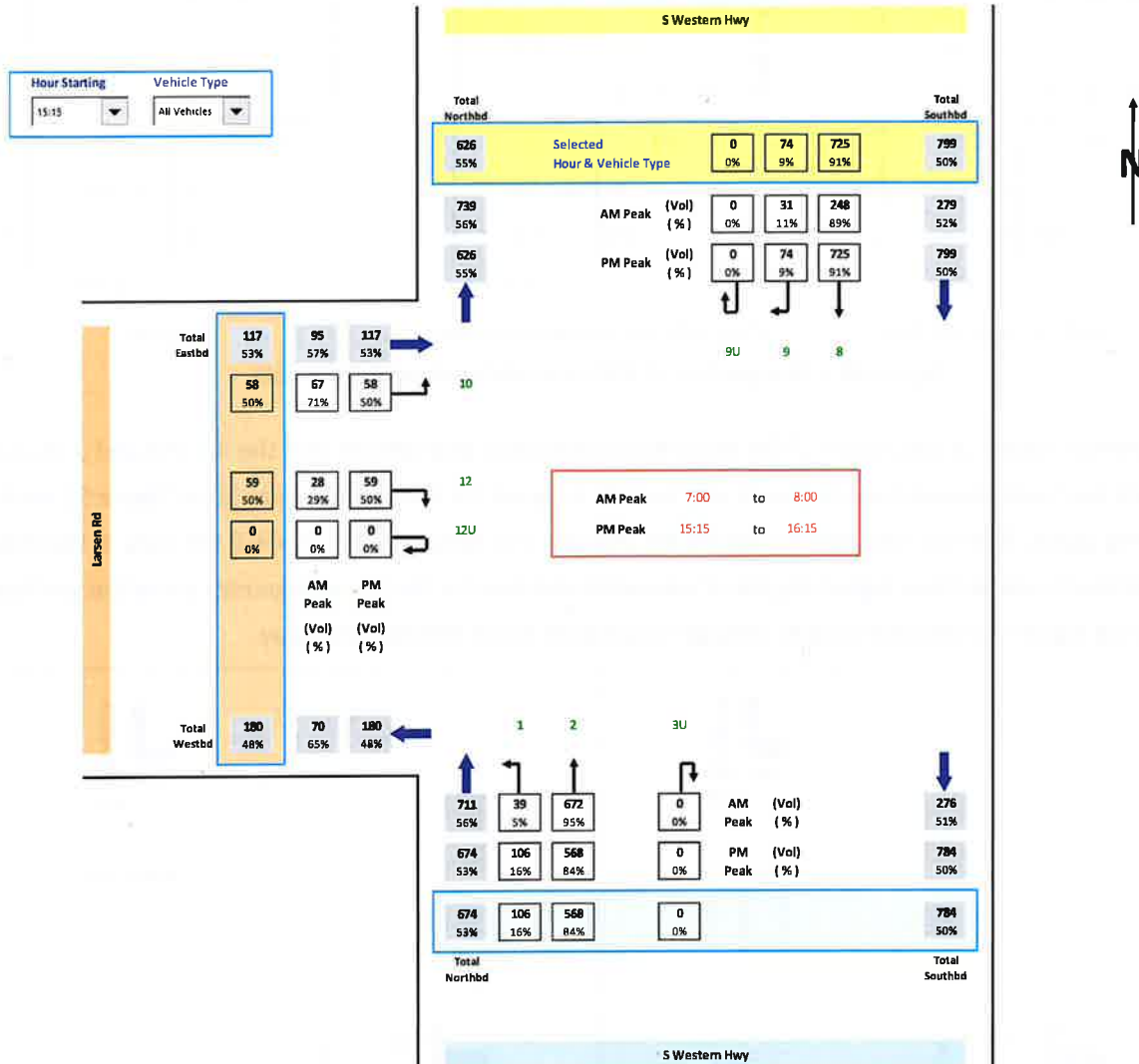


Figure 47 – Peak PM volumes through Larsen Rd/ SWH intersection on Wed 22 Aug 2018

A comparison between PM peak hour turning volume data collected on Wednesday 22nd August 2018 collected by the Shire and the PM peak hour data collected by the author in April 2018 and used for the assessment is provided as Figure 48 on the following page. This shows the total difference is 5 vehicles. There are higher volumes on Larsen Rd in the SoSJ data that may warrant assessment in order to provide stakeholders with confidence that the assessment is robust.

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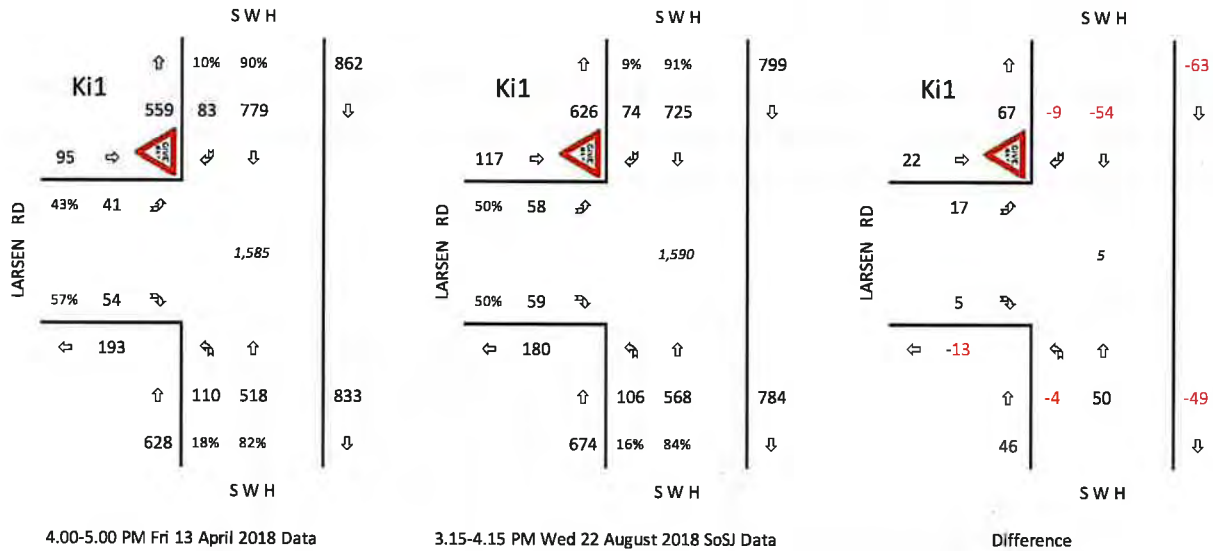


Figure 48 – Comparison of different midweek peak hour data

The forecast Degree of Saturation of the assessed intersections and options with the 4-5 PM and 3.15-4.15 PM data has been assessed and is shown side by side in Figure 49 below and Figure 50 to Figure 52 on the following pages. This has revealed no significant changes and indicates that the 4-5 PM data is the most appropriate to use as it has higher degree of saturation volumes for the key movements out of Larsen Road due to the higher northbound straight through volumes on South Western Highway.

