(53A, 53B, 55) Russell Road and (30, 32, 130, 132) Upper Ōrewa Road

Proposed Residential Development

Integrated Transportation Assessment Report

13 February 2025

[redacted]

Project:	53A, 53B, 55 Russell Rd & (30, 32, 130, 132 Upper Ōrewa Rd
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Final Report	[redacted]	[redacted]	[redacted]

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1 INTRODUCTION

Commute Transportation Consultants (Commute) has been engaged to prepare an Integrated Transport Assessment (ITA) Report for a proposed residential housing development at 88,130,133 Upper Ōrewa Road and 53a,53b,55 Russell Road, Ōrewa (referred to in this report as “the site”).

The development comprises of approximately 1250 dwellings and 27 new roads. The internal road network will connect to Grand Drive to the east via an existing roundabout / interchange and to Upper Ōrewa Road at later Stages (through Stage 2C). Of note, the proposal will be lodged under the 2024 Fast-track Approvals Act.

This report also reviews the traffic engineering components of the proposal and assesses their compliance with relevant Auckland Unitary Plan’s (“AUP”) criteria. In particular, this report reviews the following:

- A description of the site and its surrounding transport environment;
- A description of the key transport-related aspects of the proposed development;
- Intersection design;
- Ability of the network to accommodate the estimated dwelling yield;
- Road cross sections and long sections;
- The proposed form of access and egress arrangements for vehicles and pedestrians;
- Parking and access provisions;
- Construction traffic management; and
- The adequacy of the proposed servicing arrangements.

By way of summary, it is considered that the proposed development, as detailed in this report, will have minimal traffic effects to the function, capacity and safety of the surrounding transport network. The development has good accessibility to various transport modes: walking, cycling, bus (assuming the recommended upgrades occur with public transport), and private vehicle. The surrounding intersections are capable of accommodating the additional traffic.

The proposed development includes the NoR6 transport corridor which is considered to be a regionally significant road providing wider benefits to the surrounding area including connecting residents of the proposal and residents to the east of State Highway 1 a viable connection to the northbound and southbound State Highway 1. The NoR6 corridor is considered to be appropriately designed and will operate safely and efficiently while improving connectivity, safety, and efficiency of the surrounding area.

Overall, it is concluded that there is no reason from a traffic engineering or transportation planning perspective to preclude approval of the development.

2 EXISTING ENVIRONMENT

2.1 SITE LOCATION

The site is approximately 109ha in size and is located to the west of the Northern Gateway Toll Road (State Highway 1) and North of Russell and Upper Ōrewa Roads.

The site is currently zoned Future Urban Zone.

Figure 1 shows the site location with respect to the existing road network while Figure 2 shows the current zoning.

Figure 1: Site Location

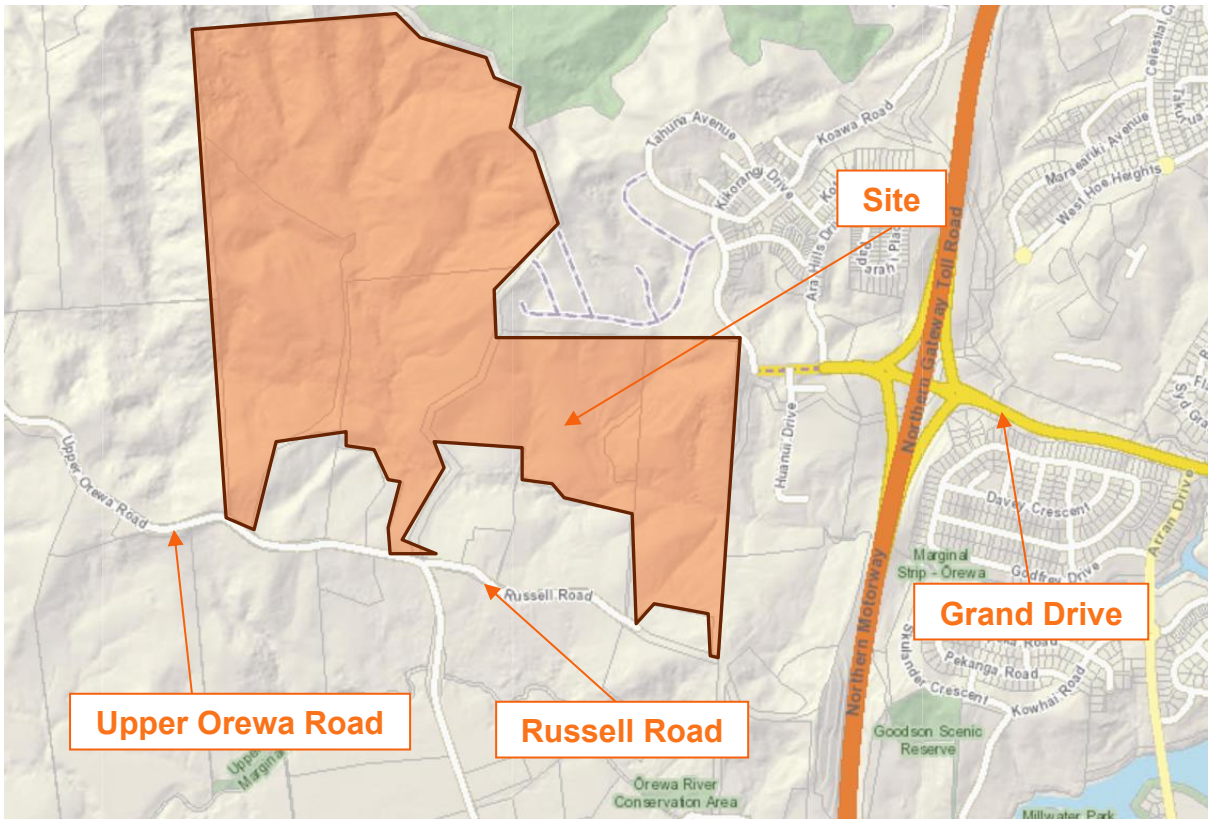
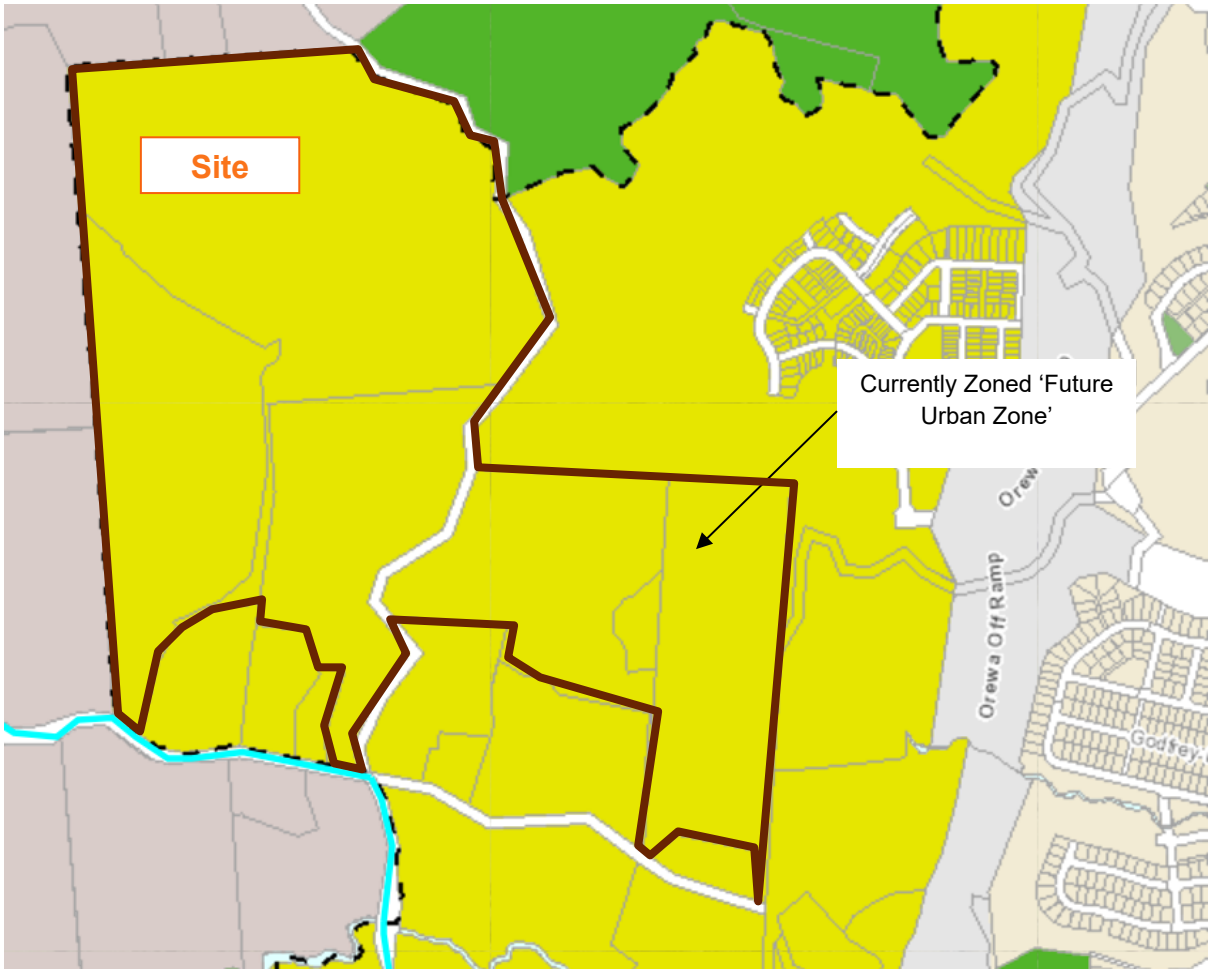


Figure 2. Unitary Plan Zoning Map



2.2 EXISTING ROAD ENVIRONMENT

Neither Upper Ōrewa Road nor Russell Road are classified as arterial roads by the AUP; however, Grand Drive is classified as an arterial road under the AUP.

Upper Ōrewa Road connects to Wainui Road to the south and Weranui Road to the north, neither of which are arterial roads. Upper Ōrewa Road is a rural road and has an approximate carriageway width of 8.5 metres, accommodating one traffic lane in each direction. No specific cycling or pedestrian facilities are provided.

Russell Road connects to Upper Ōrewa Road at a give way-controlled intersection. Russell Road has an approximate carriageway width of 6 metres, accommodating one traffic lane in each direction and is currently metal formation. No pedestrian or cycling facilities are provided in either direction.

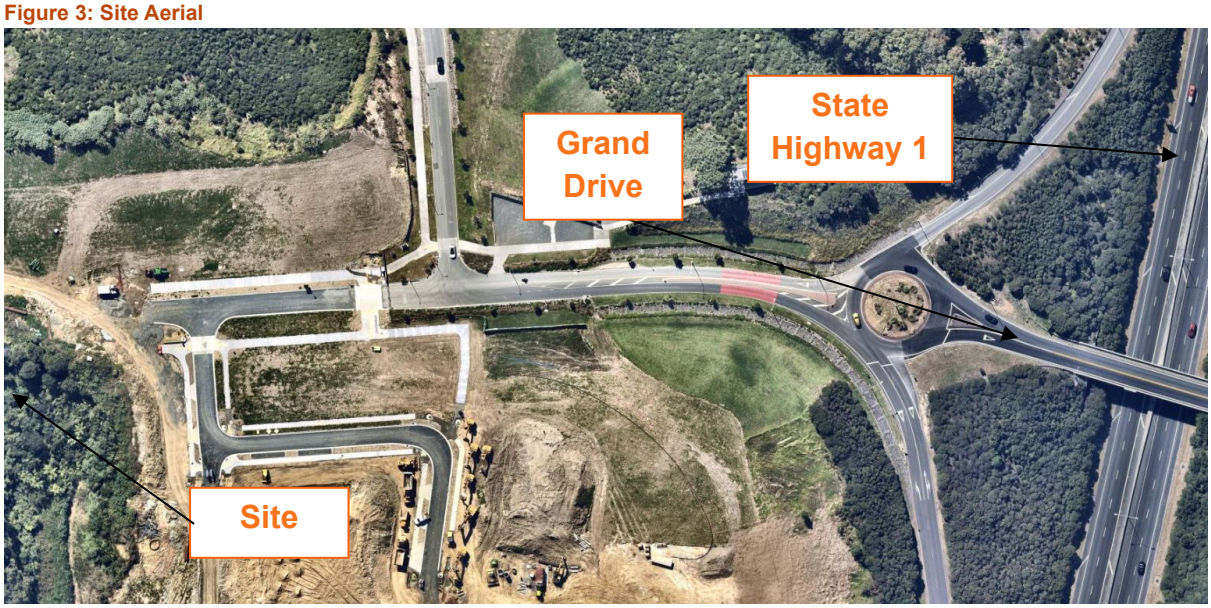
Upper Ōrewa Road has a posted speed limit of 100km/h outside the site and Russell Road has a posted speed limit of 40km/h.

Grand Drive is classified as an arterial road under the AUP and connects to West Hoe Road (Ōrewa) to the east and the site to the west. Grand Drive connects to SH1 / Northern Motorway via the Grand Drive / Ōrewa grade-separated interchange.

Grand Drive (west of SH1) has an approximate carriageway width of 10 metres, accommodating one traffic lane in each direction and a painted median. On street parking is prohibited on both sides of the road and pedestrian facilities are provided on both sides including a 3m shared path on the northern side.

Figure 3 shows a recent aerial image of the site and surrounding area of Grand Drive.

Figure 3: Site Aerial



2.3 CURRENT TRAFFIC VOLUMES

Traffic data obtained from Auckland Transport reveals Upper Ōrewa Road (which connects Wainui Road and Weranui Road and runs south of the site) had a 5-day average annual daily traffic (AADT) volume of 1,189 vehicles (two-way) in June 2017. Furthermore, it indicated that during the morning peak hour the peak hour volume was 121 vehicles per hour (vph) and during the evening peak hour the evening peak volume was 137 vph.

No traffic data was available for Russell Road; however, considering that Russell Road is a rural no exit road some 700m long, minimal traffic volumes are expected.

Auckland Transport traffic data also revealed that Grand Drive (between West Hoe Road and Grovenor Drive, is located on the opposite side of SH1 to the site in a part of Ōrewa already residentially developed) had a 5-day average annual daily traffic (AADT) volume of 12,006 vehicles (two-way) in April 2024. Furthermore, it indicated that during the morning peak hour (8:45am) the peak hour volume was 1,159 vehicles per hour (peak hour not specified) and during the evening peak hour (peak hour not specified) the evening peak volume was 1,280 vph.

Traffic surveys have been conducted at the Grand Drive interchange roundabouts on the 11th November 2024. The northbound intersection had 614 vehicles through the

intersection during the morning peak hour (7:45-8:45) and 958 vehicles through the intersection during the evening peak hour (16:15-17:15). The southbound intersection observed 1,365 vehicles through the intersection during the morning peak period (7:00-8:00) and 1,480 vehicles through the intersection during the evening peak period (16:30-17:30).

Figure 4 shows the traffic volumes through the northbound Grand Drive intersection, using traffic count data, during both morning and evening peak periods.

Figure 4: Movements through Western roundabout interchange during peak periods

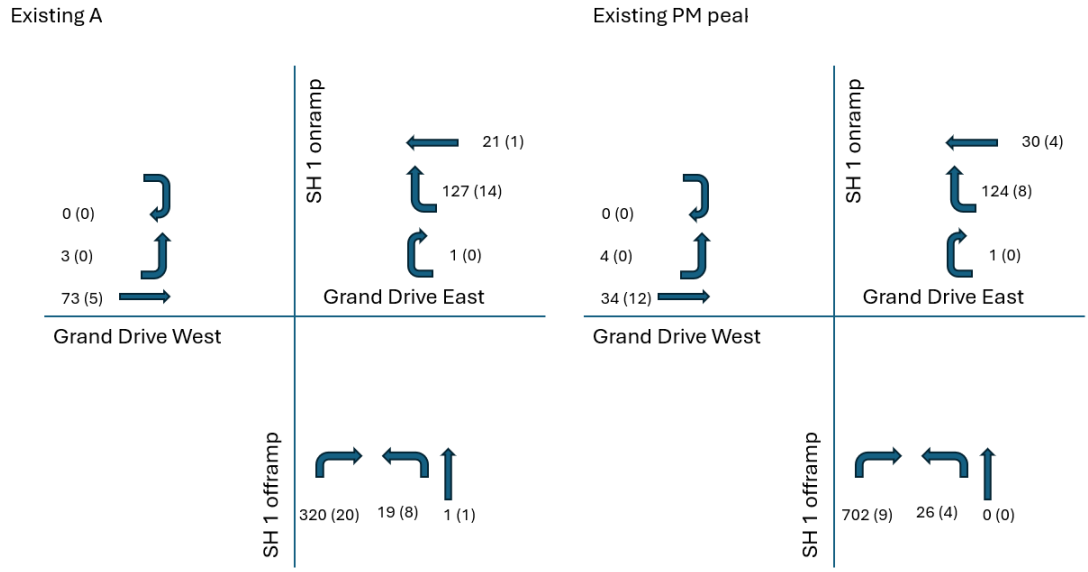
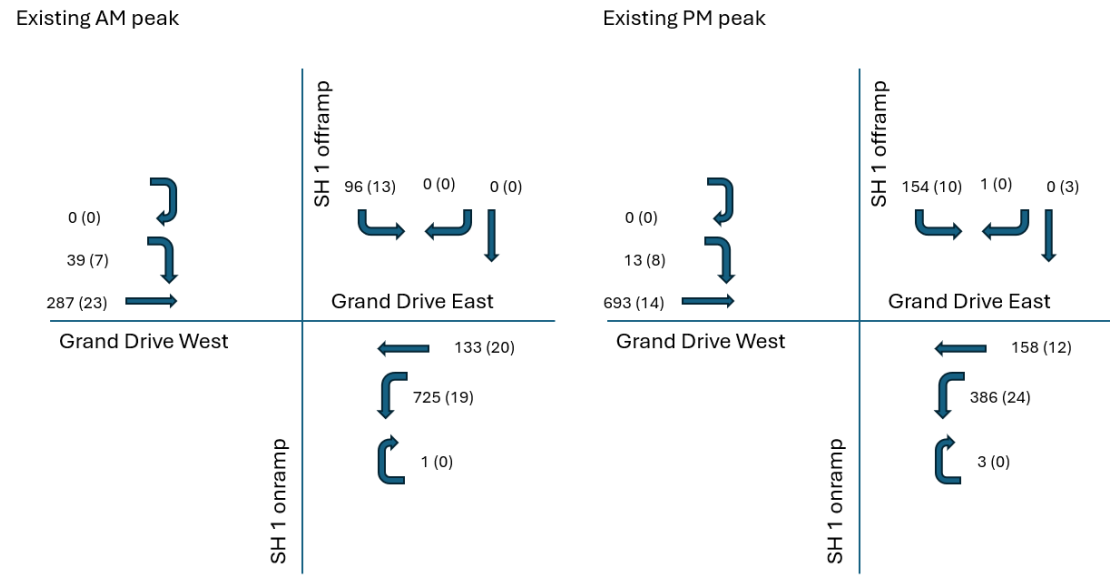


Figure 5 shows the traffic volumes through the southbound Grand Drive intersection, using traffic count data, during both morning and evening peak periods.

Figure 5: Movements through Eastern Interchange during peak periods



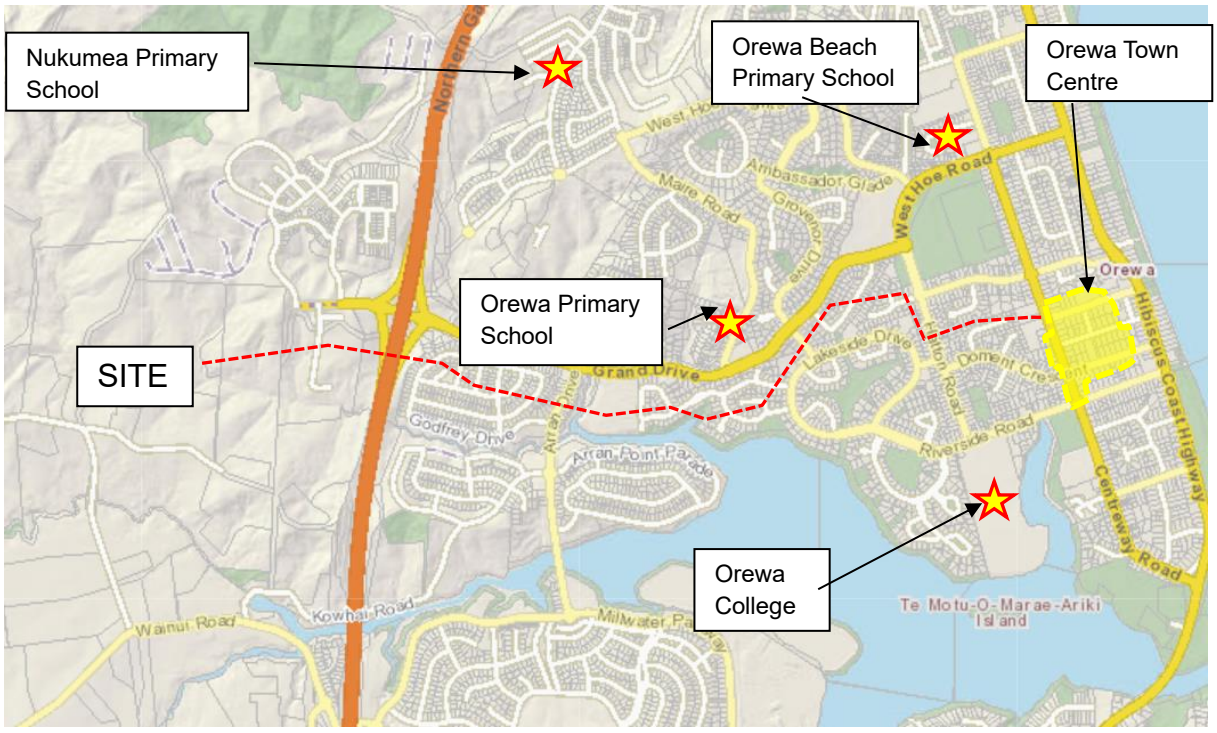
2.4 SITE ACCESSIBILITY

2.4.1 PRIVATE VEHICLES

The site will be well connected to the Ōrewa area once the proposed Grand Drive extension road is constructed, which is located 3km drive away (4 minutes) via Grand Drive. The town centre constitutes of office, supermarkets, retail stores and restaurants which is considered to satisfy the day to day needs of Delmore residents. There are also a number of schools located within Ōrewa for children of all ages. Given the amenities in the local area, residents will likely conduct trips within Ōrewa for day-to-day activities (other than work commutes).

Figure 6 shows the likely route from the site to the town centre and shows the primary schools and high schools in the nearby area.

Figure 6: Local Attractions



The site is also well located with regards to road connectivity to the wider Auckland Region. The site is located directly west of Grand Drive which connects to SH1 and directly into the strategic road network. SH1 provides the primary connection between Ōrewa, Auckland city to the south, and Warkworth to the north. This corridor also connects to Albany Metropolitan Centre and Silverdale Town Centre, which are anticipated to be attractions for residents of the site.

Travel times between the site and these key attractions are varied, with typical off peak and peak period travel times shown in Table 1.

Table 1: Travel Time Between Site and Key Attractions

Origin / Destination	Distance	Off-Peak Travel Time (Outside of peak travel times)	During Peak Travel Time (7-9 am and 4-6pm)
Site (Ōrewa) to Silverdale	4km	6-10 minutes	8-10 minutes
Site (Ōrewa) to Albany	20km	15-20 minutes	20-40 minutes
Site (Ōrewa) to Auckland City	35km	30-40 minutes	40 minutes-1 hour 15 minutes

2.4.2 PUBLIC TRANSPORT

The current public transport options near the site are limited, with the nearest bus stops to the site located within 3.5 km meters walking distance on Grand Drive. This bus stop provides access to bus route 985.

This bus service connects Hibiscus Coast Station to Ōrewa via Millwater. This service operates every 20 minutes during morning peak period on weekdays and then every 30 minutes during weekday off peak periods and on weekends.

Figure 7 shows the public transport provisions in the local area.

Figure 7: Public transport provisions in the area

2.4.3 WALKING

On the proposed NoR6 road and internal local roading, 2m and 1.8m pedestrian footpaths will be provided respectively; however, at the access points to the site, there are no existing pedestrian facilities and no pedestrian connections from the site to the surrounding pedestrian network east of SH 1. On the eastern side of SH 1, there are pedestrian footpaths along one side of West Hoe Heights and 3.0m wide footpaths on either side of Flavell Drive. The footpaths on Flavell Drive connect to 1.8m and 3.0m wide footpaths on the near side and far side of Grand Drive, respectively.

Using a practical walking distance of 1.5 kilometres and the 15th percentile walking speed of a typical fit, healthy adult of 1.2 m/s, a practical journey time is approximately 20 minutes. Currently the site does not have a pedestrian connection to the wider pedestrian network and pedestrians are currently unable to access commercial and schooling activities.

It is noted that a condition of consent of nearby Ara Hills includes the requirement of a pedestrian and cycling connection across the state highway alongside Grand Drive to connect to the existing pedestrian network on the eastern side of SH1. This is discussed further in 7.4.2 of the report.

2.4.4 CYCLING

Given the site's location in a semi-rural area, bounded by SH1, there are limited cycling routes available. To the east of the site there are cycle lanes along West Hoe Heights and a cycleway along a portion of Grand Drive. There is no connection between the cycleways along West Hoe Heights to the wider cycle network.

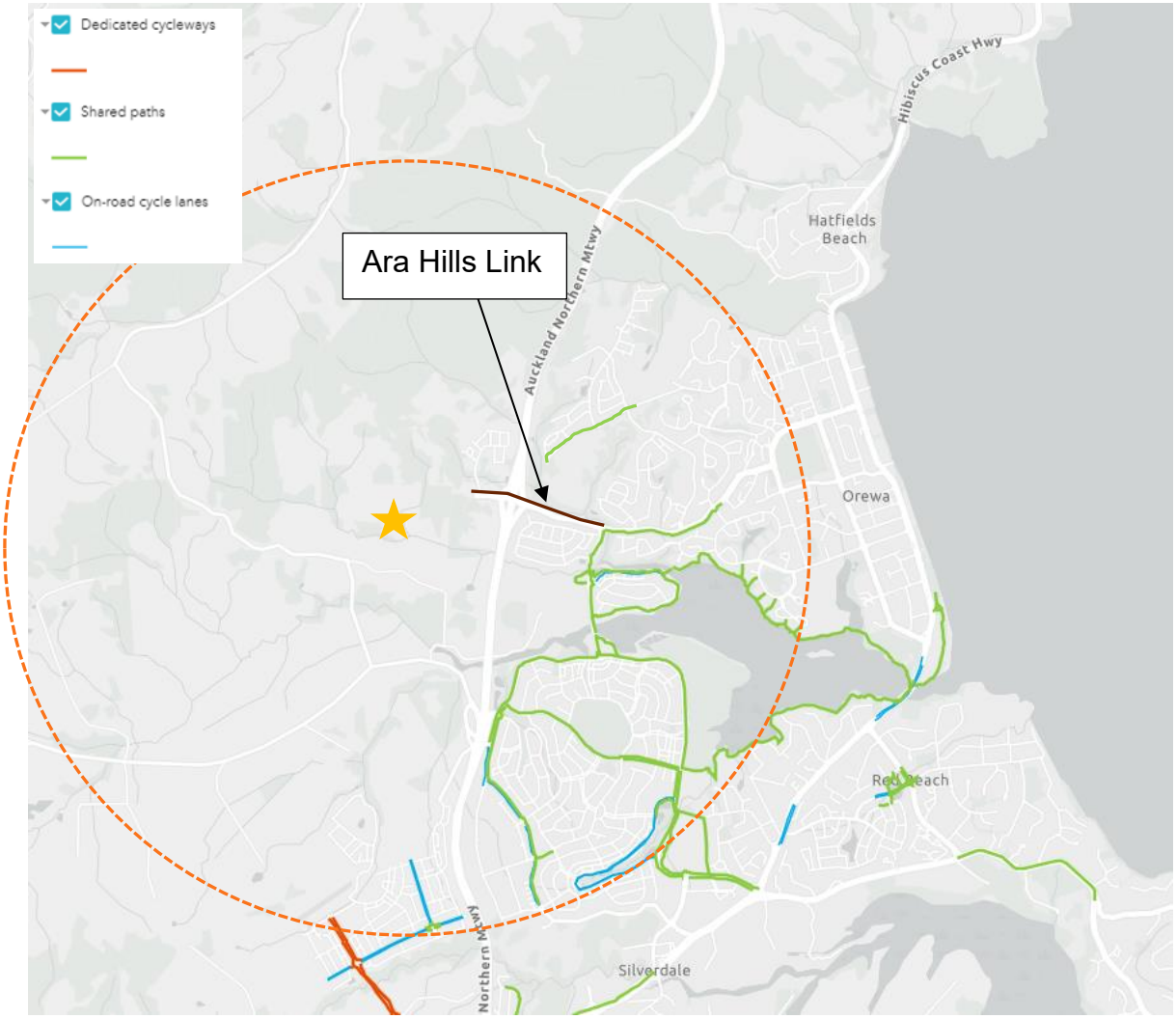
This said, the speed limit around the site is 50 km/hr and therefore on road cycling is a viable mode of transport between the site and local attractions, via local and low volume roads both to local shopping areas on Grand Drive and more widely to the Ōrewa town centre and Milldale.

There is a potential for the site to provide cycle facilities and connect the cycleways to the east and south of the site to the cycleways on Grand Drive and Wainui Road. Thus, offering cycling connectivity to a wider range of residential, employment, education, recreational and commercial activities.

It is understood that there is a requirement of Ara Hills consent for cycling and pedestrian facilities to be provided alongside Grand Drive (across SH1) to connect to existing active mode facilities on the eastern side of SH1 (near Arron Drive). This will allow cyclists and pedestrians to walk over SH1 to nearby schools, commercial activities, and public transport services.

Based on NZTA's Research Report 426, the average cycling trip length is approximately 3 kilometres. Figure 8 shows an approximate cycling catchment for the site based on a 3.0km radius, on the Auckland Regional Cycle Network Map.

Figure 8: Cycling Catchment



2.5 ROAD SAFETY

A search of the NZTA CAS database has been undertaken for all reported crashes occurring near the site for the last five-year period from 2019-2023 including all available data for 2024. The crash search area included crashes occurring within 100m of the site access points (Grand Drive Roundabout, Upper Ōrewa Road / Russel Road intersection, and Russell Road access point) and crashes occurring at the Upper Ōrewa Road / Wainui Road intersection.

A total of 5 crashes were identified by the crash search for this six-year period, all but one occurring at the Upper Ōrewa Road / Wainui Road intersection, with one collision occurred at the Grand Drive / SH1 western roundabout. The crashes are summarised as follows:

- One non-injury crash occurred at the Grand Drive / SH1 western interchange roundabout, involving an inattentive driver causing a rear end collision when failing to slow for a vehicle stopped to give way;
- Four crashes (one minor injury crash and three non-injury crashes) occurred on Wainui Road, near the intersection of Upper Ōrewa Road, when the driver lost control turning the corner in wet conditions, driving under the influence was the cause of one of the non-injury collisions.

There were no reported crashes involving movements into and out of the site or pattern of accidents around the site. It is noted that four crashes occurred at / near the Wainui Road / Upper Ōrewa Road intersection, however, as will be discussed later in this report, the level of additional traffic through this intersection due to the proposal is considered minimal. Therefore, from the assessment of the crash history, there is no indication of any significant safety concerns from the subject site.

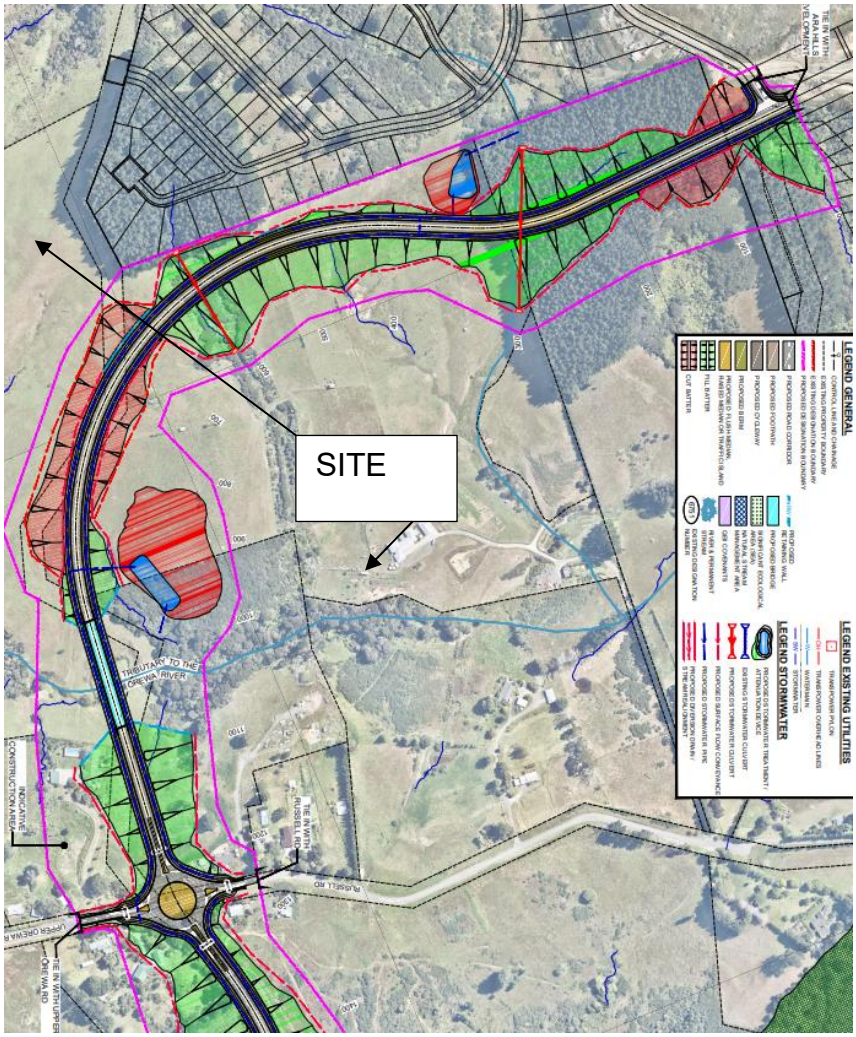
2.6 GRAND DRIVE EXTENSION DESIGNATION

New Zealand Transport Agency Waka Kotahi (NZTA) and Auckland Transport (AT), as part of Te Tupu Ngātahi - Supporting Growth Alliance (SGA), as the Requiring Authorities, gave notice to the Auckland Council (the Council) to designate land known as the 'North (Strategic and Local) Project' (North Project), located within North Auckland, under the Auckland Unitary Plan (Operative in Part) (AUP).

These comprised 9 new designations and included NoR 6 - North: New Connection between Milldale and Grand Drive, Ōrewa – AT: Notice of requirement for a designation for a new urban arterial corridor with active mode facilities between Wainui Road in Milldale and Grand Drive in Upper Ōrewa. This was lodged on 20 October 2023, notified on 16 November 2023, Submissions closed 14 December 2023 and recommendation notified on 08 November 2024. A decision by AT under s171 of the RMA to confirm the NoR was made on the 23rd January 2025. The appeals period closes on the 14th February 2025.

Figure 9 shows the general arrangement of this road.

Figure 9: NoR 6 Grand Drive



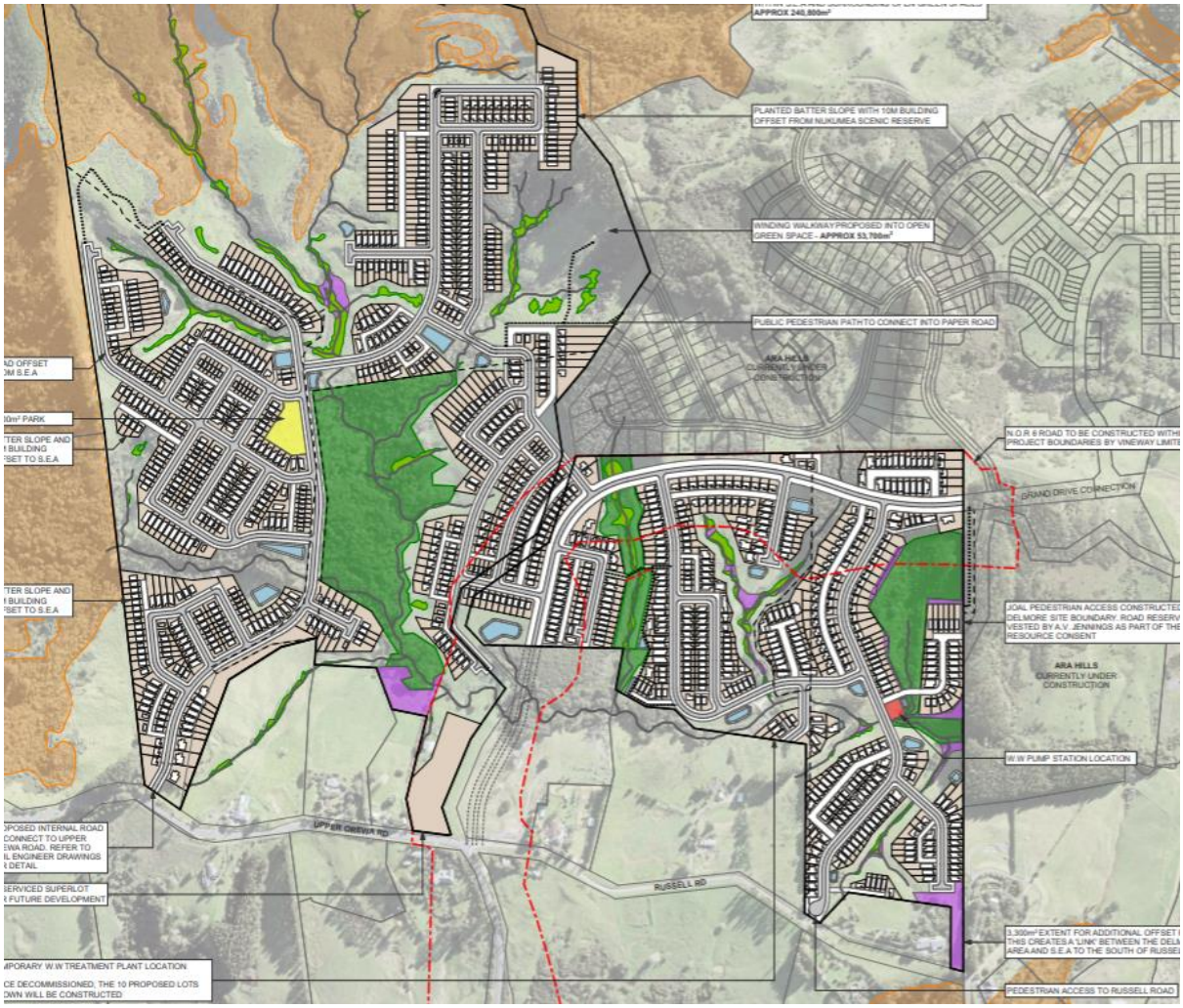
Of note a section of the NoR6 transport corridor will be constructed as part of the proposal which will essentially cut through proposed site. As mentioned in the background, the NoR6 transport corridor is regionally significant and will provide wide reaching benefits to the community and surrounding area by providing a viable connection between the State Highway 1 interchange, Orewa town centre, the Delmore site, and surrounding local community.

3 PROPOSED DEVELOPMENT

The proposed residential development will comprise a new internal road network which connects to the wider road network at Grand Drive to the east and in future provides opportunity to connect to Upper Ōrewa Road to the south. The development will yield approximately 1250 dwellings.

Figure 10 shows the proposed layout of the development.

