Porter
Consulting Engineers

TRAFFIC REPORT

LOTS 202, 203 WANDENA ROAD AND LOTS 204, 205 GREAT NORTHERN HIGHWAY LOCAL STRUCTURE PLAN

Porter

CONTENTS

1.0 INTRODUCTION

1.1 Background

Porter Consulting Engineers has been engaged to prepare a Transport Impact Statement (TIS) for the local structure plan of Lots 202-203 Wandena Road and Lots 204-205 Great Northern Highway, Muchea in the Shire of Chittering. The Site comprises of the creation of 58 industrial lots typically with a lot size of 1 hectare.

A copy of the Structure Plan layout is included in **Appendix A.**

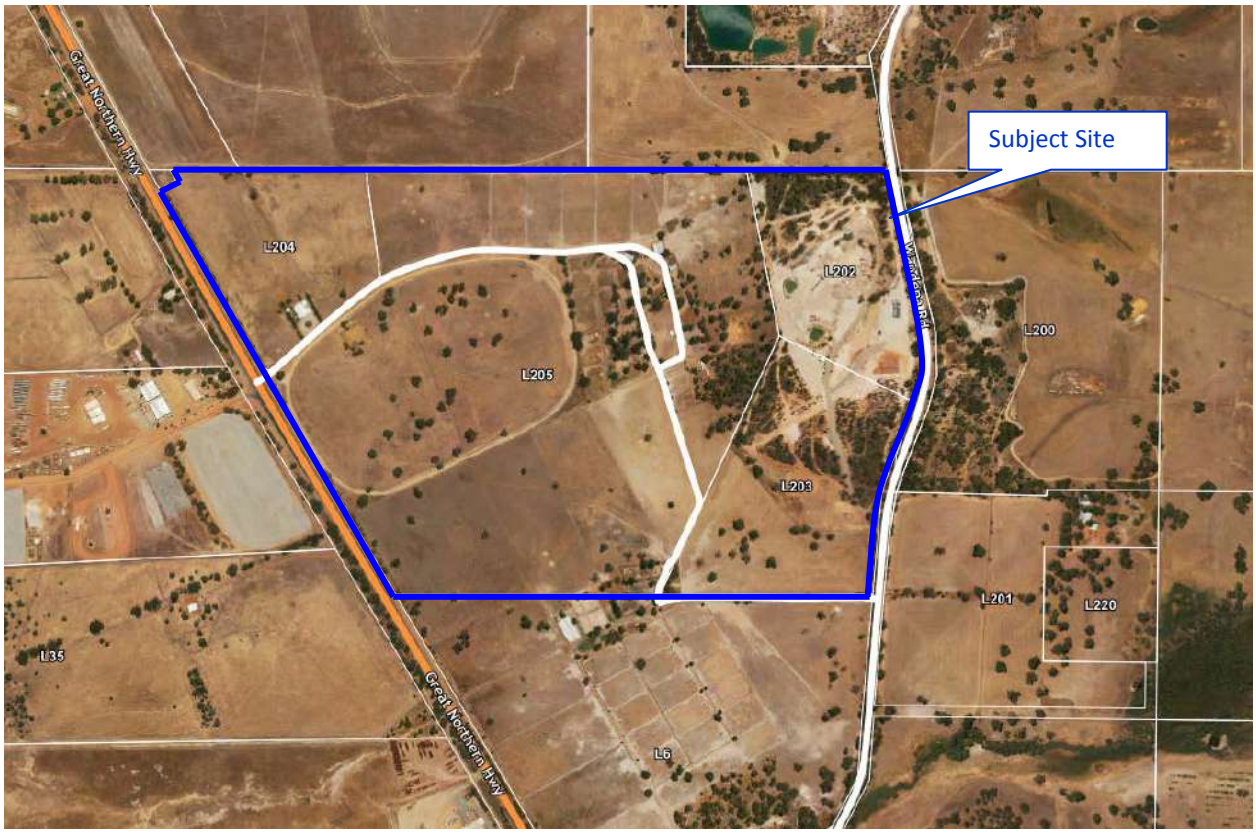


Figure 1.1: Structure Plan Lots

1.2 Scope of Assessment

The intent of this statement is to provide the approving authority with sufficient traffic information to confirm that the proponent has adequately considered the traffic aspects of the development.

2.0 STRUCTURE PLAN PROPOSAL

2.1 Structure Plan Context

The Site is bounded on the west by Great Northern Highway and on the east by Wandena Road, in Muchea within the Shire of Chittering.

The Site comprises of a number of large land holdings primarily of agricultural land uses i.e. i.e. Scenic Lodge Thoroughbred Farm, CD Tractors and industrial land uses i.e. Swan Recycling. **Figure 2.1** shows an aerial view of the Site and its immediate surrounds and its location in a local context.

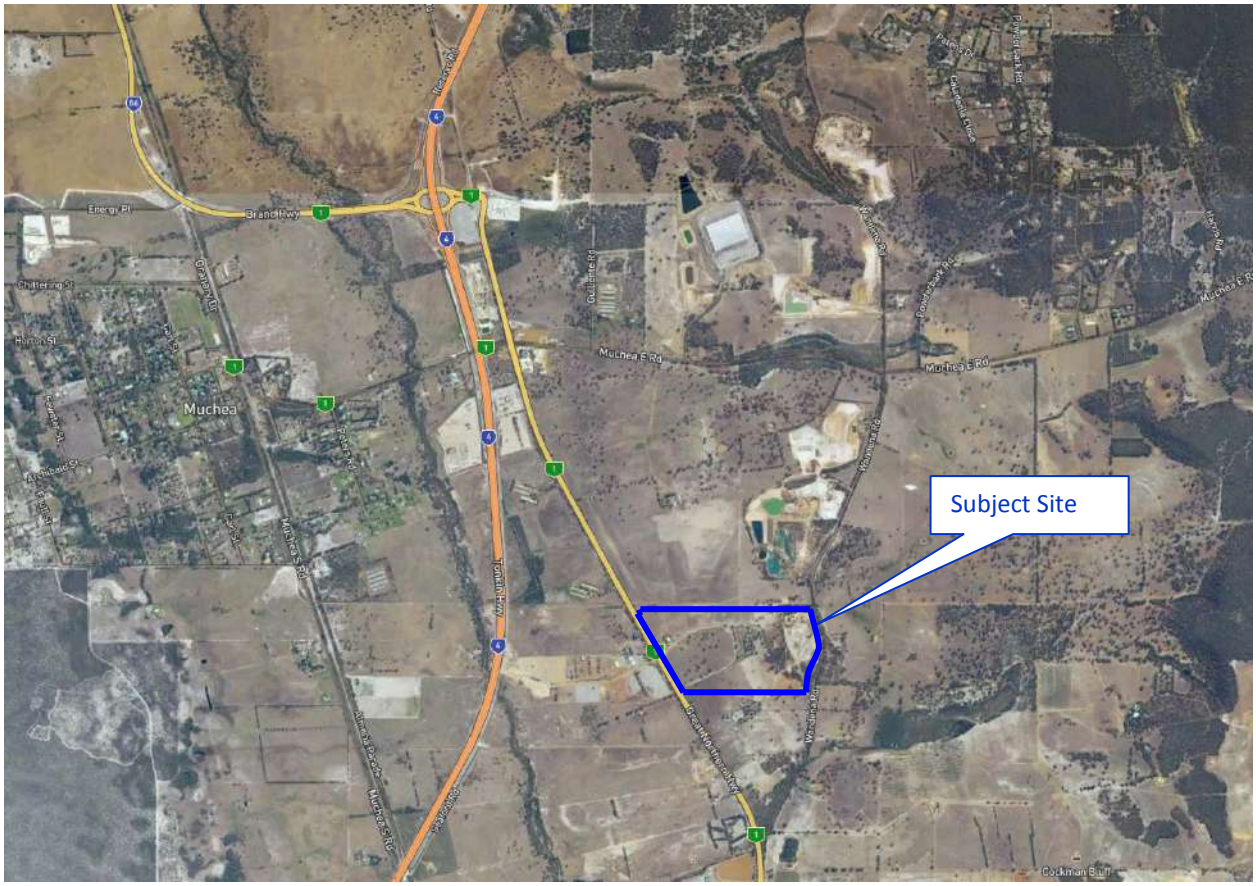


Figure 2.1: Location in a Local Context

The Site is situated approximately 5km southeast of the Muchea Townsite, 9km to the north of Bullsbrook, 35km north of Midland and 52km northeast of the Perth CBD. Major regional roads within close proximity include Great Northern Highway and the Tonkin Highway extension (Northlink). **Figure 2.2** shows the Site in a regional context.

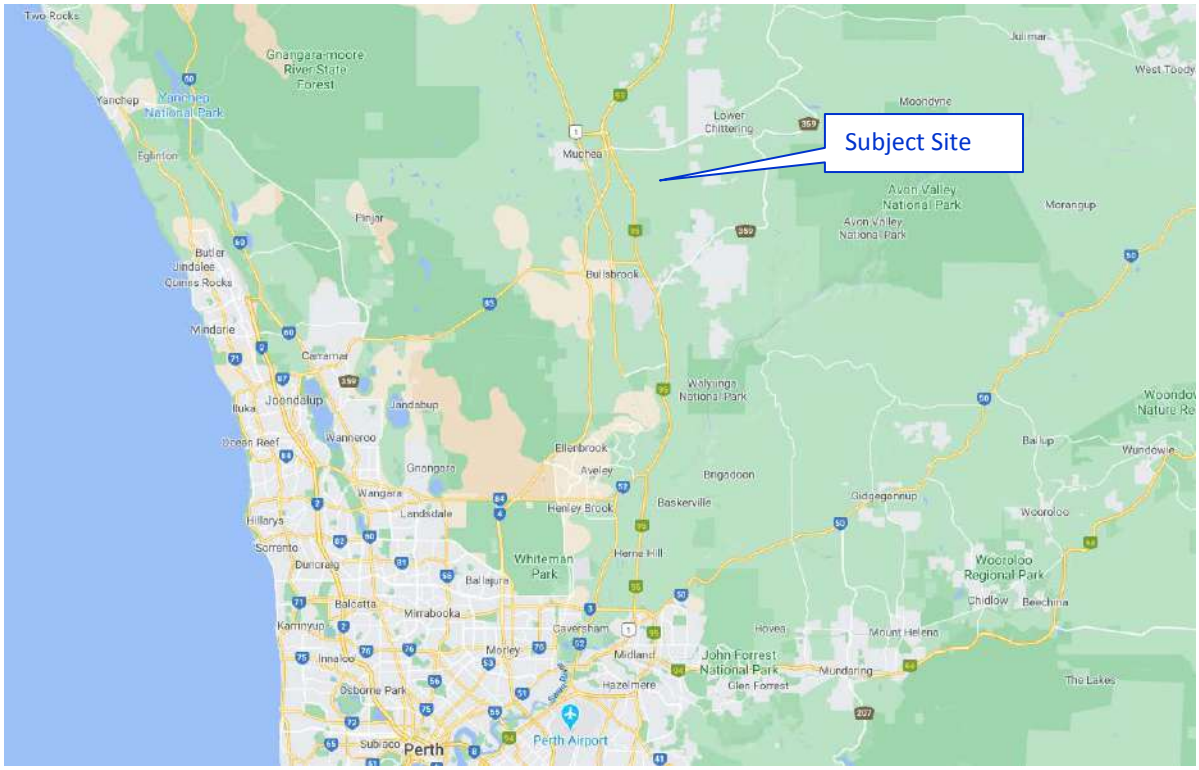


Figure 2.2: Location in a Regional Context

2.2 District Structure Plan

This local structure plan forms part of the broader area commonly referred to as the Muchea Employment Node Structure Plan. (MENSP). A district structure plan has been prepared for the MEN. The initial MENSP was prepared in August 2011. Since then the draft Muchea Industrial Park Structure Plan (MIPSP) for Stakeholder review has been prepared in December 2019.

The Muchea Industrial Park comprises of some 1,167 hectares to be developed over the next 20-30 years. The Industrial Park is intended to accommodate a range of land uses including freight and logistics, agribusiness, service based commercial, and industrial activities such as transport, livestock, fabrication, warehousing and wholesaling.

The Muchea Industrial Park has been divided into four precincts numbered 1 to 4. This Site forms part of Precinct 2 (Lots 204-205 Great Northern Highway) and Precinct 4 (Lots 202-203 Wandena Road). **Figure 2.3** outlines the Industrial Park as documented in the draft MIPSP. As demand for land within the Muchea Industrial Park is expected to be dominated by operators requiring access to a RAV10 road network, this structure plan presents a District Loop Road designed to accommodate RAV 10 vehicles.

The District Loop Road will ultimately service Precincts 1, 2 and 4 with a minimum of two connections to Great Northern Highway i.e. a northern and southern connection. Depending on staging of the various Precincts a third road connection from the District Loop Road to the Highway may also occur. The southern District Loop Road intersection with Great Northern Highway is located within the Site.