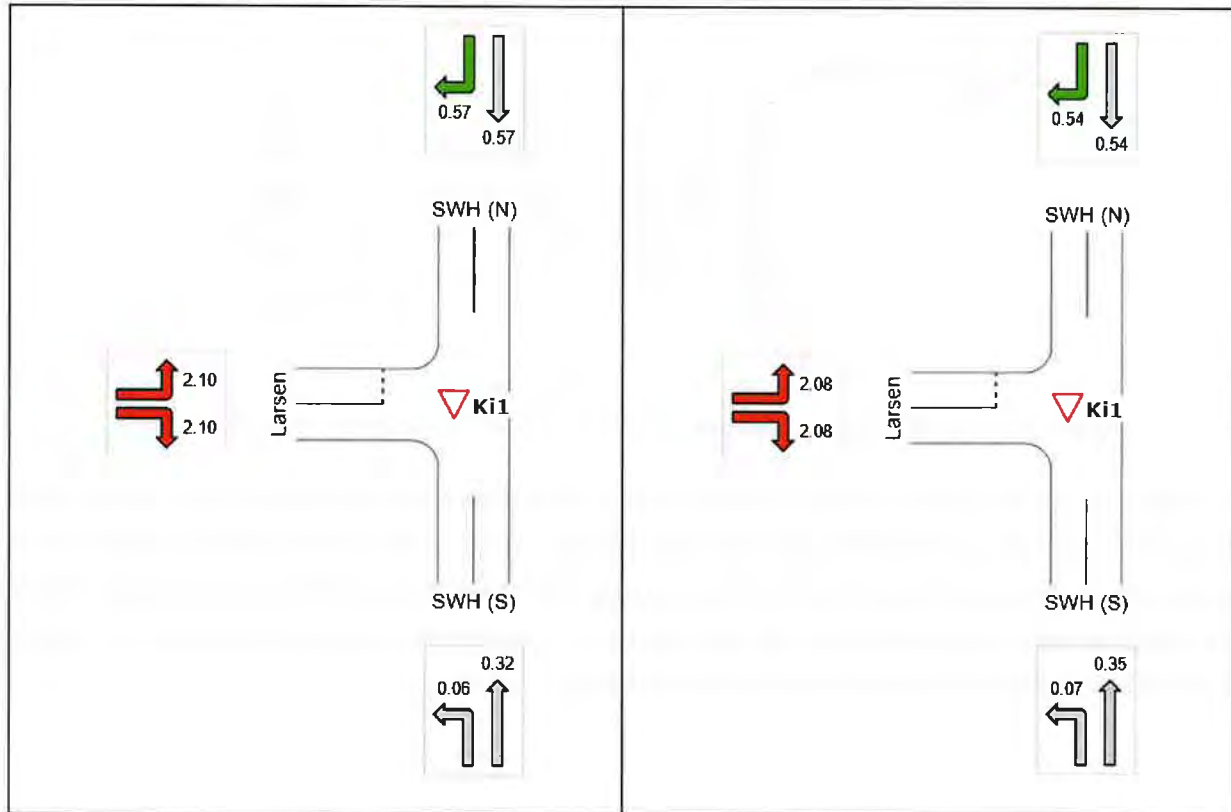


Figure 49 – Forecast 2020 Ki1 Degree of Saturation 4-5 PM v 3.15-4.15 PM data

Transport Impact Assessment

Proposed Mixed Use Development (Service Station + Convenience Store + Drive-Thru Coffee + Vehicle Servicing + Commercial Tenancies | Self Service + Automatic Car Wash), Lot 104

Prepared for Peter Webb & Associates | Procon

**DEVELOPMENT
 ASSESSMENT PANEL**
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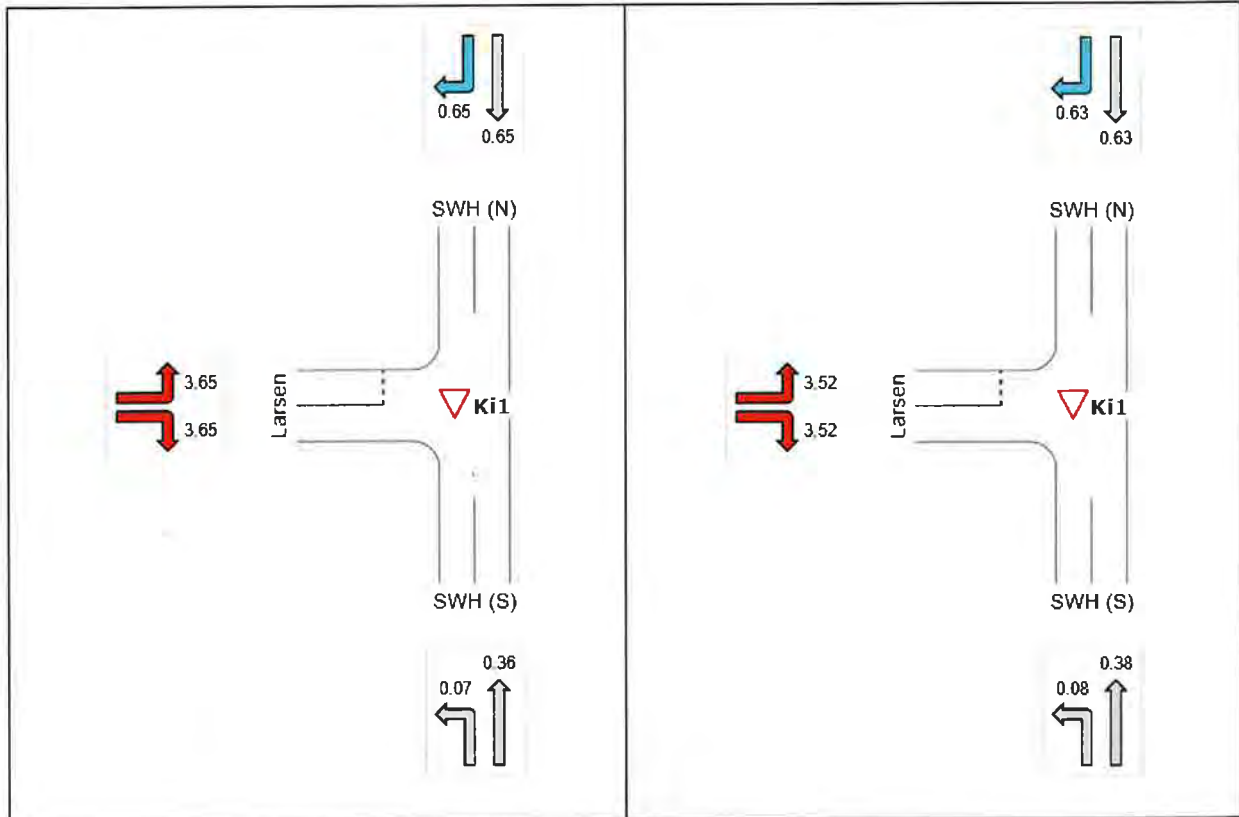