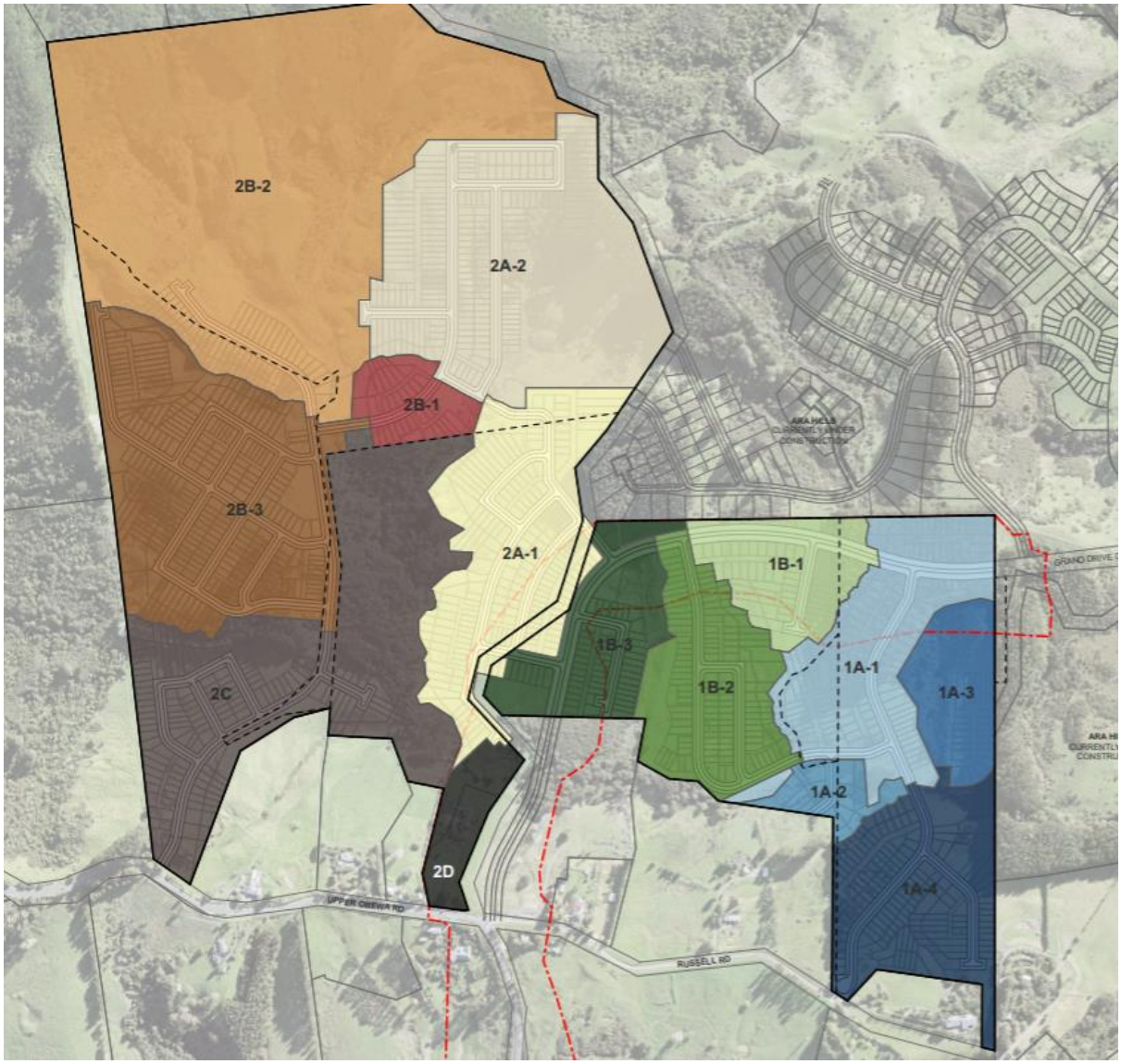
Figure 10. Proposed Site Layout



The development is proposed to be completed in two stages which will be broken down into substages. Stage 1 includes the lodged NoR6 road and the eastern section of the development east of the lodged NoR 6 road, stage 1 is broken down into substages A and B. Stage 2 is broken down into substages A through D including the rest of the development west of the lodged NoR 6 road. Figure 11 showcases stages 1 & 2 of the proposal.

Of note the proposal does not extend the NoR 6 road to either Russell Road or Upper Ōrewa Road. This is due to the land available and to avoid non residents using the site's local roads to avoid traffic congestion leading to increased traffic on the site local roads. Further, there is a local road proposed that links a local road to Upper Ōrewa Road in later stages of the proposal. As such, in the short term (before the development occurs to the south or Auckland Transport constructs the remainder of the NoR road), all the site traffic will enter / exit via the Grand Drive interchange which is considered to be acceptable from a traffic perspective.

Figure 11: Staging of Proposal



4 EXISTING TRAVEL PATTERNS

4.1 EXISTING TRIP GENERATION

The site is currently occupied by several rural residential developments and farmland. These lots are expected to generate a relatively low volume of trips both during peak hours and throughout a typical day.

4.2 EXISTING TRIP DISTRIBUTION

As mentioned above, the volume of existing trips from the site is likely to be low and scattered over the network.

With regards to travel patterns near the site, the site is situated to the north of Upper Ōrewa and Russell Roads and surrounded by residential activity to the east of the

site. Currently, it is the residents located to the east of the site (eastern residential catchment) who would access Grand Drive and SH1 via Ara Hill Drive. The assumed existing travel patterns from the residential area immediately to the east of the site are shown in Figure 12.

Figure 12: Expected Travel Patterns near the Site during Peak Hours

5 TRIP GENERATION

5.1 TRIP GENERATION OF PROPOSAL

The RTA Guide[1] is commonly used by traffic engineering practitioners in Australasia to assess the traffic generating potential of various land uses. In New Zealand, the RTA Guide is frequently used for assessing residential developments such as that proposed.

[1] The Roads and Traffic Authority of New South Wales – Guide to Traffic Generating Developments (RTA), Version 2.2, October 2002

As discussed in 2.4, the site is located in reasonably close proximity to local attractions and there are future viable active mode routes between the site and these attractions. Where there are deficiencies in walking and cycling provisions to these attractions, the proposal involves improving walking and cycling connectivity and local bus services (as discussed in Section 8.4 of this report). As such, the site is expected to have viable alternative transport modes to private vehicle transport to nearby attractions.

The RTA Guide suggests that trip rate for "*medium density residential flat buildings*[2]*"* is applicable where there is adequate public transport accessibility and connectivity to local shopping, schools and local social visits. Therefore, the trip generation of the proposal is considered to be best represented by the medium density residential flat building RTA rate.

For medium density residential flat buildings, the conservative rate for "larger units and town houses (three or more bedrooms)" has been used, which is 0.65 trips per dwelling for peak hour trips and 6.5 trips per dwelling for daily trips.

For approximately 1250 dwellings, the anticipated trip generation of the site is 813 peak hour trips and 8,125 daily trips.

5.2 TRAFFIC EFFECTS

Rule E27.6.1 (1) "Trip generation" of the Unitary Plan sets out trip generation limits, exceedance of which mean resource consent for a restricted discretionary activity is required under E27.4.1 (A3). For residential dwellings, this limit is 100 dwellings.

The proposal is for approximately 1250 dwellings and 813 peak hour trips, exceeding this limit. As such, an assessment of the wider effects on the network of the proposal is required.

The site is located near the Ōrewa Grand Drive SH1 interchange. Until any connection between the site and Upper Ōrewa or Russell Roads is provided, the only route to / from the site will be via the interchange along the NoR Road. As such, the Grand Drive interchange is expected to cater for all the traffic during peak hours.

To assess the local impact on the Grand Drive interchange and what upgrades may be required, a modelling assessment has been undertaken of the Grand Drive interchange.

[2] The RTA definition states "*A medium density residential flat building is a building containing at least 2 but less than 20 dwellings. This includes villas, town houses, flats, semi-detached houses, terrace or row houses and other medium density developments. This does not include aged or disabled persons' housing"*

5.3 TRIP DISTRIBUTION

5.3.1 PROPOSAL

All trips associated with the possible development and redirected traffic from nearby residential activity has been added to the existing road network traffic volumes. The trip generation of the development is based on an approximate 1250-dwelling yield.

In terms of inbound/outbound percentages to and from the site, the following has been assumed:

- Morning Peak Hour – 70% outbound, 30% inbound
- Evening Peak Hour – 40% outbound, 60% inbound.

In terms of directional distribution patterns to and from the site, the following has been assumed:

- Morning and Evening Peak Hour – 100% of trips will occur via Grand Drive interchange.

5.3.2 ARA HILLS

As discussed in Section 5.2 above, the consented Ara Hills subdivision comprising of some 575 dwellings will travel via Grand Drive to get to SH1 and vice versa, during peak hours. At the time of the surveyed in November 2024 it is estimated that 30% or 173 dwellings of the Ara Hills site are currently constructed and occupied and hence will be included as existing traffic (as surveyed).

Using conservative trip generation for the remaining 70% or 402 dwellings is expected that 261 additional trips during the morning peak evening peak, will be expected through the Grand Drive interchange (above that in the existing surveys). The remaining 402 dwellings will be considered as additional traffic in the traffic modelling scenario thus assuming all of Ara Hills is included in the traffic modelling.

5.3.3 TOTAL

As such, as a worst case (no links to Upper Ōrewa Road) total of 1,074 additional peak hour trips are therefore anticipated to occur through the Grand Drive interchange, during the morning and evening peak hours. This includes the remaining 402 dwellings to be constructed as part of the Ara Hills development and approximately 1250 dwellings proposed.

5.4 MOVEMENT DISTRIBUTION

The movement distribution at the Grand Drive east and west roundabouts is based on the existing distribution ratio.

Figures 13-18 show the consented, and proposed trip distribution at the east and west Grand Drive roundabouts. The consented trip distribution includes the remaining existing trips and the remaining 70% of the Ara Hills site currently under construction, and the proposed trip distribution includes the remaining 70% of Ara Hills and the subject site. The blue values show the volume of trips per movement and the orange value shows the increased volume per movement when compared to the existing, consented, and proposed peak hour traffic volume distributions are shown below in Figures 13-18.

Figure 13: Existing peak hour traffic volumes eastern roundabout

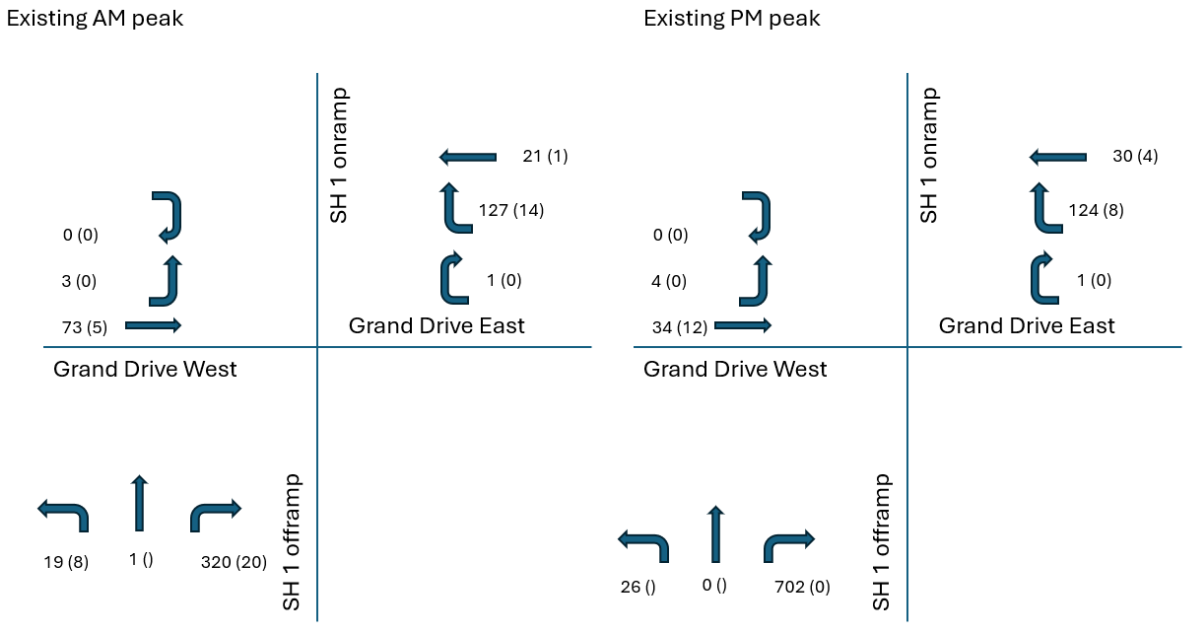


Figure 14: Peak hour consented traffic volumes eastern roundabout

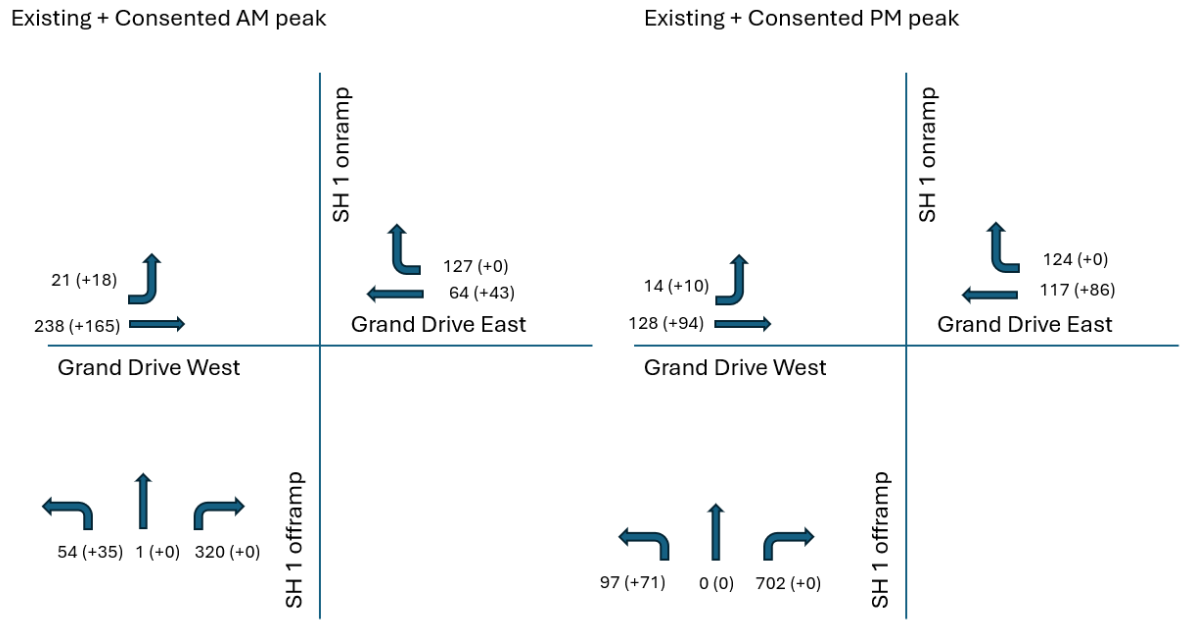


Figure 15: Peak hour proposed traffic volumes eastern roundabout

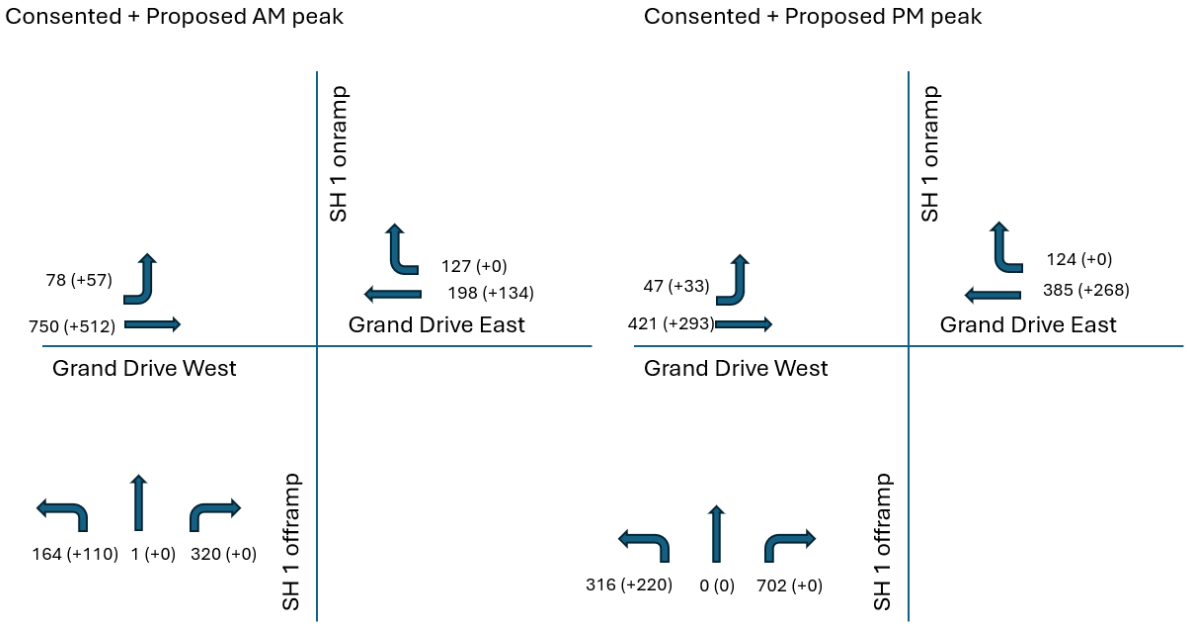


Figure 16: Peak hour existing traffic volumes western roundabout

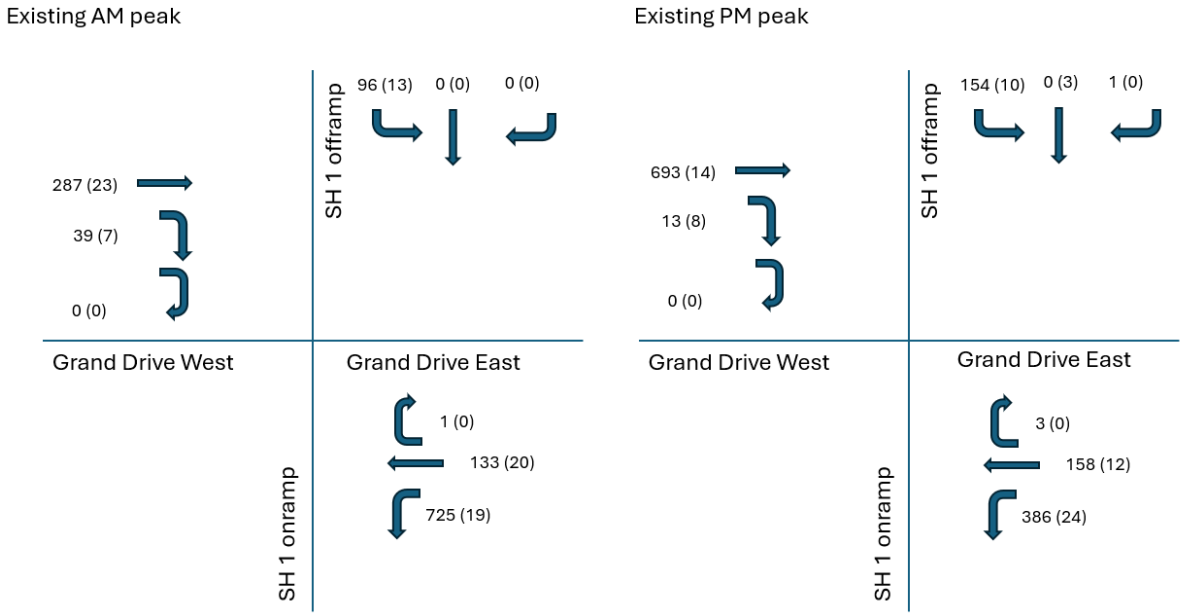


Figure 17: Peak hour consented traffic volumes southbound roundabout

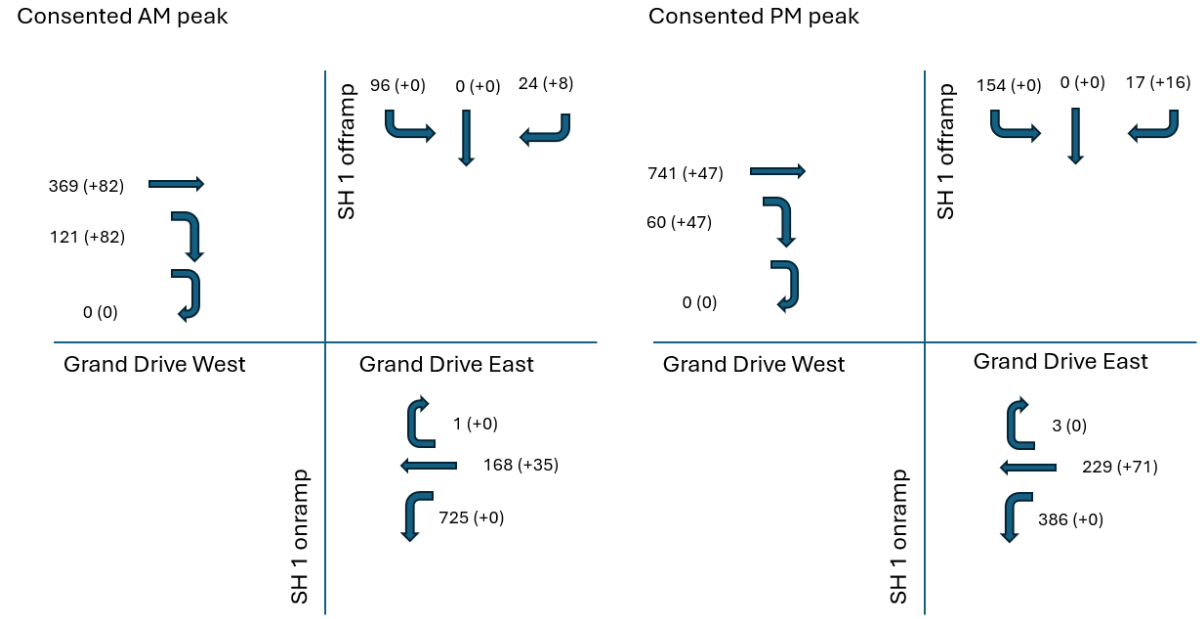
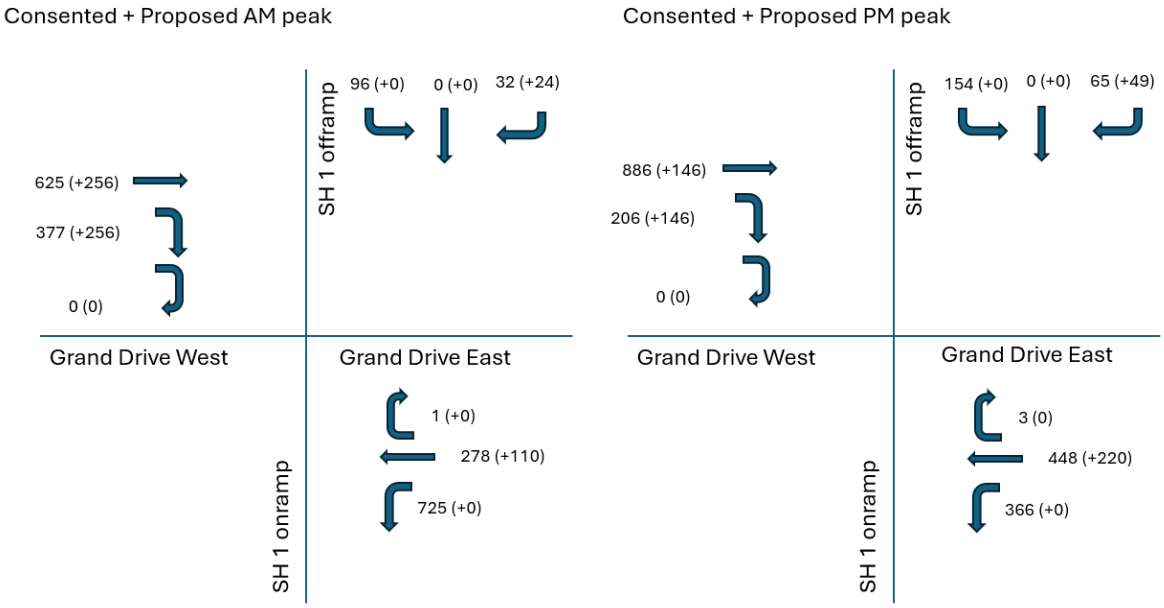


Figure 18: Peak hour proposed traffic volumes southbound roundabout



6 ASSESSMENT OF EFFECTS

6.1 ASSESSMENT TIERS

The traffic effects of the proposal have been assessed by modelling the current Grand Drive / SH1 eastern and western roundabout using the traffic modelling software SIDRA.

The results presented in this report include the Degree of Saturation, which is a measure of available capacity, queue length and the Level of Service ("LOS"), which is a generalised function of delay.

The assessment below identifies the effect of the additional vehicle trips generated by the proposed development on the existing road network.

6.2 ROAD NETWORK ASSESSMENT

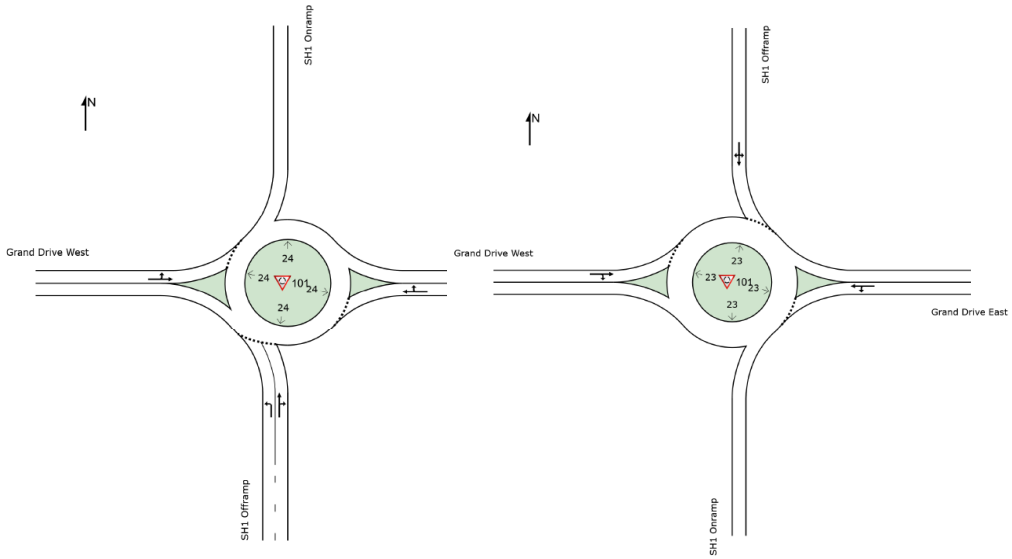
6.2.1 METHODOLOGY

As discussed, the Grand Drive / SH1 interchange will cater for all of traffic to and from the site at least in the short term, attributed to commuting out of Ōrewa via SH1.

A review of the Grand Drive / SH1 eastern and western roundabouts has been undertaken, assessing the existing performance of the intersection and the performance of the intersection after the completion of the development. The intersection review was conducted using traffic survey data and SIDRA intersection analysis.

Figure 19 shows the intersection layout used to model the intersection performance.

Figure 19: SIDRA Intersection Layout Northbound roundabout on the left and Southbound roundabout on the right



6.2.2 EXISTING INTERSECTION PERFORMANCE

Overall, the existing intersection of Grand Drive / Western roundabout is shown to currently operate with minimal delay with less than 8 seconds of delay for all approaches. The intersection also operates with an overall LOS A and 95th percentile queue length of 11-30m for both morning and evening peak periods.

The existing intersection performance is summarised in Figure 20 and Figure 21 below for the morning and evening peak hours and is considered to be acceptable from a traffic perspective.

Figure 20: Grand Drive / western roundabout Intersection performance – Morning Peak Hour

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: SH1 Offramp														
1	L2	27	8	27	29.6	0.034	4.7	LOS A	0.2	1.5	0.39	0.47	0.39	46.8
2	T1	2	1	2	50.0	0.245	3.7	LOS A	1.5	11.1	0.37	0.60	0.37	45.6
3	R2	340	20	340	5.9	0.245	8.2	LOS A	1.5	11.1	0.37	0.60	0.37	46.0
Approach		369	29	369	7.9	0.245	7.9	LOS A	1.5	11.1	0.37	0.59	0.37	46.0
East: Grand Drive East														
5	T1	22	1	22	4.5	0.098	2.3	LOS A	0.0	0.0	0.00	0.59	0.00	47.1
6	R2	141	14	141	9.9	0.098	7.4	LOS A	0.0	0.0	0.00	0.59	0.00	47.3
Approach		163	15	163	9.2	0.098	6.7	LOS A	0.0	0.0	0.00	0.59	0.00	47.2
West: Grand Drive West														
10	L2	3	0	3	0.0	0.095	5.5	LOS A	0.5	4.0	0.62	0.57	0.62	46.4
11	T1	78	5	78	6.4	0.095	5.4	LOS A	0.5	4.0	0.62	0.57	0.62	47.5
Approach		81	5	81	6.2	0.095	5.4	LOS A	0.5	4.0	0.62	0.57	0.62	47.4
All Vehicles		613	49	613	8.0	0.245	7.3	LOS A	1.5	11.1	0.31	0.59	0.31	46.5

Figure 21: Grand Drive / western roundabout intersection performance – Evening Peak Hour

Vehicle Movement Performance													
Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: SH1 Offramp														
1	L2	30	4	30	13.3	0.035	4.4	LOS A	0.2	1.3	0.38	0.46	0.38	47.0
2	T1	1	0	1	0.0	0.487	3.4	LOS A	3.9	27.3	0.47	0.61	0.47	45.5
3	R2	711	9	711	1.3	0.487	8.5	LOS A	3.9	27.3	0.47	0.61	0.47	45.8
Approach		742	13	742	1.8	0.487	8.3	LOS A	3.9	27.3	0.46	0.60	0.46	45.8
East: Grand Drive East														
5	T1	34	4	34	11.8	0.099	2.3	LOS A	0.0	0.0	0.00	0.57	0.00	47.2
6	R2	132	8	132	6.1	0.099	7.4	LOS A	0.0	0.0	0.00	0.57	0.00	47.5
Approach		166	12	166	7.2	0.099	6.3	LOS A	0.0	0.0	0.00	0.57	0.00	47.4
West: Grand Drive West														
10	L2	4	0	4	0.0	0.097	8.8	LOS A	0.6	5.0	0.81	0.75	0.81	44.3
11	T1	46	12	46	26.1	0.097	9.8	LOS A	0.6	5.0	0.81	0.75	0.81	45.2
Approach		50	12	50	24.0	0.097	9.8	LOS A	0.6	5.0	0.81	0.75	0.81	45.1
All Vehicles		958	37	958	3.9	0.487	8.0	LOS A	3.9	27.3	0.40	0.61	0.40	46.0

The existing intersection of Grand Drive / Eastern roundabout is also shown to currently operate with minimal delay (3.3 second average) with less than 10 seconds of delay for all approaches. The intersection also operates with an overall LOS A and 95th percentile queue length of 20-40m for both morning and evening peak periods.

The existing intersection performance is summarised in Figure 22 and Figure 23 below for the morning and evening peak hours and is considered to be acceptable from a traffic perspective.

Figure 22: Grand Drive / eastern roundabout Performance – Morning Peak Hour

Vehicle Movement Performance													
Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
East: Grand Drive East														
4	L2	744	19	744	2.6	0.594	3.1	LOS A	6.0	43.2	0.32	0.38	0.32	47.5
5	T1	153	20	153	13.1	0.594	3.1	LOS A	6.0	43.2	0.32	0.38	0.32	48.6
Approach		897	39	897	4.3	0.594	3.1	LOS A	6.0	43.2	0.32	0.38	0.32	47.7
North: SH1 Offramp														
7	L2	109	13	109	11.9	0.112	4.7	LOS A	0.6	4.3	0.48	0.55	0.48	47.0
8	T1	1	0	1	0.0	0.112	4.3	LOS A	0.6	4.3	0.48	0.55	0.48	48.2
9	R2	1	0	1	0.0	0.112	9.1	LOS A	0.6	4.3	0.48	0.55	0.48	48.5
Approach		111	13	111	11.7	0.112	4.7	LOS A	0.6	4.3	0.48	0.55	0.48	47.0
West: Grand Drive West														
11	T1	310	23	310	7.4	0.211	2.5	LOS A	0.0	0.0	0.00	0.35	0.00	49.3
12	R2	46	7	46	15.2	0.211	7.5	LOS A	0.0	0.0	0.00	0.35	0.00	49.4
Approach		356	30	356	8.4	0.211	3.2	LOS A	0.0	0.0	0.00	0.35	0.00	49.3
All Vehicles		1364	82	1364	6.0	0.594	3.3	LOS A	6.0	43.2	0.25	0.39	0.25	48.0

Figure 23: Grand Drive / eastern roundabout Performance – Evening Peak Hour

Vehicle Movement Performance													
Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
East: Grand Drive East														
4	L2	410	24	410	5.9	0.379	2.9	LOS A	2.9	21.1	0.18	0.35	0.18	47.8
5	T1	170	12	170	7.1	0.379	2.7	LOS A	2.9	21.1	0.18	0.35	0.18	49.0
Approach		580	36	580	6.2	0.379	2.8	LOS A	2.9	21.1	0.18	0.35	0.18	48.2
North: SH1 Offramp														
7	L2	164	10	164	6.1	0.216	7.6	LOS A	1.2	9.2	0.70	0.74	0.70	45.3
8	T1	3	3	3	100.0	0.216	11.7	LOS B	1.2	9.2	0.70	0.74	0.70	46.0
9	R2	1	0	1	0.0	0.216	12.0	LOS B	1.2	9.2	0.70	0.74	0.70	46.7
Approach		168	13	168	7.7	0.216	7.7	LOS A	1.2	9.2	0.70	0.74	0.70	45.3
West: Grand Drive West														
11	T1	707	14	707	2.0	0.421	2.5	LOS A	0.0	0.0	0.00	0.30	0.00	49.6
12	R2	21	8	21	38.1	0.421	7.6	LOS A	0.0	0.0	0.00	0.30	0.00	49.4
Approach		728	22	728	3.0	0.421	2.7	LOS A	0.0	0.0	0.00	0.30	0.00	49.6
All Vehicles		1476	71	1476	4.8	0.421	3.3	LOS A	2.9	21.1	0.15	0.37	0.15	48.5

6.2.3 CONSENTED INTERSECTION PERFORMANCE

The consented intersection considers the existing traffic and the remaining consented Ara hills dwellings (525) which are yet to be constructed and is summarised below. As such this includes all 100% of Ara Hills.

6.2.3.1 WESTERN ROUNDABOUT

In both the morning and evening peak periods the intersection is operating at a LOS of A. Acceptable delay is also observed on all approaches of less than 8 seconds on all approaches and queue lengths on average between 14-30m. This intersection generally operates within acceptable performance thresholds in the morning and evening peak hour.

The anticipated intersection performance during the morning peak period is summarised in Figure 24 below.

Figure 24: Grand Drive / western intersection Performance (consented) – Morning Peak Hour

Vehicle Movement Performance														
Mov ID	Turn	Mov Class	Demand Flows [Total	HV]	Arrival Flows [Total	HV]	Deg. Satn	Aver. Delay	Level of Service	95% Back Of Queue [Veh.	Dist]	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed
			veh/h	%	veh/h	%	v/c	sec		veh	m				km/h
South: SH1 Offramp															
1	L2	All MCs	62	12.9	62	12.9	0.075	4.7	LOS A	0.4	2.9	0.43	0.50	0.43	46.3
2	T1	All MCs	1	0.0	1	0.0	0.255	3.3	LOS A	1.6	11.5	0.42	0.59	0.42	44.4
3	R2	All MCs	340	5.9	340	5.9	0.255	8.5	LOS A	1.6	11.5	0.42	0.59	0.42	43.7
Approach			403	6.9	403	6.9	0.255	7.9	LOS A	1.6	11.5	0.42	0.57	0.42	44.1
East: Grand Drive East															
5	T1	All MCs	65	1.5	65	1.5	0.123	2.3	LOS A	0.0	0.0	0.00	0.54	0.00	46.3
6	R2	All MCs	141	9.9	141	9.9	0.123	7.4	LOS A	0.0	0.0	0.00	0.54	0.00	45.5
Approach			206	7.3	206	7.3	0.123	5.8	LOS A	0.0	0.0	0.00	0.54	0.00	45.8
West: Grand Drive West															
10	L2	All MCs	21	0.0	21	0.0	0.304	6.1	LOS A	2.0	14.2	0.69	0.59	0.69	45.6
11	T1	All MCs	243	2.1	243	2.1	0.304	5.9	LOS A	2.0	14.2	0.69	0.59	0.69	45.8
Approach			264	1.9	264	1.9	0.304	5.9	LOS A	2.0	14.2	0.69	0.59	0.69	45.8
All Vehicles			873	5.5	873	5.5	0.304	6.8	LOS A	2.0	14.2	0.40	0.57	0.40	45.0

The anticipated intersection performance during the evening peak period is summarised in Figure 25 below.

Figure 25: Grand Drive / western intersection Performance (consented) – Evening Peak Hour

Vehicle Movement Performance														
Mov ID	Turn	Mov Class	Demand Flows [Total	HV]	Arrival Flows [Total	HV]	Deg. Satn	Aver. Delay	Level of Service	95% Back Of Queue [Veh.	Dist]	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed
			veh/h	%	veh/h	%	v/c	sec		veh	m				km/h
South: SH1 Offramp															
1	L2	All MCs	101	4.0	101	4.0	0.120	5.0	LOS A	0.6	4.6	0.48	0.52	0.48	46.2
2	T1	All MCs	1	0.0	1	0.0	0.525	4.0	LOS A	4.2	29.9	0.58	0.61	0.58	44.0
3	R2	All MCs	711	1.3	711	1.3	0.525	9.1	LOS A	4.2	29.9	0.58	0.61	0.58	43.4
Approach			813	1.6	813	1.6	0.525	8.6	LOS A	4.2	29.9	0.57	0.60	0.57	43.7
East: Grand Drive East															
5	T1	All MCs	121	3.3	121	3.3	0.149	2.3	LOS A	0.0	0.0	0.00	0.49	0.00	46.7
6	R2	All MCs	132	6.1	132	6.1	0.149	7.4	LOS A	0.0	0.0	0.00	0.49	0.00	46.0
Approach			253	4.7	253	4.7	0.149	4.9	LOS A	0.0	0.0	0.00	0.49	0.00	46.3
West: Grand Drive West															
10	L2	All MCs	14	0.0	14	0.0	0.280	9.5	LOS A	1.9	14.2	0.87	0.74	0.87	43.8
11	T1	All MCs	140	8.6	140	8.6	0.280	9.8	LOS A	1.9	14.2	0.87	0.74	0.87	43.9
Approach			154	7.8	154	7.8	0.280	9.7	LOS A	1.9	14.2	0.87	0.74	0.87	43.9
All Vehicles			1220	3.0	1220	3.0	0.525	8.0	LOS A	4.2	29.9	0.49	0.60	0.49	44.3

The existing intersection of Grand Drive / SH1 northern is shown to currently operate with minimal delay with overall LOS A during both morning and evening peak periods.

6.2.3.2 EASTERN ROUNDABOUT

In both the morning and evening peak periods the intersection is operating at a LOS of A. Minimal delay is also observed, an average delay of 4.5 seconds, less than 11 seconds on each approach, and queue lengths on average between 25-60m. This intersection generally operates within acceptable performance thresholds in the morning and evening peak hour.

The anticipated intersection performance during the morning peak period is summarised in Figure 26 below.

Figure 26: Grand Drive / eastern intersection Performance (consented) – Morning Peak Hour

Vehicle Movement Performance														
Mov ID	Turn	Mov Class	Demand Flows [Total	HV]	Arrival Flows [Total	HV]	Deg. Satn	Aver. Delay	Level of Service	95% Back Of Queue [Veh.	Dist]	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed
			veh/h	%	veh/h	%	v/c	sec		veh	m				km/h
East: Grand Drive East															
4	L2	All MCs	744	2.6	744	2.6	0.720	4.5	LOS A	8.2	59.8	0.68	0.51	0.68	45.9
5	T1	All MCs	188	10.6	188	10.6	0.720	4.6	LOS A	8.2	59.8	0.68	0.51	0.68	46.1
Approach			932	4.2	932	4.2	0.720	4.6	LOS A	8.2	59.8	0.68	0.51	0.68	45.9
North: SH1 Offramp															
7	L2	All MCs	109	11.9	109	11.9	0.151	5.9	LOS A	0.8	6.0	0.58	0.61	0.58	45.2
8	T1	All MCs	1	0.0	1	0.0	0.151	5.4	LOS A	0.8	6.0	0.58	0.61	0.58	45.5
9	R2	All MCs	24	0.0	24	0.0	0.151	10.2	LOS B	0.8	6.0	0.58	0.61	0.58	45.0
Approach			134	9.7	134	9.7	0.151	6.7	LOS A	0.8	6.0	0.58	0.61	0.58	45.2
West: Grand Drive West															
11	T1	All MCs	392	5.9	392	5.9	0.305	2.5	LOS A	0.0	0.0	0.00	0.40	0.00	47.3
12	R2	All MCs	128	5.5	128	5.5	0.305	7.4	LOS A	0.0	0.0	0.00	0.40	0.00	46.7
Approach			520	5.8	520	5.8	0.305	3.7	LOS A	0.0	0.0	0.00	0.40	0.00	47.2
All Vehicles			1586	5.2	1586	5.2	0.720	4.5	LOS A	8.2	59.8	0.45	0.48	0.45	46.3

The anticipated intersection performance during the evening peak period is summarised in Figure 27 below.

