Whittlesea Planning Scheme Amendment C187

Expert Evidence - Traffic

CG140690

Prepared for
Best Hooper on behalf of Wollert Developer Consortium

30 November 2015

Cardno
Shaping the Future

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1 Qualifications and Expertise

In accordance with the guide to expert evidence prepared by Planning Panels Victoria, my qualifications and expertise to undertake this work are summarised below:-

Name:

Stephen John Hunt

Address:

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Professional Qualifications:

Bachelor of Engineering (Civil), 1975, Swinburne University of Technology

Graduate Diploma of Highway and Traffic Engineering, 1981, Chisholm Institute of Technology

Professional Experience:

Consultant, Cardno Victoria: 2007 - present

Director, Grogan Richards Pty Ltd: 1988 – 2006

Traffic Engineer with Cities of Doncaster and Templestowe, Caulfield and Prahran: 1975 – 1988

Areas of Expertise:

Car parking and traffic analysis

Traffic advice and assessment of land uses and development proposals to planning authorities, government agencies, corporations and developers (including major residential, retail, commercial, industrial, institutional and mixed use projects).

Preparation and presentation of evidence before VCAT and Planning Panels.

Expertise to Prepare This Report:

My training and experience including involvement with all forms of development over many years qualifies me to comment on the traffic and car parking implications of the proposal.

Instructions which Defined the Scope of this Report:

I have been requested by Best Hooper on behalf of Wollert Developer Consortium to express my expert opinion as to the traffic and transport infrastructure provision in proposed in conjunction with the Wollert PSP and Wollert DCP.

Facts, Matters And Assumptions Relied Upon:

Documents as exhibited including:

- Amendment C187 Explanatory Report
- Wollert Precinct Structure Plan - April 2015
- Wollert Development Contributions Plan - April 2015
- Interim and Ultimate Alignment Plans - April 2015 (Cardno)
- Wollert Cost Estimates – Intersections – April 2015 (Cardno)
- Wollert Cost Estimates –Roads – April 2015 (Cardno)
- Wollert Transport Modelling and Sidra – September 2014 (Aecom)
- North Growth Corridor 2046 Strategic Transport Model – SKM
- Revised Boundary Road cross-section
- Revised DCP Cost Estimates – November 2015 (Cardno)

Identity of Persons Undertaking the Work:

Stephen Hunt, assisted by David Ho of Cardno.

I have made all the inquiries that I believe are desirable and appropriate, and no matters of significance, which I regard as relevant, have to my knowledge been withheld from the Panel.

Stephen Hunt

Consultant

for **Cardno**

2 Introduction and Background

2.1 Instructions

My name is Stephen Hunt and I am a consultant traffic engineer practicing with Cardno Victoria.

I have been requested by Best Hooper on behalf of Wollert Developer Consortium to review the proposed Amendment C187 to the Whittlesea Planning Scheme, and to provide my expert opinion in relation to traffic and transport infrastructure issues associated with the Amendment.

Amendment C187 seeks to, amongst other things, to incorporate the "Wollert Precinct Structure Plan, April 2015" and the "Wollert Development Contributions Plan, April 2015" into the Whittlesea Planning Scheme, and to rezone the land to Urban Growth Zone Schedule 5 to facilitate urban development.

In particular, I was requested by Best Hooper in a letter dated 12th October 2015 to provide my views with respect to:

a) The obligation to construct interim intersections and in particular the timing for construction;

b) The merits of constructing an "interim-interim" intersection; and

c) The status and function of Boundary Road and Summerhill Road.

It should be noted that, prior to receiving instructions to review the exhibited Amendment, I had no previous involvement with input provided by Cardno to the Wollert Developer Consortium, the City of Whittlesea and the Metropolitan Planning Authority (MPA) in the preparation of the PSP and DCP

The Wollert Developer Consortium comprises AV Jennings, Greencor, Villawood Properties and Evolve Development, each of which has significant interest in landholdings within the PSP area. Specifically each landholding is strategically located with frontage to Craigieburn Road East which forms the southern boundary of the PSP area and the likely initial development within the PSP area.

The respective land interests of each of the consortium members are shown in Figure 2-1.

Figure 2-1 Wollert Consortium Landholding

2.2 Cardno Background in Relation to PSP Preparation

Cardno was commissioned in August 2014 by Evolve Development on behalf of the Wollert Developer Consortium to provide traffic engineering advice in relation to the preparation of the Wollert Precinct Structure Plan being prepared jointly by the City of Whittlesea and the Metropolitan Planning Authority.

The proposed road and transport network for the PSP area was formulated in initial meetings with the MPA and Council, with road function and cross-sections and intersection requirements informed by traffic modelling and analysis undertaken by Aecom for the MPA in a report entitled "*Wollert Transport Modelling and Sidra – September 2014"*.

In order to form the basis for road and intersection requirements to support development of the PSP area, the ultimate function of each road was initially determined based on Aecom modelling for 2046, representing complete development of the PSP area and the surrounding region. Based on cross-sections provided and intersection "templates", ultimate alignment plans were prepared by Cardno.

In accordance with normal practice, interim road and intersection requirements were then determined, based on 2026 modelled volumes provided in the Aecom analysis. The 2026 volumes were modelled based on expected development levels in the Northern Growth Corridor and finer grain modelling of the Wollert PSP area assuming completion of approximately 75% of the residential component of the PSP area by this time.

The "interim" road and intersection works required to meet the 2026 modelled volumes were adopted as the extent of works required to be funded through the proposed Wollert DCP.

Cardno were requested to prepare concept plans for the "interim" conditions and to prepare cost estimates for the works for inclusion on the exhibited DCP.

It is noted that for each intersection, two standards of interim intersections were considered as follows:

1. Interim intersection matching the alignment of the ultimate intersection (where possible) designed to minimise additional works required when the interim intersection is eventually upgraded (described as the VicRoads preferred treatment), and;

2. Interim intersection providing a similar level of stand-up capacity but with a reduced design “foot-print” designed to minimise the cost of the interim treatment (described as the Developer preferred treatment).

Cardno were advised by Council as to the required interim intersection to be adopted for the DCP and cost estimates for the specified treatments were subsequently prepared.

3 Wollert Precinct Structure Plan

3.1 Overview

The Wollert Precinct Structure Plan area is bound by Craigieburn Road to the south, Summerhill Road to the north, Curly Sedge Creek to the west and the reservation for the future E6 roadway to the east.

The PSP area effectively provides a northerly extension of the Aurora and Epping North development areas, which currently extend to northern boundaries with Craigieburn Road East.

The exhibited Future Urban Structure Plan for the Wollert PSP area is shown in Figure 3-1.

The exhibited PSP sets out the long term plan for the development of the area including the arterial and connector road networks, road cross-sections and shared bicycle / pedestrian networks.

The implementation guidelines within the PSP also outline particular requirement's to support the PSP implementation that include Town Centre design elements and requirements for the delivery of the road, pedestrian and cycle networks.

3.2 Street Network

The Transport and Movement Network to be provided in association with development of the PSP area is detailed in Section 3.7 of the exhibited PSP, with required road cross-sections detailed in Section 4.2.

The proposed street network is shown in Figure 3-2.

Figure 3-1 Wollert PSP – Future Urban Structure Plan

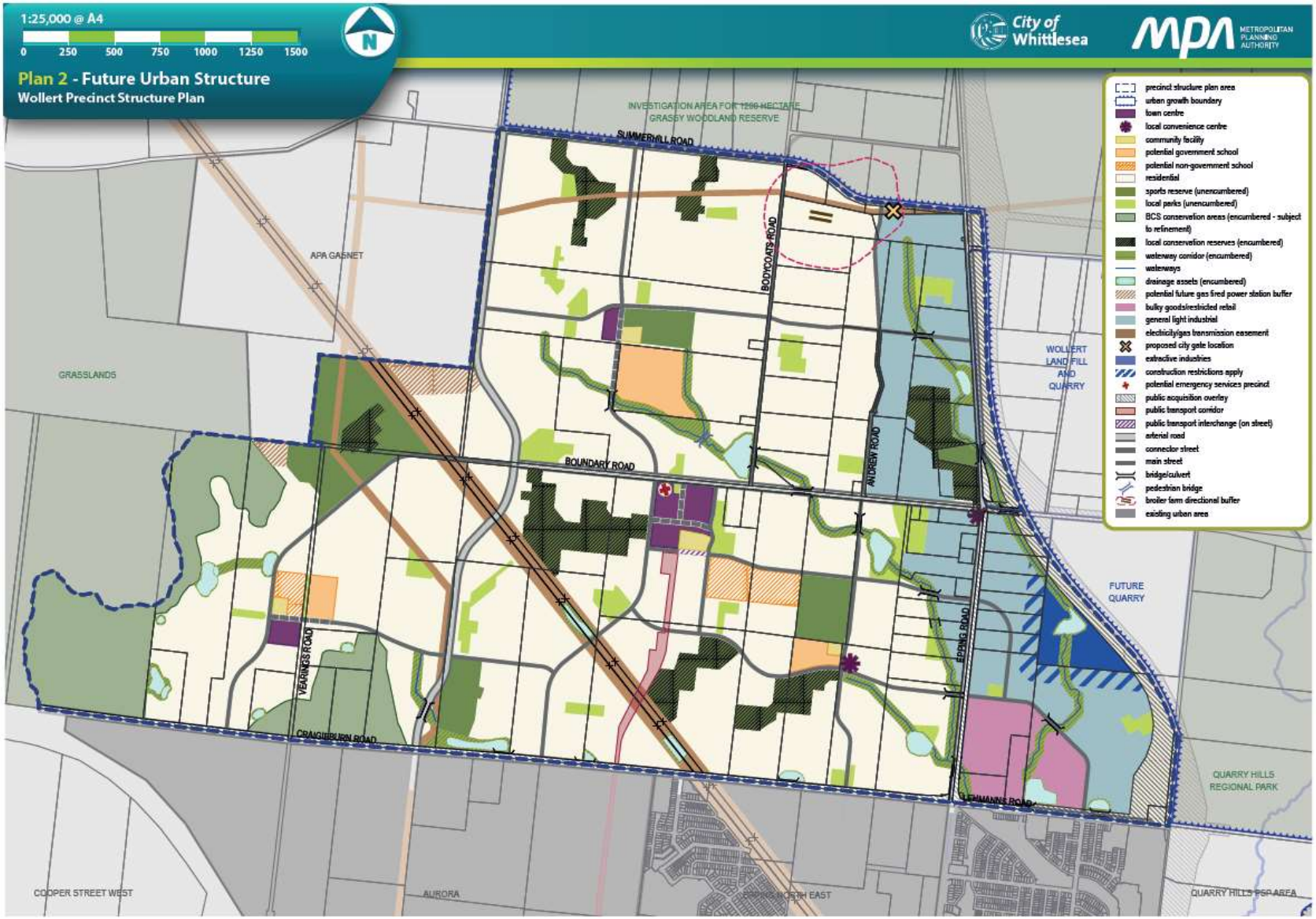
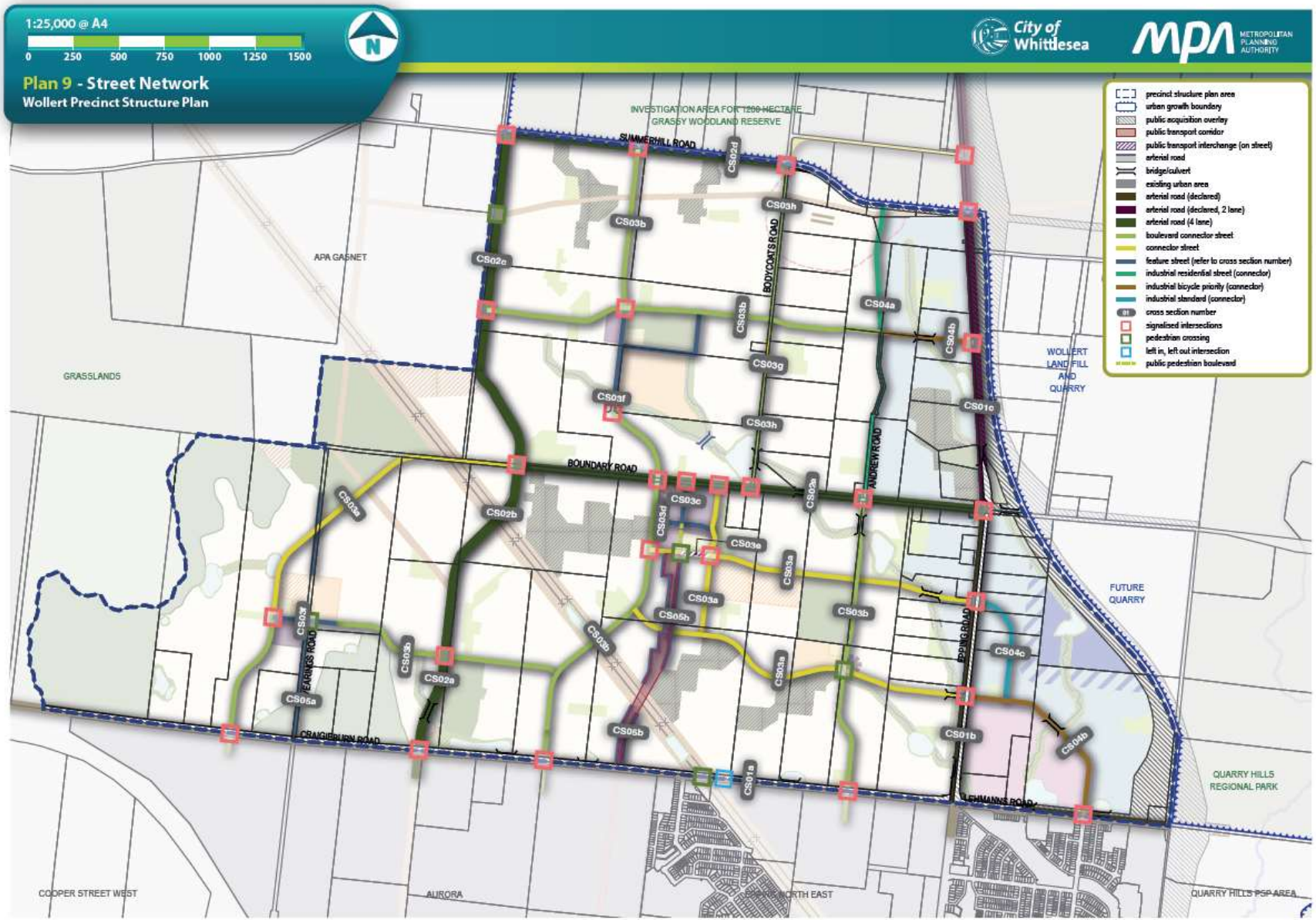


Figure 3-2 Wollert PSP – Street Network



The proposed future arterial road network is discussed in the following sections.

3.2.2 Craigieburn Road East

Craigieburn Road East is a Declared Main Road under the control and management of VicRoads, running east from the Sydney Road in Craigieburn to Epping Road in Wollert. East of Epping Road, Craigieburn Road East becomes Lehmanns Road, which is a currently a local road. Craigieburn Road intersects with the Hume Freeway east of Sydney Road, with connection available via southerly oriented ramps.

The PSP proposes that Craigieburn Road East be upgraded to a future primary arterial road. The PSP proposes an ultimate 6 lane divided cross-section accommodated with widening of the road reserve proposed on the norther side proposed to provide an ultimate 41.0 metre road reserve.

Vic Roads will be responsible for the progressive upgrading of the road, with neither the duplication of the road or land to widen the existing road reserve included in the exhibited Development Contributions Plan. As discussed in Section 4 of this report, construction of intersections with roads running to the north from Craigieburn Road East which will serve the PSP area are included as DCP items.

Five signalised intersections are proposed along Craigieburn Road East / Lehmanns Road which will provide the focus for access to the progressive development of the PSP area to the north located as follows.

- Connector Road west of Vearings Road (Boundary Road) ultimately forming a cross junction with a future connector street within the Aurora Estate to the south.
- Koukoura Drive, ultimately forming a cross junction with Koukoura Drive to be constructed to the south within the Aurora Estate.
- Edgars Road, forming a cross junction with Edgars Road soon to be constructed to the south within the Aurora Estate.
- Andrew Road, ultimately forming a cross junction with a future connector street within Epping North to the south.
- Connector Road east of Epping Road forming a cross junction with Salt Lake Boulevard constructed within the Eucalypt Estate.

VITM modelling undertaken by Aecom estimate 2046 volumes of approximately 20,000 vehicles per day using Craigieburn Road west of Koukoura Drive, reducing to approximately 15,000 vpd west of Edgars Road. For the 2026 “interim reference case” scenario volumes of approximately 17,000 vpd west of Koukoura Drive and 10,700 vpd west of Edgars Road are modelled.

Select link analysis undertaken by Cardno for Craigieburn Road west of Edgars Road indicated that, in the interim reference case, traffic generated by the PSP area accounts for approximately 55% of overall volumes.

3.2.3 Epping Road (Kilmore – Epping Road)

Epping Road is a Declared Main Road under the control and management of Vic Roads, which is currently constructed as a two lane road north from Findon Road through the Wollert PSP area, with existing flaring at a signalised intersection with Craigieburn Road East and a single lane roundabout at Boundary Road.

The PSP proposes that Epping Road, south of Boundary Road will be upgraded to a primary arterial road, with a 4 lane divided cross-section with a 14 metre wide central median accommodated by widening the road reserve to the east to provide a 42.0 metre reservation. Access to properties on both sides pf Epping Road is accommodated by 2 way access streets running parallel to the main carriageway.

North of Boundary Road, a two lane road is proposed with a shared path on the western side, accommodated within the existing road reserve.

Vic Roads will be responsible for the progressive upgrading of the road, with neither the duplication of the road or land to widen the existing road reserve included in the exhibited Development Contributions Plan.

VITM modelling undertaken by Aecom estimate 2046 volumes of approximately 20,000 vehicles per day using Epping Road north of Craigieburn Road.

3.2.4 Koukoura Drive

Koukoura Drive is a planned primary arterial road which will run from O'Herns Road through Epping North and Wollert to Donnybrook Road, and ultimately further north through Donnybrook East and Lockerbie North.

North of Craigieburn Road within the Wollert PSP, it is proposed that the road will be constructed with a four lane divided cross-section within a 27metre to 34 metre reservation.

The provision of land to create the required road reserve and the construction of the first carriageway have been included as DCP items, with Vic Roads expected to take over responsibility for the road when traffic volumes warrant duplication.

Aecom estimate Koukoura Drive north of Craigieburn Road East to carry approximately 16,000 vehicles per day in the 2026 "interim reference case" scenario, increasing to 22,500 vehicles per in 2046 assuming full development. This would suggest that the duplication of Koukoura Drive is likely to be a longer term project.

It is noted that Koukoura Drive south of Craigieburn Road East is proposed to be constructed in conjunction with the development of the Aurora Estate with concept designs understood to be currently under preparation for an initial intersection of the southern leg with Craigieburn Road.

3.2.5 Summerhill Road

Summerhill Road, which forms the norther boundary of the PSP area is a local road which runs east from Brookville Road / Amaroo Road Craigieburn to Epping Road, doglegging north at Bodycoats Road.

It is proposed to upgrade Summerhill Road to an arterial road, providing a four lane divided cross-section within a 34 metre reservation. East of Bodycoats Road, it is proposed to realign Summerhill Road to provide a direct connection to Epping Road, intersecting with Masons Lane providing connectivity to the east and potentially an interchange with the future E6.

The DCP provides for the provision of land for the widening of the road reserve along the existing alignment between Koukoura Drive and Bodycoats Road by widening the existing reservation to the south, and reconstruction of the existing carriageway to a two lane road to urban standard, and upgrading of Bodycoats Road / Summerhill Road to Epping Road (along the existing alignment).

The funding responsibility for the creation of the proposed realignment of the road east of Bodycoats Road or the ultimate duplication of Summerhill Road is unclear.

VITM modelling undertaken by Aecom estimate 2046 volumes of approximately 14,000 vehicles per day using Summerhill Road west of Koukoura Drive, assuming a connective route running from Mt Ridley Road across the Hume Freeway to an interchange with the E6 at Masons Road. Interim 2026 volumes of between 300 and 1,000 vehicles per day are modelled for Summerhill Road, indicating little or no reliance on Summerhill Road to cater for PSP generated traffic.

3.2.6 Boundary Road

Boundary Road is an existing local road running east west between Vearings Road and Epping Road, providing a "one mile grid" between Craigieburn Road and Summerhill Road. Boundary Road east of Epping Road becomes Bridge Inn Road which runs east to Mernda and The Plenty Valley Corridor.