Figure 50 – Forecast 2030 Ki1 Degree of Saturation 4-5 PM v 3.15-4.15 PM data

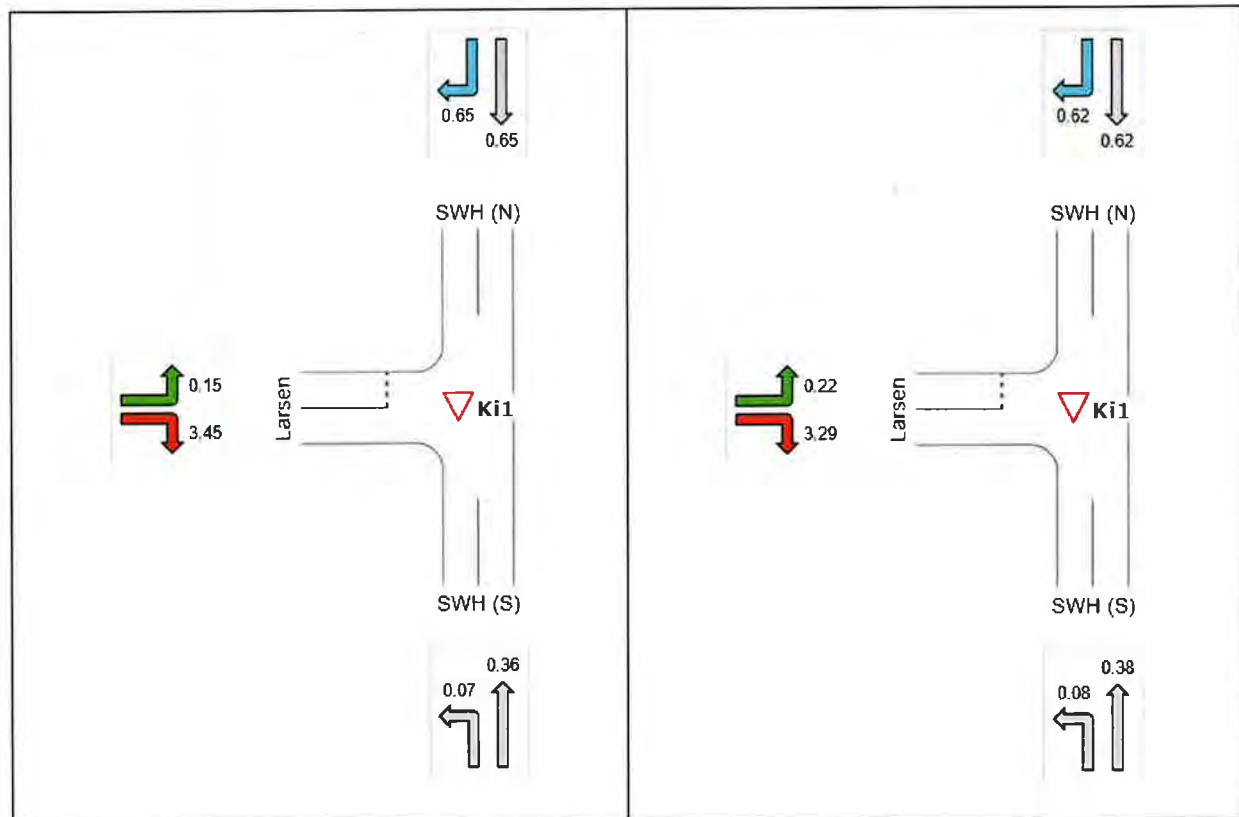


Figure 51 – Forecast 2030 Ki1 Option 1 Degree of Saturation 4-5 PM v 3.15-4.15 PM data

Transport Impact Assessment

Proposed Mixed Use Development (Service Station + Convenience Store + Drive-Thru Coffee | Vehicle Service Store | Commercial Tenancies | Self Service + Automatic Car Wash), Lot 104 (S/N3) Larsen Rd, (Cnr South Western Highway) Byford

Prepared for Peter Webb & Associates | Procon

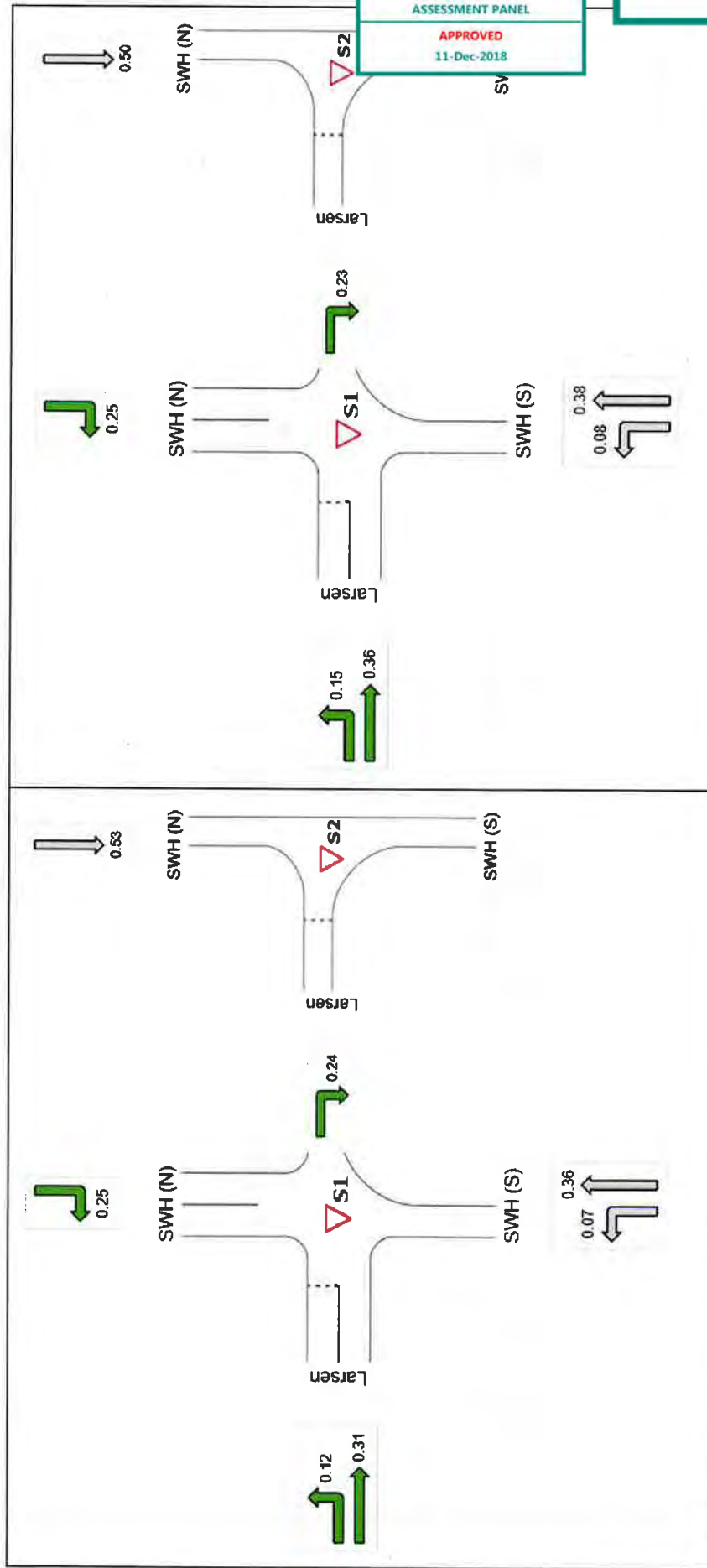


Figure 52— Forecast 2030 Ki1 Option 2 Degree of Saturation 4-5 PM v 3.15-4.15 PM data

Transport Impact Assessment

Proposed Mixed Use Development (Service Station + Convenience Store + Drive Thru Coffee + Vehicle Serv
Commercial Tenancies | Self Service + Automatic Car Wash), Lot 104
Prepared for Peter Webb & Associates | Procon



16 CONCLUSIONS

This TIA has determined that the proposed development is likely to generate up to 200 trips during its busiest hours. Up to 70% of these trips are likely to be from passing traffic. The existing Larsen Rd approach to South Western Hwy is currently very close to capacity during the road network midweek PM and Saturday peak hours, hence any increase in traffic, including that associated with annual growth and other development in the area, is likely to push this to capacity unless changes are made to this intersection.

Two options to address the capacity concerns have been assessed and have demonstrated that the intersection is forecast to perform better than the existing layout despite the increased traffic. This is due to the improved intersection layout, i.e. a two-stage crossing for right turns out of Larsen Rd and protected right and left turn lanes into Larsen Rd.



