Macedon Ranges Shire Council

ATTACHMENTS

Planning Delegated Committee Meeting
Under Separate Cover

Wednesday 12 October 2022

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Planning and Environment Act 1987

MACEDON RANGES PLANNING SCHEME

AMENDMENT C154
PLANNING PERMIT APPLICATION PLN/2022/198

EXPLANATORY REPORT

Who is the planning authority?

This amendment has been prepared by the Macedon Ranges Shire Council, which is the planning authority for this amendment.

The amendment has been made at the request of Town Planning People on behalf of Deborah Barton and Steven Waldron.

Land affected by the amendment

The amendment applies to 1 Wills Street, Malmsbury. The approximate 1.9 hectare triangular site is bounded by and has frontages to Wills Street (west), Walsh Street (north) and Mitchell Street (south) road reserves and is located within the Malmsbury Township Boundary.

The amendment is a combined planning permit application and planning scheme amendment under section 96A of the Act.

What the amendment does

Rezoning

The amendment rezones land within the Malmsbury Township Boundary from Farming Zone (FZ) to Neighbourhood Residential Zone (NRZ), and incorporates a new Schedule to the Zone (NRZ13).

The amendment proposes to remove the Heritage Overlay 148 from the site. The amendment does not propose to alter the Environmental Significance Overlay Schedule 4 – Eppalock Proclaimed Catchment.

The amendment updates planning scheme maps to reflect the above changes.

Planning Permit

The combined planning permit application seeks approval for:

- Subdivision of land into multiple lots
- Removal of Section 173 Agreement AL765770M

The planning permit is attached as a separate document to this Explanatory Report.

Strategic assessment of the amendment

Why is the amendment required?

The amendment is required to rezone land within the Malmsbury Settlement Boundary from Farming Zone to a more appropriate Neighbourhood Residential Zone to appropriately respond and align to the existing Malmsbury Settlement Boundary, with a schedule to the zone that applies appropriate subdivision and development objectives.

The amendment is also seeking to remove the Heritage Overlay 148 - HO148 Malmsbury Precinct, Mollison Street, Malmsbury. The Heritage Overlay is a precinct overlay and has been in place in its current form since 1999 as guided by the Shire of Kyneton Conservation (Heritage) Study (1990).

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The heritage overlay control was recommended and implemented more than two decades ago, it is no longer up to date with contemporary heritage industry practice or planning.

The amendment will allow for the concurrent issuance of a subdivision planning permit to enable for a modest additional number of housing opportunities that responds to the existing and preferred future character of the area in accordance with the objectives of the schedule to the zone.

How does the amendment implement the objectives of planning in Victoria?

The amendment will implement the following objectives of planning in Victoria under section 4 of the Planning and Environment Act 1987:

(a) to provide for the fair, orderly, economic and sustainable use, and development of land;

(b) to provide for the protection of natural and man-made resources and the maintenance of ecological processes and genetic diversity

(c) to secure a pleasant, efficient and safe working, living and recreational environment for all Victorians and visitors to Victoria;

(f) to facilitate development in accordance with the objectives set out in paragraphs (a), (b), (c), (d) and (e);

(g) to balance the present and future interests of all Victorians.

The amended implements these objectives by providing for the orderly and balanced growth of Malmsbury responding to the existing Malmsbury Settlement Boundary and specific site characteristics regarding a relatively small existing Farming Zone site that has no significant environmental value or farming capability.

How does the amendment address any environmental, social and economic effects?

The amendment will have positive environmental, social and economic effects and result in net community benefit.

Environmental

An Ecological Report undertaken for the site identifies there is little of ecological importance on the site, and no threatened or endangered species of flora or fauna have been recorded on the site or are likely to be present.

The primarily grassed Farming Zone site is relatively small, and farming capability is severely limited. The amendment will provide opportunity for street tree planting and landscaping associated with future development to assist in providing ecological biodiversity and habitat.

No waterways will be impacted within the catchment area, and all sites will be serviced appropriately with no requirement for septic systems or similar.

Social and Economic

The amendment will provide additional housing opportunities within the Malmsbury Settlement Boundary and allow for a more appropriate use and development to meet the community's housing needs.

Utilising the existing road reserve network and servicing infrastructure associated with the proposed schedule to the zone, moderate population growth will continue the rural township 'feel' of the area.

Does the amendment address relevant bushfire risk?

The site is not within the Bushfire Management Overlay, but is subject to a designated bushfire prone area.

A Bushfire Management Report and Landscape Assessment Plan undertaken for site identifies that the proposed combined amendment has no significant bushfire safety implications, that risk is appropriately mitigated, and that the proposal appropriately prioritises protection of human life.

The amendment has considered bushfire risk, will avoid increasing bushfire risk and minimises risk and exposure moving forward and as such is consistent with planning policy framework at *Clause 13.02 Bushfire and Clause 21.06-3 Bushfire.*

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Views of Fire Victoria were sought through Council's informal referral of the application, however a meeting was declined.

As the site is a designated bushfire prone area, any relevant future use or development applications will be subject to bushfire safety requirements under the Building Act 1983.

Does the amendment comply with the requirements of any Minister's Direction applicable to the amendment?

The Amendment complies with the requirements of the *Ministerial Direction – The Form and Content of Planning Schemes* (Section 7(5) of the Act) and *Ministerial Direction 11 Strategic Assessment of Amendments.*

No other Ministerial Direction applies to the Amendment, with the exception of *Ministerial Direction No 15 – The Planning Scheme Amendment Process.*

How does the amendment support or implement the Planning Policy Framework and any adopted State policy?

The amendment will further the objectives and considerations of planning in Victoria, and appropriately supports the following elements of the Planning Policy Framework:

- *Clause 11 Settlement* provide guidance that planning is to anticipate and respond to the needs of existing and future communities through provision of zoned and serviced land whilst preventing environmental, human health and amenity problems by taking full advantage of existing settlement patterns.

  Subsequent Clauses identify the need for housing choice and affordability within settlement boundaries (*Clause 11.01-1S Settlement*) and to ensure development recognises and responds to distinctive areas such as the Macedon Ranges Statement of Planning Policy (*Clause 11.03- 5S Distinctive Areas and Landscapes*) and distinctive neighbourhood characteristics (*Clause 11.03-6S – Regional and Local Places*).

  The amendment seeks to rezone Farming Zone land within the Malmsbury Settlement boundary to allow for fully serviced residential land supply that will improve the environmental landscape and respond to the existing subdivision pattern.

- *Clause 12 Environmental and Landscape Values* provide direction to protect and enhance the health of ecological systems and the biodiversity that they support.

  In Particular, *Clause 12.01-2S Native Vegetation Management* seeks to ensure that there is no net loss of biodiversity and *Clause 12.03-1S* seeks to protect and enhance river corridors, waterways, lakes and wetlands. Further, *Clause 14 Natural Resource Management* seeks to conserve and protect natural resources including water bodies, with *Clause 12.02-1S* further detailing the required protection and restoration of designated water catchments.

  The amendment will enable an improved landscape and environmental response compared to the existing conditions, and is supported by an Ecological Report which details that waterways will be protected and no native vegetation is proposed to be removed.

- *Clause 13.02-1S Bushfire Planning* seeks to strengthen the resilience of settlements and communities to bushfire through risk-based planning that prioritises the protection of human life.

  The Bushfire Management Report details the suitability of the proposed Planning Scheme Amendment.

- *Clause 15 Built Environment and Heritage* seeks to ensure that subdivisions respond to the site, surrounds, environment character and heritage of the area.

  Housing policies such as *Clause 16.01-1S Housing Supply*, *Clause 16.01-2S Housing Affordability* and *Clause 16.01-3S Rural Residential Development* identify the need for well planned housing opportunities within existing settlement boundaries that provide for appropriate land supply and built form outcomes.

  The amendment will provide for additional residential land supply within the existing Malmsbury Settlement Boundary, and the draft Schedule to the Neighbourhood Residential Zone responds to the neighbourhood character of the area.

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Whilst the amendment does seek to remove the Heritage Overlay 148, it does propose to implement complementary character controls through the NRZ13. Heritage Overlay 148 does not meet the threshold for contemporary heritage controls related to 1 Wills St Malmsbury.

- *Clause 18 Transport* and *Clause 19 Infrastructure* support subdivision and land uses that are well located, well serviced and support an efficient and safe road network.

  The amendment will enable for additional serviced residential lots and associated infrastructure and road network upgrades.

How does the amendment support or implement the Local Planning Policy Framework, and specifically the Municipal Strategic Statement?

The amendment will further the objectives and considerations of planning in Victoria, and appropriately supports the following elements of the Planning Policy Framework:

- The *Municipal Strategic Statement* reflects the balanced considerations of residential growth, existing character and heritage, rural and agricultural uses and the natural environment and scenic beauty of the region.
- These considerations are further highlighted in Clause 21.02 Key Issues and Influences, as well as *Clause 21.03 – Vision – Strategic Framework Plan*.

  The amendment balances these considerations and responds positively by enabling incremental residential growth within the existing Malmsbury Settlement Boundary under a Neighbourhood Residential Zone with a schedule that respects the existing subdivision layout on land which has limited agricultural value and provides opportunities for an improved environmental response through redevelopment of land.
- *Clause 21.05 Environment and Landscape Values*, *Clause 21.06 Environmental Risk* and *Clause 21.07 Natural Resource Management* highlight the importance of managing appropriate biodiversity values, rural landscapes, prioritise fire risk in planning decisions, protect water catchments and protect productive agricultural farming land.

  The site is not subject to any key landscape values, nor does the amendment provide for any unnecessary environmental risk. The proposal is supported by an Ecological Report which details that waterways will be protected and that the existing habitat value and level of native vegetation is low.
- Housing and development considerations at *Clause 21.08 – Built Environment and Heritage*, *Clause 21.09 Housing* and *Clause 21.13 Local Areas and Small Settlements* highlights the importance of appropriate development and housing opportunity not impacting on the heritage value of character of the surrounds.

  Specifically, *Clause 21.13-9 Malmsbury* identifies a rural village lifestyle and envisaged incremental development and population growth within the township boundary. It is further highlighted that heritage, township identity, and landscape values are to be respected and associated strategies to ensure this is met include:

  - Locate new development within the township boundary
  - Encourage development that maximises access to existing servicing
  - Ensure development has a minimal impact on water quality.

  The amendment respects and responds to these strategies by enabling for future sympathetic residential development in accordance with a Neighbourhood Residential Zone with an appropriate schedule that sets clear objectives and responds to the characteristics of the Malmsbury township.

The amendment does not seek to change any objective or strategy within the Local Planning Policy Framework or Municipal Strategic Statement.

How does the amendment support or implement the Municipal Planning Strategy?

This consideration does not apply as the Macedon Ranges Planning Scheme does not have a Municipal Planning Strategy at Clause 02 of the Scheme.

Does the amendment make proper use of the Victoria Planning Provisions?

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The proposed use of the Victorian Planning provisions results in the use of the most appropriate VPP tools, being:

- The application of the Neighbourhood Residential as it currently applies to the Macedon Ranges Planning Scheme within the existing Malmsbury Settlement Boundary, in keeping with zoning hierarchy in an area with adjacent existing General Residential Zoned land.
- Introduction of a Schedule to the Neighbourhood Residential Zone responding specifically to the site, surrounds and the context in which it sits.
- Removal of Heritage Overlay (Schedule 148)
- Retaining the existing Environmental Significance Overlay (Schedule 4).

How does the amendment address the views of any relevant agency?

Preliminary advice has been obtained from Coliban Water and Powercor regarding the provision of infrastructure, connections and upgrades. No concerns with the amendment have been raised.

The amendment applicant, though Council, has sought to hold a meeting with the Department of Environment, Land, Water and Planning (DELWP) and the Country Fire Authority (CFA) / Fire Victoria to discuss the amendment however the meeting request was denied.

The exhibition process will provide an opportunity for relevant agencies and authorities to give comment.

Does the amendment address relevant requirements of the Transport Integration Act 2010?

The amendment will not have any significant impact on the transport system as:

- The amendment does not impact existing public transport networks.
- The amendment will enable limited additional residential land use consistent with the surrounding land use supported by the existing road infrastructure and network.

Resource and administrative costs

What impact will the new planning provisions have on the resource and administrative costs of the responsible authority?

Future administrative cost and burden on the Responsible Authority is considered low, as it is envisaged that the proposal will result in a limited number of statutory planning applications for the development of land for single dwelling due to the existing Environmental Significance Overlay.

It is considered the additional planning permit applications can be incorporated into existing resources of Macedon Ranges Statutory Planning Unit, and no specific miscellaneous costs would be incurred. The relevant planning permit application fees will assist and support Macedon Ranges Shire Council in making these determinations.

Where you may inspect this amendment

The amendment can be inspected free of charge at the Macedon Ranges Shire Council website at https://www.mrsc.vic.gov.au/Build-Plan/Planning-For-Our-Future/Planning-Scheme-and-Amendments

The amendment is available for public inspection, free of charge, during office hours at the following places:

- Gisborne Administration Centre 40 Robertson Street, Gisborne (opposite the police station)
- Kyneton Administration Centre 129 Mollison Street, Kyneton
- Romsey Service Centre 96–100 Main St, Romsey

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- Woodend Service Centre Corner Forest and High Streets, Woodend

The amendment can also be inspected free of charge at the Department of Environment, Land, Water and Planning website at www.planning.vic.gov.au/public-inspection.

Submissions

Any person who may be affected by the amendment may make a submission to the planning authority. Submissions about the amendment must be received by [insert submissions due date].
A submission must be sent to:

Strategic Planning and Environment team
Macedon Ranges Shire Council
PO Box 151
KYNETON VIC 3444

Panel hearing dates

In accordance with clause 4(2) of Ministerial Direction No.15 the following panel hearing dates have been set for this amendment:

- directions hearing: [insert directions hearing date]
- panel hearing: [insert panel hearing date]]

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25/05/2017

SCHEDULE 13 TO CLAUSE 32.09 NEIGHBOURHOOD RESIDENTIAL ZONE

Shown on the planning scheme map as **NRZ13**

MALMSBURY TOWNSHIP EAST

1.0 Neighbourhood character objectives

25/05/2017

To provide a semi-rural residential form with larger lots, significant landscaping and generous setbacks.

To respond to and respect the semi-rural characteristics of the township fringe.

To promote generous front, side and rear setbacks to built form with visual breaks between dwellings to promote the rural village character of the town.

To promote post and wire rural style front, side and rear fencing that allows for visual permeability.

To promote planting of canopy trees in front, side and rear setbacks as a feature of all new residential development.

2.0 Minimum subdivision area

25/05/2017

The minimum lot size for subdivision is 2000 square metres.

3.0 Permit requirement for the construction or extension of one dwelling or a fence associated with a dwelling on a lot

25/05/2017

	Requirement
Permit requirement for the construction or extension of one dwelling on a lot	None specified
Permit requirement to construct or extend a front fence within 3 metres of a street associated with a dwelling on a lot	None specified

4.0 Requirements of Clause 54 and Clause 55

25/05/2017

	Standard	Requirement
Minimum street setback	A3 and B6	15 metres to the street frontage
Site coverage	A5 and B8	20 per cent
Permeability	A6 and B9	50 per cent
Landscaping	B13	In addition to the requirements of B13, development should provide for at least two canopy trees within the front setback. Where the site is a corner or double fronted lot, at least one canopy tree should be provided within the secondary street setback.

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	Standard	Requirement
Side and rear setbacks	A10 and B17	A new building should be setback 15 metres from a side or rear constructed carriagway street frontage, plus 1 metre for every metre of building height over 6.9 metres. Where the lot is a double fronted lot with no constructed carriageway to the rear of the lot, a new building should be setback 9 metres plus 0.3 metres for every metre of building height over 3.6 metres up to 6.9 metres, plus 1 metre for every metre of building height over 6.9 metres from any side or rear setback adjoining a road reserve
Walls on boundaries	A11 and B18	None specified
Private open space	A17	None specified
	B28	None specified
Front fence height	A20 and B32	None specified

5.0 Maximum building height requirement for a dwelling or residential building

25/05/2017

A building used as a dwelling or a residential building must not exceed a height of 9 metres and 2 storeys.

6.0 Application requirements

25/05/2017

None specified.

7.0 Decision guidelines

25/05/2017

None specified.

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Macedon Ranges Shire Council

PO Box 151
KYNETON Vic 3444
Tel: (03) 5422 0333
Email: mrsc@mrsc.vic.gov.au

PLANNING PERMIT

PERMIT NUMBER:	PLN/2022/198
PLANNING SCHEME:	Macedon Ranges Planning Scheme
RESPONSIBLE AUTHORITY:	Macedon Ranges Shire Council
ADDRESS OF THE LAND:	CA 1 Section 24A P/Lauriston, 1 Wills Street, Malmsbury
THE PERMIT ALLOWS:	Subdivision of the Land into Nine (9) Lots

THE FOLLOWING CONDITIONS APPLY TO THIS PERMIT:

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1 Before the plan of subdivision is certified under the *Subdivision Act 1988*, amended plans to the satisfaction of the Responsible Authority must be submitted to and approved by the Responsible Authority. When approved, the plans will be endorsed and will then form part of this permit. The plans must be generally in accordance with the plans submitted with the application, but modified to show:

a) Typical cross-section of the road within the subdivision including car parking provision;

b) Amended Building envelope plans for each lot. The building envelope plan must:

i Comply with the front, side and rear setbacks specified by the Neighbourhood Residential Zone – Schedule 13 of the Macedon Ranges Planning Scheme (or the setback requirements of any successive zone or overlay applying to the land).

ii Provide variable front setbacks of between 15 and 18 metres for lots to avoid a continuous building line.

c) The Landscape Masterplan required by Condition 3 of this permit.

d) The plans and details required by MRSC Engineering Condition 12 of this permit.

2 The subdivision allowed by this permit and shown on the plans endorsed to accompany the permit shall not be amended for any reason unless with the prior written consent of the Responsible Authority.

Landscape Masterplan

3 Prior to the certification of a plan of subdivision, a digital copy of a Landscape Masterplan to the satisfaction of the Responsible Authority must be submitted to and approved by the Responsible Authority. The Landscape Masterplan must be developed in conjunction with the Functional Layout Plan and prepared by a suitably qualified and experienced landscape designer. The plan must be drawn to scale and show:

a) Provision of canopy trees incorporating locally indigenous trees within the lots (where appropriate) including a minimum of two (2) trees within front setbacks of each lot and one

Date Issued: **Signature of the Responsible Authority:** _____

Macedon Ranges Shire Council

PLANNING PERMIT

PLN/2022/198 CONDITIONS CONTINUED:

(1) canopy tree within the secondary street setback for Lots 1, 2, 5, 6 and 7 (all inclusive) to achieve semi-rural residential character;

b) The locations of all new street tree planting within all road reserves and new upgraded roads/streets associated with the subdivision. A minimum of one tree per lot or every 12 metres, whichever is the lesser.

c) Street trees species selection to tie in with the existing surrounding character, be of a size suitably for road reserve widths at maturity, and be a mix of native and exotic species to the approval of the Responsible Authority.

d) Topography and existing features, including contours for the subject land and road reserves.

e) The location of any existing trees:

- within the site;
- within the road reserves;
- adjacent to proposed road upgrades; and
- Including any that overhang the site from adjoining land.

f) Details of tree protection zones for all trees to be retained.

g) Appropriate irrigation system;

h) Any trees proposed for removal from the site clearly designated.

Detailed Landscape Plan

4 Prior to the issue of a Statement of Compliance for the subdivision, a digital copy of a detailed Landscape Plan to the satisfaction of the Responsible Authority must be submitted to and approved by the Responsible Authority. The detailed Landscape Plan must be prepared by a suitably qualified and experienced landscape designer, be generally in accordance with the endorsed Landscape Master Plan and focus on the details of the streetscape plantings. The plan is to be overlaid on the approved Engineering plans to ensure coordination with services and other infrastructure. When approved, the plan will be endorsed and form part of this permit. The Plan must include:

a) Provision of canopy trees incorporating locally indigenous trees within the lots (where appropriate) including a minimum of two (2) trees within front setbacks of each lot and one (1) canopy tree within the secondary street setback for Lots 1, 2, 5, 6 and 7 (all inclusive) to achieve semi-rural residential character;

b) Street tree species selection to tie in with the existing surrounding character and be a mix of native and indigenous species to the approval of the Responsible Authority.

c) Typical cross-sections for each street type, dimensioning tree locations, services offsets as set out in Council's *Tree Management Plan*, 2022 and any other spatial requirements.

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Macedon Ranges Shire Council

PLANNING PERMIT

PLN/2022/198 CONDITIONS CONTINUED:

d) A Plant Schedule for proposed tree species showing minimum supply size of 45L/1.6mH.

e) An advanced Tree Planting Detail for proposed tree species showing a minimum of 26L Greenwell water saver and three (3) hardwood stakes or Tree Coach® system.

f) Submission of a maintenance schedule and projected costs in addition to the landscape plans.

(This schedule will be used to ensure that the maintenance program is consistent with Council standards and to calculate a 35% Landscape Maintenance Liability bond. It will also be useful for the developer in preparing budget projections for the 2-year maintenance requirement.)

g) The following notations:

i Tree planting is to occur between April & September to maximise establishment and survival.

ii Tree locations shown on this plan are a guide only and may require adjustment to coordinate with final service locations, Powercor requirements, and 'as constructed' infrastructure.

iii Street tree locations are to be set-out and approved on site by the Council Landscape Officer prior to installation.

iv It is the responsibility of the contractor to confirm the location of all underground services prior to commencement of any excavation.

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Landscape Completion

5 The landscaping works shown on the approved landscape plan must be carried out and completed to the satisfaction of the Responsible Authority prior to the issue of a Statement of Compliance or any other time agreed in writing by the Responsible Authority.

Landscape Maintenance

6 Landscaping shown on the endorsed Landscape Plan/s must be maintained to the satisfaction of the Responsible Authority for a period of two (2) years from the practical completion of the landscaping. During this period, any dead, diseased or damaged plants or landscaped areas are to be repaired or replaced during the period of maintenance and must not be deferred until the completion of the maintenance period.

Section 173 Agreement

7 Before the certification of the Plan of Subdivision, the owner/s of the lots must enter into an agreement with the Responsible Authority in accordance with Section 173 of the *Planning and Environment Act 1987*. The agreement must provide for:

a) Any dwelling or other building constructed on a lot must comply with the front, side and rear setbacks specified by the Neighbourhood Residential Zone – Schedule 13 of

Date Issued: **Signature of the Responsible Authority:** _____

Macedon Ranges Shire Council

PLANNING PERMIT

PLN/2022/198 CONDITIONS CONTINUED:

the Macedon Ranges Planning Scheme (or the setback requirements of any successive zone or overlay applying to the land).

b) No buildings or works are to be located outside the Building Envelopes as shown on the endorsed plans forming part of Planning Permit PLN/2022/198, unless with the prior written consent of the Responsible Authority.

c) The site coverage of all buildings constructed on any lot must not exceed 20% of the area of the lot. An area of minimum 50% of the lot area must be maintained with permeable surfacing.

d) The front, side and rear boundaries of each lot must only be fenced with post and wire rural style or similar visually permeable fencing construction to the satisfaction of the Responsible Authority.

e) The landscaping works shown on the endorsed plans must be maintained to the satisfaction of the Responsible Authority.

f) A minimum of 3000 litres rainwater tank for each lot with connection to supply water for toilet flushing and outdoor usage to the satisfaction of the Responsible Authority.

g) Any application to vary these restrictions will only be supported on the grounds that the variation achieves an appropriate outcome in respect to the preferred neighbourhood character for the locality including spaciousness of development, generous setbacks of buildings from property boundaries, and the retention of existing mature trees and establishment of new landscaped gardens.