Between Koukoura Drive and Epping Road, it is proposed to upgrade Boundary Road to a local arterial, providing a four lane divided cross-section within a 34 metre reservation. West of Koukoura Drive, it is proposed to construct Boundary Road as a connector street, to a point approximately 1.5 kilometres west, from which the connector road is proposed to deviate south to intersect with Craigieburn Road west of the existing Vearings Road intersection.

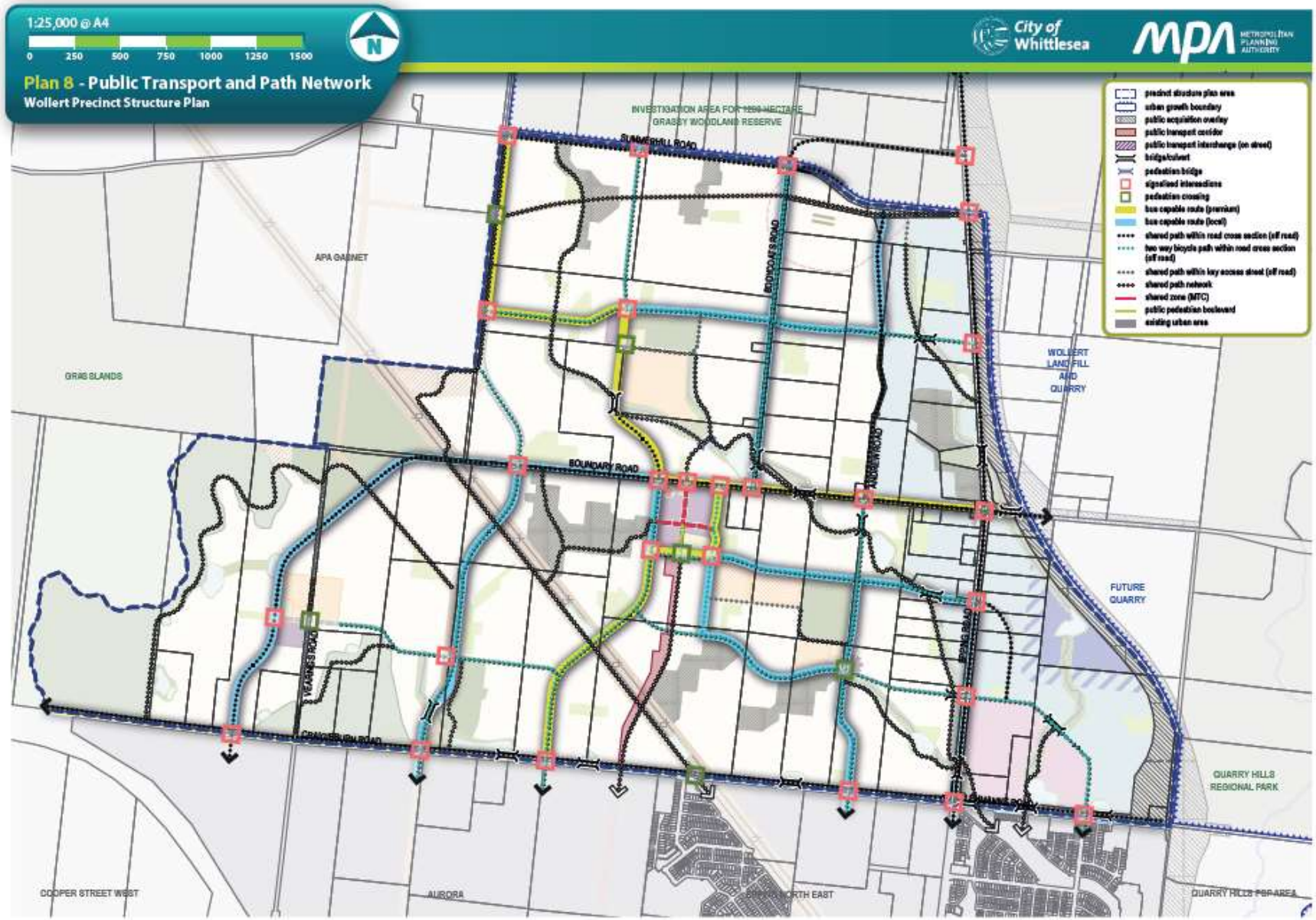
The DCP provides for the provision of land for the widening of the existing road reserve between Koukoura Drive and Epping Road, and replacement of the existing carriageway with a new divided carriageway with central median.

Daily volumes using Boundary Road between Koukoura Drive and Epping Road in the 2046 scenario are estimated by Aecom to be approximately 11,500 vehicles per day, reducing to 3,500 vehicles per day west of Koukoura Drive. Interim 2026 volumes of between 8,500 and 9,000 vehicles per day are estimated east of Koukoura Drive.

3.3 Public Transport and Path Network

The proposed public transport and path network is shown in Figure 3-3. It provides for a comprehensive bus and path network utilising the arterial and connector road network. It also provides for the potential extension of the Epping North rail line to the Town Centre south of Boundary Road.

Figure 3-3 Wollert PSP – Public Transport and Path Network



3.4 Infrastructure Plan and Staging

Clauses 3.9 and 4.7 of the PSP detail required infrastructure provision, responsibilities and staging to meet the progressive development of the PSP area.

Table 13 sets out the Precinct Infrastructure Plan (PIP), including transport items. Projects are grouped into time categories as follows;

- Short - 2015 to 2018
- Medium – 2019 to 2027
- Long – 2028

Transport Items included in the DCP in timing order are summarised in Table 3-1.

Table 3-1 Transport PIP Summary- Short to Medium Term Projects

Short Term

Project	DCP Ref	Description
Craigieburn Rd / Andrew Rd Intersection	IN-02	Provision of land for ultimate intersection and construction of signalised intersection (interim)
Craigieburn Rd / Edgars Rd Intersection	IN-04	Provision of land for ultimate intersection and construction of signalised intersection (interim)

Short to Medium Term

Project	DCP Ref	Description
Craigieburn Rd / Koukoura Dve Intersection	IN-05	Provision of land for ultimate intersection and construction of signalised intersection (interim)
Koukoura Drive from Craigieburn Rd to Gas Easement	RD-01	Provision of land for 34 m reservation ultimate and construction of first carriageway (interim)
Koukoura Dve / Connector Rd Intersection	IN-21	Provision of land for ultimate intersection and construction of signalised intersection (interim)
Craigieburn Rd / Connector Rd (Boundary Rd)	IN-06	Provision of land for ultimate intersection and construction of signalised intersection (interim)

It is noted that the scheduling envisages the early construction of four intersections to Craigieburn Road East, and construction of Koukoura Drive north of Craigieburn Road East, forming the backbone for development of the area progressively from the south.

I understand that this strategy accords closely with the development aspirations of each land interest in the Wollert Consortium.

4 Wollert Development Contributions Plan

4.1 Road and Intersection Projects

The Wollert Development Contributions Plan was exhibited in April 2015 in conjunction with the draft Wollert PSP.

The DCP identifies, amongst other things, transport projects which are considered to be strategically justified. The basis for justification is the report prepared by Aecom in September 2014 *"Strategic Modelling and Sidra: Wollert PSP 1070",* which was exhibited with the amendment.

Road projects are described in Section 2.3.1 of the DCP and accord with the projects identified within the PIP contained in the PSP described in Section 3 above.

The DCP notes:

"The road projects include road construction for the first carriageway, less pavement and works for controlled intersections and associated works. Whilst most road projects will ultimately comprise part of the arterial network, two connector road projects have been included where project funding is considered necessary to facilitate the orderly development of the area".

The exception to this principle is the required construction of Boundary Road between Koukoura Drive and Epping Road as a "new divided carriageway with median". All other future duplicated arterial roads requiring only the construction of the first carriageway, together with the provision of land to facilitate ultimate duplication by others.

Intersection projects are listed in Section 2.3.2 and accord with projects identified in the PSP.

"*DCP intersection projects include controlled intersections and associated works. While most intersection projects will ultimately comprise part of the arterial network, additional intersection projects have been included in the vicinity of the town centres and at key locations required to facilitate key pedestrian and cycle routes. In these instances, these projects have been included where project funding is considered necessary to facilitate the orderly planning of the area."*

It is noted that the generic works description for each intersection project specifies as follows:

"Purchase of land for intersection (ultimate), ultimate design, and apportionment of design and construction of arterial to connector (or boulevard connector or arterial as the case may be) 4-way signalised intersection (interim treatment)."

It is understood that this description requires for each intersection that land to be provided to allow for the anticipated ultimate intersection design, with construction of an interim intersection specified under the DCP which generally forms a "proportion" of the ultimate design.

Cardno was requested to prepare ultimate road and intersection designs to identify land requirements to be included in the DCP and to provide the basis for the design of interim intersections for which the cost of construction would be included in the DCP.

4.2 Calculation of Cost - Development Infrastructure Levy

Table 10 of the DCP specifies a schedule of costs which are allocated for each project, including road and intersection projects. The table also specifies the proportion of the overall costs for each project attributable to the DCP area.

It is noted that all road and intersection projects are 100% funded by the DCP with the exception of construction costs at four intersection projects along Craigieburn Road which are partially funded from other sources as shown in Table 4-1.

Table 4-1 Intersection Projects Partially Funded by Other Sources

Intersection	Construction Cost	Proportion DCP
Craigieburn Road / Andrew Road	$3,584,339	90%
Craigieburn Road / Edgars Road	$3,580,318	90%
Craigieburn Road / Koukoura Drive	$8,797,550	96%
Craigieburn Road / Connector Road	$3,705,314	90%

Costs estimates were prepared by Cardno on behalf of the City of Whittlesea and the MPA based on concept interim designs prepared for each project.

Alternate concept interim intersection designs were prepared for a number of intersections which considered variation on the intersection layout while retaining an agreed overall capacity with respect to intersection control and the number of traffic lanes on each leg. The options considered for these intersections, referred to as “VicRoads” and “Developer” options were essentially as follows.

VicRoads Preferred – Intersection designed to match where possible the ultimate intersection design, minimising reconstruction works required in association with the ultimate duplication of the road.

Developer Preferred – Intersection designed to provide required intersection capacity but minimising the extent of works undertaken in the first instance, usually requiring modification when ultimate duplication occurs.

An example of the options considered is shown in **Appendix A** for the intersection of Koukoura Drive and Boundary Road which shows respectively;

- The concept ultimate intersection (CG140690 T02-20 P6) matching to the proposed duplicated carriageways on the north, east and southern approaches and flaring at the intersection to provide turning lanes. It is noted that tin this case, the western Boundary Road approach is a connector road with an undivided cross-section.
- The **Developer Preferred** interim intersection (CG140690 T04-20 P3) providing for a signalised intersection matching to single carriageway construction on Koukoura Drive and Boundary Road East.
- The **VicRoads Preferred** interim intersection (CG140690 T06-20 P3) providing for a signalised intersection with comparable capacity to the Developer Preferred layout, but with widened medians to match the expected Ultimate concept.

In preparation of costings for the DCP, “template” intersection layouts were adopted providing for a mix between VicRoads and Developer preferred layouts as shown in Table 4-2 and shown in **Appendix B**.

Ultimate intersection layouts prepared by Cardno to determine land requirements and to inform the design of the interim DCP intersections are shown in **Appendix C.**

Table 4-2 Wollert DCP – Interim Intersection Templates Adopted for DCP Costings

DCP Ref	Intersection	Template
IN-01	Epping Road / Craigieburn Road	20 - VR
IN-02	Craigieburn Road / Andrew Road	26-VR
IN-04	Craigieburn Road / Edgars Road	26-VR
IN-05	Craigieburn Road / Koukoura Drive	9-VR
IN-06	Craigieburn Road / Connector Road (Boundary Road)	26-VR
IN-07	Epping Road / Saltlake Boulevard	26-VR
IN-08	Epping Road / Connector	26-VR
IN-09	Epping Road / Boundary Road	9-VR
IN-10	Epping Road / Connector	18-D
IN-13	Summerhill Road / Bodycoats Road	18-CHR
IN-14	Summerhill Road / Edgars Road	18-CHR
IN-15	Summerhill Road / Koukoura Drive	18-CHR
IN-18	Koukoura Drive / Connector to Northern NAC	18-D
IN-20	Koukoura Drive / Boundary Road	20-D
IN-21	Koukoura Drive / Connector Road	20-D
IN-22	Boundary Road / North South connector to MTC (West)	26-VR
IN-23	Boundary Road / North South connector to MTC (East)	18-VR
IN-24	Boundary Road / Bodycoats Road (North)	18-VR
IN-26	Boundary Road / Andrew Road	26-VR
IN-31	Lehmanns Road / Saltlake Boulevard	26-VR
IN-32	Epping Road / Summerhill Road	18-D
IN-33	Boundary Road / MTC Main St	18-VR

I have reviewed the intersection standards adopted for DCP costings and note the following:

- The Vic Roads Preferred option has been adopted for all intersections to declared roads (Craigieburn Road and Epping Road) where duplicated road cross-sections are proposed in the ultimate designs, and Vic Roads are responsible for construction of the second carriageway.
- For intersections to Epping Road, north of Boundary Road, where ultimate duplication is not proposed in the DCP, the smaller Developer Preferred intersections have been adopted.
- Developer Preferred layouts have been adopted for intersections to local arterials, with the exception of Boundary Road and Lehmanns Road.
- The VicRoads Preferred options have been adopted for all intersections along Boundary Road (with the exception of the Koukouras Drive intersection), presumably to match the requirement of the DCP for duplication of Boundary Road east of Koukoura Drive.
- The intersection of Lehmanns Road / Saltwater Drive is specified to the Vic Roads Preferred standard, presumably in anticipation of Vic Roads resuming responsibly for this road in the future.

4.3 Revised DCP Intersection Costs

5 Intersection Standards and Staging

5.1 Craigieburn Road Intersections

The PSP recognises that initial development within the Wollert PSP will occur from the south, with intersections to Craigieburn Road East required to be constructed to provide access to each development area.

Intersections which will provide initial access, all of which are included in the DCP are shown in Table 5-1

Table 5-1 Craigieburn Road Intersections – Initial Development

DCP Ref	Intersection	Development Proponent
IN-06	Connector Road (Boundary Road)	Villawood
IN-05	Koukoura Drive	Evolve
IN-04	Edgars Road	AV Jennings
IN-02	Andrew Road	Greencorp

The DCP requires each intersection to be constructed in accordance with the VicRoads preferred template, seeking to match the ultimate divided cross-section for Craigieburn Road East, with the intersecting road in the PSP area constructed to the design standard nominated in the DCP.

Importantly, each intersection will ultimately form a cross-junction at Craigieburn Road East, connecting to roads to the south. At present, none of the southern legs of the proposed Craigieburn Road intersections have been constructed, although Lend Lease, in association with current development applications for Aurora, have submitted plans prepared by Cardno for construction of Edgars Road, south from Craigieburn Road including a channelized T junction treatments to Craigieburn Road.

It is evident that the initial and then progressive staging of the intersections to Craigieburn Road East bring rise to a number of design, funding and equity issues which in my opinion, should be appropriately recognised within the Wollert PSP and DCP.

These include:

1. The staging of construction of the intersections, having regard to uncertain timing of the development of the southern legs at each location.
2. The desirability of minimising redundant works as the intersection is progressively developed.
3. The appropriate standard for the DCP intersection which, in my opinion, should be to meet the obligations for provision of an intersection to accommodate traffic demands generated by development within the PSP area.
4. The timing of release of DCP funding for the intersection, given that the DCP intersection contemplates a design standard which is unlikely to be required in capacity terms for many years.
5. The desirability of allowing for a three stage intersection development within the DCP, formally adopting what is generally referred to as an “interim / interim” layout and allocating a percentage of DCP funding towards that design.

The DCP contemplates construction of each intersection to an “interim” layout, which to date has not been prepared, with generic templates as described in Section 4.2 utilised for costing purposes.

Concept interim plans have been prepared in association with preparation of this report to illustrate the DCP intersections as envisaged and the issues discussed.

In particular, I have reviewed in detail the development of the Craigieburn Road / Edgars Road intersection to provide an example of the issues identified to illustrate my opinions as to modifications required.

5.2 Staging of Intersections to Craigieburn Road East

It appears likely that each intersection to Craigieburn Road East will be staged, constructed in the first instance as a T junction and then, when the opposite leg is constructed in association with neighbouring development upgraded to a cross-junction.

It can be expected that as a T junction, control without traffic signals will be appropriate, although over time, as volumes on Craigieburn Road East increase, traffic signals may be required before the cross junction is established.

A three stage development at each of the four intersections to Craigieburn Road East is considered likely as described as follows.

5.2.1 IN-06 Connector Road (Boundary Road)

Stage 1 – A connector road is expected to be initially constructed in association with Villawood Development, with a channelized unsignalised intersection constructed to Craigieburn Road. The connector road would be constructed to its ultimate cross-section and the intersection geometry aligned to match a concept design for the future southern leg and upgrading to traffic signals.

Stage 2 - At a time to be determined, the southern leg will be constructed in conjunction with future stages of Aurora and traffic signals installed. Accommodating works would be undertaken on Craigieburn Road to accommodate the signals.

Alternatively, it is possible that, if the southern leg is not constructed prior to signalisation being required due to traffic growth on Craigieburn Road, an alternate Stage 2 scenario providing a signalised T junction may be appropriate. The southern leg, when subsequently constructed would be designed to match the signalisesed T junction, with the cost of providing the southern leg undertaken outside of the Wollert DCP costing framework.

Stage 3- In association with the ultimate duplication of Craigieburn Road, the intersection will be further modified to match the duplicated design, with additional capacity potentially added through construction of additional turning lanes if required.

5.2.2 IN-05 Koukoura Drive

Stage 1- Koukoura Drive is expected to be constructed north from Craigieburn Road East in association with initial stages of the Evolve Development. Koukoura Drive will be constructed as a single carriageway in accordance with the PSP, flaring at Craigieburn Road East to a divided carriageway to match the ultimate design. Initially it is expected that Craigieburn Road East will be widened to provide a channelized unsignalised intersection.

Stage 2- At a time to be determined, the southern leg will be constructed in conjunction with future stages of Aurora and traffic signals installed. Accommodating works would be undertaken on Craigieburn Road East to accommodate signals.

Stage 3- In association with the ultimate duplication of Craigieburn Road, the intersection will be further modified to match the duplicated design, with additional capacity potentially added through construction of additional turning lanes if required.

It is noted that it is possible that Koukoura Drive south will be constructed by Lend Lease separately to the Wollert PSP prior to the northern leg being constructed by Evolve Development. In that scenario, the staging as contemplated for Edgars Road below would most likely occur.

5.2.3 IN-04 Edgars Road

Stage 1 – Lend Lease has lodged plans prepared by Cardno for the construction of Edgars Road south from Craigieburn Road in association with current stages of Aurora. The works contemplate construction of a T intersection and channelized turning lanes in Craigieburn Road East.

Stage 2 – AV Jennings propose to construct the northern leg of the intersection as a connector road, forming a signalised cross-intersection with Edgars Road to the south. The northern leg will be constructed in accordance with the PSP connector road cross-section, flaring to match the ultimate alignment of the northern leg at Craigieburn Road. It is envisaged that the completion of the signalised intersection linking to

the Aurora design would meet capacity requirements for the intersection prior to duplication of Craigieburn Road East and would hence attract DCP funding.

Stage 3- In association with the ultimate duplication of Craigieburn Road East, the intersection will be further modified to match the duplicated design, with additional capacity potentially added through construction of additional turning lanes if required.

5.2.4 IN-02 Andrews Road

Stage 1- Andrews Road is expected to be constructed north from Craigieburn Road East in association with initial stages of the Greencorp Development. Andrews Road is expected to be constructed as a connector road in accordance with the PSP, flaring at Craigieburn Road East to match the ultimate design. Initially it is expected that Craigieburn Road East will be widened to provide a channelized unsignalised intersection.

Stage 2- At a time to be determined, the southern leg will be constructed in conjunction with future stages of development in Epping North and traffic signals installed. Accommodating works would be undertaken on Craigieburn Road East to accommodate signals.

Stage 3- In association with the ultimate duplication of Craigieburn Road East, the intersection will be further modified to match the duplicated design, with additional capacity potentially added through construction of additional turning lanes if required.