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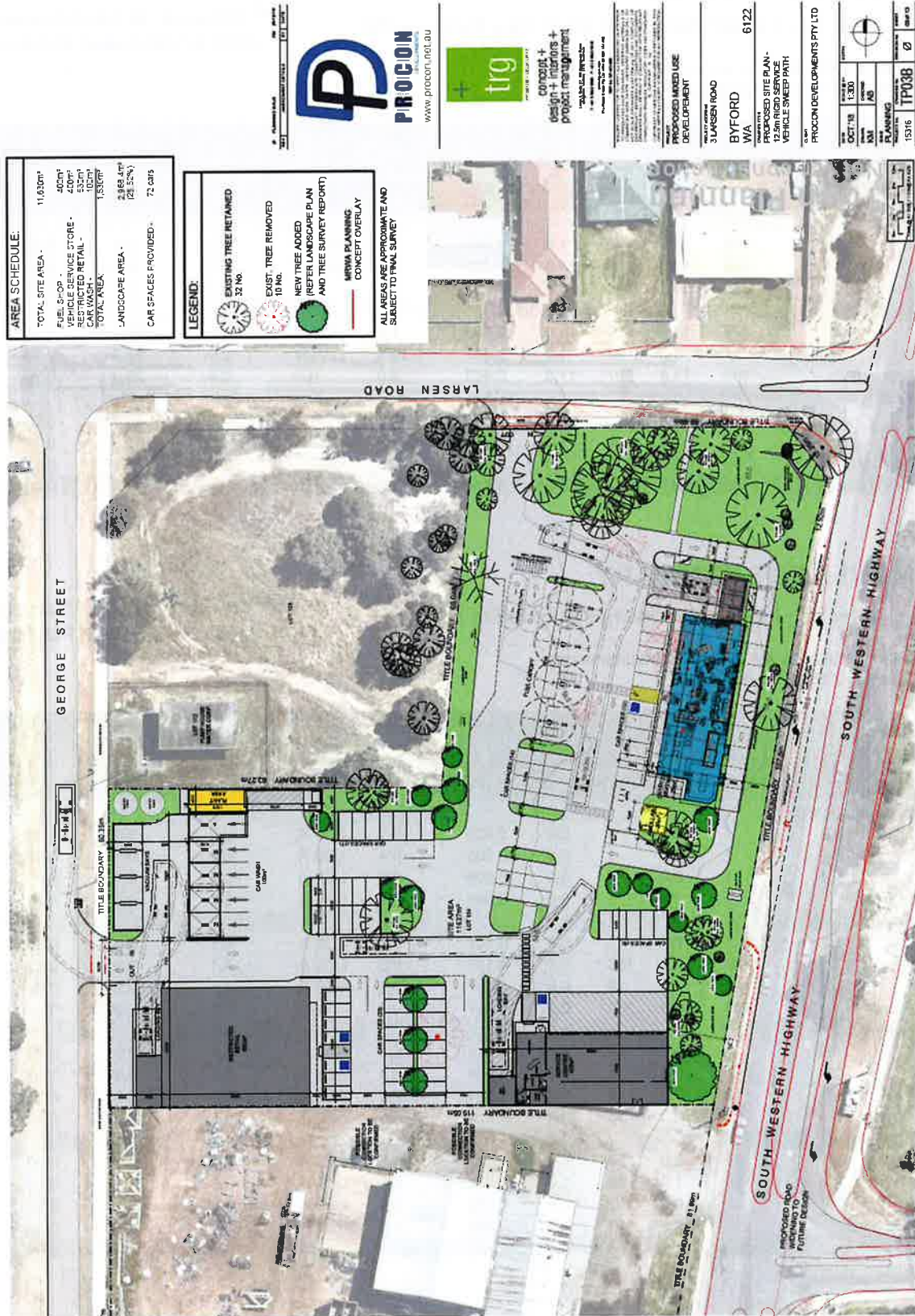


APPENDIX A DEVELOPMENT DRAWINGS

DEVELOPMENT ASSESSMENT PANEL
APPROVED 11-Dec-2018

10.1.2 - Attachment 3 DEVELOPMENT ASSESSMENT PANEL
APPROVED 09-Oct-2019





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09-Oct-2019

Transport Impact Assessment
Proposed Mixed Use Development (Service Station + Convenience Store + Commercial Tenancies | Self Service + Automatic Car Wash), Lot 104
Prepared for Peter Webb & Associates | Procon

DEVELOPMENT ASSESSMENT PANEL
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APPENDIX B SIDRA INTERSECTION DATA

MOVEMENT SUMMARY

▽ Site: Ki1: Larsen Rd/ South West Hwy Existing PM

⊕⊕ Network: Si1-Ki1 Existing
2018 4-5 Midweek PM Peak

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Giveaway / Yield (Two-Way)

Movement Performance - Vehicles													
Mov ID	ODMo v	Demand Flows		Arrival Flows		Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
		Total veh/h	HV %	Total veh/h	HV %				Vehicles veh	Distance m			
South: SWH (S)													
1	L2	116	1.0	116	1.0	0.063	5.6	LOS A	0.0	0.0	0.00	0.58	49.1
2	T1	545	13.0	545	13.0	0.303	0.0	LOS A	0.0	0.0	0.00	0.00	59.9
Approach		661	10.9	661	10.9	0.303	1.0	NA	0.0	0.0	0.00	0.10	59.0
North: SWH (N)													
3	T1	820	13.0	820	13.0	0.493	1.8	LOS A	2.9	22.3	0.26	0.08	57.6
4	R2	87	1.0	87	1.0	0.493	13.4	LOS B	2.9	22.3	0.33	0.10	55.5
Approach		907	11.8	907	11.8	0.493	3.0	NA	2.9	22.3	0.26	0.08	57.4
West: Larsen													
5	L2	43	1.0	43	1.0	0.914	87.9	LOS F	5.9	41.8	0.95	1.47	18.8
6	R2	57	1.0	57	1.0	0.914	144.3	LOS F	5.9	41.8	0.95	1.47	13.0
Approach		100	1.0	100	1.0	0.914	120.0	LOS F	5.9	41.8	0.95	1.47	15.7
All Vehicles		1668	10.8	1668	10.8	0.914	9.2	NA	5.9	41.8	0.20	0.17	52.4

MOVEMENT SUMMARY

▽ Site: Si1: Larsen Rd/ George St Existing PM

⊕⊕ Network: Si1-Ki1 Existing
2018 4-5 Midweek PM Peak

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Giveaway / Yield (Two-Way)

Movement Performance - Vehicles													
Mov ID	ODMo v	Demand Flows		Arrival Flows		Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
		Total veh/h	HV %	Total veh/h	HV %				Vehicles veh	Distance m			
South: George (S)													
1	L2	4	0.0	4	0.0	0.005	6.1	LOS A	0.0	0.1	0.28	0.54	51.0
2	T1	1	0.0	1	0.0	0.005	5.4	LOS A	0.0	0.1	0.28	0.54	52.1
3	R2	1	0.0	1	0.0	0.005	6.9	LOS A	0.0	0.1	0.28	0.54	42.7
Approach		6	0.0	6	0.0	0.005	6.1	LOS A	0.0	0.1	0.28	0.54	50.6
East: Larsen (E)													
4	L2	1	0.0	1	0.0	0.107	5.9	LOS A	0.1	0.9	0.05	0.06	54.5
5	T1	183	1.0	183	1.0	0.107	0.0	LOS A	0.1	0.9	0.05	0.06	58.9
6	R2	19	0.0	19	0.0	0.107	5.8	LOS A	0.1	0.9	0.05	0.06	56.1
Approach		203	0.9	203	0.9	0.107	0.6	NA	0.1	0.9	0.05	0.06	58.5
North: George (N)													
7	L2	9	0.0	9	0.0	0.024	5.8	LOS A	0.1	0.6	0.23	0.58	51.0
8	T1	1	0.0	1	0.0	0.024	5.4	LOS A	0.1	0.6	0.23	0.58	52.0
9	R2	14	0.0	14	0.0	0.024	7.0	LOS A	0.1	0.6	0.23	0.58	53.0
Approach		24	0.0	24	0.0	0.024	6.5	LOS A	0.1	0.6	0.23	0.58	52.4
West: Larsen (W)													
10	L2	27	0.0	27	0.0	0.062	5.6	LOS A	0.0	0.1	0.02	0.15	57.3
11	T1	89	1.0	89	1.0	0.062	0.0	LOS A	0.0	0.1	0.02	0.15	57.3
12	R2	2	0.0	2	0.0	0.062	6.0	LOS A	0.0	0.1	0.02	0.15	55.4
Approach		119	0.8	119	0.8	0.062	1.4	NA	0.0	0.1	0.02	0.15	57.2
All Vehicles		353	0.8	353	0.8	0.107	1.4	NA	0.1	0.9	0.06	0.13	57.3