Prior to a Statement of Compliance being issued:

a) Application must be made to the Registrar of Titles to register the Section 173 Agreement on the title to the land under Section 181 of the same Act.

b) The owner/s must pay all costs (including Council's costs) associated with the preparation, execution, registration and (if later sought) cancellation of the Section 173 Agreement.

Alternatively, the Section 173 Agreement specified above is not required to be entered into if a Plan of Subdivision including restrictions on the plan or a memorandum of common provisions (including design guidelines) providing for the same development restrictions specified to be included in the Section 173 Agreement (to the satisfaction of the Responsible Authority) otherwise required by this condition is submitted to and certified by the Responsible Authority.

8 Prior to the issuing of the Statement of Compliance for the approved subdivision, the owner must pay to Council a 5% cash-in-lieu open space contribution in respect to all of the land in the subdivision pursuant to Section 18 of the Subdivision Act 1988.

9 Measures must be undertaken to minimise any loss of amenity to the neighbourhood associated with subdivision works caused by dust, noise, the transport of material to and from

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Date Issued: **Signature of the Responsible Authority:** _____

Macedon Ranges Shire Council

PLANNING PERMIT

PLN/2022/198 CONDITIONS CONTINUED:

the land, and the deposit of mud and debris on public roads and the road reserve adjacent to the subject land, to the satisfaction of the Responsible Authority.

Macedon Ranges Planning Scheme Mandatory Subdivision Conditions

10 The owner of the land must enter into an agreement with:

a) A telecommunications network or service provider for the provision of telecommunication services to each lot shown on the endorsed plan in accordance with the provider's requirements and relevant legislation at the time; and

b) A suitably qualified person for the provision of fibre ready telecommunication facilities to each lot shown on the endorsed plan in accordance with any industry specifications or any standards set by the Australian Communications and Media Authority, unless the applicant can demonstrate that the land is in an area where the National Broadband Network will not be provided by optical fibre.

11 Before the issue of a Statement of Compliance for any stage of the subdivision under the *Subdivision Act 1988*, the owner of the land must provide written confirmation from:

a) A telecommunications network or service provider that all lots are connected to or are ready for connection to telecommunications services in accordance with the provider's requirements and relevant legislation at the time; and

b) A suitably qualified person that fibre ready telecommunication facilities have been provided in accordance with any industry specifications or any standards set by the Australian Communications and Media Authority, unless the applicant can demonstrate that the land is in an area where the National Broadband Network will not be provided by optical fibre.

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MRSC Engineering & Projects Unit Conditions

Functional Layout Plan

12 Prior to the certification of the plan of subdivision, a Functional Layout Plan for the subdivision must be submitted to and approved by the responsible authority. When approved the Functional Layout Plan will be endorsed and will then form part of the permit. The Plan must be drawn at a scale of 1:500 to acceptable standards and an electronic copy (PDF) must also be provided. The Plan must incorporate the following:

a) A fully dimensioned subdivision layout, including lot areas, lot numbers, open space areas, and widths of street reservations.

b) Topography and existing features, including contours for the subject land and any affected adjacent land.

c) Identification by survey of all trees (or group of trees) existing on the site, including dead trees and those that overhang the site from adjoining land.

d) Details of Tree Protection Zones for all trees to be retained on site.

Macedon Ranges Shire Council

PLANNING PERMIT

PLN/2022/198 CONDITIONS CONTINUED:

e) Any trees proposed for removal from the site (including dead trees) clearly designated.

f) Typical cross-sections for each street type, dimensioning individual elements, services offsets and any other spatial requirements.

g) Intersections with interim and/or ultimate treatments.

h) A table of offsets for all utility services and street trees.

i) Location and alignment of kerbs, footpaths and shared paths.

J) The proposed minor drainage network and any land required for maintenance access.

j) The major drainage system, including the retarding basin and/ or piped elements showing preliminary sizing.

k) Overland flow paths (100 year ARI) to indicate how excess runoff will safely be conveyed to its destination.

l) Drainage outfall system (both interim and ultimate), indicating legal point of discharge and any access requirements for construction and maintenance.

m) Preliminary location of reserves for electrical kiosks.

n) Works external to the subdivision, including both interim and ultimate access requirements.

o) Splays on all corner lots.

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Engineering Plans

13 Prior to the commencement of works for the subdivision, Engineering Plans must be submitted to and approved by Responsible Authority including payment of plan checking and supervision fees. The Engineering Plans will not be considered until the Functional Layout Plans have been approved by the Responsible Authority, Landscape Plan/s have been submitted to the Responsible Authority, the plan of subdivision has been lodged for certification with the Responsible Authority and the locations of other relevant authority services have been provided to the satisfaction of the Responsible Authority. The plans must include:

a) All necessary computations and supporting design documentation for any structure, civil and drainage infrastructure and geotechnical investigation report.

b) Details of works must be consistent with the approved Functional Layout Plan, submitted Landscape Plan/s and lodged plan of subdivision.

c) Details of any cut and fill earthworks including retaining walls.

d) Any traffic management or traffic calming devices.

e) Driveway links designed to provide one (1) visitor space per lot served by the link.

Macedon Ranges Shire Council

PLANNING PERMIT

PLN/2022/198 CONDITIONS CONTINUED:

f) Underground drains incorporating features to prevent litter, sediments, and oils from entering the drainage system and/or cut-off drains to intercept stormwater runoff from adjoining properties.

g) Pavements with kerb and channel, to dimensions generally in accordance with the approved functional layout plan, including traffic management devices where appropriate.

h) Underground stormwater drainage to each lot in the subdivision within own boundaries.

i) Water-sensitive urban design measures.

j) Maintenance management plan for all Water Sensitive Urban Design infrastructures.

k) Provision for all services and conduits (underground) including alignments and offsets.

l) Provision of public street lighting and underground electricity supply within all streets and reserves where appropriate.

m) A new crossover for each lot. Crossovers should be a minimum of 10 metres from any intersection, 1 metres from any power pole, sign or service pit and an absolute minimum of 3 metres from any street tree.

n) Vehicle exclusion measures within reserves while maintaining maintenance vehicle access.

o) Lot boundary fencing adjoining all reserves other than road reserves.

p) Temporary turnaround areas within the site for waste collection vehicles at the temporary dead end of any road.

q) Traffic control measures including street name signs.

r) A separate signage and line marking identifying the road layout, proposed signs, line-marking, RRPMs and a sign schedule.

s) Survey details of the canopy trunk location and size of trees to be retained and associated tree protection zone.

t) Permanent survey marks, levelled to the Australian Height Datum and coordinated to the Australian Map Grid.

u) Splays at all intersections, to suit the road functions.

Asset Protection

14 Prior to the commencement of works, an "Asset Protection Permit" must be obtained from Council for any of the following circumstances:

a) Entering a building site by means of a motor vehicle having a gross weight exceeding two tonnes.

b) Occupying a road for works.

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Macedon Ranges Shire Council

PLANNING PERMIT

PLN/2022/198 CONDITIONS CONTINUED:

c) Connecting any land to a stormwater drain.

d) Opening, altering or repairing a road.

e) Opening, altering or repairing a drain.

f) Accessing a building site from a point other than a crossover.

g) Constructing/repairing/widening/removing any crossover.

Site Management Plan

15 At least 14 days prior to commencement of works, a Site Management Plan (**SMP**) must be submitted to and approved by the Responsible Authority. The SMP must contain the following:

a) Name and contact details of appointed Civil Contractor and Superintendent.

b) Existing condition survey of all existing assets including private properties.

c) Construction Management Plan.

d) Traffic Management Plan.

e) Environmental Management Plan.

f) Occupational Health & Safety and Job Safely Analysis Plans.

g) Council issued Asset Protection Permit.

h) Council approved Engineering Plans.

All works must be carried out generally in accordance with measures set out in the above documents approved by the Responsible Authority.

16 Prior to issue of a Statement of Compliance, all works shown on the approved Engineering Plans must be constructed or carried out all to the satisfaction of the Responsible Authority.

17 Prior to works commencing, engineering plans detailing the storm water drainage are to be submitted for Responsible Authority approval and plan and supervision fees paid. The subdivision is to be provided with a drainage system to a design approved by the Responsible Authority and such that:

a) The subdivision as a whole is provided with a legal point of discharge approved by the Responsible Authority and any other statutory authority from which approval must be received for the discharge of drainage.

b) Stormwater details pipe alignment from the proposed development to the designated outfall.

c) A stormwater detention system demonstrating 10-year ARI post-development flow restricted to the predevelopment stage.

d) Stormwater runoff from all buildings, tanks and paved areas must be drained to a legal point of discharge.

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Macedon Ranges Shire Council

PLANNING PERMIT

PLN/2022/198 CONDITIONS CONTINUED:

e) All drainage courses or outfall drainage lines required to the legal point of discharge and which pass through lands other than those within the boundaries of the subdivision must be constructed at no cost to the Responsible Authority.

f) All drainage courses located within allotments must be contained within expressed drainage easements.

g) The flow paths of a 1 in 100 year ARI storm need to be determined and the subdivision designed such that no private property is inundated.

h) The drainage system must have provision for runoff from the upstream catchments and include any downstream works necessary to manage flows from the subdivision.

i) Objectives of the *Urban Stormwater – Best Practice Environmental Management Guidelines* (Victorian Stormwater Committee, 1999) are satisfied.

18 Prior to the issue of a Statement of Compliance, land on each lot to be used for a dwelling must be filled and compacted in accordance with Australian Standard AS3798:2007. The results of the tests must be produced and be to the satisfaction of the Responsible Authority.

19 Prior to the issue of a Statement of Compliance, the following 'as-constructed' documentation for road, drainage and public open space assets must be submitted to and approved by the Responsible Authority:

a) As-constructed drawings in hardcopy A3 format that include all alterations made during construction.

b) As-constructed drawings in AutoCAD (2000) and Acrobat PDF formats that include all alterations made during construction.

c) Asset information in digital format and in the form of a schedule of quantities.

20 The subdivision is to be constructed in accordance with Macedon Ranges Shire Council's Policy *Engineering Requirements for Infrastructure Construction* (June 2010).

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Environmental Management Plan

21 Before the commencement of works, an Environmental Management Plan must be submitted to and approved by the Responsible Authority. The plan must detail how issues such as erosion prevention, temporary drainage, dust generation and sediment control will be managed, on site, during the operation of the use permitted. Details of a contact person/site manager must also be provided, so that this person can be easily contacted should any issues arise. Reference should be made to the Environment Protection Authority's publication 960 '*Doing it right on subdivisions*'.

22 Prior to certification of the plan of subdivision under the *Subdivision Act 1988*, the operator of this permit shall provide documentary evidence to the satisfaction of the Responsible Authority in support of all proposed new road names shown on the plan. Documentation must include a completed "Road Name History" form. All proposed new road names must comply

Macedon Ranges Shire Council

PLANNING PERMIT

PLN/2022/198 CONDITIONS CONTINUED:

with the naming principles described in the Victorian Government's "*Guidelines for Geographic Names 2010*".

23 No polluted and/or sediment laden runoff is to be discharged directly or indirectly into drains or watercourses. Soil erosion control measures must be employed throughout the development works to the satisfaction of the Responsible Authority.

Construction Management Plan

24 Before the development commences, a Construction Management Plan (**CMP**) must be submitted to and approved by the Responsible Authority. The CMP must show:

a) Measures to control erosion and sediment and sediment laden water runoff including the design details of structures.

b) Dust control.

c) Where any construction wastes, equipment, machinery and/or earth is to be stored/stockpiled during construction.

d) Where access to the site for construction vehicle traffic will occur.

e) The location and details of a sign to be erected at the entrance(s) of the site advising contractors that they are entering a 'sensitive site' with prescribed tree protection zones and fences.

f) The location of any temporary buildings or yards.

25 Control measures in accordance with the approved Site Management Plan shall be employed throughout the construction of the works to the satisfaction of the Responsible Authority. The Responsible Authority must be kept informed in writing of any departures from the Site Management Plan. If in the opinion of the Responsible Authority the departure from the approved plan is significant then an amended plan must be submitted to and approved by the Responsible Authority. The approved measures must be carried out continually and completed to the satisfaction of the Responsible Authority.

26 Polluted drainage must be treated and/or absorbed on the lot from which it emanates to the satisfaction of the Responsible Authority. Polluted drainage must not be discharged beyond the boundaries of the lot from which it emanates or into a watercourse or easement drain.

27 The operator of this permit must maintain to the satisfaction of the responsible authority for a period of two (2) years, all landscaping constructed under this permit except for grass areas along street nature strips. The maintenance period shall commence on the date the landscaping is certified by the Responsible Authority as practically complete. Any defects occurring during the maintenance period shall be repaired by the operator of this permit to the satisfaction of the responsible authority. During this period, any dead, diseased or damaged plants are to be replaced during the period of maintenance and must not be deferred until the completion of the maintenance period.

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Date Issued: **Signature of the Responsible Authority:** _____

Macedon Ranges Shire Council

PLANNING PERMIT

PLN/2022/198 CONDITIONS CONTINUED:

MRSC Health Conditions

28 Prior to the issue of the statement of compliance, each lot must be connected to reticulated sewerage to the satisfaction of the Responsible Authority.

29 Prior to the issue of the statement of compliance, a licenced plumber must decommission the existing septic tank on the property in a safe manner and remove the effluent absorption trenches. Remediation works must be undertaken to ensure the land is safe to build on.

Expiry of Permit – Subdivision of Land

30 This permit will expire if one of the following circumstances applies:

a) The plan of subdivision is not certified within two years of the date of this permit.

b) The plan of subdivision is not registered at Land Registry within five years of the certification of the subdivision.

In accordance with Section 69 of the *Planning and Environment Act 1987* an application may be submitted to the Responsible Authority for an extension of the periods referred to in this condition.

Note:

- Future owners of the land must be made aware of the existence of this permit.
- The Defect Liability Period commences from the date of Acceptance of Works (Maintenance work time completion) and extend for a minimum period of 24 months, including 2 summers, or other agreed period.

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Date Issued: **Signature of the Responsible Authority:** _____

WHAT HAS BEEN DECIDED?

The Responsible Authority has issued a permit.

WHEN DOES A PERMIT BEGIN?

A permit operates:

- from the date specified in the permit, or
- if no date is specified, from:
  - (i) the date of the decision of the Victorian Civil and Administrative Tribunal, if the permit was issued at the direction of the tribunal, or
  - (ii) the date on which it was issued, in any other case.

WHEN DOES A PERMIT EXPIRE?

1. A permit for the development of land expires if:
   - the development or any stage of it does not start within the time specified in the permit, or
   - the development requires the certification of a plan of subdivision or consolidation under the *Subdivision Act 1988* and the plan is not certified within two years of the issue of the permit, unless the permit contains a different provision; or
   - the development or any stage of it is not completed within the time specified in the permit, or, if no time is specified, within two years after the issue of the permit or in the case of a subdivision or consolidation within 5 years of the certification of the plan of subdivision or consolidation under the *Subdivision Act 1988.*
2. A permit for the use of land expires if:
   - the use does not start within the time specified in the permit, or if no time is specified, within two years after the issue of the permit, or
   - the use is discontinued for a period of two years.
3. A permit for the development and use of land expires if:
   - the development or any stage of it does not start within the time specified in the permit; or
   - the development or any stage of it is not completed within the time specified in the permit, or if no time is specified, within two years after the issue of the permit; or
   - the use does not start within the time specified in the permit, or if no time is specified, within two years after the completion of the development, or
   - the use is discontinued for a period of two years.
4. If a permit for the use of land or the development and use of land or relating to any of the circumstances mentioned in Section 6A(2) of the *Planning and Environment Act 1987*, or to any combination of use, development or any of those circumstances requires the certification of a plan under the *Subdivision Act 1988,* unless the permit contains a different provision:
   - the use or development of any stage is to be taken to have started when the plan is certified; and
   - the permit expires if the plan is not certified within two years of the issue of the permit.
5. The expiry of a permit does not affect the validity of anything done under that permit before the expiry.

WHAT ABOUT APPEALS?

- The person who applied for the permit may appeal against any condition in the permit unless it was granted at the direction of the Victorian Civil and Administrative Tribunal where, in such case, no right of appeal exists.
- An appeal must be lodged within 60 days after the permit was issued, unless a Notice of Decision to grant a permit has been issued previously, in which case the appeal must be lodged within 60 days after the giving of that notice.
- An appeal is lodged with the Victorian Civil and Administrative Tribunal.
- An appeal must be made on a Notice of Appeal form which can be obtained from the Victorian Civil and Administrative Tribunal, and be accompanied by the prescribed fee.
- An appeal must state the grounds upon which it is based.
- An appeal must also be served on the Responsible Authority.
- Details about appeals and fees payable can be obtained from the Victorian Civil and Administrative Tribunal. The address of the Victorian Civil and Administrative Tribunal is 55 King Street, Melbourne, 3000. The telephone number is (03) 9628 9777. Internet www.vcat.vic.gov.au.

Planning and Environment Regulations 1987

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ETHOS
URBAN

13 June 2019

Ref: 3190200

Ms Sharon Macaulay
Urban & Regional Planner
Macaulay Town Planning
Kyneton, VIC 3444

Dear Sharon,

RE: Malmsbury Residential Assessment

We have prepared this Letter of Advice for your client who is seeking an assessment of likely future residential land demand in the township of Malmsbury in Macedon Ranges Shire. We are advised that the client wishes to have their land at 1 Wills Street in Malmsbury (the subject site) rezoned from the Farming Zone to the General Residential Zone. The subject site is located within the town boundary and is serviceable. The site is identified in Figure 1 on the following page.

At this point in the early stages of the rezoning process, the client is seeking in-principle support from Council prior to the preparation and lodgement of a formal planning scheme amendment application.

We are advised that Council has requested an assessment of likely population growth and associated housing demand and supply in Malmsbury that will inform Council in this planning process.

Generally, Malmsbury has positive attributes to support growth in population and housing, including an attractive rural setting, proximity to Kyneton for services, large blocks for rural-style living, and sufficient vacant commercial zoned land for the provision of facilities and services and to accommodate local job growth. To date, the rather slow take-up of vacant land, both residential and commercial, is due mainly to the town's current small population numbers and low rate of population growth.

This Letter of Advice considers these aspects associated with residential land supply and demand in Malmsbury, and contains the following information:

1. Local and Regional Context
2. Existing and Forecast Population Growth
3. Forecast Dwelling Growth
4. Forecast Residential Land Demand
5. Residential Land Supply
6. Implications of Insufficient Growth
7. Conclusion.

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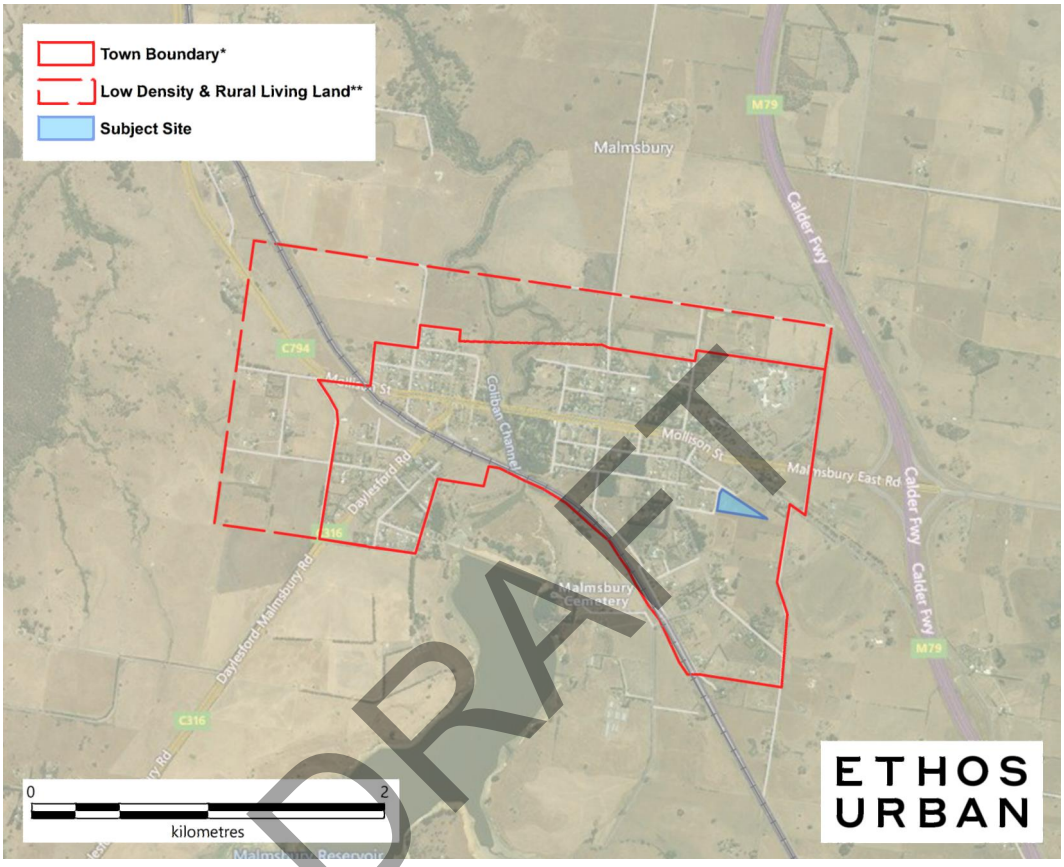
Figure 1: Location of Subject Land in Malmsbury Township



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1 Local and Regional Context

Malmsbury is a small township located in Macedon Ranges Shire, approximately 9km north-west of Kyneton, 59km south of Bendigo, and 97km north-west of the Melbourne CBD. The town is readily accessible to both Bendigo (a drive time of 44 minutes) and Melbourne CBD (a drive time of 72 minutes) via the Calder Freeway. Malmsbury also enjoys access to both cities via the Bendigo railway line, with the local railway station serviced by around 25 trains stopping daily *en route* to and from Melbourne and Bendigo.

Historically, Malmsbury was the main town servicing the former Coliban gold diggings which stretched from Lauriston to Taradale. Post-goldrush times, Census data shows Malmsbury had a resident population that peaked at around 1,370 persons in 1891, although numbers declined to around 1,220 persons by 1903 (ABS Census). The lowest level of population numbers was recorded in the 1947 Census when resident numbers fell to just 320 persons. Since 1947, resident numbers have been slowly increasing at an average annual rate of approximately 1%. In 2019 the township has an estimated population of 720 persons (Ethos Urban, based on an ABS Estimated Residential Population of 705 persons in 2018) ; this number represents an increase of 120 persons on the 600 residents recorded at the 2006 Census.

Clearly, the economic fortunes of Malmsbury have fluctuated over the years and this is evident from the listing of industries (farming, gold-mining, blue-stone extraction, flour mill), churches, schools and recreational facilities that have existed in the town over generations. In more recent years the growth of larger settlements has had a negative impact on residential population levels in Malmsbury; however, this pattern is also changing as potential new residents show interest in the town's lifestyle and accessibility features. The ease of access to both Melbourne and Bendigo is assisting in the revival of Malmsbury today.

Recent strong population and dwelling growth in Melbourne's northern and western urban growth areas and in Bendigo, as well as growth in the nearby town of Kyneton, means that Malmsbury can be regarded as part of a broader peri-urban area. The town is attractive to people seeking a rural, semi-rural or regional lifestyle that is within reasonable commuting distance of the Melbourne CBD or Bendigo. This feature is evident with the emergence over time of several coffee shops and a provedore store in Malmsbury, with these amenities popular with the residential and visitor market. Often, small trends such as these provide a pointer to more significant future residential growth.