5.3 Staging of Intersection - Edgars Road Example

5.3.1 Initial T – Junction

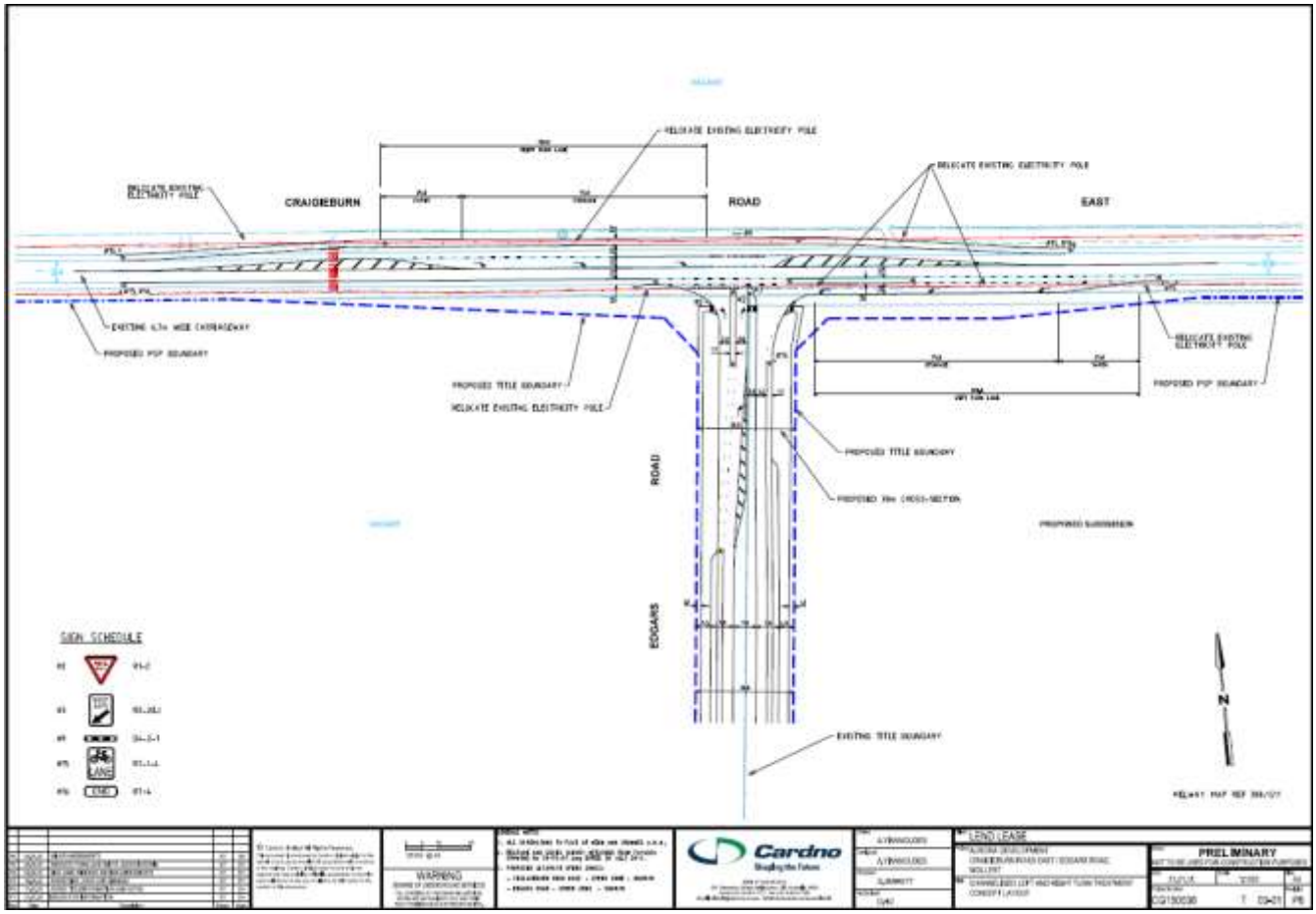
Cardno, on behalf of Lend Lease prepared a concept design for the southern leg of the intersection of Edgars Road and Craigieburn Road East to provide required access to future stages of the Aurora Estate.

The initial T-junction design including on-road bicycle lanes, which was undertaken prior to consideration of the Wollert PSP and ultimate construction standards for Craigieburn Road East effectively provides for widening within the existing Craigieburn Road East reserve for construction of right and left turn lanes at the proposed Edgars Road T intersection.

The works also seek to design Edgars Road south to allow upgrading of the intersection to traffic signals as required.

It is noted that these works are required to facilitate development within the Aurora Development Plan area and are not associated with the Wollert PSP.

Figure 5-1 Edgars Road / Craigieburn Road – T Junction in Association with Aurora

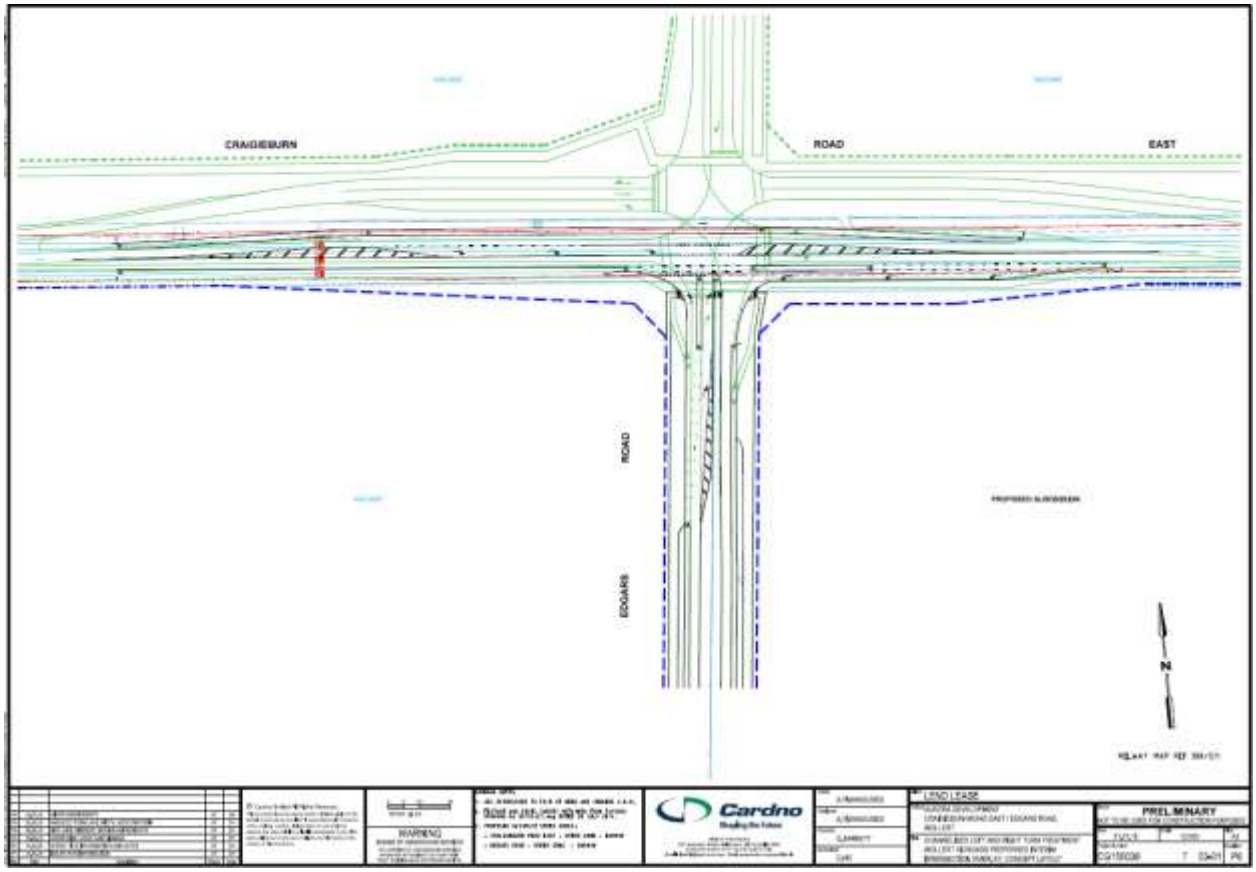


5.3.2 VicRoads Preferred Intersection

The DCP intersection for the Wollert PSP proposes a concept which matches the ultimate duplicated design for Craigieburn Road, including widening of the road reserve along to northern side to accommodate the proposed duplicate carriageway.

The proposed VicRoads preferred interim design is shown in Figure 5-2 overlayed onto the initial T junction design, which illustrates the extent of works required to upgrade the intersection as proposed to be constructed to the DCP intersection.

Figure 5-2 Edgars Road / Craigieburn Road –VicRoads Preferred Interim Design

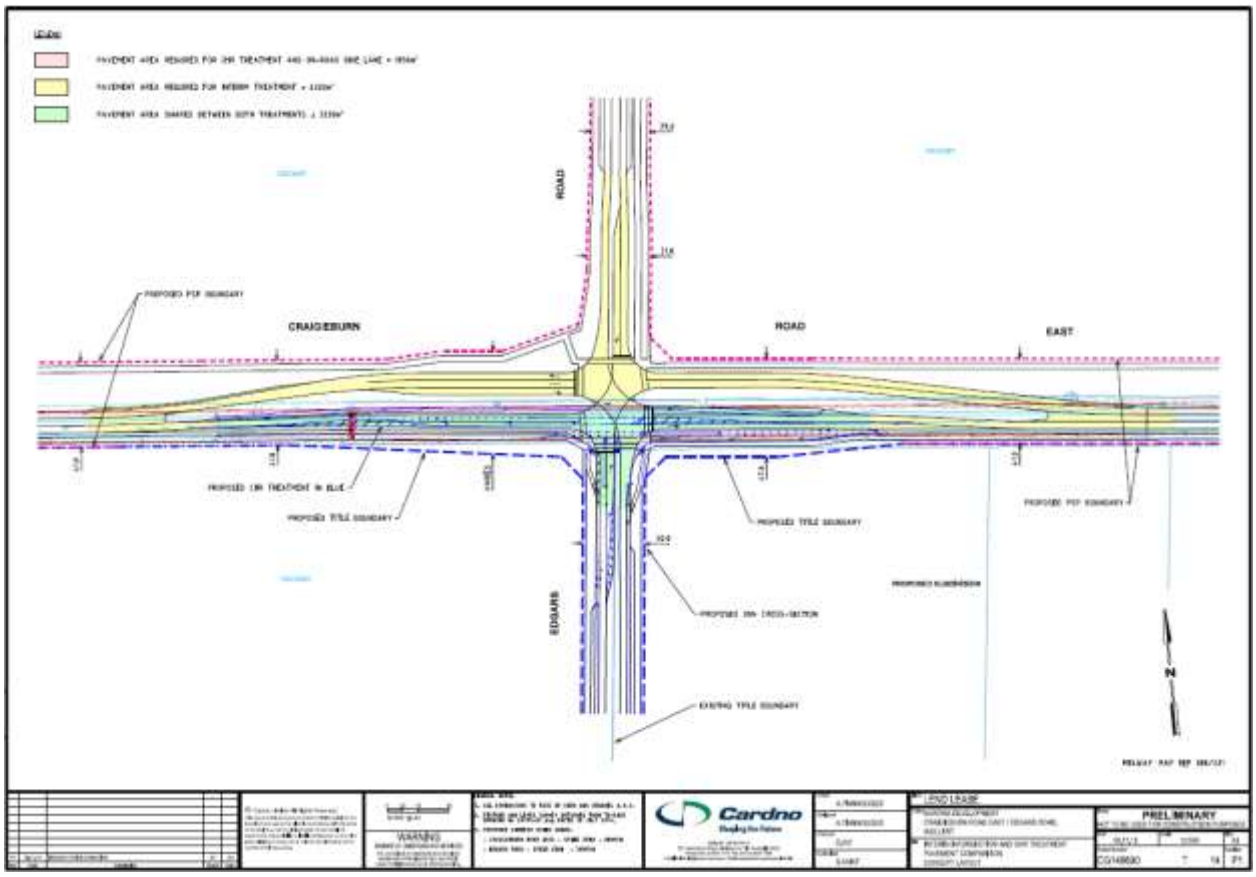


Of note is that, due to the relative alignments of the two layouts, initial construction of the T-junction intersection and on-road bicycle lanes as proposed will be partially redundant for the proposed DCP intersection. To minimise the amount of redundant work, the left turn declaration lane on Craigieburn Road East turning into Edgars Road can be constructed without kerb.

The extent of redundant works is shown in detail in Figure 5-3.

It is noted that the redundant works along the southern kerb largely result from the modification between the initial intersection, which provides on-road bike lanes, to the signalised intersection where the bike lanes are removed in accordance with VicRoads current standards, requiring off road bike paths.

Figure 5-3 Edgars Road / Craigieburn Road – Redundant Works



5.3.3 Modified Alignment to Reduce Redundant Works

It is considered that the inclusion of bike lanes in the initial T junction design is unnecessary (and quite frankly farcical) given that, on-road bike lanes are not expected to be required for the signalised intersection.

To avoid the redundant works it is recommended that the bike lanes be deleted from the T junction design. If this is not possible, retention of on-road bike lanes should be considered for the interim signalised intersection to allow orderly staging of works.

In addition, the initial intersection works should be reviewed to allow for provision of signal conduits and service relocations to match the proposed interim signalised intersection design.

5.3.4 Alternate T junction Design to Match Ultimate

It is understood that the southern leg of the intersection to serve the Aurora Estate will be constructed over the next few months. Following approval of the PSP, I am instructed that AV Jennings propose to lodge a planning application to commence development, with Stage 1 including initial access from Craigieburn Road East through construction of Edgars Road north.

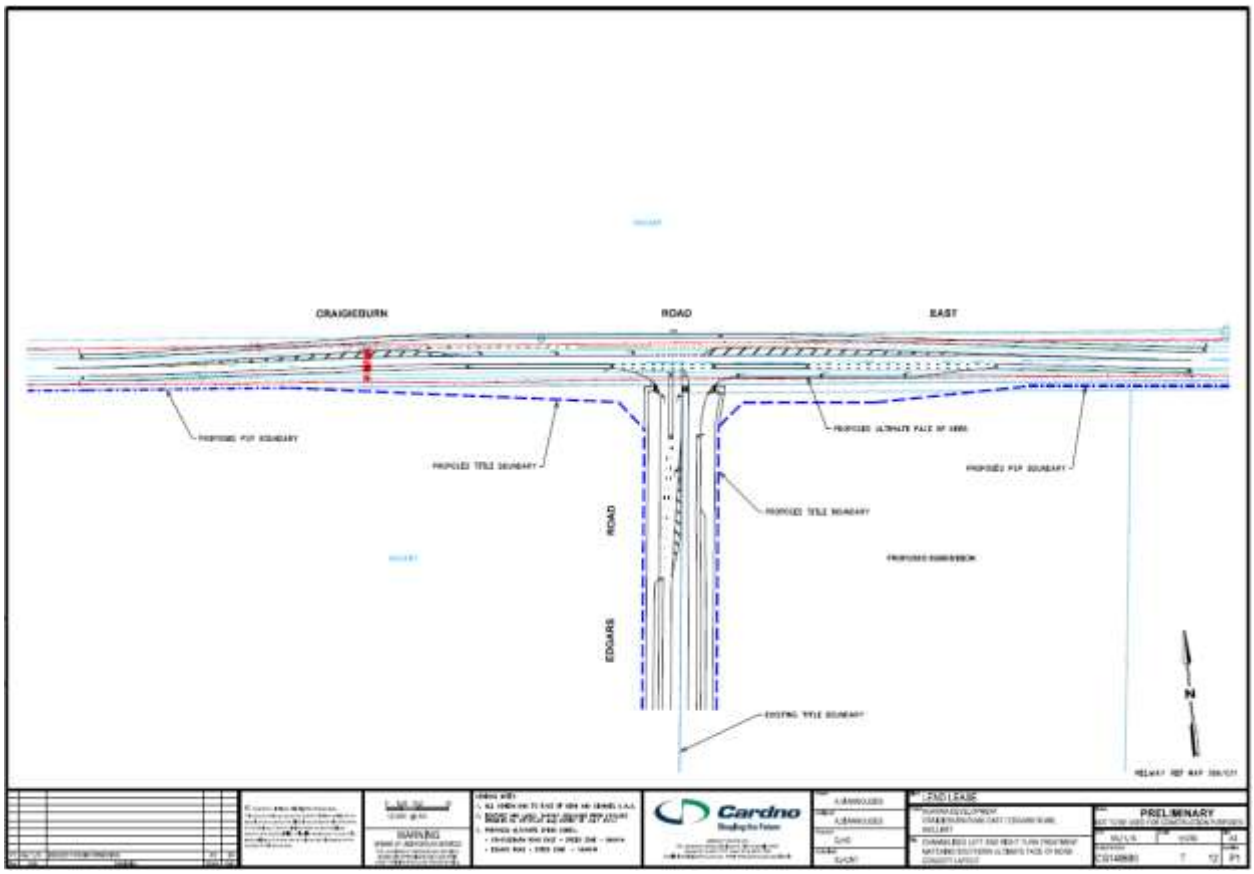
As such, within approximately 12 months of the construction of the initial intersection, it is likely that upgrading and inclusion of a northern leg will occur. As it stands, unless a modified DCP intersection is considered, a portion of the initial T-junction intersection will be redundant and additional costs will occur.

A possible solution is to modify the T junction works proposed by Lend Lease to match the ultimate design as shown in Figure 5-4.

It is noted that to achieve this alignment, widening of the road reserve to the north would be required and the extent of initial works required to be undertaken by Lend Lease is increased. The additional cost to lend Lease could be funded through the DCP.

It is understood that construction of the road on this alignment could not be constructed until the time when the road widening on the north side through a PAO has been undertaken.

Figure 5-4 Edgars Road / Craigieburn Road – Modified T Junction To South Matching Ultimate



5.4 Interim Intersection Requirements

The required standard under the PSP for the construction of intersections along Craigieburn Road East contemplates a design which seeks to conform to the alignment of the ultimate duplicated carriageway.

The geometry of the intersection to achieve this requirement, while matching back to the single carriageway for Craigieburn Road East attributable to the PSP results in a significantly expanded intersection design, with a very wide median at the intersection and extended tapers on the west and east approaches.

In my opinion the requirement for the interim intersection to match ultimate to minimise lost works when Craigieburn Road East is duplicated, while being sensible from a staging of works and overall cost point of view, effectively loads intersection costs within the DCP such that ultimate duplication works are being subsidised.

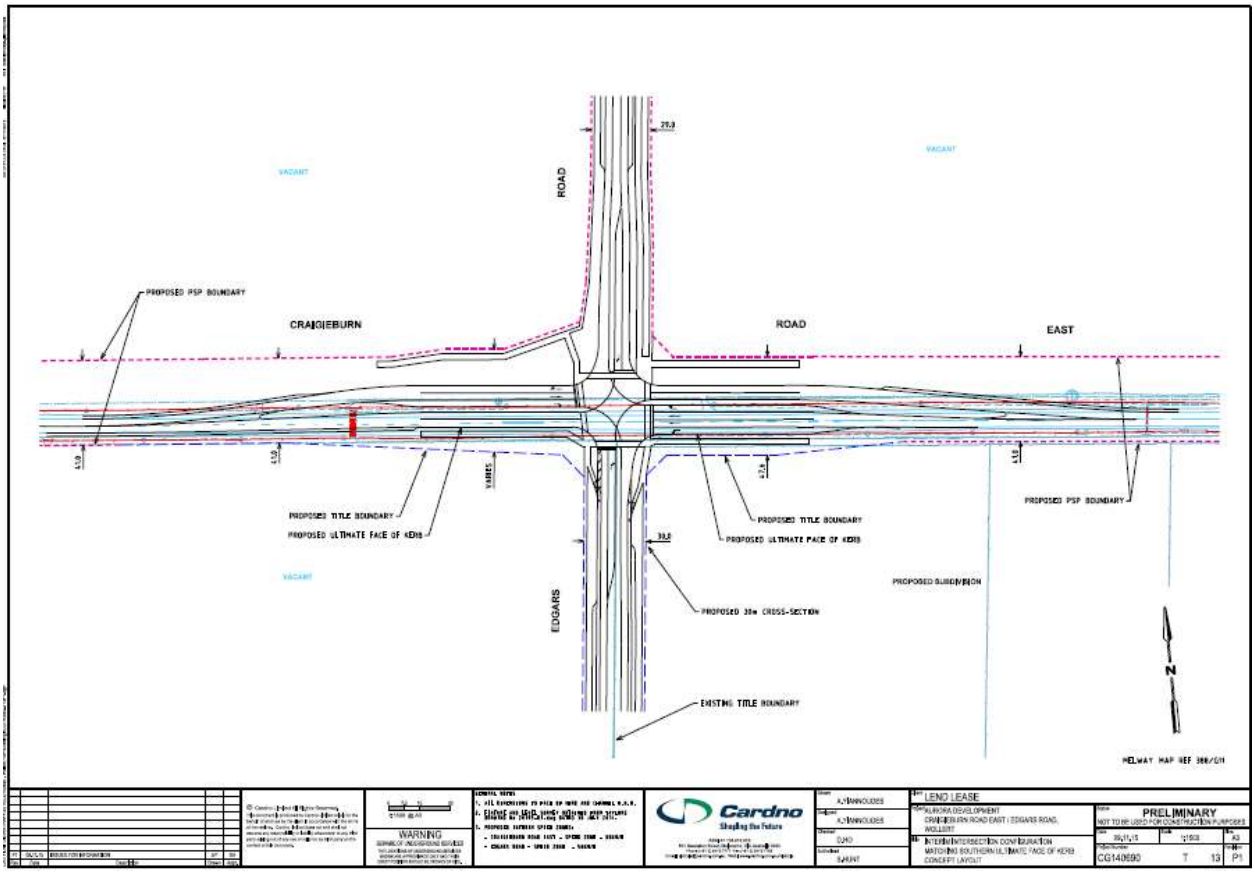
While it is sensible to minimise lost works where possible, if the intersections were to be constructed as proposed, a proportion of the costs of the works should be met from other sources, equivalent to the savings in ultimate duplication costs when the intersecting roads are ultimately duplicated.