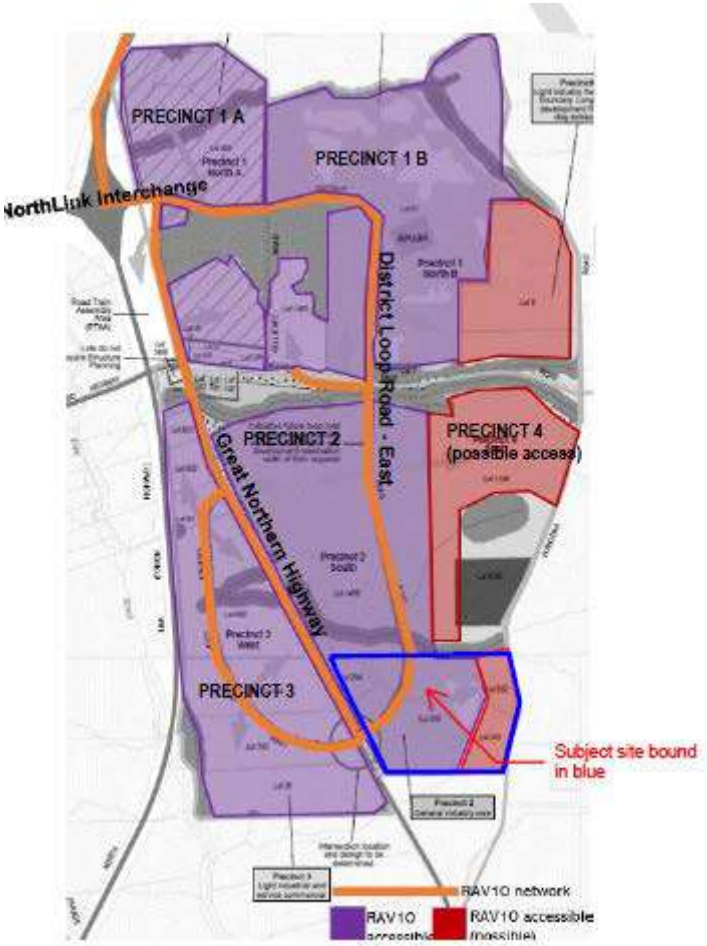


Figure 2.3: Muchea Industrial Park Structure Plan Area

2.3 Proposed Land Uses

Based on the indicative lot layout a total of 58 industrial lots are proposed typically with a lot size of 1 hectare (say 80mx 125m). The total area is approximately 68 hectares.

It is noted that the draft MIPSP informs that typically for RAV 10 access the minimum lot size is likely to be approximately 4.1hectares (i.e. 394m x 197m) or 2.5hectares (i.e. 159m x 197m) based on providing internal straight sections for unloading, decoupling and general operation. Based on the proposed lot layout and sizes within the local structure plan it is likely that adjacent lots will need to be purchased if RAV 10 access is required.

The local structure plan proposes industrial zoning which is consistent with both the MENSP and draft MIPSP.

2.4 Major Attractors and Generators of Traffic

Due to the nature of the proposed industrial structure plan it is likely to become a major employment attractor from surrounding areas.

3.0 ROAD NETWORK SITUATION

3.1 Existing Road Network

Figure 3.1 illustrates the road network within approximately 2 kilometres surrounding the Site. Due to the existing agricultural nature of the subject site the existing road network is not expansive. The Site is bordered by two existing roads, being Great Northern Highway (western boundary) and Wandena Road (eastern boundary).

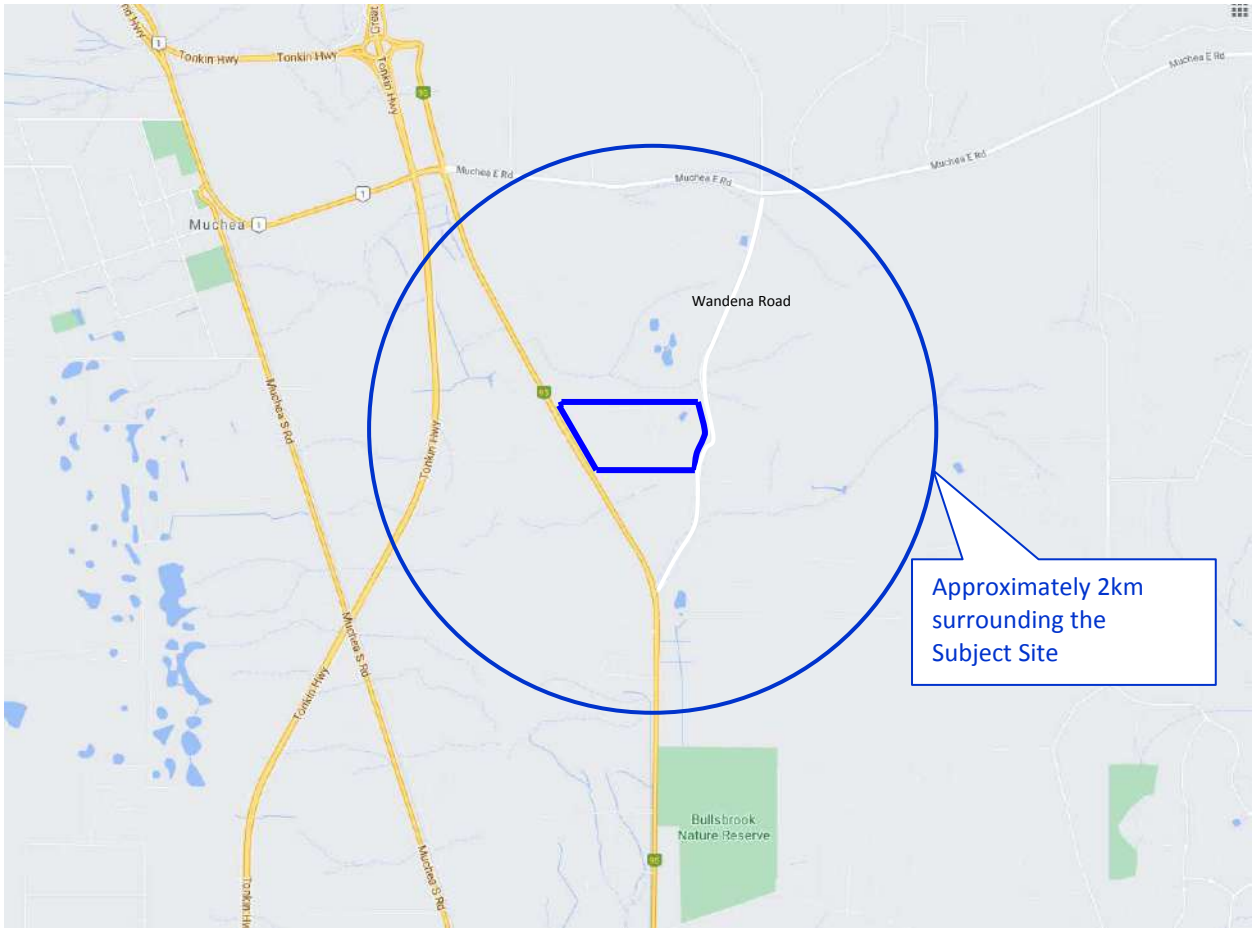


Figure 3.1: Existing Surrounding Road Network

3.2 Road Infrastructure and Road Hierarchy Classification

The road hierarchy classification of the surrounding road network as defined by Main Roads WA functional road hierarchy is shown in **Figure 3.2**.

Figure 3.2 Functional Road Hierarchy (MRWA)

Great Northern Highway

Great Northern Highway forms part of the Primary Distributor Road network and as such is controlled by Main Roads. By definition its function is to "*provide for major regional and inter-regional traffic movement and carry large volumes of generally fast moving traffic.*" This road runs in a north south direction and forms the western boundary of the Site.

The Highway at this location is constructed to a two lane undivided standard with a typical width of 7.2m plus sealed shoulders either side. The section of Highway in vicinity of the Site also includes overtaking lanes for both the southbound (1.2km in length) and northbound (800m in length) traffic. The existing sign posted speed limit along this section of Highway is 110km/hr.

Wandena Road

Wandena Road is a Local Distributor road whose function is defined as being to "*carry traffic within a cell and link to District Distributors….. should discourage through traffic so that it only carries traffic belonging to or serving the area.*" This road is controlled by the Shire of Chittering.

This road runs in a north –south direction forming the minor road of the t-junction at its intersection with Great Northern Highway at both its northern and southern ends. Wandena Road is constructed to a two lane undivided road standard with centre line marking and is

approximately 8.65 km in length. The road is subject to the default 110km/h speed limit that applies outside of built up areas.

Tonkin Highway – Northlink
The extension of Tonkin Highway from Reid Highway in Malaga to Great Northern Highway in Muchea, some 37 kilometres was completed in April 2020. This new route was designed to increase efficiency of the road movement network and support the development of the Industrial Park. This is road is defined as a Primary Distributor Road to "*provide for major regional and inter-regional traffic movement and carry large volumes of generally fast moving traffic."* The road is constructed to a four lane divided standard running in a north south direction. It has a posted speed limit of 110km/h.

Muchea Road East
Muchea Road East is a Regional Distributor Road whose function is defined as being to "*link significant destinations and are designed for the efficient movement of people and goods within and beyond regional areas."* This road is controlled by the Shire of Chittering. This road runs in an east west direction connecting to Granary Drive and Tonkin Highway at its western end and Chittering Road some 8.7km to the east. This road is constructed to a two lane undivided road standard with centre line markings. The speed limit varies from 80km/hr near Great Northern Highway and 1.5km eastwards transitioning to 100 km/hr prior to Wandena Road and further eastwards.

3.3 Existing Traffic Volumes

Table 1.1 shows the traffic flows recorded on the road network surrounding the development Site obtained from Main Roads WA traffic map website.

3.4 Crash History

A study of the recent crash history for Great Northern Highway and Wandena Road in the vicinity of the Site has been conducted for the five year period to the end of December 2019 from the Main Roads Western Australia Integrated Road Information System (IRIS) crash database. The database records the following crashes:

- 7 intersection crashes at Great Northern Highway and Wandena Road. Five crashes involving rear end crashes between vehicles turning left from Wandena Road onto Great Northern Highway with 4 of these crashes involving property damage and one crash resulting in medical attention being required. One crash was a hit object off the carriageway crash resulting in hospitilisation. The remaining crash resulted in minor property damage only.
- 7 midblock crashes occurred along Great Northern Highway between Wandena Road and the northern boundary of the Site. Five crashes were hit object single vehicle crashes. One midblock crash was a sideswipe crash involving northbound vehicles. One crash was a rear end crash. Six of these crashes resulted in major property damage and one resulted in hospitalisation.

Table 1.1: Recorded Traffic Volumes on the Surrounding Road Network

Location	Date	AWT (veh/day)	Heavy Vehicles (%)	85% Speed (km/h)
Great Northern Highway, north of Wandena Road, SLK 34.5	Sept 2020	2,268 1,331 (N) 938(S)	30.8	
Great Northern Highway, north of Wandena Road, SLK 33.5	2018/19	7,512 3,649 (N) 3,863 (S)	30.4	107
Great Northern Highway, south of Wandena Road SLK 32.71	2015/16	9,014 4,387 (N) 4,627 (S)	27.0	112
Wandena Road, east of Great Northern Highway SLK 0.41	2015/16	2,347 1,169 (N) 1,178 (S)	18.4	100
Wandena Road, south of Muchea Road East SLK 2.6	2015/16	2,199 1,102 (N) 1,097 (S)	39.0	106
Muchea Road East, west of Wandena Road SLK 6.2	2015/16	544 254 (E) 290 (W)	52	138
Muchea Road East, east of Great Northern Hgihway SLK 8.38	2018/19	794 389 (E) 405 (W)	20.8	89.2
Brand Highway, west of Great Northern Highway SLK 0.5	2014/15	3,891 1,937 (E) 1,954 (W)	26.4	88.3
Great Northern Highway, north of Old Gingin Road SLK 38.92	2015/16	4,226 2,000 (N) 2,226 (S)	25.6	100

3.5 RAV Network

The existing surrounding road network allows for the movements of Restricted Access Vehicles (RAV) as shown in **Figure 3.3.** Great Northern Highway and Wandena Road are currently classified as RAV 7 and RAV 2 networks respectively.