The location of Malmsbury in its regional context is illustrated in Figure 2.

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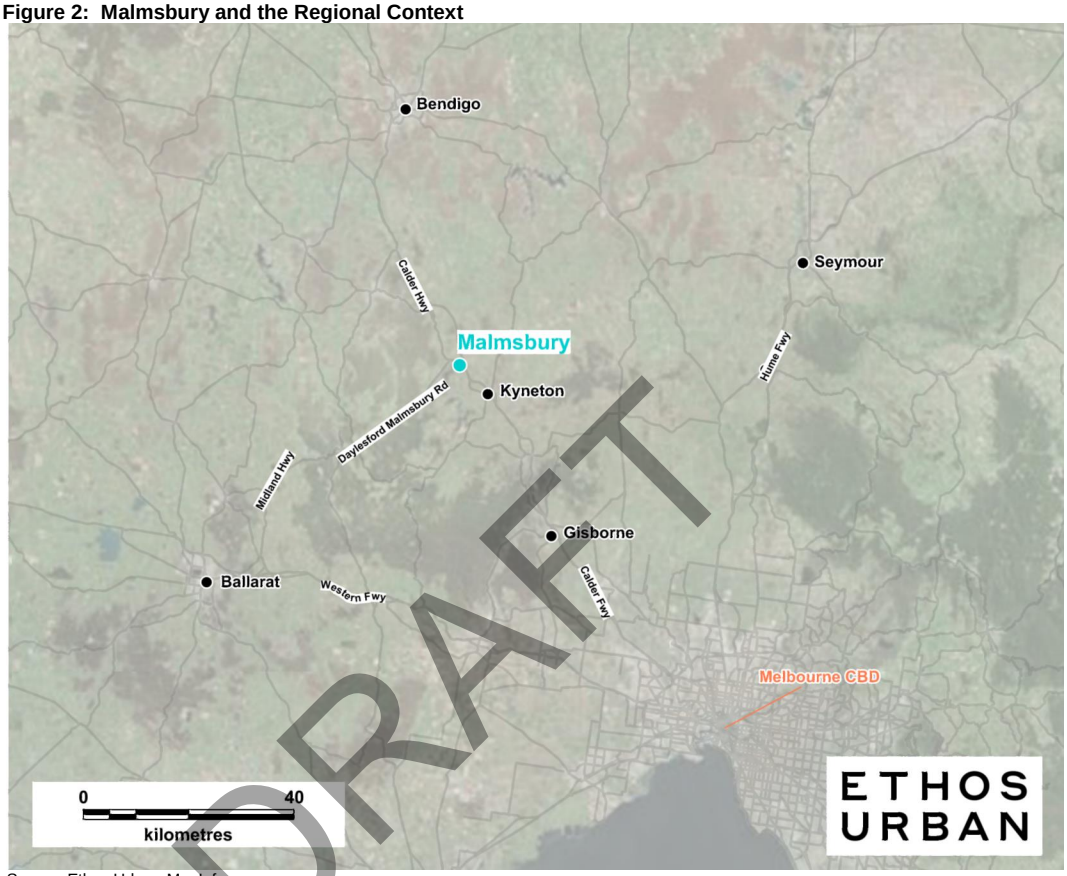
Figure 2: Malmsbury and the Regional Context



Source: Ethos Urban, MapInfo

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2 Existing Population and Forecast Growth

Existing Population

Existing population in Malmsbury is estimated at 720 persons, estimated from Estimated Resident Population (ERP) data collected by the Australian Bureau of Statistics (ABS) to 2018 and applying modest growth in 2019, as shown in Table 1.

Table 1: Recent and Current Population Levels, Malmsbury Township, 2006 to 2019

	2006 (1)	2011 (1)	2016 (1)	2018 (1)	2019 (2)
Malmsbury Township Population (No.)	600	620	650	705	720
Average Annual Growth (No.)	-	+4	+6	+30	+15
Average Annual Growth (%)	-	0.7%	0.9%	4.5%	1.9%

Source: (1) ABS ERP Data; (2) Ethos Urban.
Note: Figures rounded

Population growth in Malmsbury township over the decade to 2016 was relatively modest however growth has increased significantly since. Further potential exists for an increase in resident numbers in coming years. This potential growth is driven by the popularity of small-town residential opportunities, proximity to larger services centres, and accessibility (via rail and freeway) to employment opportunities in metropolitan Melbourne.

Forecast Population Growth

The level and rate of population growth in small townships – particularly those in proximity to major urban and metropolitan areas – can change rapidly due to demand factors (such as market trends) and supply factors (such as well-presented residential land being brought to market). Accordingly, relying on past trends to forecast future trends can be unreliable.

In assessing the future population growth prospects for Malmsbury, consideration is given to the following:

- Malmsbury's proximity to Greater Melbourne and Bendigo, particularly as employment centres, as destinations for higher-order services and as major growth centres in their own right;
- Future upgrades to rail infrastructure are expected to make Malmsbury more accessible to metropolitan Melbourne and Bendigo, with an additional 38 services a week proposed for the Melbourne-Bendigo line (currently 25 services are provided daily);
- The town's rural and lifestyle aspects, which appear to be increasingly valued by residents and visitors; and
- Nearby Kyneton's significant urban growth in recent years as an alternative to metropolitan growth, with Kyneton expected to continue to experience population growth.

Having regard for the variables that are likely to affect Malmsbury's population levels over time, projections of resident numbers prepared by the consultant reflect three scenarios:

- Scenario 1: Low-growth at an average annual growth rate of 1.7% pa which reflects the 10 year average growth rate.
- Scenario 2: Medium-growth at an average annual growth rate of 2.5% pa which reflects an approximate mid-point between scenarios 1 and 3.
- Scenario 3: High-growth at an average annual growth rate of 4.0% pa which reflects growth trends since 2016.

While Scenarios 2 and 3 have growth rates higher than have occurred in recent years, it is necessary to recognise that any growth over the forecast period to 2036 will be off a low base number and, accordingly, any increase in growth will appear to be relatively high in percentage terms.

Each of the three scenarios is presented in Table 2, noting that variations can be expected to occur year-on-year over the forecast period to 2036.

Table 2: Malmsbury Township Population Growth Scenarios, 2019 to 2036

Scenarios	2019	2021	2026	2031	2036	Total Increase (and Average Annual Increase)
1: Low Growth (1.7% pa)	720	740	810	880	950	+230 (+14)
2: Medium Growth (2.5% pa)	720	760	860	970	1,100	+380 (+22)
3: High Growth (4% pa)	720	790	960	1,170	1,430	+710 (+42)

Source: Ethos Urban
Note: Figure rounded

Scenario 2 – which is approximately the mid-point in the three scenarios – has been selected for the purpose of assessing likely household growth over the forecast period and the associated requirement for residential land.

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Under Scenario 2, by 2036 Malmsbury's resident population is expected to total 1,100 persons, representing an increase of 380 persons on the current 2019 level and an average increase of approximately 22 persons per year over the period.

Of interest, the Shire's Municipal Strategic Statement (MSS, p54, Clause 21.13) indicates that the town "could be expected to accommodate a population of approximately 900 in 2036", based on the Macedon Ranges Settlement Strategy, 2011. The MSS (p54) also notes from the Settlement Strategy that "the existing land supply in Malmsbury may have the potential to accommodate as many as 1,200 people … within the township boundary and surrounding area".

To place Malmsbury's potential population growth in the context of overall growth trends in Macedon Ranges Shire, forecasts prepared by id Consulting on behalf of the Shire indicate that the total population is likely to increase from 49,625 persons in 2019 to 65,405 persons in 2036. This increase represents an average annual growth rate of 1.6% pa and an increase of +930 persons per year. Based on the adopted Scenario 2 growth forecasts for Malmsbury, the town would account for a very small 2.1% of annual population growth in the overall Shire. While this share is not significant in the Shire-wide context, the forecast growth in Malmsbury would provide new residential location opportunities for households and also contribute to the economic development of the township and environs over coming years, particularly in the service sector, including local shops and amenities.

3 Forecast Dwelling Requirements

Forecast requirements for the provision of new dwellings in Malmsbury over the period 2019 to 2036 are based on forecast population growth and average household size, and with allowance for vacant dwellings (including dwellings for sale or rent, undergoing restoration/upgrade, etc). The resultant forecast of dwelling requirements is presented in Table 3 and is based for forecast population growth in Scenario 2 shown in Table 2.

The forecast indicates that between 2019 and 2036 an additional 185 dwellings would be required and this equates to the provision of approximately 10 new dwellings a year over the period.

Table 3: Forecast Dwelling Requirements for Malmsbury Township, 2019 to 2036 (No. Dwellings)

	2019	2021	2026	2031	2036	Change 2019 – 2036	Change p.a 2019 – 2036
No. Township Residents (1)	720	760	860	970	1,100	+380	+22
Average No. Persons per household (2)	2.38	2.36	2.35	2.34	2.32	-	-
Estimated No. Households	300	320	370	410	470	+170	+10
Estimated No. Dwellings/Sites (3)	330	350	405	450	515	+185	+11

Source: (1) Ethos Urban, Table 2; (2) id.Consulting (Macedon Ranges Shire)
Note: (3) Allowance of 10% for un-occupied dwellings (i.e. vacant dwellings for sale or rent or under-going renovation. All figures rounded

4 Forecast Residential Land Demand

The forecast demand for an additional 185 dwelling sites in the period 2019 to 2036 averages approximately eleven sites per year.

These residential sites are likely to involve a range of allotment sizes, having regard for the types of households seeking to locate in Malmsbury. A share of residential demand will involve standard residential allotments generally in the range 750m^2 to 1,000m^2 (and likely to be lower than this figure in many cases), while others may be seeking larger residential allotments, reflecting life-style factors.

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For the purpose of this demand assessment, if the typical residential allotment has an average of (say) 850m^2, a total of approximately 160,000m^2 of residential land (16ha) would be required (175 lots x an average of 850m^2 each), and this excludes the provision of roads, public access for infrastructure, open space, etc.

Allowing for residential allotments to account for 70% of total residential land requirements, the total land area involved in accommodating 185 new lots by 2036 would be in the order of 22.5ha (and this allows for road access, open space, etc).

In reality however, residential allotments are likely to be presented to the market at a variety of sizes. While some lots will be sought at 850m^2, others are likely to be larger in scale. This is particularly the case in a town like Malmsbury where larger lot sizes (of say, 1,000m^2, 1,500m^2 and 2,000m^2) are likely to represent a key drawcard for potential new residents seeking the lifestyle offered in a small township but without the conventional urban densities of larger towns and regional cities. It is expected that demand will be met by the existing supply of residential allotments (say, up to 3,000m^2 per allotment), while in other cases opportunities may exist for a new subdivision to be created where roads and open space and so on need to be accommodated in a suitably-planned environment.

5 Residential Land Supply

In the process of identifying vacant parcels of land available for the establishment of a dwelling or identified as being capable of further subdivision needs to take into account a number of variables which include the following:

- An area of land identified as a potential source of future residential supply may be controlled by a landowner unwilling to develop or sell for the purposes of development.
- Unidentified development constraints may render a parcel of land undevelopable or unviable for developers to undertake a development (such as contaminated land or land that requires extensive drainage infrastructure).
- Market conditions may impact on project viability of some development parcels, particularly those with significant infrastructure costs or other limitations.

In forecasting residential land requirements for Malmsbury township, the following assumptions have been applied:

- Land in the RLZ and LDRZ is not be considered to have further subdivision potential; and
- Individual blocks within the general residential zone larger than 3,000m^2 are considered as development sites with subdivision potential. From the survey of vacant land in Malmsbury, no individual blocks are noted in the GRZ that are over the 3,000m^2 in area and therefore regarded as of a developable scale. On this basis, the supply of residential land in Malmsbury is the aggregate of those allotments in the GRZ and RLZ that are considered to be vacant at this point of time.

Vacant lots are summarised by area in Table 4 which indicates there are:

- 37 vacant lots of less than 1,000m^2
- 104 vacant lots between 1,001m^2 and 1,500m^2
- 16 vacant lots between 1,501m^2 and 2,000m^2
- 24 vacant lots between 2,001m^2 and 2,500m^2
- 2 vacant lots between 2,501m^2 and 3,000m^2
- 116 vacant lots greater than 3,000m^2.

Table 4: Summary of Vacant Lots by Area (m^2)

Size (sqm)	>1000	1,001 - 1,500	1,501 - 2,000	2,001 - 2,500	2,501 - 3,000	3,001 +	Total
Count	37	104	16	24	2	116	**299**

Source: (1) Nearmap; (2) MapInfo

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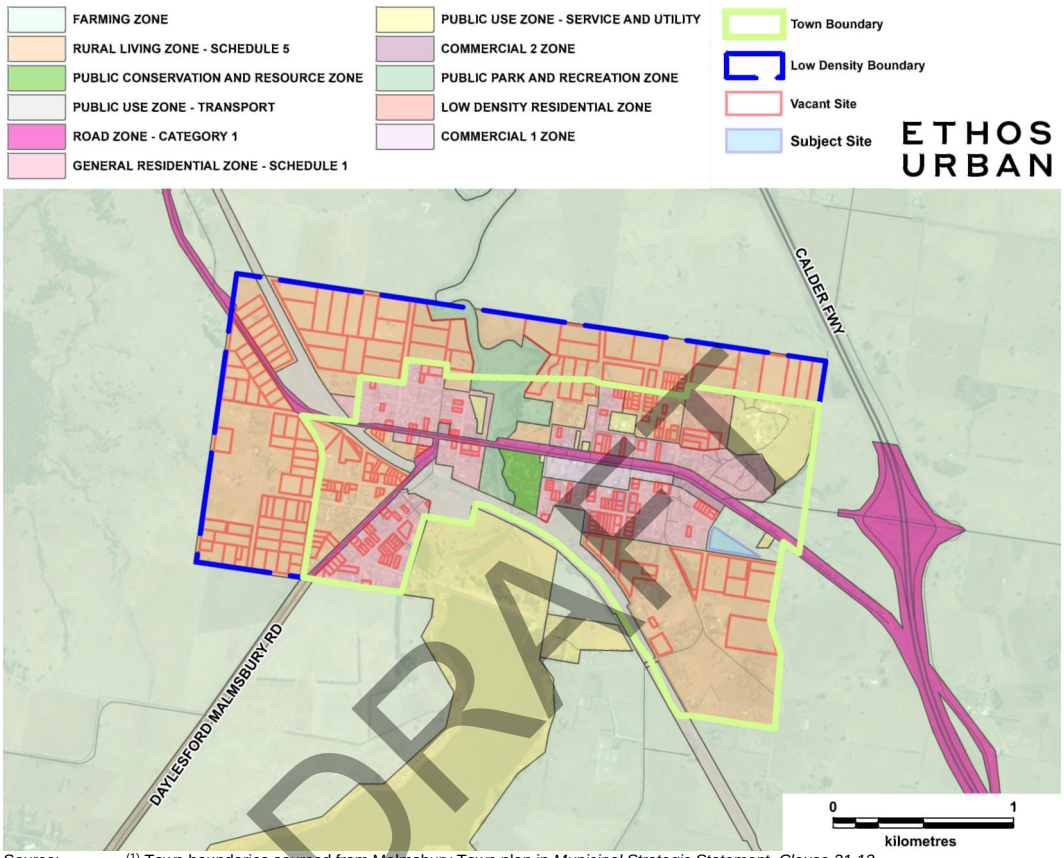
Figure 3: Existing Residential Land Supply in Malmsbury



Source: (1) Town boundaries sourced from Malmsbury Town plan in *Municipal Strategic Statement, Clause 21.13*
(2) Vacant site information identified by Ethos Urban from Nearmap and MapInfo

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Adequacy of Residential Land Supply

According to analysis of vacant residential land in the General Residential Zone, Malmsbury has an existing provision of 113 residential lots. With an estimated take-up rate of eleven lots per year, the town has an existing residential lot supply of 10 years.

A significant number of vacant lots (182 in total) also exist in the Rural Living Zone however many of these lots exist in name only. In many cases streets are unmade and it is unclear as to whether the cost of development, including servicing costs, would provide for a viable development outcome. Thus, a considerable proportion of the allotments that technically exist in the Rural Living Zone are theoretical in nature only at this point of time.

It is also considered that a significant number of residential allotments in the General Residential Zone present relatively poorly to the market with unsealed streets and little in the way of landscaping and presentation generally expected in contemporary residential neighbourhoods.

Even so, discounting the supply of Rural Living Zone land but taking into account land in the General Residential Zone there is in the order of 10 years of land supply, level that is below the normal practice in residential planning to ensure a 15-year supply of residential land.

As indicated in Table 3, an estimated 185 residential sites are expected to be required in Malmsbury by 2036. Accordingly, additional residential sites will be required in coming years if the township is to accommodate the anticipated level of demand for residential lots

Malmsbury Vacant Land Sales

Another measure of the strength of the local residential market is to examine the rate and variation in recent residential lot sales.

Over the past decade 2009 to 2018, the vacant *land* market in Malmsbury has experienced average sales of around 11 per year and within the general range of between 5 sales (in 2009) and 22 sales (in 2011) per year.
In more recent years, 2016 to 2018, vacant land sales have averaged 13 sales per year. This data refers to all vacant land in Malmsbury.

During the same period, vacant land prices have averaged $95,500 (2009) and reaching $199,292 (2018), showing an average annual increase of 8.5%. (these figures are quoted in current prices, i.e. including price inflation).
Although residential land is not specifically identified in this sales data, sales for vacant sites under 1,000m^2 (which typically includes residential sites) numbered 11 sales over the period 2009 to 2018 and with an average sale price of $104,100 per sale.

In addition, a total of 41 sales were recorded for vacant land between 1,000m^2 and 1,500m^2 in area over the 10-year period and the average price was $119,300 per sale.
The increase in average prices and the moderate number of sales indicates that demand exists for *residential land* properties that offers a regional lifestyle which many potential homeowners (often referred to as tree changers) are seeking, and from those seeking investment opportunities.

Figure 4 illustrates vacant land sales in Malmsbury, together with the increase in average of sale price in each year. The conclusion drawn from Figure 4 is that vacant land prices have continued to increase over time, while the number of sales has varied over that period.

The variation evident in lot sales from one year to the next can be a function of a range of factors including the availability of serviced allotments.

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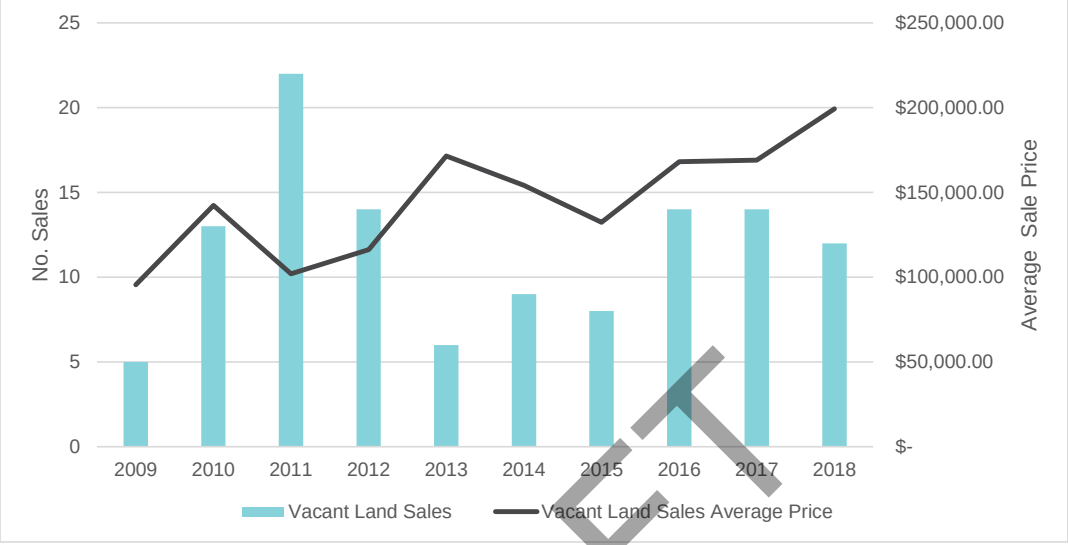
Figure 4: Vacant Land Sales and Average Price Per Annum, Malmsbury, 2009 to 2018



Source: Price Finder

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6 Implications of Insufficient Growth

With a population of approximately 700 persons and only 10km distant from Kyneton, Malmsbury faces a number of challenges in terms of its ability to sustain commercial activities and community facilities.

Enrolments at Malmsbury Primary School have declined from 82 students in 2011 to 69 students in 2018. Although these numbers do not represent a dangerous level of decline or a precipitous enrolment level, it does suggest a downward trend on an already relatively low student population. Schools experiencing a decline in student numbers or failing to maintain a critical mass frequently experience a further decline as some families opt for larger schools with better infrastructure and a broader range of educational opportunities.

Moreover, it is understood that in terms of infrastructure, the primary school has significant capacity for additional students.

From a commercial perspective, the business mix in the town centre comprises basic convenience retail services along with several higher end gourmet and lifestyle businesses (including a well-regarded bakery) which complement the broad and growing gourmet foods and lifestyle focus of the region.

Since Malmsbury was bypassed in 2008, the challenges for retail businesses in the town have increased.

Encouraging an increase in the town's population will assist in buttressing existing businesses from difficult retail conditions by increasing the intensity of existing business uses, as well creating the conditions for an expansion in retail and commercial offerings.

Similarly, an increase in the town's population will assist in supporting the ongoing viability of community facilities including the primary school.

7 Conclusion

1. **The Township:** Malmsbury is located in regional Victoria between Kyneton and Bendigo and is well-served by road (Calder Freeway) and rail (Melbourne to Bendigo) infrastructure.
2. **Population growth:** Malmsbury increased its population by an average of 5 persons per annum between 2006 and 2016. Population growth has increased significantly from 2016, averaging 30 persons per annum from 2016 to 2018 and the population is currently estimated to be 720 persons. Future growth scenarios vary from a population growth rate of 1.7% per annum (similar to that of recent growth) 4% per annum (in which Malmsbury capitalises on its strategic location) and 2.5% (an approximate mid-point between the lower and higher scenario). Based on the township's location, transport infrastructure and an ongoing pipeline of developable residential land, the three growth scenarios are all regarded as plausible.
3. **Dwelling Growth**: Based on the medium population growth scenario (2.5% per annum), 11 dwellings per annum would be required to support population growth.
4. **Supply of Residential Land**: A potential supply yield of approximately vacant 300 lots have been identified between the relevant zone of township. However, many of these lots – particularly those in the Rural Living Zone – exist in name only and are un-serviced and require road construction for access. Although many vacant lots in the General Residential Zone can be accessed via unmade streets, they do not present as modern residential allotments. For the purpose of the assessment, only vacant lots in the General Residential Zone (113 lots) are regarded as a genuine source of residential land supply.
5. **Adequacy of Residential Land Supply**: Based on the supply and demand assumptions set out above, supply is considered adequate for a period of 10.3 years. Even then, it is questionable as to how many existing vacant lots are likely to prove attractive to potential purchasers. Normal practice in residential planning is to ensure a 15-year supply of residential land is provided in an area that is identified for residential growth. Maintenance of a 15 year supply of residential land provides for a competitive land market and ensures any upwards pressure on the price of land is limited.
6. **Implications of Insufficient Growth**: Malmsbury's commercial sector and community facilities would benefit from additional population growth to ensure the catchment population is of a critical mass to support the ongoing viability of existing business and provision of community facilities and services. In particular, Malmsbury Primary School, which has seen a decline in student numbers from 82 students in 2011 to 69 students in 2018, is considered to be a beneficiary of population growth in the township.
7. **Recommendation:** Based on the analysis undertaken for this Letter of Advice, it is considered that the rezoning of additional land in the General Residential Zone that can be properly serviced and presented to the market in a contemporary manner with a sense of amenity, would provide a range of benefits to the town.