Figure 27: Grand Drive / eastern intersection Performance (consented) – Evening Peak Hour

Vehicle Movement Performance														
Mov ID	Turn	Mov Class	Demand Flows [Total	HV]	Arrival Flows [Total	HV]	Deg. Satn	Aver. Delay	Level of Service	95% Back Of Queue [Veh.	Dist]	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed
			veh/h	%	veh/h	%	v/c	sec		veh	m				km/h
East: Grand Drive East															
4	L2	All MCs	410	5.9	410	5.9	0.475	3.4	LOS A	4.0	29.2	0.38	0.39	0.38	46.6
5	T1	All MCs	241	5.0	241	5.0	0.475	3.3	LOS A	4.0	29.2	0.38	0.39	0.38	46.8
Approach			651	5.5	651	5.5	0.475	3.4	LOS A	4.0	29.2	0.38	0.39	0.38	46.7
North: SH1 Offramp															
7	L2	All MCs	164	6.1	164	6.1	0.256	8.9	LOS A	1.5	11.3	0.75	0.71	0.75	43.8
8	T1	All MCs	3	100.0	3	100.0	0.256	13.6	LOS B	1.5	11.3	0.75	0.71	0.75	43.7
9	R2	All MCs	17	0.0	17	0.0	0.256	13.2	LOS B	1.5	11.3	0.75	0.71	0.75	43.5
Approach			184	7.1	184	7.1	0.256	9.3	LOS A	1.5	11.3	0.75	0.71	0.75	43.8
West: Grand Drive West															
11	T1	All MCs	755	1.9	755	1.9	0.475	2.5	LOS A	0.0	0.0	0.00	0.33	0.00	47.8
12	R2	All MCs	68	11.8	68	11.8	0.475	7.4	LOS A	0.0	0.0	0.00	0.33	0.00	47.1
Approach			823	2.7	823	2.7	0.475	2.9	LOS A	0.0	0.0	0.00	0.33	0.00	47.8
All Vehicles			1658	4.3	1658	4.3	0.475	3.8	LOS A	4.0	29.2	0.23	0.39	0.23	46.9

The existing roundabout are shown to operate with minimal delay with overall LOS A during both morning and evening peak periods.

6.2.4 PROPOSED INTERSECTION PERFORMANCE

An analysis of the eastern and western roundabout intersections has been conducted accounting for traffic generated from the proposed development (approximately 1250 dwellings) in addition to the consented (100%) Ara Hills residential development and is summarised below.

6.2.4.1 WESTERN ROUNDABOUT

In the morning peak period, the intersection is operating at a LOS of C overall which is considered appropriate. The delay increases to approximately 34 seconds on the western leg in the morning peak with maximum queue lengths on the same leg / peak period extending to 220m. This intersection generally operates within acceptable performance thresholds in the morning and evening peak hour.

The anticipated intersection performance during the morning peak period is summarised in Figure 28 below.

Figure 28: Grand Drive / western intersection development intersection performance – Morning Peak Hour

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: SH1 Offramp															
1	L2	All MCs	172	4.7	172	4.7	0.182	5.2	LOS A	1.0	7.4	0.53	0.55	0.53	46.0
2	T1	All MCs	1	0.0	1	0.0	0.282	4.1	LOS A	1.8	13.0	0.54	0.63	0.54	44.1
3	R2	All MCs	340	5.9	340	5.9	0.282	9.3	LOS A	1.8	13.0	0.54	0.63	0.54	43.5
Approach			513	5.5	513	5.5	0.282	7.9	LOS A	1.8	13.0	0.54	0.60	0.54	44.3
East: Grand Drive East															
5	T1	All MCs	199	0.5	199	0.5	0.199	2.3	LOS A	0.0	0.0	0.00	0.45	0.00	47.1
6	R2	All MCs	141	9.9	141	9.9	0.199	7.4	LOS A	0.0	0.0	0.00	0.45	0.00	46.3
Approach			340	4.4	340	4.4	0.199	4.4	LOS A	0.0	0.0	0.00	0.45	0.00	46.7
West: Grand Drive West															
10	L2	All MCs	78	0.0	78	0.0	0.943	34.6	LOS C	31.4	221.1	1.00	1.81	2.74	33.9
11	T1	All MCs	755	0.7	755	0.7	0.943	34.3	LOS C	31.4	221.1	1.00	1.81	2.74	34.0
Approach			833	0.6	833	0.6	0.943	34.4	LOS C	31.4	221.1	1.00	1.81	2.74	34.0
All Vehicles			1686	2.8	1686	2.8	0.943	20.3	LOS C	31.4	221.1	0.66	1.17	1.52	38.9

The anticipated intersection performance during the evening peak period is summarised in Figure 29 below.

Figure 29: Grand Drive / western intersection development intersection performance – Evening Peak Hour

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: SH1 Offramp															
1	L2	All MCs	320	1.3	320	1.3	0.388	7.3	LOS A	2.5	17.7	0.71	0.66	0.71	44.9
2	T1	All MCs	1	0.0	1	0.0	0.640	8.3	LOS A	7.1	50.2	0.83	0.83	1.03	42.3
3	R2	All MCs	711	1.3	711	1.3	0.640	13.4	LOS B	7.1	50.2	0.83	0.83	1.03	41.8
Approach			1032	1.3	1032	1.3	0.640	11.5	LOS B	7.1	50.2	0.79	0.78	0.93	42.7
East: Grand Drive East															
5	T1	All MCs	389	1.0	389	1.0	0.302	2.3	LOS A	0.0	0.0	0.00	0.39	0.00	47.5
6	R2	All MCs	132	6.1	132	6.1	0.302	7.4	LOS A	0.0	0.0	0.00	0.39	0.00	46.8
Approach			521	2.3	521	2.3	0.302	3.6	LOS A	0.0	0.0	0.00	0.39	0.00	47.3
West: Grand Drive West															
10	L2	All MCs	47	0.0	47	0.0	0.895	44.3	LOS D	18.9	135.0	1.00	1.69	2.64	31.1
11	T1	All MCs	433	2.8	433	2.8	0.895	44.2	LOS D	18.9	135.0	1.00	1.69	2.64	31.2
Approach			480	2.5	480	2.5	0.895	44.3	LOS D	18.9	135.0	1.00	1.69	2.64	31.2
All Vehicles			2033	1.8	2033	1.8	0.895	17.2	LOS B	18.9	135.0	0.64	0.89	1.10	40.2

Therefore, from a traffic perspective no upgrades are required to this intersection.

6.2.4.2 EASTERN ROUNDABOUT

In the morning peak period, the intersection is operating at a LOS of E on average with the Grand Drive East approach in the morning peak hour operating at an LOS of F, vehicle queues over 600m, and average delays of over 100 seconds.

The anticipated intersection performance during the morning peak period is summarised in Figure 30 below.

Figure 30: Grand Drive / eastern roundabout development intersection performance – Morning Peak Hour

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows [Total	HV]	Arrival Flows [Total	HV]	Deg. Satn	Aver. Delay	Level of Service	95% Back Of Queue [Veh.	Dist]	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed
			veh/h	%	veh/h	%	v/c	sec		veh	m				km/h
East: Grand Drive East															
4	L2	All MCs	744	2.6	744	2.6	1.044	114.2	LOS F	94.6	683.7	1.00	4.11	6.78	19.5
5	T1	All MCs	298	6.7	298	6.7	1.044	114.3	LOS F	94.6	683.7	1.00	4.11	6.78	19.5
Approach			1042	3.7	1042	3.7	1.044	114.2	LOS F	94.6	683.7	1.00	4.11	6.78	19.5
North: SH1 Offramp															
7	L2	All MCs	109	11.9	109	11.9	0.246	12.6	LOS B	1.5	11.5	0.84	0.77	0.84	41.8
8	T1	All MCs	1	0.0	1	0.0	0.246	11.6	LOS B	1.5	11.5	0.84	0.77	0.84	42.0
9	R2	All MCs	32	0.0	32	0.0	0.246	16.4	LOS B	1.5	11.5	0.84	0.77	0.84	41.5
Approach			142	9.2	142	9.2	0.246	13.4	LOS B	1.5	11.5	0.84	0.77	0.84	41.7
West: Grand Drive West															
11	T1	All MCs	648	3.5	648	3.5	0.597	2.5	LOS A	0.0	0.0	0.00	0.45	0.00	47.0
12	R2	All MCs	384	1.8	384	1.8	0.597	7.3	LOS A	0.0	0.0	0.00	0.45	0.00	46.4
Approach			1032	2.9	1032	2.9	0.597	4.3	LOS A	0.0	0.0	0.00	0.45	0.00	46.7
All Vehicles			2216	3.7	2216	3.7	1.044	56.6	LOS E	94.6	683.7	0.52	2.19	3.24	28.2

The anticipated intersection performance during the evening peak period is summarised in Figure 31 below.

Figure 31: Grand Drive / eastern roundabout development intersection performance – Evening Peak Hour

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows [Total	HV]	Arrival Flows [Total	HV]	Deg. Satn	Aver. Delay	Level of Service	95% Back Of Queue [Veh.	Dist]	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed
			veh/h	%	veh/h	%	v/c	sec		veh	m				km/h
East: Grand Drive East															
4	L2	All MCs	390	6.2	390	6.2	0.766	8.9	LOS A	11.4	82.8	0.88	0.76	1.07	44.2
5	T1	All MCs	460	2.6	460	2.6	0.766	8.6	LOS A	11.4	82.8	0.88	0.76	1.07	44.5
Approach			850	4.2	850	4.2	0.766	8.7	LOS A	11.4	82.8	0.88	0.76	1.07	44.3
North: SH1 Offramp															
7	L2	All MCs	164	6.1	164	6.1	0.426	17.0	LOS B	3.3	24.1	0.92	0.89	1.11	39.7
8	T1	All MCs	3	100.0	3	100.0	0.426	24.5	LOS C	3.3	24.1	0.92	0.89	1.11	39.6
9	R2	All MCs	65	0.0	65	0.0	0.426	21.2	LOS C	3.3	24.1	0.92	0.89	1.11	39.4
Approach			232	5.6	232	5.6	0.426	18.3	LOS B	3.3	24.1	0.92	0.89	1.11	39.6
West: Grand Drive West															
11	T1	All MCs	900	1.6	900	1.6	0.641	2.5	LOS A	0.0	0.0	0.00	0.38	0.00	47.5
12	R2	All MCs	214	3.7	214	3.7	0.641	7.4	LOS A	0.0	0.0	0.00	0.38	0.00	46.9
Approach			1114	2.0	1114	2.0	0.641	3.4	LOS A	0.0	0.0	0.00	0.38	0.00	47.4
All Vehicles			2196	3.2	2196	3.2	0.766	7.0	LOS A	11.4	82.8	0.44	0.58	0.53	45.3

Therefore, from a traffic perspective, the intersection operates within acceptable thresholds all periods except the Grand Drive East approach in morning peak. This is discussed below.

6.2.5 REVISED SIDRA MODEL

As mentioned above, the Grand Drive East leg of the eastern roundabout would not operate within acceptable boundaries with all the additional traffic included in the proposal (100% of Ara Hills and approximately 1250 dwellings from the subject site) assuming all traffic has only one way in and out of the area (ie none of the southern

legs including the NoR6 transport corridor connection and local road 17 apart of stage 2 connections to Upper Orewa Road).

To test the sensitivity of this analysis, a series of reductions in the subject site traffic has been undertaken on the eastern roundabout in the morning peak to assess where / when this intersection reaches capacity. This has been found to be 30%. The SIDRA output for the southbound morning peak hour intersection is included below in Figure 32.

Figure 32: Eastern intersection morning peak hour with 30% volume reduction

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
East: Grand Drive East															
4	L2	All MCs	744	2.6	744	2.6	0.938	24.3	LOS C	31.6	228.7	1.00	1.49	2.08	37.2
5	T1	All MCs	265	7.5	265	7.5	0.938	24.4	LOS C	31.6	228.7	1.00	1.49	2.08	37.4
Approach			1009	3.9	1009	3.9	0.938	24.3	LOS C	31.6	228.7	1.00	1.49	2.08	37.3
North: SH1 Offramp															
7	L2	All MCs	109	11.9	109	11.9	0.202	9.8	LOS A	1.2	8.9	0.76	0.72	0.76	43.2
8	T1	All MCs	1	0.0	1	0.0	0.202	8.9	LOS A	1.2	8.9	0.76	0.72	0.76	43.5
9	R2	All MCs	25	0.0	25	0.0	0.202	13.8	LOS B	1.2	8.9	0.76	0.72	0.76	43.0
Approach			135	9.6	135	9.6	0.202	10.5	LOS B	1.2	8.9	0.76	0.72	0.76	43.2
West: Grand Drive West															
11	T1	All MCs	572	4.0	572	4.0	0.510	2.5	LOS A	0.0	0.0	0.00	0.44	0.00	47.0
12	R2	All MCs	308	2.3	308	2.3	0.510	7.4	LOS A	0.0	0.0	0.00	0.44	0.00	46.4
Approach			880	3.4	880	3.4	0.510	4.2	LOS A	0.0	0.0	0.00	0.44	0.00	46.8
All Vehicles			2024	4.1	2024	4.1	0.938	14.6	LOS B	31.6	228.7	0.55	0.98	1.09	41.4

Other connections on the southern side of the site are proposed including the NoR6 arterial road, and a connection to Upper Ōrewa Road will provide alternative routes for residents, this in combination with the proposed cyclist and pedestrian connections to the wider network. From a traffic perspective a 30% traffic volume reduction on the Grand Drive intersections due to the alternative connections is considered to be likely.

As the construction of Stage 2, comprising 749 dwellings/allotments, expressly includes the construction of the connection to Upper Ōrewa Road, the 30% reduced traffic volumes on Grand Drive are considered to be likely; therefore, ensuring that the operation of the roundabout will operate within acceptable boundaries.

Further it is noted that as part of “The North Assessment Package”, an Assessment of Transport Effects (August 2023) was undertaken by Supporting Growth Alliance (which included NoR6). Significantly the assessment which including growth in the wider area including the subject site did not identify any upgrades were required to the interchange. This assessment was based on a wider assessment including the use of the regional multi-modal model (MSM).

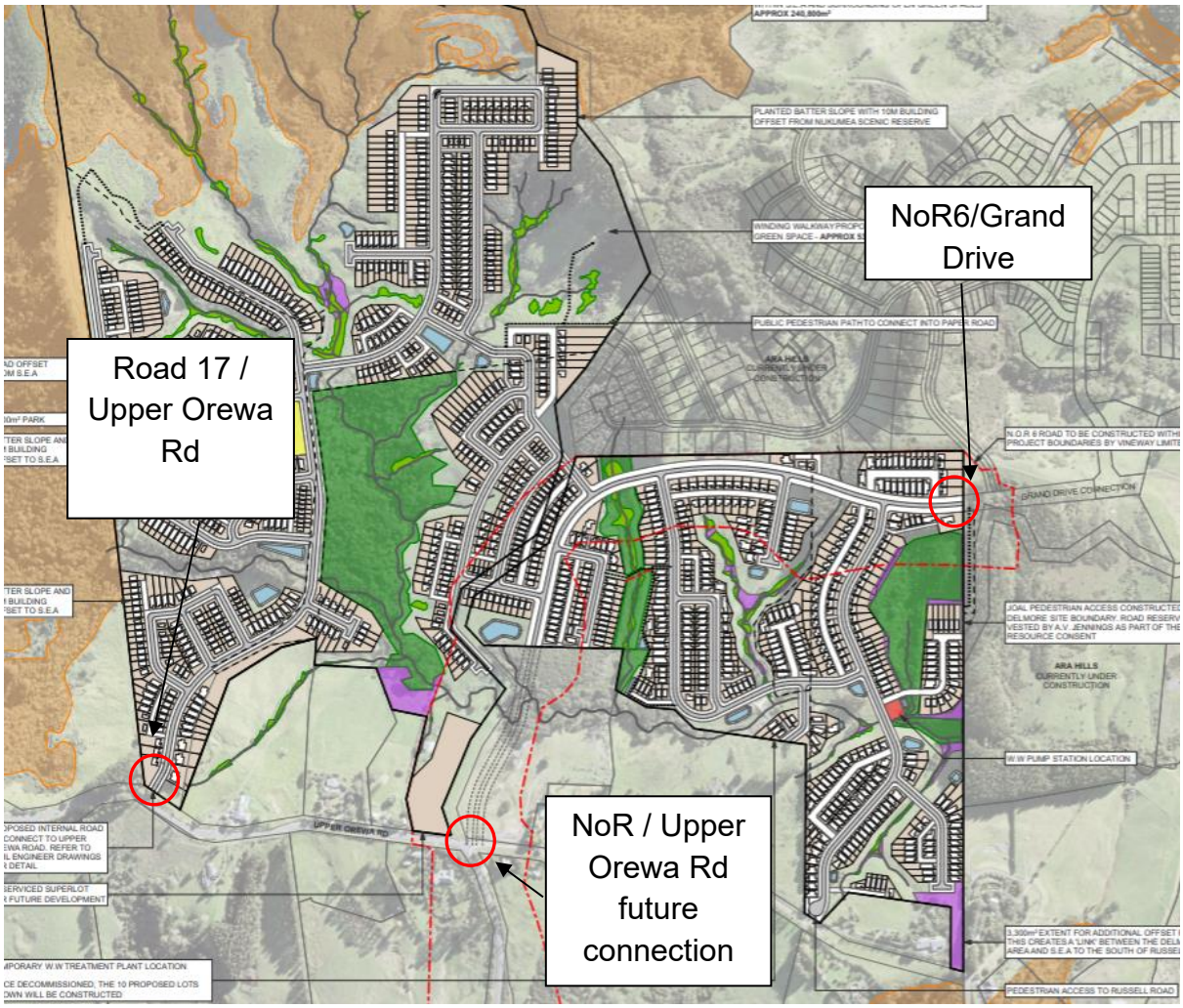
7 PROPOSED ROAD NETWORK

7.1 ROAD LAYOUT

The site connects to the wider road network at one location being Grand Drive. Provision has also been made in the design to connect in future to Russell Road and Upper Ōrewa Road.

Internal to the site, stage 1 of the development includes 10 local roads. Figure 33 shows the proposed internal road layout and the connections to Upper Ōrewa Road and Grand Drive.

Figure 33. Proposed Road Network



In stage 2 of the development includes 17 internal roads and 34 JOALs have been proposed.

Table 7-2 outlines the proposed Roads / JOALS and the number of dwellings they serve.

Table 7-2: Road / JOALs

Stage 1 Road & JOAL	Number of Dwellings serviced	Stage 2AB Roads and JOALs	Number of Dwellings serviced	Stage 2CD Roads and JOALs	Number of Dwellings serviced
N0R6					
Road 1	64	Road 7	4	Road 17	65
Road 2	57	Road 11	13	Road 18	26
Road 3	17	Road 12	32	Road 19	10
Road 4	26	Road 13	42	Road 20	11
Road 5	2	Road 14	97	Road 21	35
Road 6	3	Road 15	18	Road 22	41
Road 7	7	Road 16	16	Road 23	16
Road 8	21			Road 24	35
Road 9	21			Road 25	16
Road 10	7			Road 26	17
				Road 27	24
JOAL 1	25	JOAL 13	40	JOAL 28	5
JOAL 2	5	JOAL 14	5	JOAL 29	3
JOAL 3	41	JOAL 15	5	JOAL 31	6
JOAL 4	23	JOAL 16	9	JOAL 32	6
JOAL 5b	20	JOAL 17	8	JOAL 33	10
JOAL 5a	4	JOAL 18	5	JOAL 35	11
JOAL 6	34	JOAL 19	5	JOAL 36	10
JOAL 7	7	JOAL 20	4	JOAL 38	6
JOAL 8	21	JOAL 21	13	JOAL 39	14
JOAL 9	28	JOAL 22	2		
JOAL 10	7	JOAL 22B	15		
JOAL 11	6	JOAL 23	5		
JOAL 12	0	JOAL 26	6		
JOAL 13	12	JOAL 27B	9		
JOAL 16	3				

7.2 SPEED CALMING MEASURES

Because of the residential nature of the proposed development, slower traffic speeds are desirable to enhance the safety, amenity, and liveability of the neighbourhood.

The Traffic Calming Chapter 8: Traffic Calming Devices and Local Area Traffic Management (LATM) provides a range of recommended measures to achieve slower speeds.

Within the site, traffic calming in the form of speed tables is proposed at approximately 60m intervals. While the proposed roads have an intended posted speed limit of 50km/hr, they have been designed to operate at lower speeds (30-40km/hr) with traffic calming provisions.

7.3 ROAD CROSS SECTION

Table 3 shows the cross sections of the proposed internal roads. In this regard there are only two road types proposed being the NoR 6 arterial / Grand Drive extension and local roads.

Table 3: Road Cross Section

Roads	Road Reserve Width	Lane Width	Pedestrian Footpath Width	Parking Provisions
NoR 6 Road / Grand Drive extension	24 metres	3.8m in either direction plus 2.8m median (10.4 total width)	2.0m footpath and 2.0m cycle lane on either side	NA
All other local Roads	16 metres	3.0m in either direction (6.0m total width)	1.8m width on both sides	2.25m allocated for berm/on street parking
12m JOAL	12m	3.0m in either direction (6.0m total width)	1.2m width on both sides	NA
10m JOAL	10m	3.0m in either direction (6.0m total width)	1.2m width on both sides	NA
9m JOAL	9m	3.0m in either direction (6.0m total width)	NA	NA
8m JOAL	8m	3.0m in either direction (6.0m total width)	NA	NA
4.5m JOAL	4.5m	3.0m single lane width (3.0m total width)	NA	NA
4m JOAL	4m	3.0m single lane width (3.0m total width)	NA	NA

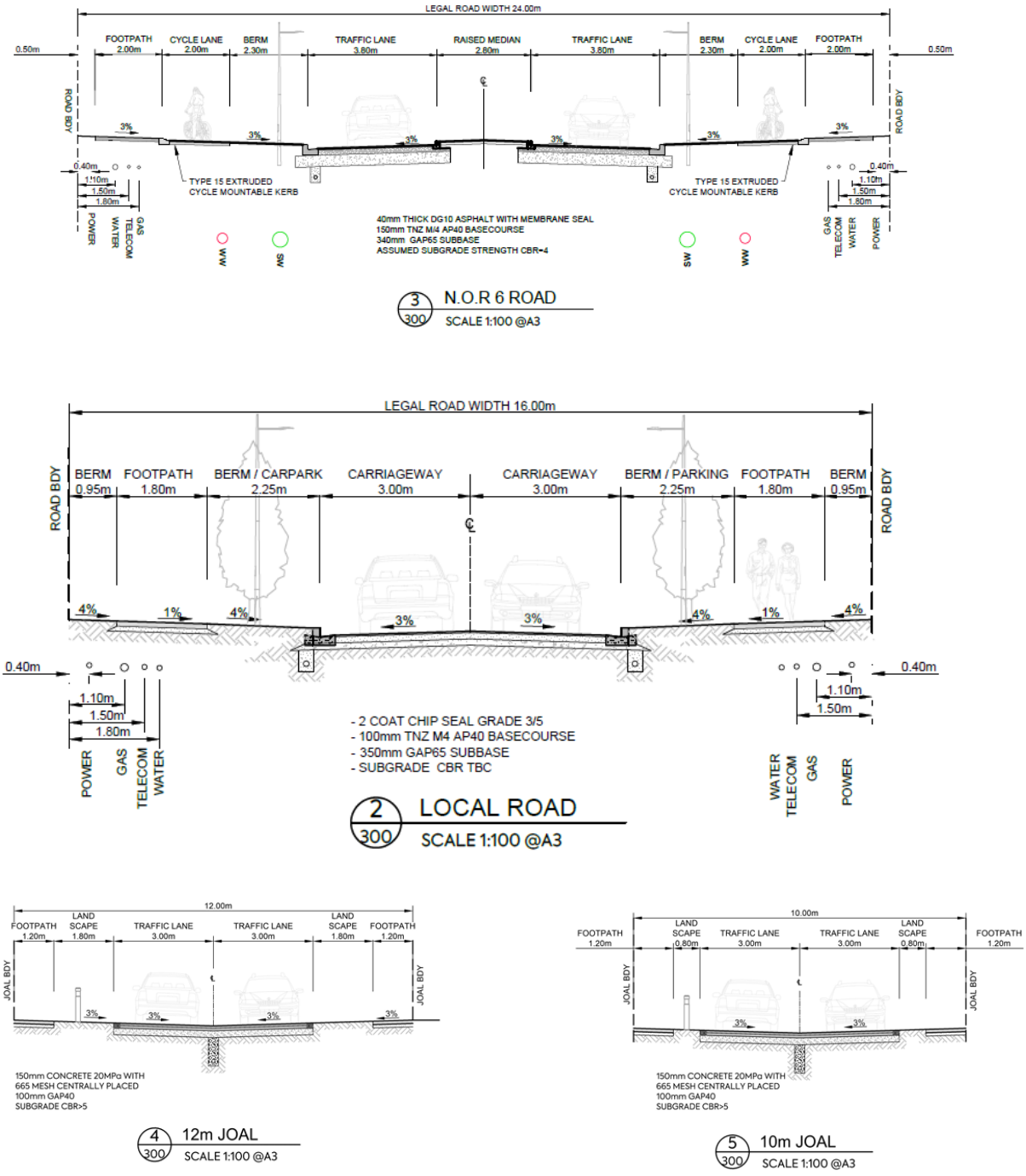
It is noted that the carriageway width will have localised widening at the bends to accommodate truck movements.

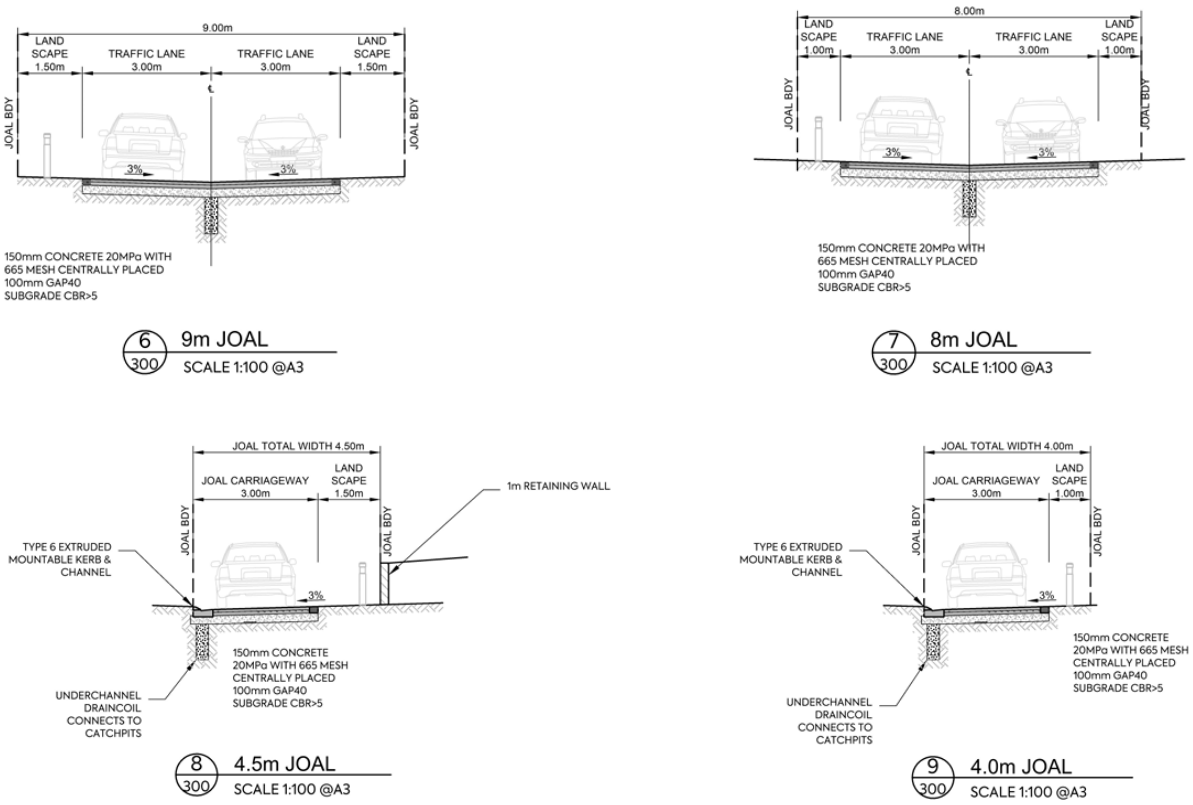
An assessment has been undertaken of the proposed new roads against the local road cross-sectional requirements in the Auckland Transport Design Manual (ATDM) standards.

The proposed road reserve, lane width and footpath dimensions comply with the applicable cross-section in the ATDM.

The cross sections of the proposed roads and JOALs are shown in Figure 34.

Figure 34. Road Cross Sections





Overall, all road / pedestrian footpath / cycle-lanes and berm / parking areas comply with ATDM.

7.4 FUTURE EFFECTS

7.4.1 PUBLIC TRANSPORT

The proposed road network would provide a through connection for potential bus services. Based on the existing public transport network, the 985-bus service could be extended (with increased frequency) through the site as shown in Figure 35.

In the long term, a new bus service (987) referenced in the Auckland Regional Public Transport Plan (ARPTP)[3] is planned to connect Orewa, West Hoe Heights, Ara Hills, and Hibiscus Coast Station from 2027. The route of this service is yet to be determined, and therefore it could be extended to route through the subject site.

[3] https://at.govt.nz/about-us/transport-plans-strategies/regional-public-transport-plan-2023-2031-rptp

Figure 35: Potential Public Transport Route

The surrounding area has deficiencies in alternative modes of transport to private vehicle travel. As discussed earlier, under the Ara Hills consented development, a new pedestrian and cycling connection will be provided along Grand Drive connecting the existing pedestrian facilities to the site, providing the site and surrounding residential areas with a viable mode of public transport to travel to the key attractions in the area.

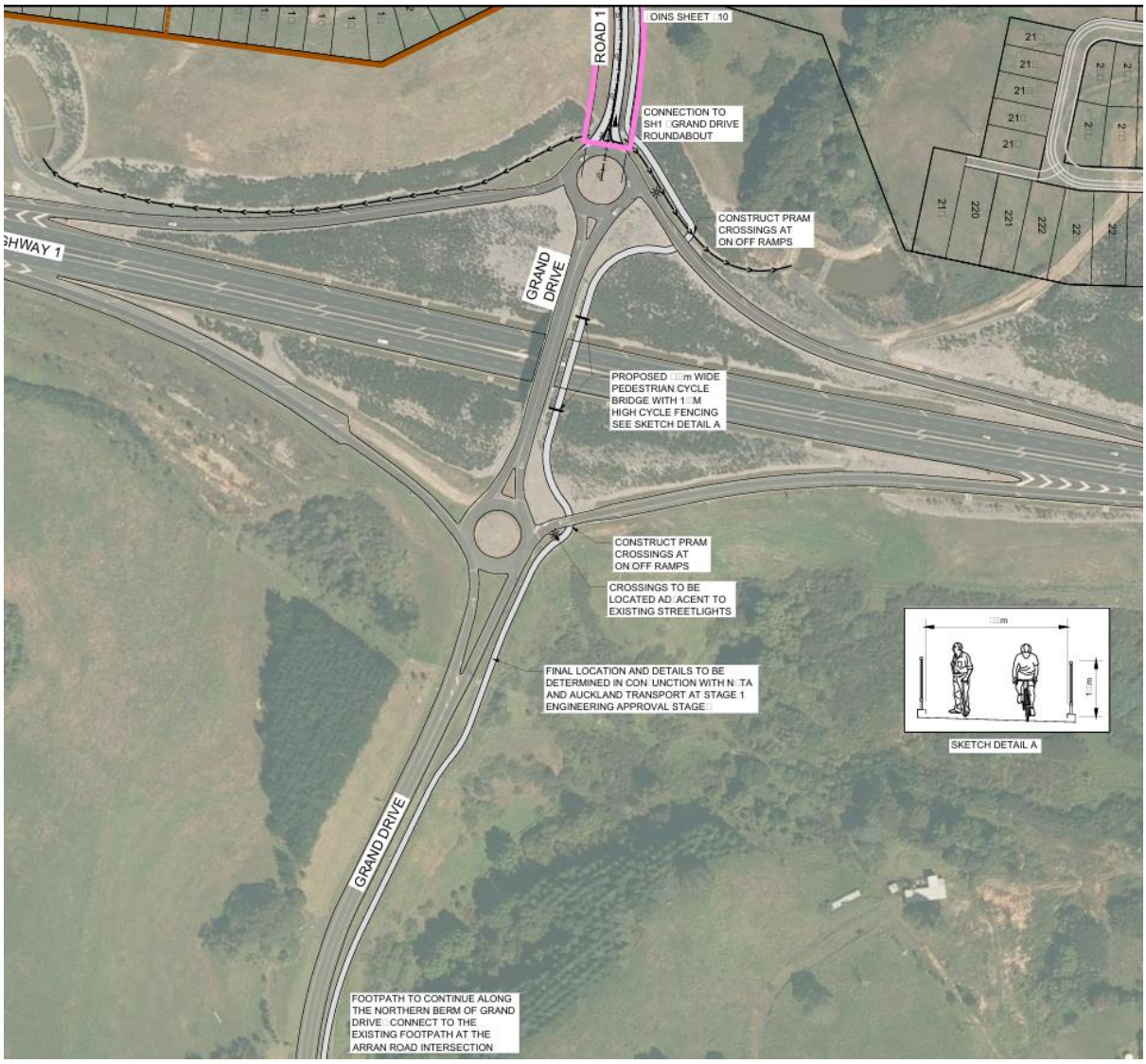
It is noted, whilst driving a private vehicle from the site takes approximately 10-15 minute during peak hours and is therefore likely to be more attractive in a time-sense, there are limited park-n-ride spaces available at the Hibiscus Coast Station, as such public transport will be an attractive mode of transport for those commuting.

7.4.2 ACTIVE MODES

As discussed in Section 2.4.3, the site and residential area to the north of the site has poor accessibility in the north-south direction towards Grand Drive.

It is proposed to provide a cycle path along both sides of the NoR 6 road within the site This would connect into the Ara Hills development and as noted earlier, Ara Hills has a condition to provide a path across SH1 to the existing paths to the east as seen in Figure 36 below.

Figure 36: Ara Hills Pedestrian Facilities Consent Requirement

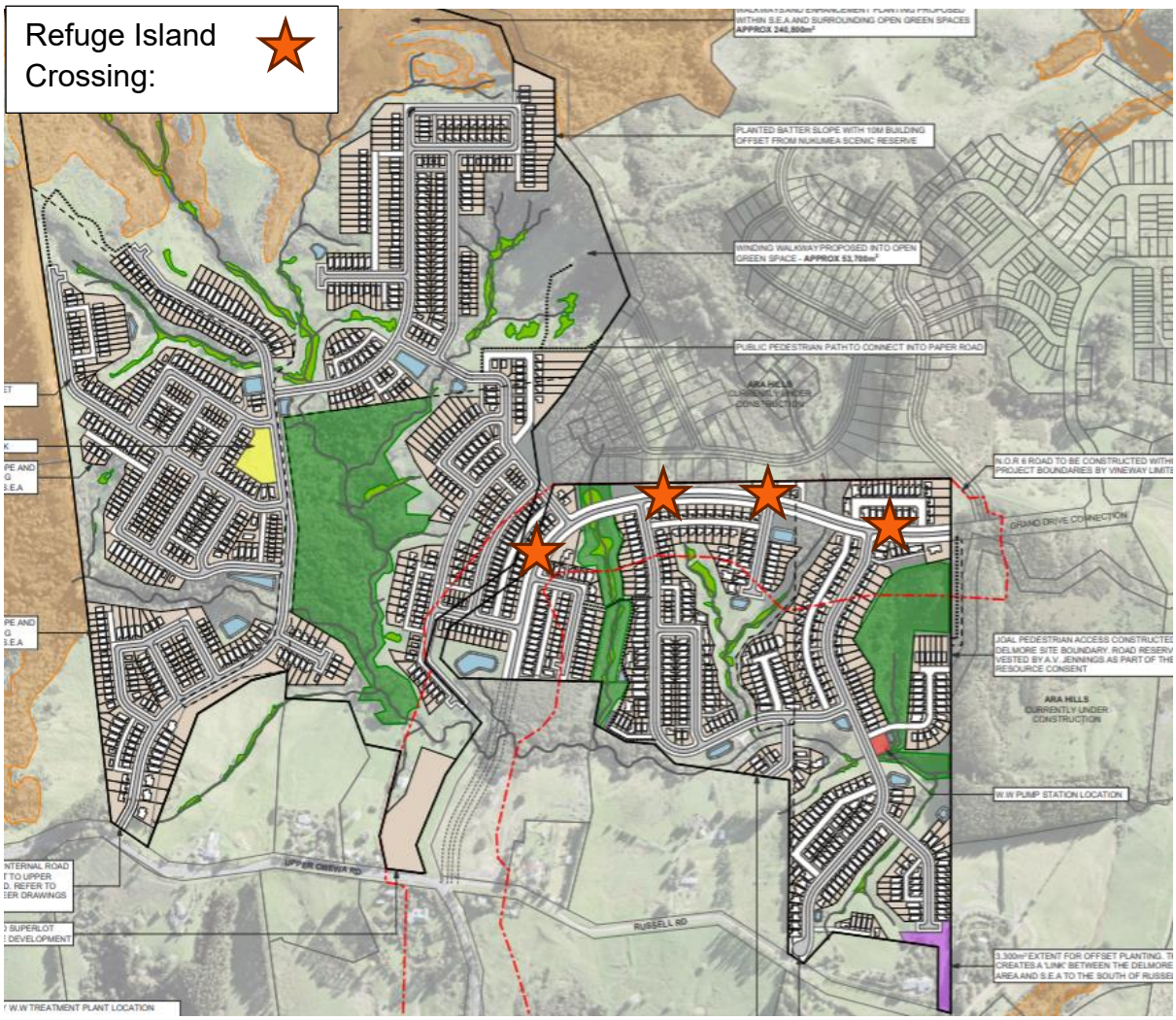


Pedestrian footpaths are provided on either side of the NoR6 road as 1.8m footpaths which will be able to connect into the proposed footpaths and cycle ways along Grand Drive leading to an effective pedestrian connection from the site to attraction facilities in Ōrewa.

Figure 37 provides a plan of the key pedestrian and cycle links through the site. The proposed arrangement provides footpaths in both directions on the NoR6 and all

local roads and provides connections to key walking and cycling corridors external to the site in the future. Pram crossings are provided at all local road intersections. Refuge islands including pram crossings are provided across the NoR6 arterial road in four places as indicated below.

Figure 37: Active Mode Facilities within the site



8 ROAD GEOMETRY

8.1 VEHICLE TRACKING

The ATDM requires that local roads must be capable of accommodating:

- Mid-block:
  - Simultaneous movement of two AT 6.3m vans
  - Simultaneous movement of an AT 6.3m van and 10.3 m truck
- Intersections:
  - 10.3m truck (essentially a public collection rubbish truck) using full road width to turn
  - Simultaneous turning movement of two AT 6.8m vans

For local roads accommodating bus routes, the roads must be capable of accommodating:

- Midblock:
  - Simultaneous movement of two 12.6m buses
  - 13.5m bus not crossing the marked centreline to avoid penetrating opposing traffic lane

Vehicle tracking has been undertaken for all roads within the proposed internal road network. The following parameters were used for vehicle tracking:

- 500mm body clearance for vans and trucks;
- Body clearance provided to the kerb and any oncoming vehicle (where simultaneous movement is occurring); and
- 20km/h speed midblock and 15km/h speed when turning within intersections

Vehicle tracking demonstrates various sections of local roads cannot accommodate simultaneous movements of a 10.3m truck (public rubbish truck) and 6.3m van. Generally, intersection movements are well accommodated within the local road network. Vehicle tracking is shown in **Attachment B** and demonstrates the above requirements .

There are minor areas (intersections and curves) that require slight widening to accommodate the vehicles (less than 300mm). This widening of kerbs will not change the overall lot layout however **vehicle tracking will be checked again at the EPA stage to ensure compliance**.