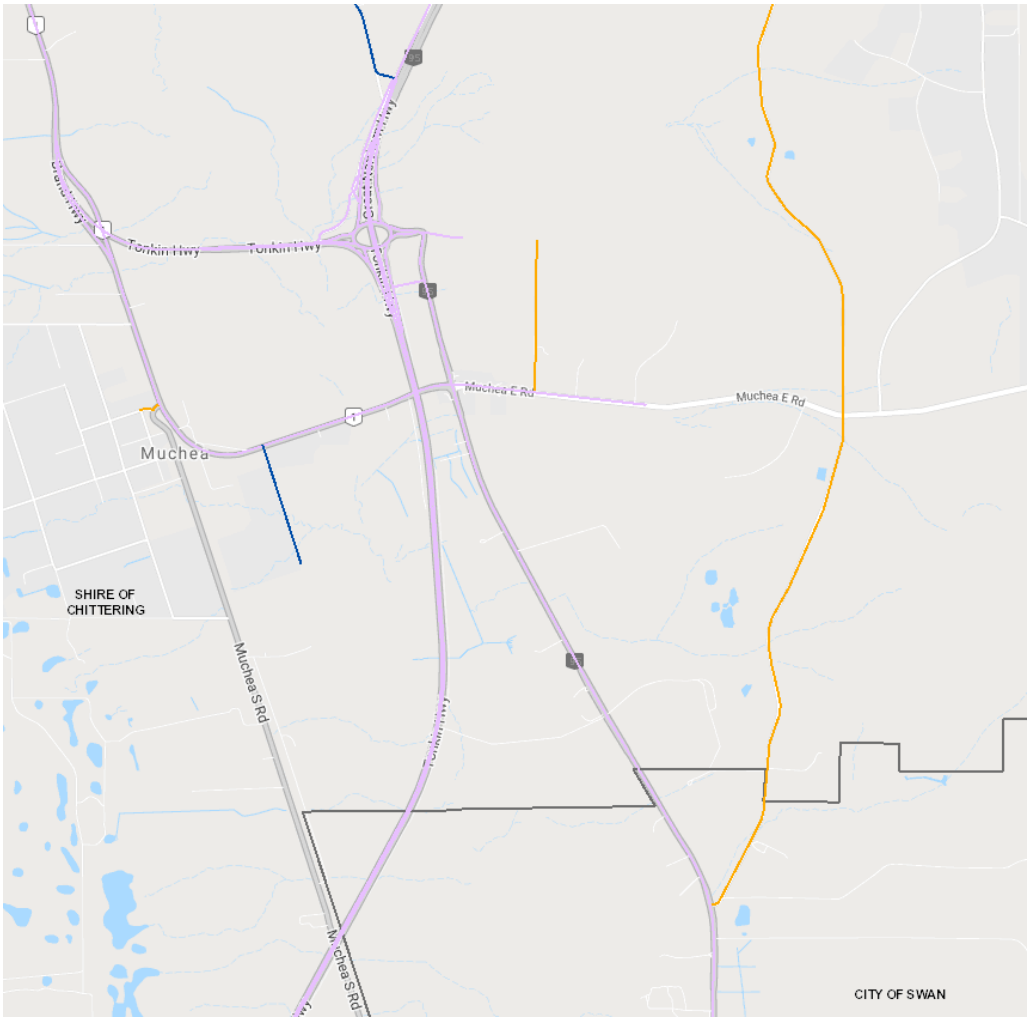


Figure 3.3. RAV Network (MRWA)

3.6 Public Transport

The MENSP indicates that public transport facilities have not been included within the overall structure plan due to the large scale industrial land uses proposed, that are likely to make the provision of feasible public transport difficult to achieve. It is noted however that the proposed road network designed to cater for trucks could readily accommodate bus routes if they were to be introduced in the future should the demand warrant services feasible.

3.7 Pedestrian and Cyclist Network

Due to the largely rural nature of the existing Site there are limited pedestrian and cyclist facilities. The MENSP indicates that no formal cycle or pedestrian facilitates are provided in the overall structure plan as the large scale industrial land use would largely cause the provision of a pedestrian network futile. Where sealed shoulders are proposed cyclists could readily use this facility. At this stage there are no clear pedestrian desire lines within the Industrial Park.

4.0 ASSESSMENT OF VEHICULAR TRANSPORT NETWORK

4.1 Internal Road Network

The Site does not currently have any existing roads located within it. The Site only abuts Great Northern Highway to the west and Wandena Road to the east.

Road Hierarchy

The Site will include the southern portion of the District Loop Road as outlined in the MENSP/MIPSP. **Figure 4.1** shows this District Loop Road that would act as the main RAV 10 route through the eastern side of the Muchea Industrial Park servicing Precincts 1, 2 and 4. The draft MIPSP states that the District Loop Road is not to provide direct vehicle access to lots. For this reason if RAV 10 lots are to be provided internal roads should be designed for RAV 10 access. For example, Road 6 and/or Road 8 could be designed for RAV 10 vehicles thus providing RAV10 access to lots fronting these roads. The remaining roads within the Site are considered to be access roads and could be designed for smaller design vehicles such as a b –double as the development and lot demand requires. This is yet to be confirmed.

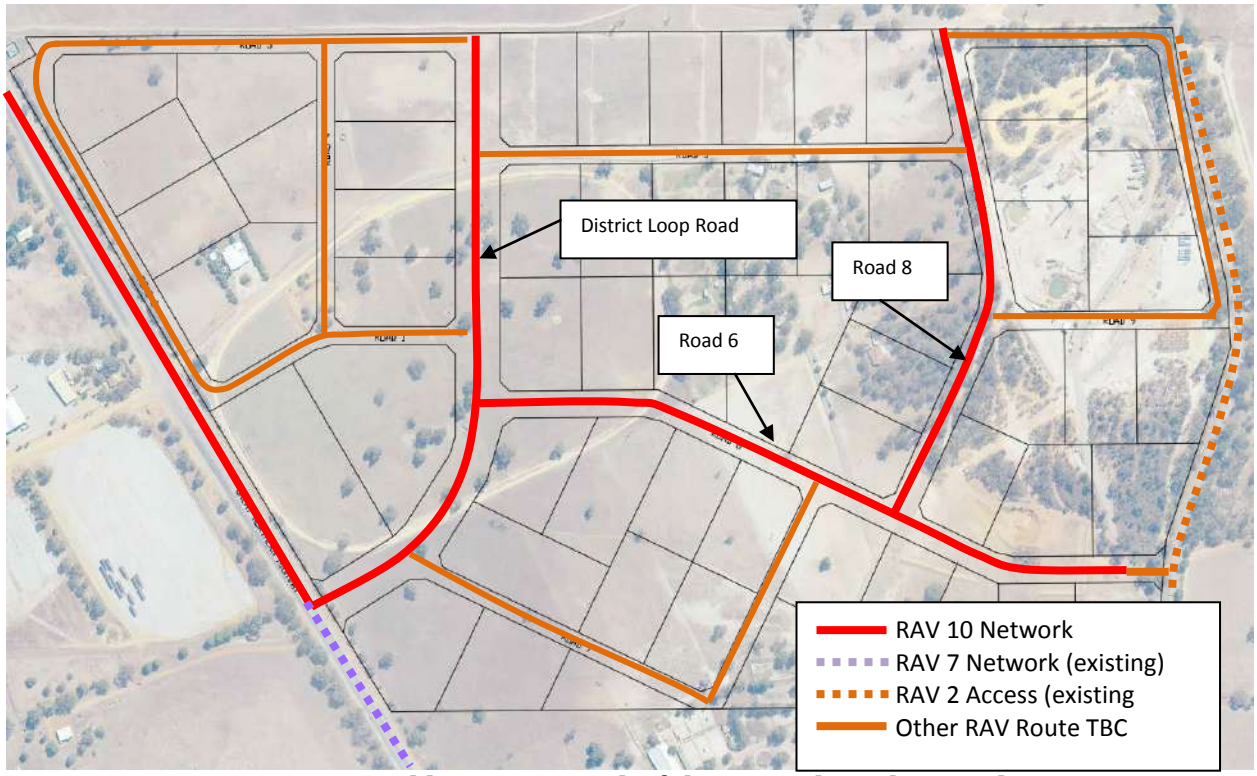


Figure 4.1: Possible RAV Network of the Internal Road Network

On district distributor roads, the priority is given to vehicle movement function over access. For this reason spacing of intersections is reduced compared to lower order road, to ensure that traffic flow is maintained with minimal disruptions. This also reduces the potential points of conflicts thereby improving safety. The layout proposes 5 internal intersections with the District Loop Road over a length of 700m. To prioritise vehicle movement function consideration should be given to restricting the turning vehicular movements at a number of

intersections providing one intersection with full turning movements to service the area to the west of the District Loop Road and one intersection to service the area to the east. **(Figure 4.2)** This will result in the spacing of the two key intersections being approximately 400m. The permeability of the proposed internal road network layout will accommodate these vehicular movement restrictions.

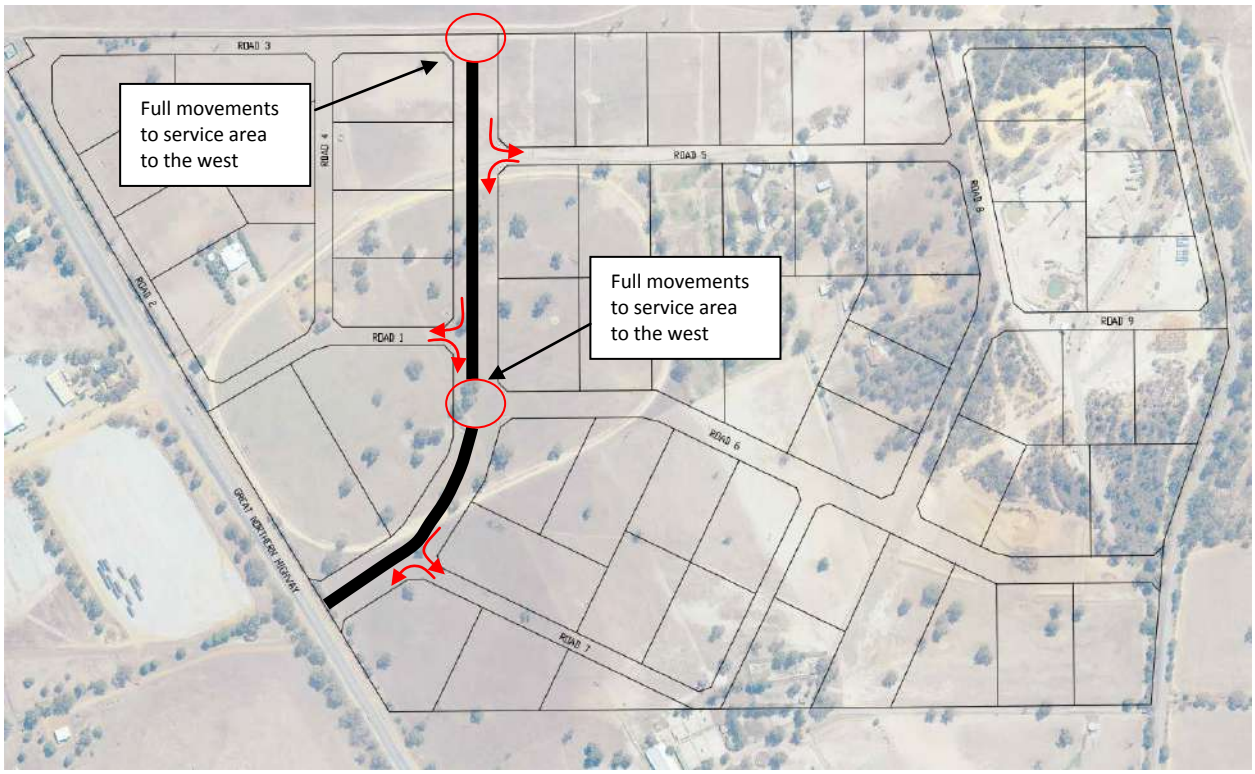


Figure 4.2 Indicative Intersection Configuration along District Distributor Loop Road

Road Reserve and Road Cross Section

The draft MIPSP outlines a 50m road reserve for the District Loop Road. The road reserve widths for the remaining roads within the local structure plan range from 20-30m. **(Figure 4.3)** The ultimate design will need to demonstrate that the road reserve is adequate to accommodate swept paths of the design vehicle (RAV 10 or smaller as proposed) at intersections, earthwork batters, public utilities as well as road drainage and swale requirements.

The District Loop Road cross section is proposed to comprise of 2 x3.5m traffic lanes plus 1.5m sealed shoulders with a 5m central median. The central median will accommodate queued right turning vehicles thus minimising the delay to through traffic in line with its role as a district distributor road.

Other internal roads propose either a 20 or 30m road reserve. In accordance with WAPC Development Control Policy 4.1 a minimum road reserve of 20m is required for industrial roads typically comprising of a 10m pavement. These local access internal roads within the Site are likely to carry less than 2,000 vehicles per day hence it would be considered

appropriate to adopt a 10m wide pavement. (Please note that the entire Site only generates in the order of 2,200 vehicles per day)

The draft MIPSP recommends a road reserve width of 30m for access roads, to allow for the provision of roadside swales. Where a 20m road reserve is proposed, the stormwater drainage system will need to demonstrate it meets the necessary objectives of the relevant stormwater management and drainage requirements for the region.

A preliminary review indicates that standard 10x 10m wide truncations as currently shown are not necessarily adequate at intersections in order to allow for RAV10 vehicle access. **Appendix B** contains indicative concepts showing the swept paths of RAV 10 vehicles at some intersections indicating that truncations will need to be modified during the detailed design.

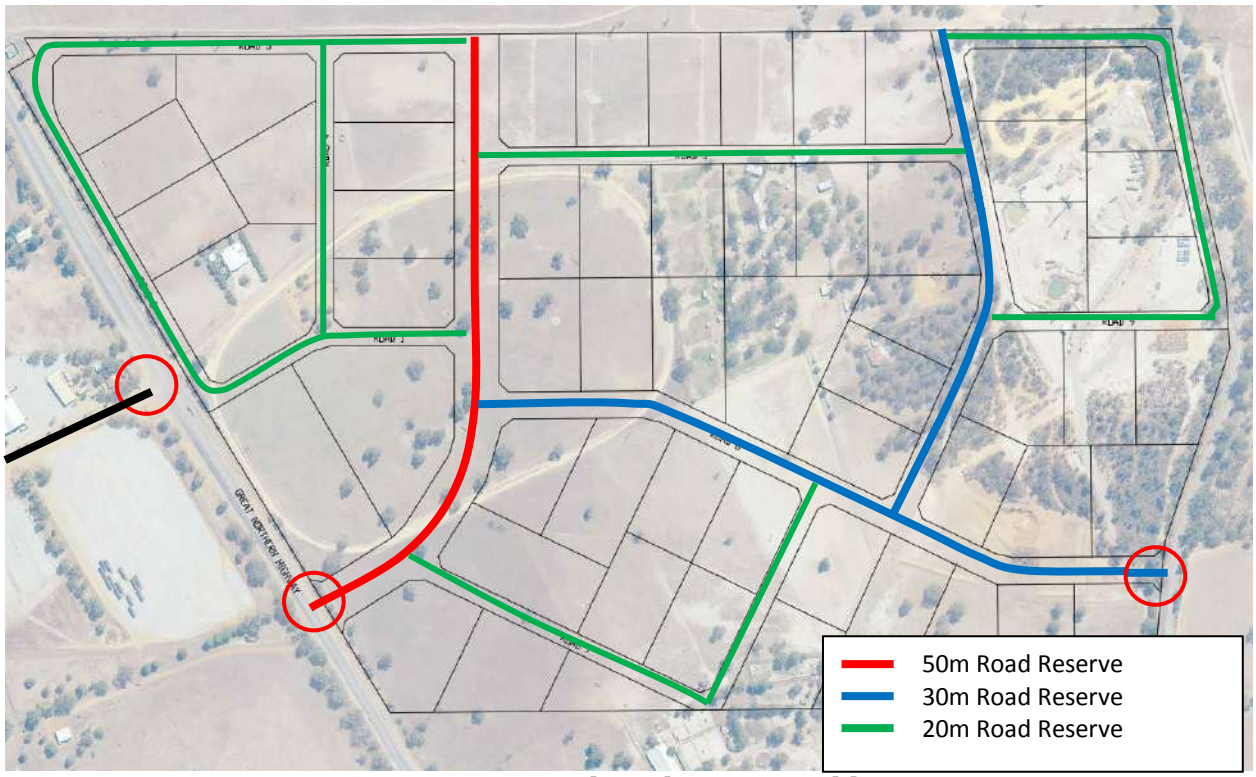


Figure 4.3: Proposed Road Reserve Widths

4.2 External Road Network

The proposed road network will result in the creation of two new intersections on the external road network; one on Great Northern Highway and the other on Wandena Road.