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Transport Impact Assessment

Proposed Mixed Use Development (Service Station + Convenience Store + Drive Thru Coffee + Vehicle Servicing + Commercial Tenancies | Self Service + Automatic Car Wash), Lot 104 (Northern)

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DEVELOPMENT ASSESSMENT PANEL

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11-Dec-2018

MOVEMENT SUMMARY

Site: Ki1: Larsen Rd/ South West Hwy Existing SAT

Network: Si1-Ki1 Existing
2018 1-2 Saturday Peak

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Giveaway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	ODMo v	Demand Flows		Arrival Flows		Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
		Total veh/h	HV %	Total veh/h	HV %								
South: SWH (S)													
1	L2	80	1.0	80	1.0	0.060	5.6	LOS A	0.0	0.0	0.00	0.43	51.3
2	T1	564	13.0	564	13.0	0.298	0.0	LOS A	0.0	0.0	0.00	0.02	59.7
Approach		644	11.5	644	11.5	0.298	0.7	NA	0.0	0.0	0.00	0.07	59.3
North: SWH (N)													
3	T1	597	13.0	597	13.0	0.375	1.6	LOS A	2.0	15.1	0.25	0.09	57.7
4	R2	78	1.0	78	1.0	0.375	11.8	LOS B	2.0	15.1	0.32	0.12	55.7
Approach		675	11.6	675	11.6	0.375	2.8	NA	2.0	15.1	0.26	0.09	57.5
West: Larsen													
5	L2	47	1.0	47	1.0	0.510	16.9	LOS C	2.1	15.0	0.87	1.06	37.2
6	R2	55	1.0	55	1.0	0.510	45.3	LOS E	2.1	15.0	0.87	1.06	29.8
Approach		102	1.0	102	1.0	0.510	32.2	LOS D	2.1	15.0	0.87	1.06	33.8
All Vehicles		1421	10.8	1421	10.8	0.510	4.0	NA	2.1	15.1	0.18	0.15	56.4

MOVEMENT SUMMARY

Site: Si1: Larsen Rd/ George St Existing SAT

Network: Si1-Ki1 Existing
2018 1-2 Saturday Peak

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Giveaway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	ODMo v	Demand Flows		Arrival Flows		Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
		Total veh/h	HV %	Total veh/h	HV %								
South: George (S)													
1	L2	1	0.0	1	0.0	0.004	5.9	LOS A	0.0	0.1	0.28	0.55	51.2
2	T1	1	0.0	1	0.0	0.004	5.0	LOS A	0.0	0.1	0.28	0.55	52.2
3	R2	2	0.0	2	0.0	0.004	6.6	LOS A	0.0	0.1	0.28	0.55	43.0
Approach		4	0.0	4	0.0	0.004	6.1	LOS A	0.0	0.1	0.28	0.55	49.3
East: Larsen (E)													
4	L2	1	0.0	1	0.0	0.084	5.8	LOS A	0.1	0.9	0.06	0.08	54.1
5	T1	137	1.0	137	1.0	0.084	0.1	LOS A	0.1	0.9	0.06	0.08	58.5
6	R2	20	0.0	20	0.0	0.084	5.7	LOS A	0.1	0.9	0.06	0.08	55.9
Approach		158	0.9	158	0.9	0.084	0.8	NA	0.1	0.9	0.06	0.08	58.1
North: George (N)													
7	L2	17	0.0	17	0.0	0.020	5.8	LOS A	0.1	0.5	0.18	0.55	51.4
8	T1	1	0.0	1	0.0	0.020	5.1	LOS A	0.1	0.5	0.18	0.55	52.3
9	R2	7	0.0	7	0.0	0.020	6.6	LOS A	0.1	0.5	0.18	0.55	53.2
Approach		25	0.0	25	0.0	0.020	6.0	LOS A	0.1	0.5	0.18	0.55	52.2
West: Larsen (W)													
10	L2	8	0.0	8	0.0	0.048	5.6	LOS A	0.0	0.1	0.01	0.06	58.0
11	T1	83	1.0	83	1.0	0.048	0.0	LOS A	0.0	0.1	0.01	0.06	58.8
12	R2	1	0.0	1	0.0	0.048	5.9	LOS A	0.0	0.1	0.01	0.06	56.3
Approach		93	0.9	93	0.9	0.048	0.6	NA	0.0	0.1	0.01	0.06	58.6
All Vehicles		280	0.8	280	0.8	0.084	1.3	NA	0.1	0.9	0.06	0.12	57.4

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Transport Impact Assessment
Proposed Mixed Use Development (Service Station + Convenience Store +
Commercial Tenancies | Self Service + Automatic Car Wash), Lot 104
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DEVELOPMENT ASSESSMENT PANEL
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MOVEMENT SUMMARY

Site: Ki1: Larsen Rd/ South West Hwy 2030 1-2 PM

Network: Si1-Ki1 Forecast 2030
1-2 PM Midweek Peak

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Giveaway / Yield (Two-Way)

Movement Performance - Vehicles													
Mov ID	OD Mov	Demand Total veh/h	Flows HV %	Arrival Total veh/h	Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: SWH (S)													
1	L2	89	1.0	89	1.0	0.056	5.6	LOS A	0.0	0.0	0.00	0.50	50.2
2	T1	520	13.0	520	13.0	0.281	0.0	LOS A	0.0	0.0	0.00	0.01	59.8
Approach		609	11.2	609	11.2	0.281	0.8	NA	0.0	0.0	0.00	0.09	59.2
North: SWH (N)													
3	T1	534	13.0	534	13.0	0.376	2.0	LOS A	2.3	17.9	0.30	0.14	57.2
4	R2	107	1.0	107	1.0	0.376	11.2	LOS B	2.3	17.9	0.40	0.18	54.6
Approach		641	11.0	641	11.0	0.376	3.5	NA	2.3	17.9	0.32	0.14	56.9
West: Larsen													
5	L2	81	1.0	81	1.0	0.670	20.9	LOS C	3.6	25.5	0.87	1.18	36.6
6	R2	82	1.0	82	1.0	0.670	46.4	LOS E	3.6	25.5	0.87	1.18	29.2
Approach		163	1.0	163	1.0	0.670	33.7	LOS D	3.6	25.5	0.87	1.18	33.4
All Vehicles		1414	9.9	1414	9.9	0.670	5.8	NA	3.6	25.5	0.24	0.24	54.6

MOVEMENT SUMMARY

Site: Si1: Larsen Rd/ George St 2030 1-2 PM

Network: Si1-Ki1 Forecast 2030
1-2 PM Midweek Peak

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Giveaway / Yield (Two-Way)

Movement Performance - Vehicles													
Mov ID	OD Mov	Demand Total veh/h	Flows HV %	Arrival Total veh/h	Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: George (S)													
1	L2	2	0.0	2	0.0	0.020	5.9	LOS A	0.1	0.5	0.33	0.60	50.7
2	T1	1	0.0	1	0.0	0.020	5.3	LOS A	0.1	0.5	0.33	0.60	51.8
3	R2	15	0.0	15	0.0	0.020	6.9	LOS A	0.1	0.5	0.33	0.60	42.0
Approach		18	0.0	18	0.0	0.020	6.7	LOS A	0.1	0.5	0.33	0.60	45.2
East: Larsen (E)													
4	L2	14	0.0	14	0.0	0.091	5.8	LOS A	0.2	1.1	0.08	0.11	53.3
5	T1	137	1.0	137	1.0	0.091	0.1	LOS A	0.2	1.1	0.08	0.11	57.9
6	R2	20	0.0	20	0.0	0.091	5.8	LOS A	0.2	1.1	0.08	0.11	55.4
Approach		171	0.8	171	0.8	0.091	1.2	NA	0.2	1.1	0.08	0.11	57.3
North: George (N)													
7	L2	12	0.0	12	0.0	0.016	5.9	LOS A	0.1	0.4	0.23	0.56	51.2
8	T1	1	0.0	1	0.0	0.016	5.3	LOS A	0.1	0.4	0.23	0.56	52.1
9	R2	6	0.0	6	0.0	0.016	6.8	LOS A	0.1	0.4	0.23	0.56	53.1
Approach		19	0.0	19	0.0	0.016	6.2	LOS A	0.1	0.4	0.23	0.56	52.1
West: Larsen (W)													
10	L2	4	0.0	4	0.0	0.067	5.8	LOS A	0.0	0.2	0.02	0.03	58.2
11	T1	121	1.0	121	1.0	0.067	0.0	LOS A	0.0	0.2	0.02	0.03	59.2
12	R2	3	0.0	3	0.0	0.067	5.9	LOS A	0.0	0.2	0.02	0.03	56.6
Approach		128	0.9	128	0.9	0.067	0.3	NA	0.0	0.2	0.02	0.03	59.0
All Vehicles		336	0.8	336	0.8	0.091	1.5	NA	0.2	1.1	0.08	0.13	57.0