As this is unlikely to be achievable practically, in my opinion reduced standards of intersections should be accepted and costed into the DCP, whereby interim intersections only need to meet the requirements for mitigation of development traffic without the additional costs of matching projected ultimate layouts.

In effect, this is the “Developer Preferred” option considered in initial preparation of intersection designs informing the DCP.

An alternate layout for the intersection of Edgars Road / Craigieburn Road has been prepared and is shown in Figure 5-5.

Figure 5-5 Edgars Road / Craigieburn Road – Modified Interim Intersection



The modified interim design provides for effectively identical capacity to the VicRoads Preferred option, however it does not seek to match the ultimate layout for Craigieburn Road East when duplicated.

The design however:

- Meets the capacity requirements for development of the PSP area and growth in traffic on Craigieburn Road prior to duplication,
- Forms a logical addition to the initial T junction treatment proposed by Lend Lease and functionally supported by Vic Roads and Council,
- Reduces the cost of the DCP intersection.

In my opinion, similar intersection designs should be considered for all intersections along Craigieburn Road, forming the basis for development contribution costings.

If adopted, concept intersection designs should then be included in the DCP.

5.5 Interim-interim (Stage1) Intersections

The DCP as drafted provides for the construction of intersections required to serve the PSP area, with the proposed standard of construction at each location designed to provide for the traffic generated by development within the PSP area. The PSP recognises that the construction standard specified at many locations will be further upgraded in the future (by others), such that intersections provided are referred to as "interim" intersection treatments.

The design of the interim intersection is prepared to provide a logical staging to the foreshadowed ultimate layout if possible.

The interim intersection designs are purposefully designed to provide for traffic growth as the area develops and in most instances, provide for a standard which is far above levels of capacity likely to be required in the first instance. As such staging of intersection construction is often undertaken, whereby an initial intersection (or an "interim – interim intersection") is provided to establish access, with the intersection then upgraded as required.

The interim- interim intersection approach is commonly used where one leg of a future cross junction to an arterial road is established initially not requiring control by traffic signals. As development progresses, the fourth leg of the intersection is established and traffic signals installed.

This scenario is expected to occur at most intersections included in the Wollert DCP, including intersections to Craigieburn Road East whereby the southern leg will be constructed by development outside of the Wollert DCP.

The DCP should recognise the likely staging of construction of intersections, to include identification of an interim-interim (or Stage 1) layout prior to the establishment of the DCP interim intersection in the future defining the layout of the Stage 1 intersection and the proportion of the DCP funding for the intersection applicable to the Stage 1 intersection.

The inclusion of agreed "Stage 1" or "interim / interim" treatments for intersections along Craigieburn Road East (and potentially elsewhere) within the PSP is consistent with the practical outcomes regularly negotiated in growth areas, whereby initial works are agreed and constructed to facilitate initial access prior to the DCP intersection works, usually requiring traffic signals and significant road widening are warranted.

Initially each intersection should be constructed to provide safe and efficient access from Craigieburn Road East in a manner which will:

- Provide in capacity terms, for a specified number of lots and agreed traffic growth on Craigieburn Road, ensuring an acceptable design life of the intersection,
- Match as far as possible to the DCP (or Stage 2) intersection configuration so as to avoid redundant works when upgrading is required,
- Allow for partial claims against the DCP allowance for Stage 1 intersections in proportion to the extent of works undertaken towards the Stage 2 intersection,
- Ensure that works undertaken at each intersection are compatible to provide a consistent level of service along Craigieburn Road East,

- Provide for works to be staged where the intersection forms the northern leg of a cross road with intersections to the south from Aurora or Epping North.

It is noted that intersections to Craigieburn Road will form cross intersections with roads being constructed from the south within Aurora and Epping North. I understand that the DCP intersections to Craigieburn Road East are to be funded only by the Wollert DCP with no contribution from Aurora or Epping North, other than construction of the southern leg to suit their requirements.

The staging of works (and cost proportions) will also be potentially be influenced by which leg of the intersection is constructed first. Generally, if the southern leg is not yet constructed, an initial signalised T junction would be adequate as a Stage 1 intersection.

6 Construction Standard of Boundary Road

6.1 Construction Standard as Exhibited

Boundary Road is the westerly extension of Bridge Inn Road, which is currently a rural road running west from Epping Road to Vearings Road. Within the PSP, it is designated as an arterial road (4 lanes) between Epping Road and Koukoura Drive. West of Koukoura Drive, Boundary Road becomes a connector road, swinging south west of Vearings Road to intersect with Craigieburn Road.

The DCP provides for widening of the road from 21 metres to 34 metres between Koukoura Drive and Epping Road, and for the construction of the road as a four lane divided road, effectively to meet ultimate requirements.

Boundary Road and Bridge Inn Road is shown as an arterial road between Koukoura Drive and Yan Yean Road in the Northern Growth Corridor Plan.

The basis for the designation of Boundary Road as an arterial road is derived from modelling undertaken by Aecom in the report "Traffic Modelling and Intersection Analysis- Wollert Precinct Structure Plan prepared for the City of Whittlesea in September 214 and exhibited with the PSP.

Aecom have modelled Boundary Road between Koukoura Drive and Epping Road as carrying between 11,400 and 12,300 vehicles per day in the reference scenario, increasing to up to 13,500 vehicles per day in the "worst case" scenario where Boundary Road provides the only interchange to the E6. In the interim condition at 2026, volumes up to 8,900 vehicles per day are predicted. The volumes as modelled are considered representative of the likely function of the road, given the effective termination of the road at Koukoura Drive.

The designation of the road as a secondary arterial is consistent with the MPA guidelines in "Our Roads: Connecting People" which contemplate a volume range of between 12,000 and 40,000 vehicles per day. Clearly the road will be at the very lower end of the volume range however and, in my view, a lower design standard, potentially as a Boulevard Connector west from Epping Road could be appropriate. It is noted that, in many circumstances, upgrading of a road from a two lane road to four lane divided is only considered when volumes exceed 15,000 to 18,000 vehicles per day.

It is likely that the arterial designation has been adopted to "complete the grid" linking Bridge Inn Road to Koukoura Drive and in this context, I consider it is appropriate.

6.2 Alternate Boundary Road Cross-section

On the 20th Novembers 2015, I was provided with correspondence from the City of Whittlesea in relation to the proposed cross-section for Boundary Road east of Koukoura Drive, and consideration to adoption of an alternate cross-section having regard to modelled volumes using the road, the character of the precinct, the changing land use along its length and the downgraded nature of the road west of Koukoura Drive

The revised cross-sections are shown in Appendix D which effectively down grade the road to a Boulevard Connector, providing for

- a single traffic lane and a parking lane separated by a 4.0 metre median within a 29 metre reservation between Koukoura Drive and Andrew Road, and
- a single traffic lane in either direction (without a parking lane) separated by a 6.0 metre wide median within a 29.0 metre reservation between Andrew Road and Epping Road.

It is understood that the revised cross-section is supported by Council, with the MPA indicating that they are not in a position to support the change without additional information to provide:

1. An understanding of how the proposed cross section will impact on intersection designs,
2. An understanding of how this will impact on the expected volumes on Boundary Road as this scenario was not modelled by Aecom,

3. The impact of the cross section on the ability to deliver the proposed bus routes along Boundary Rd and through intersections on Boundary Road,
4. Whether the proposed pavement width meets emergency services requirements, and
5. Impacts of the proposed concept on the broader road network

I have reviewed the proposed alternate cross-section and consider, with some modification east of Andrew Road, which it provides appropriately for the requirements of the PSP and abutting land uses.

The proposed cross-section will reduce the function of Boundary Road between Koukoura Drive and Epping Road from a four lane arterial road to a two lane connector road.

The modified cross-section between Koukoura Drive and Andrew Road through the Town Centre is effectively the standard cross-section for a Boulevard Connector recommended by the MPA and in my view is the appropriate cross-section to accommodate projected volumes and traffic function including operation as a bus route.

The alternate cross-section between Andrew Road and Epping Road providing a single traffic lane in each direction is also appropriate, however the traffic lanes will need to be widened from 3.5 metres as shown to a minimum of 5.0 metres to enable buses to pass another vehicle in a breakdown situation. This dimension is also required for emergency service access. This can be achieved by either continuing the parking lane east of Andrew Road or simply widening the carriageway into the median and / or verge on each side.

With respect to the further information sought by the MPA to enable them to consider the option, I provide the following comments:

- The revised cross-section will modify the intersection designs, which at present contemplate intersections designed to match the current arterial four lane cross-section for the road, noting that the road reservation narrows from 33.8 metres to 29 metres for the boulevard connector option. The intersections will be smaller as the median width is reduced. Potentially the reduction of the mid-block road capacity to a single lane in each direction can run through each intersection, with flaring to allow for development of turning lanes. This would further reduce the size (and cost) of the intersections. Flaring on each approach is desirable to provide two through stand-up lanes on Boundary Road at intersections to reduce queueing. Through the town centre, this can be achieved by converting the parking lane to a traffic lane through each intersection. East of Andrew Road, flaring on the approach to intersections can be achieved to provide two stand-up lanes as required.

- The proposed 4.0 metre median through the town centre is appropriate provided that staging of pedestrian movements in the median is not required at signalised intersections, given that a residual width of only 1 metre would be available when a 3.0 metre turn lane is provided within the median on the approach to an intersection. In my view, pedestrian movements across Boundary Road can and should be accommodated within a single movement along Boundary Road, with sufficient capacity available to not require pedestrian staging usually only provided to reduce green time to the intersecting roads to achieve arterial through capacity.

- The modelling undertaken by Aecom considers a base case and 6 different scenarios which test different interchange options to the E6 and reductions in traffic lanes on Craigieburn Rd, Koukoura Drive and Summerhill Road. In all options Boundary Road is modelled as a four lane divided arterial. Daily volumes on Boundary Road, even in the worst case scenario of Boundary Road providing the only interchange to the E6, remain below 12,500 vehicles per day, well within the capacity of the road as modelled. Reducing the capacity of the road to a Boulevard Connector is unlikely to result in significant changes to the modelled network, with the volumes as modelled effectively matching the proposed function of Boundary Road and its role in providing access to the Town Centre.

- Provided the carriageway is widened a minimum of 5.0 metres east of Andrew Road and sufficient capacity and bus priority is provided through the intersections, the proposed alternate cross-section will not compromise the delivery of the bus route.

- Emergency service requirements are met, provided the pavement is widened east of Andrew Road.

- The adoption of the proposed cross-section, as discussed above, is not expected to compromise the concept for the broader road network.

Intersections along Boundary Road within the DCP should be modified to provide for matching of the design to a single carriageway road.

7 Construction Standard of Summerhill Road

7.1 Construction Standard as Exhibited

Summerhill Road, which forms the norther boundary of the PSP area is a local road which runs east from Brookville Road / Amaroo Road Craigieburn to Epping Road, doglegging north at Bodycoats Road.

It is proposed to ultimately upgrade Summerhill Road to an arterial road, providing a four lane divided cross-section within a 34 metre reservation. East of Bodycoats Road, it is proposed to realign Summerhill Road to provide a direct connection to Epping Road, intersecting with Masons Lane providing connectivity to the east and potentially an interchange with the future E6.

The DCP provides for the provision of land for the widening of the road reserve along the existing alignment between Koukoura Drive and Bodycoats Road by widening the existing reservation to the south, and reconstruction of the existing carriageway to a two lane road to urban standard, and upgrading of Bodycoats Road / Summerhill Road to Epping Road (along the existing alignment).

The funding responsibility for the creation of the proposed realignment of the road east of Bodycoats Road or the ultimate duplication of Summerhill Road is unclear.

VITM modelling undertaken by Aecom estimate 2046 volumes of approximately 14,000 vehicles per day using Summerhill Road west of Koukoura Drive, assuming a connective route running from Mt Ridley Road across the Hume Freeway to an interchange with the E6 at Masons Road. Interim 2026 volumes of between 300 and 1,000 vehicles per day are modelled for Summerhill Road, indicating little or no reliance on Summerhill Road to cater for PSP generated traffic.

7.2 Future Function of Summerhill Road

It is apparent that Summerhill Road, forming the northern boundary of the Wollert PSP area and with limited connection available to the east and west will provide a very limited role in the transport network of the Wollert PSP.

Modelling of ultimate volumes suggest that Summerhill Road, forming part of a future “one mile grid” may assume an arterial function in the regional context, depending on future decisions in relation to connectivity to the west across the Hume Freeway and connection to the eat to the future OMR / E6.

It is considered that the concept in the DCP of requiring construction of the existing carriageway to urban standard is appropriate and the option to widen the road reserve in the future to allow potential upgrading to a four lane divided arterial is prudent in a regional; sense.

It is noted that similar widening reservations have been provided on east west arterial roads within the Northern Growth Corridor by widening to the north, including Craigieburn Road on the southern boundary of the Wollert PSP, Harvest Home Road and O’Herns Road to the south and Donnybrook Road to the north.

In my opinion, the inclusion of road widening for Summerhill Road, if required, should be designated on the north side of the existing road reserve, which in this case is within the Green Wedge Zone. Relocation of the widening to the north is not only consistent with previous strategies adopted for east west roads, but allows for maximisation of development within the Urban Growth Zone, while still preserving the option of regional connections to be provided in the future.

8 Conclusions

Based on my assessment of the Wollert PSP and DCP as exhibited, I have concluded the following with respect to the issues I have been asked to assess.

1. The Wollert PSP as exhibited provides for an appropriate transport network designed to accommodate that transport requirements of the PSP area, matching to the overall strategic network planned for the Northern Growth Corridor.
2. The designation of Craigieburn Road East as a future primary arterial road is appropriate, including allowance for future ultimate construction as a 6 lane arterial road by Vic Roads as may be required to accommodate regional traffic movements, as well as access to the Wollert PSP area.
3. Boundary Road is expected to ultimately act as an east-west connector road with the function of the road reinforced by limited connectivity to the west. The downgrading of Boundary Road from a four lane arterial road to a Boulevard Connector Road east of Koukoura Drive is considered appropriate and consistent with projected ultimate traffic volumes and management of the route through the Town Centre.
4. Summerhill Road, which forms the northern boundary of the PSP, will provide a very limited role in the transport network serving the PSP with reconstruction of the existing road to urban standard considered appropriate. Future upgrading of the road to an arterial function will depend on regional road connectivity provided, with road widening to allow for ultimate duplication transferred to the northern side of the existing roadway to lane within the Green Wedge Zone.
5. Intersection standards contemplated within the DCP are designed to accommodate traffic volumes generated by the development of the overall PSP area, with design standards likely to exceed the intersection requirements for initial development. As such, the DCP should recognise the likely staging of construction of intersections, to include identification of an interim-interim (or Stage 1) layout prior to the establishment of the DCP interim intersection in the future defining the layout of the Stage 1 intersection and the proportion of the DCP funding for the intersection applicable to the Stage 1 intersection.
6. The requirement for the interim intersection to match ultimate to minimise lost works when Craigieburn Road East is duplicated, while being sensible from a staging of works and overall cost point of view, effectively loads intersection costs within the DCP such that ultimate duplication works are being subsidised.
7. While it is sensible to minimise lost works where possible, if the intersections were to be constructed as proposed, a proportion of the costs of the works should be met from other sources, equivalent to the savings in ultimate duplication costs when the intersecting roads are ultimately duplicated.
8. As this is unlikely to be achievable practically, in my opinion reduced standards of intersections should be accepted and costed into the DCP, whereby interim intersections only need to meet the requirements for mitigation of development traffic without the additional costs of matching projected ultimate layouts.

Expert Evidence - Traffic

APPENDIX

A

KOUKOURA DRIVE / BOUNDARY ROAD INTERSECTION DESIGNS

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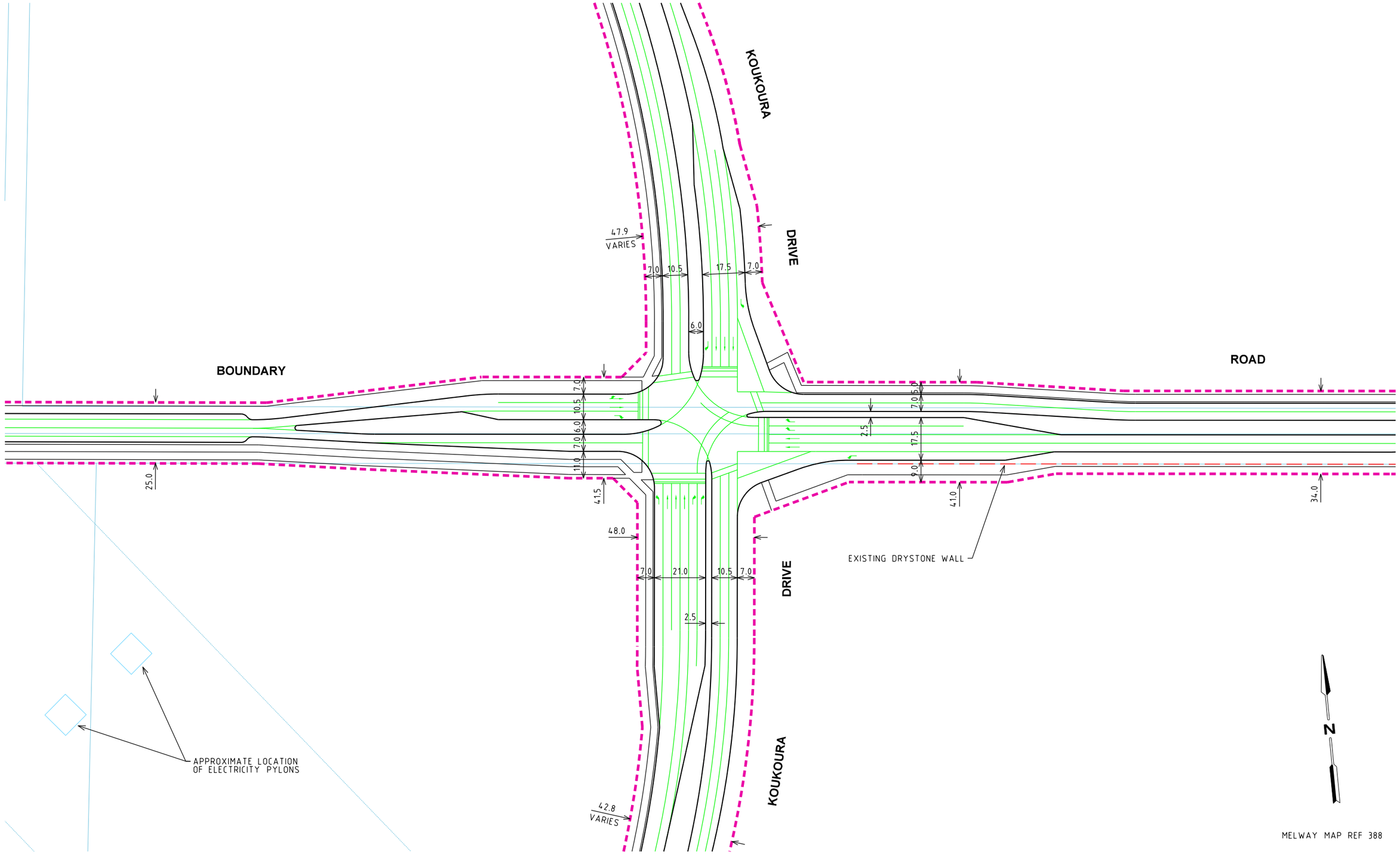