The draft MIPSP proposes a 4 way intersection on Great Northern Highway with the District Loop Road (this Site) and the Loop Road to Precinct 3 of the Industrial Park located on the western side of Great Northern Highway. This new 4 way intersection is proposed to be controlled via a roundabout. However, a staggered T-junction arrangement was proposed along Great Northern Highway within the MENSP for this intersection and not a roundabout.

Initial liaison with Main Roads WA has indicated that in principal there is no objection to a staggered T-junction arrangement instead of a 4 way roundabout as currently outlined in the draft MIPSP. The proposed staggered T-junction arrangement also aligns with the Local Structure Plan prepared for Precinct 3.

The proposed connection from the Site to Great Northern Highway has been positioned as close as practical to the southern end of the Site in order to maximise the staggered T separation distance. The staggered T-junction would create a right left stagger arrangement and as such the proposed intersection spacing of approximately 300m should be adequate.

Austroads *"Guide to Road Design Part 4A:Unsignalised and Signalised Intersections"* makes recommendation on the sightlines. Based on an operating speed of 110km/h the safe intersection sight distances (SISD) are 300m preferred (reaction time of 2.5 seconds) or 285m minimum (reaction time of 2.0 seconds). Whilst Great Northern Highway currently has a posted speed limit of 110km/h in the vicinity of the new intersection, it is likely that with full development of the Industrial Park the speed limit may be reduced to say 80-90km/h which will typically require reduced sight distances of 226m (preferred) and 214m (minimum). Google Streetview suggests that adequate sight lines will be available along Great Northern Highway in both directions at the proposed new intersection.

At present there is a southbound overtaking lane provided on this section of Great Northern Highway at the location of the proposed new intersection with the Site. Recent traffic counts in September 2020 indicate a considerable reduction in traffic flow since the construction of the Tonkin Highway extension – Northlink. Existing traffic volumes are in the order of 2,300 vehicles per weekday compared to 7,500 vehicles per weekday previously.

It is acknowledged however that traffic volumes are likely to increase with the full development of the Muchea Industrial Park. Based on the existing traffic volumes the overtaking lanes are not necessarily warranted. Similarly with the new Tonkin Highway extension the function of this section of Great Northern Highway has altered and on this basis the overtaking lanes may also no longer be warranted. Whilst the overtaking lanes for passing may not be warranted, however in this situation they could be used as acceleration lanes to allow heavy vehicles to accelerate and minimise the disruption of through traffic.

Subsequently two concepts with respect to the connection of the local structure plan to Great Northern Highway have been developed and are contained in **Appendix C**. These are:

Option 1: Overtaking lanes maintained through intersection
The southbound overtaking lane effectively allows for the deceleration of the left turning vehicles into the local structure plan and beyond hence a separate left turn lane has not been shown. The southbound overtaking lane has been extended so that it allows for left turning traffic from the industrial park to accelerate to speed before merging with the through traffic. A right turn acceleration lane is not provided as there is limited length between the two intersections. Ultimately, the majority of the right turning traffic is likely to use one of the two northern connections from Precinct 2 to Great Northern Highway.

Option 2: Overtaking lanes not maintained through the intersection.
The existing southbound overtaking lane used as a left turn lane. Whilst the overtaking lane to the south of the intersection is proposed to be extended and designed as an exclusive acceleration lane for left turning vehicles.

Both options propose a right turn lane on Great Northern Highway into the Site.

A new T-junction is proposed at the location of the existing Swan Recycling driveway on Wandena Road. Based on an operating speed of 110km/hr, a SISD of between 285-300m is required. Google streetview suggests that to the north of the proposed intersection the SISD is likely to be limited to 285m due to the horizontal alignment of Wandena Road whilst the SISD to the south is likely to exceed requirements.

4.3 Traffic Generation

The generation of land uses within Industrial Estates can vary depending on the industry type (low to high traffic generators) and the subsequent number of employees. It is envisaged that land uses within the MEN will likely be low traffic generators.

Guide to Traffic Generating Developments, Roads and Traffic Authority, (RTA) provides some average rates for Industrial Parks based on the number of employees. At this developmental stage of the local structure plan area, the number of employees is not known. RTA suggests a figure of 28 employees per hectare for an industrial estate where employee numbers or Gross Floor Area (GFA) are not known This employee figure has been reduced for this site to 14 employees per hectare due to the low trip generating land uses within the subject site. Additionally, it is likely that the transport orientated land uses will have a lower number of employees per site area due to the space required on site for larger transport vehicles creating a lower ratio between floor space (ultimately staff) and site area.

The MENSP (2011) suggests a trip generation rate for the MEN area of 23 trips per day per gross hectare of development. This trip rate actually corresponds to a rate of 10 employees per hectare. Adopting the higher employee density of 14 employees per hectare for the subject site will ensure a robust assessment.

The standard industrial trip generation rates per employee as outlined in RTA document can then be applied. These are 2.3 daily trips per employee with an am and pm peak hour trips rates of 0.318 and 0.365 per staff which equate to the following trip generation:

- Daily Trips = 2,216 trips per day
- Am peak hour = 306 trips per hour
- Pm peak hour = 352 trips per hour

4.4 Traffic Distribution

In the interim stage, all the Site trips will be assigned to the intersection of Great Northern Highway until such time as development to the north including the extension of the District Loop Road within Precinct 1, 2, and 4 occurs.

In terms of wider regional access to and from the Site, the majority of the traffic is expected to be via the Perth Darwin National Highway. For the purpose of trip distribution, it has been estimated that 65% of vehicle movements will be to/from the north via Great Northern Highway with 33% to/from the south via Great Northern Highway with only a small volume of traffic anticipated to use Wandena Road, say 2%. (Refer **Figure 4.4**)

Traffic volumes along Great Northern Highway are currently in the order of 2,300 vehicles per day. The MENSP indicates traffic will ultimately increase on Great Northern Highway to in the order of 5,300 vehicles per day with the additional Muchea Industrial Park traffic.

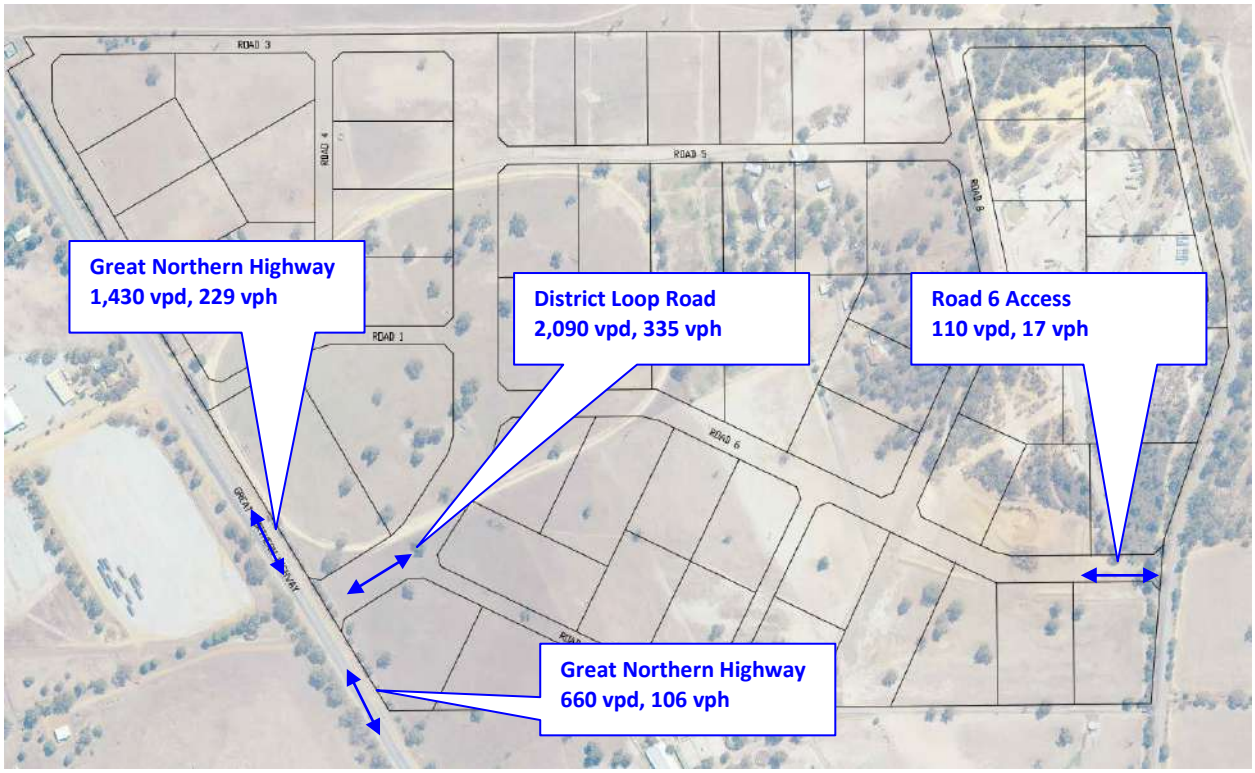


Figure 4.4: Indicative Development Daily Traffic Distribution

4.5 Impact on the Local Road Network

The Site is expected to generate approximately 2,200 vehicle trips per weekday. Indicative traffic volumes for a District Distributor Road are typically above 6,000 - 8,000 vehicles per weekday depending on the type of road. Until future development to the north of the Site occurs the District Loop road will only carry in the order of 2,100 vehicles per weekday. The MENSP estimates that this District Loop Road may ultimately carry in the order of 7,000 vehicles per weekday at full development of the entire Industrial Park. This is line with the lower volumes expected for a District Distributor Road.

The indicative maximum volume of traffic suitable for an Access Street is approximately 3,000 vehicles per day. (*Liveable Neighbourhoods, WAPC 2009 and 2015*). Distribution of the Site industrial traffic over the proposed internal road network will result in the majority of the internal roads (with the exception of the District Loop Road) carrying less than this indicative maximum.

Great Northern Highway currently carries in the order of 2,300 vehicles per weekday. It is currently constructed to a two lane undivided standard. Under the interim stage (until development to the north of the Site proceeds and new road connections to Great Northern Highway are constructed) the Site is likely to increase traffic volumes on Great Northern Highway to 3,730 vehicles per weekday and 2,960 vehicles per weekday north and south of the new connection respectively. This is less than the previous volumes on Great Northern Highway prior to the opening of the Tonkin Highway extension – Northlink, when traffic volumes where in the order of 7,500 vehicles per day. Accordingly, there is sufficient spare capacity for the additional traffic generated by the proposed Site on to Great Northern Highway.

4.6 Great Northern Highway and Southern District Loop Road Connection

The proposed intersection of Great Northern Highway and the District Loop Road, at the southern end of the Muchea Industrial Park and within this Site, has been analysed using the SIDRA computer package (*version 9*).

The assessment period analysed is for the full development of the Site without further extension of the District Loop Road, requiring the majority of Site traffic to use the Great Northern Highway intersection (with the exception of the Wandena Road connection which is likely to take negligible Site traffic). The pm peak assessment is considered to represent the worst situation with the majority of vehicles exiting the Site onto Great Northern Highway.

To ensure a robust assessment the following assumptions have been made:

- Through traffic volumes along Great Northern Highway have been generously estimated to be 5,000 vehicles per day or 500 vehicles per hour to allow for traffic increases associated with the Industrial Park along the Highway.
- The Site reaches full development prior to the extension of the District Loop Road to the north which will include further connections to Great Northern Highway.

The geometric layouts modelled are those outlined in section 4.2 and included in **Appendix B.**

The intersection under Option 1 layout would operate with a degree of saturation of 0.700 associated with the right turn from the District Loop Road onto Great Northern Highway in the pm peak hour. This movement also experiences the highest average delay of 33 seconds resulting in a level of service D and longest 95th percentile queue length of 50m.

There are minimal alterations to the intersection operation under layout Option 2 which includes a dedicated southbound acceleration lane for left turn movements onto Great

Northern Highway. The intersection would operate with a degree of saturation of 0.636 associated with the right turn from the District Loop Road onto Great Northern Highway. This movement also experiences the highest average delay of 28 seconds resulting in a level of service D and longest 95th percentile queue length of 43m.