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Transport Impact Assessment

Proposed Mixed Use Development (Service Station + Convenience Store + Drive-Thru Coffee | Vehicle Serv
 Commercial Tenancies | Self Service + Automatic Car Wash), Lot 104
 Prepared for Peter Webb & Associates | Procon

DEVELOPMENT ASSESSMENT PANEL
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MOVEMENT SUMMARY

Site: Ki1: Larsen Rd/ South West Hwy 2030 4-5 PM

Network: Si1-Ki1 Forecast 2030
 4-5 PM Midweek Peak

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 Giveaway / Yield (Two-Way)

Movement Performance - Vehicles													
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: SWH (S)													
1	L2	151	1.0	151	1.0	0.082	5.6	LOS A	0.0	0.0	0.00	0.58	49.1
2	T1	651	13.0	651	13.0	0.362	0.0	LOS A	0.0	0.0	0.00	0.00	59.9
Approach		801	10.7	801	10.7	0.362	1.1	NA	0.0	0.0	0.00	0.11	58.9
North: SWH (N)													
3	T1	957	13.0	957	13.0	0.656	4.4	LOS A	6.9	52.6	0.44	0.12	55.2
4	R2	131	1.0	131	1.0	0.656	19.2	LOS C	6.9	52.6	0.59	0.16	51.1
Approach		1087	11.6	1087	11.6	0.656	6.2	NA	6.9	52.6	0.46	0.13	54.9
West: Larsen													
5	L2	89	1.0	89	1.0	3.737	2506.4	LOS F	52.8	372.8	1.00	3.64	1.3
6	R2	104	1.0	104	1.0	3.737	2661.5	LOS F	52.8	372.8	1.00	3.64	0.8
Approach		194	1.0	194	1.0	3.737	2589.8	LOS F	52.8	372.8	1.00	3.64	1.0
All Vehicles		2082	10.3	2082	10.3	3.737	244.6	NA	52.8	372.8	0.33	0.45	12.3

MOVEMENT SUMMARY

Site: Ki1: Larsen Rd/ South West Hwy 2030 4-5 PM

Network: Si1-Ki1 Forecast 2030
 4-5 PM Midweek Peak

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 Giveaway / Yield (Two-Way)

Movement Performance - Vehicles													
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: SWH (S)													
1	L2	151	1.0	151	1.0	0.082	5.6	LOS A	0.0	0.0	0.00	0.58	49.1
2	T1	651	13.0	651	13.0	0.362	0.0	LOS A	0.0	0.0	0.00	0.00	59.9
Approach		801	10.7	801	10.7	0.362	1.1	NA	0.0	0.0	0.00	0.11	58.9
North: SWH (N)													
3	T1	957	13.0	957	13.0	0.656	4.4	LOS A	6.9	52.6	0.44	0.12	55.2
4	R2	131	1.0	131	1.0	0.656	19.2	LOS C	6.9	52.6	0.59	0.16	51.1
Approach		1087	11.6	1087	11.6	0.656	6.2	NA	6.9	52.6	0.46	0.13	54.9
West: Larsen													
5	L2	89	1.0	89	1.0	3.737	2506.4	LOS F	52.8	372.8	1.00	3.64	1.3
6	R2	104	1.0	104	1.0	3.737	2661.5	LOS F	52.8	372.8	1.00	3.64	0.8
Approach		194	1.0	194	1.0	3.737	2589.8	LOS F	52.8	372.8	1.00	3.64	1.0
All Vehicles		2082	10.3	2082	10.3	3.737	244.6	NA	52.8	372.8	0.33	0.45	12.3

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Transport Impact Assessment

Proposed Mixed Use Development (Service Station + Convenience Store + Drive Thru Coffee + Vehicle Servicing + Commercial Tenancies | Self Service + Automatic Car Wash), Lot 104
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DEVELOPMENT ASSESSMENT PANEL
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MOVEMENT SUMMARY

Site: Ki1: Larsen Rd/ South West Hwy 2030 1-2 Sat

Network: Si1-Ki1 Forecast 2030
1-2 PM Saturday Peak

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Giveaway / Yield (Two-Way)

Movement Performance - Vehicles													
Mov ID	OD Mov	Demand Total veh/h	Flows HV %	Arrival Total veh/h	Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: SWH (S)													
1	L2	117	1.0	117	1.0	0.073	5.6	LOS A	0.0	0.0	0.00	0.51	50.1
2	T1	672	13.0	672	13.0	0.364	0.0	LOS A	0.0	0.0	0.00	0.01	59.8
Approach		788	11.2	788	11.2	0.364	0.9	NA	0.0	0.0	0.00	0.09	59.1
North: SWH (N)													
3	T1	708	13.0	708	13.0	0.531	4.0	LOS A	4.8	36.8	0.42	0.15	55.6
4	R2	126	1.0	126	1.0	0.531	16.2	LOS C	4.8	36.8	0.57	0.20	51.5
Approach		835	11.2	835	11.2	0.531	5.8	NA	4.8	36.8	0.44	0.15	55.1
West: Larsen													
5	L2	105	1.0	105	1.0	1.985	921.4	LOS F	52.8	372.8	1.00	4.44	3.3
6	R2	114	1.0	114	1.0	1.985	992.9	LOS F	52.8	372.8	1.00	4.44	2.0
Approach		219	1.0	219	1.0	1.985	958.5	LOS F	52.8	372.8	1.00	4.44	2.6
All Vehicles		1842	10.0	1842	10.0	1.985	116.9	NA	52.8	372.8	0.32	0.63	20.9