MELWAY MAP REF 388

FOR DISCUSSION ONLY

Rev	Date	Description	Drawn	Appr.
P6	11.05.15	CRAIGIEBURN RD EAST AND KOUKOURA DVE BATTER INFO ADDED	AY	DH
P5	19.03.15	INTERSECTIONS 1, 7, 8, 9, 10, 26 & 32 AMENDED AS PER COMMENTS	AY	DH
P4	09.01.15	INTERSECTION 4 AMENDED AS PER COMMENTS	AY	DH
P3	08.12.14	AMENDED AS PER REVISED ALIGNMENTS AND INTERSECTIONS	AY	DH
P2	15.10.14	MODIFIED AS PER COMMENTS	AY	DH
P1	12.09.14	ISSUED FOR INFORMATION	AY	DH

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GENERAL NOTES
1. ALL DIMENSIONS TO FACE OF KERB AND CHANNEL U.N.O.
2. CADASTRAL INFORMATION OBTAINED FROM VICMAP DATA.
3. PROPOSED ULTIMATE SPEED ZONES:
   - KOUKOURA DRIVE - SPEED ZONE - 80KM/H
   - BOUNDARY ROAD (EAST) - SPEED ZONE - 60KM/H
   - BOUNDARY ROAD (WEST) - SPEED ZONE - 50KM/H

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Authorised: D.HO

Client: WOLLERT PSP
Project: WOLLERT PSP
WOLLERT
KOUKOURA DRIVE / BOUNDARY ROAD
Title: ULTIMATE INTERSECTION DESIGN
FUNCTIONAL LAYOUT
INTERSECTION 20

Status: PRELIMINARY
NOT TO BE USED FOR CONSTRUCTION PURPOSES

Date	Scale	Size
12.09.14	1:1500	A3

Project Number	Sheet Number	Revision
CG140690	T02 - 20	P6

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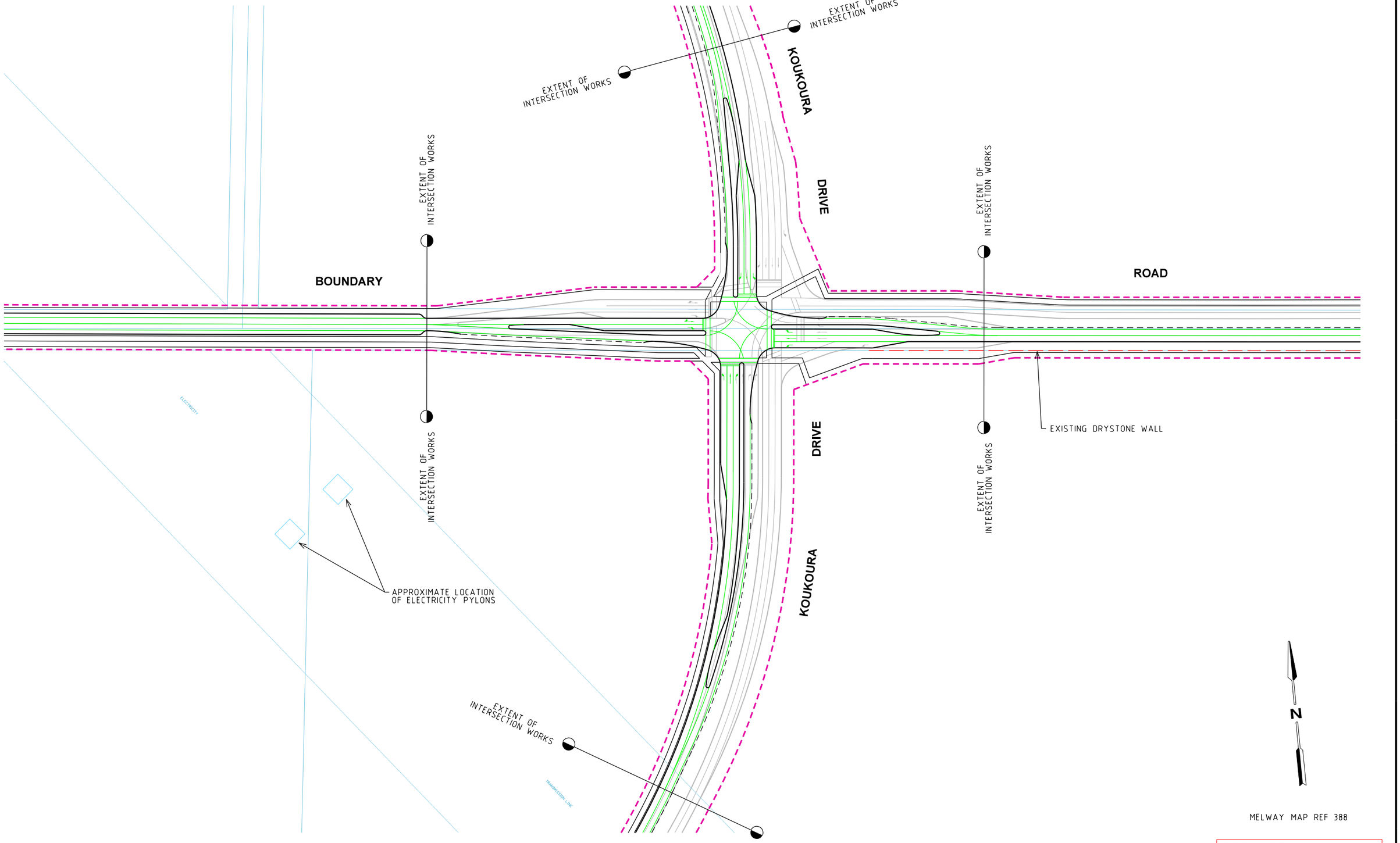

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Rev	Date	Description	Drawn	Appr.
P3	05.12.14	AMENDED AS PER COMMENTS	AY	DH
P2	21.10.14	AMENDED AS PER COMMENTS	BVH	DH
P1	10.10.14	ISSUED FOR INFORMATION	AY	DH

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2. CADASTRAL INFORMATION OBTAINED FROM VICMAP DATA.
3. PROPOSED INTERIM SPEED ZONES:
   - KOUKOURA DRIVE - SPEED ZONE - 60KM/H
   - BOUNDARY ROAD (EAST) - SPEED ZONE - 60KM/H
   - BOUNDARY ROAD (WEST) - SPEED ZONE - 50KM/H

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Authorised: D.HO

Client: WOLLERT PSP
Project: WOLLERT PSP
WOLLERT
KOUKOURA DRIVE / BOUNDARY ROAD
Title: DRAFT INTERIM INTERSECTION DESIGN
CONSORTIUM PREFERRED - FUNCTIONAL LAYOUT
INTERSECTION 20

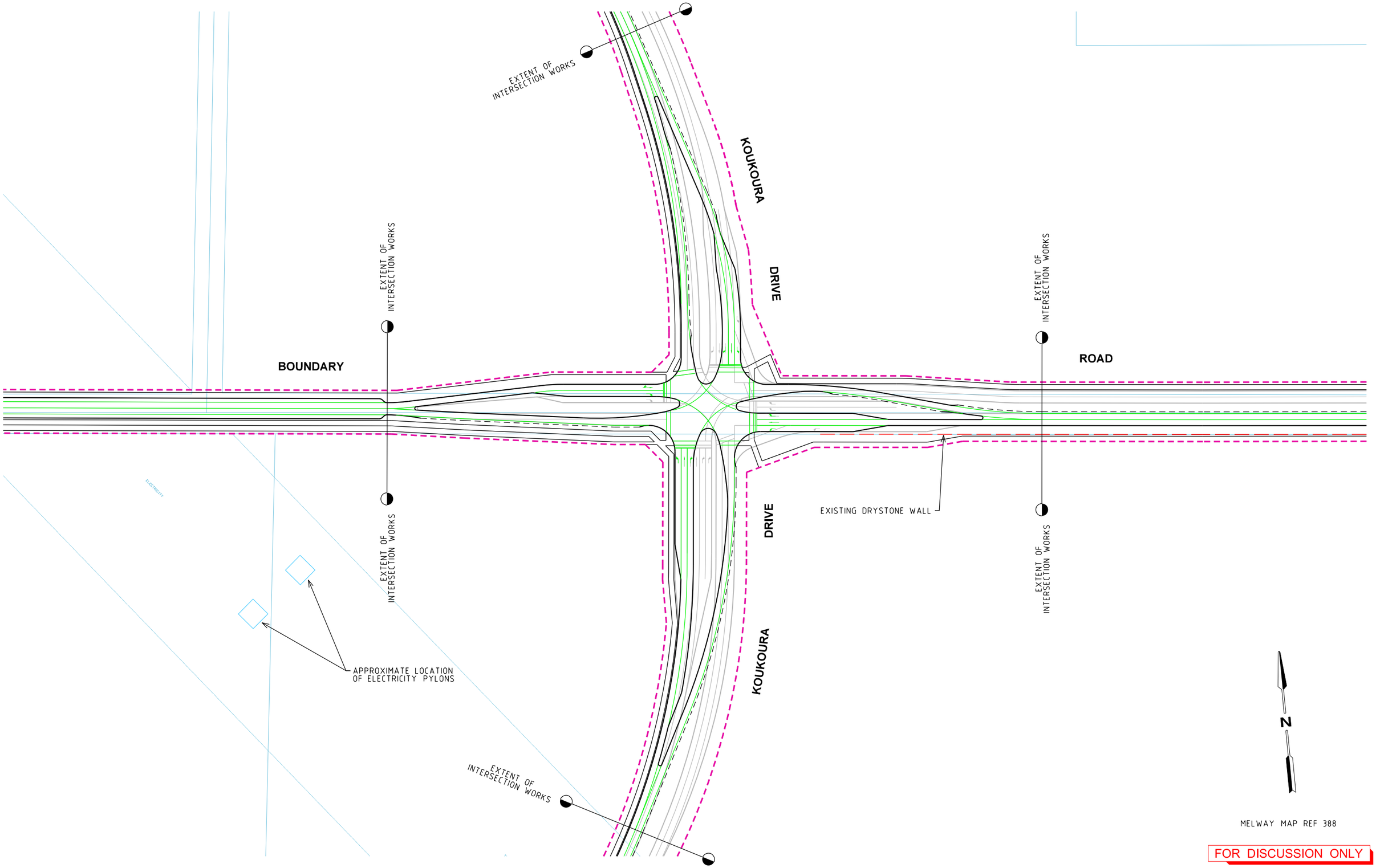
Status: PRELIMINARY
NOT TO BE USED FOR CONSTRUCTION PURPOSES

Date	Scale	Size
10.10.14	1:2000	A3

Project Number	Sheet Number	Revision
CG140690	T04 - 20	P3

CAD FILE: O:\DRAT\RAFF\2014\CG140690 - Wollert PSP\Drawings\CG140690-T04P3.dgn

DATE PLOTTED: 5/12/2014 4:13:17 PM BY: andrew.yiannoudes



MELWAY MAP REF 388

FOR DISCUSSION ONLY

Rev	Date	Description	Drawn	Appr.
P3	05.12.14	AMENDED AS PER COMMENTS	AY	DH
P2	21.10.14	ISSUED FOR INFORMATION	BVH	DH
P1	10.10.14	ISSUED FOR INFORMATION	AY	DH

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0 10 20 40
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2. CADASTRAL INFORMATION OBTAINED FROM VICMAP DATA.
3. PROPOSED INTERIM SPEED ZONES:
   - KOUKOURA DRIVE - SPEED ZONE - 60KM/H
   - BOUNDARY ROAD (EAST) - SPEED ZONE - 60KM/H
   - BOUNDARY ROAD (WEST) - SPEED ZONE - 50KM/H

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Drawn: A.YIANNOUDES
Designed: A.YIANNOUDES
Checked: G.JARRETT
Authorised: D.HO

Client: WOLLERT PSP
Project: WOLLERT PSP
WOLLERT
KOUKOURA DRIVE / BOUNDARY ROAD
Title: DRAFT INTERIM INTERSECTION DESIGN
MPA / VICROADS PREFERRED - FUNCTIONAL LAYOUT
INTERSECTION 20

Status: PRELIMINARY
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Date	Scale	Size
10.10.14	1:2000	A3

Project Number	Sheet Number	Revision
CG140690	T06 - 20	P3

CAD FILE: O:\DRAT\RAFP\2014\CG140690 - Wollert PSP\Drawings\CG140690-T06P3.dgn

Expert Evidence - Traffic

APPENDIX

B

WOLLERT DCP – TEMPLATE INTERSECTIONS

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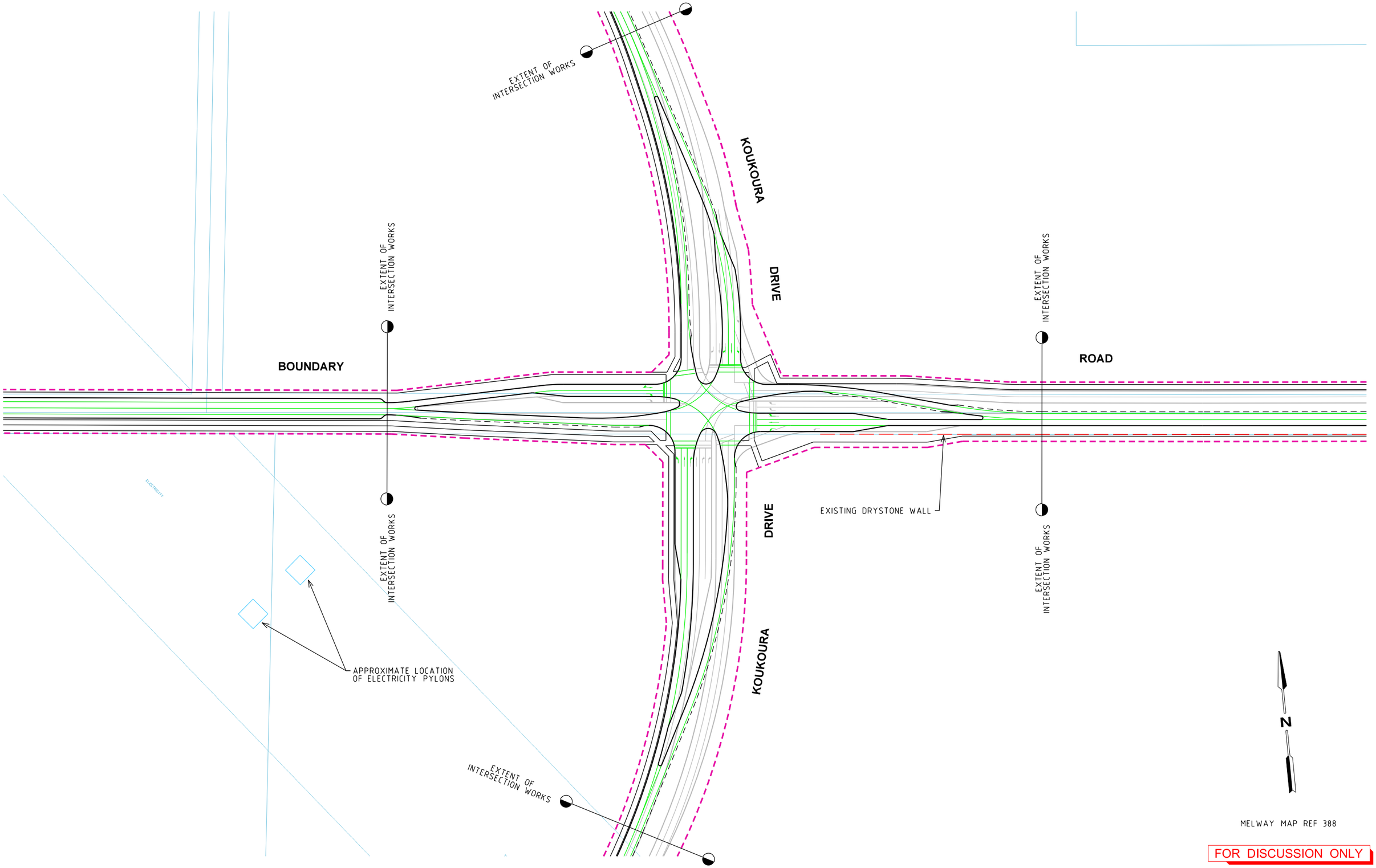

MELWAY MAP REF 388

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Rev	Date	Description	Drawn	Appr.
P3	05.12.14	AMENDED AS PER COMMENTS	AY	DH
P2	21.10.14	ISSUED FOR INFORMATION	BVH	DH
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   - BOUNDARY ROAD (EAST) - SPEED ZONE - 60KM/H
   - BOUNDARY ROAD (WEST) - SPEED ZONE - 50KM/H

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Drawn: A.YIANNOUDES
Designed: A.YIANNOUDES
Checked: G.JARRETT
Authorised: D.HO

Client: WOLLERT PSP
Project: WOLLERT PSP
WOLLERT
KOUKOURA DRIVE / BOUNDARY ROAD
Title: DRAFT INTERIM INTERSECTION DESIGN
MPA / VICROADS PREFERRED - FUNCTIONAL LAYOUT
INTERSECTION 20

Status: PRELIMINARY
NOT TO BE USED FOR CONSTRUCTION PURPOSES

Date	Scale	Size
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Project Number	Sheet Number	Revision
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CAD FILE: O:\DRAT\RAFP\2014\CG140690 - Wollert PSP\Drawings\CG140690-T06P3.dgn

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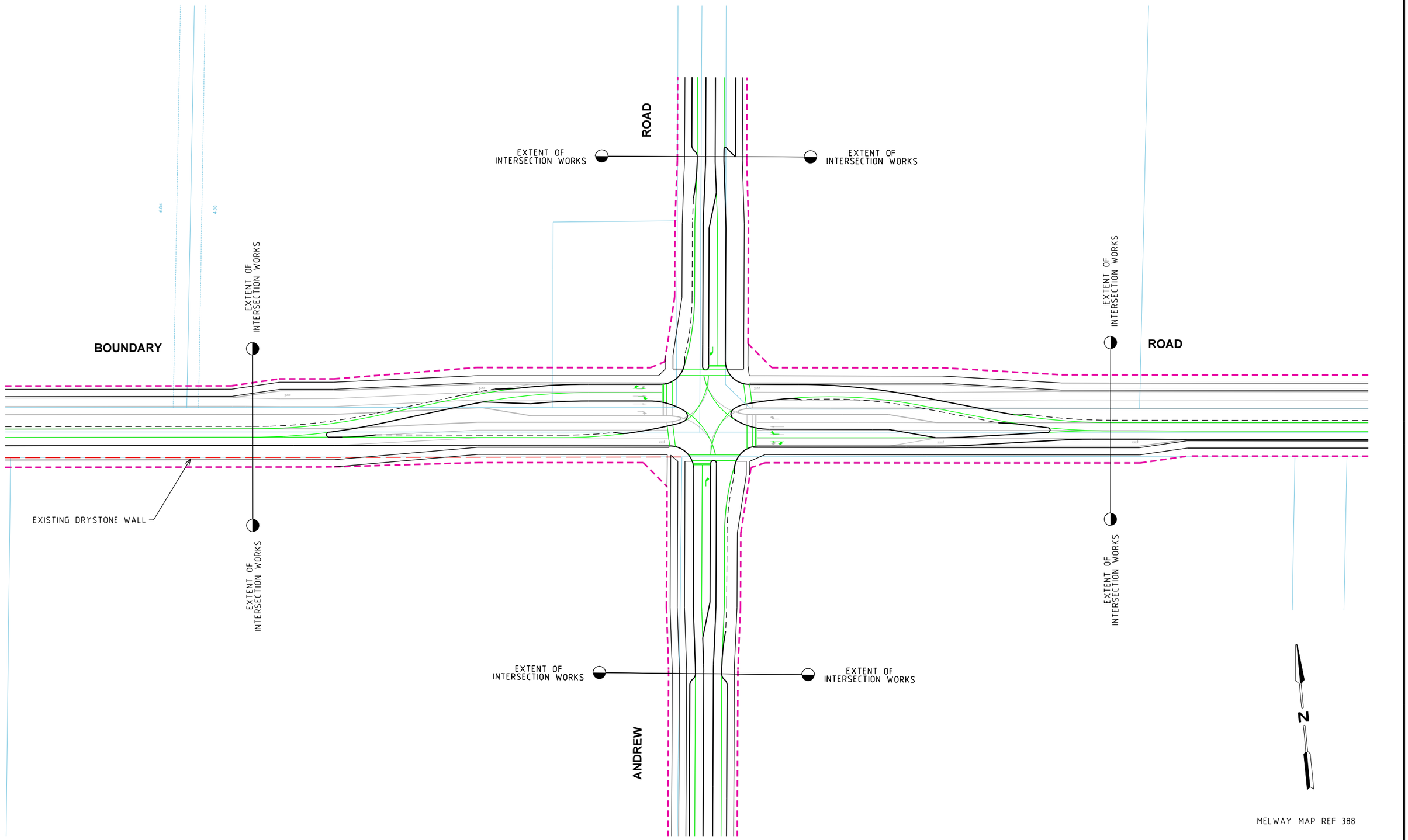