Detailed SIDRA results are included in **Appendix D.**

The MENSP envisages that the southern connection of the District Loop Road to Great Northern Highway would be signalised. A point of difference between the two district structure plans in that the MIPSP does outline that construction staging of the development may require a third intersection with Great Northern Highway from the land to the east via the District Loop Road as shown in **Figure 4.5**. Whilst this is dependent on the stages of development it will also alter the traffic distribution patterns and potentially the ultimate intersection configurations of connections with Great Northern Highway.

As Main Roads WA is the controlling authority of Great Northern Highway, the ultimate treatment and layout of the intersections with the highway will be subject to Main Roads WA approval.

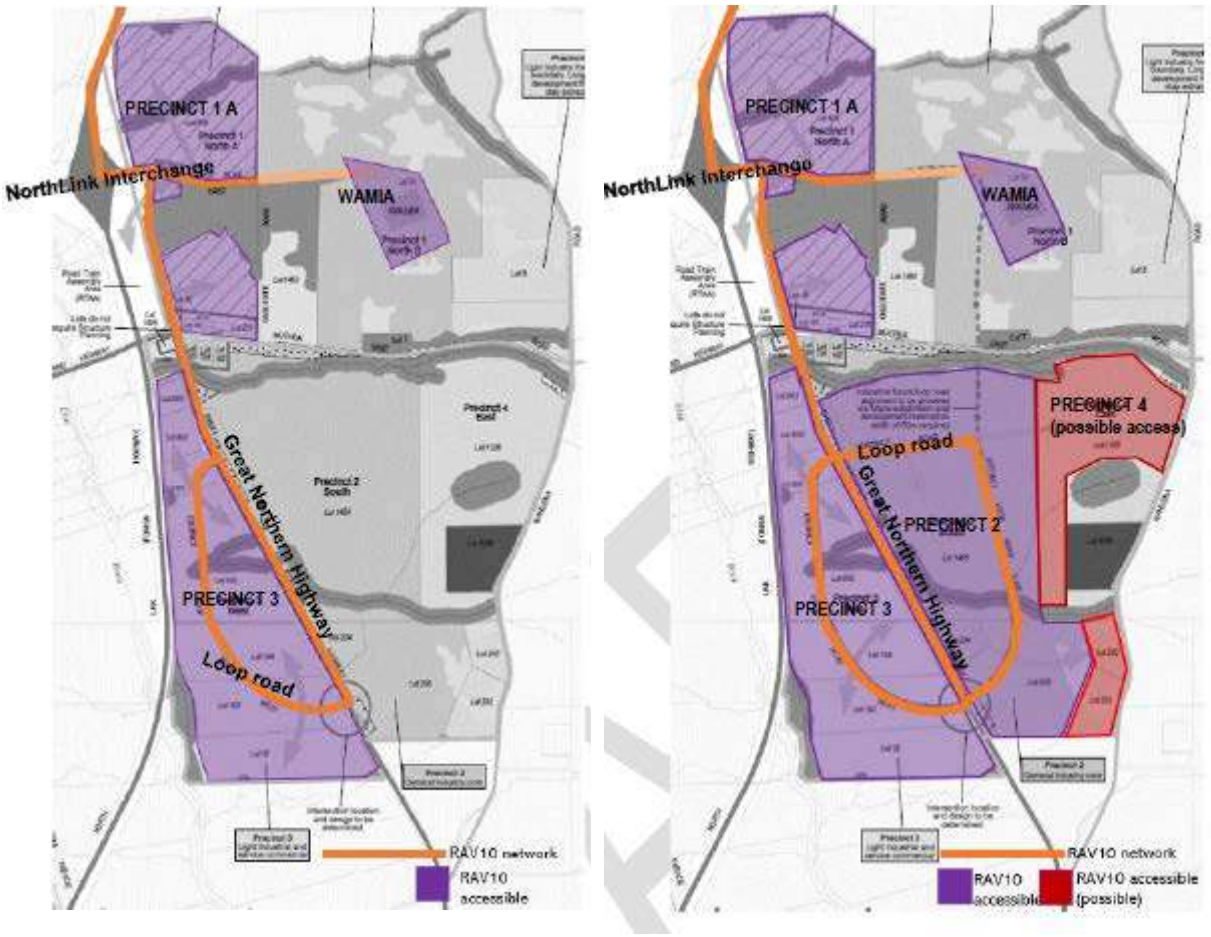


Figure 4.5: Various Road Network Connections Dependent on the Staging of Development

Further development to the north of the Site will likely see increases in generated traffic along the District Loop Road and further connections to Great Northern Highway resulting in the redistribution of traffic. As development progresses and the likely staging is known, further investigations regarding the level of intersection control will be required at the intersection of Great Northern Highway and the southern District Loop Road..

5.0 SUMMARY AND CONCLUSION

The Local Structure Plan for Lots 202-203 Wandena Road and Lots 204-205 Great Northern Highway, Muchea in the Shire of Chittering will form part of the larger area known as the Muchea Industrial Park or previously the Muchea Employment Node.

The Muchea Industrial Park has been divided into four precincts numbered 1 to 4. This Local Structure Plan forms part of both Precinct 2 (Lots 204-205 Great Northern Highway) and Precinct 4 (Lots 202-203 Wandena Road). A District Loop Road designed to accommodate RAV 10 vehicles will ultimately service precincts 1, 2 and 4 with a minimum of 2 connections to Great Northern Highway. Depending on staging of the various precincts a third road connection from the District Loop Road to the Highway is likely to be constructed. The southern District Loop Road intersection with Great Northern Highway is located within the Local Structure Plan Site of this report.

Based on an indicative lot layout, it is estimated the Site will provide 58 industrial lots typically with a lot size of 1 hectare. These lot sizes may be considered too small for RAV 10 access based on the general recommendations for a RAV 10 lot within the MIPSP. The demand for RAV 10 lots will likely be better understood as the design progresses. Under the current layout, adjacent lots may need to be purchased if RAV 10 access is required based on the current lot sizes. A preliminary review indicates that standard 10x 10m wide truncations as currently shown are not necessarily adequate at intersections in order to allow for RAV10 vehicle access.

The layout proposes 5 internal intersections with the District Loop Road over a length of 700m. To prioritise vehicle movement function along the District Loop Road consideration should be given to restricting the turning vehicular movements at a number of intersections providing one intersection with full turning movements to service the area to the west of the District Loop Road and one intersection to service the area to the east. This will result in the spacing of the two main intersections being approximately 400m. The permeability of the proposed internal road network layout will accommodate these vehicular movement restrictions.

The Site is expected to generate in the order of 2,200 vehicles per weekday with approximately 304 and 349 vehicles within the am and pm peak hours.

The additional Site traffic of 2,200 vehicles per day on the District Loop Road is lower than that ultimately expected to be carried on this category of road with the full development of the Muchea Industrial Park. The internal traffic flows within the development site are in line with those expected on local access roads.

There is sufficient spare capacity for the additional traffic generated by the Site on to Great Northern Highway with traffic volumes estimated to be in the order of 2,960-3,730 vehicles per day which is still less than the historic volumes of 7,500 vehicles per day that occurred prior to the Tonkin Highway – Northlink extension.

This Local Structure Plan proposes the creation of a staggered T-junction arrangement on Great Northern Highway with the District Loop Road (this Site) and the Loop Road to Precinct 3 of the Industrial Park located on the western side of Great Northern Highway. The draft MIPSP has alternatively proposed a 4 way roundabout. Initial liaison with Main Roads WA has indicated that in principal there is no objection to a staggered T-junction arrangement instead of a 4 way roundabout as currently outlined in the draft MIPSP.

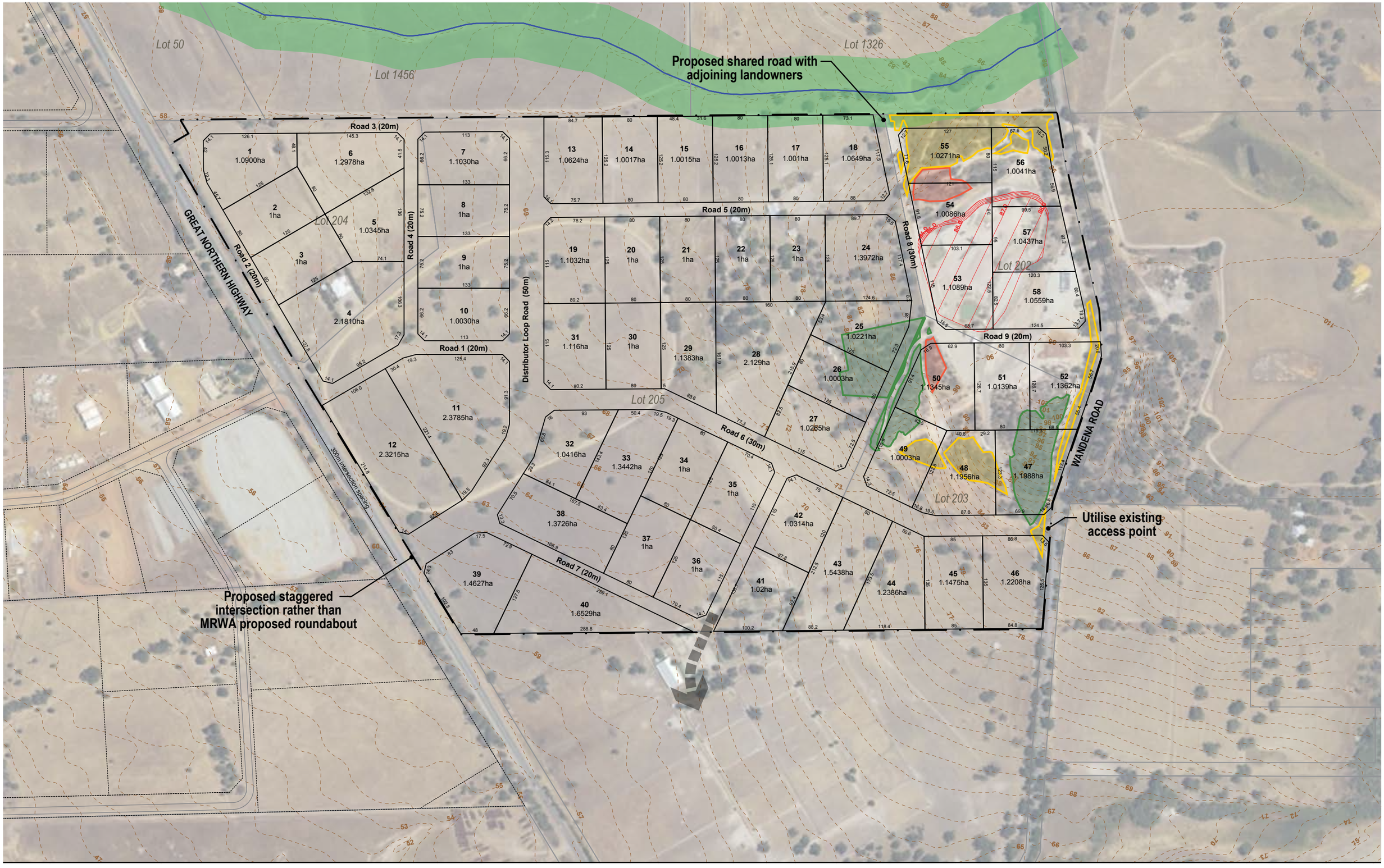
The intersection of Great Northern Highway and the southern District Loop Road which is included within the Site has been assessed. To ensure a robust assessment the analysis was based on full development of the Site without the further extension of the District Loop Road to the north of the Site, requiring the majority of Site traffic to use the Great Northern Highway intersection. Furthermore, traffic volumes along Great Northern Highway were increased generously to 5,000 vehicles per day which would allow for development within the Industrial Park. Two intersection layout options were modelled that utilised the existing overtaking lanes on Great Northern Highway in the form of acceleration lanes and/or auxiliary turning lanes. The analyses indicated that both intersections would operate satisfactorily.

Further development to the north of the Site will likely see increases in generated traffic along the District Loop Road and further connections to Great Northern Highway resulting in the redistribution of traffic. As development progresses and the likely staging is known, further investigations to confirm the level of intersection control will be required at the intersection of Great Northern Highway and the southern District Loop Road..

As Main Roads WA is the controlling authority of Great Northern Highway, the ultimate and staged treatments and layout of all intersections with the highway will be subject to Main Roads WA approval.