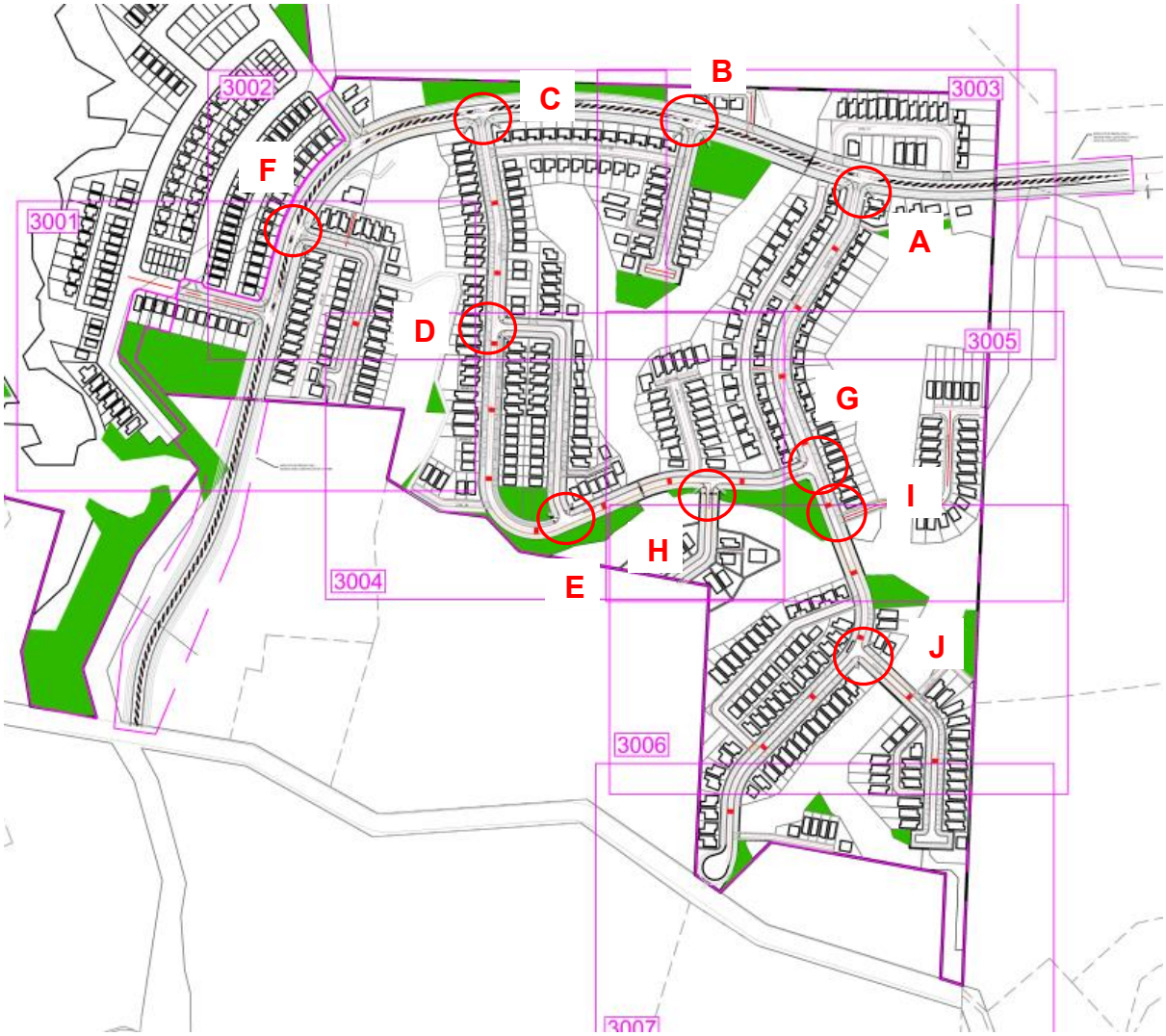
8.2 LOCAL ROAD INTERSECTIONS

8.2.1 STAGE 1

A total of 10 intersections have been proposed within stage 1, with all intersections characterised as local / local road, priority-controlled ‘T’ intersections and priority afforded to the major approach. As discussed in Section 9.1, each intersection has been designed to accommodate the simultaneous turning manoeuvres of a 6.3m van and 6.3m van, and a 10.3m truck utilising both lanes when manoeuvring on the local road. Priority controlled intersections are considered appropriate from a capacity perspective within the development.

These local road intersections are shown in Figure 38 below.

Figure 38. Stage 1 Proposed Local Road Intersection locations



8.2.1.1 SAFE INTERSECTION SIGHT DISTANCE (SISD)

Safe Intersection Sight Distance (SISD) is the minimum distance that should be provided on the major road at any intersection, for a driver on the major road to observe a vehicle moving into a collision position from the minor road and to decelerate to a stop before reaching the collision point.

All new internal intersections as part of this proposal will be controlled with give way road markings. While the proposed roads have an intended posted speed limit of 50km/hr, they have been designed to be lower operating speed roads (30-40km/hr) with the provisions for traffic calming devices such as speed tables. As such, sight distance has been calculated based on 40km/h, which is considered a conservative operating speed of the road.

The Austroads: Guide to Road Design Part 4A Table 3.2 requires for intersections on a 40 km/h carriageway that a safe sight distance of 73m be provided.

Table 4 shows the SISD provided at each proposed intersection and the compliance based on the SISD requirement of 73m.

Table 4: Safe Intersection Sight Distance at all local road intersections

Intersection	SISD western/Left direction	SISD eastern/right direction	Compliance
A	150+ metres	150+ metres	Yes
B	150+ metres	150+ metres	Yes
C	100 metres	100+ metres	Yes
D	140 metres	100+ metres	Yes
E	100+ metres	37 metres to corner	No, in eastern direction
F	100+ metres	88 metres	Yes
G	100+ metres	135 metres	Yes
H	90 metres	89 metres	Yes
I	81 metres	135 metres	Yes
J	100+ metres	73 metres	Yes

As shown in the table above, all proposed intersections except for intersection E meet the full minimum SISD requirement of 73 metres.

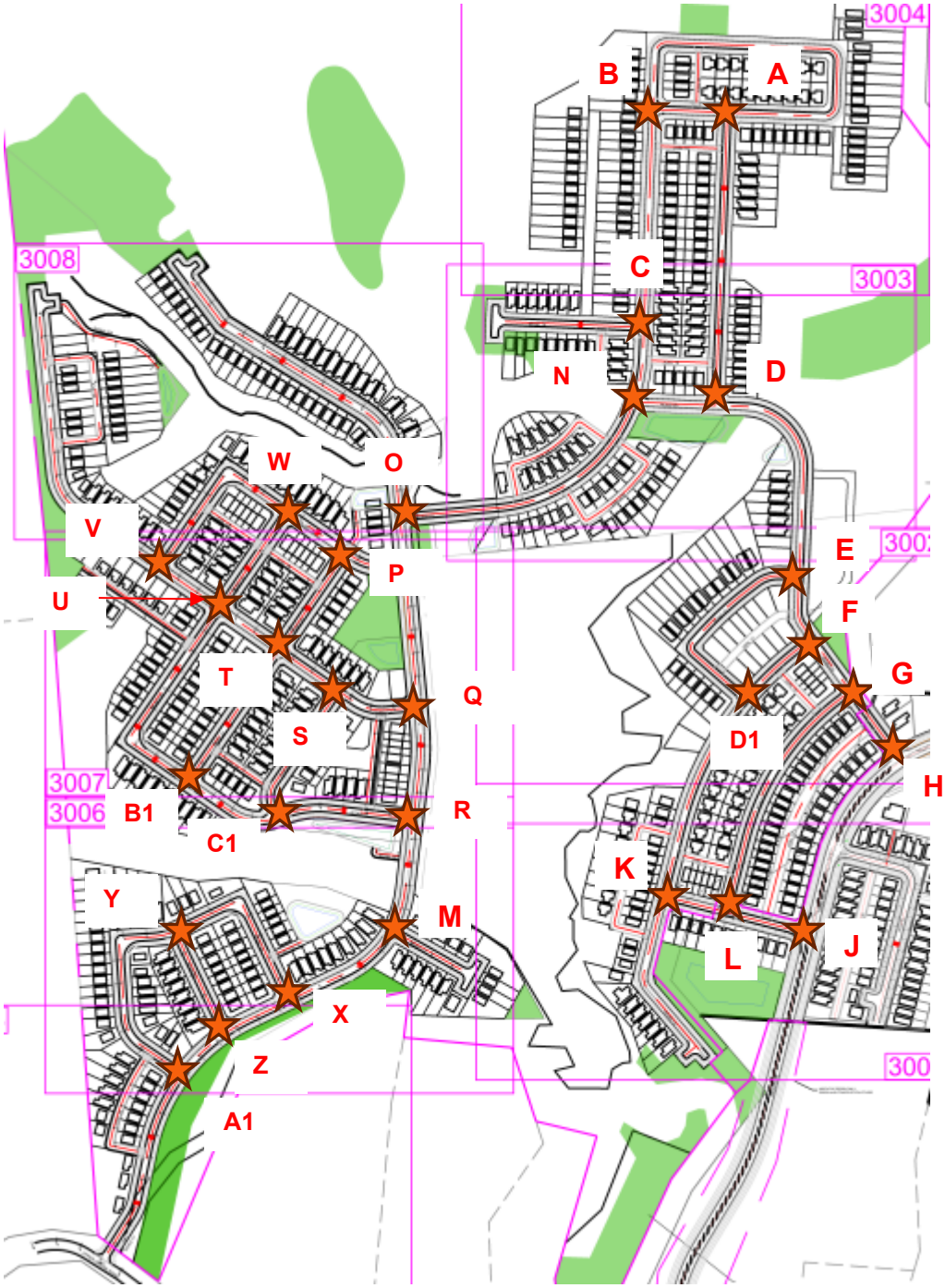
In the case on intersection O which does meet the SISD in the eastern direction the limited sight distance is a result of another intersection, corner, or end of road. As vehicles turning corners or into intersections will be travelling at a much slower speed, the lower sight distances are considered to be acceptable.

8.2.2 STAGE 2

A total of 29 intersections have been proposed within stage 2, with all intersections characterised as local / local road, priority-controlled ‘T’ intersections and priority afforded to the major approach. As discussed in Section 9.1, each intersection has been designed to accommodate the simultaneous turning manoeuvres of a 6.3m van and 6.3m van, and a 10.3m truck utilising both lanes when manoeuvring on the local road. Priority controlled intersections are considered appropriate from a capacity perspective within the development.

These local road intersections are shown in Figure 39 below. These intersections will be referred to by these labels in this report.

Figure 39. Stage 2 Proposed Local Road Intersection locations



8.2.2.1 SAFE INTERSECTION SIGHT DISTANCE (SISD)

Table 5 shows the SISD provided at each proposed intersection and the compliance based on the SISD requirement of 73m.

Table 5: Safe Intersection Sight Distance at all local road intersections

Intersection	SISD western/Left direction	SISD eastern/right direction	Compliance
A	55 metres	100 metres	No, in western direction
B	200+ metres	57 metres	No, in eastern direction
C	200+ metres	91 metres	Yes
D	68 metres	68 metres	No, in both directions
E	120 metres	80 metres	Yes
F	150+ metres	129 metres	Yes
G	92 metres	73 metres	Yes
H	166 metres	109 metres	Yes
J	140 metres	150+ metres	Yes
K	74 metres	119 metres	Yes
L	63 metres	54 metres	No, in both directions
M	150+ metres	150+ metres	Yes
N	106 metres	150+ metres	Yes
O	150+ metres	95 metres	Yes
P	115 metres	51 metres	No, in eastern direction
Q	150+ metres	93 metres	Yes
R	100 metres	100 metres	Yes
S	150+ metres	70 metres	No, in eastern direction
T	150+ metres	100 metres	Yes
U	150 metres	150+ metres	Yes
V	150+ metres	100+ metres	Yes
W	58 metres to corner	100 metres	No, in western direction
X	85 metres	100+ metres	Yes
Y	50 metres to corner	61 metres to corner	No, in both directions
Z	150+ metres	120 metres	Yes
A1	100+ metres	100+ metres	Yes
B1	71 metres to corner (check)	61 metres to corner	No, in both directions
C1	110 metres to intersection	31 metres to corner	No, in eastern direction
D1	73 metres	120+ metres	Yes

As shown in the table above, 10 intersections do not meet the minimum SISD requirement of 73 metres, in the eastern direction and western directions. This non-compliance is assessed below.

The lower sight distance values can be considered to be acceptable as vehicles will be travelling at lower speeds when turning the corner or exiting an intersection, combined with traffic calming measures. This is considered to be acceptable from a traffic perspective

8.2.3 UPPER ŌREWA ROAD INTERSECTION

Part of the Stage 2 proposal includes a connection to the existing Upper Ōrewa Road via a priority-controlled intersection (Upper Ōrewa Road having priority). Due to the rural nature of Upper Ōrewa Road and a posted speed limit of 60km/h, a sight distance analysis has been conducted to ensure the proposed intersection can operate safely. Referring to the AUSTROADS guide to road design, a safe intersection sight distance for a design speed of 60km/h is 114m; however, the posted speed limit changes to open road (100km/h) looking to the left from Road 17 therefore it is recommended from a traffic perspective that the speed signage is shifted around the bend further from the intersection to ensure all vehicles have slowed down around the bend before reaching the intersection

A SISD of 114m can be achieved in both directions provided that vegetation is removed in the road reserve in both directions to ensure a clear view is achieved at all times. This is considered acceptable from a traffic perspective, with the following consent condition proposed to ensure a safe intersection is provided.

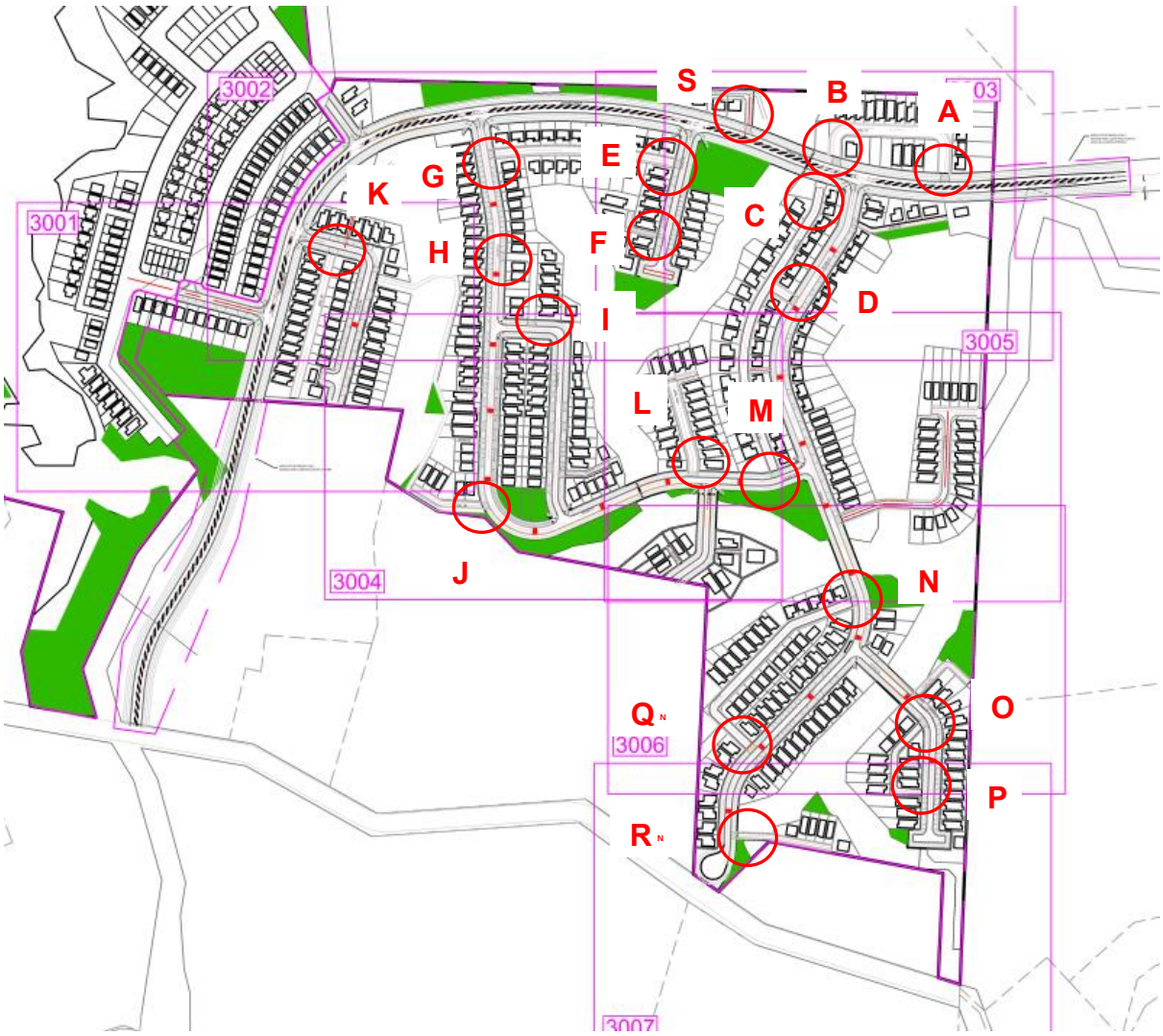
Road 17 should only be connected through to Upper Ōrewa Road when adequate sightlines can be provided.

8.3 LOCAL JOAL INTERSECTIONS

8.3.1 STAGE 1

A total of 19 Local Joal intersections have been proposed within stage 1, with all intersections characterised as JOAL / local road 'T' intersections. These local JOAL intersections are shown in Figure 40 below.

Figure 40. Stage 1 proposed JOAL / local road Intersection locations



8.3.1.1 SAFE INTERSECTION SIGHT DISTANCE (SISD)

Safe Intersection Sight Distance (SISD) is the minimum distance that should be provided on the major road at any intersection, for a driver on the major road to observe a vehicle moving into a collision position from the minor road and to decelerate to a stop before reaching the collision point.

While the proposed roads have an intended posted speed limit of 50km/hr, they have been designed to be lower operating speed roads (30-40km/hr) with the provisions

for traffic calming devices such as speed tables. As such, sight distance has been calculated based on 40km/h, which is considered a conservative operating speed of the road.

The Austroads: Guide to Road Design Part 4A Table 3.2 requires for intersections on a 40 km/h carriageway that a safe sight distance of 73m be provided.

Table 6 shows the SISD provided at each proposed JOAL intersection and the compliance based on the SISD requirement of 73m.

Table 6: Stage 1 Safe Intersection Sight Distance at all JOAL / local road intersections

Intersection	SISD western direction	SISD eastern direction	Compliance
A	150+ metres	150 metres	Yes
B	**100+ metres**	100+ metres	**Yes**
C	150+ metres	150+ metres	Yes
D	86 metres	85 metres	Yes
E	33 metres to intersection	94 metres	No, in western direction
F	95 metres	25 metres to end of road	No, in eastern direction
G	200+ metres	35 metres to intersection	No, in eastern direction
H	200 metres	120 metres	Yes
I	35 metres to corner	28 metres to intersection	No, in both directions
J	200+ metres	57 metres to corner	No, In eastern direction
K	34 metres to intersection	35 metres to corner	No, in both directions
L	89 metres to intersection	150 metres	Yes
M	26 metres to intersection	100+ metres	No, in western direction
N	188 metres	44 metres, to corner	No, in eastern direction
O	82 metres	73 metres (Check)	Yes
P	73 metres	42 metres to end of road	No, in eastern direction
Q	120 metres	80 metres	Yes
R	37 metres to end of road	56 metres, to corner	No, in both directions
S	150+ metres	150+ metres	Yes

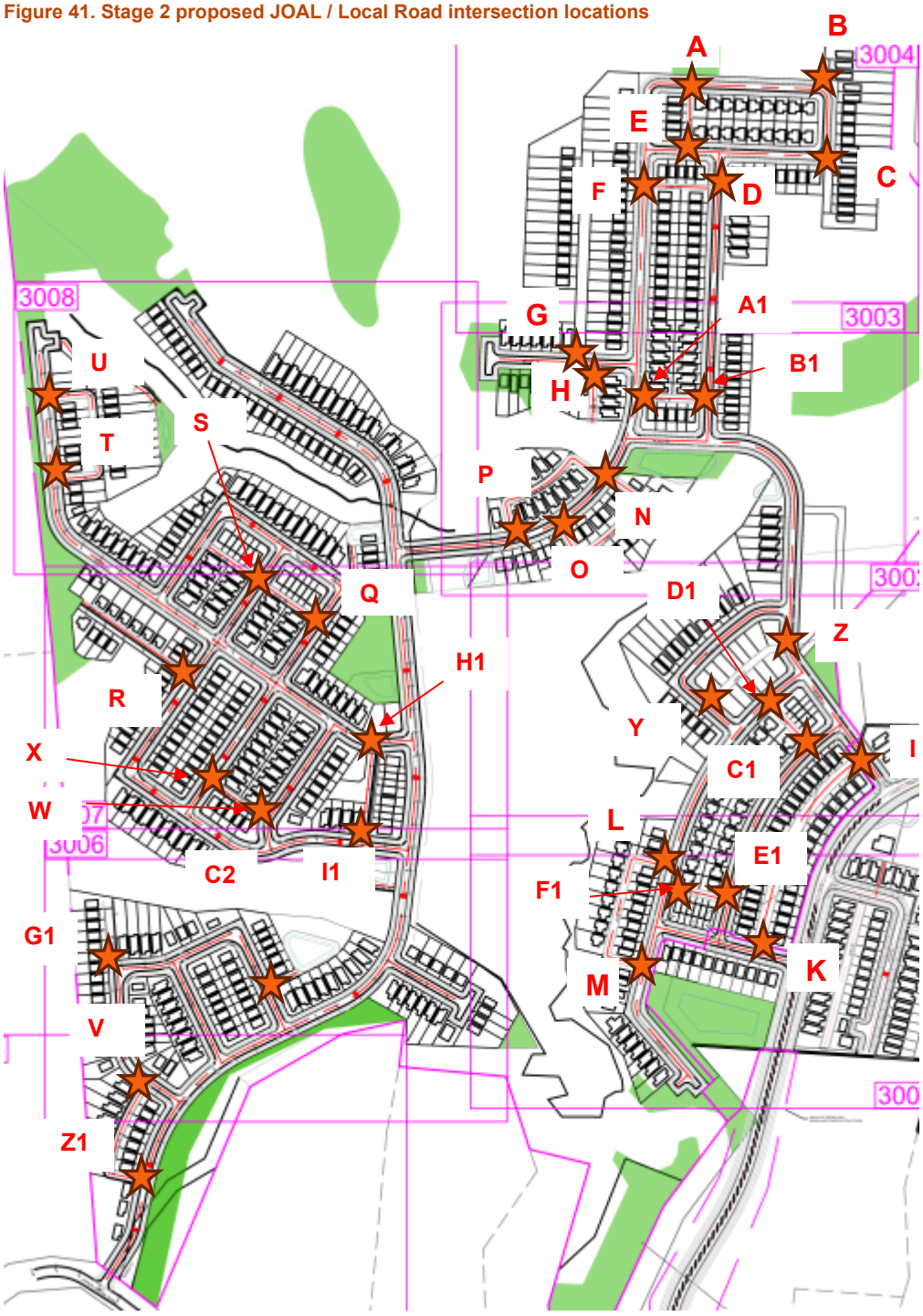
As shown in the table above, there are a number of intersections do not meet the full minimum SISD requirement of 73 metres.

In all cases however the limited sight distance is a result of another intersection, corner, or end of road. As vehicles turning corners or into intersections will be travelling at a much slower speed, the lower sight distances are considered to be acceptable in this case

8.3.2 STAGE 2

A total of 35 local JOAL / local road intersections has been proposed within stage 2, with all intersections characterised as JOAL / local road 'T' intersections. These local road intersections are shown in Figure 41 below. These intersections will be referred to by these labels in this report.

Figure 41. Stage 2 proposed JOAL / Local Road intersection locations



8.3.2.1 SAFE INTERSECTION SIGHT DISTANCE (SISD)

Table 7 shows the SISD provided at each proposed JOAL intersection and the compliance based on the SISD requirement of 73m.

Table 7: Stage 2 Safe Intersection Sight Distance at all JOAL / local road intersections

Intersection	SISD western/Left direction	SISD eastern/right direction	Compliance
A	49 metres to corner	112 metres	No, in western direction
B	150 metres	62 metres to corner	No, in eastern direction
C	150+ metres	65 metres	No, in eastern direction
D	29 metres	Exceeds 200 metres (straight horizontal alignment)	No, in western direction
E	116 metres	35 metres	No, in eastern direction
F	200+ metres	86 metres	Yes
G	45 metres	81 metres	No, in western direction
H	91 metres	36 metres	No, in eastern direction
I	110	36 metres	No, in eastern direction
K	38 metres	88 metres	No, in western direction
L	150 metres	130 metres	Yes
M	150+ metres	60 metres	No, in eastern direction
N	109 metres	130 metres	Yes
O	137 metres	112 metres	Yes
P	87 metres	100 metres	Yes
Q	33 metres	63 metres	No, in both direction
R	33 metres	100 metres	No, in western direction
S (Joal 31 & 32)	57 metres to intersection	37 metres to intersection	No, in both directions
T	55 metres to corner (check)	100+ metres	No, in western direction
U	120 metres	61 metres to end of road	No, in eastern direction
V	60 metres (check)	32 metres to intersection	No, in both directions
W	97 metres	28 metres to intersection	No, in eastern direction
X	30 metres to intersection	100 metres	No, in western direction
Y	25 metres to intersection	33 metres to corner	No, in both directions
Z	130+ metres	120+ metres	Yes
A1	102 metres	150+ metres	Yes
B1	150+ metres	35 metres to intersection	No, in eastern direction
C1	29 metres to intersection	120+ metres	No, in western direction
D1	100 metres	38 metres to intersection	No, in eastern direction
E1	133 metres	35 metres to intersection	No, eastern direction

F1	117 metres	87 metres	Yes
G1	73 metres	95 metres	Yes
H1	150+ metres	32 metres to intersection	No, in eastern direction
I1	33 metres to intersection	100+ metres	No, in western direction

As shown in the table above, many JOAL / Local road intersections do not meet the minimum SISD requirement of 73 metres, in the eastern direction and western directions. This non-compliance is assessed below.

The lower sight distance values can be considered to be acceptable as vehicles will be travelling at lower speeds when turning the corner or exiting an intersection, combined with traffic calming measures. This is considered to be acceptable from a traffic perspective

8.4 VERTICAL ALIGNMENT

Vertical alignment is the longitudinal profile along the centreline of a road. It is made up of a series of grades forming a vertical curve. The grades are generally expressed as a percentage of the vertical component divided by the horizontal component.

The vertical curves are usually parabolic in shape and are expressed as a K value. The K value is the vertical curve constant, used to define the size of a parabola. It is the length (m) required for a 1% change of grade.

NZS4404:2010 provides no K-values for roads. In this regard, the Austroads Guide to Road Design Part 3: Geometric design, Table 8.7 and Figure 8.9 gives K values for crest and sag curves respectively which are outlined in Table 8 below.

Table 8: Minimum K-values for a crest and sag (requirements)

Minimum K-values	Crest	Sag
40km/hr	Desirable minimum: 3.5 Absolute minimum: 2.9	Desirable minimum: 3 Absolute minimum: 1
50 km/hr	Desirable minimum: 6.8 Absolute minimum: 5.4	Desirable minimum: 4 Absolute minimum: 2

The civil design long sections show all roads meet the desirable minimum for 40km/hr. With the speed calming provided this is considered appropriate.

K-values of the proposed roads will be rechecked at EPA stage to comply with the above Austroads requirements.

8.5 LONGITUDINAL GRADIENTS

With reference to the Auckland Transport TDM "*the maximum longitudinal grade accepted by Auckland Transport for new footpaths is 8%. This is to ensure that all new footpaths can be accessed by users with mobility impairments. Any footpaths above this gradient up to the legal limit of 12.5% must be assessed through the departure of standard process*."

In this regard, with reference to the Civil Engineering "*Delmore Access and Roading Report*" the steepest grade on the arterial road (NoR6) is 8% which is considered to be acceptable and meets Auckland Transport requirements. The steepest gradient on the local roads is 12.5% which exceeds the AT TDM requirement of 8% for footpaths; however, these are considered acceptable due to:

- They are generally small sections / length
- These are local roads and thus do not have specific cycling components
- The site is not flat in nature and thus requires roads to be steeper than 8% to practically gain access;
- 12.5% (1 in 8) meet the legal limit for public road gradients and have been used in local residential streets all over Auckland for a number of years.

9 PROPERTY ACCESS

9.1 GENERAL

Access to individual lots has been provided directly onto the road via individual vehicle crossings, combined vehicle crossings or via JOALs. Vehicle crossings have been combined to minimise crossing points and maximise crossing separation and JOALs have been provided on higher volume roads to minimise the number of vehicle crossings.

- **all vehicle crossings are designed as per the Auckland Transport Standard GD017A (or equivalent)**

- **visibility splays to be provided on either side of all vehicle crossings (including JOAL crossings) in accordance with Figure 3.3 of Standard ASNZS2890.1-2004 (2.0m x 2.5m splays), whereby any vegetation within the splay area should be limited to 0.6m in height and any fencing should be permeable and restricted to a maximum of 1m in height should be a condition of consent.**

The following sections outline the applicable AUP access requirements.

9.2 PROXIMITY TO INTERSECTIONS

9.2.1 REQUIREMENTS

AUP E27.6.4.1(3) states that vehicle crossings should be located to provide a separation distance greater than 10m from an intersection, measured at the property boundary (illustrated in Figure 27.6.4.1.1 of the AUP). Otherwise, the driveway is within the vehicle access restriction and a restricted discretionary assessment is required.

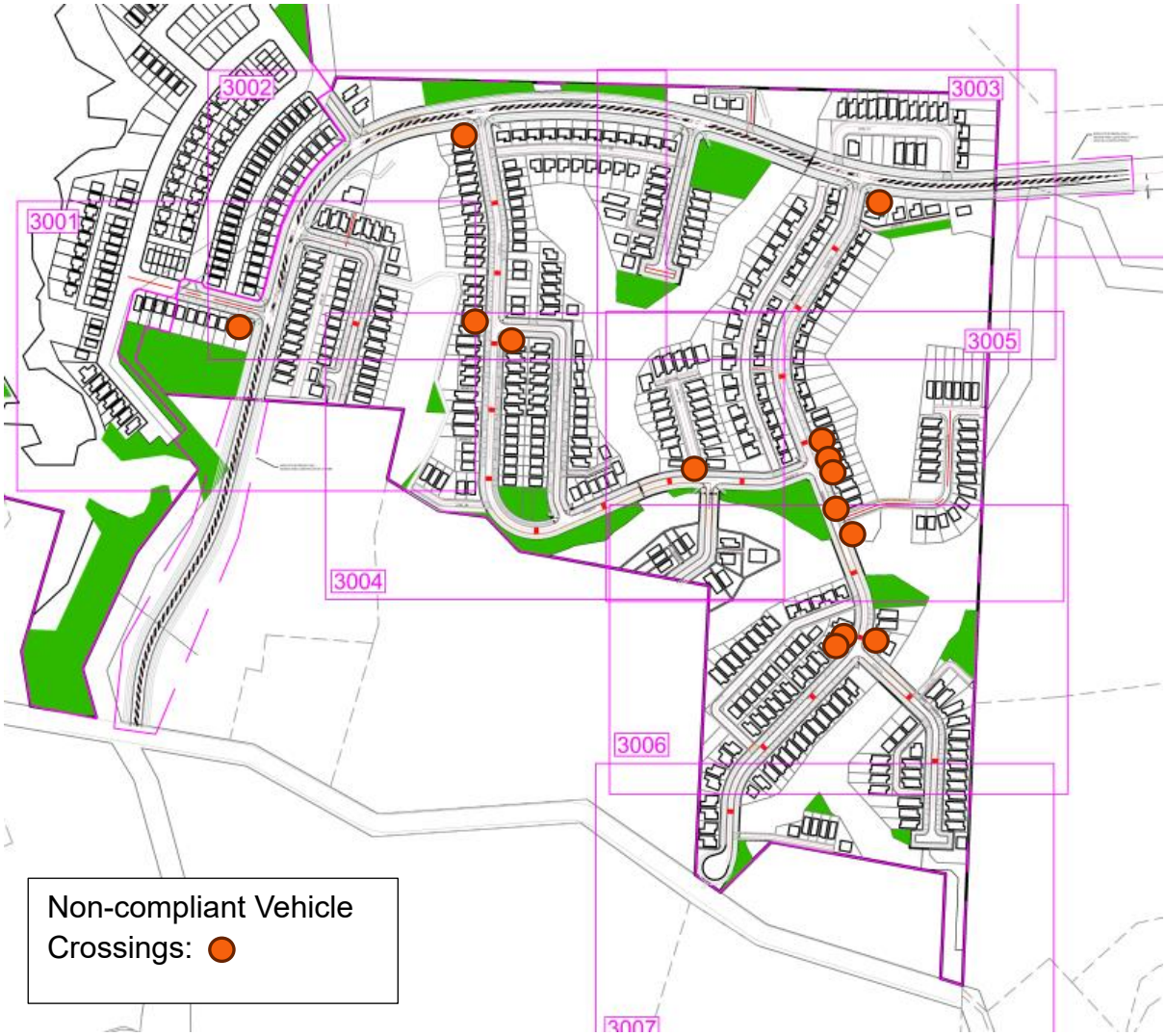
9.2.2 NON-COMPLIANT VEHICLE CROSSINGS STAGE 1

The majority of vehicle crossings, have been located outside of the vehicle access restriction area (i.e. greater than 10m). There are 17 proposed crossings as listed in Table 9 and indicated in Figure 42 which do not meet this requirement and thus require resource consent in stage 1. The majority (14) of these non-compliant vehicle crossings are located on the major road at the top of a T intersection which is discussed below.

Table 9: Vehicle Crossings Located within 10 metres of an intersection

Intersection reference	Intersection	Lot/JOAL	
		Located at top of T	Located on minor road
A	Road 1 / N0R 6		Lot 26 (9.1m from intersection)
B	Road 1 / Road 2	Lots 49-52	
C	Road 2 / Road 10	JOAL 4	
D	Road 2 / Road 4	Lots 309, 393 & 321	
E	Road 1 / Road 9	Lots 55 & 1600	
F	Road 1 / Road 8	Lot 183 & 184	Lot 227 (9.6m from intersection)
G	Road 2 / N0R 6		Lot 409 (8.3m from intersection)
I	Road 7 / N0R 6		Lot 461 & 462 (9.9m from intersection)

Figure 42: Vehicle Crossings Located within 10 metres of an intersection



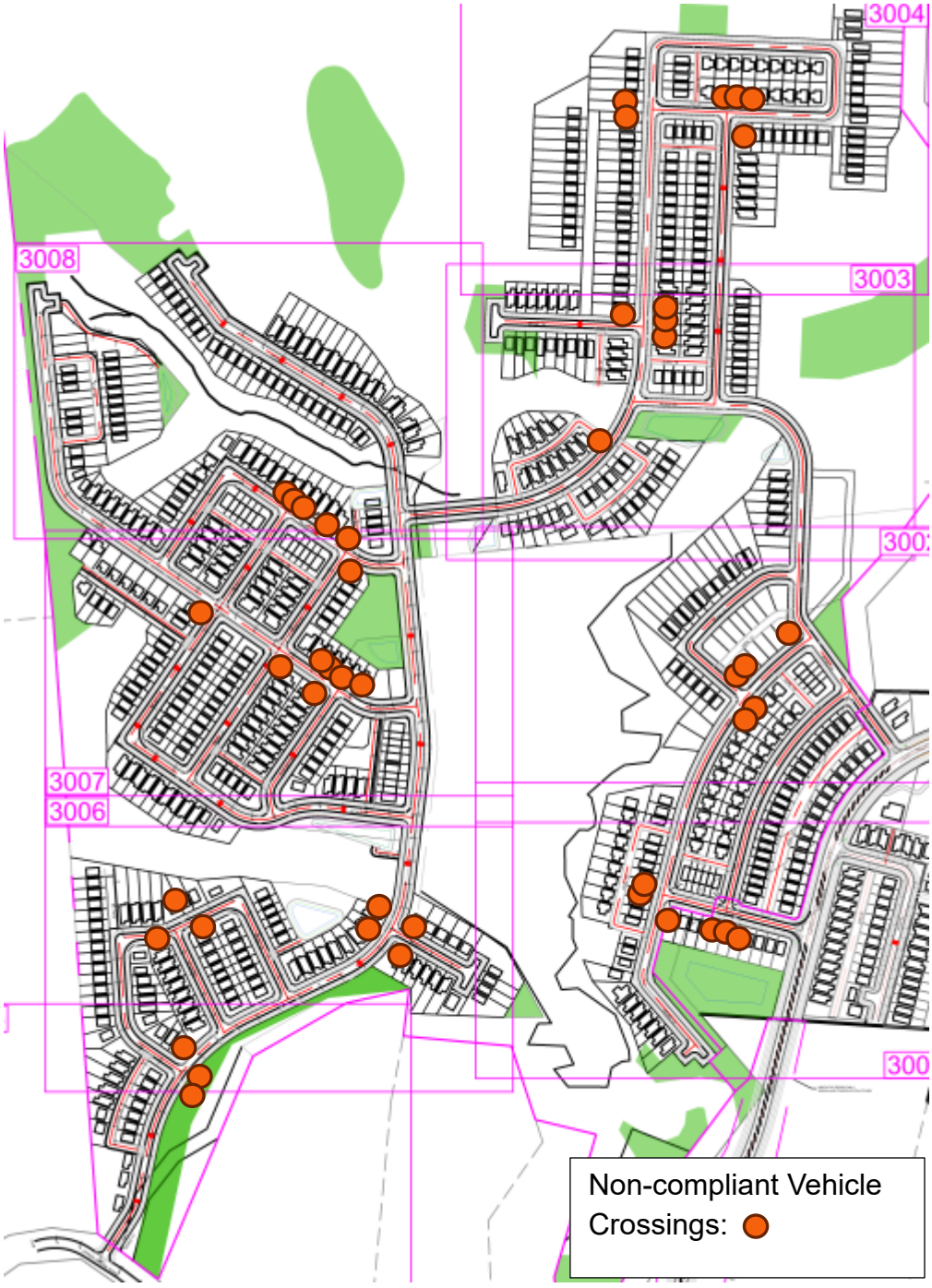
9.2.3 NON-COMPLIANT VEHICLE CROSSINGS STAGE 2

The majority of vehicle crossings, have been located outside of the vehicle access restriction area (i.e. greater than 10m). There are 56 proposed non-compliant crossings as listed in as listed in Table 10 and indicated in Figure 43 which do not meet this requirement and thus require resource consent in stage 2. The majority of the non-complaint vehicle crossings are located on the major road at the top of the T intersection which is discussed below.