MELWAY MAP REF 388

FOR DISCUSSION ONLY

Rev	Date	Description	Drawn	Appr.
P3	05.12.14	AMENDED AS PER COMMENTS	AY	DH
P2	21.10.14	ISSUED FOR INFORMATION	BVH	DH
P1	13.10.14	ISSUED FOR INFORMATION	AY	DH

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0 7.5 15 30
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2. CADASTRAL INFORMATION OBTAINED FROM VICMAP DATA.
3. PROPOSED INTERIM SPEED ZONES:
   - BOUNDARY ROAD - SPEED ZONE - 60KM/H
   - CONNECTOR ROADS - SPEED ZONE - 50KM/H

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Designed: A.YIANNOUDES
Checked: G.JARRETT
Authorised: D.HO

Client: WOLLERT PSP
Project: WOLLERT PSP
WOLLERT
BOUNDARY ROAD / ANDREW ROAD
Title: DRAFT INTERIM INTERSECTION DESIGN
MPA / VICROADS PREFERRED - FUNCTIONAL LAYOUT
INTERSECTION 26

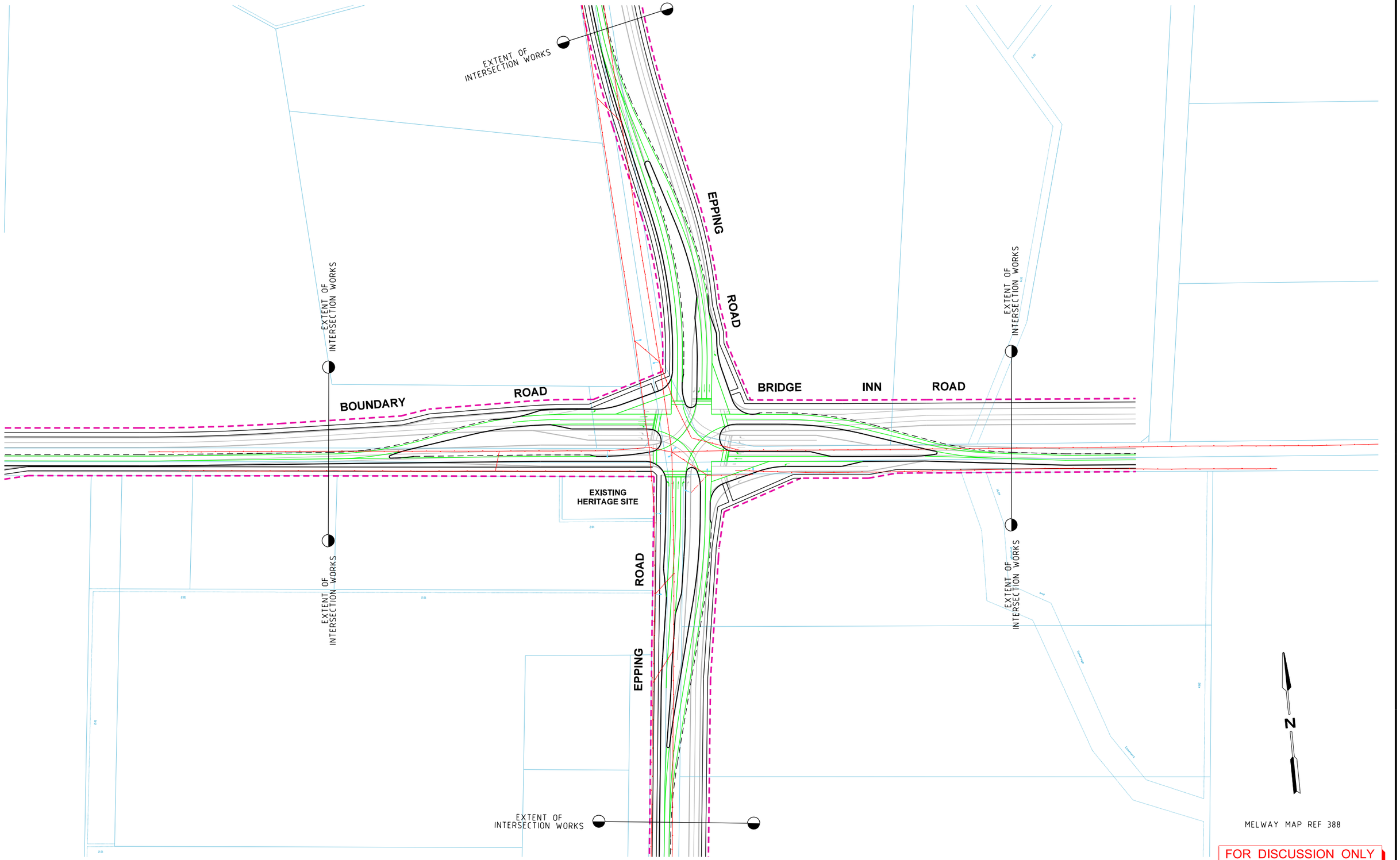
Status: PRELIMINARY
NOT TO BE USED FOR CONSTRUCTION PURPOSES

Date	Scale	Size
13.10.14	1:1500	A3

Project Number	Sheet Number	Revision
CG140690	T06 - 26	P3

CAD FILE: O:\DRAT\RAFF\2014\CG140690 - Wollert PSP\Drawings\CG140690-T06P3.dgn

DATE PLOTTED: 18/12/2014 3:12:46 PM BY: andrew.yiannoudes



MELWAY MAP REF 388

FOR DISCUSSION ONLY

Rev	Date	Description	Drawn	Appr.
P3	05.12.14	AMENDED AS PER COMMENTS	AY	DH
P2	21.10.14	ISSUED FOR INFORMATION	BVH	DH
P1		NO ISSUE	AY	DH

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2. CADASTRAL INFORMATION OBTAINED FROM VICMAP DATA.
3. PROPOSED ULTIMATE SPEED ZONES:
- EPPING ROAD - SPEED ZONE - 60KM/H
- BOUNDARY ROAD - SPEED ZONE - 60KM/H
- BRIDGE INN ROAD - SPEED ZONE - 60KM/H

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Designed: A.YIANNOUDES
Checked: G.JARRETT
Authorised: D.HO

Client: WOLLERT PSP
Project: WOLLERT PSP
WOLLERT
EPPING ROAD / BOUNDARY ROAD / BRIDGE INN ROAD
Title: DRAFT INTERIM INTERSECTION DESIGN
MPA / VICROADS PREFERRED - FUNCTIONAL LAYOUT
INTERSECTION 9

Status: PRELIMINARY
NOT TO BE USED FOR CONSTRUCTION PURPOSES
Date: 22.09.14 | Scale: 1:2500 | Size: A3
Project Number: CG140690 | Sheet Number: T06 - 09 | Revision: P3

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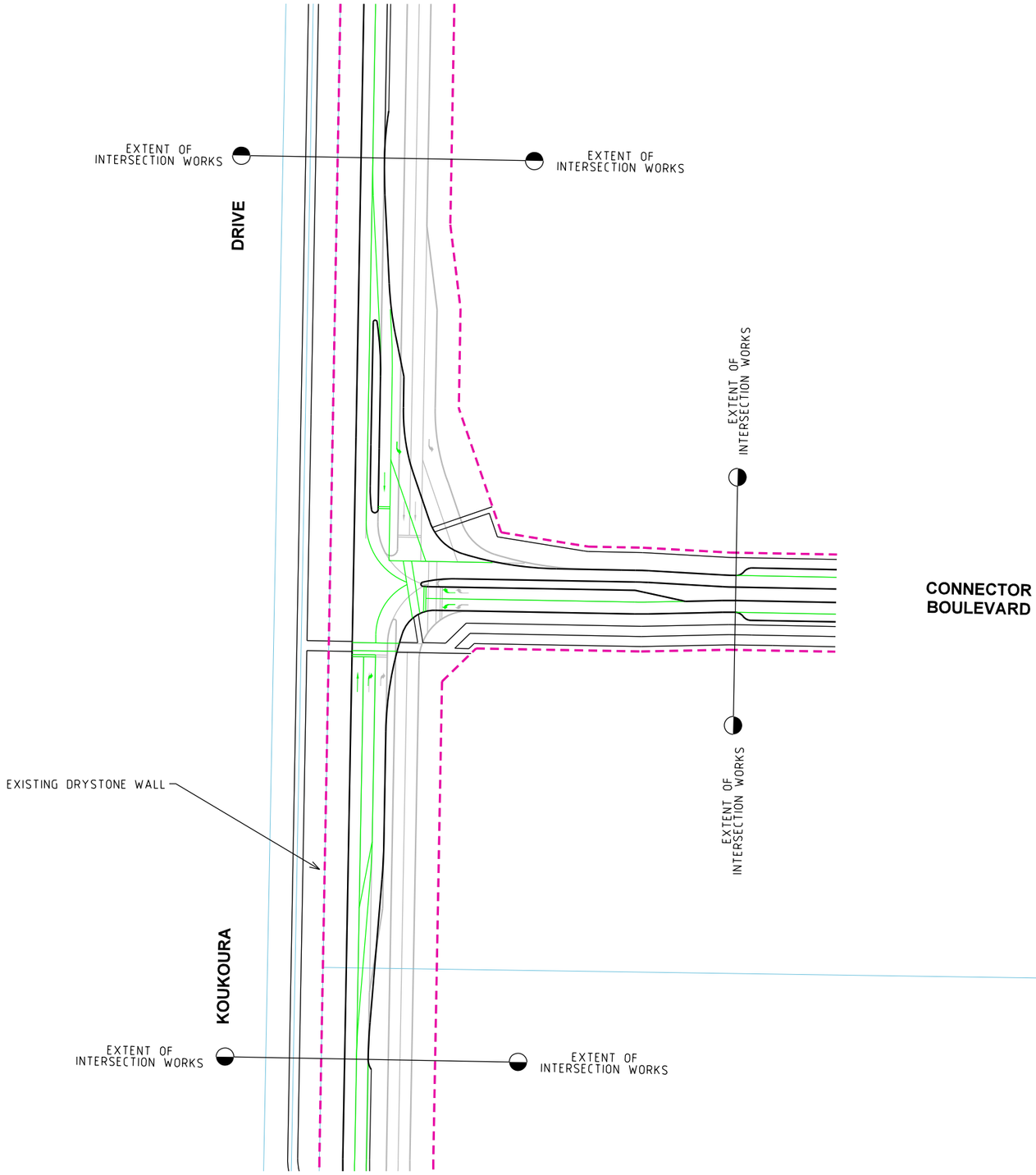
DATE PLOTTED: 5/12/2014 4:33:04 PM BY: andrew.yiannoudes



MELWAY MAP REF 388

FOR DISCUSSION ONLY

Rev	Date	Description	Drawn	Appr.
P3	05.12.14	AMENDED AS PER COMMENTS	AY	DH
P2	21.10.14	AMENDED AS PER COMMENTS	BVH	DH
P1	08.10.14	ISSUED FOR INFORMATION	AY	DH

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2. CADASTRAL INFORMATION OBTAINED FROM VICMAP DATA.
3. PROPOSED INTERIM SPEED ZONES:
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   - CONNECTOR ROAD - SPEED ZONE - 50KM/H

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Designed	A.YIANNOUDES
Checked	G.JARRETT
Authorised	D.HO

Client: WOLLERT PSP
Project: WOLLERT PSP
WOLLERT
KOUKOURA DRIVE / CONNECTOR ROAD
Title: DRAFT INTERIM INTERSECTION DESIGN
CONSORTIUM PREFERRED - FUNCTIONAL LAYOUT
INTERSECTION 18

Status: **PRELIMINARY**
NOT TO BE USED FOR CONSTRUCTION PURPOSES

Date	Scale	Size
08.10.14	1:1500	A3

Project Number	Sheet Number	Revision
CG140690	T04 - 18	P3

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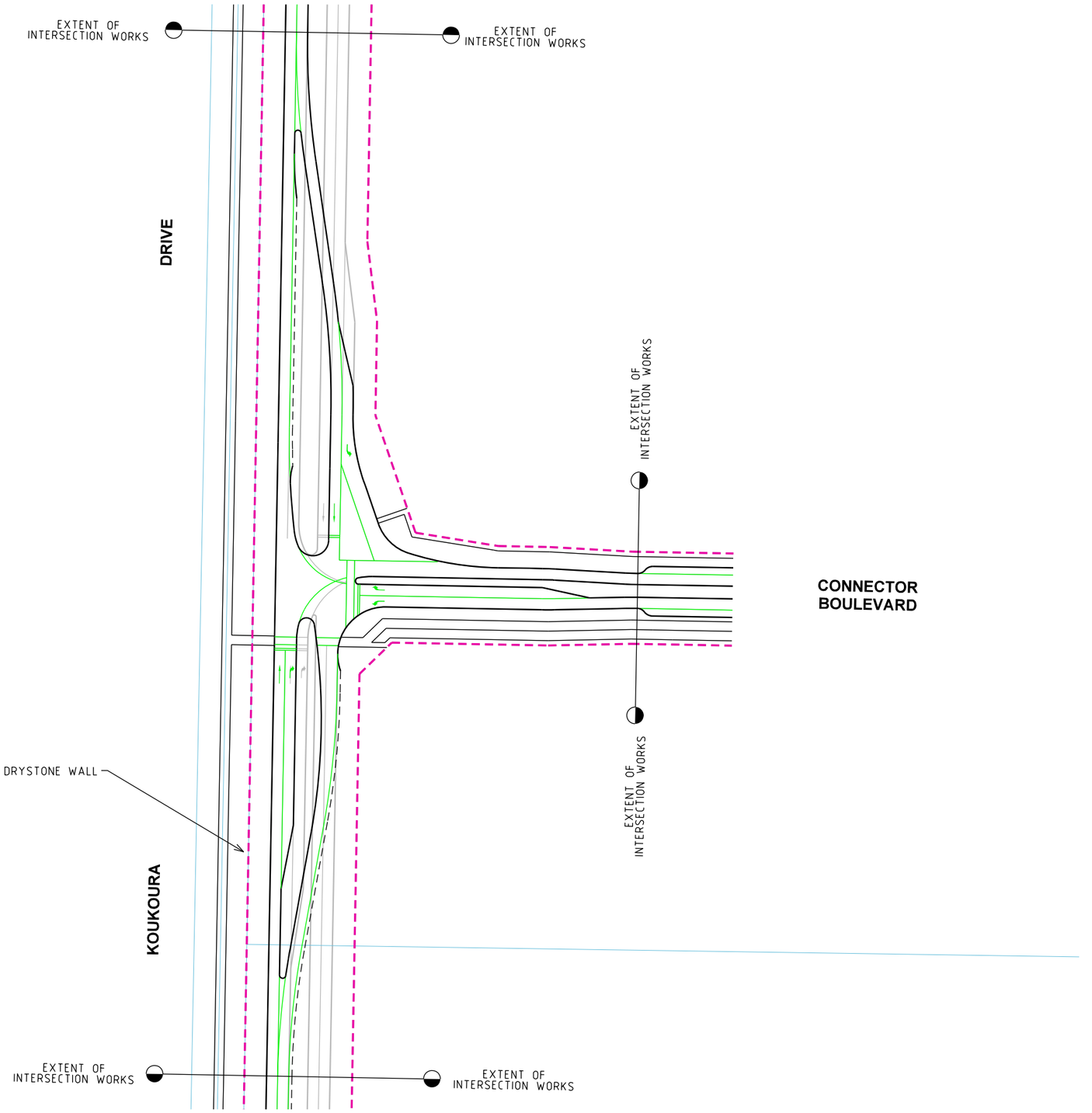

MELWAY MAP REF 388

FOR DISCUSSION ONLY

Rev	Date	Description	Drawn	Appr.
P3	05.12.14	AMENDED AS PER COMMENTS	AY	DH
P2	21.10.14	ISSUED FOR INFORMATION	BVH	DH
P1	08.10.14	ISSUED FOR INFORMATION	AY	DH

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- CONNECTOR ROAD - SPEED ZONE - 50KM/H

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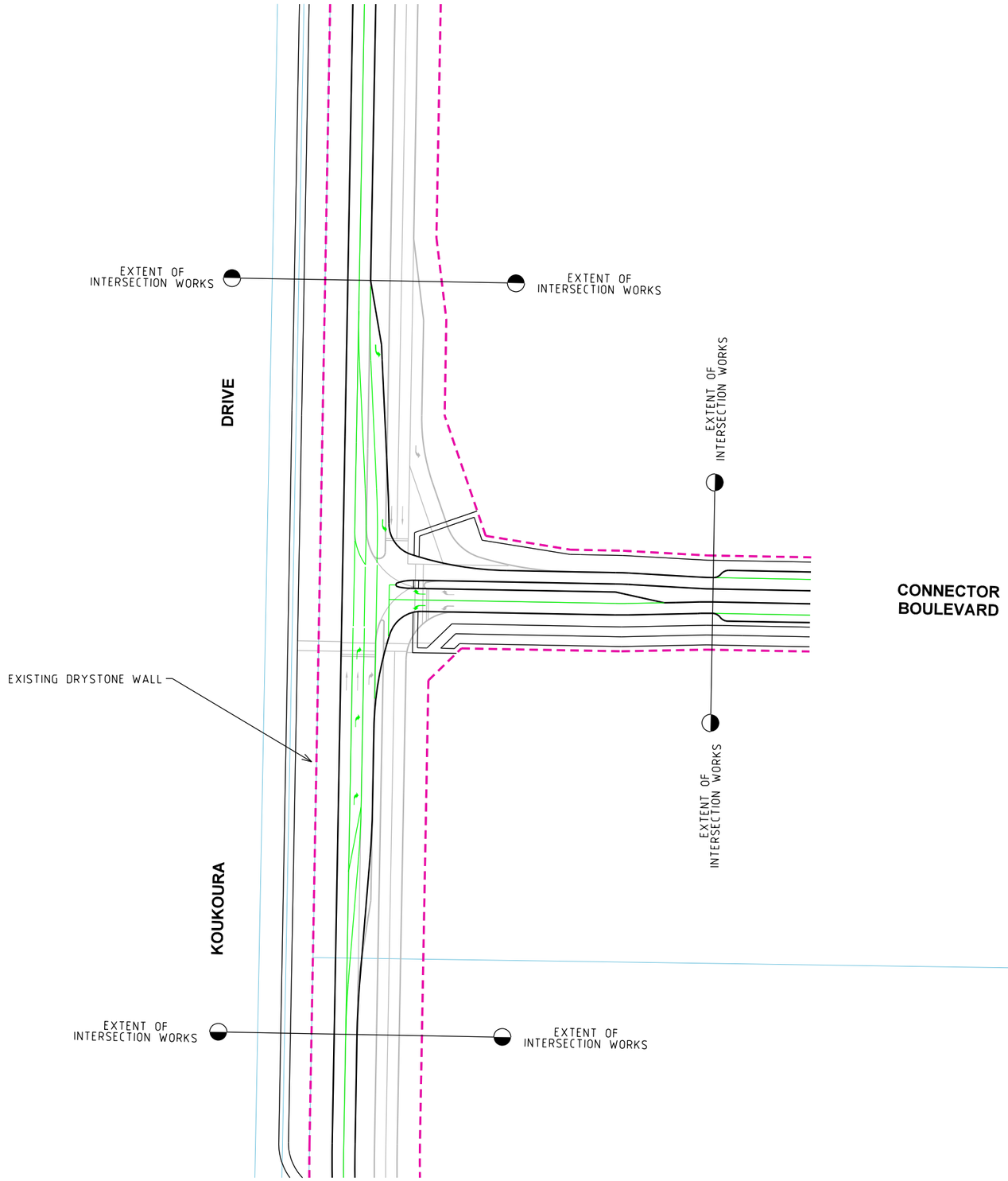
Drawn	A.YIANNOUDES
Designed	A.YIANNOUDES
Checked	G.JARRETT
Authorised	D.HO

Client	WOLLERT PSP
Project	WOLLERT PSP WOLLERT KOUKOURA DRIVE / CONNECTOR ROAD
Title	DRAFT INTERIM INTERSECTION DESIGN MPA / VICROADS PREFERRED - FUNCTIONAL LAYOUT INTERSECTION 18
Status	PRELIMINARY NOT TO BE USED FOR CONSTRUCTION PURPOSES
Date	08.10.14
Scale	1:1500
Size	A3
Project Number	CG140690
Sheet Number	T06 - 18
Revision	P3