APPENDIX A

Structure Plan Layout



Concept Plan

Lots 202-203 Wandena Road & Lots 204-205 Great Northern Highway, Muchea

Date: 9 February 2021 | 1:5000@ A3 | 1:2500 @ A1 | 19-545 | A | Staff: MR LC | Checked: MR

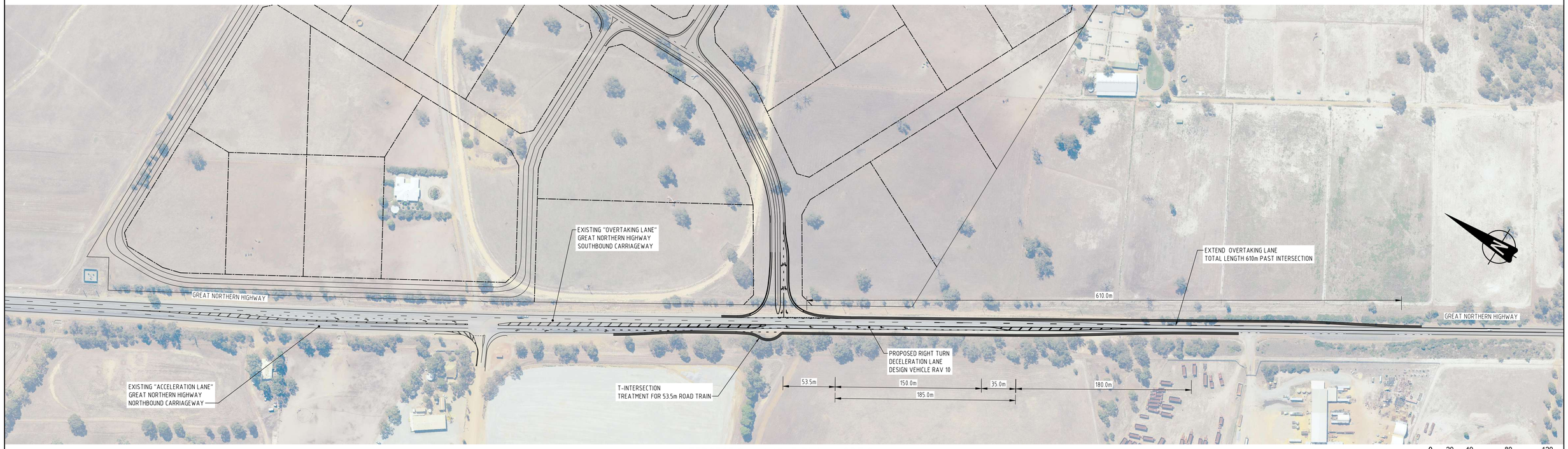
0 50 100m

element.

Level 18, 191 St Georges Terrace, Perth Western Australia 6000.
PO Box 7375 Cloisters Square, Perth Western Australia 6850.
T. +61 8 9289 8300 I E. hello@elementwa.com.au elementwa.com.au

APPENDIX B

Concept Layouts for
Great Northern Highway and District Loop Road Intersection



INTERSECTION LAYOUT PLAN - OPTION 1

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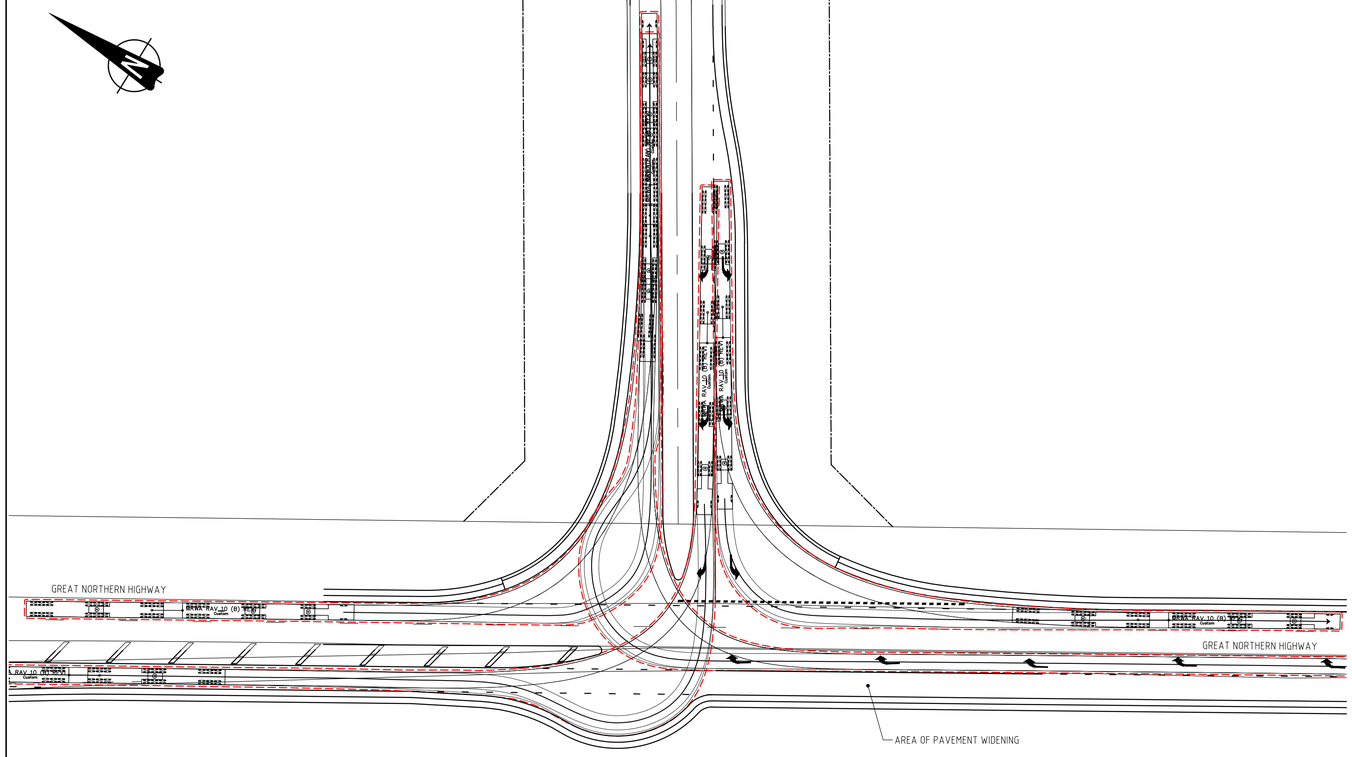
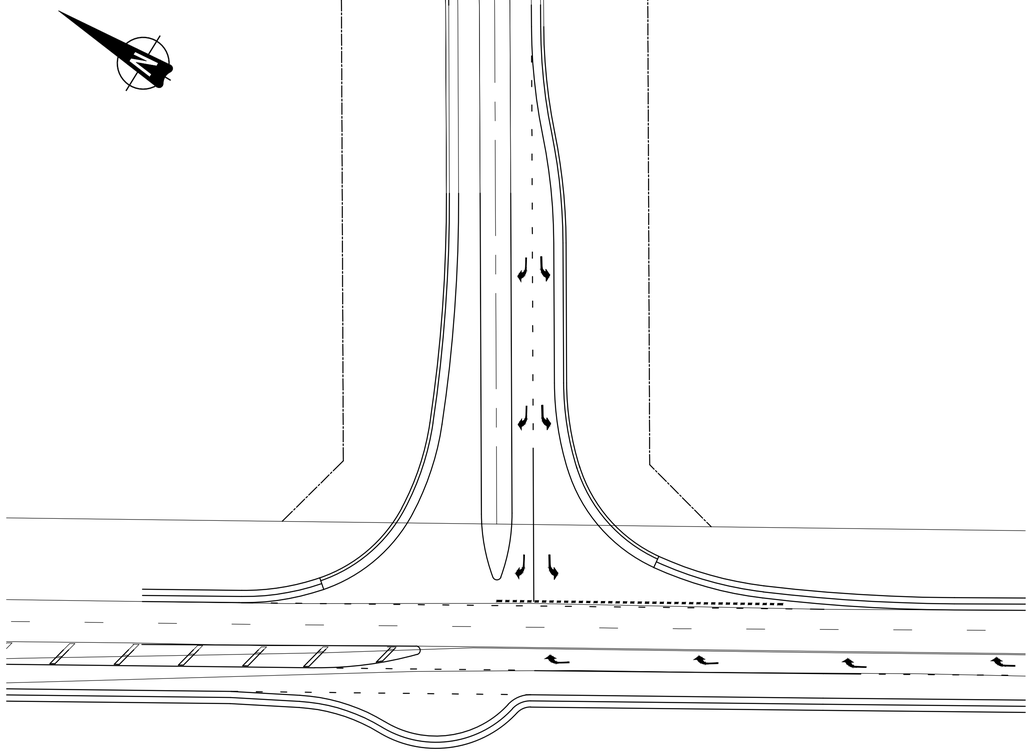


MRWA RAV 10 SWEPT PATHS

1:500

1:500 0 5 10 20 30 Half Size 1:1000 - SCALE (m)



T-INTERSECTION TREATMENT - OPTION 1

1:500

1:500 0 5 10 20 30 Half Size 1:1000 - SCALE (m)

DIAL BEFORE YOU DIG www.1100.com.au

PROJECT:

GREAT NORTHERN HIGHWAY MUCHEA

No.	DATE	REVISION	BY
A	29-9-2020	ISSUED FOR COMMENT	MJV

Porter Consulting Engineers

Level 2 Kishorn Court
58 Kishorn Road
Mt Pleasant 6153 WA

PO Box 1036
Canning Bridge 6153 WA

Tel (08) 9315 9955
Email office@porterengr.com.au
www.porterengr.com.au

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

CLIENT: **ELEMENT**

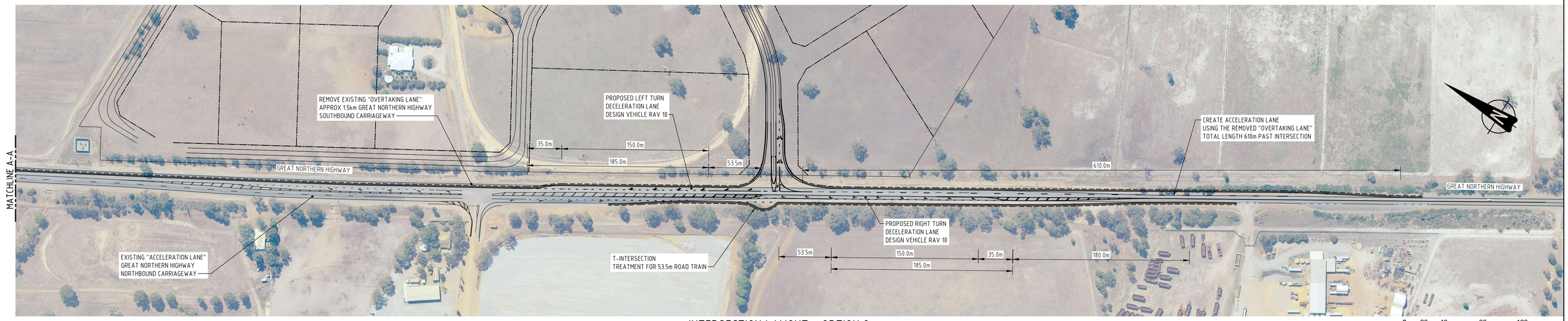
DRAWING: **OPTION 1 INTERSECTION TREATMENT**