DRAFT

***

If you require any further information in relation to the demand for and supply of residential land in Malmsbury, please call me on 03 9419 7226.

Yours sincerely,

Chris McNeill
Director, Economics
03 9419 7226
cmcneill@ethosurban.com

Town Planning People

Landscape Master Plan

1 Wills Street, Malmsbury

DRAFT

INDICATIVE STREETSCAPE TREE SCHEDULE			
CODE	BOTANICAL NAME	COMMON NAME	HEIGHT x WIDTH
	Quercus Palustris	Pin Oak	20 x 8-12m
	Fraxinu 'Raywood'	Claret Ash	15-20 x 8-15m
	Frainus pennsylvanica	Green Ash	13-15 x 7-9m

STREETSCAPE TREES

Quercus Palustris
Pin Oak

Fraxinu 'Raywood'
Claret Ash

Frainus pennsylvanica
Green Ash

LEGEND

- Extent of Works
- Naturestrip
- Street trees

- This indicative Landscape Master Plan has considered the Macedon Ranges Shire Council Street Tree Planting Preferred Species List, the site, surrounds and commentary provided by internal Council departments.

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DRAFT

10 0 10 20 30 40 50 60m
SCALE 1:1000

1 Wills Street, Malmsbury
Landscape Master Plan

102-21
01.02.2021
Ver 03

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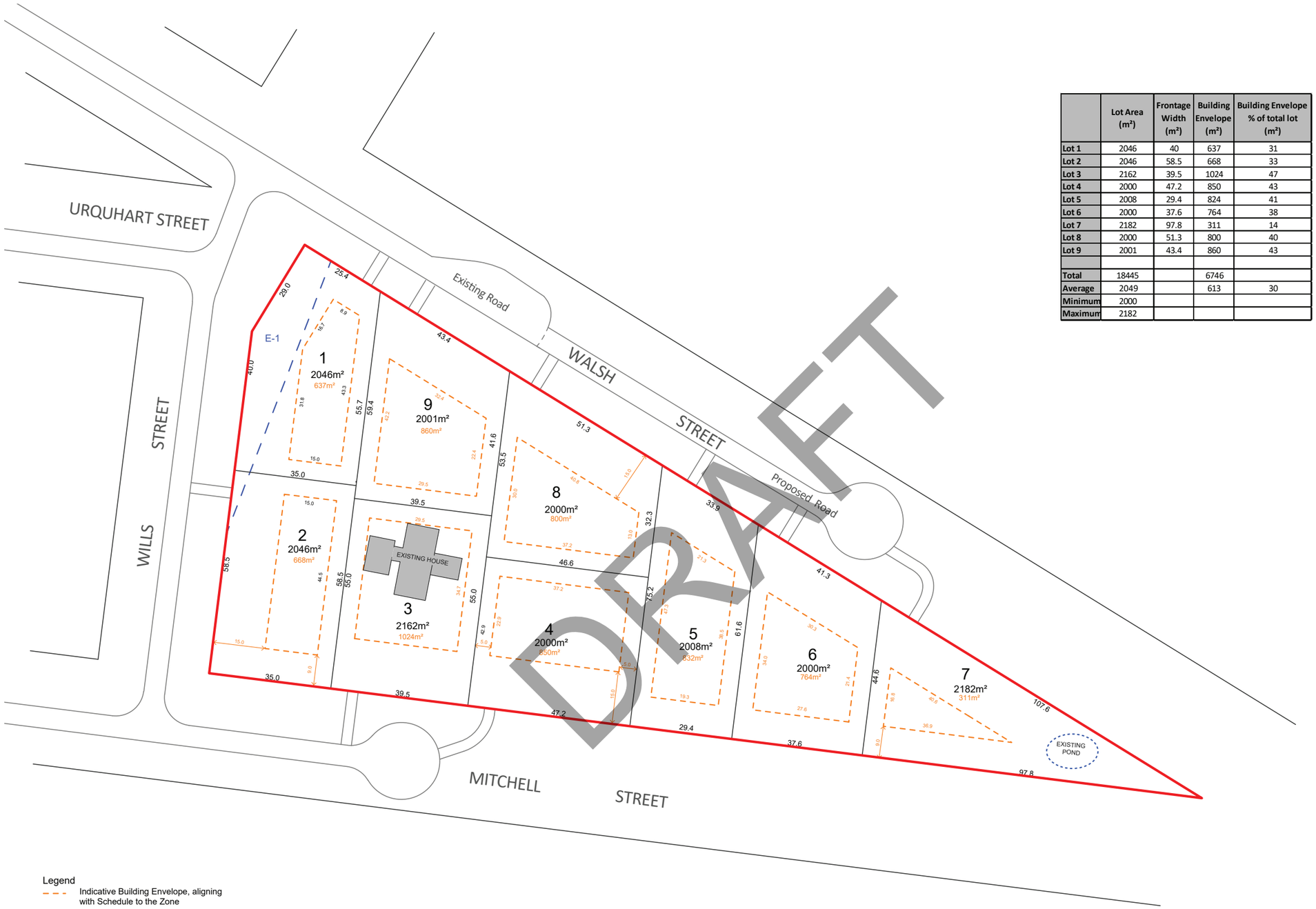

	Lot Area (m^2)	Frontage Width (m^2)	Building Envelope (m^2)	Building Envelope % of total lot (m^2)
Lot 1	2046	40	637	31
Lot 2	2046	58.5	668	33
Lot 3	2162	39.5	1024	47
Lot 4	2000	47.2	850	43
Lot 5	2008	29.4	824	41
Lot 6	2000	37.6	764	38
Lot 7	2182	97.8	311	14
Lot 8	2000	51.3	800	40
Lot 9	2001	43.4	860	43
Total	18445		6746	
Average	2049		613	30
Minimum	2000			
Maximum	2182			

Legend

Indicative Building Envelope, aligning with Schedule to the Zone

Town Planning People

10 0 10 20 30 40 50 60m

SCALE 1:1000

1 Wills Street, Malmsbury

Concept Plan of Subdivision

102-21
08.02.2021
Ver 04

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G2 URBAN PLANNING

BENNETT ROAD DEVELOPMENT PLAN

MACEDON RANGES PLANNING SCHEME
DEVELOPMENT PLAN OVERLAY SCHEDULE 18

DEVELOPMENT PLAN REPORT

DECEMBER 2021

G2 URBAN PLANNING
670 Mt Alexander Road Moonee Ponds VIC 3039 (p) 9372 0401 (f) 9375 2862 (e) gap@gattini.com.au

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1.0 INTRODUCTION

The Development Plan for the Bennett Road Precinct applies to the land described under the Macedon Ranges Planning Scheme, as the "Bennett Road, Gisborne, Rural Living Area Development Plan Overlay Schedule 18". The site is on the east side of Bennett Road and south of McGregor Road and has an area of approximately 132 hectares.

The Development Plan Overlay Schedule 18 (DPO18) specifies the planning requirements for future development of the area in a Development Plan with supporting specialist assessments. These planning requirements are addressed in this report which will guide future planning permit applications for subdivision and development.

The DPO18 supports the Rural Living Zone Schedule 2 over this precinct. There are no other planning scheme overlay controls.

The Bennett Road Precinct Development Plan by Terraco outlines the site conditions and key requirements to be considered for future development.

The Development Plan is supported by the following documents:

- Development Plan Overall by Terraco
- Development Plan Concept Plans by Terraco
- Site Photo Survey by Terraco
- Servicing Report by Terraco
- Drainage / Culvert Report by Terraco
- Survey plan by JR Edwards
- Traffic Management and Impact Plan by Traffix Group
- Land Capability and Storm Water Review by Archaeo-Environments Ltd
- Sustainability Report by Archaeo-Environments Ltd
- Biodiversity Assessment: Existing Conditions by Ecology & Heritage Partners
- Flora and Fauna Targeted Survey by Ecology & Heritage Partners
- Vegetation Management Plan by Ecology & Heritage Partners
- Cultural Heritage Assessment by Archaeo-Environments Ltd
- Landscape Concept by Habitat
- Fire Statement by Regional Planning & Design Ltd
- Acoustic Report by Cogent Acoustics

2.0 CONTEXT

2.1 The Site

The site has an area of approximately 132ha around Bennett Road & McGregor Road Gisborne, 4km south-east of the town centre. Residential development is to the west side of the Calder Freeway and rural residential lots are to the north side of McGregor Road and along Panorama Drive to the north.

Figure 1: Site Location

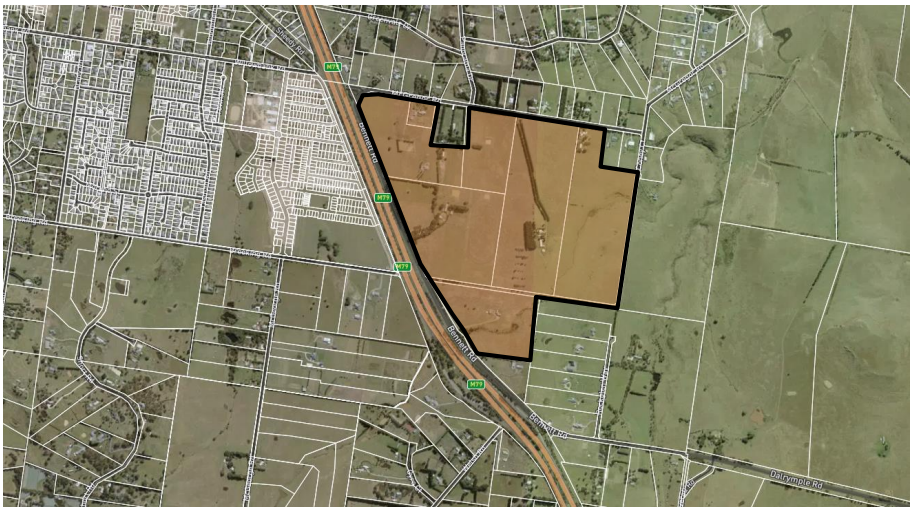


Figure 2: Aerial of Site Context

Figure 3: The Development Plan Area

The site is comprised of 6 allotments as follows:

- 88 Bennett Road (Lot 1, PS343448) 16.2ha
- 128 Bennett Road (Lot 1, PS343449) 25.7ha
- 168 Bennett Road (Lot 2, PS627007) 16.6ha
- 15 McGregor Road (Lot 1, TP886104) 11 ha
- 94 McGregor Road (Lot 1, LP134525) 31.8ha
- 134 McGregor Road (Lot 1, PS633404) 27.7ha

The precinct is bound by Bennett Road to the west, McGregor Road to the north, Coney Court and an unmade road to the east and the unmade Brooking Road and 88 Bennett Road to the south. All lots include a dwelling and associated outbuildings other than 15 McGregor Road. The properties currently have rural related uses with some grazing and haymaking to maintain grass heights. A drainage line runs through the precinct from the south-west to the north-east, known as the Djirri Djirri Creek which is evident on the survey plan at Figure 4.

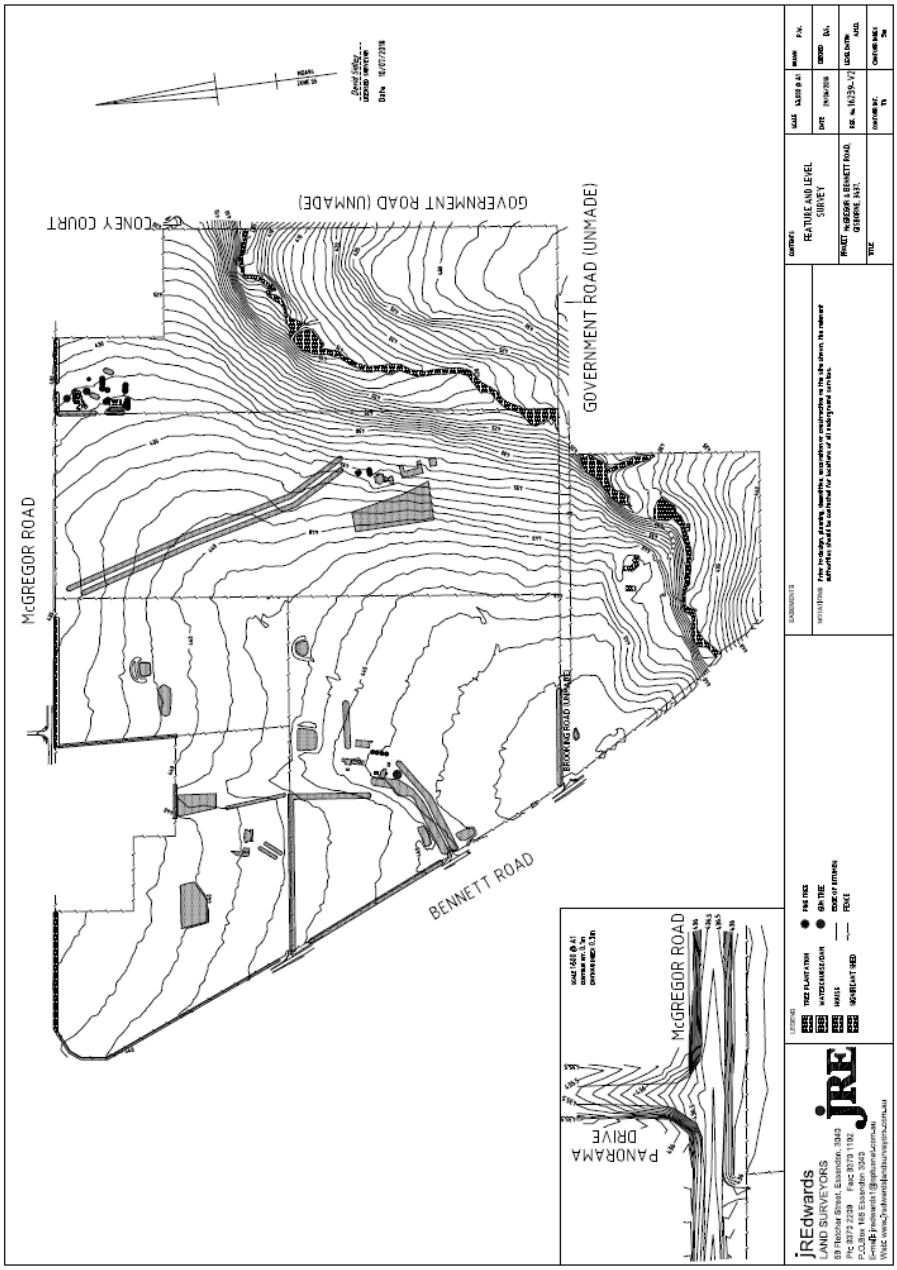


Figure 4: Survey Plan

The precinct is largely flat to undulating, however is steep along the drainage line or watercourse particularly to the east. The precinct is described in the Sustainability Report by Archaeo-Environments Ltd as follows:

> *The study area is characterised by a broad and open volcanic plain which includes an incised waterway across the south-west. The area has been almost entirely cleared of native vegetation, with minor clumps of eucalypts (predominantly grey box) and tree plantations, with the main vegetation existing as exotic plantings as driveway avenues and some cypress windbreaks and boundary plantings. There are 10 dams which are for the most part across gentle drainage depressions. The study area is fenced throughout with a range of grazing property and lifestyle properties.*

2.2 The Site Context

The site is designated under the Planning Scheme Development Plan Overlay Schedule 18 for rural residential lots a minimum of 2ha in area.

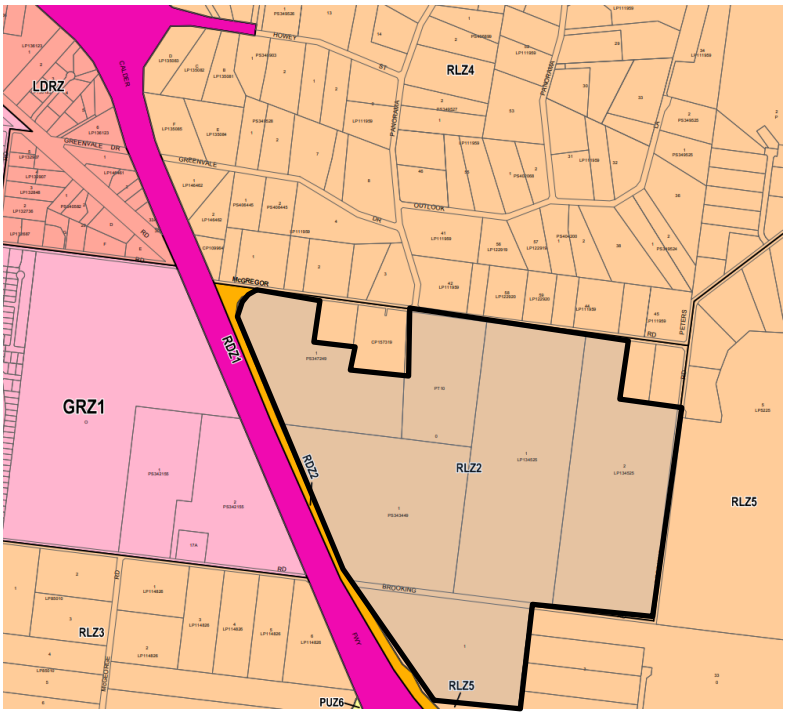


Figure 5: Macedon Planning Scheme Zone Map

The adjacent lane units are described as follows:

- Land to the north of McGregor Road comprises of rural residential lots that are mostly built upon and well established with vegetation and outbuildings. The Rural Living Zone Schedule 4 applies to this area specifying a 1 hectare lot size and lots generally range between 1 and 3 hectares.
- Land to the east and south is in the Rural Living Zone 5 which has an 8 hectare lot size with averaging provisions allowing for lesser lots to be created. Planning Permit PLN/2018/541 was issued at 21 Coney Court and 25 Dalrymple Road for a 10 lot subdivision including lots in the order of 2 hectares directly opposite the Development Plan area to the east side of Rockglen Way and south of the unmade Brooking Road.
- West of the Calder Freeway for the most part is a General Residential Zone under which standard residential subdivision is taking place.

The road access and general conditions are outlined in the Traffic Management and Impact Plan by Traffix Group as follows:

Vehicle access for the site to/from the Gisborne township to the northwest is available via Panorama Drive and Emmeline Drive. Access to/from areas to the north of the site and Melbourne city to the southeast is available via Calder Freeway, which can also be accessed via the Panorama Drive/Emmeline Drive route, and approximately 3.5km from the south via local roads to the Coangualt Road/Mundy Road freeway interchange.

The site has good access to central Sunbury to the southeast via two primary route options as follows: Via Dalrymple Road (to the southeast) which connects with Bennett Road directly; and Via Calder Freeway (via access ramps to the northwest).

Local roads are outlined as follows:

- *Bennett Road is a sealed road and has a carriageway width of approximately 6.35m, which accommodates a single lane of traffic in each direction.*
- *McGregor Road is a sealed road and has a carriageway width of 7m (approximate) which accommodates a single lane of traffic in each direction.*
- *Coney Court is a cul-de-sac road which extends to the south from McGregor Road. Coney Court is a sealed road and has a carriageway width of 3.9m (approximate).*

To the north:

Panorama Drive is generally aligned in a north-south 'loop' between McGregor Road and Outlook Lane. Panorama Drive is a sealed road and has a carriageway width of approximately 5.5m, which accommodates a single lane of traffic in each direction.

3.0 BENNETT ROAD DEVELOPMENT PLAN

The Bennett Road Development Plan (DP) site plans prepared by Terraco are in response to the Planning Scheme DPO18 and are supported by the specialist consultant inputs.

The DP plans include the following:

1. Development Plan Overall Plan
2. Development Plan Concept Plans
3. Site Photo Survey

The DP is supported by the Survey Plan prepared for the area. The plan outlines the 6 properties in the precinct, the existing road network and the unmade road reserves. It details the site slope at 1m contour intervals, the drainage line / watercourse through the site and areas of minimal and greater slope adjacent to the watercourse.

The Subdivision Concept Plan outlines lots of the minimum 2 hectare size and a potential yield of 53 lots. The actual yield and configuration shall be determined at the planning permit subdivision stage under site analysis including waste water treatment. This particularly relates to the southern portion of 134 McGregor Road which has rocky areas.

Development is expected to commence from the north-west where there is direct availability of services, however it will be up to individual sites as to when development occurs. Building envelope setbacks from the watercourse (Djirri Djirri Creek) environs are specified where slope is steepest in 134 McGregor Road and 88 Bennett Road. The southern portion of 134 McGregor Road has a stony rise and poor soils for waste water treatment; it is shown as a “superlot” with a maximum yield of 6 lots to be dependant upon a land capability and environmental assessment.

The key features of the subdivision concept plan are:

- The concept responds to the topography and minimises cut and fill. This relates to along the Djirri Djirri Creek as the land is otherwise flat to undulating.
- The water course is to be vested in Council as a minimum 60m wide reserve, 30m to each side of the waterline and wider where shown with a Council maintenance and fire protection access track on the north side. Additional land shall form part of the reserve as shown on the subdivision concept plan.
- Dwellings and sheds are to be constructed on slopes that are flatter than 1:6.
- Buildings shall be setback a minimum 30m from the roads and 10m from side and rear boundaries while on lots abutting the creek reserve are to be setback a minimum 20m from it. These envelopes are conceptual and will be fully detailed under subdivision applications.

- To the east of the waterway, rock outcrop elements will be addressed.
- Road construction is avoided on steep slopes illustrated by the position of the T Intersection of Brooking Road and the proposed internal north-south road positioned west of the steep land in 94 McGregor Road.
- The lot form and building envelopes will all be consistent with surrounding development.
- Retention of trees in road reserves and in the precinct where possible.
- The Coney Court road alignment is to terminate at the escarpment of the Djirri Djirri Creek for environmental and aesthetic reasons.
- The watercourse buffer also acts as a stock exclusion zone.

4.0 THE DEVELOPMENT PLAN OVERLAY SCHEDULE 18

The Development Plan Overlay at Clause 43.04-2 "Requirement before a permit is granted" states that:

A permit must not be granted to use or subdivide land, construct a building or construct or carry out works until a development plan has been prepared to the satisfaction of the responsible authority.

This does not apply if a schedule to this overlay specifically states that a permit may be granted before a development plan has been prepared to the satisfaction of the responsible authority.

A permit granted must:

- *Be generally in accordance with the development plan.*
- *Include any conditions or requirements specified in a schedule to this overlay*

Clause 43.04-4 states that:

The development plan may consist of plans or other documents and may, with the agreement of the responsible authority, be prepared and implemented in stages.

This schedule has the following directions:

- *To coordinate development and provide an integrated and safe road and path network connecting land within the development plan area with neighbouring land.*
- *To provide for a range of lot densities that respond to and manage site features and constraints.*
- *To strategically manage the features and constraints of the development area, including the protection and enhancement of drainage lines and steeply sloping land and limiting the visual intrusion of development adjacent to the Calder Freeway.*
- *To protect and manage waterways, drainage lines and adjacent escarpments.*
- *To provide sustainable access to water supplies, and allow natural run-off to be maintained to waterways within and connecting with the area.*

These directions have been applied in the formulation of the Development Plan documentation and the response to the DPO18 is outlined below.

Clause 1: Requirements before a permit is granted

Development Contributions
There are no external infrastructure items requiring development contributions.