DATE PLOTTED: 5/12/2014 4:35:01 PM BY: andrew.yiannoudes



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P1	05.12.14	ISSUED FOR INFORMATION	AY	DH

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3. PROPOSED INTERIM SPEED ZONES:
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- CONNECTOR ROAD - SPEED ZONE - 50KM/H

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Designed	A.YIANNOUDES
Checked	G.JARRETT
Authorised	D.HO

Client: WOLLERT PSP

Project: WOLLERT PSP
WOLLERT
KOUKOURA DRIVE / CONNECTOR ROAD

Title: DRAFT INTERIM INTERSECTION DESIGN
CHANNELISED RIGHT TURN - FUNCTIONAL LAYOUT
INTERSECTION 18

Status: **PRELIMINARY**
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Date	Scale	Size
05.12.14	1:1500	A3

Project Number	Sheet Number	Revision
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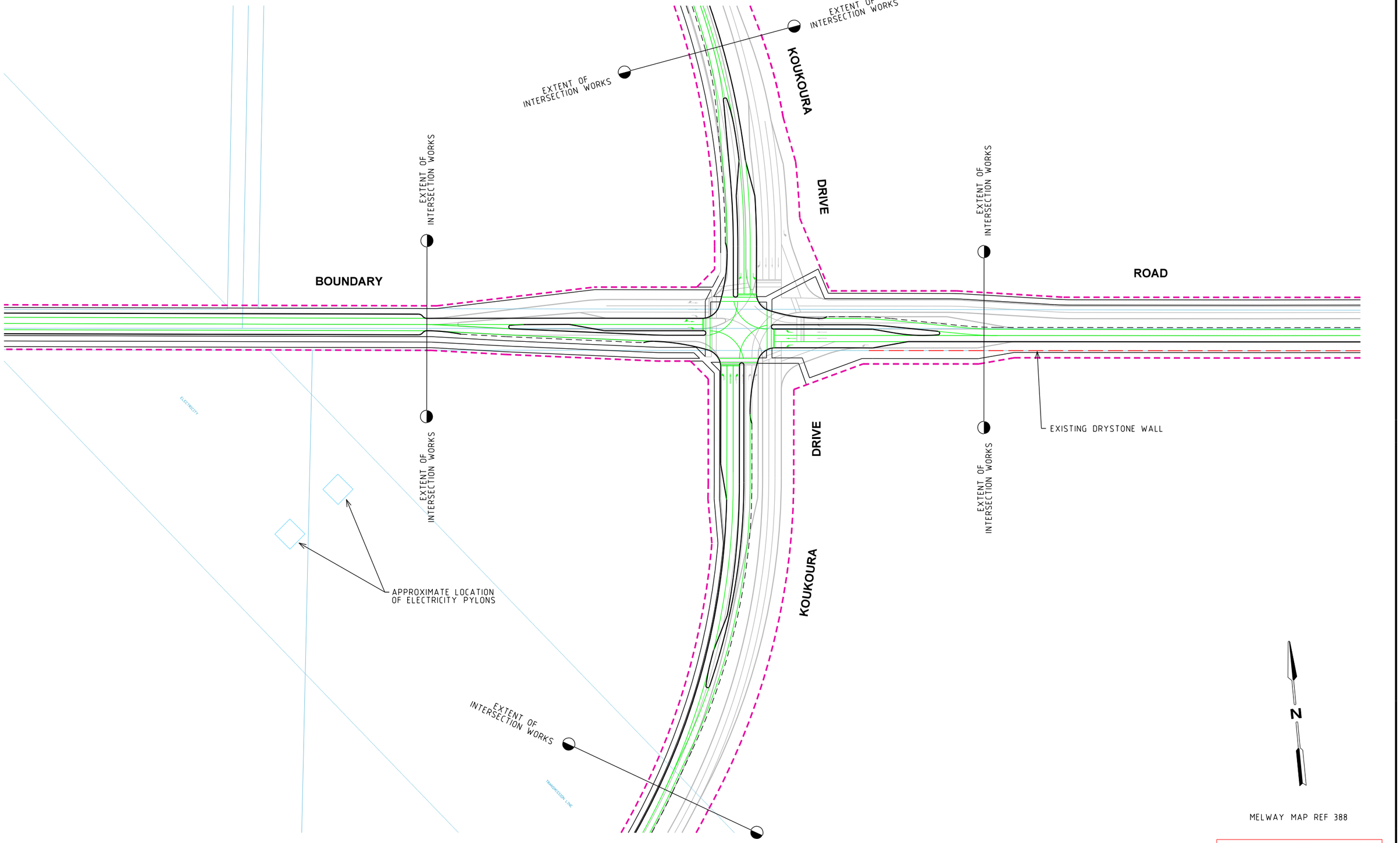

MELWAY MAP REF 388

FOR DISCUSSION ONLY

Rev	Date	Description	Drawn	Appr.
P3	05.12.14	AMENDED AS PER COMMENTS	AY	DH
P2	21.10.14	AMENDED AS PER COMMENTS	BVH	DH
P1	10.10.14	ISSUED FOR INFORMATION	AY	DH

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   - BOUNDARY ROAD (EAST) - SPEED ZONE - 60KM/H
   - BOUNDARY ROAD (WEST) - SPEED ZONE - 50KM/H

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Drawn: A.YIANNOUDES
Designed: A.YIANNOUDES
Checked: G.JARRETT
Authorised: D.HO

Client: WOLLERT PSP
Project: WOLLERT PSP
WOLLERT
KOUKOURA DRIVE / BOUNDARY ROAD
Title: DRAFT INTERIM INTERSECTION DESIGN
CONSORTIUM PREFERRED - FUNCTIONAL LAYOUT
INTERSECTION 20

Status: PRELIMINARY
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Date	Scale	Size
10.10.14	1:2000	A3

Project Number	Sheet Number	Revision
CG140690	T04 - 20	P3

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Expert Evidence - Traffic

APPENDIX C

ULTIMATE INTERSECTION LAYOUTS

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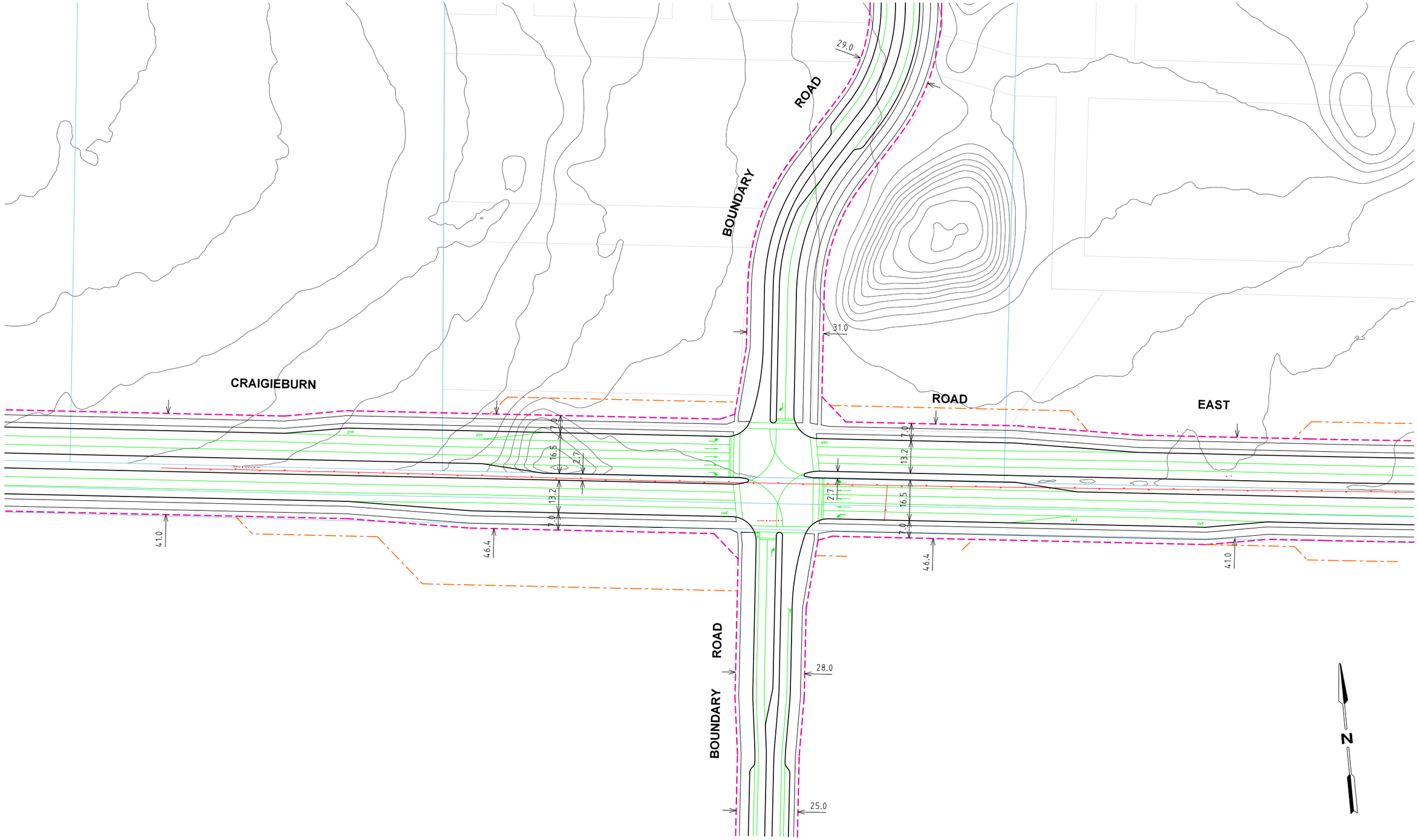

MELWAY MAP REF 388

FOR DISCUSSION ONLY

Rev	Date	Description	Drawn	Appr.
P6	11.05.15	CRAIGIEBURN RD EAST AND KOUKOURA DVE BATTER INFO ADDED	AY	DH
P5	19.03.15	INTERSECTIONS 1, 7, 8, 9, 10, 26 & 32 AMENDED AS PER COMMENTS	AY	DH
P4	09.01.15	INTERSECTION 4 AMENDED AS PER COMMENTS	AY	DH
P3	05.11.14	ISSUED FOR INFORMATION	BVH	DH
P2	15.10.14	MODIFIED AS PER COMMENTS	AY	DH
P1	06.09.14	ISSUED FOR INFORMATION	AY	DH

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0 7.5 15 30
1:1500 @ A3

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2. CADASTRAL INFORMATION OBTAINED FROM VICMAP DATA.
3. PROPOSED ULTIMATE SPEED ZONES:
   - CRAIGIEBURN ROAD EAST - SPEED ZONE - 80KM/H
   - BOUNDARY ROAD - SPEED ZONE - 50KM/H

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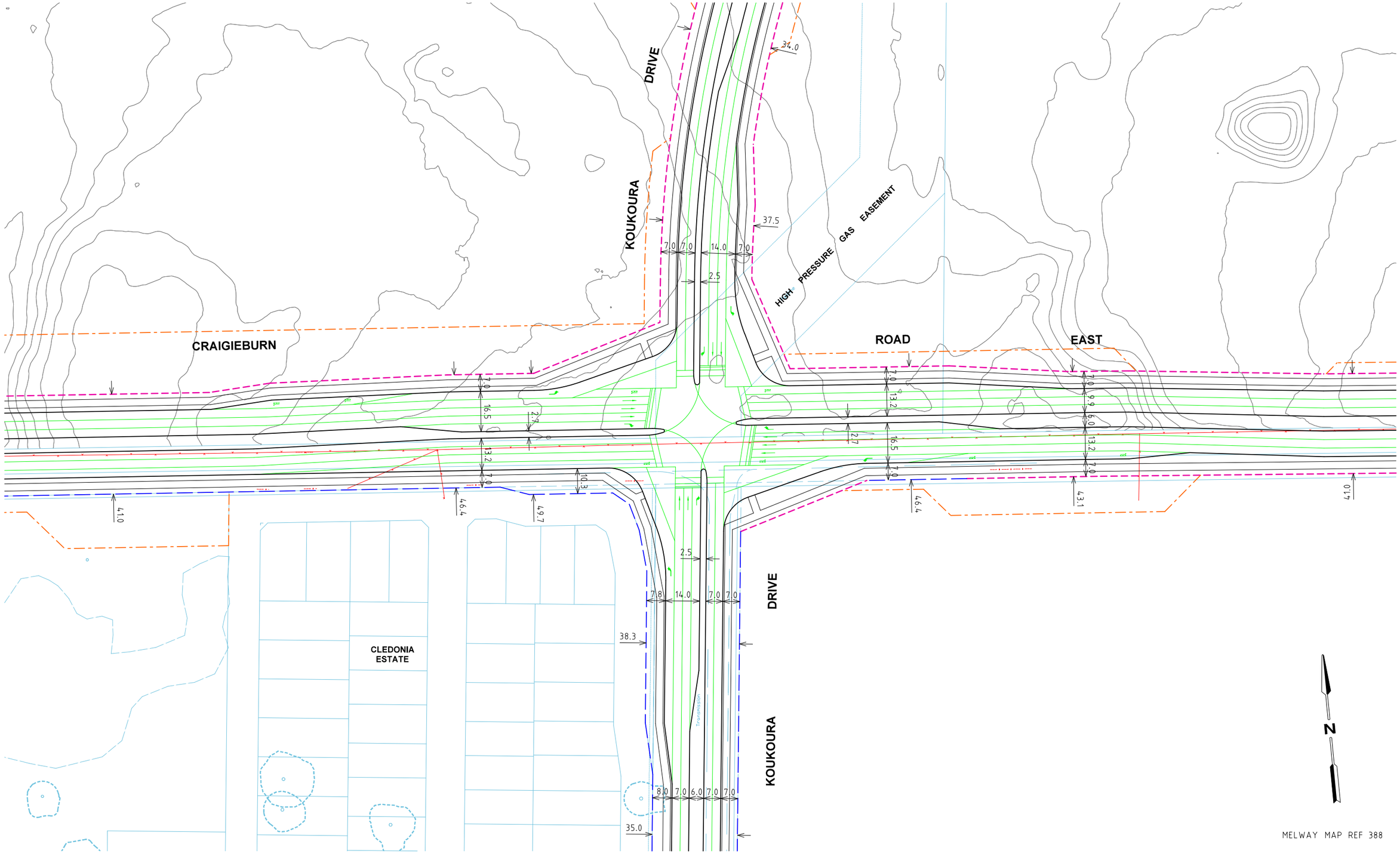
Drawn: A.YIANNOUDES
Designed: A.YIANNOUDES
Checked: G.JARRETT
Authorised: D.HO

Client: WOLLERT PSP
Project: WOLLERT PSP
WOLLERT
CRAIGIEBURN ROAD EAST / BOUNDARY ROAD
Title: ULTIMATE INTERSECTION DESIGN
FUNCTIONAL LAYOUT
INTERSECTION 6

Status: PRELIMINARY
NOT TO BE USED FOR CONSTRUCTION PURPOSES
Date: 08.09.14
Scale: 1:1500
Size: A3
Project Number: CG140690
Sheet Number: T02 - 06
Revision: P6

CAD FILE: C:\cDRAT\RAFP\2014\CG140690 - Wollert PSP\Drawings\CG140690-T02P6.dgn

DATE PLOTTED: 11/05/2015 10:28:21 AM BY: andrew.yiannoudes



MELWAY MAP REF 388

FOR DISCUSSION ONLY

Rev	Date	Description	Drawn	Appr.
P6	11.05.15	CRAIGIEBURN RD EAST AND KOUKOURA DVE BATTER INFO ADDED	AY	DH
P5	19.03.15	INTERSECTIONS 1, 7, 8, 9, 10, 26 & 32 AMENDED AS PER COMMENTS	AY	DH
P4	09.01.15	INTERSECTION 4 AMENDED AS PER COMMENTS	AY	DH
P3	08.12.14	AMENDED AS PER REVISED ALIGNMENTS AND INTERSECTIONS	AY	DH
P2	15.10.14	MODIFIED AS PER COMMENTS	AY	DH
P1	19.09.14	ISSUED FOR INFORMATION	AY	DH

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3. PROPOSED ULTIMATE SPEED ZONES:
- CRAIGIEBURN ROAD EAST - SPEED ZONE - 80KM/H
- KOUKOURA DRIVE - SPEED ZONE - 80KM/H

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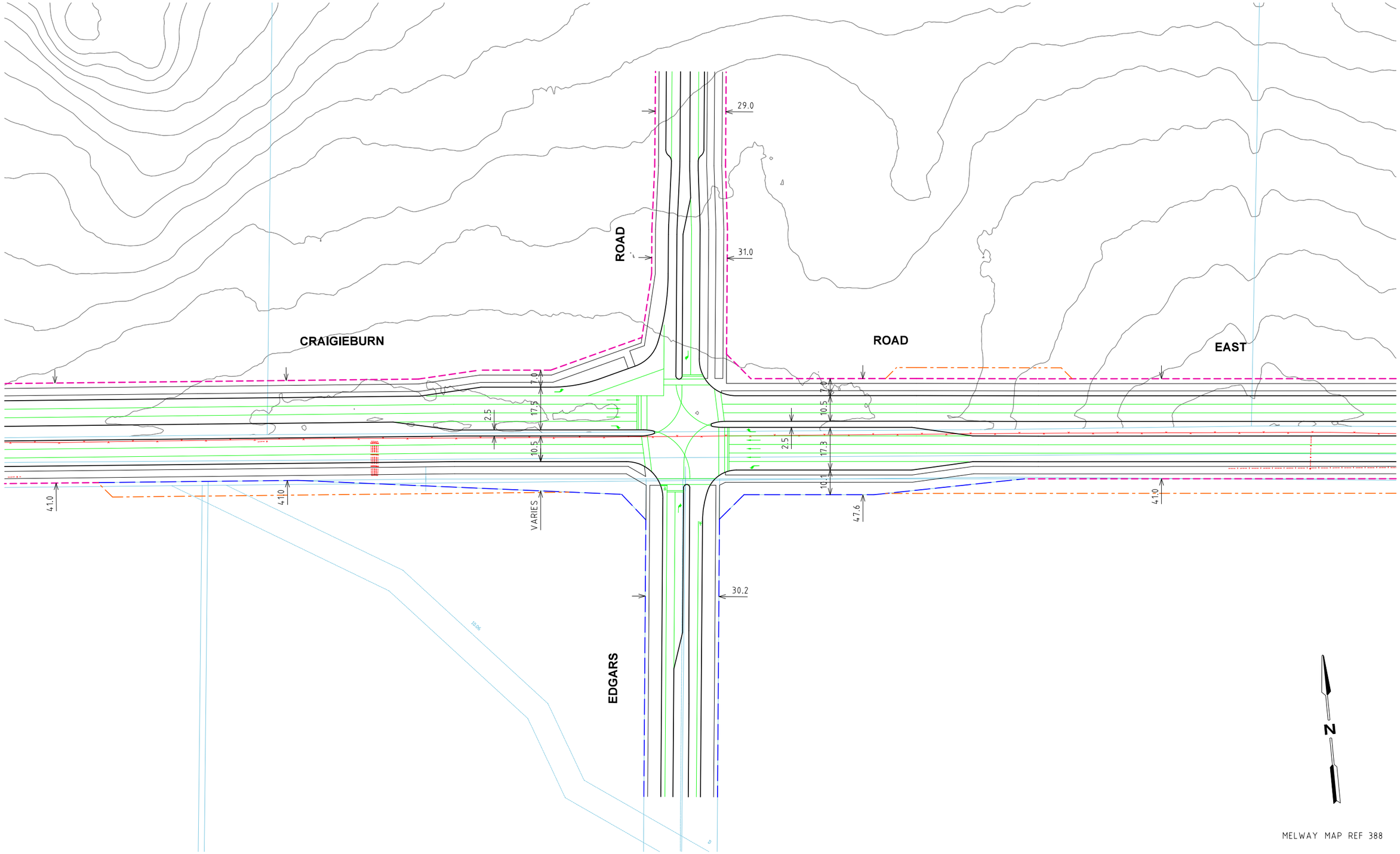
Drawn: A.YIANNOUDES
Designed: A.YIANNOUDES
Checked: G.JARRETT
Authorised: D.HO

Client: WOLLERT PSP
Project: WOLLERT PSP
WOLLERT
CRAIGIEBURN ROAD EAST / KOUKOURA DRIVE
Title: ULTIMATE INTERSECTION DESIGN
FUNCTIONAL LAYOUT
INTERSECTION 5

Status: PRELIMINARY
NOT TO BE USED FOR CONSTRUCTION PURPOSES
Date: 19.09.14
Scale: 1:1500
Size: A3
Project Number: CG140690
Sheet Number: T02 - 05
Revision: P6

CAD FILE: C:\DRAT\RAFF\2014\CG140690 - Wollert PSP\Drawings\CG140690-T02P6.dgn

DATE PLOTTED: 11/05/2015 10:28:21 AM BY: andrew.yiannoudes



MELWAY MAP REF 388

FOR DISCUSSION ONLY

Rev	Date	Description	Drawn	Appr.
P6	11.05.15	CRAIGIEBURN RD EAST AND KOUKOURA DVE BATTER INFO ADDED	AY	DH
P5	19.03.15	INTERSECTIONS 1, 7, 8, 9, 10, 26 & 32 AMENDED AS PER COMMENTS	AY	DH
P4	09.01.15	INTERSECTION 4 AMENDED AS PER COMMENTS	AY	DH
P3	08.12.14	AMENDED AS PER REVISED ALIGNMENTS AND INTERSECTIONS	AY	DH
P2	15.10.14	MODIFIED AS PER COMMENTS	AY	DH
P1	19.09.14	ISSUED FOR INFORMATION	AY	DH

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0 7.5 15 30
1:1500 @ A3

WARNING
BEWARE OF UNDERGROUND SERVICES
THE LOCATIONS OF UNDERGROUND SERVICES SHOWN ARE APPROXIMATE ONLY AND THEIR EXACT POSITION SHOULD BE PROVEN ON SITE.