STATUS: **FOR COMMENT**

SCALE	1:2000
DATE	SEPT 2020
DESIGN	JH
DRAWN	MJV
CHECK	
APP'D	

DRAWING No. 20-3-35/800 | REV No. A | ORIGINAL DRAWING SIZE A1

FILE NAME S:\ACTIVE PROJECTS\20-03-035\ACAD\20335-800.dwg



INTERSECTION LAYOUT - OPTION 2

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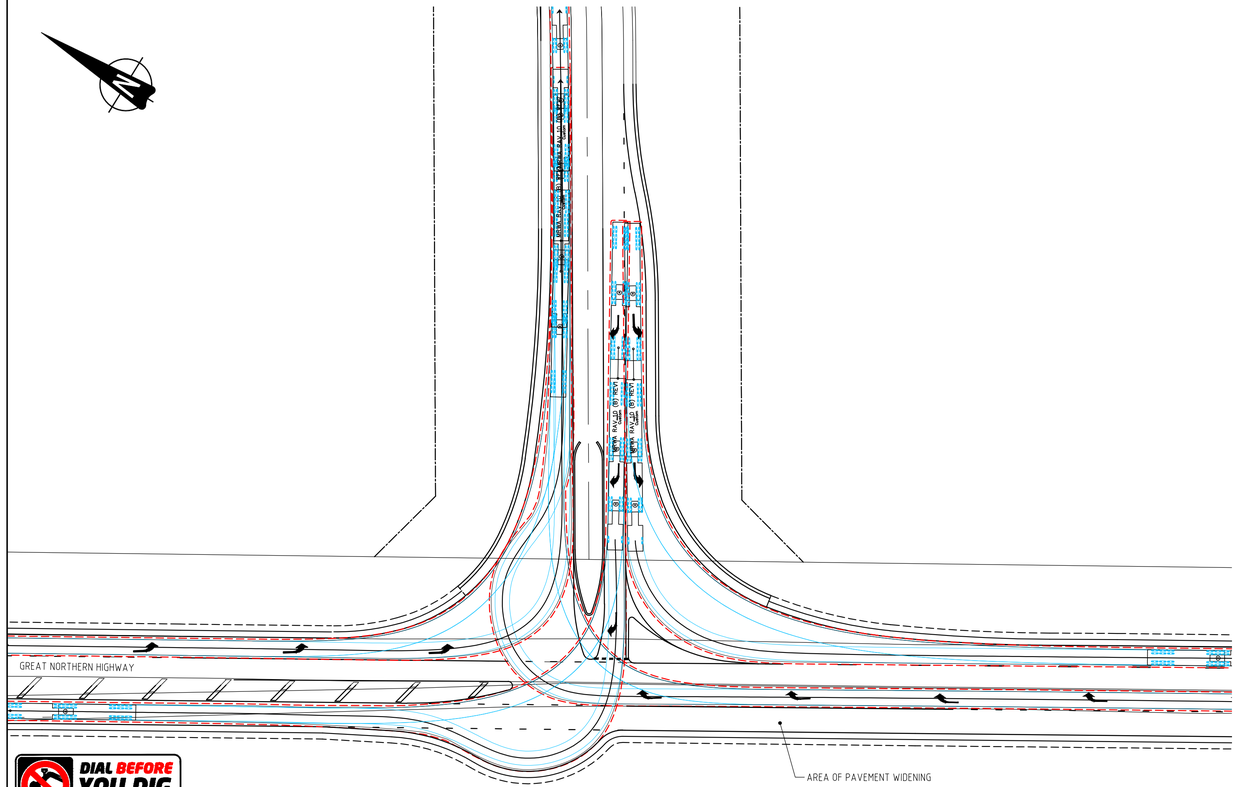
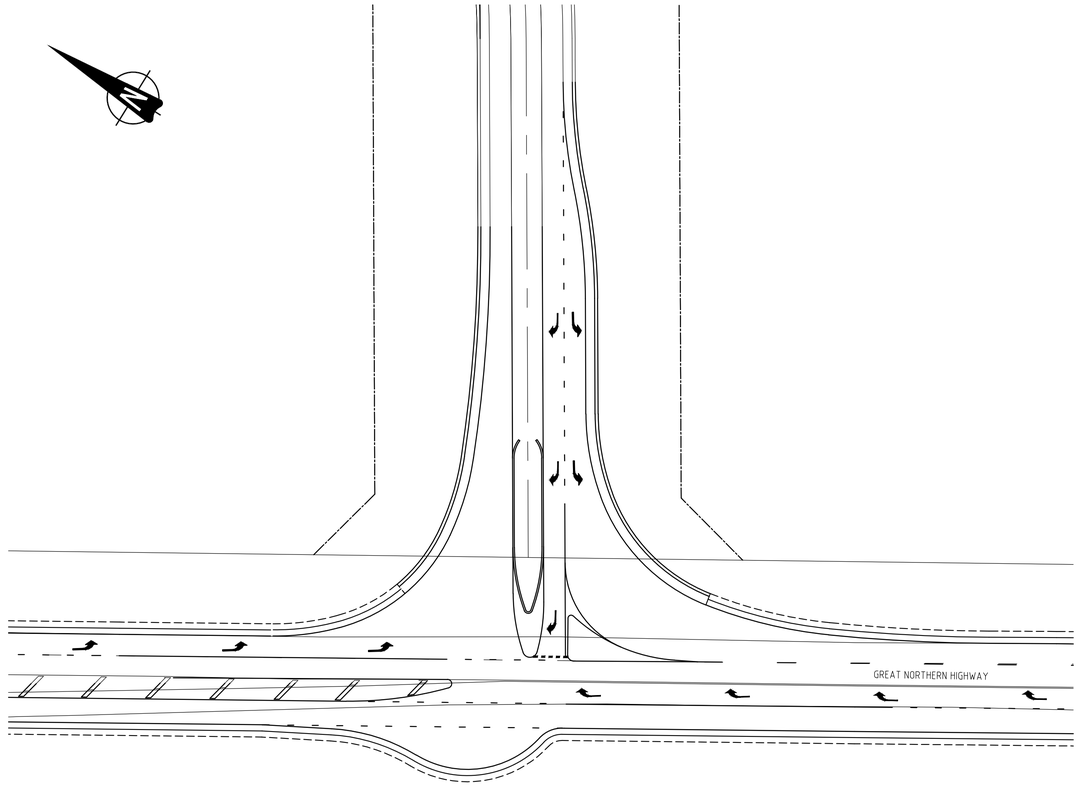
Half Size 1:4000 - SCALE (m)



DIAL BEFORE YOU DIG www.1100.com.au

MRWA RAV 10 SWEPT PATHS

1:500



T-INTERSECTION TREATMENT - OPTION 2

1:500

1:500 0 5 10 20 30
Half Size 1:1000 - SCALE (m)

PROJECT:

GREAT NORTHERN HIGHWAY
MUCHEA

No.	DATE	REVISION	BY
A	29-9-2020	ISSUED FOR COMMENT	MJV

Porter Consulting Engineers

Level 2 Kishorn Court
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TUSMO Pty Ltd ACN 070 097 548 as trustee for the Consulting Engineering Unit Trust trading as Porter Consulting Engineers ABN 78 636 396 385

CLIENT: **ELEMENT**

DRAWING: **OPTION 2 INTERSECTION TREATMENT**

STATUS: **FOR COMMENT**

SCALE	1:2000
DATE	SEPT 2020
DESIGN	JH
DRAWN	MJV
CHECK	
APP'D	

DRAWING No. **20-3-35/801**

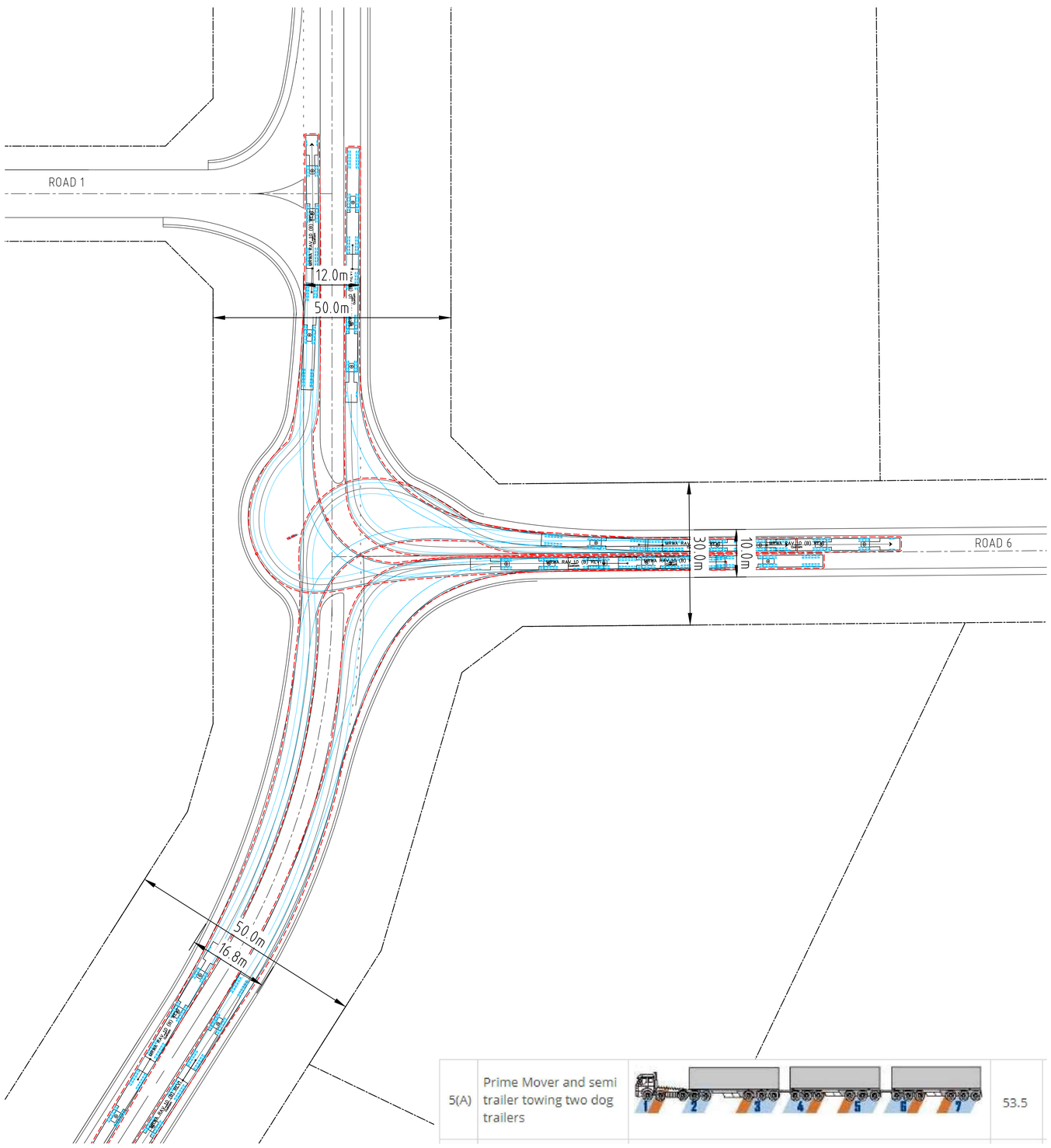
REV No. **A**

ORIGINAL DRAWING SIZE **A1**

FILE NAME S:\ACTIVE PROJECTS\20-03-035\ACAD\20335-801.dwg

APPENDIX C

Sample Internal Road Network Swept Paths



5(A)	Prime Mover and semi trailer towing two dog trailers		53.5

MRWA RAV 10 SWEPT PATHS
1:500

N

0 5 10 20 30
1:500
Half Size 1:1000 - SCALE (m)

PROJECT:
GREAT NORTHERN HIGHWAY MUCHEA

No	DATE	REVISION	BY
A	29-9-2020	ISSUED FOR COMMENT	MJV

Porter Consulting Engineers
Level 2 Kishorn Court
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TUSMO Pty Ltd ACN 070 097 168 as Trustee for the Consulting Engineering Unit Trust trading as Porter Consulting Engineers ABN 78 636 396 385

CLIENT:
ELEMENT

DRAWING:
RAV 10 SWEPT PATH
ROAD 6 AND MAIN ENTRANCE ROAD

STATUS: **FOR COMMENT**

SCALE	1:2000
DATE	SEPT 2020
DESIGN	JH
DRAWN	MJV
CHECK	
APP'D	

DRAWING No. **20-3-35/802**
REV No. **A**
ORIGINAL DRAWING SIZE **A1**
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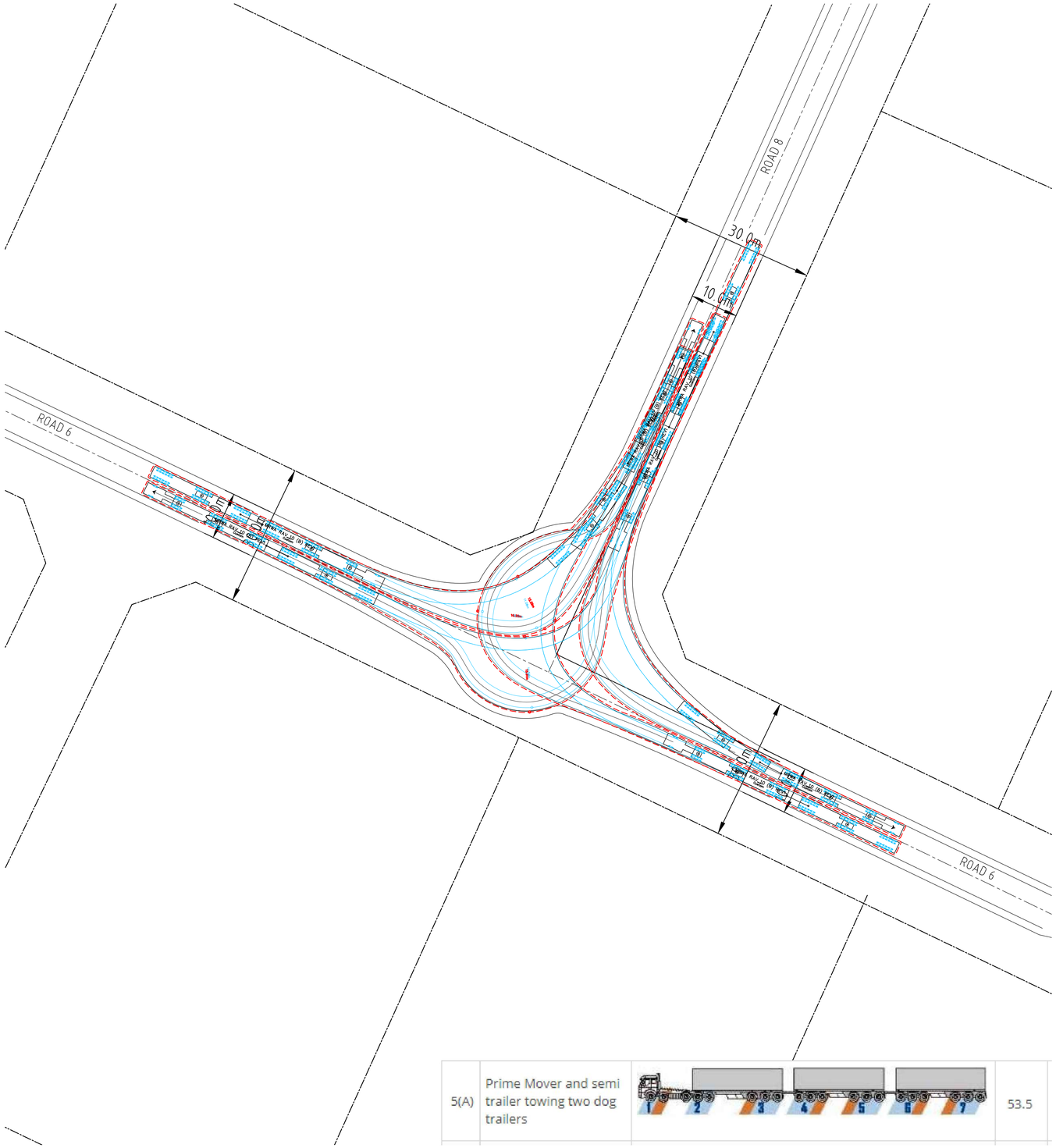

MRWA RAV 10 SWEPT PATHS
1:500

N

1:500 0 5 10 20 30
Half Size 1:1000 - SCALE (m)