Table 10: Vehicle Crossings Located within 10 metres of an intersection

Intersection reference	Intersection	Lot/JOAL	
		Located on the major road	Located on minor road
A	Road 7 / Road 11	Lot 465-467, and lot 600	
B	Road 7 / Road 12	Lots 626-631	Lot 603 (6.69m from intersection)
C	Road 5 / Road 12		Lot 714 (8.84m from intersection)
D	Road 12 / Road 15	Lot 662,663, 711,722	
E	Road 5 /Road 14	JOAL 26	
F	Road 16 / Road 14	Lot 862-864 & 854	
G	Road 14 /Road 14	Lot 833-835	
H	Road 13 / Road 14	Lot 961 & 962	
I	Road 18 / Road 20	Lot 975, 1150, and JOAL 29	Lot 1119 (9.6m from intersection)
J	Road 18 / Road 19	Lots 978-980	
K	Road 19 / 20 / 21		Lot 1039 (8.8m from intersection)
L	Road 27 / 20 / 21		Lot 1102 (9.75m from intersection)
M			
N	Road 21 / Road 26	Lot 977-980	Lot 1172, 1161 (9.4m from intersection)
O	Road 17 / Road 23	Lot 1241-1242	Lots 1225 & 1240 (9.5m from intersection)
P	Road 24 / Road 25	Lot 1259-1258	Lots 1304 & 1319 (6 & 9m from intersection)
Q	Road 24 / Road 17	Lot 1294	
R	Road 27 / Road 22	Lots 1056-1059	Lots 1068, 1093 (9.2m from intersection)

Figure 43: Vehicle Crossings Located within 10 metres of an intersection



9.2.4 NON-COMPLIANT VEHICLE CROSSINGS ON MAJOR ROAD

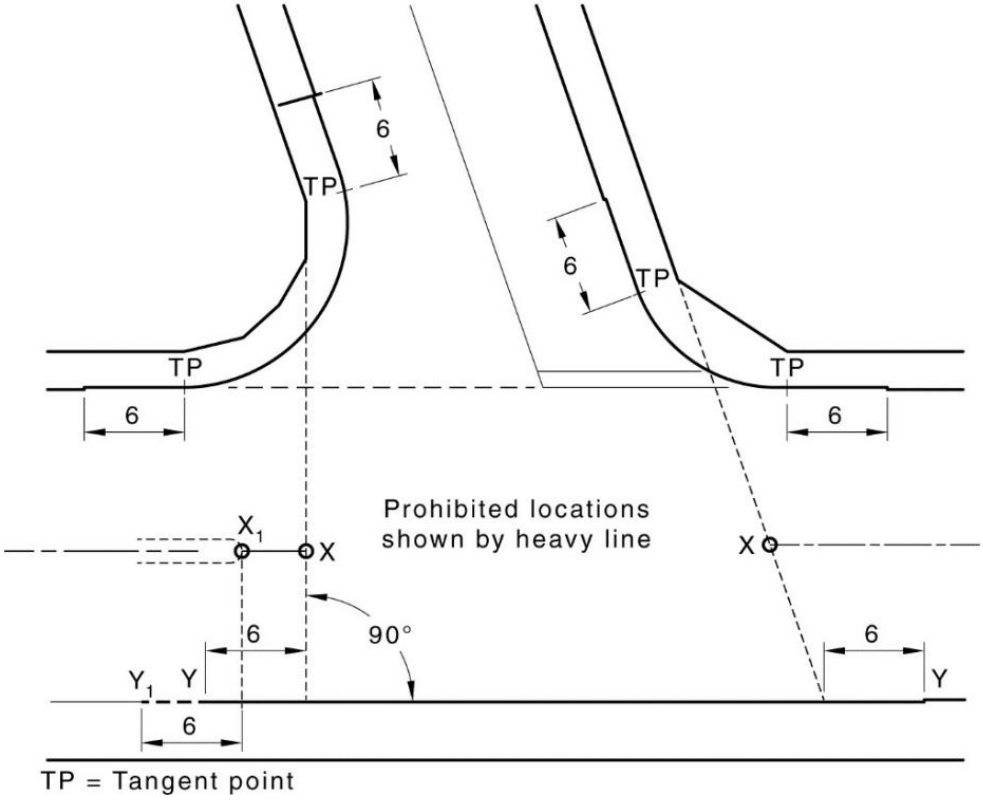
In both stages, all driveways located on a major road of an intersection are located at the top of a 'T' intersection.

In this regard, Figure 3.1 of AS / NZS 2890.1 details prohibited locations for driveways. As seen in Figure 44 below (taken from this standard), domestic driveways located at 'the top of a 'T' are excluded from this prohibition and are considered acceptable. This is due to driveways in this location access domestic

driveways are low volume and being opposite the intersection (ie top of the T) have excellent visibility to the intersection. These have been approved for this reason in most subdivision in Auckland.

Figure 44: AS / NZS 2890.1 (Figure 3.1)

Dimensions in metres



9.2.5 VEHICLE CROSSINGS ON A MINOR ROAD

Table 9 and Table 10 also outlines the vehicle crossings located on a minor road (not located at the top of a 'T' intersection).

The majority of the vehicle crossings located on a minor are located with the furthest possible separation to their respective intersection whilst remaining within the lot boundary. Given that these vehicle crossings have approximately 8-10 metres separation the non-compliance is considered to be minimal and is considered acceptable.

Additionally, these crossing locations are considered acceptable for the following reasons:

- Given the local and slow speed road environment proposed the location of these vehicle crossings are considered acceptable and will be able to operate safely. The local and slow speed road environment, as a result of speed calming measures, will provide any exiting vehicles with sufficient visibility of

oncoming vehicles (SISD) and for oncoming vehicles to see exiting vehicles (ASD) the locations of these vehicle crossings are considered acceptable and will be able to operate safely.

- For the majority of vehicle crossings located within 10 metres of the intersection, the lot boundary is located entirely within 10 metres of the nearby intersection. In most instances, the vehicle crossing has been located as far away from the intersection whilst keeping with the lot boundaries.
- visibility splays will be provided on either side of the crossings identified above in accordance with Figure 5 of the RTS 6 Standard, whereby any vegetation within the splay area should be limited to 0.6m in height and any fencing should be permeable and restricted to a maximum of 1m in height.
- For vehicle crossings on a minor road, the sight distance from the minor road approach is sufficient given the straight horizontal alignment. For sight distance towards the intersection (major road), vehicles will be turning into a minor road at a very slow speed (10-15kmhr) in order to navigate the turn. As such, the available sight distance is unlikely to factor into conflict between vehicles egressing the site and oncoming vehicles.
- For Lots 1304 & 603 it is noted that the driveway is currently not located at the lot boundary as far as possible from the intersection and on the approach side of the intersection; therefore, it is a condition of consent that the driveways are shifted to be adjacent to the lot boundary. With the visibility splays in place as noted above, together with shifting the driveways to the lot boundary this will provide ~8m of distance to the intersection.
- Additionally, for lot 1304 the intersection distance is reduced due to the lot boundaries, the distance to the kerb is ~13m.

Provided that the above recommendations are implemented, the proposed crossing locations are considered acceptable from a traffic perspective.

9.3 VEHICLE CROSSING NUMBER AND WIDTHS

9.3.1 REQUIREMENTS

It is recognised that the underlining zoning is rural and thus technically the rural standards of the AUP apply. In this regard the rural standard is a minimum driveway width of 3m and maximum of 6m. As such technically all single width driveways do not comply with this rural standard. However, given the site will in fact be urban in nature, it is considered the urban standards are more applicable.

Table E27.6.4.2.1 (T146) of the AUP indicates that one vehicle crossing is a permitted activity per 25m of road frontage. Vehicle crossings should be separated by a minimum of 6m when serving the same site and a minimum of 2m when serving adjacent sites. Two vehicle crossings can be combined (thus have no separation) providing the total width of the crossing does not exceed 6m.

Table E27.6.4.3.2 of the AUP outlines the dimensional requirements for vehicle crossing and access widths in residential zones as follows:

Table 11: Unitary Plan vehicle crossing dimensional requirements

Zone	No. of parking spaces served	Minimum width of crossing at site boundary	Maximum width of crossing at site boundary	Minimum formed access width
Residential	1 or 2 parking spaces	2.75m	3.0m	2.5m, provided is contained within a clear corridor 3m wide
	3 to 9 parking spaces	3.0m (one-way)	3.5m (one-way)	3.0m, provided is contained within a clear corridor 3.5m wide
	10 or more parking spaces	5.5m (two-way)	6.0m (two-way)	5.5m (two-way)

With reference to Table E27.6.4.2.1 (T146) of the AUP, two crossings on adjacent sites can be combined where they do not exceed a total width of 6 m at the property boundary.

9.3.2 NUMBER OF DRIVEWAYS

As noted above, Table E27.6.4.2.1 specifies that one driveway per 25 m of frontage (or part thereof) needs to be provided for residential sites to be a permitted activity.

Approximately 1250 dwellings are provided on site, 765 dwellings are within ‘front lots’ and gain direct access off the fronting roads. The remaining dwellings are served by JOALs (358 dwellings served by 40 JOALs).

Based on the above, the overall development site does not comply with the maximum of one crossing per 25m of road frontage permitted activity rule outlined in

the AUP. However, this assessment is based on considering the development site as a whole, whereas in reality, dwellings will be located within their own lots (sites) and therefore the AUP requirements can be satisfied after subdivision (with maximum one crossing proposed for each subdivided lot). The number of vehicle crossings is not considered to be excessive and is typical of many high density developments.

In terms of pedestrian safety:

- Where possible driveways have been combined;
- All proposed vehicle crossings comply with the minimum separation distance requirements, therefore, provides the necessary ability for pedestrians to have a 'refuge' between crossings;
- The vehicle crossing is proposed to be a standard design as per the Auckland Transport Standard GD017A-1B (or VX0103 as per the TDM working draft, 14/02/20), therefore pedestrians will always have priority; and
- Visibility to be provided on either side of all vehicle crossings (including JOAL crossings) in accordance with Figure 3.3 of Standard ASNZS2890.1-2004 (2.0m x 2.5m splays), whereby any vegetation within the splay area should be limited to 0.6m in height and any fencing should be permeable and restricted to a maximum of 1m in height. In this regard, adequate visibility can be achieved between exiting vehicles and oncoming pedestrians.

9.3.3 INDIVIDUAL LOTS

Each lot within the site is served by one vehicle crossing leading to 1-2 parking spaces or a parking area serving up to three parking spaces. All vehicle crossings are designed in accordance with one of three vehicle crossing options:

- a single 2.75m – 3.5m wide vehicle crossing, serving that lot only and separated from any adjacent vehicle crossings by at least 2m;
- a double 5.5m – 6.0m wide vehicle crossing, serving that lot only and separated from any adjacent vehicle crossings by at least 2.0m; and
- a combined vehicle crossing (with the neighbouring lot), maximum 6.0m wide at the property boundary with 0m separation between lots.

Overall, all proposed vehicle crossings serving individual lots comply with the AUP dimensional permitted activity requirements and are considered acceptable except for.

- Lots 121/121 (1.13m separation)
- Lots 267/266 (1.93m separation)
- Lot 614 / JOAL 16 (1m separation)
- Lot 634 / JOAL 16 (1.6m separation)
- Lot 902 / JOAL 19 (1.6m separation)
- Lots 860/861 (1.74m separation)

- Lot 782 / JOAL 26 (1.5m separation)

Although these vehicle crossings currently do not comply with the AUP, all vehicle crossings are not located on the boundary and can be shifted; therefore, a **condition of consent** will be that the above vehicle crossings are shifted slightly to allow the 2m separation.

It is **recommended that** all vehicle crossings are designed as per the Auckland Transport Standard or VX0103.

9.3.4 REAR LOTS (SHARED ACCESSWAY / JOALS)

All proposed JOALs have been designed to comply (or exceed width) with the AUP access width requirements.

All JOALs without direct pedestrian access to a public road include 1.2m wide footpaths.

9.4 VEHICLE ACCESS GRADIENTS

9.4.1 REQUIREMENTS

Table E27.6.4.4.1 of the AUP sets out the maximum gradients for access to be permitted. In this case, the parking areas themselves should be designed to have a maximum gradient of 1 in 20 (5 per cent) to be permitted.

AUP Rule E27.6.4.4 requires that all vehicle accesses be designed so that where the access adjoins the road there is sufficient space on-site for a platform to enable vehicles to stop safely and check for pedestrians and other vehicles prior to exiting. To achieve this Note 1 under Table E27.6.4.4.1, states that the platform must have a maximum gradient no steeper than 1 in 20 (5 per cent) and a minimum length of 4m to be permitted.

Further, to avoid the underside of the car striking the ground, the AUP states that access must have a maximum gradient of 1 in 5 (20%) with a change in gradient exceeding 1 in 8 (greater than 12.5 per cent change) at the summit or a 1 in 6.7 (15 per cent change) at a sag, must include transition sections to achieve adequate ground clearance, (Figure E27.6.4.4.3 of the Unitary Plan). Typically, a transition section requires a minimum length of 2m.

9.4.2 INDIVIDUAL LOTS

Unitary Plan Rule E27.6.4.4.1 requires that all vehicle accesses be designed so that where the access adjoins the road there is sufficient space on-site for a platform to enable vehicles to stop safely and check for pedestrians and other vehicles prior to exiting. The platform must have a maximum gradient no steeper than 1 in 20 (5 per

cent) and a minimum length of 4m. The parking areas themselves should be designed to have a maximum gradient of 1 in 20 (5 per cent).

Further, to avoid the underside of the car striking the ground, the Unitary Plan states that access with a change in gradient exceeding 1 in 8 (greater than 12.5 per cent change) at the summit or a 1 in 6.7 (15 per cent change) at a sag, must include transition sections to achieve adequate ground clearance, (Figure E27.6.4.4.3 of the Unitary Plan). Typically, a transition section requires a minimum length of 2m.

In assessing the effects of not providing the 1:20 platform, we have referred to relevant Australian and New Zealand standards. AS/NZS2890.1[1] requires a 1:20 platform for domestic driveways however notes that a maximum gradient of 1:8 can be applied if all three of the following conditions are met:

(i) The grade is a downgrade for traffic leaving the property and entering the frontage road.

(ii) The user class is Class 1, 1A or 2 only.

(iii) The maximum car park size is –

(1) for entry into an arterial road – 25 car spaces, or

(2) for entry into a local road – 100 car spaces.

The driveways for the non-compliant lots identified below all provide a downgrade from the site to the fronting road, the user class is Class 1A (*residential, domestic and employee parking*) and the maximum car park size is two parking spaces (fronting a local road). On this basis, Australian and New Zealand standards support the use of 1:8 gradients within the site without a 1:20 platform. Our view is that the effects of the non-provision of the 1:20 platform (with 1:8 provided as a maximum) are acceptable

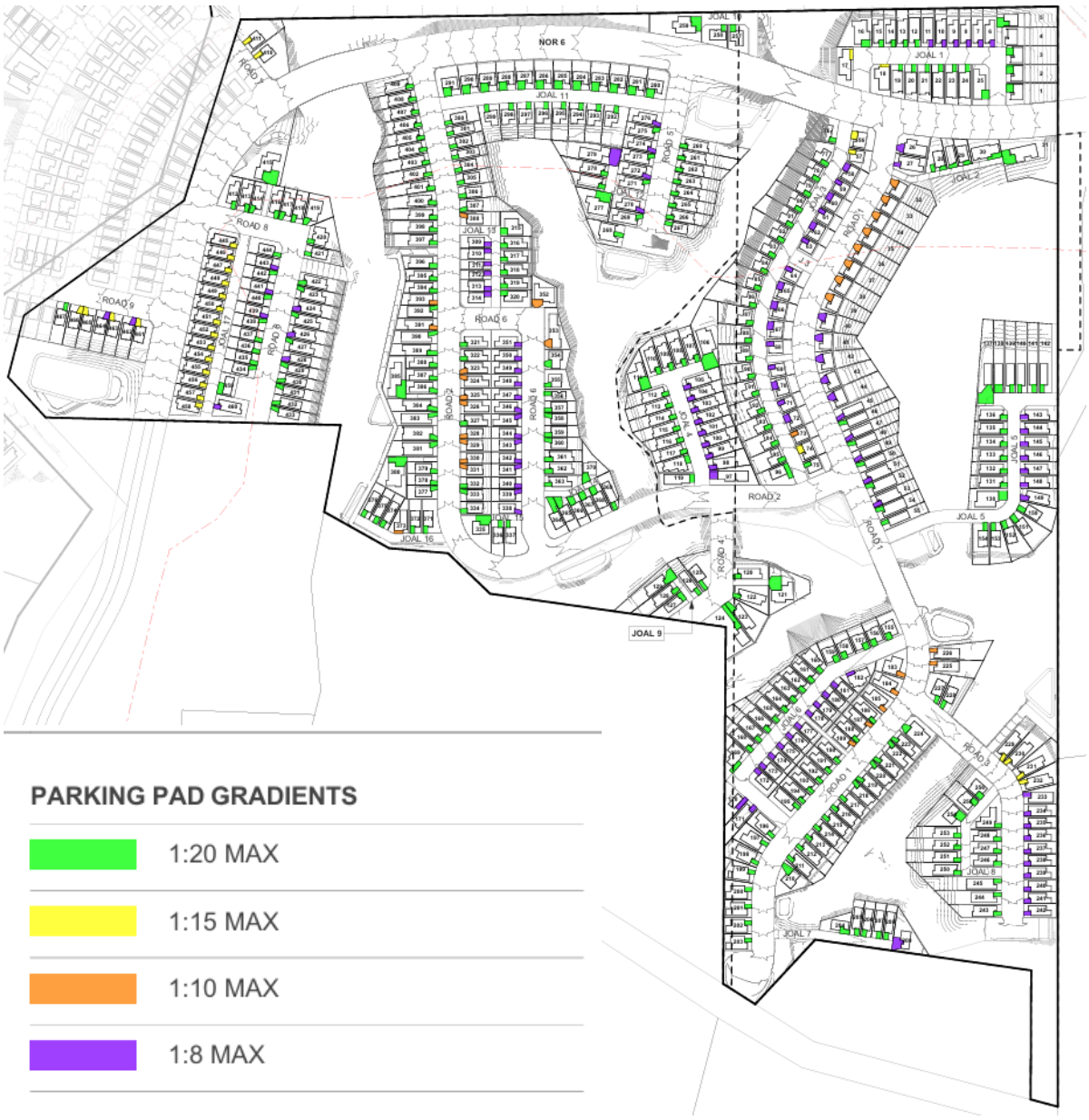
9.4.2.1 STAGE 1

The majority of lots proposing a single car pad space will provide a maximum gradient of 1 in 20 along the length of the car pad as per Rule E27.6.3.6 (3) of the Unitary Plan (which satisfies the 1 in 20 safety platform requirement).

The non-compliant driveway gradients are indicated in yellow (maximum 1:15), light blue (maximum 1:10) and purple (maximum 1:8) below. Detailed plans are provided in the architectural set.

[1] AS/NZS2890.1:2004, Australian/ New Zealand Standard, Parking Facilities Part 1: Off-street car parking, August 2005

Figure 45: Non-compliant driveways Stage 1

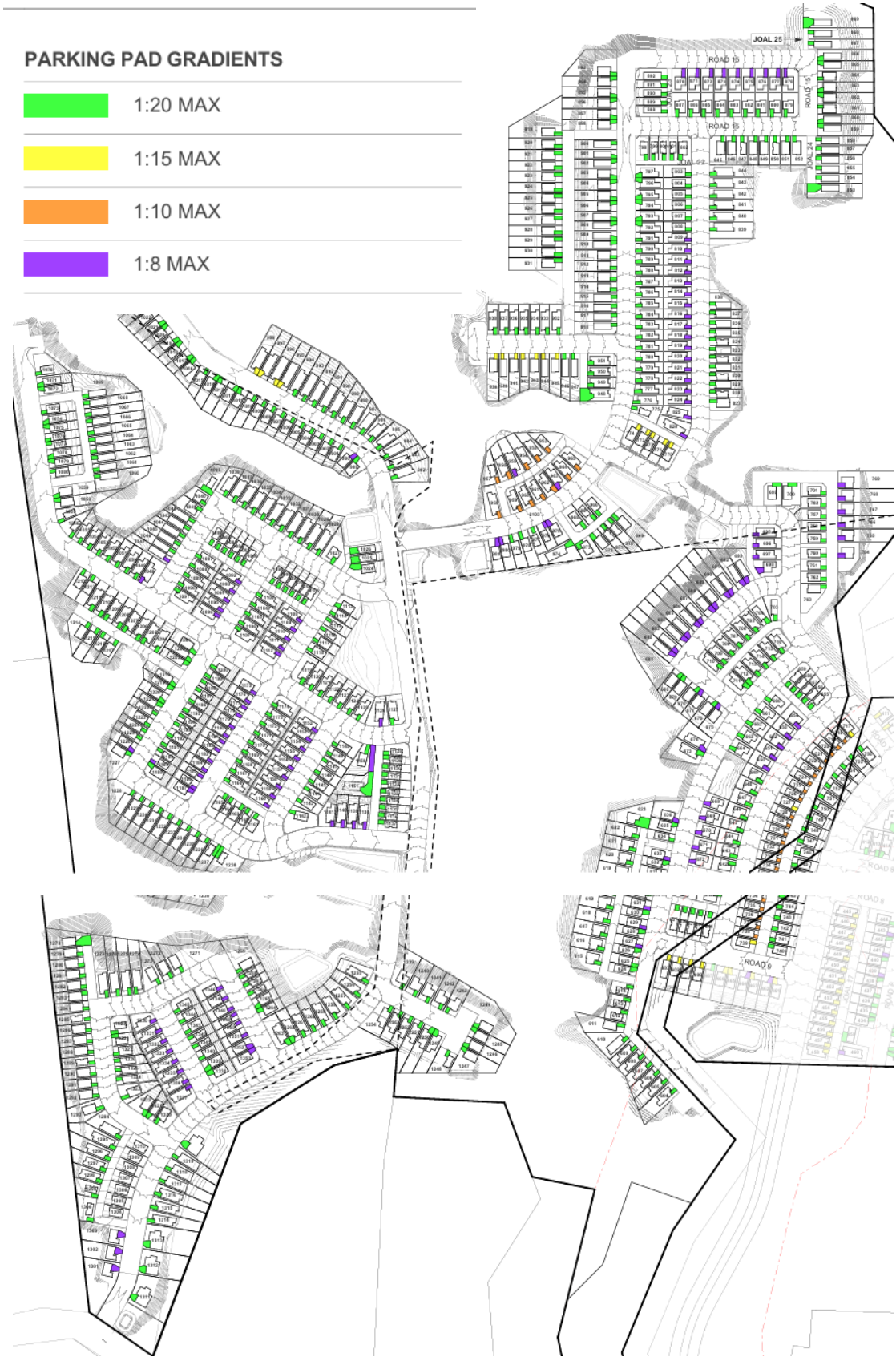


9.4.2.2 STAGE 2

The majority of lots proposing a single car pad space will provide a maximum gradient of 1 in 20 along the length of the car pad as per Rule E27.6.3.6 (3) of the Unitary Plan (which satisfies the 1 in 20 safety platform requirement).

The non-compliant driveway gradients are indicated in yellow (maximum 1:15), light blue (maximum 1:10) and purple (maximum 1:8) below. Detailed plans are provided in the architectural set.

Figure 46: Non-compliant driveways Stage 2



9.4.3 REAR LOTS (SHARED ACCESSWAY / JOALS)

The gradients along the proposed JOAL have been assessed based on the 'Delmore Access and Roading Report' plans prepared by McKenzie & Co

The proposed JOALS have been designed to have at least a 4m platform with a maximum grade of 5% adjacent to the road reserve, thus meeting AUP requirements.

10 PARKING

10.1 PARKING PROVISIONS

Each lot is supported by one of the following parking provision options:

- One at-grade uncovered parking pad;
- A single garage space; or
- A single garage space with a secondary at-grade uncovered parking pad (stacked).
- In addition, on street parking will also be provided throughout the site.

10.2 PARKING DIMENSIONS

Table E27.6.3.1.1 of the AUP sets out the minimum permitted activity car parking space and manoeuvring dimensions for "regular users". As such for resident parking spaces, the following dimensional requirements are set out in Table 12.

Table 12: Parking Dimensions

User Type	Space Width	Space length	Manoeuvring Aisle
Regular 90-degree parking space	2.4m 2.5m 2.6m 2.7m	5m	7.1m 6.7m 6.3m 5.9m
0 degrees (parallel)	6m	2.4m	3.7m

All proposed parking spaces have compliant space width and space length.

For all parking spaces accessed via the road, the manoeuvring width meeting AUP permitted activity requirements.

For all vehicles accessed off JOALs, the proposed JOAL widths generally provide sufficient manoeuvring width.

Vehicle tracking has been undertaken on the most difficult to access spaces proposed on the JOALs to determine their accessibility. **Attachment B** shows vehicle tracking for an 85th percentile Unitary Plan car accessing these spaces, which are all considered acceptable and comply with the AUP.

10.3 PARKING GRADIENTS

Rule E27.6.3.6 relates to formation and gradients of car parks and their manoeuvring areas and requires that the gradient of all manoeuvring areas does not exceed 1 in 8 (12.5%) and that the gradient within all parking spaces does not exceed 1 in 20 (5%) in any direction and 1 in 25 (4%) for accessible spaces, for these to be permitted

The car park and manoeuvring area gradients have been assessed based on the 'Stage 1 and 2 Parking Gradients Plan'.

All lots proposing a car pad space provide a maximum gradient of 1 in 20 along the length of the car pad, thus satisfying the Unitary Plan permitted activity requirements.

JOAL long sections will comply with manoeuvring area requirements and is discussed below.

10.4 REVERSE MANOEUVRING

All proposed residential lots not accessed off JOALS, will require vehicles to reverse manoeuvre onto the fronting local road.

Rule E27.6.3.4 in the Unitary Plan outlines the following: "Sufficient space must be provided on the site, so vehicles do not need to reverse off the site or onto the road from any site where any of the following apply:

- Four or more required parking spaces are served by a single access;
- There is more than 30 m between the parking space and the road boundary of the site; or
- Access would be from an arterial road or otherwise within a Vehicle Access Restriction covered in Standard E27.6.4.1."

The proposed residential lots satisfy all these requirements, with no reversing onto the NoR6

As discussed in 9.2 of this report, 73 vehicle crossings are located within 10m of an intersection, therefore considered a vehicle access restriction.

As detailed previously, the crossing locations are considered acceptable from a traffic perspective provided the following condition is implemented:

Visibility splays to be provided on either side of all vehicle crossings (including JOAL crossings) in accordance with Figure 3.3 of Standard ASNZS2890.1-2004 (2.0m x 2.5m splays), whereby any vegetation within the splay area should be limited to 0.6m in height and any fencing should be permeable and restricted to a maximum of 1m in height.

Provided the above is implemented, it is considered acceptable for vehicles to reverse manoeuvre out of these crossings onto the fronting road.

Vehicle tracking has been checked using an 85th percentile Unitary Plan car to ensure that manoeuvring into and out of the crossings is workable with any road. This is provided in **Attachment B**.

10.5 CYCLE PARKING

Secure garages or suitable yards to secure a bicycle should be provided for future dwellings at building consent. This is further discussed in the PC 79 assessment in Appendix A.

10.6 VERTICAL CLEARANCE

Under the AUP rule E27.6.3.5 a minimum clearance between the formed surface and the structure must be:

- 2.1m where access and/or parking for cars is provided for residential activities;
- 2.3m where access and/or parking for cars is provided for all other activities;
- 2.5m where access and/or accessible parking for people with disabilities is provided; or
- 3.8m where loading is required.

All garages are understood to have at least 2.1m vertical clearance; therefore, there will be no vertical clearance concerns for this proposal which is considered to be acceptable.

11 SERVICING / LOADING

Servicing requirements for residential activity are typically minimal and generally limited to public rubbish collection and occasional deliveries (e.g. furniture or appliances). These can be easily accommodated on-street.

Occasional servicing (deliveries) by heavy vehicles may occur (e.g. deliveries of furniture / appliances). Such events can be accommodated within the proposed internal road network.

In terms of waste management strategy, it is anticipated that all residential lots will be serviced by public on-street kerbside collection (using the Auckland Transport 10.3m truck). Waste management should be confirmed for the lots accessed via JOALs in later stages of the development.

12 CONSTRUCTION

12.1 GENERAL

The development site is currently unoccupied for the most part. To facilitate construction, access would be established via Grand Drive.

As is typical with a development of this scale, it is recommended that as part of any resource consent, a Construction Traffic Management Plan (CTMP) should be required as a condition (or an equivalent be required as a component of a Construction Management Plan). It is considered that this Construction Traffic Management Plan should include:

(i) Construction dates and hours of operation including any specific non-working hours for traffic congestion/noise etc.
(ii) Truck route diagrams both internal to the site and external to the local road network. This should take into account of the large trucks expected delivering the houses.
(iii) Temporary traffic management signage/details for both pedestrians and vehicles to appropriately manage the interaction of these road users with heavy construction traffic.
(iv) Details of site access/egress over the entire construction period. Noting that all egress points to be positioned so that they achieve appropriate site distance as per the Land Transport Safety Authority “Guidelines for visibility at driveways” RTS-6 document.
(v) Location of construction vehicle parking onsite.

Based on experience of constructing similar projects and bearing in mind capacity within the existing road network, with the appropriate Construction Traffic Management Plan in place and the above measures implemented, it is considered that construction activities can be managed to ensure any generated traffic effects are appropriately mitigated

12.2 SITE ACCESS

Construction vehicles are expected to access the site using both the Grand Drive, Upper Ōrewa Road, and Russell Road access. In this regard all three roads have appropriate width to safely and efficiently accommodate heavy vehicles associated with construction of residential dwellings.

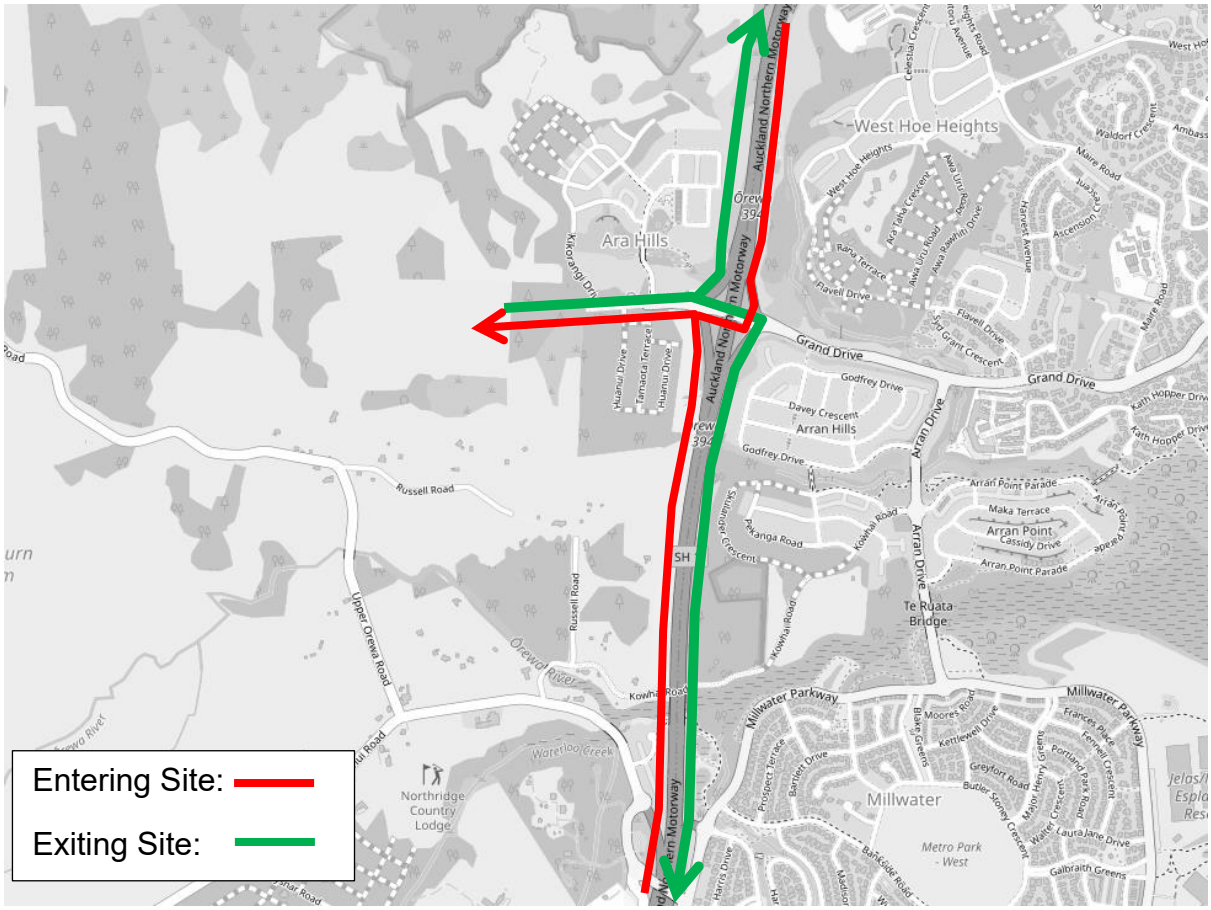
12.3 VEHICLES OF WORKERS AND SUBCONTRACTORS

Given the size of the site, construction parking requirements can be accommodated on-site and thus not need to require parking in existing residential areas.

12.4 TRUCK ROUTES

Using the strategic freight network map, SH1 is the safest and most efficient route for trucks, routes to and from the site are expected to be focused to and from SH1 as shown in Figure 47.

Figure 47: Routes to and from the SH1



12.5 CONSTRUCTION HOURS

Construction hours are expected to be between 7AM-7PM Monday to Saturday.

Based on the existing road network no further times restrictions are considered to be required from a traffic / transportation point of view.

12.6 CONCLUSIONS

Based on experience of constructing similar residential development and bearing in mind the capacity within the existing roading network, with the appropriate Construction Traffic Management Plan in place and the measures implemented, it is considered that construction activities will be managed to ensure an appropriately low level of traffic effects and in accordance with best practice.

The construction activities are temporary and anticipated by the Unitary Plan development expectations for the site. The construction traffic effects can be appropriately managed and are considered minimal.

13 CONSULTATION

Commute has not engaged with Auckland Transport in relation to this proposal. It is understood that McKenzie and Co have engaged with Auckland Transport in relation to the proposal.

14 IMPLEMENTATION PLAN

As stated above in this report, there are a number of roading and infrastructure projects programmed for the area. Several projects are directly relevant to this site and these are therefore included in the Implementation Plan summarised in Table 13.

Table 13: Implementation Plan

Project	Responsibility	Upgrade	Trigger / Timing
Construction of NoR 6	Developer	Access to the site is provided via NoR 6	Initial development
New street network through the site	Developer	As the site develops, the internal road network will be required. Pedestrian / cycling provisions to be included.	Any site with frontage to a new street
Public transport	Auckland Transport	A local service should be provided between the site and Hibiscus Station. The wider area would benefit by this service.	Ideally, should be implemented early on given the surrounding area is occupied and lacks public transport

15 CONCLUSION

The proposal is for a residential subdivision and development (approximately 1250 dwellings) at 53A, 53B, 55 Russell Road and 88,130,132 Upper Ōrewa Road, Ōrewa Auckland. The development includes a new internal road network which will connect to Grand Drive.

Following a review of the proposal, the following can be concluded:

- The site and surrounding area currently have poor pedestrian and cyclist connectivity to nearby activities, the application will have significant positive benefits of linking NoR6 and Grand Drive for pedestrians, cyclists, and potentially for public transport by providing a new arterial route through the site;
- No traffic safety issues have been identified near the proposed development. Given the local residential nature of the surrounding roads, the proposed development is considered unlikely to exacerbate the road safety in any way both during construction and once the development is completed;
- The key intersection anticipated to be used by residents to access the wider area and road network is that at the Grand Drive interchange with SH1. Intersection modelling shows that the Grand Drive / NoR 6 (roundabout intersection) will be able to accommodate the additional trips generated by the proposed residential development and diverted trips from the surrounding area and will continue to operate acceptably in the future. It is noted that the eastern roundabout will be over capacity in the morning peak (Grand Drive east approach); however, this is considered to be acceptable once the additional southern connections to Upper Orewa Road have been provided
- The internal road layout and cross-sections comply with ATDM standards and are considered be appropriate. All Vehicle tracking shown in Attachment B is considered acceptable once minor widening has been conducted for some curves and intersections.
- All proposed intersections have been reviewed in relation to the relevant sight distance requirements are appropriate to ensure a safe and efficient roading environment;
- The driveway locations are considered appropriate. While a small number do not meet the intersection separation requirement of the Unitary Plan, they have all been assessed as appropriate;
- All waste is expected to be accommodated on-street via public collection; and
- The effects relating to construction are temporary and the site is well positioned for safe and efficient access for construction vehicles.

Recommendations / Conditions:

- A CTMP as described in Section 12 should be a condition of consent.
- Crossing sight distance requirements for proposed pram crossings are checked through engineering approval stage.
- K-values of the proposed roads are rechecked at EPA stage to comply with the above Austroads requirements.
- Visibility splays be provided on either side of all vehicle crossings (including JOAL crossings) in accordance with Figure 3.3 of Standard ASNZS2890.1-2004 (2.0m x 2.5m splays), whereby any vegetation within the splay area should be limited to 0.6m in height and any fencing should be permeable and restricted to a maximum of 1m in height. This should be a condition of consent.
- Vehicle tracking is checked again at the EPA stage to ensure compliance.
- Road 17 be connected through to Upper Ōrewa Road only when an adequate sight distance (114m) is provided in each direction will be a condition of consent.
- The vehicle crossings be constructed as per the Auckland Transport Standard GD017
- For Lots 1304 & 603 both driveways will be moved slightly to be located adjacent to the lot boundary. This should be a condition of consent.

Overall, there is no reason to preclude acceptance of the proposal as currently intended, subject to the recommendations made above. Accordingly, it is concluded that there are no traffic engineering or transportation planning reasons that would preclude the development of the subject site as proposed.