There are no internal infrastructure items requiring development contributions to be apportioned.

Given the relatively small size of each landholding and the overall small lot yield of approximately 50 lots there is no staging plan, but rather sites will be developed independently based upon necessary infrastructure being provided by the developer. It would be counter productive to have a staging plan which could limit a "development ready" site from proceeding.

All infrastructure required will be contributed by each landholder as necessary to facilitate its development. Headworks charges as necessary to connect existing service locations to each lot will be borne by the individual developer in agreement with the particular servicing authority. This will be specified under a planning permit for subdivision.

Each developer will be solely responsible for the provision of all infrastructure including landscaping, paths and roads, within and fronting each development parcel and any necessary extension of roads and other servicing infrastructure such as water, electricity or telecommunications required to service the subdivision. Where there is a road to be constructed between two lots the first developer will be responsible for the entire road construction. The new east-west running road between 168 Bennett Road and 128 Bennett Road has been purposefully splayed over part of these lots. It provides for construction at a mid-point however in the event of one developing first would be on either one or the other parcels. Brooking Road will be constructed as required when development occurs by the developer that proceeds first.

The key site and road engineering matters are addressed in the Concept Plans, Servicing Report and Drainage / Culvert Sizing Report by Terraco and Traffic Impact Statement by Traffix Group.

The "Drainage/Culvert Sizing Report by Terraco outlines the culvert treatment requirements for the Brooking Road crossing of Djirri Djirri Creek. The Traffic Impact Statement outlines the required road upgrading of intersections with McGregor Road and Bennett Road. New road connections with Bennett Road and McGregor Road will feature right turn treatments. All these works will be undertaken by the applicable frontage developer as required to facilitate subdivision.

The Djirri Djirri Creek waterway is designated on the Development Plan as a waterway reserve to be vested with Council and so its transfer would not form part of any open space

contribution. The reserve improvements including landscaping, paths and fencing will be undertaken by the affected lot under subdivision applications. An open space contribution from those subdivisions may include capital works reserve improvements, to be considered at the subdivision stage.

The Planning Scheme Development Plan Overlay Schedule 18 specifies various planning requirements which are addressed in the following section of this report.

Clause 2: Conditions and requirements for permits

Permit conditions

Permits for development are to have regard to specified matters as relevant. Subdivision permits will seek:

- building envelopes for dwellings and sheds.
- access and driveways.
- tree retention of non-native trees where suitable and protection of native vegetation.
- any dams on lots to be de-commissioned or modified.

These matters are all addressed in the Concept Plan and Landscape Concept.

Any requirements or conditions set out in an approved development plan.

The overall requirements and matters to have regard to are specified in the DP and the supporting reports.

Before the issue of a statement of compliance, all lots (except for lots south of the creek line) must be connected to potable reticulated water, and any reticulated services must be installed underground.

This will be addressed by permit condition.

Before the issue of a statement of compliance:

- ***All lots must be serviced with sealed, all weather public roads fit for fire fighting purposes at the cost of the proponent.***
- ***Any areas within 30 metres of the drainage line are to be fenced with appropriate stock exclusion fences. Fencing must be designed to minimise the impact of free ranging wildlife to the satisfaction of the responsible authority.***
- ***The stock exclusion area is to be revegetated using suitable native plant species of local provenance to the satisfaction of the responsible authority.***

The DP Concept Plan outlines a minimum 30m reserve either side of the drainage line to be vested with Council, whilst where land is steeper it is substantially wider. It shall be fenced with post and wire fencing to exclude stock as shown on the landscape concept. A landscape plan shall be prepared for the reserve as part of subdivision applications of those properties along the drainage line. The landscaping treatment shall protect and enhance native vegetation.

Before the certification of a plan of subdivision, or at such other time which is agreed in writing by the responsible authority, the owner must enter into an agreement or agreements under section 173 of the Planning and Environment Act 1987 which provides:

- **Stock exclusion fencing 30m from the drainage line**
- ***The 15 metre wide planted landscape buffer along Bennett Road***
- ***Dwellings on lots on the road adjoining the drainage line must be setback 40 metres from the road frontage***
- ***Water supply infrastructure for fire fighting***
- ***The owner of the land incorporating the drainage line shown on the concept plan must provide and maintain a perimeter road/fire access track adjoining the north side of the drainage line escarpment in a trafficable condition, suitable for it to be used as a fire access track to the satisfaction of the Country Fire Authority and the responsible authority.***

These matters are all addressed in the DP and will be stipulated under a planning permit. A CFA access track is defined along the escarpment and it is supported by the Bushfire/Grassfire Management Statement by Regional Planning & Design Ltd, allowing access between Coney Court and the internal north-south road above the slope. The access will also be a maintenance track.

Before the issue of a statement of compliance unless otherwise agreed in writing by the responsible authority:
On existing and proposed lots less than 4 hectares, existing man-made dams, reservoirs and bodies of water must be filled and compacted in accordance with relevant Australian Standards.
The Subdivision Concept Plan states that:
Dams in watercourse are to be decommissioned. All other dams are to be considered at subdivision stage for any decommissioning
It may be that some dams are retained. This will enable detailed consideration at the appropriate time when overflow of dams in lots can be considered as it may be that overflow is not problematic or alternatively that only part filling is required.

Clause 3: Requirements for development plan

A development plan, which may consist of plans and other documents, must be prepared to the satisfaction of the responsible authority. Only one development plan may be approved for the entire area covered by this Schedule. The development plan must be generally in accordance with the concept plan at sub-clause 5.0 of this Schedule

The DP has been prepared for the land in line with the DPO18 Concept Plan and it will facilitate the consideration of permit applications for subdivision.

General

The DP includes a site analysis plan that identifies the key attributes and constraints of the land and its context, including: Topographical features; Landscape features; Existing buildings and infrastructure (including dams); The relationship between the land and any existing or proposed use and development on adjoining land and; Any other relevant elements or features of the land and its surrounds.

The DP includes a Subdivision Concept Plan that outlines the road network, waterway reserve, lot configuration, environmental aspects and building envelopes for lots that are adjacent to the waterway. Any building envelopes will be ratified under permit applications for subdivision. The Concept Plan outlines a wider creek reserve above the slope to its north side, north of Brooking Road. A superlot of 12.35 hectares is outlined in part of 134 McGregor Road where there is a stony rise and the plan notes as follows: "Maximum of 6 lots for 134 McGregor Road superlot subject to detailed land capability assessment, avoidance of rock outcrops to maximum extent and setback of building envelopes from the waterway reserve." The plan notes for 88 Bennett Road that: "Reserve, maintenance track, lots and building envelopes within 88 Bennett Road are subject to detailed review."

Land Capability Assessment & Storm Water Review

A Land Capability and Storm Water Review by Archaeo-Environments Pty Ltd maps the 5 landform types across the precinct with the most constrained for development being the watercourse and adjacent to the watercourse escarpment which are not to be developed. The report advises that:

It is expected that there would be few constraints to wastewater disposal across the majority (73%) of the subject property. Djirri Djirri Creek and areas of rock outcrop to the east of the development area include some areas which will constrain waste water disposal. The concept plan specifies a maximum of 6 lots in this area and subject to detailed assessment under subdivision application. The EPA Septic Code (2016) recommends setbacks from waterways and

features and this will include a 60m buffer of the waterway and 30m from various scattered dams in accord with Table 5 (EPA Septic Code 2016).

The report also advises that:
Within a minimum 2ha lot size, the proposed residential dwellings will be designed to harvest rainwater to water tanks. Engineering design plans will include retarding and management of runoff from driveways and paved surfaces. Rain water that is not harvested from the dwelling and sheds as well as rain water from access roads etc shall be retarded on site to maintain flow at current conditions.
At an individual lot level, it is expected that rain water runoff from dwellings and shedding would be managed to reduce run-off and retain rain water on site. It is recommended that each block will be landscaped and planted to reduce/retard run-off.

A typical waste water and stormwater treatment is outlined in Figure 3 of the report.

Flora & Fauna Assessment
Ecology & Heritage Partners has prepared 3 reports:

- Biodiversity Assessment: Existing Conditions
- Flora and Fauna Targeted Survey
- Vegetation Management

The Biodiversity Assessment was based upon surveys in 2018 and it describes the natural condition of the area as follows:
The study area is mostly undulating cleared agricultural land with introduced grasses, planted windrows of trees and some patches of native vegetation to the south of the study area trees. Patches of native vegetation, characteristic of Plains Sedgy Wetland and Tall Marsh Ecological Vegetation Classes (EVCs) are present along the creek line (Figures 2b, 2c). Patches of native vegetation (characteristic of Stony Knoll shrubland EVC) occurs in the south-east of the study area, but this has been grazed by livestock and the patches are highly degraded (Figure 2b). One continuous patch of native vegetation (characteristic of Plains Grassland EVC), is present adjacent to a driveway planted with windrow trees, in the south of the study area

The majority of the study area comprises introduced and planted vegetation in the form of crops, pasture, windrows and ornamental plantings. However, there are some small areas of native vegetation scattered within the study area.

Native vegetation is mapped in the report and the DP Concept Plan.

The Flora and Fauna Targeted Surveys report was based on subsequent surveys in late 2020 and it states that there is no Matted Flax-lily, Swamp Everlasting and Swamp Fireweed on the land nor presence of Golden Sun Moth or Growling Grass Frog.

The Vegetation Management Plan was prepared to outline treatment of the water way reserve based upon the following objectives:

- The native vegetation to be retained and protected within the waterway reserve.
- Information relating to mitigation, monitoring and control methods to be implemented to achieve ecologically appropriate on-going management of pest species within the water reserve
- Measures to minimise the spread of noxious weeds from the waterway reserve to the rest of the study area.

Cultural Heritage

A Heritage Assessment has been undertaken by Archaeo-Environments Ltd. It outlines the obligations under the *Aboriginal Heritage Act* 2006 and the Aboriginal Heritage Regulations 2007.

It states that:

Preliminary discussion with the local Registered Aboriginal Party (Wurundjeri and Woi Wurrung Cultural Heritage Aboriginal Corporation) in July 2021 advised of the Development Plan and future subdivision, Liaison with the RAP group will be included as part of any future CHMP process.

The future subdivision lot development of the area is directed away from the area of prime potential sensitivity, being the waterway with areas away from the water way having lesser potential for artefact presence. An aim will be to retain the current form of this area, with low impact paths and additional scattered vegetation. A detailed assessment will not be required for those parts of the reserve that are not altered. Assessment will be required around reinstated dams.

The 2ha lot size under the current Development Plan will mitigate against high risk of impact to Aboriginal cultural heritage, certainly compared with smaller lot subdivision. In other words the relatively small development footprint (dwelling, outbuildings, driveway etc) will allow for a large proportion of the lot to remain undisturbed. The large lot sizes when compared to a standard intensive residential subdivision such as to the west side of the Calder Freeway allow considerable capacity for potential sensitive sites to be avoided.

As a guide to future works, the Djirri Djirri Creek is an area of mapped Aboriginal Cultural Heritage sensitivity and under current legislation, a Cultural Heritage Management Plan (CHMP) will be mandatory for lots at 88 Bennett Road and 94 and 134 McGregor Road.

A CHMP is not mandatory under the Development Plan process as this stage does not propose development itself. A CHMP will be mandatory under a permit application for subdivision which is a CHMP trigger according to AHR (2018) (discussed in Section 1.2.1).

Aboriginal cultural heritage is provided with blanket protection in Victoria under the Aboriginal Heritage Act 2006. If any Aboriginal artefacts or sites are found during development works or at any other time, excavation must cease immediately and the local RAP (WLCCHC) should be notified for advice before work can re-commence.

Infrastructure Provision Plan

The Servicing Report by Terraco supports the Development Plan as follows:

- The proposed roads are to be constructed in accordance with Council's Engineering Requirements for Infrastructure Construction. Typically, that includes 20m road reserves with 6.6m wide seal width (2 coat sprayed) and 1.0m wide unsealed shoulders
- There is an existing 150mm PVC water main coming off the Calder Freeway and running along McGregor Road. This main reduces to a 100mm PVC water main at Panorama Drive which continues along the northern side of McGregor Road and into Coney Court. The proposed allotments will be serviced via the existing 150mm and 100mm PVC water mains. Mains extensions and upgrades will be carried out as required to service all proposed allotments. Currently the system has sufficient capacity and pressure to provide adequate supply to this proposed development.
- The site will be treated with on-site septic systems.
- All essential services and utilities are available.

Sustainable development

The Sustainability Report by Archaeo-Environments Ltd notes that the proposed development will provide for lots consistent with the Panorama Dr estate to the north, which appears to function well in terms of "sustainability" / environmental considerations.

The report describes the precinct as follows:

The land encompasses a gently undulating volcanic terrain which falls toward the north and north-east. Water flow and local drainage is predominantly toward a defined waterway (Djirri Djirri Creek) which extends across the south-west corner of the property. Otherwise drainage across the property is via very gentle drainage swales and undefined drainage depressions. There is rock outcrop along the edge of low escarpments above the main drainage line to the east as

well as within a stoney rise in the south-east part of the block.

It states that:
The primary protection of environmental assets will include protection of native vegetation up to a minimum of 30 metres either side of the Djirri Djirri Creek line which will be retained and stock excluded. Dwellings will be set back from the drainage line buffer by at least 20 metres. Trees within the road reserve, including revegetation, will be retained where possible

A program of revegetation of Djirri Djirri Creek will provide habitat, erosion and flood mitigation as well as an area of passive recreation (Plate 2). In addition the wider Development Area will retain original vegetation where possible and establish a program of buffer/corridor planting, road reserve and habitat planting

Subdivision layout concept
The subdivision concept outlines the road layout, water reserve and estimated 53 lots. There will be no lot fragmentation as the waterway is proposed to be a Council reserve with lots on either side. The Concept Plan key features are:

- The concept responds to the topography and minimises cut and fill with roads and maintenance access located above areas of steep slope. Dwellings and sheds are to be constructed on slopes that are flatter than 1:6.
- To the east of the overall area, rock outcrop elements will be recognised
- Road construction is avoided on steep slopes illustrated by the position of the T Intersection of Brooking Road with the proposed internal north-south road.
- Building envelopes are specified along the watercourse being setback a minimum 20m from the waterway reserve to avoid potential flood impacts.

Traffic Management and Impact Plan
The Traffic Management and Impact Plan by Traffix Group states that:
A number of lots within the proposed Development Plan will take direct vehicle access off McGregor Road or Bennett Road. The remaining lots will utilise the internal road network to access the external road network at four locations.
The T intersection at the Panorama Drive/McGregor Road intersection has the capacity to readily accommodate the additional traffic without the need for modification.
No external traffic-related works, other than at intersections of new internal roads with Bennett Road and McGregor Road and the introduction of a BAR treatment at the existing Panorama Drive/McGregor Road intersection, are required as a result of a future subdivision at the subject site
Street lighting will be provided at the four site intersections with Bennett and McGregor Roads;

The proposed internal road reservations and intersections are in accordance with DPO18 and will provide safe connection and permeability for pedestrians, cyclists and motor vehicles, in a fashion that is typically better than existing arrangements in the surrounding area

The DPO18 refers to new roads and a round-a-bout at the McGregor Road/Panorama Drive intersection. The assessment removes the need for a roundabout at the McGregor Road/Panorama Drive intersection on capacity grounds - a standard T-intersection has the capacity to accommodate the relatively low volume of traffic that will use this intersection.

Landscaping and open space

The landscape concept by Habitat outlines an overall concept for the site including a mix of native and exotic species. It includes a list of trees and large shrubs as well as ground cover for select areas. It provides a basis under which detailed landscape plans will be prepared prior to subdivision.

The plan addresses the following key matters:

- the central 60m wide reserve cross-section of the waterway (Djirri Djirri Creek) is detailed.
- a landscape buffer up to 15m wide is to be provided to the Bennett Road frontage.
- road reserve planting will include native trees.
- native species shall be provided adjacent to the watercourse and habitat areas.
- landscaping will address the Ecology & Heritage Partners Biodiversity Assessment (flora & fauna report).
- existing exotic trees will be retained where feasible and appropriate
- Councils preferred tree list is incorporated.
- post and wire fencing is identified along the creek reserve: this will also apply to the area overall.
- watercourse dams to be de-commissioned and other dams to be considered at subdivision stage for potential modification and removal.

Drainage/Culvert Sizing Report

The "Drainage/Culvert Sizing Report" by Terraco outlines the drainage catchment and culvert treatment requirements for the Brooking Road crossing of Djirri Djirri Creek as well as a pedestrian crossing south of Coney Court.

Bushfire / Grassfire Management Statement

Regional Planning & Design has prepared a Bushfire / Grassfire Management Statement which details matters to be addressed under permit applications for subdivision. The Statement

advises that it meets state planning policy Clause 13.02-1S Bushfire planning and the objectives of Clause 53.02 of the planning scheme.
The requirements of the report will be applied to at the time of subdivision.

Acoustic Report

Cogent Acoustics Pty Ltd has prepared a road traffic noise assessment advising of noise attenuation measures necessary to protect the future occupants from noise form the Calder Freeway. This report forms part of the Development Plan. The report addresses "VicRoads Requirements of Developers – Noise Sensitive Uses (VicRoads, 2004)" The report refers to lots near the Freeway interfaces and extending in the order of 400m into the site as requiring more detailed construction as follows:

- *Residential buildings constructed within the lots highlighted in Figure 4 should be constructed in accordance with Construction Category 3 as prescribed in AS 3671:1989.*

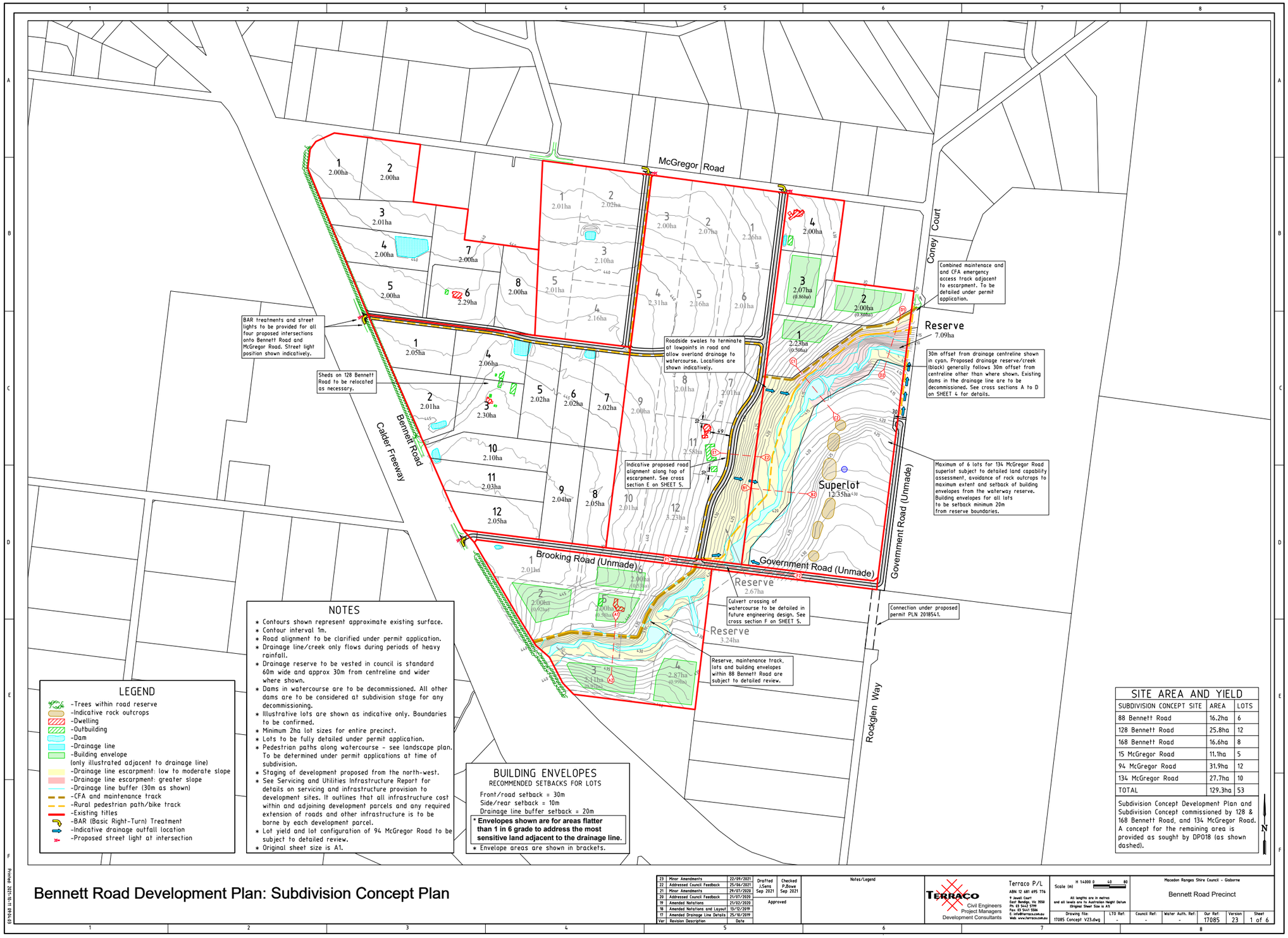
For the remainder of the area it states that:

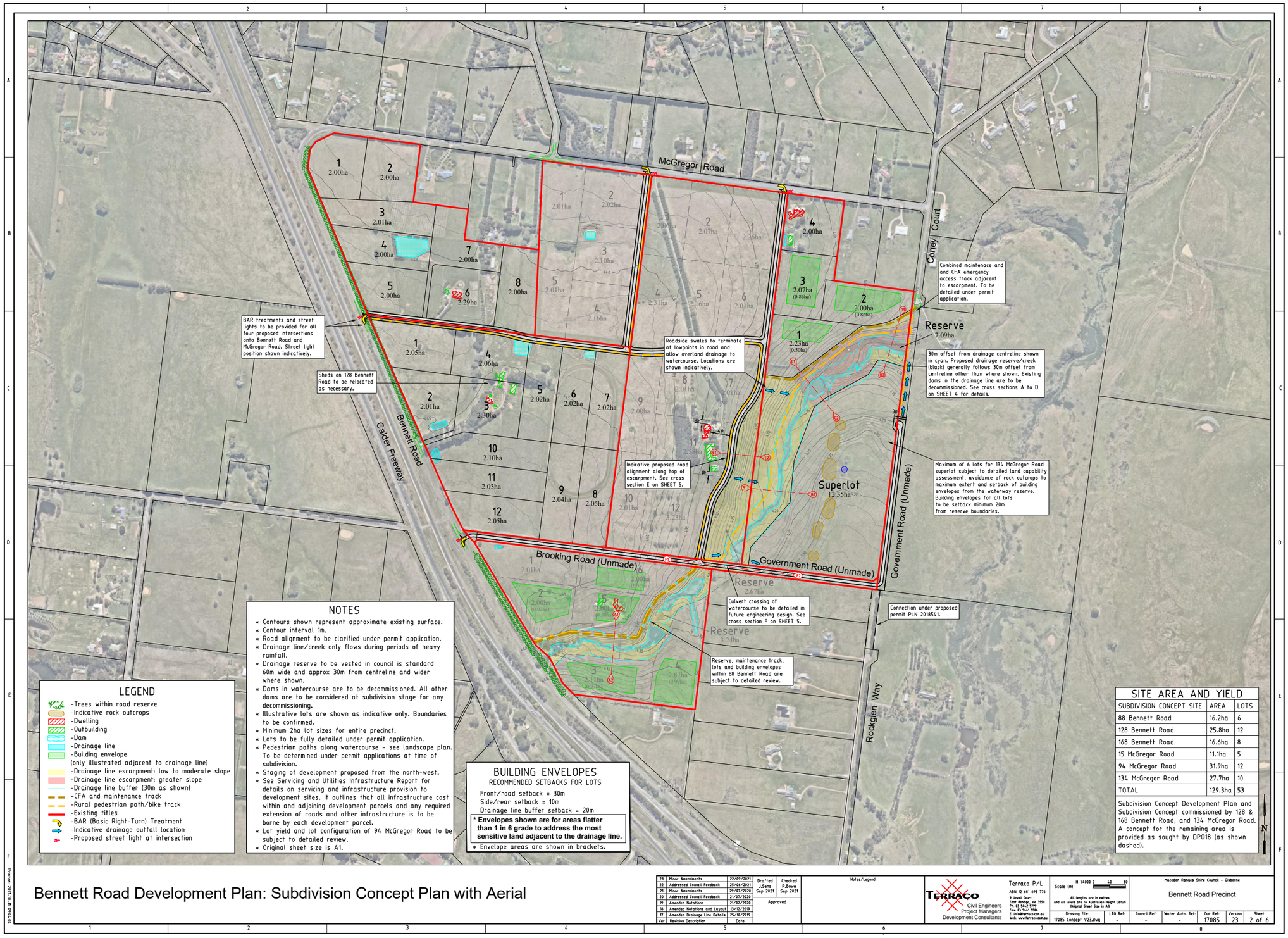
- *Residential buildings constructed within all remaining lots (not highlighted in Figure 4) should be constructed in accordance with Construction Category 2 as prescribed in AS 3671:1989.*

The requirements of the report at the time of subdivision will be addressed.