PROJECT:
GREAT NORTHERN HIGHWAY
MUCHEA

No	DATE	REVISION	BY
A	19-10-2020	ISSUED FOR COMMENT	MJV

Porter Consulting Engineers
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Email: office@porterengr.com.au
www.porterengr.com.au
TUSMO Pty Ltd ACN 070 097 148 as trustee for the Consulting Engineering Unit Trust trading as Porter Consulting Engineers ABN 78 636 396 385

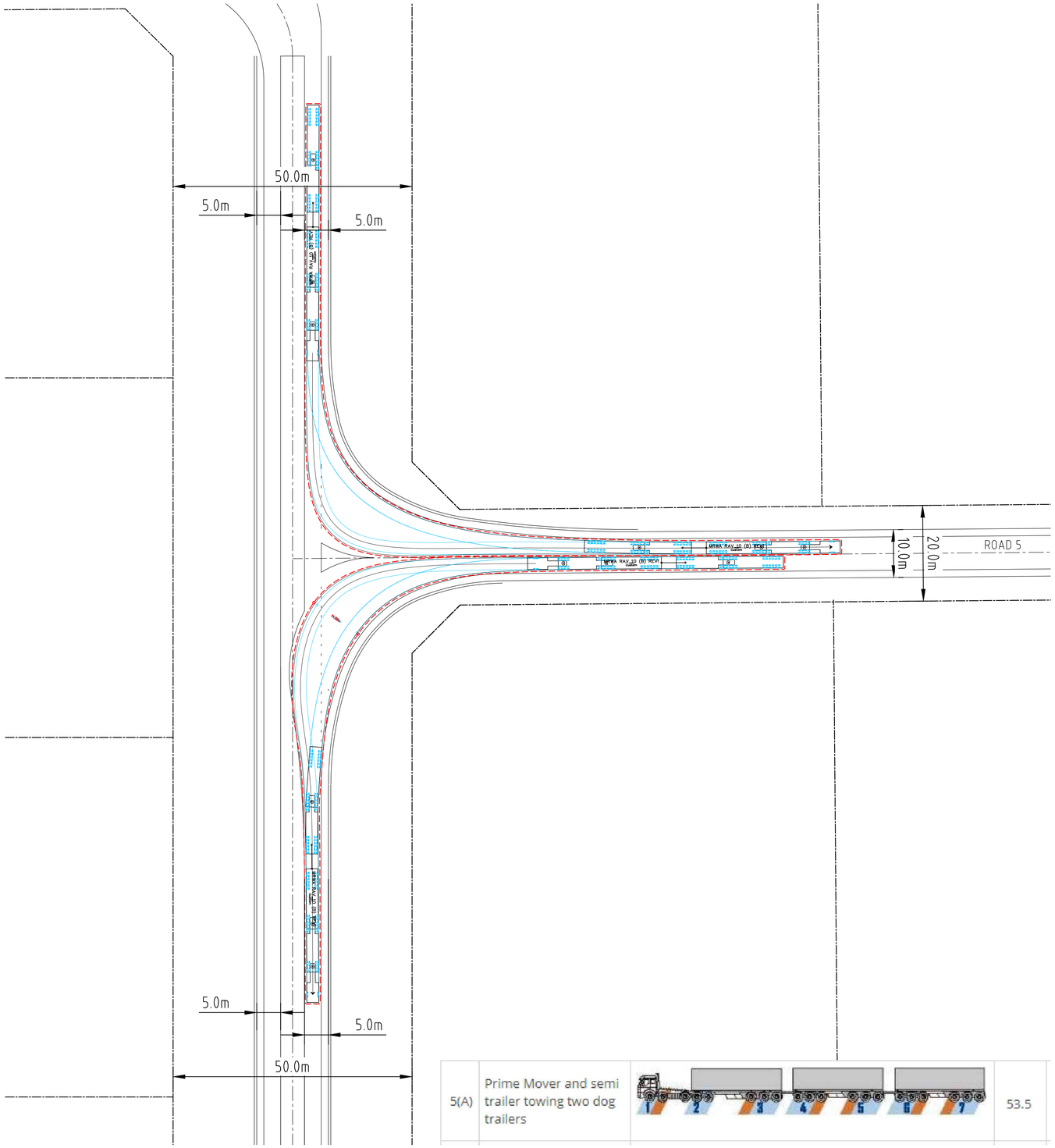
CLIENT:
ELEMENT

DRAWING:
RAV 10 SWEPT PATH
ROAD 6 AND ROAD 8 ENTRANCE ROAD
STATUS: **FOR COMMENT**

SCALE	1:2000
DATE	OCT 2020
DESIGN	JH
DRAWN	MJV
CHECK	
APP'D	

DRAWING No.	REV No.	ORIGINAL DRAWING SIZE
20-3-35/803	A	A1

FILE NAME S:\ACTIVE PROJECTS\20-03-035\ACAD\20335-803.dwg



5(A)	Prime Mover and semi trailer towing two dog trailers		53.5

MRWA RAV 10 SWEPT PATHS
1:500

N

0 5 10 20 30
1:500
Half Size 1:1000 - SCALE (m)

PROJECT:
GREAT NORTHERN HIGHWAY
MUCHEA

No	DATE	REVISION	BY
A	29-9-2020	ISSUED FOR COMMENT	MJV

Porter Consulting Engineers
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TUSMO Pty Ltd ACN 070 097 948 as trustee for the Consulting Engineering Unit Trust trading as Porter Consulting Engineers ABN 78 636 396 385

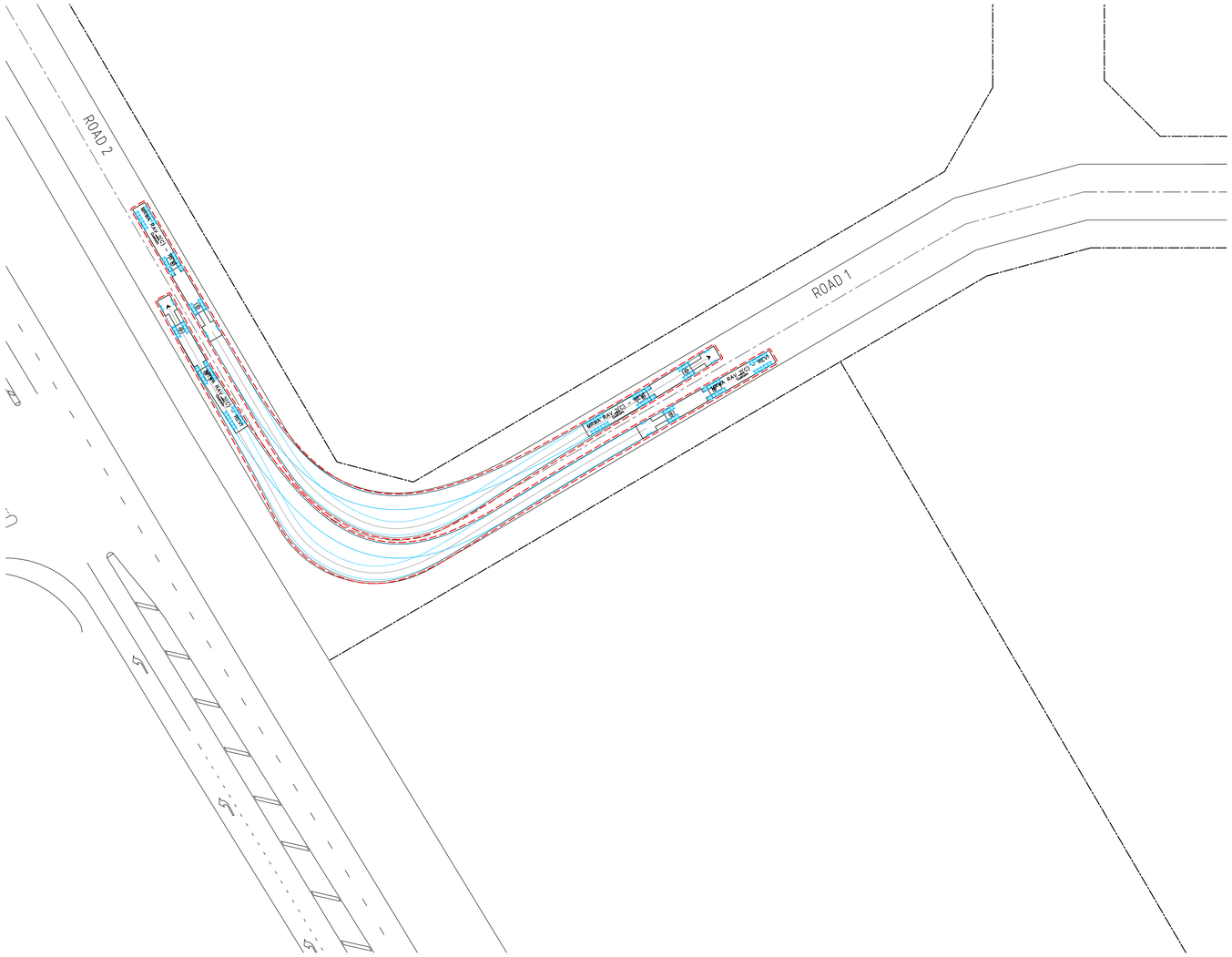
CLIENT:
ELEMENT

DRAWING:
RAV 10 SWEPT PATH
ROAD 5 AND MAIN ENTRANCE ROAD

STATUS: **FOR COMMENT**

SCALE	1:2000
DATE	SEPT 2020
DESIGN	JH
DRAWN	MJV
CHECK	
APP'D	

DRAWING No. **20-3-35/804**
REV No. **A**
ORIGINAL DRAWING SIZE **A1**
FILE NAME S:\ACTIVE PROJECTS\20-03-035\ACAD\20335-804.dwg



MRWA RAV 2 27.5m B-DOUBLE SWEPT PATHS
1:500

N

0 5 10 20 30
1:500
Half Size 1:1000 - SCALE (m)

PROJECT:
GREAT NORTHERN HIGHWAY MUCHEA

No.	DATE	REVISION	BY
A	29-9-2020	ISSUED FOR COMMENT	MJV

Porter Consulting Engineers

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TUSMO Pty Ltd ACN 070 097 168 as trustee for the Consulting Engineering Unit Trust trading as Porter Consulting Engineers ABN 78 626 396 385

CLIENT:
ELEMENT

DRAWING:
RAV 2 SWEPT PATH ROAD 1 AND ROAD 2

STATUS: **FOR COMMENT**

SCALE	1:2000
DATE	SEPT 2020
DESIGN	JH
DRAWN	MJV
CHECK	
APP'D	

DRAWING No. 20-3-35/805
REV No. A
ORIGINAL DRAWING SIZE A1
FILE NAME S:\ACTIVE PROJECTS\20-03-035\ACAD\20335-805.dwg

APPENDIX D

SIDRA Detailed Results

Site: 101 [Great Northern Highway and Loop Road PM Peak Proposed - Option 1 (Site Folder: General)]

New Site
Site Category: (None)
Stop (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Great Northern Highway														
2	T1	250	30.0	263	30.0	0.162	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	109.9
3	R2	24	30.0	25	30.0	0.034	11.6	LOS B	0.1	1.4	0.46	0.70	0.46	65.8
Approach		274	30.0	288	30.0	0.162	1.0	NA	0.1	1.4	0.04	0.06	0.04	104.8
East: Loop Road														
4	L2	98	30.0	103	30.0	0.111	8.7	LOS A	0.4	4.5	0.27	0.62	0.27	64.1
6	R2	181	30.0	191	30.0	0.700	32.8	LOS D	4.6	49.9	0.88	1.21	1.80	48.1
Approach		279	30.0	294	30.0	0.700	24.3	LOS C	4.6	49.9	0.67	1.00	1.26	52.7
North: Great Northern Highway														
7	L2	46	30.0	48	30.0	0.096	9.1	LOS A	0.0	0.0	0.00	0.23	0.00	54.6
8	T1	250	30.0	263	30.0	0.096	0.1	LOS A	0.0	0.0	0.00	0.08	0.00	107.6
Approach		296	30.0	312	30.0	0.096	1.5	NA	0.0	0.0	0.00	0.11	0.00	95.5
All Vehicles		849	30.0	894	30.0	0.700	8.9	NA	4.6	49.9	0.23	0.39	0.43	79.3

Site: 101 [Great Northern Highway and Loop Road PM Peak Proposed -Option 2 (Site Folder: General)]

New Site
Site Category: (None)
Stop (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Great Northern Highway														
2	T1	250	30.0	263	30.0	0.162	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	109.9
3	R2	24	30.0	25	30.0	0.032	11.1	LOS B	0.1	1.3	0.43	0.68	0.43	66.2
Approach		274	30.0	288	30.0	0.162	1.0	NA	0.1	1.3	0.04	0.06	0.04	104.9
East: Loop Road														
4	L2	98	30.0	103	30.0	0.067	8.5	LOS A	0.0	0.0	0.00	0.59	0.00	65.6
6	R2	181	30.0	191	30.0	0.636	27.7	LOS D	4.0	43.0	0.84	1.14	1.56	50.7
Approach		279	30.0	294	30.0	0.636	21.0	LOS C	4.0	43.0	0.55	0.95	1.01	55.2
North: Great Northern Highway														
7	L2	46	30.0	48	30.0	0.032	9.1	LOS A	0.0	0.0	0.00	0.67	0.00	72.2
8	T1	225	22.2	237	22.2	0.139	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	110.0
Approach		271	23.5	285	23.5	0.139	1.5	NA	0.0	0.0	0.00	0.11	0.00	102.3
All Vehicles		824	27.9	867	27.9	0.636	7.9	NA	4.0	43.0	0.20	0.38	0.35	82.0

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