APPENDIX A- PLAN CHANGE 79 ASSESSMENT

PLAN CHANGE 79 ASSESSMENTS

Table A-1: Plan Change 79 Amendment Assessment

PC79 ID	Assessment Criteria	Assessment
18	**E27.6.1 Tip generation** (1) Where a proposal (except where excluded in Standard E27.6.1(2)) exceeds one of the following thresholds: (a) A new development or subdivision in Table E27.6.1.1; (b) 100 v/hr (any hour) for activities not specified in Table E27.6.1.1 requiring a controlled or restricted discretionary land use activity consent in the applicable zone where there are no requirements for an assessment of transport or trip generation effects. This standard does not apply to development activities provided for as permitted in the applicable zone.	The proposed development is for approximately 1250 dwellings and 813 peak hour trips; therefore, exceeds thresholds in Table E27.6.1. of TA1 and T1. **Requires Assessment.** The vehicle trip generation assessment is triggered regardless of PC79 and is assessed in Section 6 of this report. The alternative mode assessment is provided after this Table.
20	**E27.6.2 Number of parking and loading spaces** (6) Bicycle parking: (e) The activities specified in Table E27.6.2.5 must provide the minimum number of bicycle parking spaces specified; (aa) For residential developments, the required secure long-stay bicycle parking must be located and designed in a manner that (is): i) Not required of any required outdoor living space or landscaped area; ii) In a location accessible from either the road, vehicle access, pedestrian access or car parking area; iii) Sheltered from the weather; iv) Lockable and secure; xii) The following bicycle parking requirements apply to new buildings and developments. **Table E27.6.2.5 Required bicycle parking rates** (T81) **Visitor (short-stay) minimum rate** 1 per 20 for developments of 20 or more dwellings **Secure (long-stay) minimum rate** 1 per dwelling without a dedicated garage or basement car parking space	Approximately 1250 dwellings are proposed with a garage car parking space. Each dwelling has a dedicated garage; therefore, no dedicated bicycle parks are required. Upon subdivision each Lot will hold a single residential dwelling and therefore no short stay spaces are considered to be required. It is likely that visitors will park their bicycles within the garage of the resident they are visiting. As such, it is considered that the proposed bicycle parking arrangement is satisfactory and compliant. **Complies.**
21	**E27.6.2 Number of parking and loading spaces** (8) Number of loading spaces: (a) All activities must provide loading as specified in Table E27.6.2.7. (b) Residential activities where part of the site has frontage to an arterial road as identified on the planning maps, must provide loading as specified in Table E27.6.2.7A **Table E27.6.2.7A Minimum small loading space requirements**	Upon subdivision one dwelling is proposed per Lot which will not trigger the requirement for loading when assessed as residential activity. Similarly, if assessed as a rural activity no loading is required. Dwellings which front NoR6 are anticipated to have direct pedestrian access to this road. **NA**

Activity	GFA/Number of dwellings	Minimum rate
(T111B)	Developments where all dwellings have individual pedestrian access directly from a public road	No loading space required
	Up to 9 dwellings without individual pedestrian access directly from a public road	No loading space required

		Greater than 9 dwellings up to 5,000m^2 without individual pedestrian access directly from a public road	1*
		Greater than 5,000m^2	N/A
	* Refer to T137A of Table E27.6.3.2.1 Minimum loading space dimensions		
22	**E27.6.2 (9)** (9) Fractional spaces: (c) Where the calculation of the permitted parking results in a fractional space, any fraction that is less than one-half will be disregarded and any fraction of one-half or more will be counted as one space. If there are different activities within a development, the parking permitted for each activity must be added together prior to rounding.		Fractional space calculations are considered when assessing PC79. **Complies.**
23	**E27.6.3.1 Size and location of parking spaces** (1) Every parking space must: (a) Comply with the minimum dimensions given in Table E27.6.3.1.1 and Figure E27.6.3.1.1; except accessible parking dimensions and accessible route requirements must be designed in accordance with the New Zealand Standard for Design for Access and Mobility – Buildings and Associated Facilities (NZS: 4121-2001).		All proposed car parking spaces comply with the minimum Unitary Plan dimensions. **Complies.**
24	**E27.6.3.2 Size and location of loading spaces** (1) Every loading space must: (d) Comply with the following when any yard of a site is used to provide the loading space (where it is permitted within the zone). i) The use of the loading space does not create a traffic hazard on the road at any time; and (e) Have a maximum crossfall of 1:50 (2%) in all directions. **Table E27.6.3.2.1 Minimum loading space dimensions** (T137A) **Activities requiring a small loading space under Standard E27.6.2(8)(b)** Length of loading space(m) 6.4 Width of loading space (m) 3.5		No loading spaces are required, and none have been provided. **NA**
25	**E27.6.3.2(A) Accessible parking** (1) Accessible parking must be provided for all new activities, changes of activity type, and / or the expansion or intensification of an existing activity in all zones, except for those listed below in E27.6.3.2(A)(2); (2) Accessible parking is not required in the following zones, unless car parking is provided on site, in which case the required number of accessible parking spaces must be determined in accordance with Table 1 or Table 2 below, whichever is relevant: Business Zones: (a) Business – City Centre Zone; (b) Business – Metropolitan Centre Zone; (c) Business – Town Centre Zone; (d) Business – Local Centre Zone; (e) Business – Mixed Use Zone; (f) Business – Neighbourhood Centre Zone. Residential Zones: (a) Residential – Terrace Housing and Apartment Buildings Zone. (3) For residential developments in residential zones (excluding the Terrace Housing and Apartment Buildings Zone unless car parking is provided on site), accessible parking spaces must be provided for developments of 10 or more dwellings on a site. (4) The required number of onsite accessible parking spaces provided must be calculated using the following method: (i) For non-residential land uses:		Accessible users could utilise the vehicle access to park their vehicle instead of using the garage. Many of the dwellings are anticipated to have a pedestrian path adjacent to the vehicle access (indicated by the front door location), which could be used as a clear zone. For approximately 1250 dwellings 51 accessible parking spaces are required, which the proposal informally achieves. **Complies.**

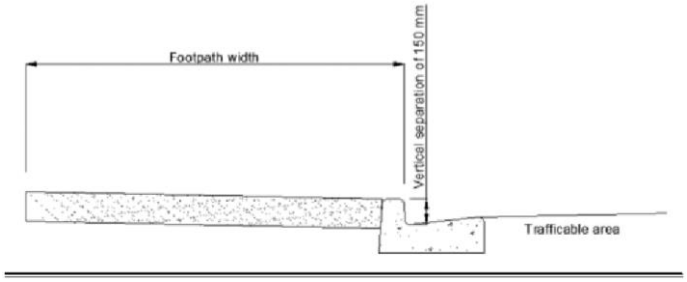
<table>
<tr><td></td><td>Step 1 – Use the Parking Demand Guidelines in Appendix 23 to determine the theoretical parking demand
Step 2 – Use Table 1 – Number of accessible parking spaces – Non-Residential, below to determine the required number of accessible car park spaces based on either the number of parking spaces that are proposed to be provided or the theoretical parking demand calculated in Step 1, whichever is higher.
Table 1 – Number of accessible parking spaces – Non-Residential land uses
<table>
<tr><th>Total number of parking spaces provided or theoretical parking spaces, whichever is the higher</th><th>Number of accessible parking spaces</th></tr>
<tr><td>1-20</td><td>Not less than 1</td></tr>
<tr><td>21-50</td><td>Not less than 2</td></tr>
<tr><td>For every additional 50 parking spaces or part of a parking space</td><td>Not less than 1</td></tr>
</table>
(ii) For retirement villages, supported residential care, visitor accommodation and boarding houses
The same method for calculating the required number of onsite accessible parking spaces for non-residential uses in 4(i) applies.
(iii) For residential land uses
The required number of accessible parking spaces provided must be in accordance with Table 2 below:
Table 2 – Number of accessible parking spaces – Residential land uses
<table>
<tr><th>Number of dwellings</th><th>Number of accessible parking spaces</th></tr>
<tr><td>10-19</td><td>Not less than 1</td></tr>
<tr><td>20-29</td><td>Not less than 2</td></tr>
<tr><td>30-50</td><td>Not less than 3</td></tr>
<tr><td>For every additional 25 dwellings or units</td><td>Not less than 1</td></tr>
</table></td><td></td></tr>
<tr><td>26</td><td>E27.6.3.3 Access and manoeuvring
(2A) For every loading space required by Table E27.6.3.2.1 (T137A) the access and manoeuvring areas associated with that loading space must accommodate the 6.4m van tracking curves set out in Figure E27.6.3.3.3.</td><td>No loading spaces are required
N/A.</td></tr>
<tr><td>27</td><td>E27.6.3.4 Reverse manoeuvring
(1) Sufficient space must be provided on the site so vehicles do not need to reverse off the site or onto or off the road from any site where any of the following apply:
(a) Four or more parking spaces are served by a single access;
(b) There is more than 30m between the parking space and the road boundary of the site; or
(c) Access would be from an arterial road or otherwise within a Vehicle Access Restriction covered in Standard E27.6.4.1</td><td>Where a vehicle access services a single dwelling, and therefore 1 or 2 parking spaces, the vehicle will reverse onto the road network.
Where a vehicle access services multiple dwellings and at least 4 parking spaces vehicle will be able to turn either within the Lot or within the adjacent JOAL.
Complies.</td></tr>
<tr><td>28</td><td>E27.6.3.4A Heavy vehicle access
(1) Where a site in a residential zone provides heavy vehicle access it must provide sufficient space on the site so an 8m heavy vehicle does not need to reverse onto or off the site or road, with a maximum reverse manoeuvring distance within the site of 12m.
(2) Heavy vehicle access and manoeuvring areas associated with access required by E27.6.3.4A (1) must comply with the</td><td>No loading spaces are required
N/A.</td></tr>
</table>

	tracking curves set out in the Land Transport New Zealand Road and traffic guidelines: RTS 18: New Zealand on-road tracking curves for heavy motor vehicles (2007).	
29	**E27.6.3.5 Vertical clearance** (1) To ensure vehicles can pass safely under overhead structures to access any parking and loading spaces, the minimum clearance between the formed surface and the structure must be: (a) 2.1m where access and/or parking for cars is provided for residential activities; (b) 2.3m where access and/or parking for cars is provided for all other activities; (c) 2.5m where access and/or accessible parking is provided and/or required; (ca) 2.8m where loading is required for residential activities denoted with an asterisk (*) in Table E27.6.2.7A; (cb) 3.8m where heavy vehicle access in Standard E27.6.3.4A is provided; or (d) 3.8m where loading is required in Table E27.6.2.7	All garages are understood to have at least 2.1m vertical clearance. **Complies.**
30	**E27.6.3.7 Lighting** (1) Lighting is required where there are 10 or more parking spaces which are likely to be used during the hours of darkness. The parking and manoeuvring areas and associated pedestrian routes must be adequately lit during use in a manner that complies with the rules in Section E24 Lighting. (2) Lighting is required, in residential zones to primary pedestrian access, vehicle access, parking and manoeuvring areas, where any of the following apply: (a) There are four or more dwellings accessible from a primary pedestrian access which is not adjacent to a vehicle access; (b) There are 10 or more parking spaces; or (c) There are 10 or more dwellings. Adequate must be provided during the hours of darkness in a manner that complies with the rules in Section E24 Lighting.	Given the proposal is more comparable to a residential activity, assessing the site against the residential requirements lighting needs to be considered. There are proposed to be more than 10 parking spaces which are likely to be used during hours of darkness; therefore, lighting will be required. Refer to Greenwood's lighting plan.
31	**E27.6.4.3 Width of vehicle access, queueing and speed management requirements** (1) Every on-site parking and loading space must have vehicle access from a road, with the vehicle access complying with the following standards: (a) Passing bays are provided in accordance with Table E27.6.4.3.1; and (b) Meeting the minimum formed access width specified in Table E27.6.4.3.2; and (c) Meeting the minimum speed management measure spacing specified in Table E27.6.4.3.3. … Emergency responder access requirements are further controlled by the Building Code. Plan users should refer to the Building Code to ensure compliance can be achieved at building consent stage. Granting of a resource consent does not imply that waivers of Building Code requirements will be granted. Fire and Emergency New Zealand publishes guidance in the context of Building Code requirements. **Table E27.6.4.3.3 Speed management requirements** (T156A) Residential Zones **Length of vehicle access** Exceeds 30m **Location of minimum speed management measures** Not more than 10m from the site boundary with the legal road; and Not more than 30m spacing between speed management measures.	Traffic calming can be provided within the JOALs as and where required. A minimum of 5.5m formed access width is provided in the JOALs where the JOAL services 10 or more parking spaces, therefore, no passing bay will be required. **Complies**

	Note: Where heavy vehicle access and speed management measures are required, the design of speed management measures should include consideration of heavy vehicle requirements.	
32	**E27.6.6 Design and location of pedestrian access in residential zones** (1) Where two or more dwellings are proposed in residential zones, primary pedestrian access must be provided which meets the following: (a) Have the minimum pedestrian access width and separation specified in Table E27.6.6.1 for its full length; (c) Have a gradient no greater than: (i) 1 in 12 for pedestrian access which is not adjacent to vehicle access; (ii) The maximum vehicle access gradient as specified in Table E27.6.4.4.1 where the pedestrian access is adjacent to vehicle access; (e) Have a surface treatment which is firm, stable and slip resistant in any weather conditions; (f) Provide direct and continuous access to the dwellings from a public footpath; (g) Be free from permanent obstructions and have a clear height of at least 2.1m; (2) A minimum clear width of 3m and a minimum clear height of 2.1m for its full length is required for primary pedestrian access where not adjacent to vehicle access and serving: (a) Up to three dwellings and has a length greater than 50m; or (b) Four or more dwellings. (3) For the purposes of (2) above, the clear width may include: (a) The minimum 1.8m formed primary pedestrian access width; (b) Landscape treatment with a maximum mature height of 600mm; (c) Lighting infrastructure. (4) Standards E27.6.6(1), (2) and (3) above do not apply where: (a) Up to three dwellings are proposed on a site and vehicle access is provided to each dwelling; or (b) A dwelling directly fronts and has direct access to a street. (5) For four or more dwellings in residential zones, pedestrian access must be provided to each parking space within a parking area consisting of four or more parking spaces served by the same vehicle access and: (a) Have a minimum width of 1.2m; (b) Be vertically separated from trafficable areas as shown in Figure E27.6.4.3.1; (c) Connect to the primary pedestrian access or the dwellings associated with those parking spaces; (d) Have a surface treatment which is firm, stable and slip resistant in any weather condition; and (e) Be free from permanent obstructions and have a clear height of 2.1m for its full length. This standard does not apply where the pedestrian access forms part of a primary pedestrian access. **Table E27.6.6.1 Primary Pedestrian Access width and separation requirements** **Location of site** / **The total number of parking spaces or dwellings served by a vehicle and/or Primary Pedestrian Access** / **Minimum formed Primary Pedestrian Access width where not adjacent to vehicle access** / **Minimum formed Primary Pedestrian Access width and separation where adjacent to vehicle access**	The design of the JOALs is discussed in Sectio 9.3.4. (T156C) applies in this instance for the vehicle access, which serves 20 or more. Grade separated pedestrian facilities are provided on all local roads, this is discussed in further detail in section 7.3. **Does not comply**

	(T156A)	**Serves 2-3 dwellings**	**1.8m**	**No requirement under E27.6.6(1) to (3)**
	(T156B)	**Serves 4 to 19 parking spaces or 4 to 19 dwellings, whichever is the greater**	**1.8m**	**1.4m (including the kerb), which must be vertically separated from trafficable areas as shown in Figure E27.6.4.3.1**
	(T156C)	**Serves 20 or more parking spaces or 20 or more dwellings, whichever is the greater**	**1.8m**	**1.8m (including the kerb), which must be vertically separated from trafficable areas as shown in Figure E27.6.4.3.1**

Figure E27.6.4.3.1 Vertical separation of pedestrian access



33	**E27.6.7 Provision for electric vehicle charging** *Purpose: to ensure that any undercover car parks for new semi-detached dwellings or for new dwellings within a terrace or apartment building are provided with the capability to install Electric Vehicle Supply Equipment.* (1) Any new dwellings with car parking (with the exception of new detached dwellings) must provide each undercover car park with the capability to install Electric Vehicle Supply Equipment with designated space for the necessary conduit, circuit and metering between the car park and an electrical distribution board on the same building storey, or ground level if the car parking space is at ground level. Note: (a) This standard does not apply to any car parking permanently allocated to visitors. *Refer to the following standards and guidelines:* - *Australian/New Zealand Wiring Rules AS/NZS 3000:2018* - *SNZ PAS 6011:2021 Electric Vehicle Chargers for Residential Use* - *SNZ PAS 6011:2021 Electric Vehicle Chargers for Commercial Applications* - *WorkSafe EV charging safety guidelines 2nd addition plus addendums 1 and 2*	The proposal includes detached dwellings and therefore is not included in this rule; however, duplex dwellings with garage parking is also proposed meaning electric vehicle charging provisions can be added as required. **Complies.**

As discussed in Table A-1 above, the proposed development generally complies with the Plan Change 79 amendments, with the primary exception being the trip generation.

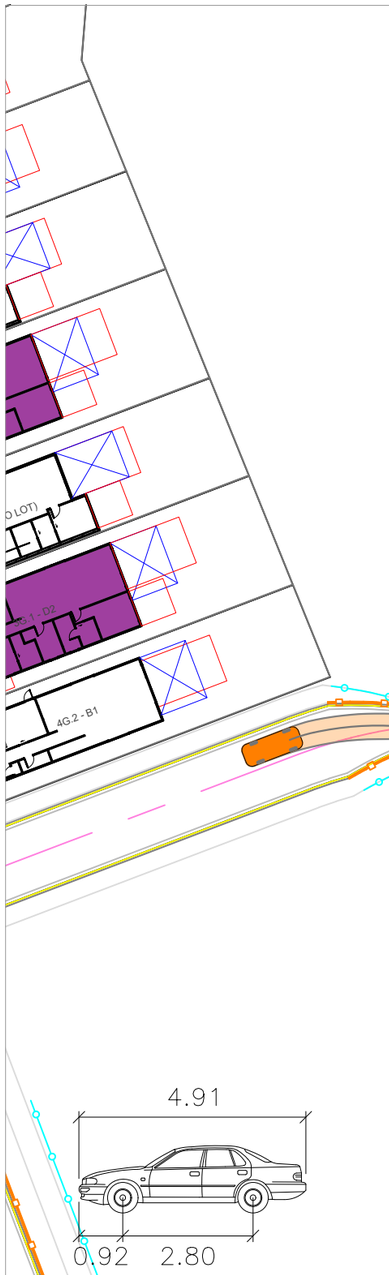
The proposed trip generation triggers the 40 dwelling threshold and has been assessed against the amended criteria outlined in E27.8.2 (3) of Plan Change 79 and is provided in Table A-2 below.

Table A-2: Plan Change 79 Amended Assessment Criteria E27.8.2 (3)

Assessment Criteria	Comment
(3) any activity or subdivision which exceeds the trip generation thresholds under Standard E27.6., with the exception of the thresholds (TA1), (T1A), (T2A) and (T3A) in Table E27.6.1.1:	
a) the effects on the function and the safe and efficient operation of the transport network with consideration of all modes of transport, particularly at peak times;	All new roads provide pedestrian footpaths on both sides, providing pedestrian access through the site to the wider network. Cycle paths are provided on both sides of NoR6, which will connect to the neighbouring development when this is constructed (as discussed in Section 7.4.2). Currently there are limited public transport facilities in the area, however Auckland Transport Public Transport Plan shows future services connecting to Ara Hills. This service could be extended to the subject site. The effects of vehicle traffic have been assessed in the original transport assessment.
b) the implementation of mitigation measures proposed to address adverse effects which may include, but are not limited to, the following measures: **i. travel planning;** **ii. providing alternatives to private vehicle trips including accessibility to public transport;** **iii. staging development;** **iv. providing or contributing to improvements to the local transport network across all modes; or**	As above, pedestrian facilities are provided within the site which will connect to neighbouring developments. Similarly cycle paths are proposed on NoR6 which will also connect to neighbouring projects. It is also anticipated that as development occurs in the area that it will become more feasible to provide bus services. The public bus network is operated by Auckland Transport and therefore this ultimately sits with Auckland Transport.
c) the trip characteristics of the proposed activity on the site.	The proposal is for residential, which is anticipated to primarily result in vehicle trips. The nearby Ara Hills development which has been consented includes a commercial area on Grand Drive west of the motorway. Which is within walking and cycling distance of the site and therefore anticipated to lead to some walking and cycling trips. Similarly, as the area is developed it becomes more feasible to provide public transport facilities.
(3A) any activity or subdivision which exceeds the thresholds (TA1), (T1A), (T2A) and (T3A) in Table E27.6.1.1:	
a) the effects on the function and the safe and efficient operation of the transport network as they relate to active modes (walking and cycling) and public transport infrastructure, particularly at peak times; and	Please see above the response to (3) a) above.
b) the assessment criteria at E27.8.2(3)(b) and (c) above apply, but with consideration of the implementation of mitigation measures and trip characteristics focused on active modes (walking and cycling) and public transport infrastructure; and	Please see above the response to (3) b) above.
c) for the purpose of assessing E27.8.2(3A) a) and b) only*, the local transport network	Until such time that Auckland Transport provide a service to Ara Hills as per the Regional Public Transport Plan, provision of bus facilities (stops,

refers to the area in the immediate vicinity of the site. For the purpose of this assessment, public transport infrastructure includes infrastructure associated with public transport stops, and excludes bus lanes. Any mitigation measures must relate to the effects of the proposal on the environment, demand on public transport infrastructure and active mode journeys from the site. *** Note: this does not alter the meaning of 'local transport network' in any other context.**	shelters, etc) would be premature. The exact route of the bus is yet to be determined and therefore providing facilities at this stage is not recommended. With regards to pedestrian connectivity, the proposed site will have internal footpaths, as well as connect to neighbouring projects.

ATTACHMENT B – VEHICLE TRACKING



Unitary Plan 85 %

	meters
Width	: 1.87
Track	: 1.87
Lock to Lock Time	: 4.0
Steering Angle	: 34.5

Revision notes:

Rev:	Date:	Notes:

Drawn by:
HA
J003135

Client:

Project:
Delmore, Orewa
Proposed Residential Development

Drawing Title:
Vehicle Tracking
Lot 154 85th Percentile Vehicle Tracking

Date:
05/02/25

Scale @ A3:
1:500

Revision:
A

commute
TRANSPORTATION CONSULTANTS

Figure:
1A

Revision notes:		
Rev:	Date:	Notes:

Drawn by:
HA
J003135

Client:

Project:
Delmore, Orewa
Proposed Residential Development

Drawing Title:
Vehicle Tracking
Lot 504 85th Percentile Vehicle Tracking

Date:
05/02/25

Scale @ A3:
1:200

Revision:
A

commute TRANSPORTATION CONSULTANTS

Figure:
2A

Revision notes:		
Rev:	Date:	Notes:

Drawn by:
HA
J003135

Client:

Project:
Delmore, Orewa
Proposed Residential Development

Drawing Title:
Vehicle Tracking
JOAL 24 85th Percentile Vehicle Tracking

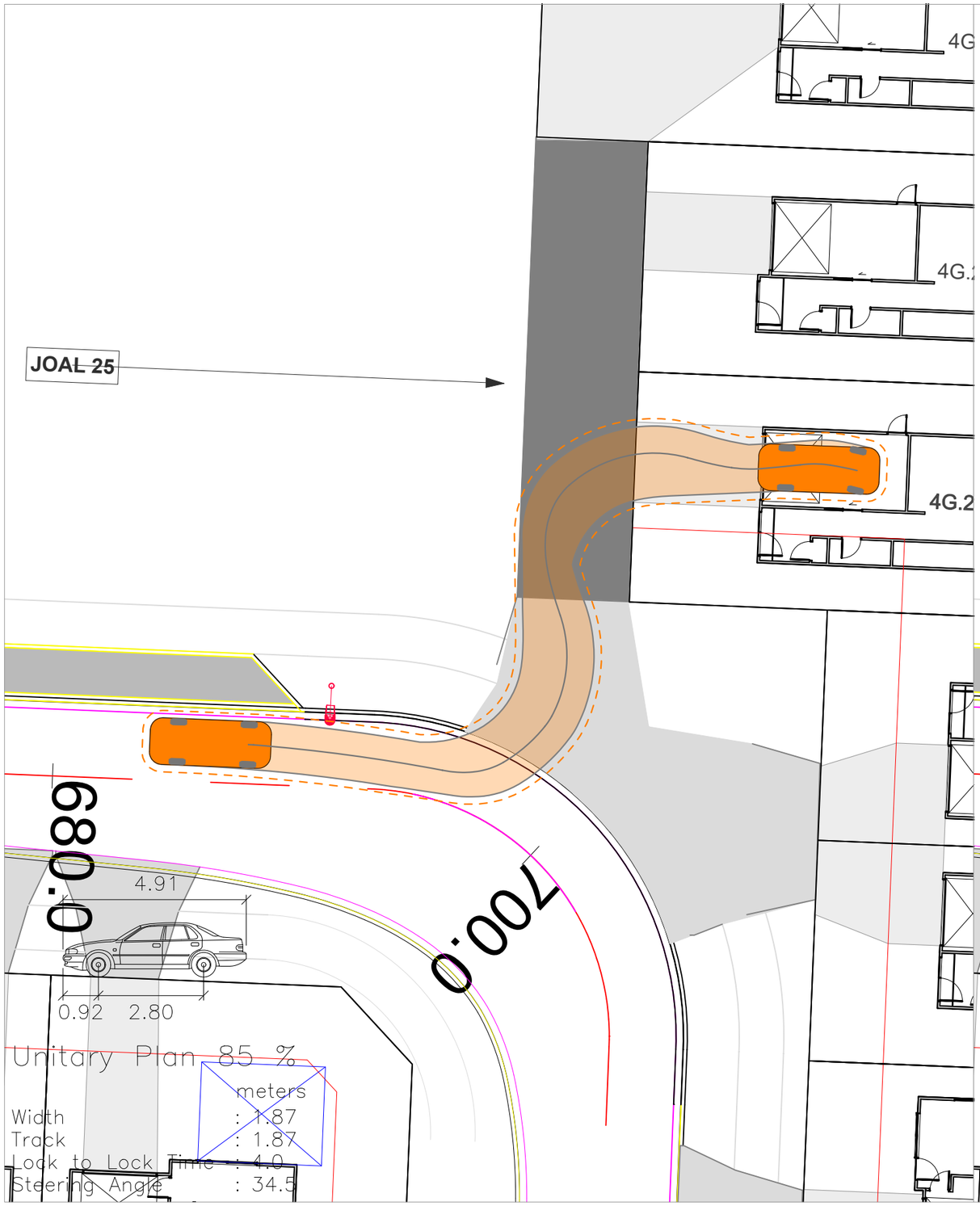
Date:
05/02/25

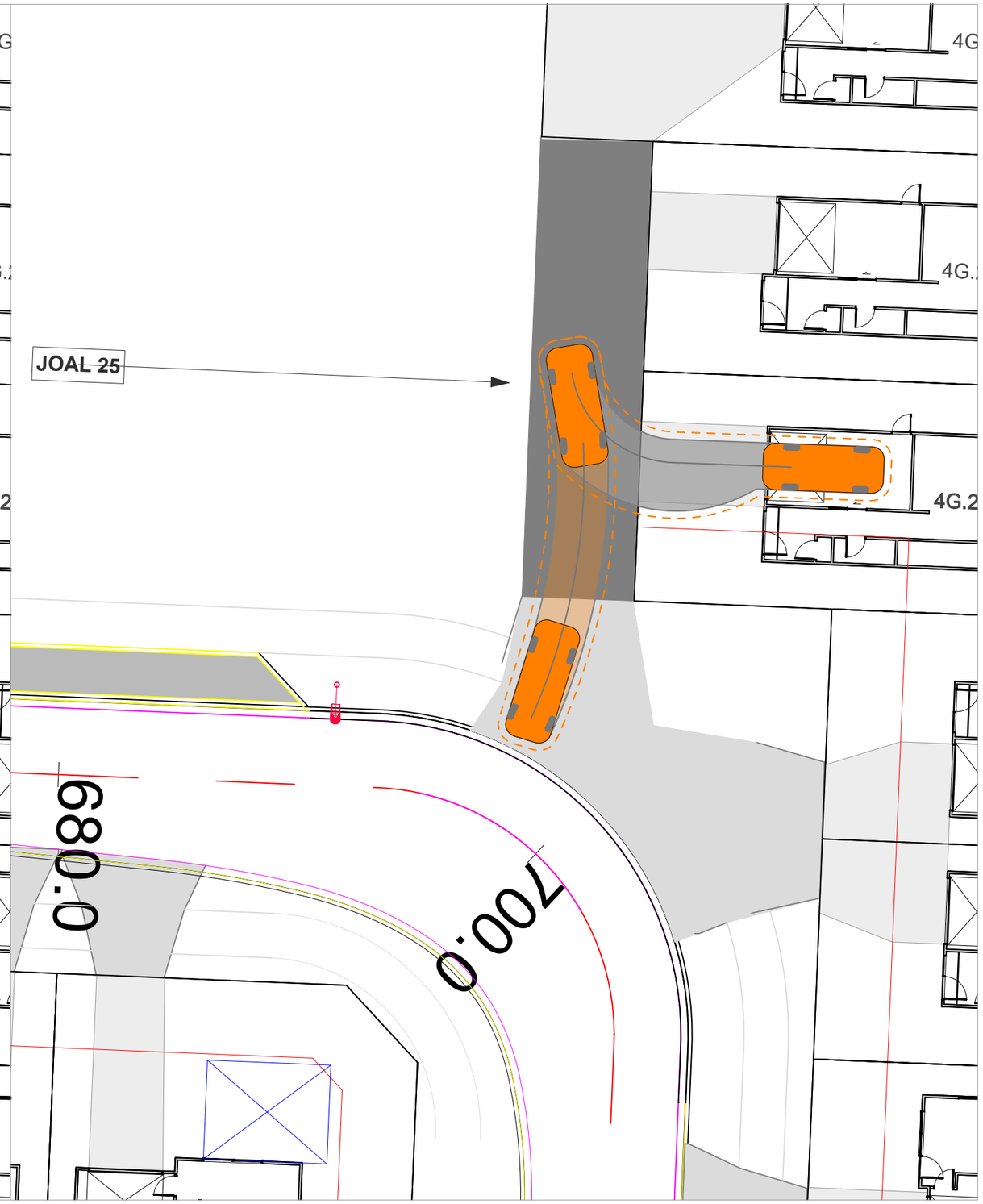
Scale @ A3:
1:200

Revision:
A

commute TRANSPORTATION CONSULTANTS

Figure:
3A





Revision notes:

Rev:	Date:	Notes:

Drawn by:
HA
J003135

Client:

Project:
Delmore, Orewa
Proposed Residential Development

Drawing Title:
Vehicle Tracking
JOAL 25 85th Percentile Vehicle Tracking

Date:
05/02/25

Scale @ A3:
1:200

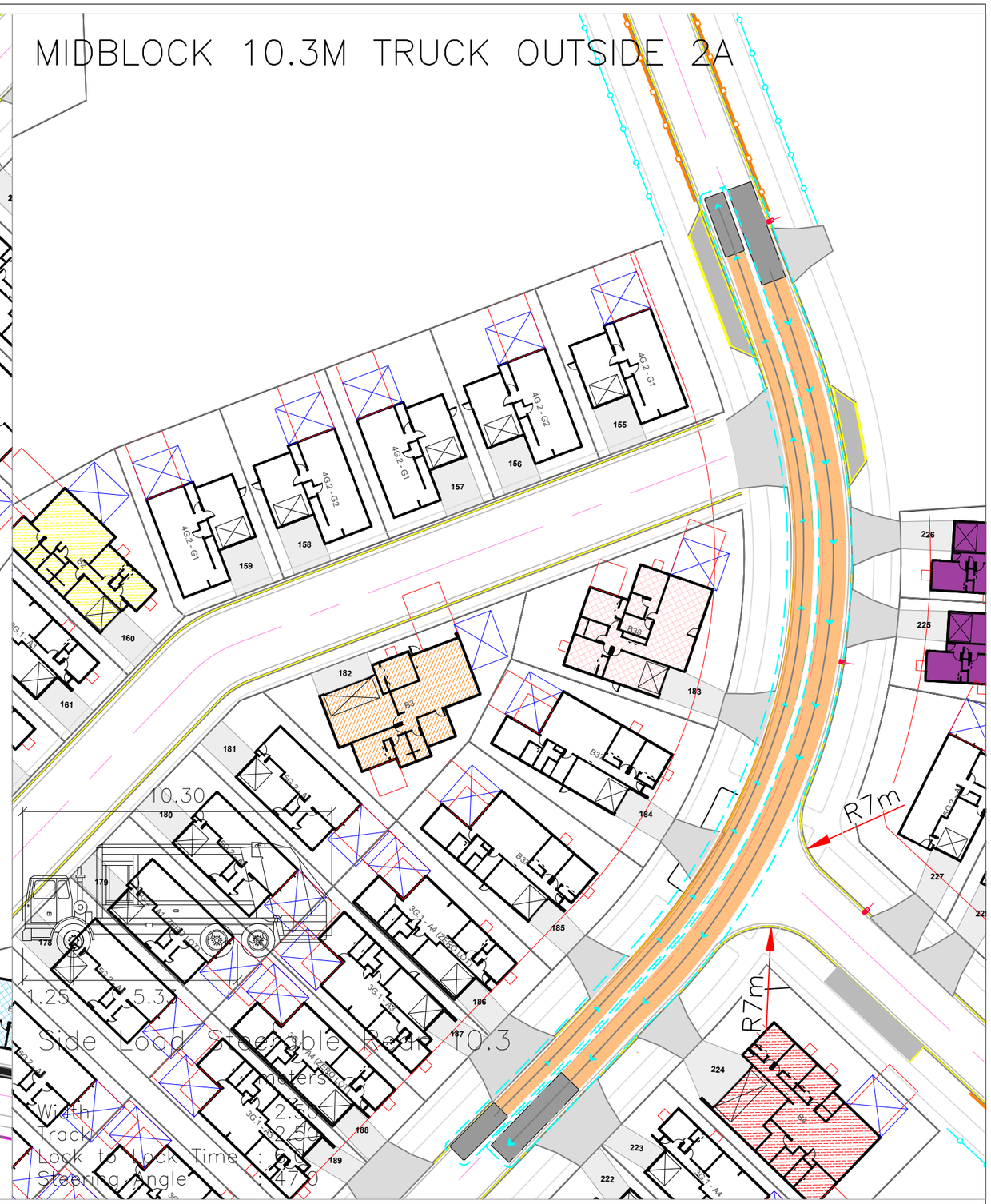
Revision:
A

commute
TRANSPORTATION CONSULTANTS

Figure:
4A

MIDBLOCK 10.3M TRUCK OUTSIDE 1A

MIDBLOCK 10.3M TRUCK OUTSIDE 2A



Revision notes:		
Rev:	Date:	Notes:

Drawn by: HA J003135

Client:

Project: Delmore, Orewa
Proposed Residential Development

Drawing Title: 6.3m Van and 10.3m Truck Mid Block Tracking
Road Road 1

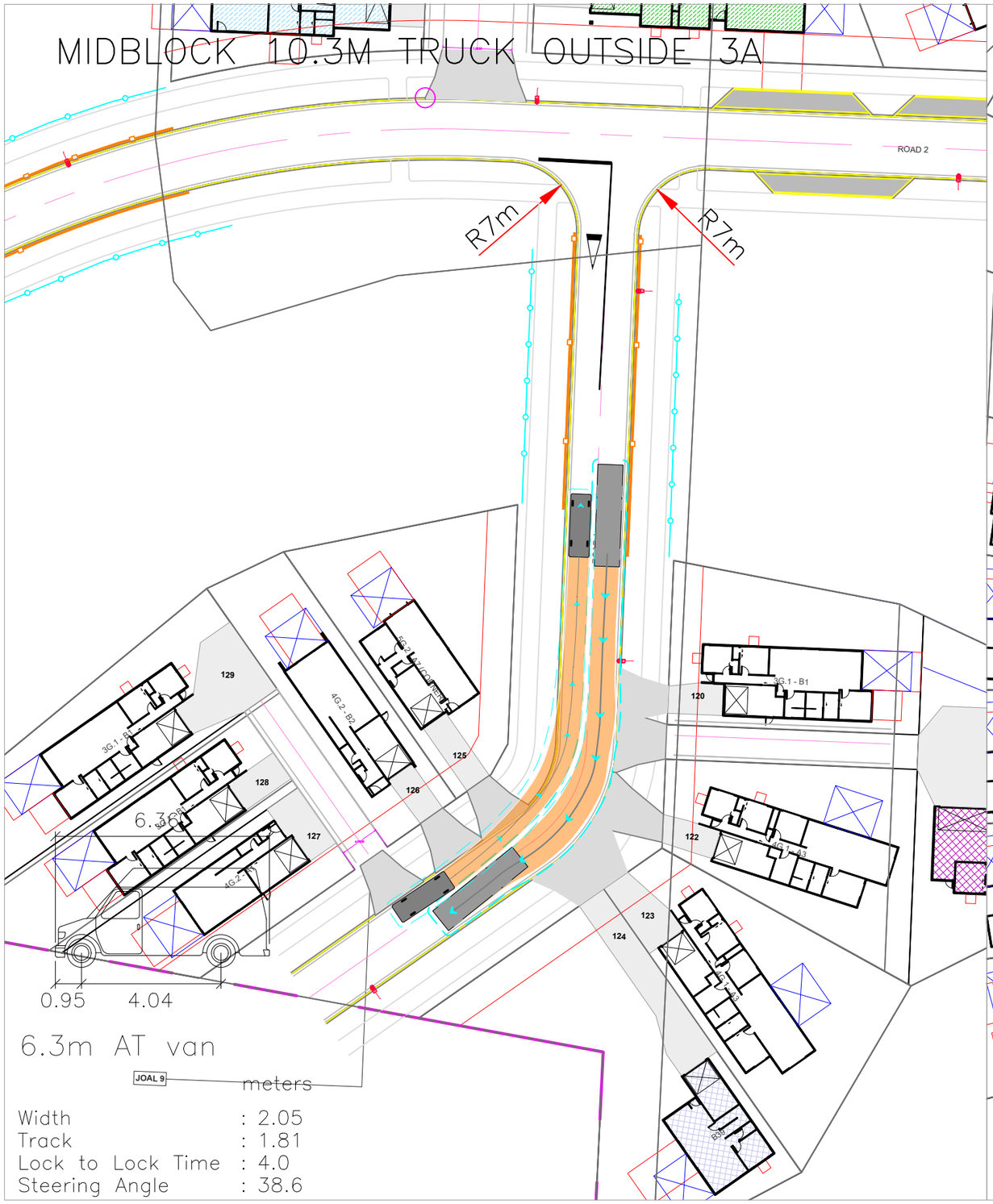
Date: 05/02/25

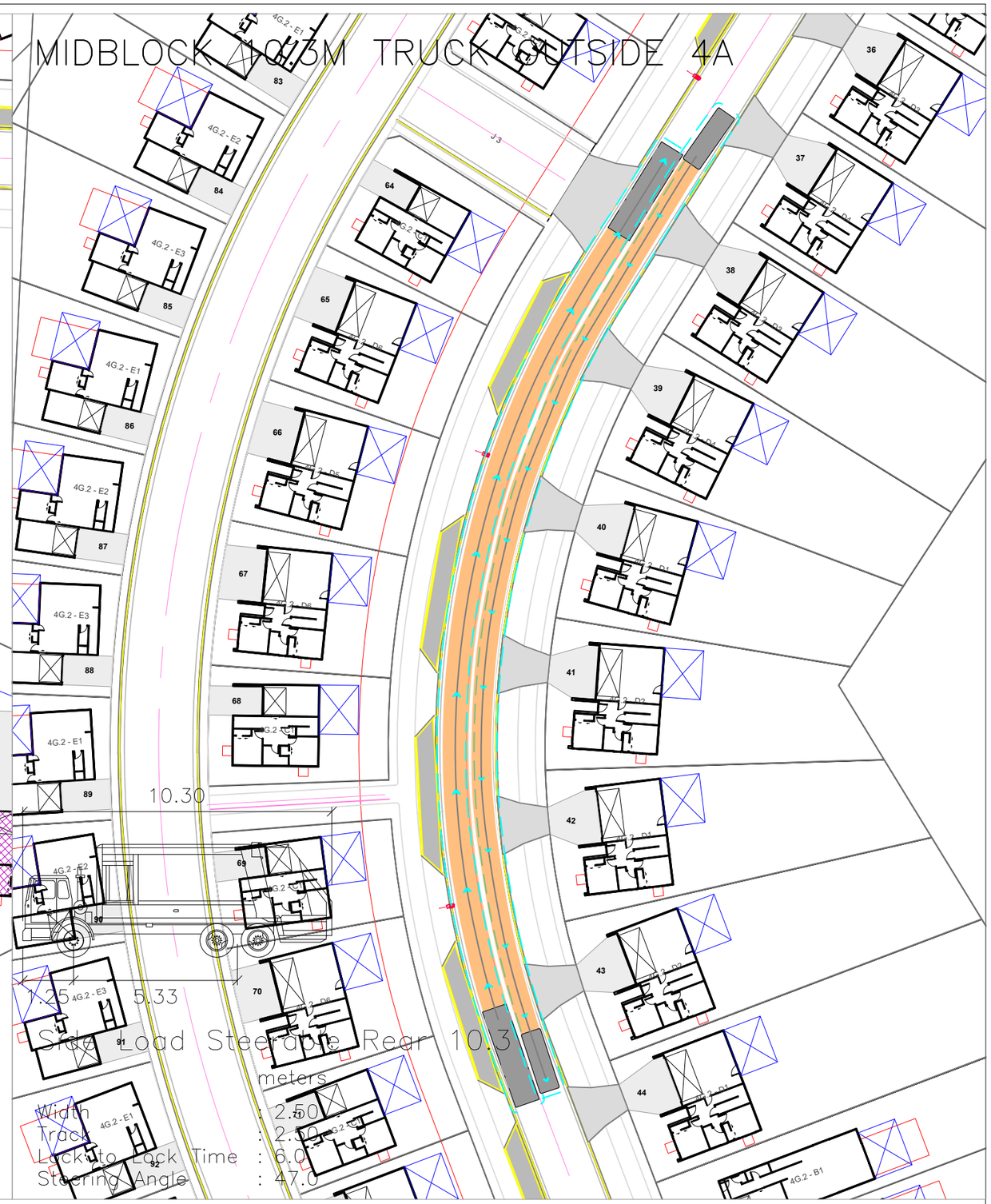
Scale @ A3: 1:500

Revision: A

commute TRANSPORTATION CONSULTANTS

Figure: 1B





Revision notes:

Rev:	Date:	Notes:

Drawn by:
HA
J003135

Client:

Project:
Delmore, Orewa
Proposed Residential Development

Drawing Title:
6.3m Van and 10.3m Truck Mid Block Tracking
Road 10 (LHS) and Road 1 (RHS)