5.0 CONCLUSION

The Development Plan and supporting reports articulate a clear framework for future subdivision and development of the Bennett Road Precinct in accordance with the Development Plan Overlay Schedule 18 and will be compatible with the pattern of adjacent development.


McGregor Road
Coney Court
Bennett Road
Calder Freeway
Brooking Road (Unmade)
Government Road (Unmade)
Rockglen Way
Reserve
7.09ha
Superlot
12.35ha
Reserve
2.67ha
Reserve
3.24ha
BAR treatments and street lights to be provided for all four proposed intersections onto Bennett Road and McGregor Road. Street light position shown indicatively.
Sheds on 128 Bennett Road to be relocated as necessary.
Roadside swales to terminate at lowpoints in road and allow overland drainage to watercourse. Locations are shown indicatively.
Indicative proposed road alignment along top of escarpment. See cross section E on SHEET 5.
Combined maintenace and and CFA emergency access track adjacent to escarpment. To be detailed under permit application.
30m offset from drainage centreline shown in cyan. Proposed drainage reserve/creek (black) generally follows 30m offset from centreline other than where shown. Existing dams in the drainage line are to be decommissioned. See cross sections A to D on SHEET 4 for details.
Maximum of 6 lots for 134 McGregor Road superlot subject to detailed land capability assessment, avoidance of rock outcrops to maximum extent and setback of building envelopes from the waterway reserve. Building envelopes for all lots to be setback minimum 20m from reserve boundaries.
Culvert crossing of watercourse to be detailed in future engineering design. See cross section F on SHEET 5.
Connection under proposed permit PLN 2018541.
Reserve, maintenance track, lots and building envelopes within 88 Bennett Road are subject to detailed review.
NOTES
* Contours shown represent approximate existing surface.
* Contour interval 1m.
* Road alignment to be clarified under permit application.
* Drainage line/creek only flows during periods of heavy rainfall.
* Drainage reserve to be vested in council is standard 60m wide and approx 30m from centreline and wider where shown.
* Dams in watercourse are to be decommissioned. All other dams are to be considered at subdivision stage for any decommissioning.
* Illustrative lots are shown as indicative only. Boundaries to be confirmed.
* Minimum 2ha lot sizes for entire precinct.
* Lots to be fully detailed under permit application.
* Pedestrian paths along watercourse - see landscape plan. To be determined under permit applications at time of subdivision.
* Staging of development proposed from the north-west.
* See Servicing and Utilities Infrastructure Report for details on servicing and infrastructure provision to development sites. It outlines that all infrastructure cost within and adjoining development parcels and any required extension of roads and other infrastructure is to be borne by each development parcel.
* Lot yield and lot configuration of 94 McGregor Road to be subject to detailed review.
* Original sheet size is A1.
LEGEND
-Trees within road reserve
-Indicative rock outcrops
-Dwelling
-Outbuilding
-Dam
-Drainage line
-Building envelope
(only illustrated adjacent to drainage line)
-Drainage line escarpment: low to moderate slope
-Drainage line escarpment: greater slope
-Drainage line buffer (30m as shown)
-CFA and maintenance track
-Rural pedestrian path/bike track
-Existing titles
-BAR (Basic Right-Turn) Treatment
-Indicative drainage outfall location
-Proposed street light at intersection
BUILDING ENVELOPES
RECOMMENDED SETBACKS FOR LOTS
Front/road setback = 30m
Side/rear setback = 10m
Drainage line buffer setback = 20m
* Envelopes shown are for areas flatter than 1 in 6 grade to address the most sensitive land adjacent to the drainage line.
* Envelope areas are shown in brackets.
SITE AREA AND YIELD
SUBDIVISION CONCEPT SITE | AREA | LOTS
88 Bennett Road | 16.2ha | 6
128 Bennett Road | 25.8ha | 12
168 Bennett Road | 16.6ha | 8
15 McGregor Road | 11.1ha | 5
94 McGregor Road | 31.9ha | 12
134 McGregor Road | 27.7ha | 10
TOTAL | 129.3ha | 53
Subdivision Concept Development Plan and Subdivision Concept commissioned by 128 & 168 Bennett Road, and 134 McGregor Road. A concept for the remaining area is provided as sought by DPO18 (as shown dashed).
N
Bennett Road Development Plan: Subdivision Concept Plan
Terraco P/L
Civil Engineers
Project Managers
Development Consultants
Macedon Ranges Shire Council - Gisborne
Bennett Road Precinct
Drawing file: 17085 Concept V23.dwg
Sheet 1 of 6


McGregor Road
Coney Court
Bennett Road
Calder Freeway
Brooking Road (Unmade)
Government Road (Unmade)
Government Road (Unmade)
Rockglen Way
Reserve
7.09ha
Superlot
12.35ha
Reserve
2.67ha
Reserve
3.24ha
BAR treatments and street lights to be provided for all four proposed intersections onto Bennett Road and McGregor Road. Street light position shown indicatively.
Sheds on 128 Bennett Road to be relocated as necessary.
Roadside swales to terminate at lowpoints in road and allow overland drainage to watercourse. Locations are shown indicatively.
Indicative proposed road alignment along top of escarpment. See cross section E on SHEET 5.
Combined maintenace and and CFA emergency access track adjacent to escarpment. To be detailed under permit application.
30m offset from drainage centreline shown in cyan. Proposed drainage reserve/creek (black) generally follows 30m offset from centreline other than where shown. Existing dams in the drainage line are to be decommissioned. See cross sections A to D on SHEET 4 for details.
Maximum of 6 lots for 134 McGregor Road superlot subject to detailed land capability assessment, avoidance of rock outcrops to maximum extent and setback of building envelopes from the waterway reserve. Building envelopes for all lots to be setback minimum 20m from reserve boundaries.
Culvert crossing of watercourse to be detailed in future engineering design. See cross section F on SHEET 5.
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Reserve, maintenance track, lots and building envelopes within 88 Bennett Road are subject to detailed review.
NOTES
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* Minimum 2ha lot sizes for entire precinct.
* Lots to be fully detailed under permit application.
* Pedestrian paths along watercourse - see landscape plan. To be determined under permit applications at time of subdivision.
* Staging of development proposed from the north-west.
* See Servicing and Utilities Infrastructure Report for details on servicing and infrastructure provision to development sites. It outlines that all infrastructure cost within and adjoining development parcels and any required extension of roads and other infrastructure is to be borne by each development parcel.
* Lot yield and lot configuration of 94 McGregor Road to be subject to detailed review.
* Original sheet size is A1.
LEGEND
-Trees within road reserve
-Indicative rock outcrops
-Dwelling
-Outbuilding
-Dam
-Drainage line
-Building envelope
(only illustrated adjacent to drainage line)
-Drainage line escarpment: low to moderate slope
-Drainage line escarpment: greater slope
-Drainage line buffer (30m as shown)
-CFA and maintenance track
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-Existing titles
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-Indicative drainage outfall location
-Proposed street light at intersection
BUILDING ENVELOPES
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* Envelopes shown are for areas flatter than 1 in 6 grade to address the most sensitive land adjacent to the drainage line.
* Envelope areas are shown in brackets.
SITE AREA AND YIELD
SUBDIVISION CONCEPT SITE | AREA | LOTS
88 Bennett Road | 16.2ha | 6
128 Bennett Road | 25.8ha | 12
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134 McGregor Road | 27.7ha | 10
TOTAL | 129.3ha | 53
Subdivision Concept Development Plan and Subdivision Concept commissioned by 128 & 168 Bennett Road, and 134 McGregor Road. A concept for the remaining area is provided as sought by DPO18 (as shown dashed).
N
Printed: 2021-10-11 09:04:04
Bennett Road Development Plan: Subdivision Concept Plan with Aerial
23 Minor Amendments 22/09/2021
22 Addressed Council Feedback 25/06/2021
21 Minor Amendments 29/07/2020
20 Addressed Council Feedback 21/07/2020
19 Amended Notations 21/02/2020
18 Amended Notations and Layout 13/12/2019
17 Amended Drainage Line Details 25/10/2019
Ver Revision Description Date
Drafted J.Sens Sep 2021
Checked P.Bowe Sep 2021
Approved
Notes/Legend
TERRACO
Civil Engineers
Project Managers
Development Consultants
Terraco P/L
ABN 12 681 695 776
9 Jewell Court
East Bendigo, Vic 3550
Ph: 03 5442 5799
Fax: 03 5443 5506
E: info@terraco.com.au
Web: www.terraco.com.au
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All lengths are in metres and all levels are to Australian Height Datum (Original Sheet Size is A1)
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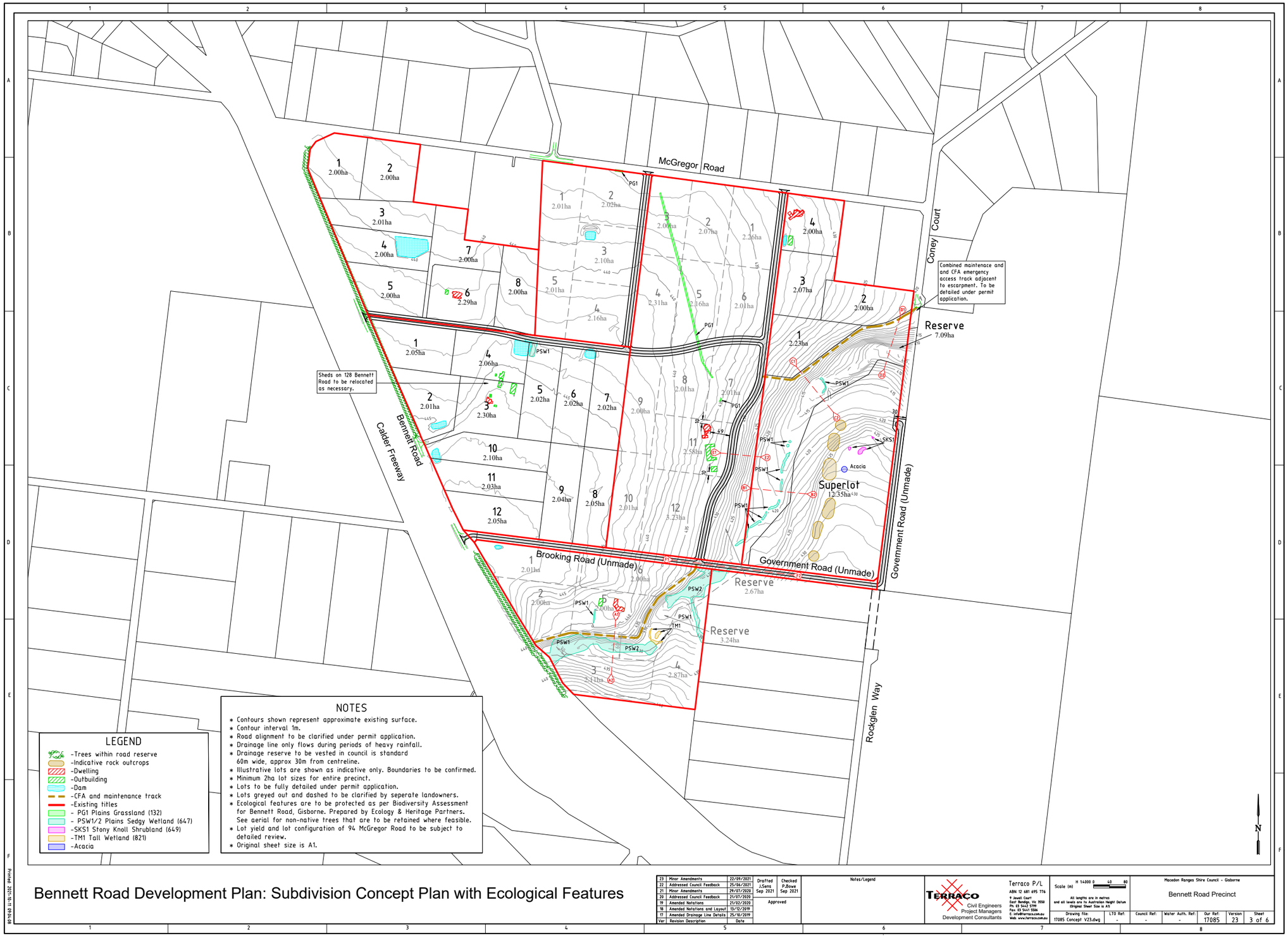
Macedon Ranges Shire Council - Gisborne
Bennett Road Precinct
Council Ref: -
Water Auth. Ref: -
Our Ref: 17085
Version 23
Sheet 2 of 6


McGregor Road
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Combined maintenace and and CFA emergency access track adjacent to escarpment. To be detailed under permit application.
Reserve
7.09ha
Sheds on 128 Bennett Road to be relocated as necessary.
Bennett Road
Calder Freeway
Superlot
12.35ha
Acacia
Brooking Road (Unmade)
Government Road (Unmade)
Reserve
2.67ha
Reserve
3.24ha
Rockglen Way
LEGEND
-Trees within road reserve
-Indicative rock outcrops
-Dwelling
-Outbuilding
-Dam
-CFA and maintenance track
-Existing titles
- PG1 Plains Grassland (132)
- PSW1/2 Plains Sedgy Wetland (647)
-SKS1 Stony Knoll Shrubland (649)
-TM1 Tall Wetland (821)
-Acacia
NOTES
* Contours shown represent approximate existing surface.
* Contour interval 1m.
* Road alignment to be clarified under permit application.
* Drainage line only flows during periods of heavy rainfall.
* Drainage reserve to be vested in council is standard 60m wide, approx 30m from centreline.
* Illustrative lots are shown as indicative only. Boundaries to be confirmed.
* Minimum 2ha lot sizes for entire precinct.
* Lots to be fully detailed under permit application.
* Lots greyed out and dashed to be clarified by seperate landowners.
* Ecological features are to be protected as per Biodiversity Assessment for Bennett Road, Gisborne. Prepared by Ecology & Heritage Partners. See aerial for non-native trees that are to be retained where feasible.
* Lot yield and lot configuration of 94 McGregor Road to be subject to detailed review.
* Original sheet size is A1.
Bennett Road Development Plan: Subdivision Concept Plan with Ecological Features
Terraco P/L
Civil Engineers
Project Managers
Development Consultants
Macedon Ranges Shire Council - Gisborne
Bennett Road Precinct
17085 Concept V23.dwg
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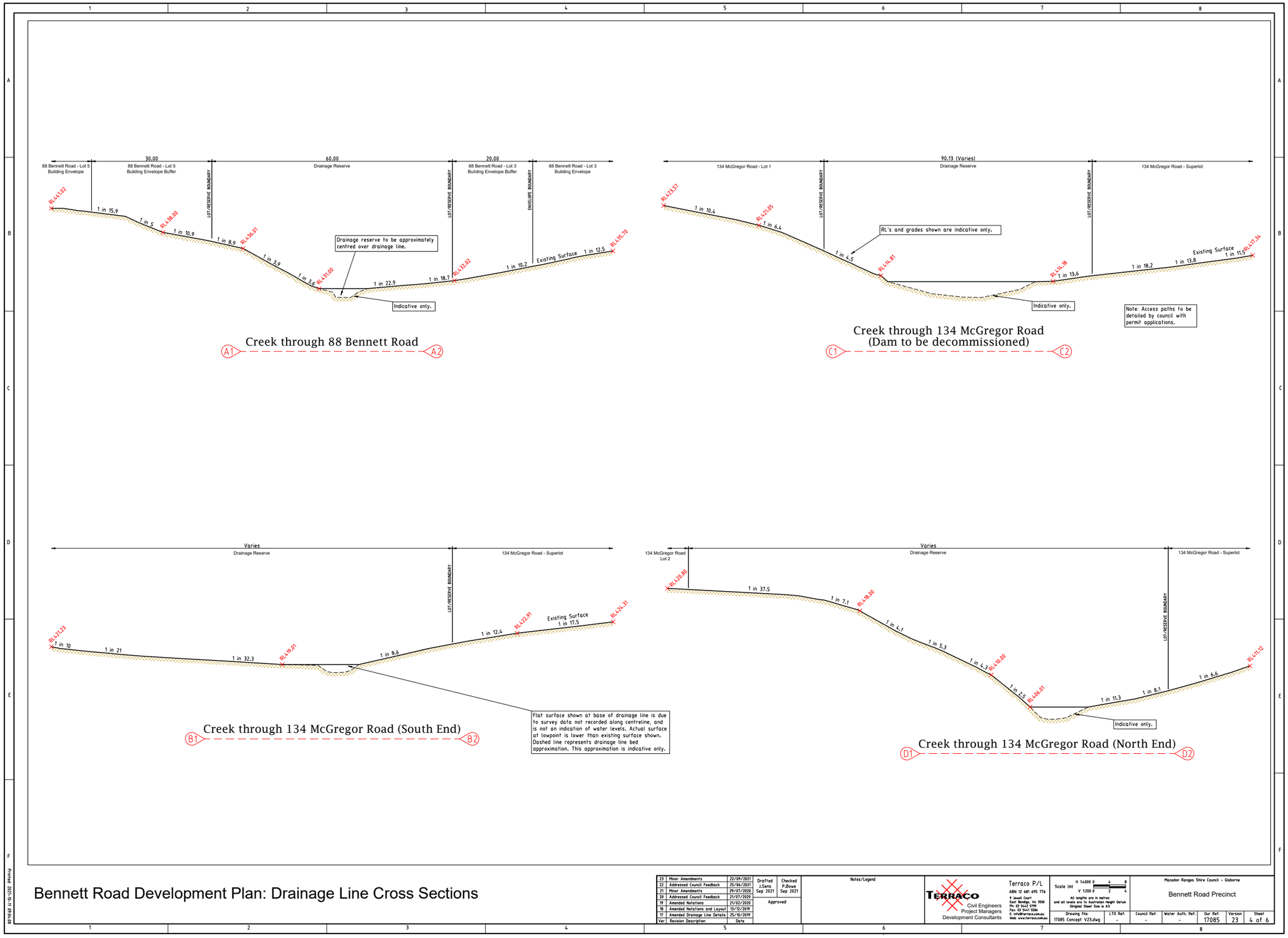
3 of 6



Bennett Road Development Plan: Drainage Line Cross Sections

Ver	Revision Description	Date
23	Minor Amendments	22/09/2021
22	Addressed Council Feedback	25/06/2021
21	Minor Amendments	29/07/2020
20	Addressed Council Feedback	21/07/2020
19	Amended Notations	21/02/2020
18	Amended Notations and Layout	13/12/2019
17	Amended Drainage Line Details	25/10/2019

Drafted J.Sens Sep 2021 | Checked P.Bowe Sep 2021 | Approved

Notes/Legend

TERRACO Civil Engineers Project Managers Development Consultants

Terraco P/L
ABN 12 681 695 776
9 Jewell Court
East Bendigo, Vic 3550
Ph: 03 5442 5799
Fax: 03 5441 5506
E: info@terraco.com.au
Web: www.terraco.com.au

Scale (m) H 14000 0 4 8 V 1200 0 2 4
All lengths are in metres and all levels are to Australian Height Datum (Original Sheet Size is A1)

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Macedon Ranges Shire Council - Gisborne
Bennett Road Precinct

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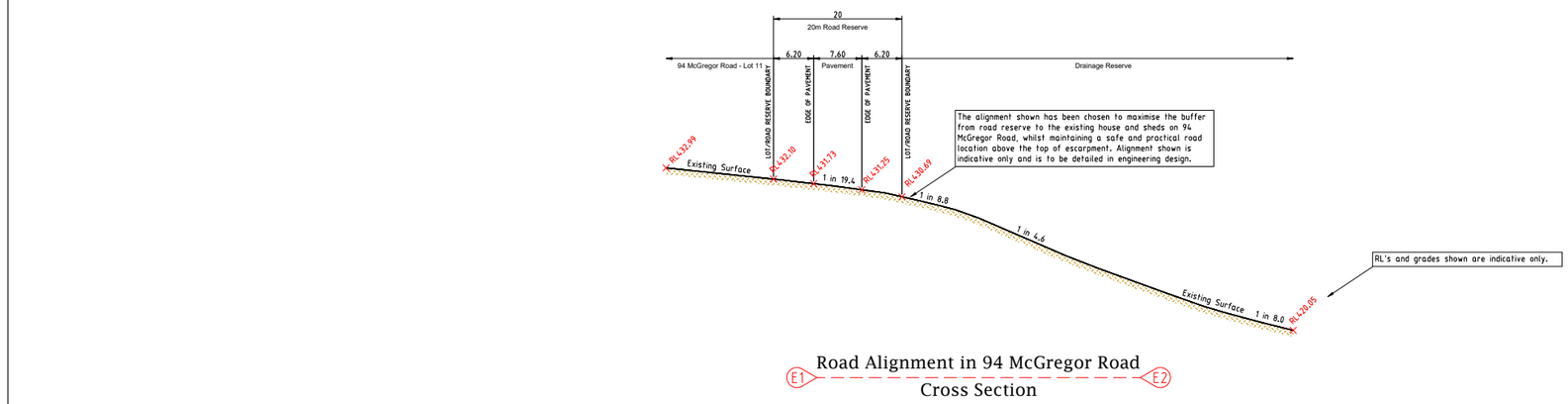
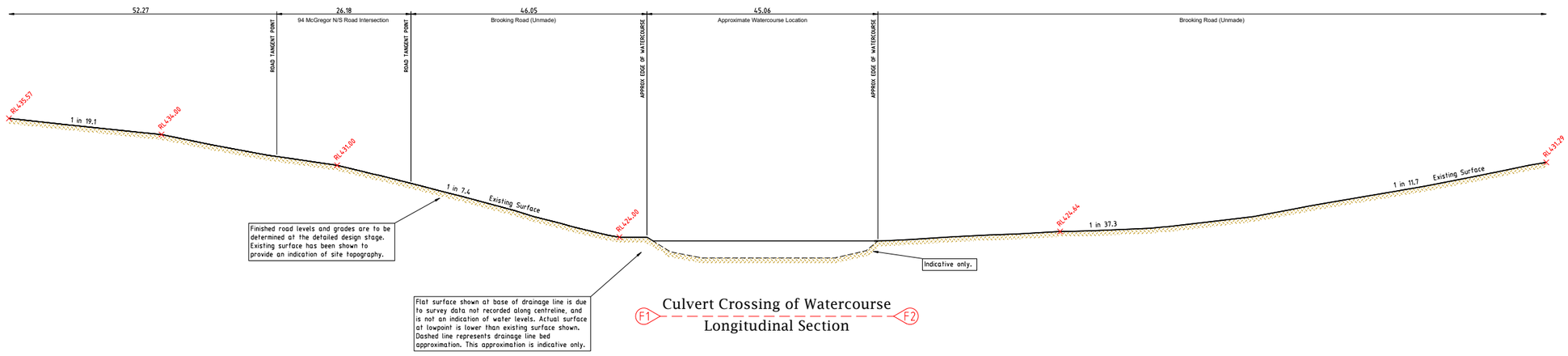