MOVEMENT SUMMARY

Site: Si1: Larsen Rd/ George St 2030 1-2 Sat

Network: Si1-Ki1 Forecast 2030
1-2 PM Saturday Peak

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Movement Performance - Vehicles													
Mov ID	OD Mov	Demand Total veh/h	Flows HV %	Arrival Total veh/h	Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: George (S)													
1	L2	3	0.0	3	0.0	0.048	29.9	LOS D	0.3	2.4	0.78	0.68	38.8
2	T1	1	0.0	1	0.0	0.048	19.8	LOS C	0.3	2.4	0.78	0.68	40.6
3	R2	18	0.0	18	0.0	0.048	22.2	LOS C	0.3	2.4	0.78	0.68	24.2
Approach		22	0.0	22	0.0	0.048	23.2	LOS C	0.3	2.4	0.78	0.68	28.8
East: Larsen (E)													
4	L2	16	0.0	16	0.0	0.104	5.9	LOS A	0.2	1.3	0.08	0.11	53.2
5	T1	158	1.0	158	1.0	0.104	0.1	LOS A	0.2	1.3	0.08	0.11	57.9
6	R2	22	0.0	22	0.0	0.104	6.0	LOS A	0.2	1.3	0.08	0.11	55.4
Approach		196	0.8	196	0.8	0.104	1.2	NA	0.2	1.3	0.08	0.11	57.3
North: George (N)													
7	L2	19	0.0	19	0.0	0.041	27.2	LOS D	0.5	3.3	0.80	0.55	35.9
8	T1	1	0.0	1	0.0	0.041	17.3	LOS C	0.5	3.3	0.80	0.55	39.9
9	R2	8	0.0	8	0.0	0.041	19.8	LOS C	0.5	3.3	0.80	0.55	42.7
Approach		28	0.0	28	0.0	0.041	24.7	LOS C	0.5	3.3	0.80	0.55	38.7
West: Larsen (W)													
10	L2	9	0.0	9	0.0	0.158	27.6	LOS D	0.7	4.9	0.22	0.04	53.7
11	T1	145	1.0	145	1.0	0.158	4.1	LOS A	0.7	4.9	0.22	0.04	50.1
12	R2	3	0.0	3	0.0	0.158	33.9	LOS D	0.7	4.9	0.22	0.04	50.6
Approach		158	0.9	158	0.9	0.158	6.1	NA	0.7	4.9	0.22	0.04	50.5
All Vehicles		404	0.8	404	0.8	0.158	6.0	NA	0.7	4.9	0.23	0.15	51.0

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Transport Impact Assessment

Proposed Mixed Use Development (Service Station + Convenience Store + Drive-Thru Coffee | Vehicle Servicing + Commercial Tenancies | Self Service + Automatic Car Wash), Lot 104

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MOVEMENT SUMMARY

Site: Ki1: Option 1: Larsen Rd/ South West Hwy 2030 4-5 PM S1 - Copy

Network: Option 1: 2030 4-5 PM Midweek Peak

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 Giveaway / Yield (Two-Way)

Movement Performance - Vehicles													
Mov ID	OD Mov	Demand Total veh/h	Flows HV %	Arrival Total veh/h	Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back Vehicles veh	Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: SWH (S)													
1	L2	151	1.0	151	1.0	0.082	5.6	LOS A	0.0	0.0	0.00	0.58	49.3
2	T1	651	13.0	651	13.0	0.362	0.0	LOS A	0.0	0.0	0.00	0.00	59.9
Approach		801	10.7	801	10.7	0.362	1.1	NA	0.0	0.0	0.00	0.11	58.6
North: SWH (N)													
4	R2	131	1.0	131	1.0	0.257	12.4	LOS B	1.0	7.2	0.71	0.91	47.3
Approach		131	1.0	131	1.0	0.257	12.4	NA	1.0	7.2	0.71	0.91	47.3
West: Larsen													
5	L2	89	1.0	89	1.0	0.436	11.7	LOS B	2.2	15.4	0.78	1.00	45.7
6	T1	104	0.0	104	0.0	0.436	18.8	LOS C	2.2	15.4	0.78	1.00	23.2
Approach		194	0.5	194	0.5	0.436	15.5	LOS C	2.2	15.4	0.78	1.00	39.2
All Vehicles		1125	7.8	1125	7.8	0.436	4.9	NA	2.2	15.4	0.22	0.35	54.6

MOVEMENT SUMMARY

Site: Ki1: Option 1: Larsen Rd/ South West Hwy 2030 4-5 PM S2 - Copy

Network: Option 1: 2030 4-5 PM Midweek Peak

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 Giveaway / Yield (Two-Way)

Movement Performance - Vehicles													
Mov ID	OD Mov	Demand Total veh/h	Flows HV %	Arrival Total veh/h	Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back Vehicles veh	Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
North: SWH (N)													
7	T1	957	13.0	957	13.0	0.532	0.2	LOS A	0.0	0.0	0.00	0.00	59.8
Approach		957	13.0	957	13.0	0.532	0.2	NA	0.0	0.0	0.00	0.00	59.8
West: Larsen													
3	R2	104	1.0	104	1.0	0.243	9.5	LOS A	0.8	5.4	0.76	0.91	40.3
Approach		104	1.0	104	1.0	0.243	9.5	LOS A	0.8	5.4	0.76	0.91	40.3
All Vehicles		1061	11.8	1061	11.8	0.532	1.1	NA	0.8	5.4	0.07	0.09	58.7

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Proposed Mixed Use Development (Service Station + Convenience Store + Self-Service Car Wash + Commercial Tenancies | Self Service + Automatic Car Wash), Lot 104
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MOVEMENT SUMMARY

Site: Ki1: Option 2: Larsen Rd/ South West Hwy 2030 4-5 PM S1

Network: Option 2: 2030 4-5 PM Midweek Peak

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 Giveway / Yield (Two-Way)

Movement Performance - Vehicles													
Mov ID	OD Mov	Demand Flows Total veh/h	Flows HV %	Arrival Flows Total veh/h	Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: SWH (S)													
1	L2	151	1.0	151	1.0	0.082	5.6	LOS A	0.0	0.0	0.00	0.58	49.3
2	T1	651	13.0	651	13.0	0.362	0.0	LOS A	0.0	0.0	0.00	0.00	59.9
Approach		801	10.7	801	10.7	0.362	1.1	NA	0.0	0.0	0.00	0.11	58.6
North: SWH (N)													
4	R2	131	1.0	131	1.0	0.257	12.4	LOS B	1.0	7.2	0.71	0.90	47.5
Approach		131	1.0	131	1.0	0.257	12.4	NA	1.0	7.2	0.71	0.90	47.5
West: Larsen													
5	L2	89	1.0	89	1.0	0.117	9.0	LOS A	0.4	3.0	0.57	0.80	50.3
6	T1	104	0.0	104	0.0	0.319	17.3	LOS C	1.4	9.5	0.80	0.96	21.4
Approach		194	0.5	194	0.5	0.319	13.4	LOS B	1.4	9.5	0.70	0.88	41.0
All Vehicles		1125	7.8	1125	7.8	0.362	4.5	NA	1.4	9.5	0.20	0.33	55.0

MOVEMENT SUMMARY

Site: Ki1: Option 2: Larsen Rd/ South West Hwy 2030 4-5 PM S2

Network: Option 2: 2030 4-5 PM Midweek Peak

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 Giveway / Yield (Two-Way)

Movement Performance - Vehicles													
Mov ID	OD Mov	Demand Flows Total veh/h	Flows HV %	Arrival Flows Total veh/h	Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
North: SWH (N)													
7	T1	957	13.0	957	13.0	0.532	0.2	LOS A	0.0	0.0	0.00	0.00	59.8
Approach		957	13.0	957	13.0	0.532	0.2	NA	0.0	0.0	0.00	0.00	59.8
West: Larsen													
3	R2	104	1.0	104	1.0	0.243	9.5	LOS A	0.8	5.4	0.76	0.91	40.3
Approach		104	1.0	104	1.0	0.243	9.5	LOS A	0.8	5.4	0.76	0.91	40.3
All Vehicles		1061	11.8	1061	11.8	0.532	1.1	NA	0.8	5.4	0.07	0.09	58.7

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Transport Impact Assessment

Proposed Mixed Use Development (Service Station + Convenience Store + Drive-Thru Coffee + Vehicle Servicing + Commercial Tenancies | Self Service + Automatic Car Wash), Lot 104

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MOVEMENT SUMMARY

Site: Larsen Rd/ Access 2030 Midweek 1-2

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Giveaway / Yield (Two-Way)