Date:
05/02/25

Scale @ A3:
1:500

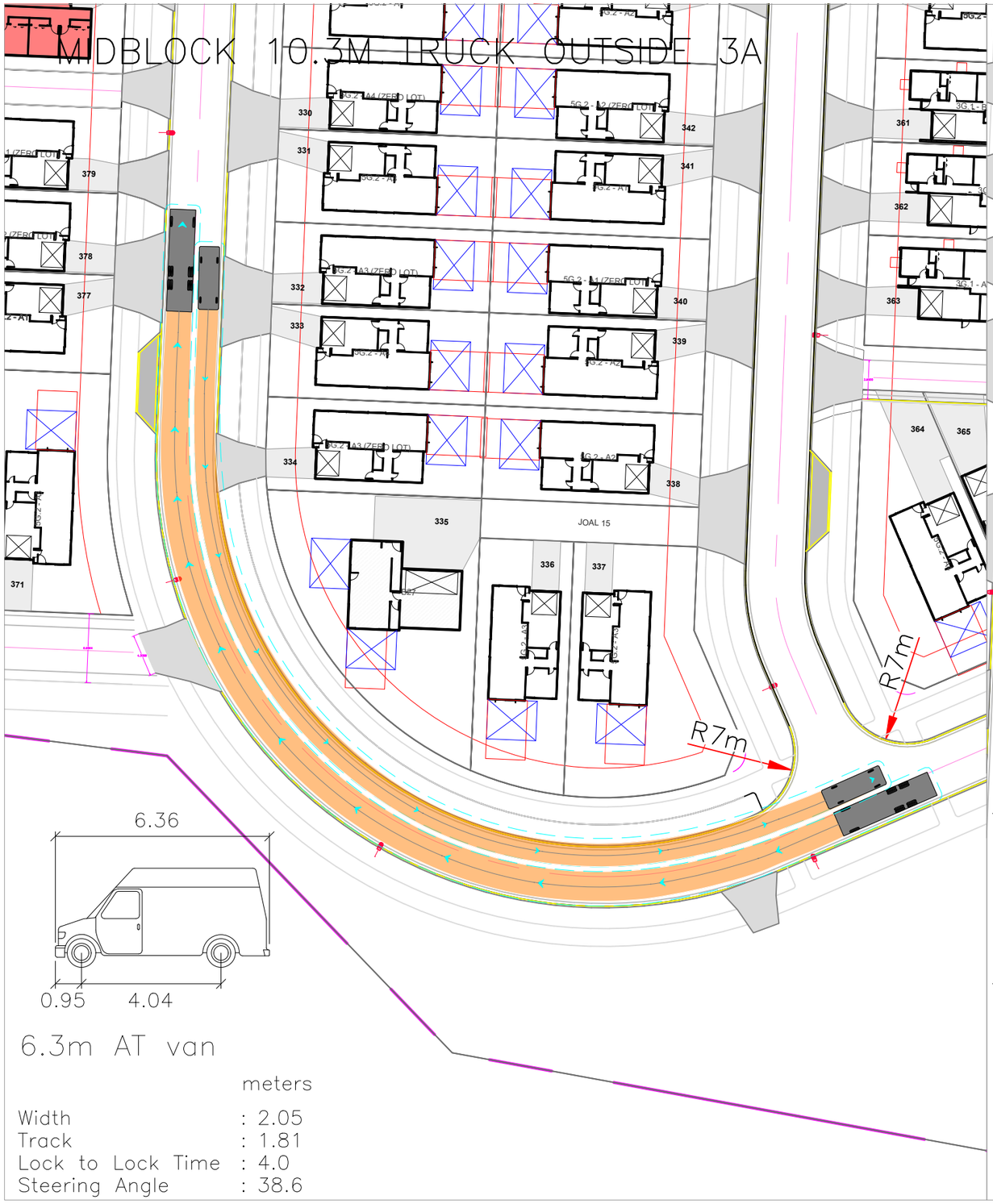
Revision:
A

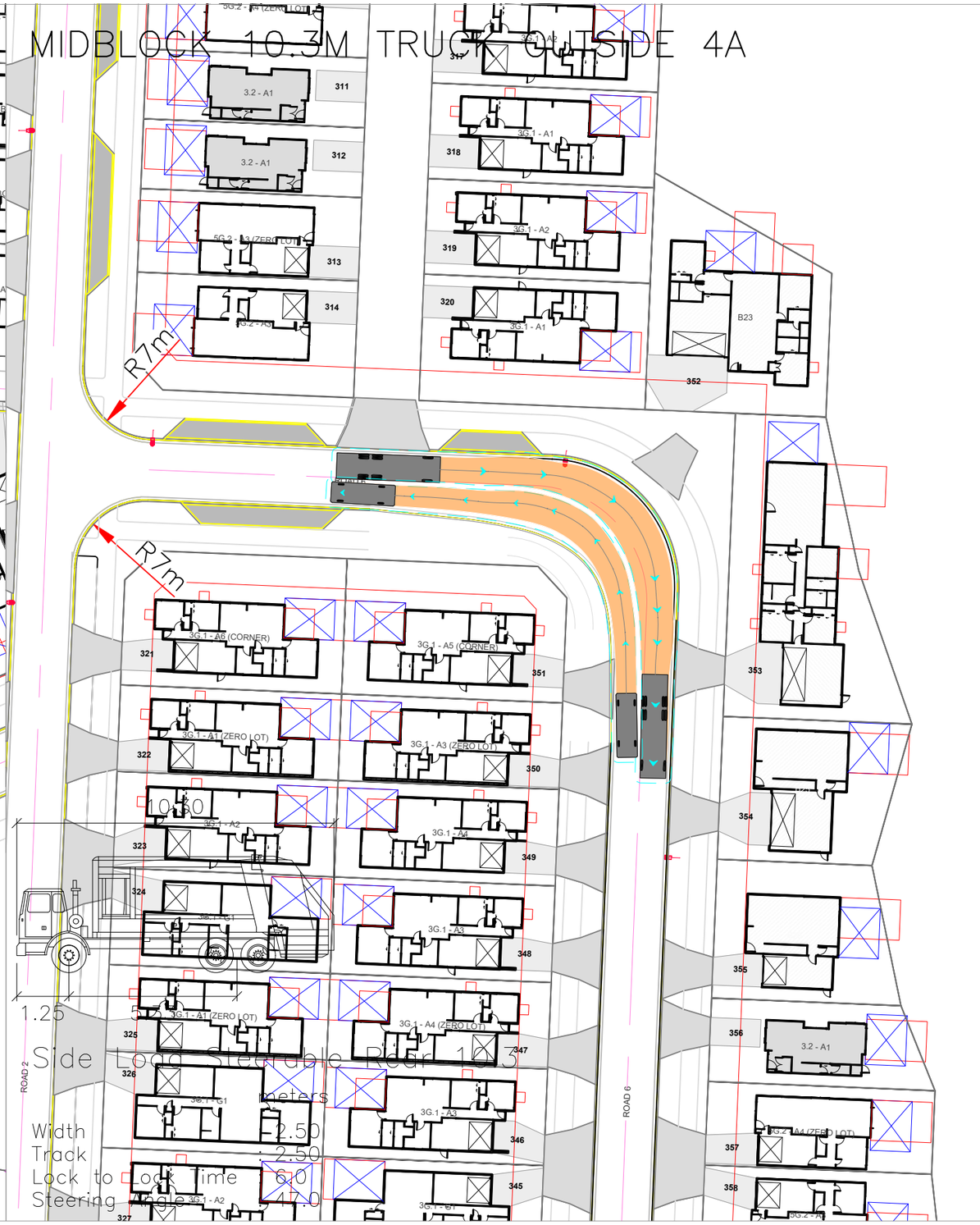
commute TRANSPORTATION CONSULTANTS

Figure:
2B

MIDBLOCK 10.3M TRUCK OUTSIDE 3A

MIDBLOCK 10.3M TRUCK OUTSIDE 4A





6.3m AT van

	meters
Width	: 2.05
Track	: 1.81
Lock to Lock Time	: 4.0
Steering Angle	: 38.6

10.30

1.25

Side Loading Steerable Rear 10.3

	meters
Width	: 2.50
Track	: 2.50
Lock to Lock Time	: 6.0
Steering Angle	: 47.0

Revision notes:		
Rev:	Date:	Notes:

Drawn by:
HA
J003135

Client:

Project:
Delmore, Orewa
Proposed Residential Development

Drawing Title:
6.3m Van and 10.3m Truck Mid Block Tracking
Road 2 (LHS) & Road 4 (RHS)

Date:
05/02/25

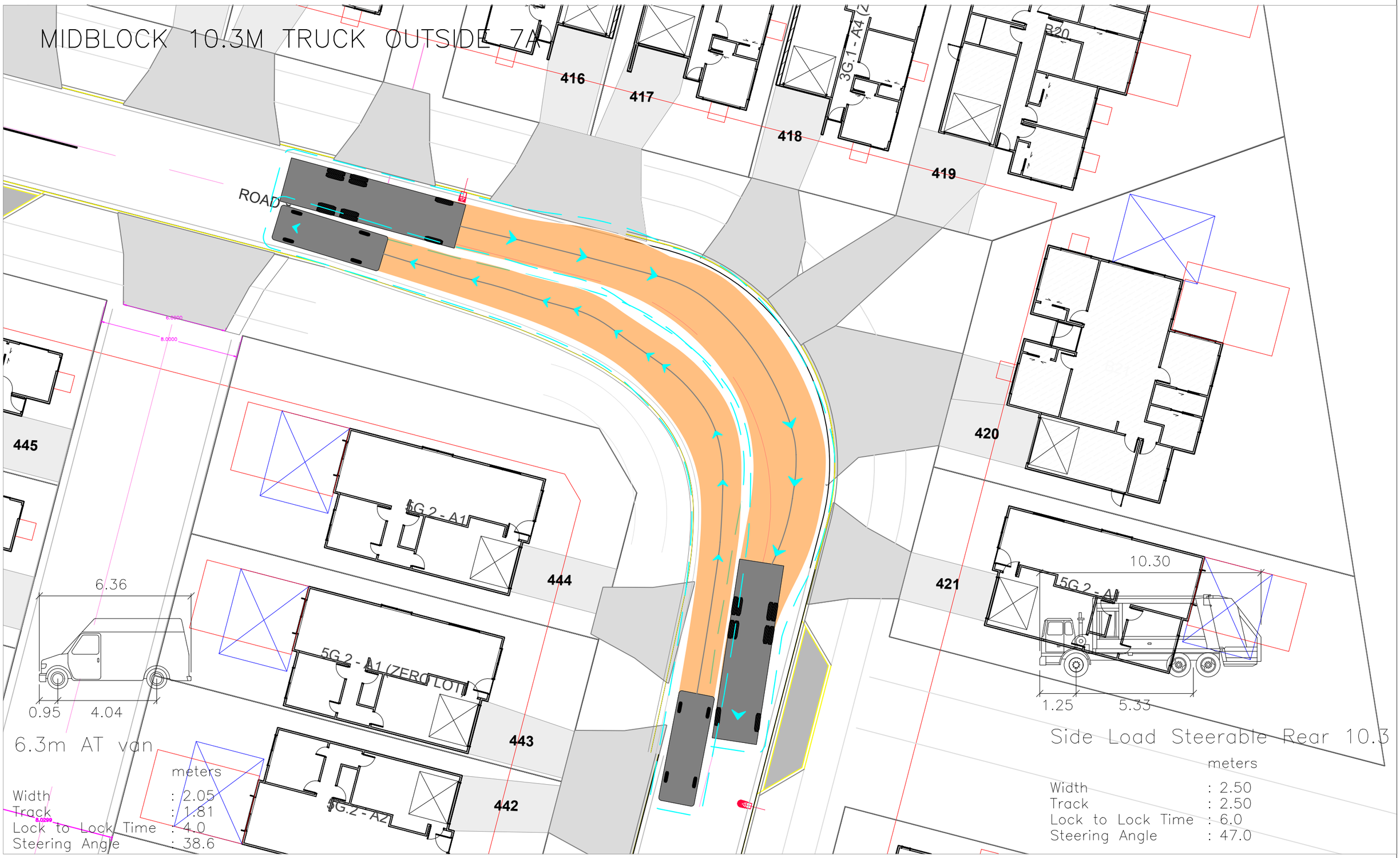
Scale @ A3:
1:500

Revision:
A

commute TRANSPORTATION CONSULTANTS

Figure:
3B

MIDBLOCK 10.3M TRUCK OUTSIDE 7A



6.3m AT van

	meters
Width	: 2.05
Track	: 1.81
Lock to Lock Time	: 4.0
Steering Angle	: 38.6

Side Load Steerable Rear 10.3

	meters
Width	: 2.50
Track	: 2.50
Lock to Lock Time	: 6.0
Steering Angle	: 47.0

Revision notes:

Rev:	Date:	Notes:

Drawn by: HA
J003135

Client:

Project: Delmore, Orewa
Proposed Residential Development

Drawing Title: 6.3m Van and 10.3m Truck Mid Block Tracking
Road 6

Date: 05/02/25

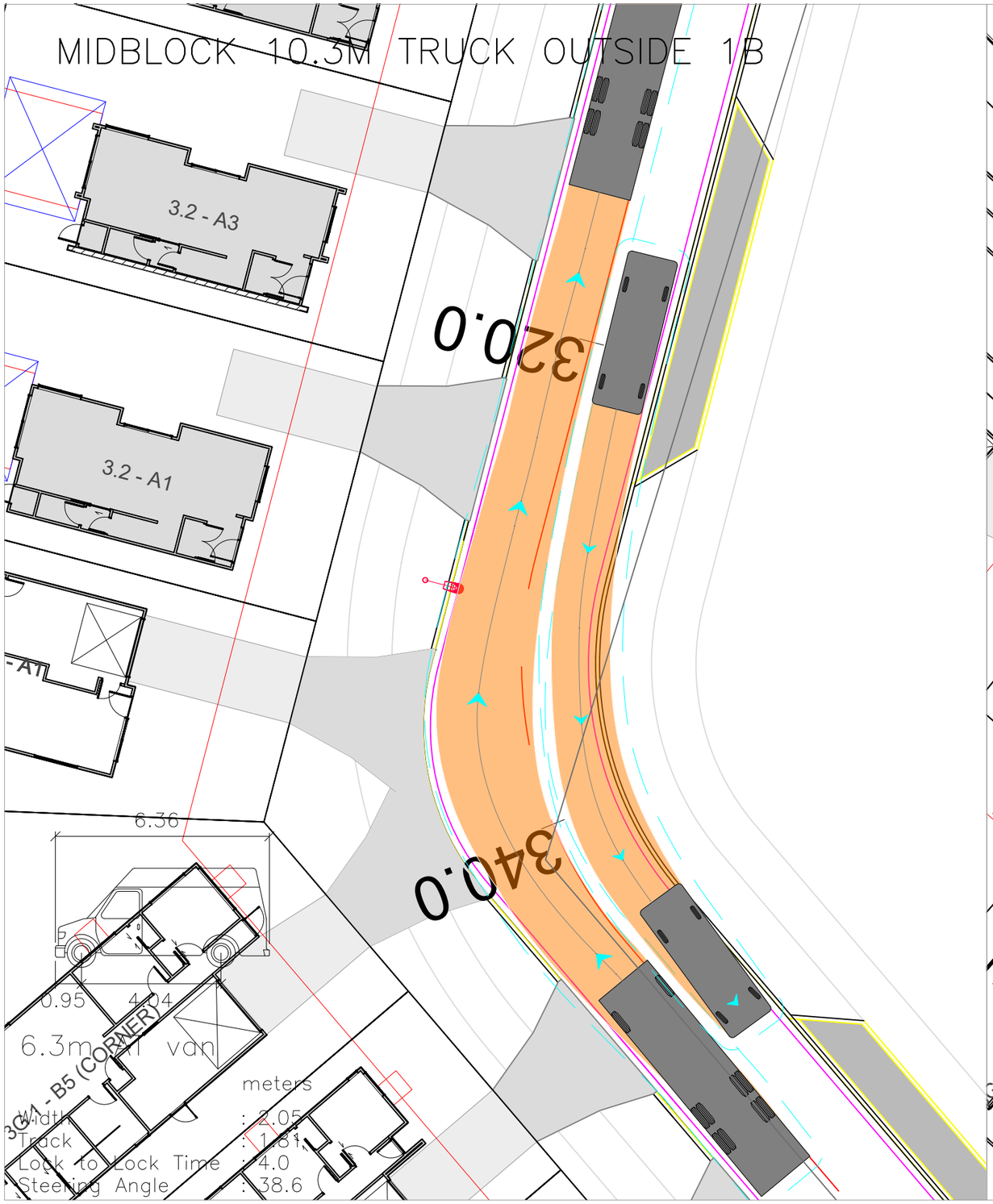
Scale @ A3: 1:200

Revision: A

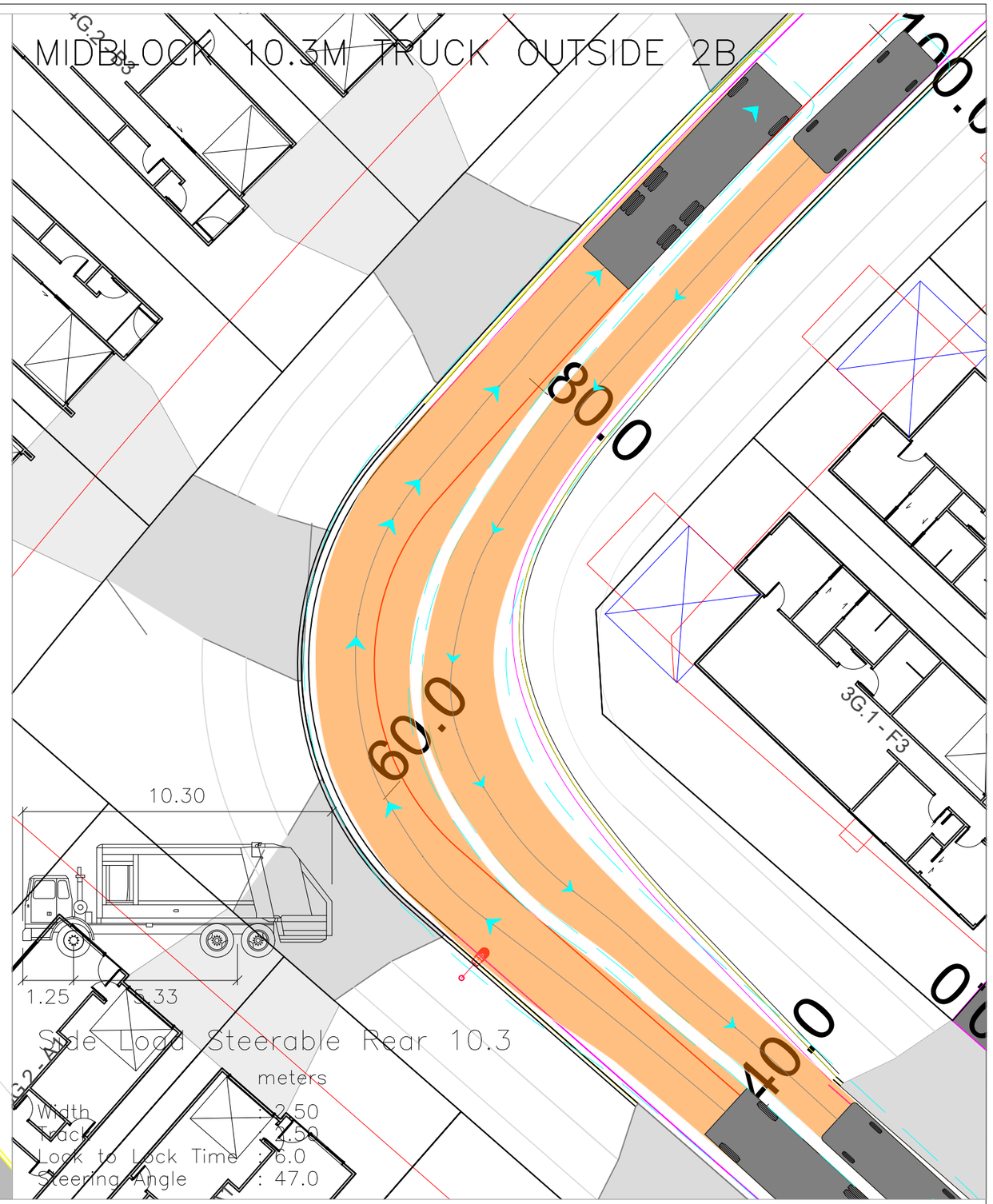
commute TRANSPORTATION CONSULTANTS

Figure: 4B

MIDBLOCK 10.3M TRUCK OUTSIDE 1B



MIDBLOCK 10.3M TRUCK OUTSIDE 2B



Revision notes:

Rev:	Date:	Notes:

Drawn by:
HA
J003135

Client:

Project:
Delmore, Orewa
Proposed Residential Development

Drawing Title:
6.3m Van and 10.3m Truck Mid Block Tracking
Road 12 & Road 15

Date:
05/02/25

Scale @ A3:
1:500

Revision:
A

commute TRANSPORTATION CONSULTANTS

Figure:
5B

MIDBLOCK 10.3M TRUCK OUTSIDE 3B

MIDBLOCK 10.3M TRUCK OUTSIDE 4B

Side Load Steerable Rear 10.3

	meters
Width	: 2.50
Track	: 2.50
Lock to Lock Time	: 6.0
Steering Angle	: 47.0

Revision notes:

Rev:	Date:	Notes:

Drawn by:
HA
J003135

Client:

Project:
Delmore, Orewa
Proposed Residential Development

Drawing Title:
6.3m Van and 10.3m Truck Mid Block Tracking
Road 5 & Road 15

Date:
05/02/25

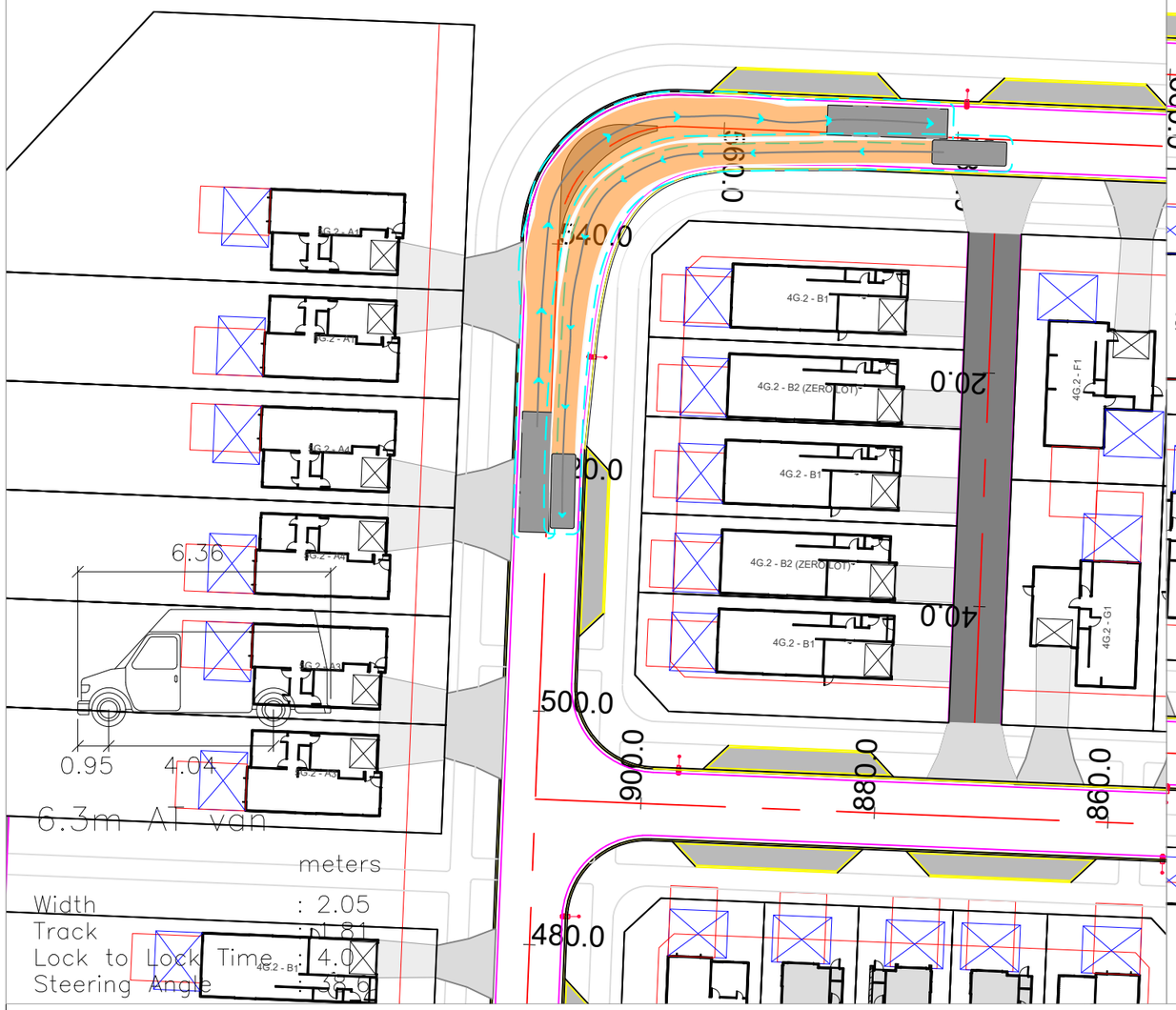
Scale @ A3:
1:500

Revision:
A

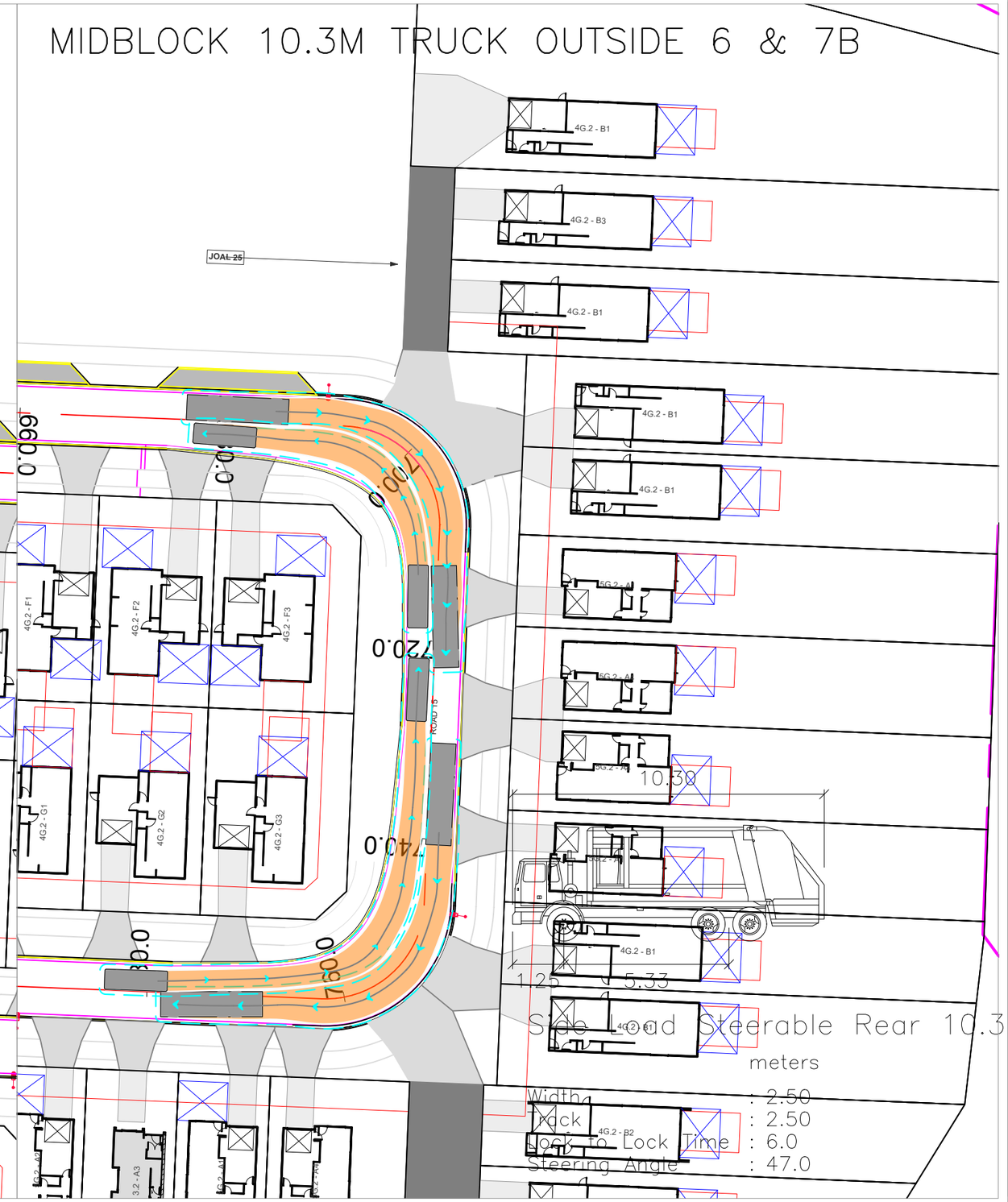
commute TRANSPORTATION CONSULTANTS

Figure:
6B

MIDBLOCK 10.3M TRUCK OUTSIDE 5B



MIDBLOCK 10.3M TRUCK OUTSIDE 6 & 7B



Revision notes: Rev: / Date: / Notes:	**Drawn by:** HA J003135 **Client:**	**Project:** Delmore, Orewa Proposed Residential Development **Drawing Title:** 6.3m Van and 10.3m Truck Mid Block Tracking Road 14	**Date:** 05/02/25 **Scale @ A3:** 1:500 **Revision:** A	commute TRANSPORTATION CONSULTANTS	**Figure:** 7B

MIDBLOCK 10.3M TRUCK OUTSIDE 8B

MIDBLOCK 10.3M TRUCK OUTSIDE 9B

6.3m AT van

	meters
Width	: 2.05
Track	: 1.81
Lock to Lock Time	: 4.0
Steering Angle	: 38.6

Side Road Steerable Rear 10.3

	meters
Width	: 2.50
Track	: 2.50
Lock to Lock Time	: 6.0
Steering Angle	: 45.0

Revision notes:

Rev:	Date:	Notes:

Drawn by:
HA
J003135

Client:

Project:
Delmore, Orewa
Proposed Residential Development

Drawing Title:
6.3m Van and 10.3m Truck Mid Block Tracking
Road 24

Date:
05/02/25

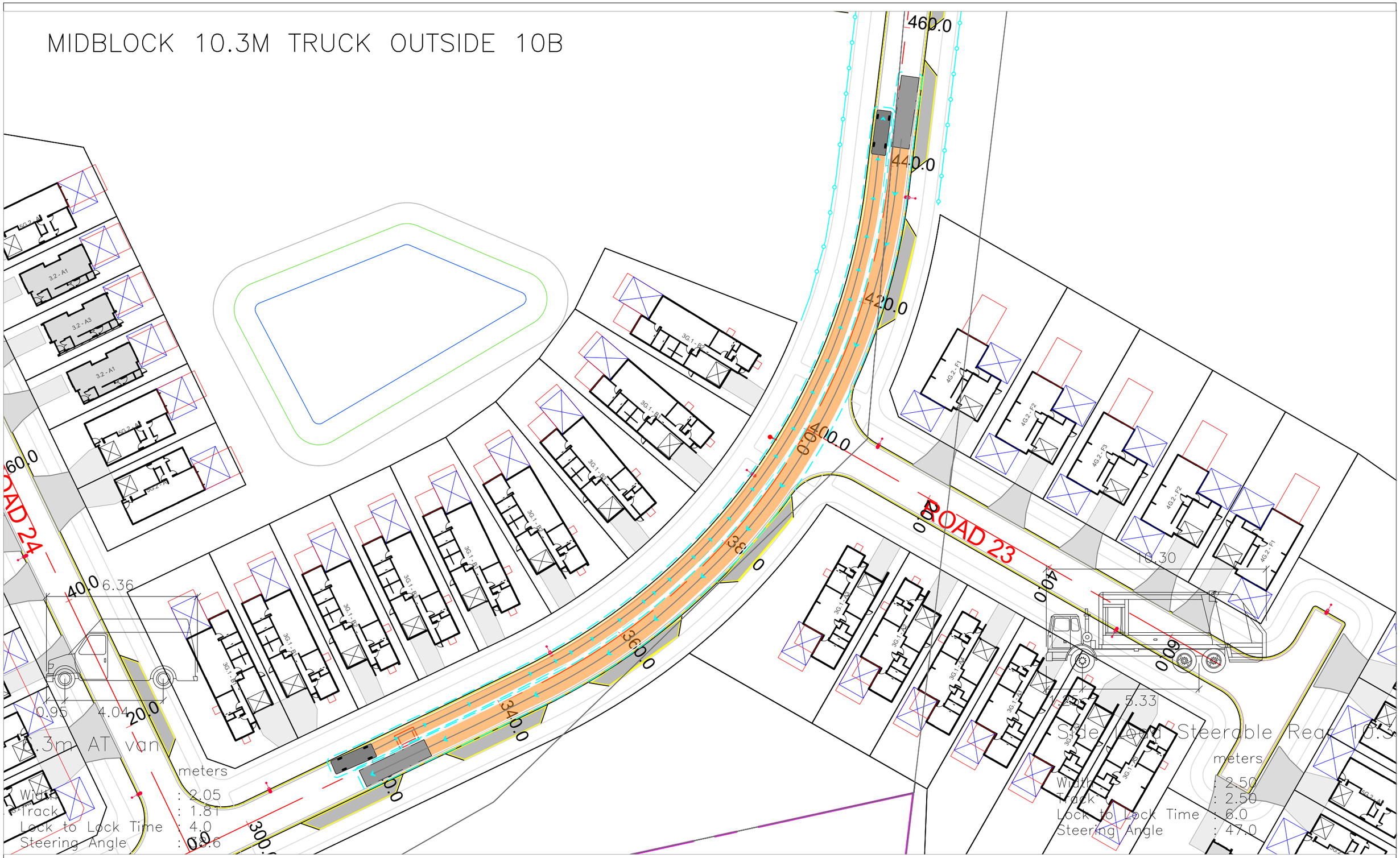
Scale @ A3:
1:500

Revision:
A

commute TRANSPORTATION CONSULTANTS

Figure:
8B

MIDBLOCK 10.3M TRUCK OUTSIDE 10B



Revision notes:

Rev:	Date:	Notes:

Drawn by:
HA
J003135

Client:

Project:
Delmore, Orewa
Proposed Residential Development

Drawing Title:
6.3m Van and 10.3m Truck Mid Block Tracking
Road 17

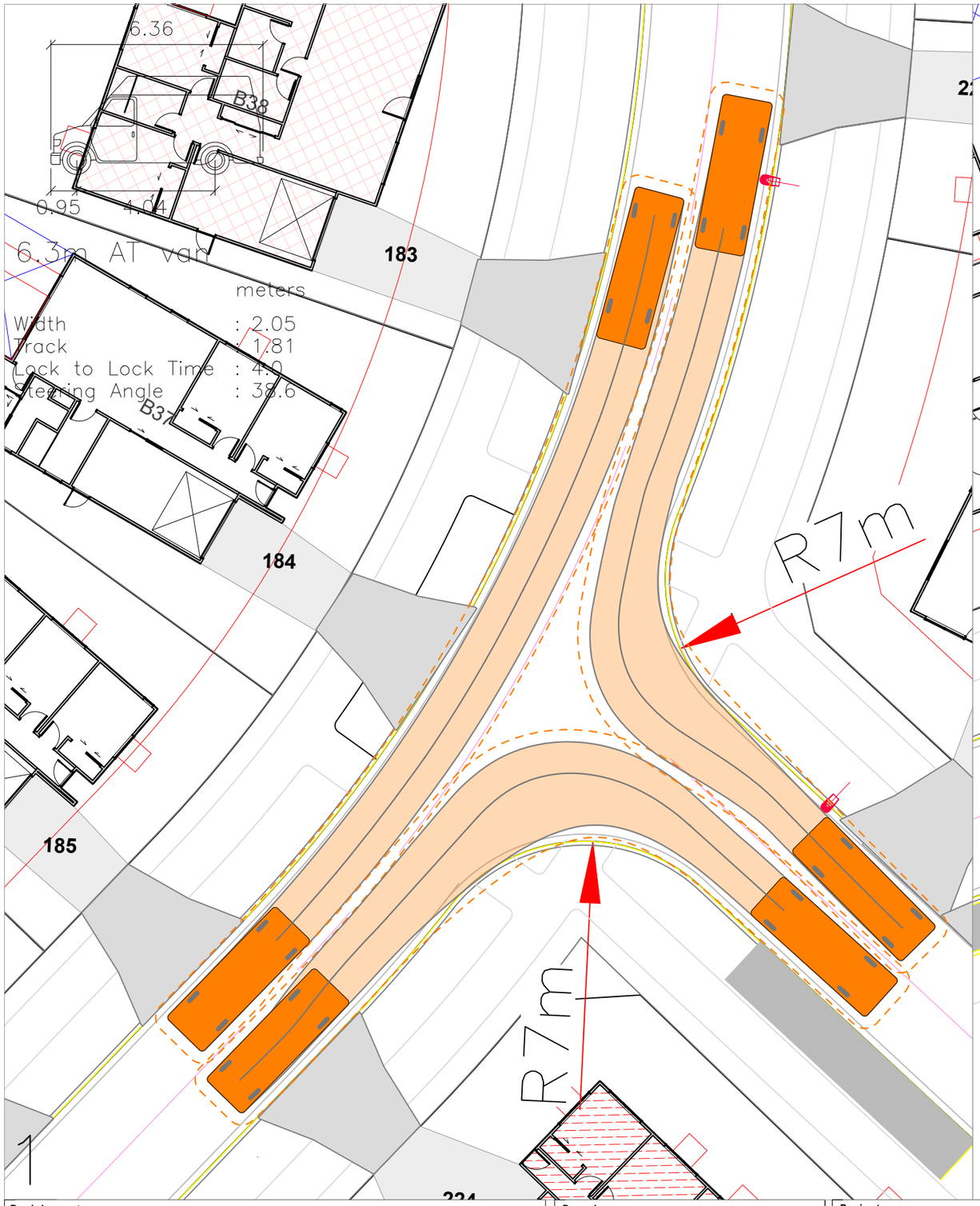
Date:
05/02/25

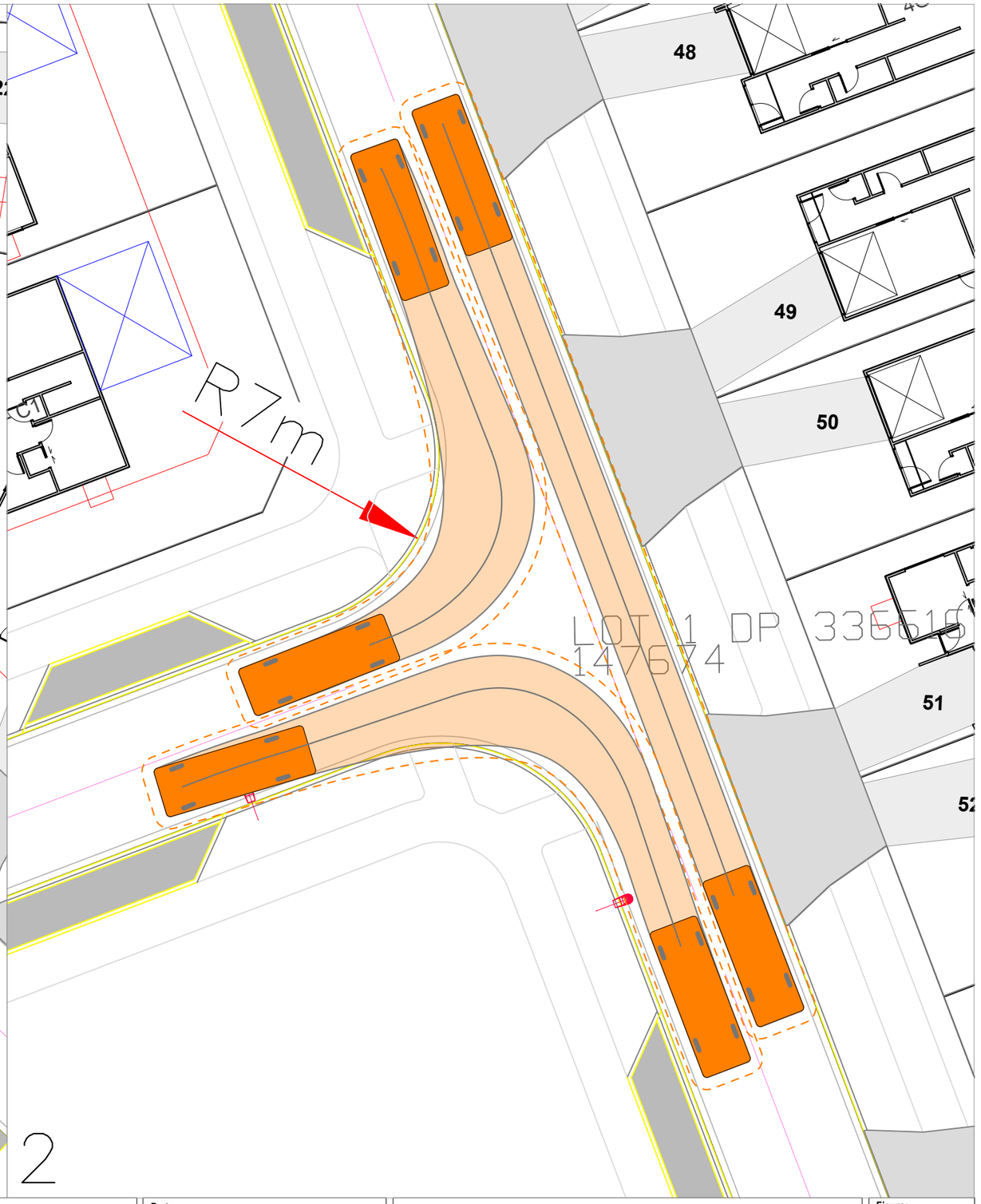
Scale @ A3:
1:500

Revision:
A

commute TRANSPORTATION CONSULTANTS

Figure:
9B





Revision notes:		
Rev:	Date:	Notes:

Drawn by:
HA
J003135

Client:

Project:
Delmore, Orewa
Proposed Residential Development

Drawing Title:
Vehicle Tracking
Road 8/1 Intersection (LHS) and Road 2/Road 1 Intersection (RHS)