Road Alignment in 94 McGregor Road
Cross Section



Culvert Crossing of Watercourse
Longitudinal Section

Bennett Road Development Plan: Road Sections

Ver	Revision Description	Date
23	Minor Amendments	22/09/2021
22	Addressed Council Feedback	25/06/2021
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Macedon Ranges Shire Council - Gisborne
Bennett Road Precinct

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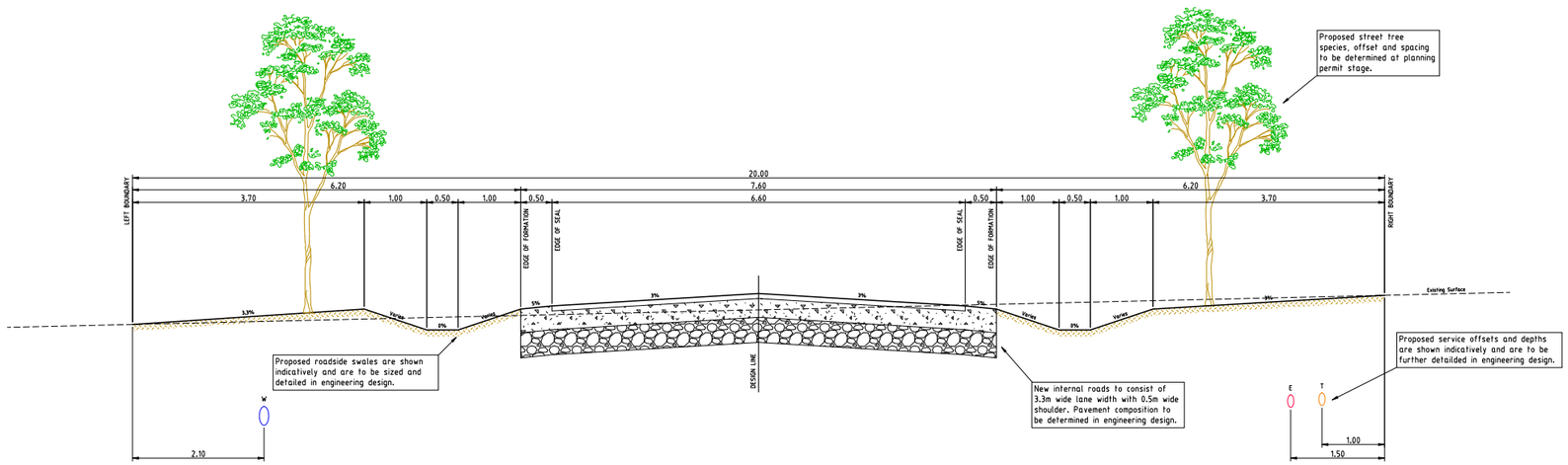

Typical Cross Section - Internal Roads

Bennett Road Development Plan: Typical Road Cross Sections

Ver	Revision Description	Date
23	Minor Amendments	22/09/2021
22	Addressed Council Feedback	25/06/2021
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TERRACO Civil Engineers Project Managers Development Consultants

Terraco P/L
ABN 12 681 695 776
9 Jewell Court
East Bendigo, Vic 3550
Ph: 03 5442 5799
Fax: 03 5441 5506
E: info@terraco.com.au
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Macedon Ranges Shire Council - Gisborne
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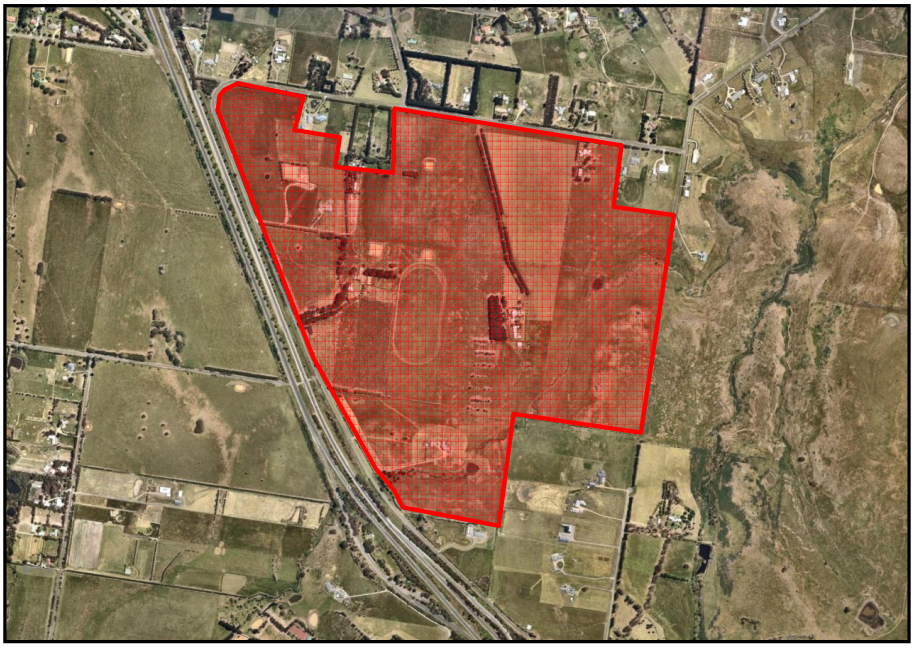

Bennett Road, Gisborne
Drainage / Culvert Sizing Report

August 2020

Version 2

Terraco Pty Ltd – ABN 12 681 695 776
e: info@terraco.com.au
PO Box 5077, Bendigo East, Vic 3550
9 Jewell Court, East Bendigo, Vic 3550
www.terraco.com.au
Ph: (03) 5442 5799
Fax: (03) 5441 5506

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- **Time of Concentration** 3

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LOCATION 2: PROPOSED PEDESTRIAN CROSSING 5

CONCLUSION 6

REFERENCES 7

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- **Drawing 1 – "Location 1 – Proposed Road Crossing"**
- **Drawing 2 – "Location 2 – Proposed Pedestrian Crossing"**
- **Colebrook-White Chart – Location 1**
- **Colebrook-White Chart – Location 2**

Terraco Pty Ltd – ABN 12 681 695 776 PO Box 5077, Bendigo East, Vic 3550 Ph: (03) 5442 5799
e: info@terraco.com.au 9 Jewell Court, East Bendigo, Vic 3550 Fax: (03) 5441 5506
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Introduction

This report is to assist in the application for an Overall Development Plan at Bennett Road, Gisborne. The report details the drainage infrastructure requirements at critical locations for the proposed development.

The report assesses the catchment area of the ephemeral creek/drainage line that traverses the Development Plan area and feeds into Jacksons Creek to the east of Coney Court. The purpose of the assessment is to outline the overall indicative response for locations where vehicle or pedestrian infrastructure will be constructed over the creek.

The Development Plan does not envisage a notable increase in runoff to the creek due to the minimal 2ha lot sizes and the objective to detain and maintain lot runoff to current rural guidelines. This report is therefore focused upon drainage infrastructure at the two creek crossings denoted below.

Two locations have been identified in accordance with the Concept Plans submitted as part of the application. Location 1 is a proposed road crossing on the existing waterway that runs through the site in the unmade Brooking Road reserve. Location 2 is a potential proposed pedestrian crossing located within the existing and unmade Coney Court road reserve. Both crossings will require the installation of culverts underneath so the waterway may maintain its existing flow path.

The existing upstream culvert entering the site in the south-west corner located underneath the Calder Freeway is a 2.55m diameter circular pipe, which has likely been sized to cater for a 1% AEP (100 year storm event) due to the size and use of the road.

Council's drainage response has been considered. "AustRoads Guide to Road Design Part 5: Drainage General and Hydrology Considerations" Table 4.3 states that the suggested ARI for flood immunity for culvert and bridge drainage is 10 years. An annual exceedance probability of 5% (20 year storm event) was chosen for the calculations provided in this report, which is more conservative than AustRoads recommendations. Both culverts have been sized using the Rational Method and rainfall data as per Australian Rainfall and Runoff 2019 (ARR2019). Results from the Rational Method were then inputted on a Colebrook-White Chart to obtain approximate culvert sizes. Calculations are provided in the following sections of this report, and an overview of the rational method and its variables is provided on the following page.

A RORB model will be created at the time of subdivision of 134 McGregor Road (the lot adjoining the crossings). At that time the detailed design will be determined and will be applied as a permit condition for the development of that lot.

An initial feasibility estimate of development costs has been prepared by Terraco and included as an appendix to this report; it is a conservative estimate.

Formulae

Rational Method

Used to calculate flow rates for each catchment.

$Q = 0.278 * C * I * A$

Where Q = Flow Rate (m^3/s)
C = Runoff Coefficient (as per IDM Table 10)
I = Rainfall Intensity (mm/hr) (determined using BOM Rainfall IFD Charts)
A = Catchment Area (km^2)

Time of Concentration

Used as an input for BOM rainfall IFD charts, to determine Rainfall Intensity.

$t_c = 0.76 * A^{0.38}$

Where t_c = Time of Concentration (hrs)
A = Catchment Area (km^2)

Terraco Pty Ltd – ABN 12 681 695 776 PO Box 5077, Bendigo East, Vic 3550 Ph: (03) 5442 5799
e: info@terraco.com.au 9 Jewell Court, East Bendigo, Vic 3550 Fax: (03) 5441 5506
www.terraco.com.au

Location 1: Proposed Internal Road Crossing

Location 1 is a proposed road crossing of the waterway in the Brooking Road unmade road reserve. Calculations are provided below.
See Sheet 1 (appended) for location and catchment sizes.
See Colebrook-White Chart 1 (appended) for pipe size determination.

Location 1 - Road Crossing		
ACTUAL FLOW - AEP = 5%		
Catchment Type	**Runoff Coefficient C**	**Area A (ha)**
Residential Road Reserve	0.75	28.65
Lots (2ha+)	0.30	254.73
Total	0.340	279.38

Variable	Equation	Value
Time of Concentration	$t_c = 0.76*A^{0.38}$ (hrs) (A in km^2)	1.123
Time of Concentration	t_c*60 (mins)	67
Intensity	I (mm/hr)	28.4
Actual Flow	Q = 0.278*CIA (m^3/s)	7.4931
Actual Flow	Q (L/s)	7493.1
Approx. Pipe Size	Colebrook-White Chart (k=0.60mm)	**1950mm**

Using the calculated flow rate (Q, L/s) above and an assumed hydraulic gradient (S) of 1 in 300 (generally the absolute flattest grade to run a pipe, and therefore the worst case scenario), and inputting those two values into a Colebrook-White chart (assumed pipe roughness k=0.60mm), an approximate pipe size was determined.

Based on preliminary studies, the proposed road crossing at location 1 will require a 1950mm circular culvert to cater for a 5% AEP storm event. A pipe arrangement of similar capacity such as a box culvert or twin culverts may also be acceptable to reduce the amount the road reserve needs to be built up, subject to detailed design and council approval.

As a cross-check, the catchment was added to the Regional Flood Frequency Estimation Model, which is freely available online. Results using this tool are provided below.

RFFE Lower Confidence Limit (5%) = 1.58 m^3/s
RFFE Discharge = 4.67 m^3/s
Rational Method Actual Flow Rate (Q) = 7.49 m^3/s
RFFE Upper Confidence Limit (95%) = 13.80 m^3/s

Actual Flow Rate (Q) calculated by hand is within the confidence limits of results provided via the Regional Flood Frequency Estimation Model.

Location 2: Proposed Pedestrian Crossing

Location 2 is a proposed pedestrian crossing of the waterway in the Coney Court road reserve, between the existing Coney Court bowl and the proposed roads court bowl. Calculations are provided below.
See Sheet 2 (appended) for location and catchment sizes.
See Colebrook-White Chart 2 (appended) for pipe size determination.

Location 2 - Pedestrian Crossing		
ACTUAL FLOW - AEP = 5%		
Catchment Type	**Runoff Coefficient C**	**Area A (ha)**
Residential Road Reserve	0.75	28.66
Lots (2ha+)	0.30	316.98
Total	0.337	345.64

Variable	Equation	Value
Time of Concentration	$t_c = 0.76*A^{0.38}$ (hrs) (A in km^2)	1.218
Time of Concentration	t_c*60 (mins)	73
Intensity	I (mm/hr)	26.8
Actual Flow	Q = 0.278*CIA (m^3/s)	8.6862
Actual Flow	Q (L/s)	8686.2
Approx. Pipe Size	Colebrook-White Chart (k=0.60mm)	**2100mm**

Using the calculated flow rate (Q, L/s) above and an assumed hydraulic gradient (S) of 1 in 300 (generally the absolute flattest grade to run a pipe, and therefore the worst case scenario), and inputting those two values into a Colebrook-White chart (assumed pipe roughness k=0.60mm), an approximate pipe size was determined.

Based on preliminary studies, the proposed pedestrian crossing at location 2 will require a 2100mm circular culvert to cater for a 5% AEP storm event. A pipe arrangement of similar capacity such as a box culvert or twin culverts may also be acceptable to reduce the amount the road reserve needs to be built up, subject to detailed design and council approval.

As a cross-check, the catchment was added to the Regional Flood Frequency Estimation Model, which is freely available online. Results using this tool are provided below.

RFFE Lower Confidence Limit (5%) = 2.42 m^3/s
RFFE Flow Rate = 7.48 m^3/s
Rational Method Actual Flow Rate (Q) = 8.69 m^3/s
RFFE Upper Confidence Limit (95%) = 23.30 m^3/s

Actual Flow Rate (Q) calculated by hand is within the confidence limits of results provided via the Regional Flood Frequency Estimation Model.

Conclusion

Location 1, the proposed internal road crossing, will require a 1950mm circular culvert or equivalent to cater for a 5% AEP storm event.

Location 2, the proposed pedestrian crossing, will require a 2100mm circular culvert or equivalent to cater for a 5% AEP storm event. Note that the need for a pedestrian crossing is yet to be determined by council, this report is simply to provide further information to assist in the feasibility for provision of a crossing at that location. An appropriate "environmental" response would suggest that such a formalised crossing as outlined would not be appropriate or needed for the rare times the creek would carry water. A crossing with culverts sized to a smaller and more frequent storm event, such as a 20% AEP, with excess flows (in more uncommon storm events) travelling over the crossing could have merit as a more appropriate pedestrian crossing solution.

Each crossing would require significant earthworks to build up the crossing in order to provide sufficient cover on the culverts, though slimmer culvert profiles of equivalent capacity may be utilised at the detail design stage to minimise this.

These results come with several disclaimers as to their accuracy. Firstly, the catchment areas were approximated based purely on contours, and do not consider roadside swales or drainage infrastructure that may introduce other catchments or remove sections of the catchment on the attached plans. Secondly, the AEP used for the preceding calculations was chosen as it is considered (in the preliminary calculations stage) to be an overestimate, as it's likely that council may recommend a 10% or 20% AEP instead to align with AustRoads and commonly adopted guidelines, reducing pipe size requirements.

As previously mentioned, A RORB model will be created at the time of subdivision of 134 McGregor Road (the lot adjoining the crossings) to further detail requirements.
The detailed design will be undertaken at subdivision stage to align with the results of the RORB model and achieve a design that is acceptable to council. The waterway crossings will be designed in accordance with Melbourne Water's Waterway Crossing Guidelines. Detailed design of the crossings will need to be undertaken with the applicable stage of the development.

This report and associated calculations should be treated as indicative only, and details are to be clarified at the design stage.

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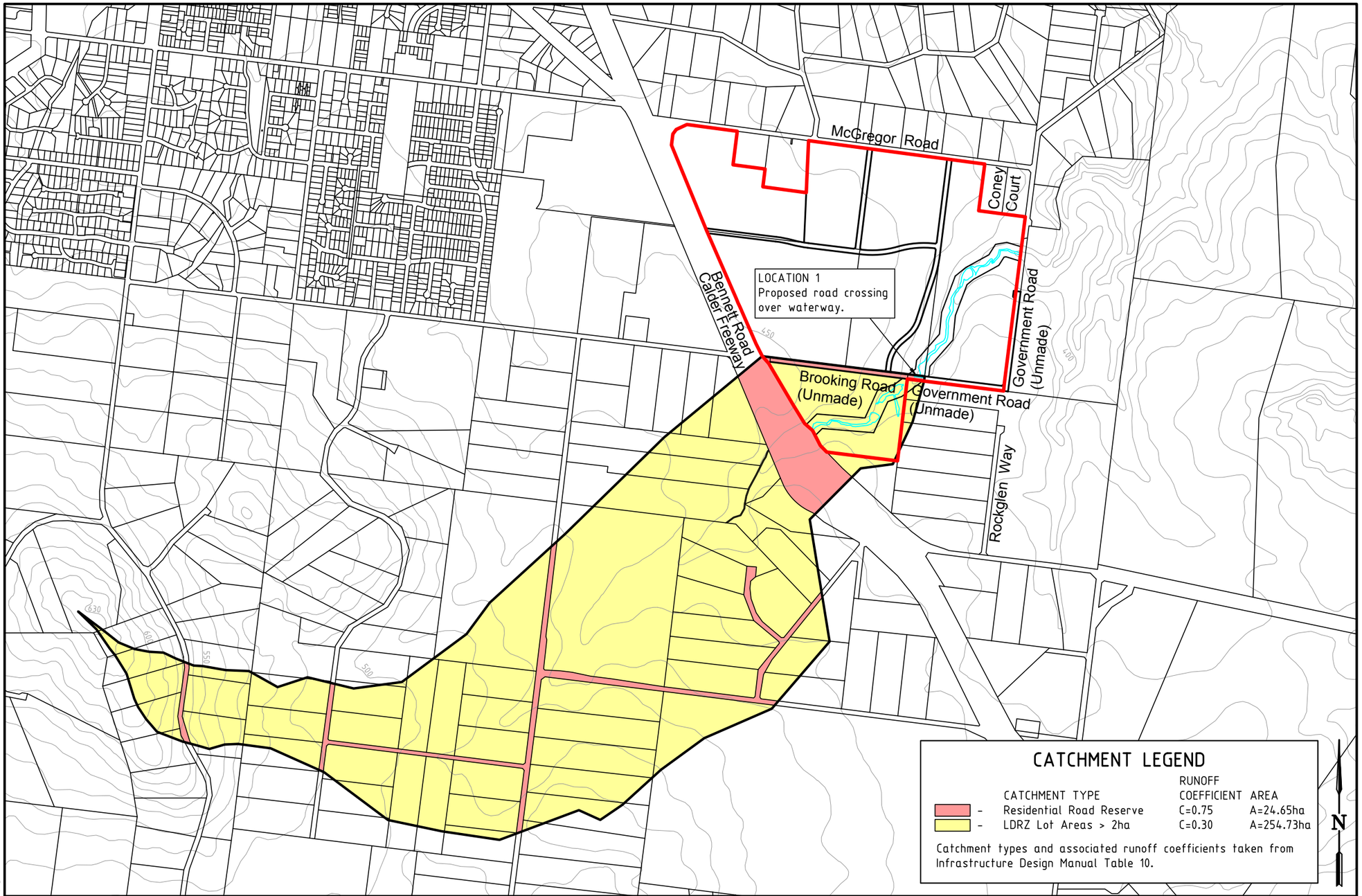

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Ver	Revision Description	Date
6		
5		
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1	Original Issue	28/01/2020
0	Draft	-

Drafted J.Sens Jan 2020 | Checked P.Bowe Jan 2020 | Approved

Notes/Legend
Contours shown on plan indicate the approximate existing surface.
Contour interval 10m.
Indicative catchment area shown is based on existing surface contours, and does not consider existing drainage infrastructure.