Movement Performance - Vehicles												
Mov ID	OD Mov	Demand Total veh/h	Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h	
South: Access												
1	L2	22	2.0	0.081	0.3	LOS A	0.3	2.0	0.22	0.12	24.9	
2	R2	73	2.0	0.081	0.7	LOS A	0.3	2.0	0.22	0.12	22.6	
Approach		95	2.0	0.081	0.6	LOS A	0.3	2.0	0.22	0.12	23.1	
East: Larsen Rd												
3	L2	47	2.0	0.067	4.3	LOS A	0.0	0.0	0.00	0.19	42.1	
4	T1	87	2.0	0.067	0.0	LOS A	0.0	0.0	0.00	0.19	44.0	
Approach		135	2.0	0.067	1.5	NA	0.0	0.0	0.00	0.19	43.2	
West: Larsen Rd												
5	T1	15	2.0	0.037	0.4	LOS A	0.2	1.2	0.24	0.39	35.7	
6	R2	47	2.0	0.037	5.0	LOS A	0.2	1.2	0.24	0.39	26.4	
Approach		62	2.0	0.037	3.9	NA	0.2	1.2	0.24	0.39	27.8	
All Vehicles		292	2.0	0.081	1.7	NA	0.3	2.0	0.12	0.21	30.4	

MOVEMENT SUMMARY

Site: Larsen Rd/ Access 2030 Midweek 4-5

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Giveaway / Yield (Two-Way)

Movement Performance - Vehicles												
Mov ID	OD Mov	Demand Total veh/h	Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h	
South: Access												
1	L2	4	2.0	0.074	0.3	LOS A	0.2	1.7	0.24	0.14	24.8	
2	R2	78	2.0	0.074	0.7	LOS A	0.2	1.7	0.24	0.14	22.5	
Approach		82	2.0	0.074	0.7	LOS A	0.2	1.7	0.24	0.14	22.7	
East: Larsen Rd												
3	L2	41	2.0	0.066	4.3	LOS A	0.0	0.0	0.00	0.17	42.6	
4	T1	92	2.0	0.066	0.0	LOS A	0.0	0.0	0.00	0.17	44.6	
Approach		133	2.0	0.066	1.3	NA	0.0	0.0	0.00	0.17	43.9	
West: Larsen Rd												
5	T1	15	2.0	0.033	0.4	LOS A	0.2	1.1	0.24	0.38	36.0	
6	R2	41	2.0	0.033	5.0	LOS A	0.2	1.1	0.24	0.38	26.5	
Approach		56	2.0	0.033	3.8	NA	0.2	1.1	0.24	0.38	28.1	
All Vehicles		271	2.0	0.074	1.6	NA	0.2	1.7	0.12	0.20	30.9	

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Transport Impact Assessment

Proposed Mixed Use Development (Service Station + Convenience Store + Commercial Tenancies | Self Service + Automatic Car Wash), Lot 104
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MOVEMENT SUMMARY

▽ **Site: Larsen Rd/ Access 2030 Sat 12-1**

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 Giveway / Yield (Two-Way)

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Total veh/h	Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Access											
1	L2	5	2.0	0.097	0.4	LOS A	0.3	2.3	0.27	0.18	24.7
2	R2	99	2.0	0.097	0.9	LOS A	0.3	2.3	0.27	0.18	22.4
Approach		104	2.0	0.097	0.8	LOS A	0.3	2.3	0.27	0.18	22.5
East: Larsen Rd											
3	L2	53	2.0	0.083	4.3	LOS A	0.0	0.0	0.00	0.17	42.5
4	T1	114	2.0	0.083	0.0	LOS A	0.0	0.0	0.00	0.17	44.5
Approach		166	2.0	0.083	1.4	NA	0.0	0.0	0.00	0.17	43.8
West: Larsen Rd											
5	T1	16	2.0	0.042	0.5	LOS A	0.2	1.4	0.27	0.40	35.3
6	R2	53	2.0	0.042	5.1	LOS A	0.2	1.4	0.27	0.40	26.2
Approach		68	2.0	0.042	4.0	NA	0.2	1.4	0.27	0.40	27.6
All Vehicles		339	2.0	0.097	1.7	NA	0.3	2.3	0.14	0.22	30.6



APPENDIX C WAPC TRANSPORT IMPACT ASSESSMENT CHECKLIST

Checklist for a Transport Impact Assessment for individual development

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

ITEM	PROVIDED	COMMENTS/PROPOSALS
Summary		
Introduction/Background		
name of applicant and consultant	✓	Section 1
development location and context	✓	Section 1 & Figure 2
brief description of development proposal	✓	Section 1 & Table 1
key issues	✓	Section 1
background information	✓	Section 1
Existing situation		
existing site uses (if any)	✓	Section 2.1, Photograph 1 & Photograph 2
existing parking and demand (if appropriate)	NA	Vacant site
existing access arrangements	✓	Off South Western Hwy (Photograph 1)
existing site traffic	NA	Vacant site
surrounding land uses	✓	Sections 4.1 and 5
surrounding road network	✓	Section 2.4
traffic management on frontage roads	✓	Section 2.4
traffic flows on surrounding roads (usually AM and PM peak hours)	✓	Section 2.5, Figure 12, Figure 13 and Figure 14
traffic flows at major intersections (usually AM and PM peak hours)	✓	Section 2.5, Figure 12, Figure 13 and Figure 14
operation of surrounding intersections	✓	Section 10.2.1, Figure 29 & Appendix B
existing pedestrian/cycle networks	✓	Sections 1 & 14 & Figure 2
existing public transport services surrounding the development	✓	Sections 1 & 13, Figure 2, Table 7 & Table 8
crash data	✓	Section 11, Figure 34 and Figure 35.

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Transport Impact Assessment

Proposed Mixed Use Development (Service Station + Convenience Store + Drive Thru Coffee + Mini Supermarket + Commercial Tenancies | Self Service + Automatic Car Wash), Lot 104
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ITEM	PROVIDED	COMMENTS/PROPOSALS
Development proposal		
regional context	✓	Section 5
proposed land uses	✓	Section 3, Table 1 & Appendix A
table of land uses and quantities	✓	Table 1
access arrangements	✓	Section 3 & Appendix A
parking provision	✓	Section 14 & Appendix A
end of trip facilities	x	No end of cycle trip facilities shown
any specific issues	✓	Section 15
road network	✓	Sections 2.2 & 4.2, Figure 4 & Figure 16
intersection layouts and controls	✓	Sections 2.4.4 & 2.4.5
pedestrian/cycle networks and crossing facilities	✓	Section 13, Figure 2 & Photograph 8
public transport services	✓	Sections 1 & 13, Figure 2, Table 7 & Table 8
Integration with surrounding area		
surrounding major attractors/ generators	✓	Section 5
committed developments and transport proposals	✓	Section 4
proposed changes to land uses within 1200 metres	✓	Section 4
travel desire lines from development to these attractors/ generators	✓	Section 13, Figure 2 & Photograph 8
adequacy of existing transport networks	✓	Section 12
deficiencies in existing transport networks	✓	Section 12
remedial measures to address deficiencies	✓	Section 4.3
Analysis of transport networks		
assessment years	✓	Section 6
time periods	✓	Section 8
development generated traffic	✓	Section 8, Figure 25, Figure 26 & Figure 27.
distribution of generated traffic	✓	Section 8, Figure 25, Figure 26 & Figure 27.
parking supply and demand	✓	Section 14
base and 'with development' traffic flows	✓	Sections 10.2.2 & 10.2.3
analysis of development accesses	NA	Left-in only off South Western Hwy
impact on surrounding roads	✓	Section 9 & Table 3.
impact on intersections	✓	Section 10, Table 4 & Table 5

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 Commercial Tenancies | Self Service + Automatic Car Wash), Lot 104
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ITEM	PROVIDED	COMMENTS/PROPOSALS
Analysis of transport networks (cont.)		
impact on neighbouring areas	✓	Sections 9 & 10
road safety	✓	Section 11
public transport access	✓	Section 12
pedestrian access/amenity	✓	Section 13
cycle access/amenity	✓	Section 13
analysis of pedestrian/cycle networks	✓	Section 13
safe walk/cycle to school (for residential and school site developments only)	NA	
traffic management plan (where appropriate)	NA	
Conclusions	✓	Section 16

Proponent's name

Company Procon Developments **Date**

Transport assessor's name David Wilkins

Company i3 consultants WA **Date** 09/11/18

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