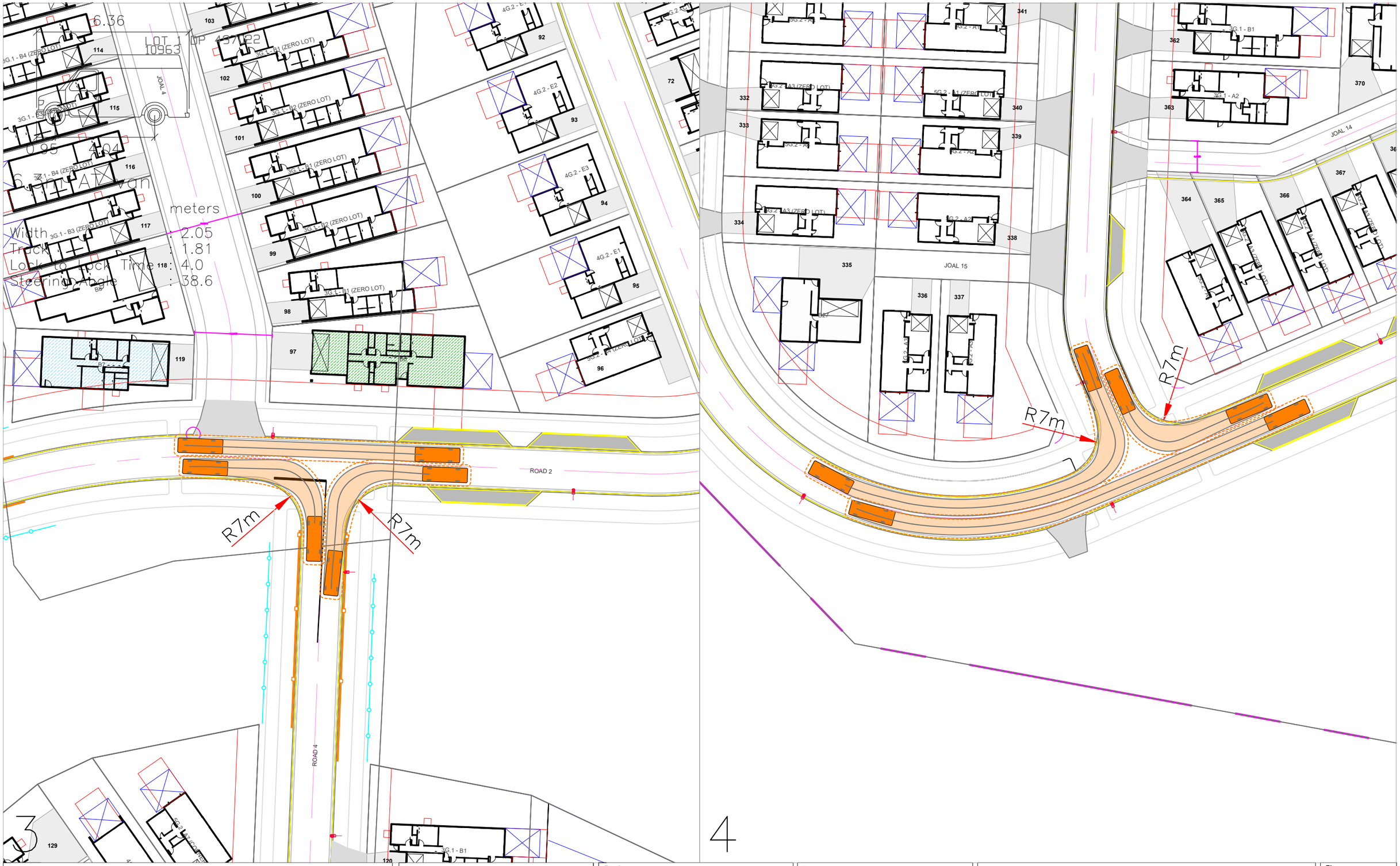
Date:
05/02/25

Scale @ A3:
1:200

Revision:
A

commute TRANSPORTATION CONSULTANTS

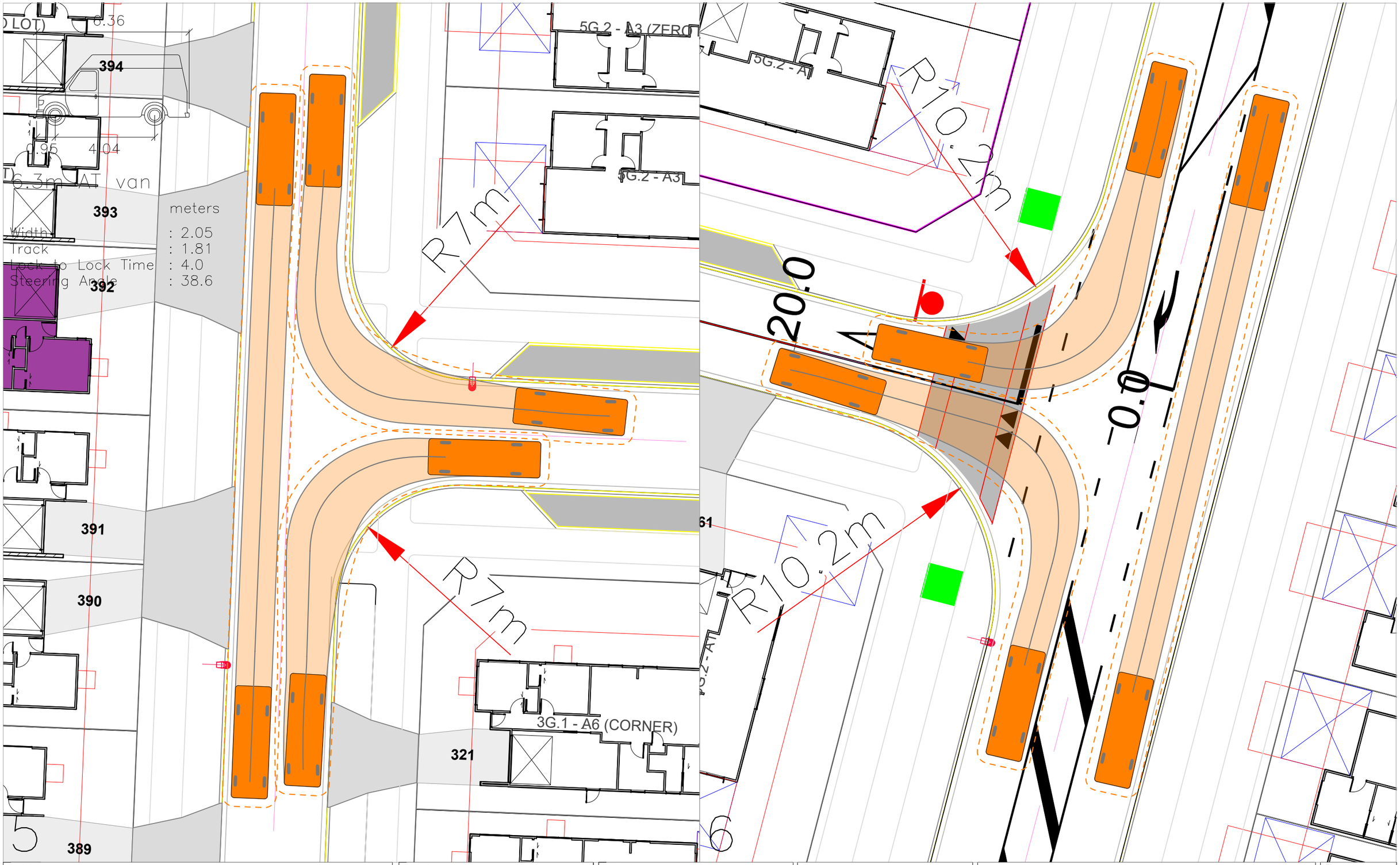
Figure:
1C



4

Revision notes:		
Rev:	Date:	Notes:

Drawn by: HA J003135	**Project:** Delmore, Orewa Proposed Residential Development	**Date:** 05/02/25	commute TRANSPORTATION CONSULTANTS	**Figure:** 2C
Client:	**Drawing Title:** Vehicle Tracking Road 10/Road 2 Intersection (LHS) and Road 4/Road 2 Intersection (RHS)	**Scale @ A3:** 1:500 **Revision:** A		



Revision notes:

Rev:	Date:	Notes:

Drawn by:
HA
J003135

Client:

Project:
Delmore, Orewa
Proposed Residential Development

Drawing Title:
Vehicle Tracking
Road 4/Road 2 Tracking and Road 7/NoR6 Tracking

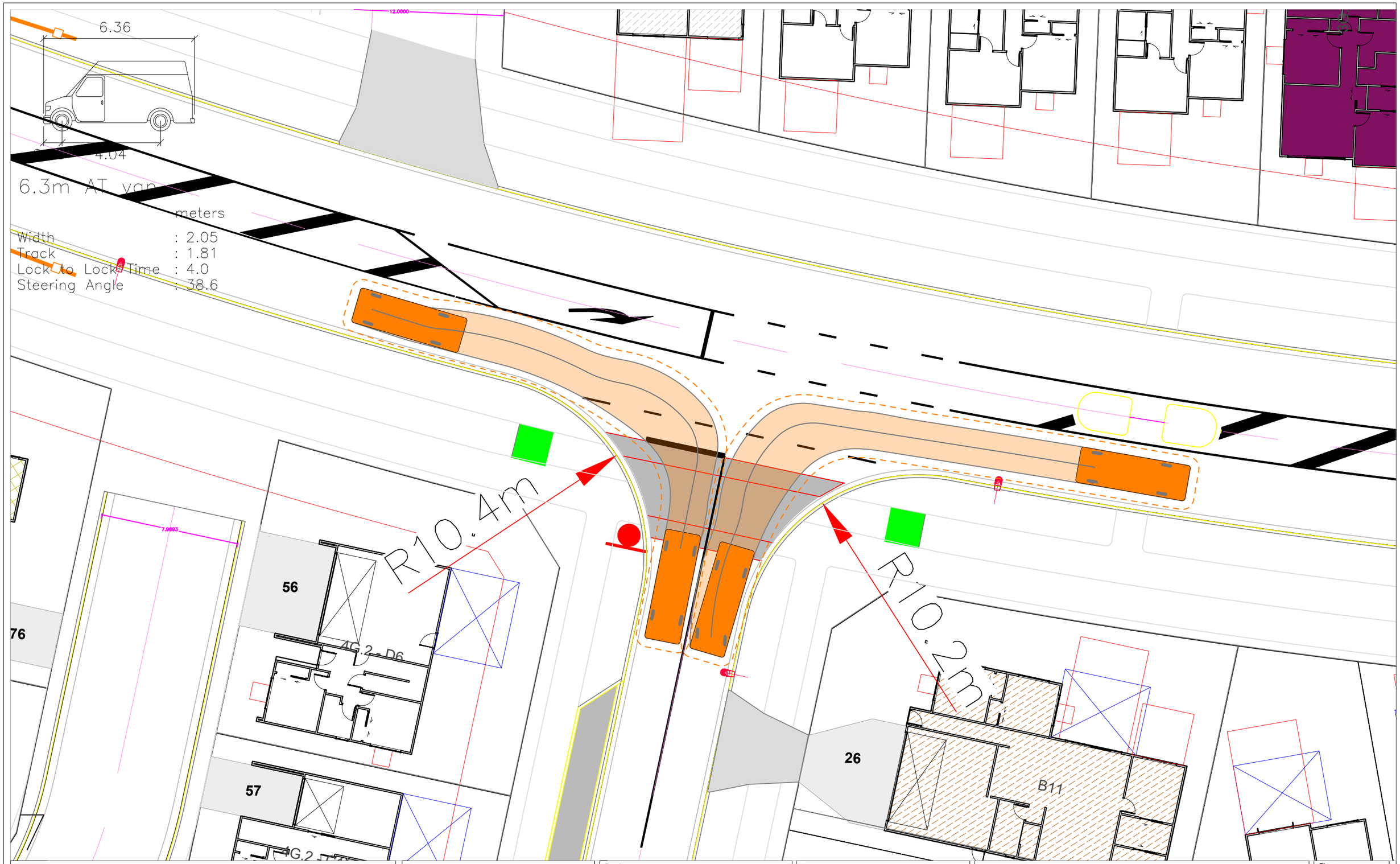
Date:
05/02/25

Scale @ A3:
1:200

Revision:
A

commute TRANSPORTATION CONSULTANTS

Figure:
3C



Revision notes:

Rev:	Date:	Notes:

Drawn by:
HA
J003135

Client:

Project:
Delmore, Orewa
Proposed Residential Development

Drawing Title:
6.3m Van Intersection Tracking
Road 1/NoR6

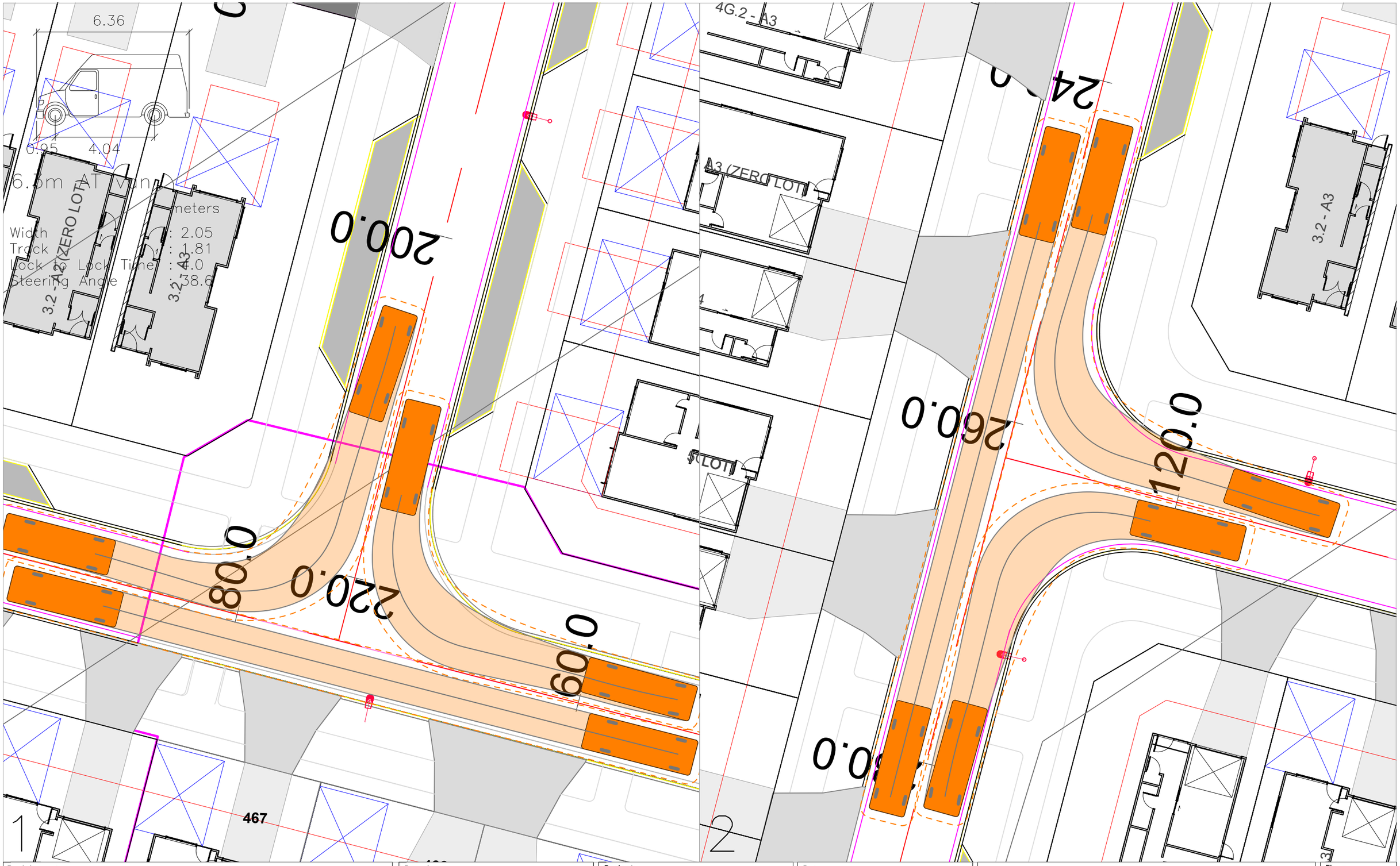
Date:
05/02/25

Scale @ A3:
1:200

Revision:
A

commute
TRANSPORTATION CONSULTANTS

Figure:
4C



Revision notes:		
Rev:	Date:	Notes:

Drawn by: HA
J003135

Client:

Project: Delmore, Orewa
Proposed Residential Development

Drawing Title: Vehicle Tracking
Road 7/Road 11 (LHS) & Road 7/Road 12 (RHS)

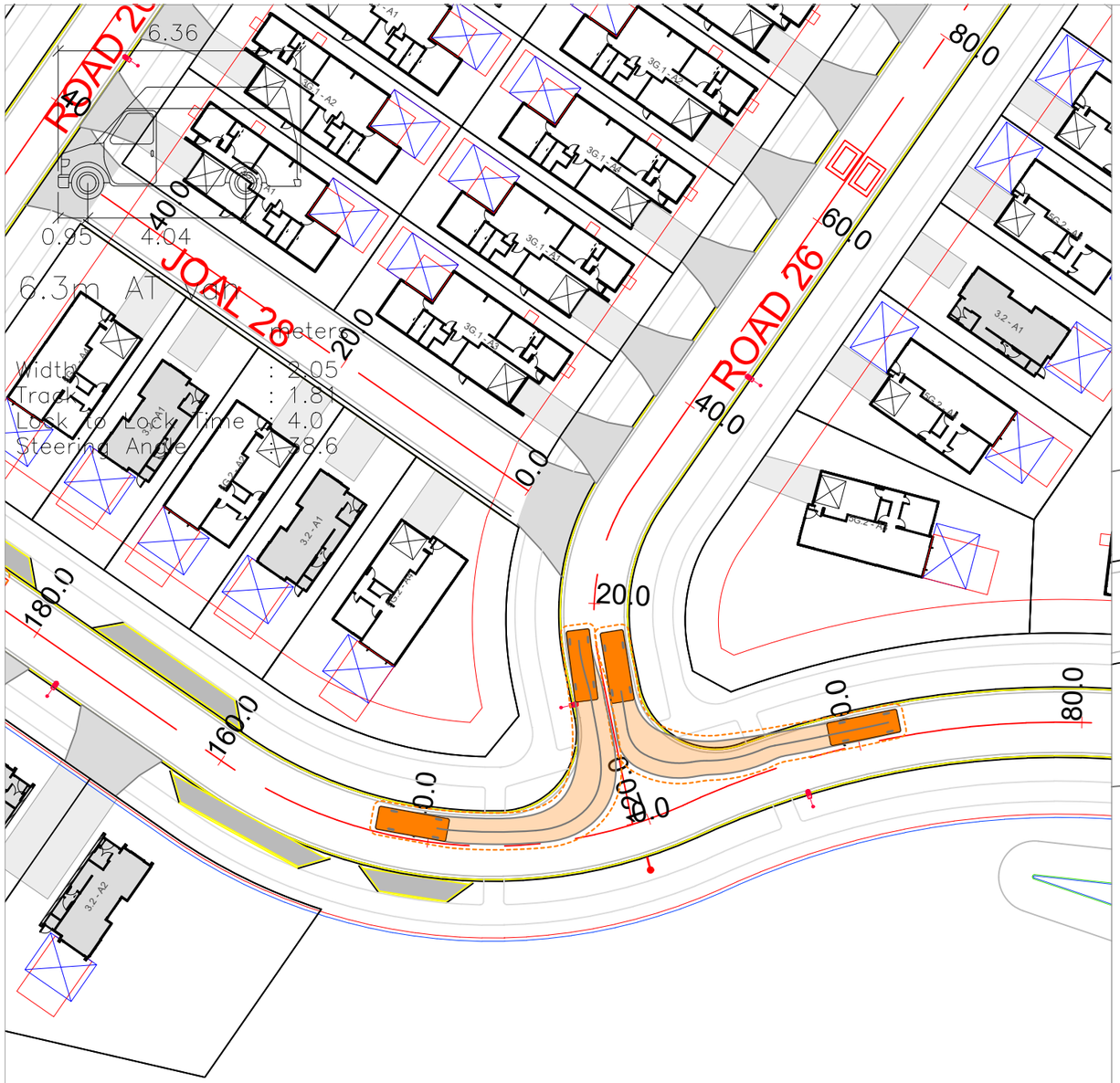
Date: 05/02/25

Scale @ A3: 1:200

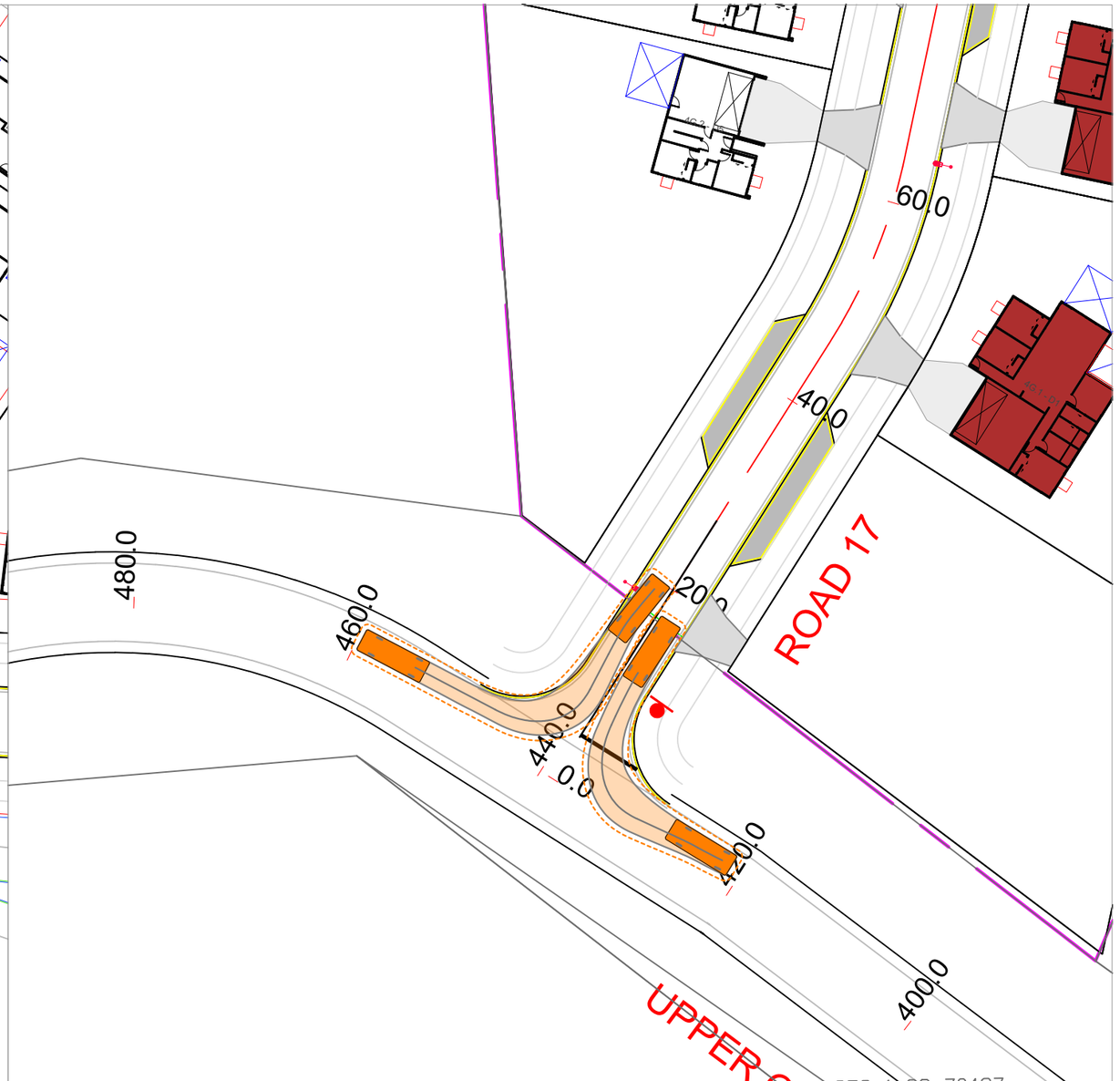
Revision: A

commute TRANSPORTATION CONSULTANTS

Figure: 5C



1



2

Revision notes:		
Rev:	Date:	Notes:

Drawn by: HA J003135

Client:

Project: Delmore, Orewa
Proposed Residential Development

Drawing Title: 6.3m Van Intersection Tracking
Road 26/22 (LHS) & Road 17/Upper Orewa Road (RHS)

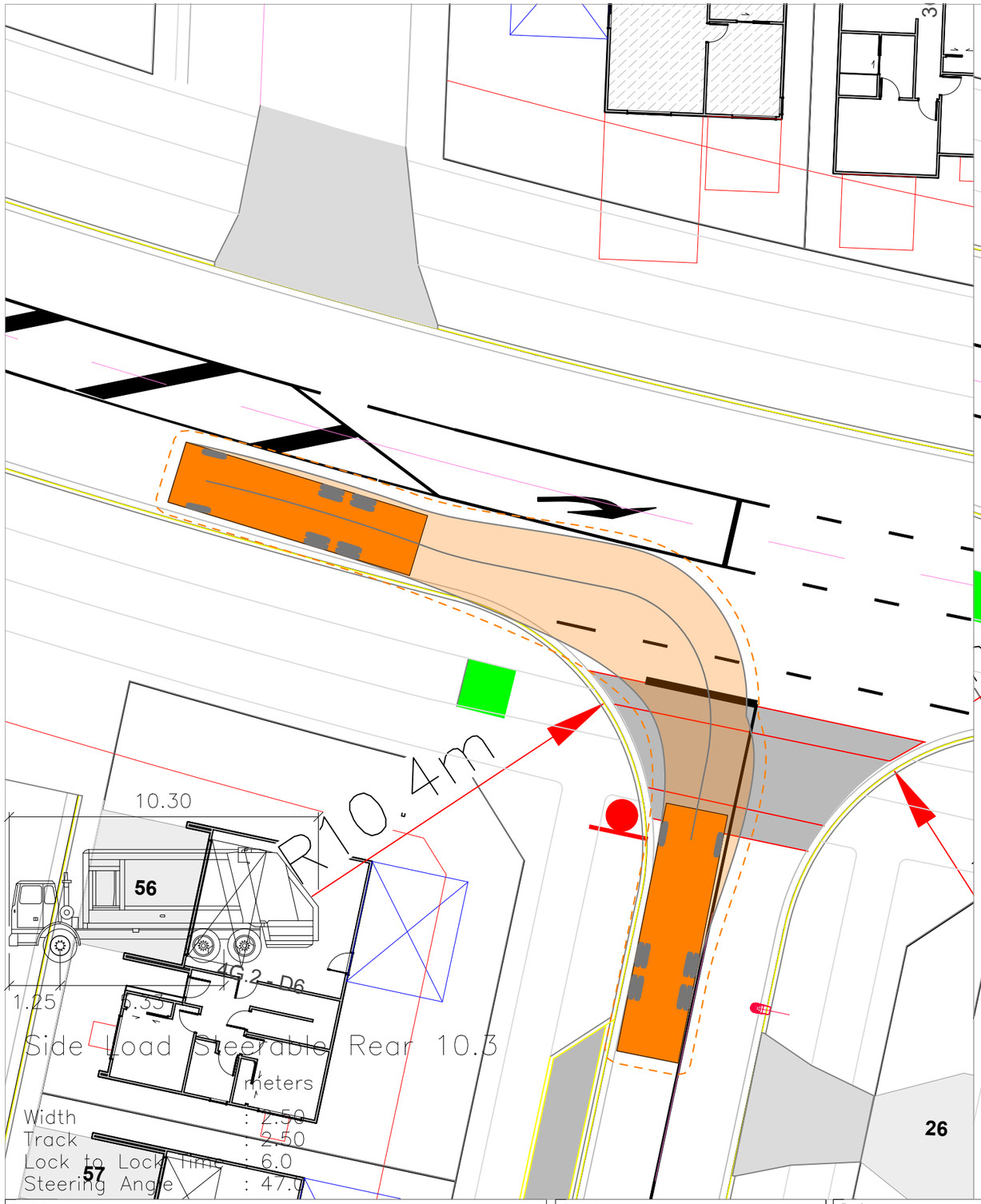
Date: 05/02/25

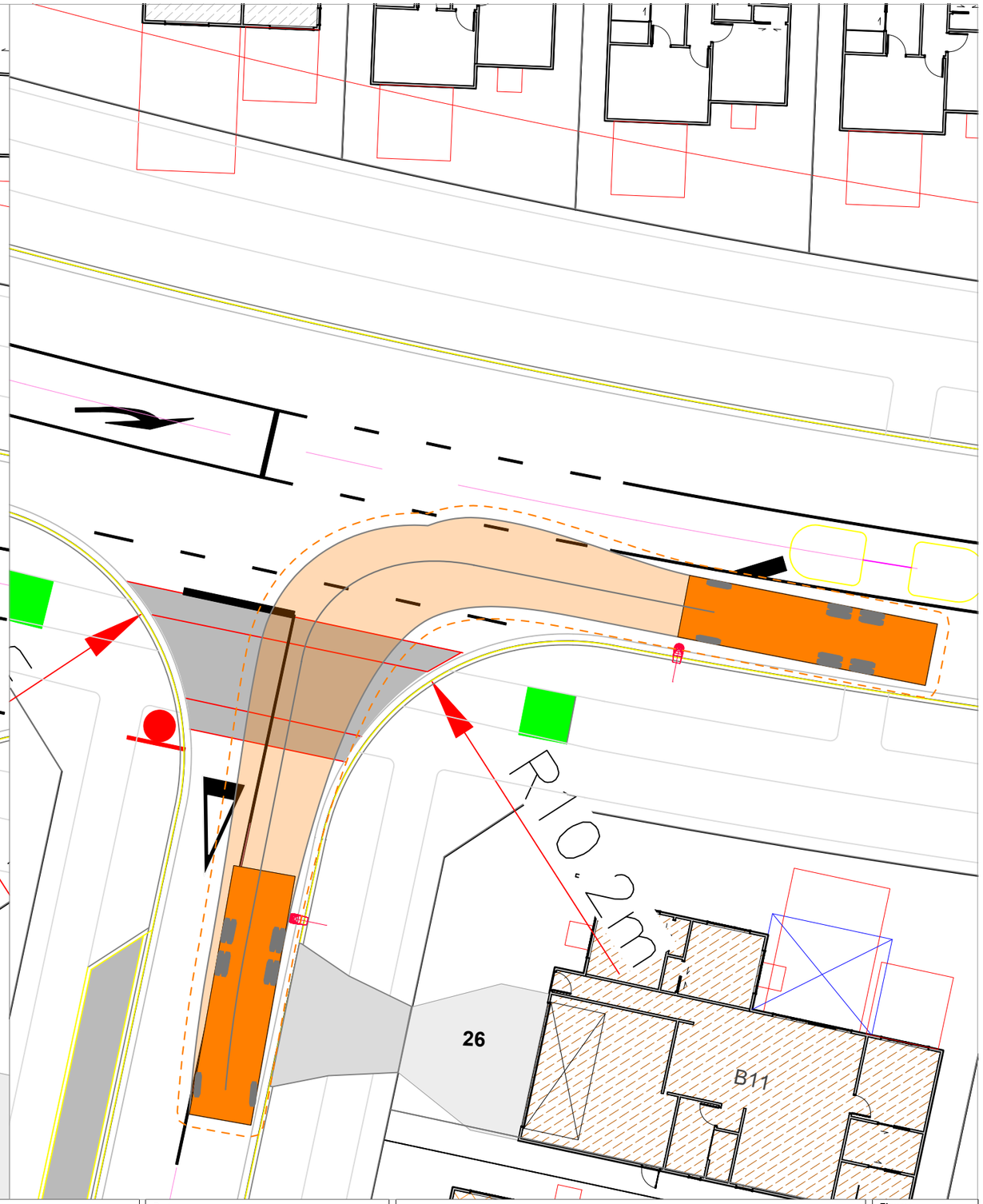
Scale @ A3: 1:200

Revision: A

commute TRANSPORTATION CONSULTANTS

Figure: 6C





Revision notes:

Rev:	Date:	Notes:

Drawn by:
HA
J003135

Client:

Project:
Delmore, Orewa
Proposed Residential Development

Drawing Title:
Vehicle Tracking
Road 1/NoR6 Road Intersection

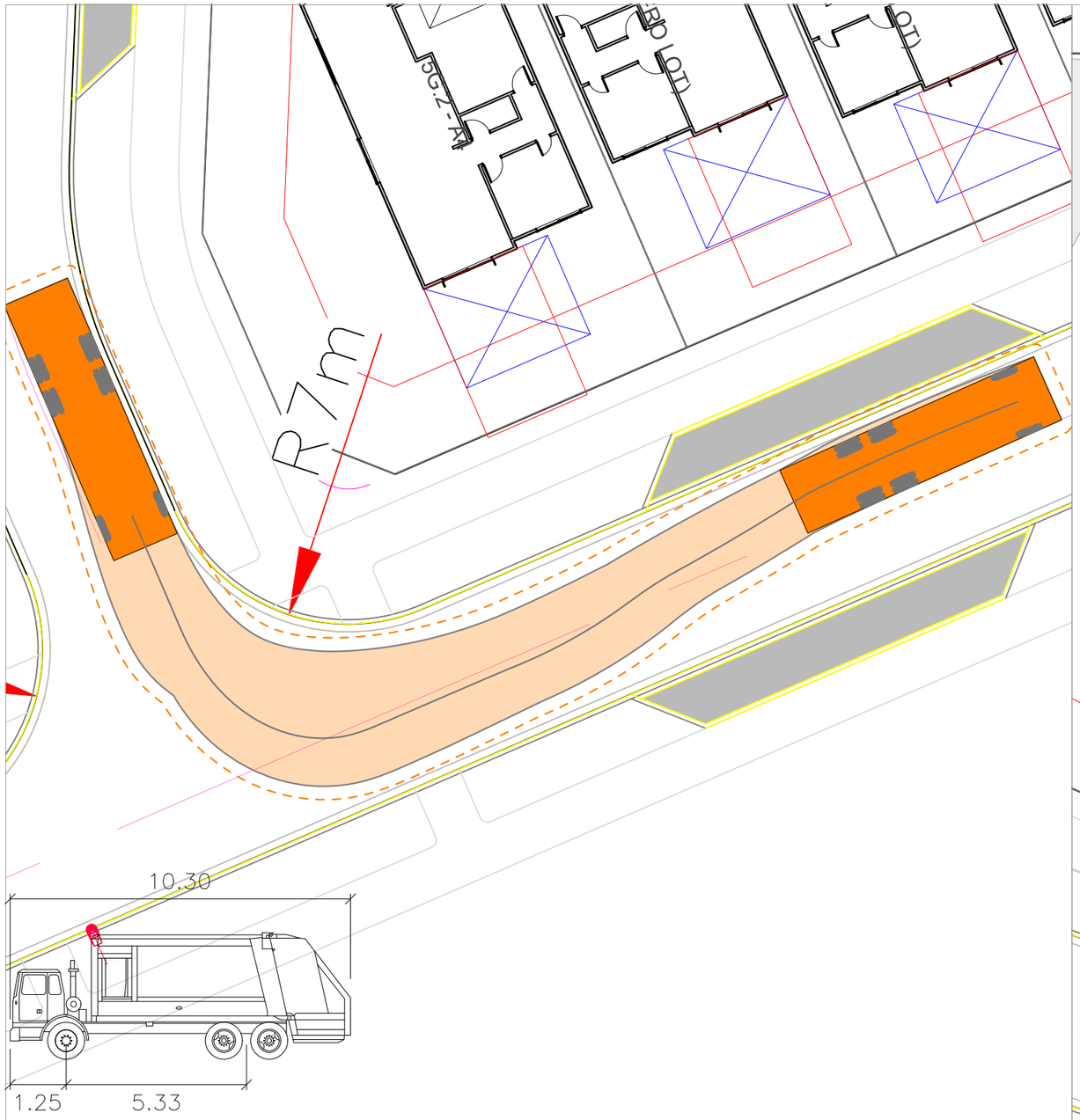
Date:
05/02/25

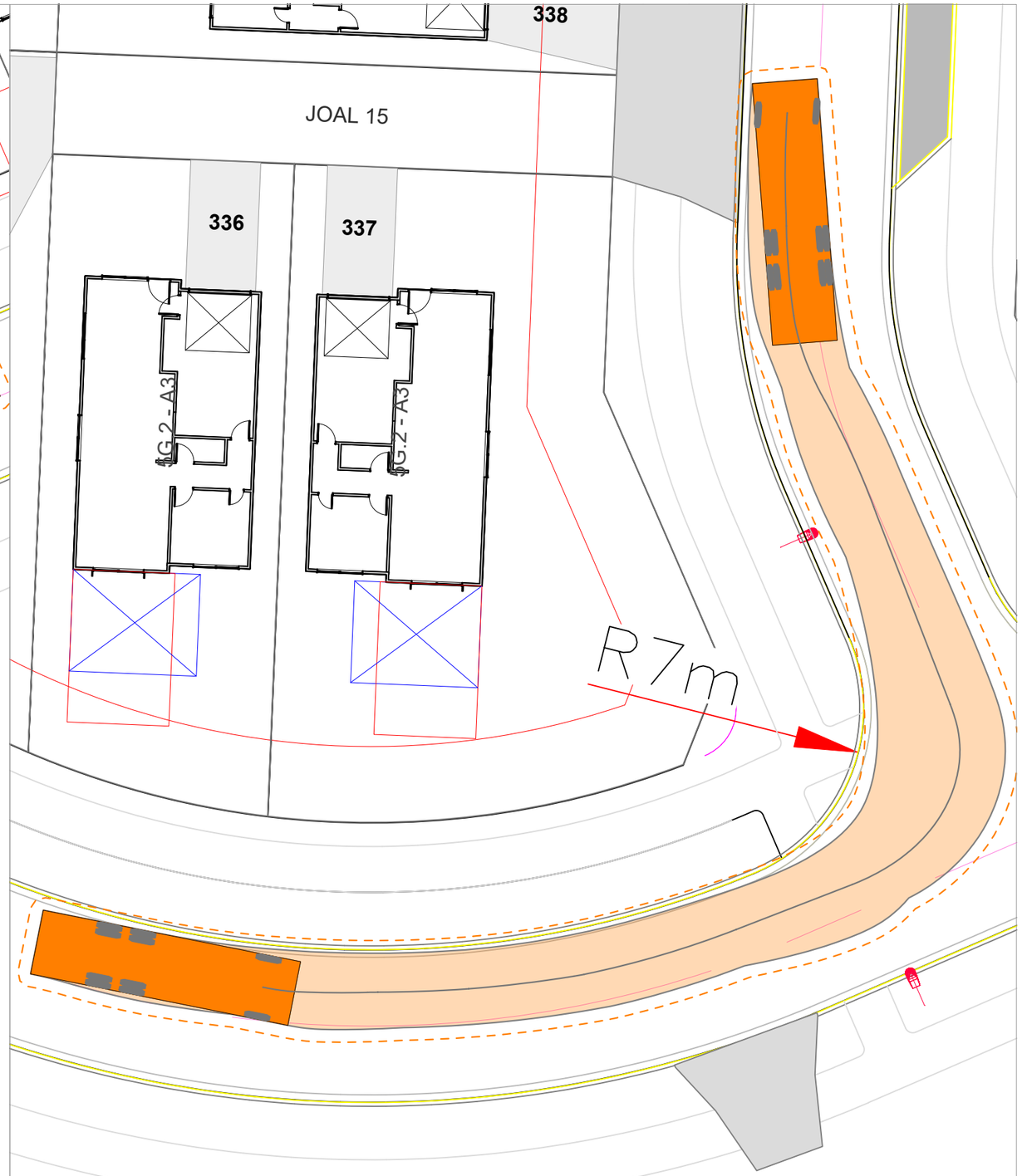
Scale @ A3:
1:200

Revision:
A

commute
TRANSPORTATION CONSULTANTS

Figure:
1D





Side Load Steerable Rear 10.3

meters

Width	: 2.50
Track	: 2.50
Lock to Lock Time	: 6.0
Steering Angle	: 47.0

Revision notes:

Rev:	Date:	Notes:

Drawn by: HA
J003135

Client:

Project: Delmore, Orewa
Proposed Residential Development

Drawing Title: 10.3m Truck Intersection Tracking
Road 4/Road 2 Intersection

Date: 05/02/25

Scale @ A3: 1:200

Revision: A

commute TRANSPORTATION CONSULTANTS

Figure: 2D

Revision notes:		
Rev:	Date:	Notes:

Drawn by:
HA
J003135

Client:

Project:
Delmore, Orewa
Proposed Residential Development

Drawing Title:
10.3m Truck Intersection Tracking
Road 26/22

Date:
05/02/25

Scale @ A3:
1:200

Revision:
A

commute TRANSPORTATION CONSULTANTS

Figure:
3D