GENERAL NOTES
1. ALL DIMENSIONS TO FACE OF KERB AND CHANNEL U.N.O.
2. CADASTRAL INFORMATION OBTAINED FROM VICMAP DATA.
3. PROPOSED ULTIMATE SPEED ZONES:
- CRAIGIEBURN ROAD EAST - SPEED ZONE - 80KM/H
- EDGARS ROAD - SPEED ZONE - 50KM/H

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Drawn: A.YIANNOUDES
Designed: A.YIANNOUDES
Checked: G.JARRETT
Authorised: D.HO

Client: WOLLERT PSP
Project: WOLLERT PSP
WOLLERT
CRAIGIEBURN ROAD EAST / EDGARS ROAD
Title: ULTIMATE INTERSECTION DESIGN
FUNCTIONAL LAYOUT
INTERSECTION 4

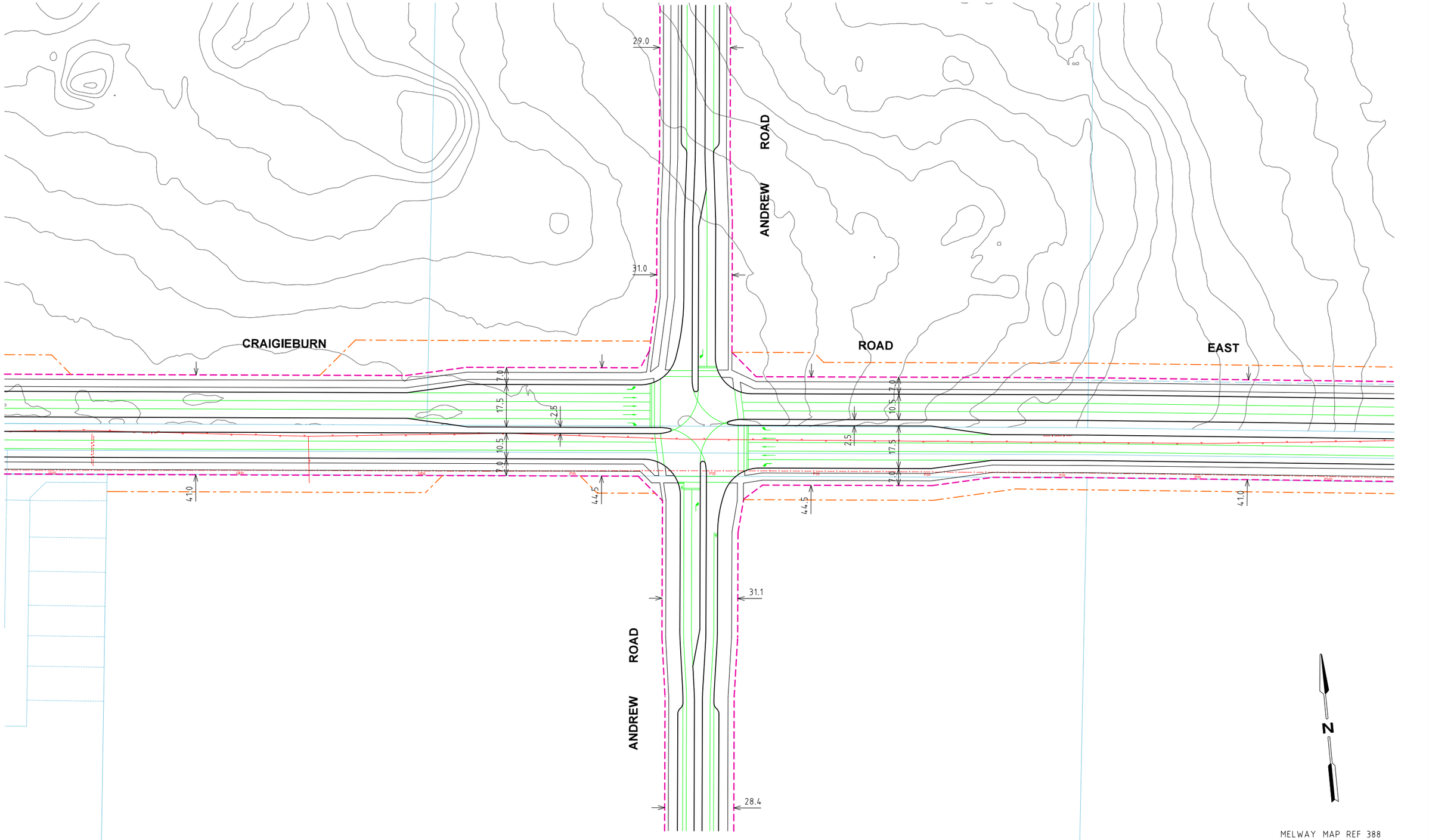
Status: PRELIMINARY
NOT TO BE USED FOR CONSTRUCTION PURPOSES

Date	Scale	Size
19.09.14	1:1500	A3

Project Number	Sheet Number	Revision
CG140690	T02 - 04	P6

CAD FILE: C:\DRAFT\PI\2014\CG140690 - Wollert PSP\Drawings\CG140690-T02P6.dgn

DATE PLOTTED: 11/05/2015 10:28:20 AM BY: andrew.yiannoudes



FOR DISCUSSION ONLY

Rev	Date	Description	Drawn	Appr.
P6	11.05.15	CRAIGIEBURN RD EAST AND KOUKOURA DVE BATTER INFO ADDED	AY	DH
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P3	08.12.14	AMENDED AS PER REVISED ALIGNMENTS AND INTERSECTIONS	AY	DH
P2	15.10.14	MODIFIED AS PER COMMENTS	AY	DH
P1	06.09.14	ISSUED FOR INFORMATION	AY	DH

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Drawn: A.YIANNOUDES
Designed: A.YIANNOUDES
Checked: G.JARRETT
Authorised: D.HO

Client: WOLLERT PSP
Project: WOLLERT PSP
WOLLERT
CRAIGIEBURN ROAD EAST / ANDREW ROAD
Title: ULTIMATE INTERSECTION DESIGN
FUNCTIONAL LAYOUT
INTERSECTION 2

Status: PRELIMINARY
NOT TO BE USED FOR CONSTRUCTION PURPOSES

Date	Scale	Size
08.09.14	1:1500	A3
Project Number	Sheet Number	Revision
CG140690	T02 - 02	P6

CAD FILE: C:\DRAT\RAFT\2014\CG140690 - Wollert PSP\Drawings\CG140690-T02P6.dgn

APPENDIX

D

ALTERNATE BOUNDARY ROAD CROSS-SECTION

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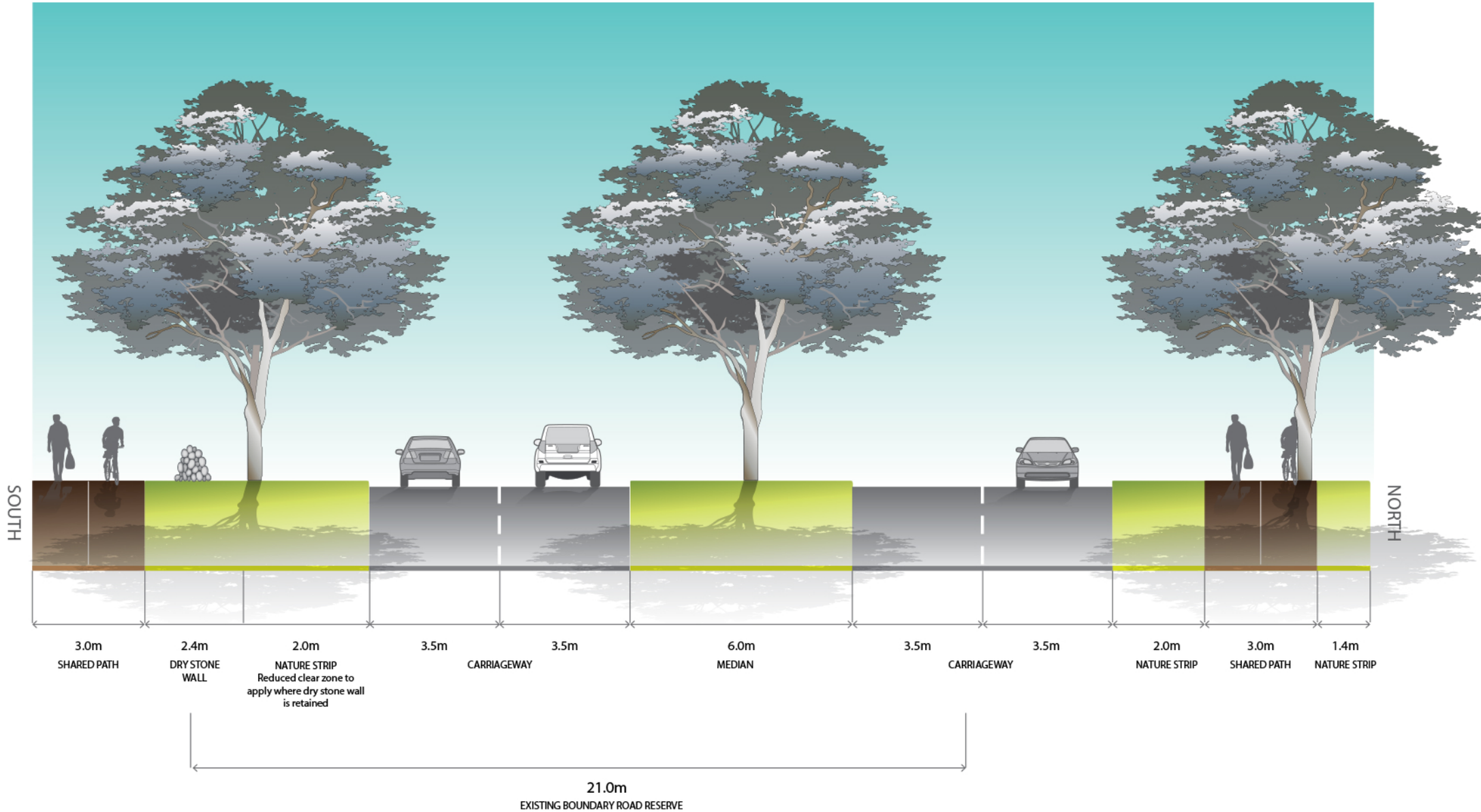
EXISTING PSP CROSS SECTION



Arterial Road CS02e (34m) Local

Boundary Road

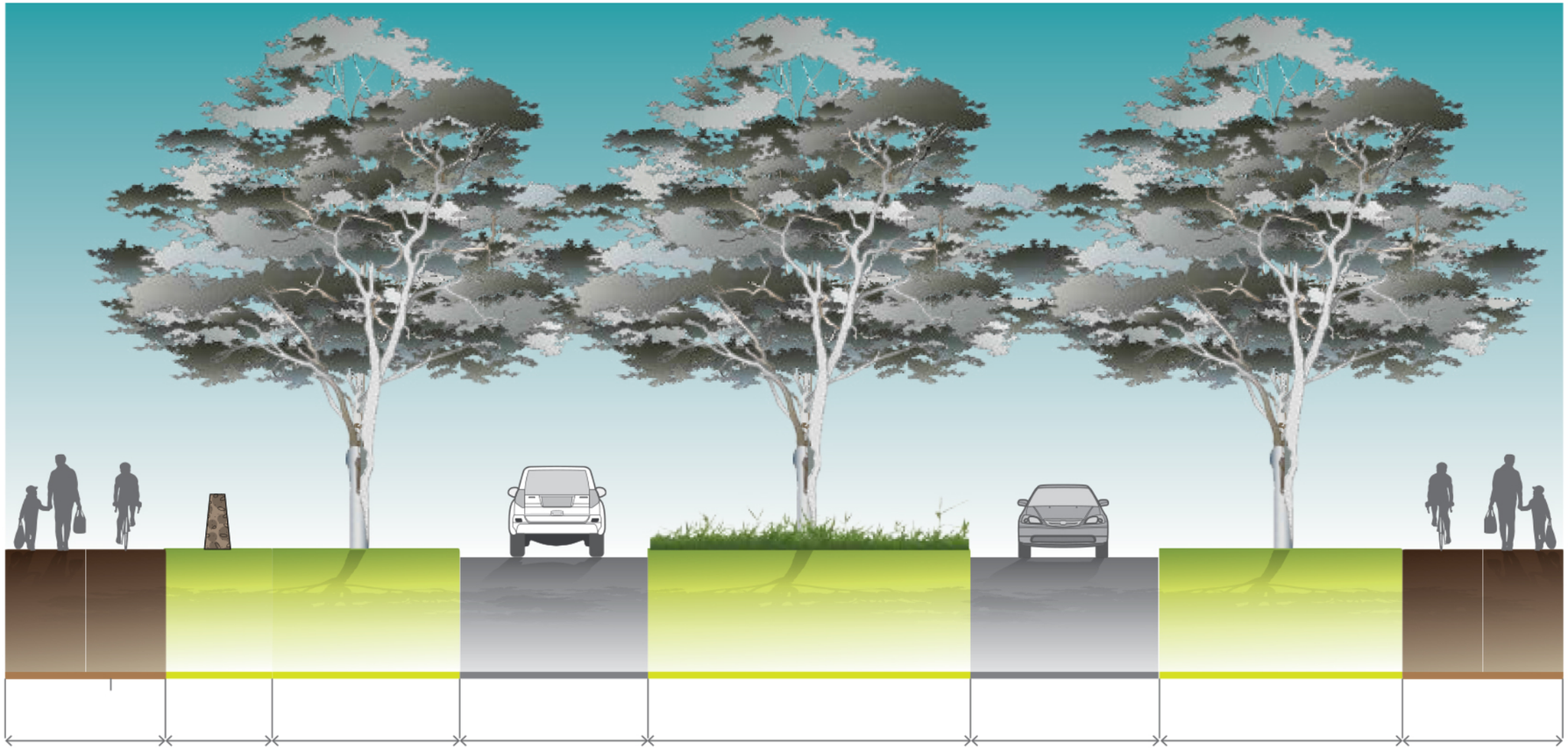
City of Whittlesea

MPA METROPOLITAN PLANNING AUTHORITY

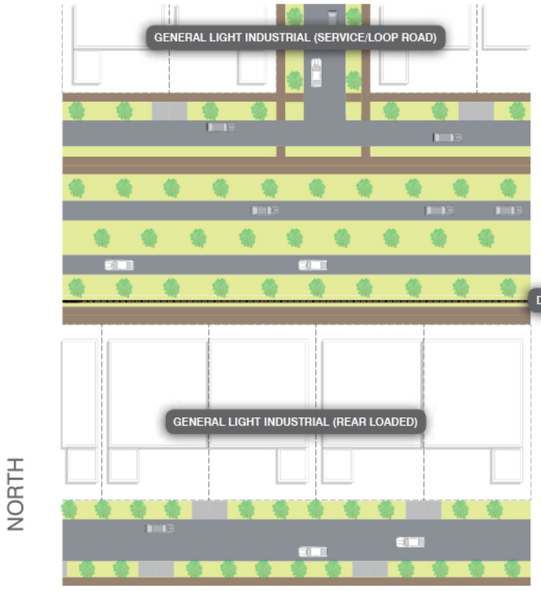
NOTES:

- Street trees to meet requirements of the Responsible Authority
- Dimensions labelled from face of kerb
- 60km/h speed limit
- Vehicle access to lots fronting arterial streets must be provided from a service street, local internal street or rear lane only, to the satisfaction of the coordinating street authority.

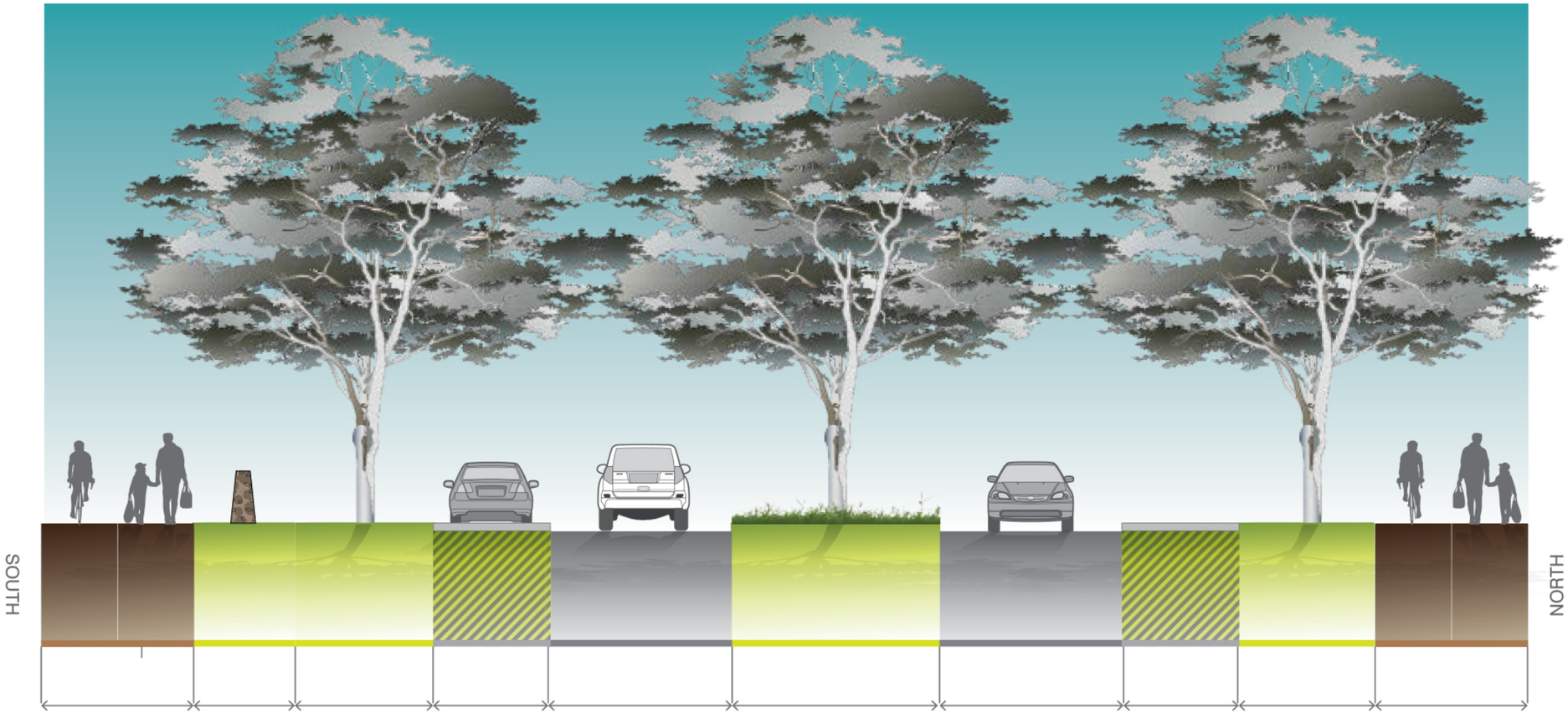
Boundary Road Arterial [29.0m]
Between Epping Road and Andrew Road
CONCEPT 01



EXISTING BOUNDARY ROAD RESERVE [21.0m]



Boundary Road Arterial [29.0m]
Between Andrew Road and Koukoura Drive
CONCEPT 02



EXISTING BOUNDARY ROAD RESERVE [21.0m]