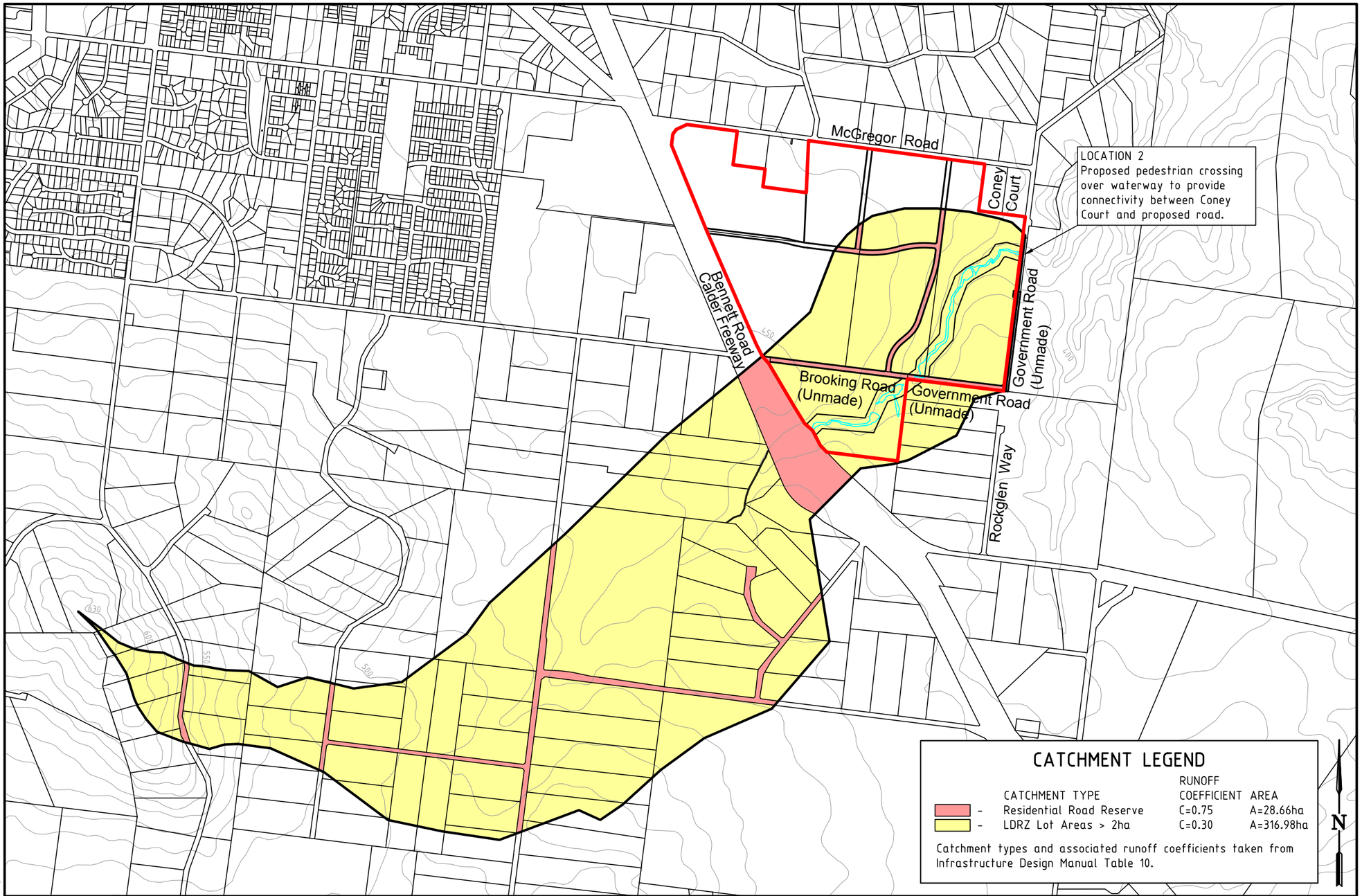
TERRACO
Civil Engineers
Project Managers
Development Consultants

Terraco P/L
ABN 12 681 695 776
9 Jewell Court
East Bendigo, Vic 3550
Ph: 03 5442 5799
Fax: 03 5441 5506
E: info@terraco.com.au
Web: www.terraco.com.au

Scale (m) NTS
All lengths are in metres and all levels are to Australian Height Datum (Original Sheet Size is A3)

Macedon Ranges Shire Council - Gisborne
Bennett Road Precinct
Indicative Catchment Plan
Location 1 - Proposed Road Crossing

Drawing file:	LTO Ref:	Council Ref:	Water Auth. Ref:	Our Ref:	Version	Sheet
17085 Catchment.dwg	-	-	-	17085	1	1 of 2



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TERRACO
Civil Engineers
Project Managers
Development Consultants

Terraco P/L
ABN 12 681 695 776
9 Jewell Court
East Bendigo, Vic 3550
Ph: 03 5442 5799
Fax: 03 5441 5506
E: info@terraco.com.au
Web: www.terraco.com.au

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Macedon Ranges Shire Council - Gisborne

Bennett Road Precinct
Indicative Catchment Plan
Location 2 - Proposed Pedestrian Crossing

Drawing file:	LTO Ref:	Council Ref:	Water Auth. Ref:	Our Ref:	Version	Sheet
17085 Catchment.dwg	-	-	-	17085	1	2 of 2

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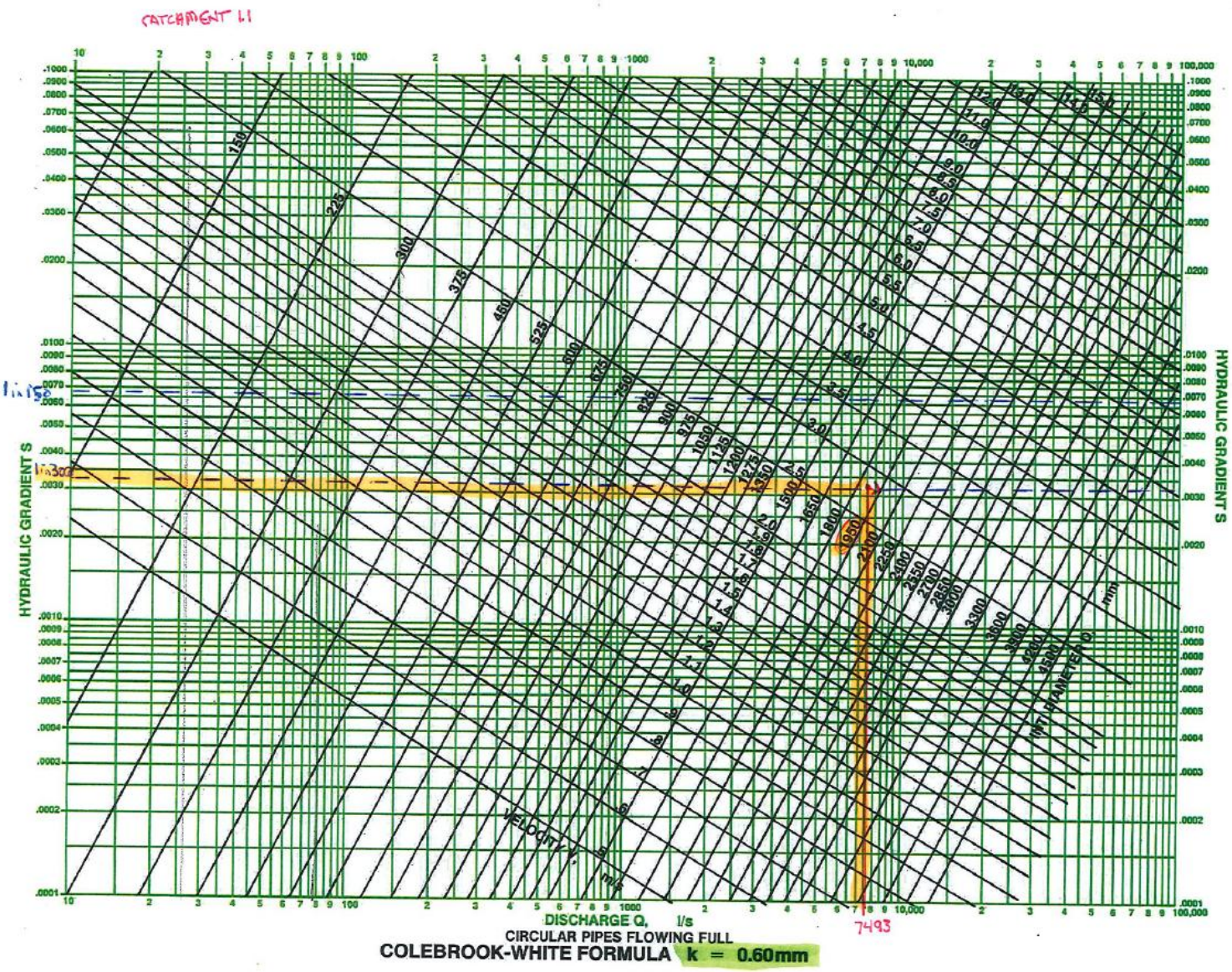
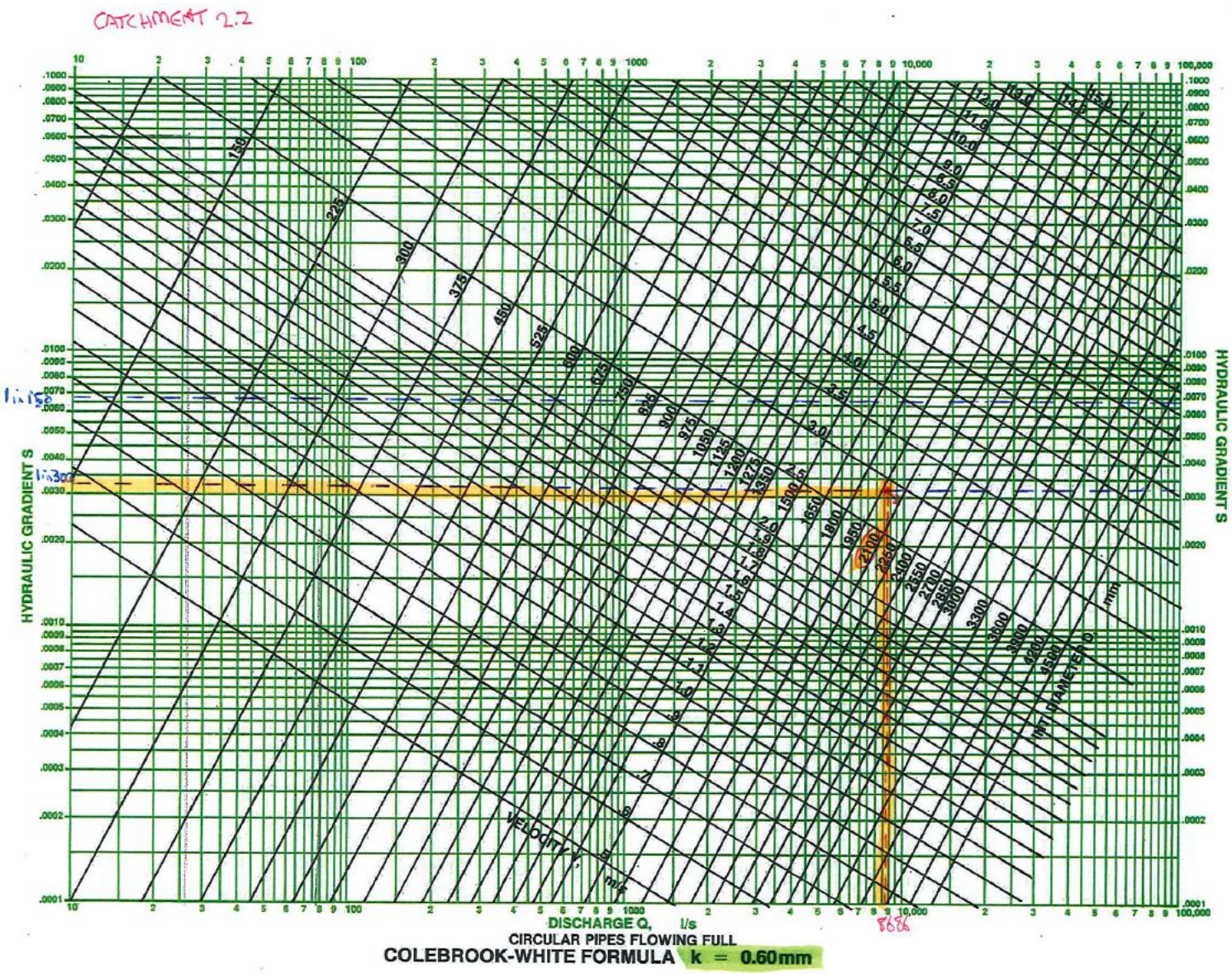

CATCHMENT 1.1
HYDRAULIC GRADIENT S
DISCHARGE Q, l/s
7493
CIRCULAR PIPES FLOWING FULL
COLEBROOK-WHITE FORMULA k = 0.60mm

CATCHMENT 2.2



CIRCULAR PIPES FLOWING FULL
COLEBROOK-WHITE FORMULA k = 0.60mm

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Bennett Road, Gisborne

Development Plan

Macedon Ranges Planning Scheme

Acoustic Engineering Report

Cogent Acoustics

Bennett Road, Gisborne

Development Plan

Macedon Ranges Planning Scheme

Acoustic Engineering Report

Prepared for:

G2 Urban Planning
670 Mt Alexander Road
Moonee Ponds VIC 3039

Prepared by:

Cogent Acoustics Pty Ltd
ABN: 13 610 344 986
11/27 Thornton Crescent,
Mitcham VIC 3132
03 8814 3250

Project Number: 19442

Prepared by **Te-liang Chong**
Bachelor of Mechanical Engineering
MAAS
te@cogentacoustics.com.au

Signature

Reviewed by **Irena Peoples**
MEng Global Automotive and Manufacturing Engineering
BSc, BE(Mech)(Hons)
irena@cogentacoustics.com.au

Signature

Revision History

Rev.	Date	Purpose	Prepared by:	Reviewed by:
0	24/01/2020	Draft for comment	Te-liang Chong	Irena Peoples
1	24/01/2020	Revised noise attenuation measures	Te-liang Chong	Irena Peoples
2	07/02/2020	Minor revisions	Te-liang Chong	Irena Peoples
3	07/02/2020	Updated Plans	Te-liang Chong	Irena Peoples
4	18/02/2020	For Issue	Te-liang Chong	Irena Peoples
5	3/08/2020	Amendment based on VicRoads response	Te-liang Chong	Irena Peoples
6	13/10/2021	Minor updates	Te-liang Chong	Irena Peoples

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Executive Summary

G2 Urban Planning has instructed Cogent Acoustics Pty Ltd to provide acoustic engineering consulting services associated with the Development Plan for a proposed rural residential subdivision development at Bennett Road, Gisborne.

Advice in relation to the following acoustic engineering elements has been requested, and is presented in this report:

Table 1 Acoustic Engineering Elements and Reference Criteria

Acoustic Design Element	Reference Criteria
External noise ingress via building façade and roof	▪ Macedon Ranges Planning Scheme Clause 21.11-1 ▪ VicRoads Requirements of Developers – Noise Sensitive Uses ▪ AS/NZS 2107:2016 ▪ AS 3671:1989

A review of the above elements has been undertaken and it is considered that the residential development will satisfy the reference criteria with inclusion of the following acoustic engineering measure:

- Residential buildings constructed within the lots highlighted in Figure 4 should be constructed in accordance with Construction Category 3 as prescribed in AS 3671:1989; and
- Residential buildings constructed within the lots highlighted in Figure 4 should have building layouts where the service areas (laundry, bathroom, garage, etc.) face Calder Freeway whilst the noise sensitive uses (bedrooms, living areas, etc.) are located away from the Calder Freeway side of the building; and
- Residential buildings constructed within the lots fronting Bennett Road should be setback no less than 30 meters from the Bennett Road lot boundary (with the 30 meter setback, the highest Sound Pressure Level at the most affected residential buildings is calculated to be $L_{A10,18hr}$ 70 dB(A)); and
- Residential buildings constructed within all remaining lots (not highlighted in Figure 4) should be constructed in accordance with Construction Category 2 as prescribed in AS 3671:1989.
- Where Construction Category 3 is recommended, specialist acoustic advice should be obtained during planning permit stage.
- Refer to Section 6.4 for details of the AS 3671:1989 Construction Categories.
- Refer to Section 8 for full details of the acoustic engineering measure.

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1 Introduction

1.1 Purpose

G2 Urban Planning has instructed Cogent Acoustics Pty Ltd to conduct a road traffic noise assessment at the site of a proposed residential subdivision at 88-168 Bennett Road and 15-134 McGregor Road, Gisborne, and to provide advice on any noise attenuation measures necessary to protect the future occupants from external noise. This report shall form part of the Development Plan support reports for this area.

This report documents the investigations and advice provided in relation to the above services.

A glossary of the acoustic nomenclature used in this report is presented in Appendix A.

1.2 Reference Documentation

This report is based on information contained in the following documents and drawings:

Table 2 Reference Documentation

Document	Prepared by	Issue
Bennett Road Precinct Development Plan; Drawing No. 17085 Face Sheet V23, 17085 Site Context V23, 17085 Layout V23, 17085 Development V23	Terraco	22/09/2021
Bennett Road Precinct: Subdivision Concept Plan with Aerial; Drawing No. 17085 Concept V23 Sheet 1 to 6	Terraco	22/09/2021
Bennett Road Development Plan Report	G2 Urban Planning	08/2019
VicRoads Request for Information; Planning Application No. DP/2019/1; VicRoads Reference No. PPR 30959/19	VicRoads	10/11/2019
Email To: Te-liang Chong CC: Brian Hogan; Thomas Cybula Subject: RE: Bennett Road, Gisborne Development Plan VicRoads Ref: PPR 30959/19	Chris King, VicRoads	Fri 31/07/2020 3:20 PM

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1.3 Report Limitations

The following limitations are applicable with respect to the acoustic advice presented in this report:

- Cogent Acoustics has prepared this document for the sole use of the Client and for the specific purpose expressly stated in the document. No other party should rely on this document without the prior written consent of Cogent Acoustics. Cogent Acoustics undertakes no duty, nor accepts any responsibility, to any third party who may rely upon or use this document.
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- The recommendations, data and methodology documented in this assessment are based on the listed reference documentation. The recommendations apply specifically to the project under consideration, and must not be utilised for any other purpose. Any modifications or changes to the project from that described in the listed reference documentation may invalidate the advice provided in this document, necessitating a revision.
- Subject to the above conditions, this document may be transmitted, reproduced or disseminated only in its entirety.

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2 Project Characteristics

2.1 Site Location

The project site is located at 88-168 Bennett Road and 15-134 McGregor Road, Gisborne, as shown in Figure 1.

The project comprises development of a Development Plan for a new rural residential subdivision located adjacent to Calder Freeway.

The topography in the area of the site is near flat with steep features along the drainage line or watercourse running through the southern and eastern sections of the site.

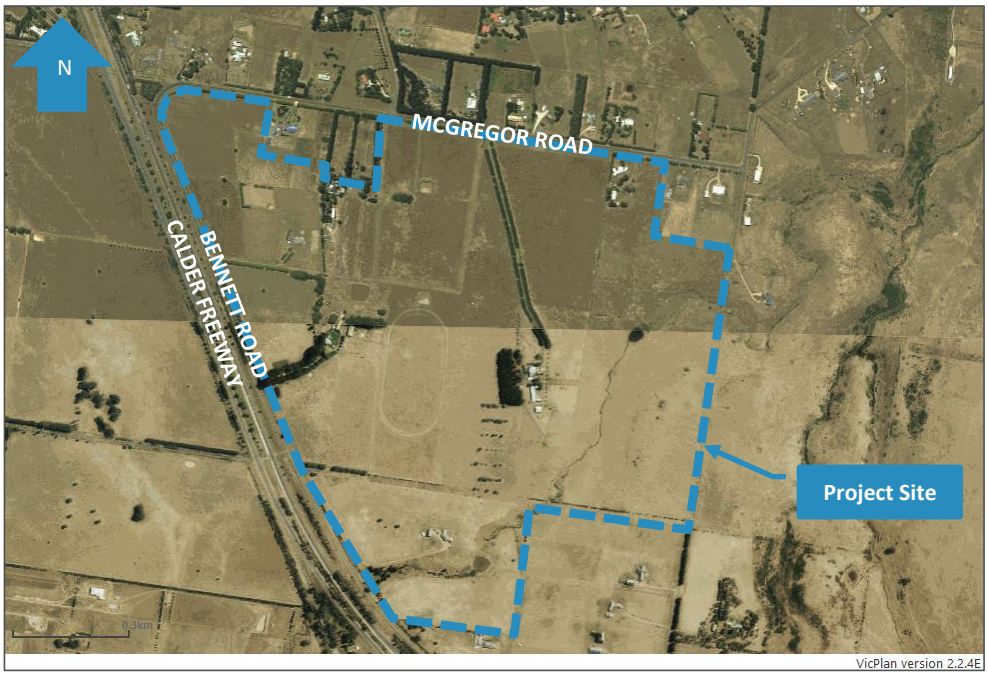

Figure 1 Aerial Image of Site (Image Source: VicPlan)

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2.2 Subdivision Plan

Figure 2 shows the subdivision concept plan.

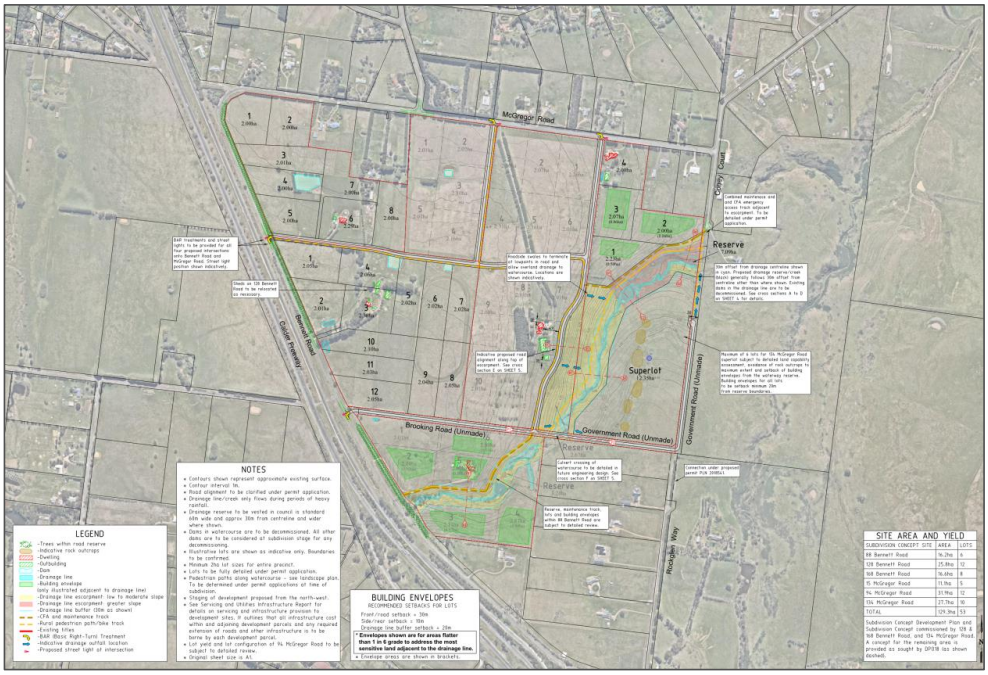

Figure 2 Subdivision Concept Plan (Image Source: Terraco)

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3 Town Planning Requirements

VicRoads Request for Information in relation to the Development Plan Application No. DP/2019/1 issued on 10 November 2019 specifies items that need to be addressed in the planning permit application for the development. Table 3 presents the relevant acoustic items to be addressed.

Table 3 Relevant VicRoads Request for Information Acoustic Items

Item No.	Item Text
2	The application must review and address clause 21.11-1 of the Macedon Ranges Planning Scheme which states: ***Criteria*** *An application for land within 100 metres of the Calder Highway and Calder Freeway should meet the following criteria:* • *Dwellings should be designed and constructed to acoustic standards as set out in AS3671-1989 "Acoustics – Road Traffic Noise Intrusion – Building Siting and Construction" where the noise level is in excess of 60dB(A). (Note: Noise levels quoted are free field L10[18hr]).* • *Other buildings providing for noise sensitive uses, should be designed and constructed to acoustic standards with interior noise levels not greater than those set out in AS2107-1987 "Acoustics – Recommended Design Sound Levels and Reverberation Times for Building Interiors."* • *Subdivision of land that creates a lot for a dwelling should have sufficient space for a dwelling to be sited where noise does not exceed 70dB(A).*

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4 Legislation and Guidelines

Table 4 presents a summary of the relevant legislation and guidelines applicable to the proposed development. The information contained in these documents forms the basis of the design criteria and advice presented in this report.

Table 4 Summary of Relevant Statutory Requirements and Guidelines

Document	Status	Relevance to this Project
Macedon Ranges Planning Scheme Clause 21.11-1 (Macedon Ranges Shire Council, 2019)	Policy	Provides acoustic criteria for an application of land within 100 metres of the Calder Highway and Calder Freeway.
AS/NZS 2107:2016 Acoustics – Design Sound Levels and Reverberation Times for Building Interiors (Standards Australia, 2016)	Guideline	Provides guidance on internal noise levels for different types of spaces. The guidance provided is relevant to the development in respect of noise intrusion from external sources.
AS 3671:1989 – Acoustics – Road Traffic Noise Intrusion – Building Siting and Construction (Standards Australia, 1989)	Guideline	Provides guidance on determining the required traffic noise reduction from outside to inside a building exposed to traffic noise, and the types of construction required to achieve acceptable internal noise levels.
VicRoads Requirements of Developers – Noise Sensitive Uses (VicRoads, 2004)	Guideline	Prescribes noise amelioration responsibility and standards of property developers of noise sensitive developments adjacent to freeways under VicRoads control.
VicRoads Requirements for Acoustic Consultants (VicRoads, 2005)	Guideline	Prescribes the method adopted by VicRoads for measurement of road traffic noise levels.

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5 Road Traffic Noise Measurement

5.1 Soundscape

During the site visits on 11 and 18 December 2019, the soundscape was dominated by road traffic noise from Calder Freeway. Bird noise, insect noise, and wind-induced vegetation noise also contributed to the soundscape but were not dominant sources of noise.

5.2 Road Traffic Noise Levels

Environmental noise logging was performed at the site to establish the current levels of road traffic noise. The measurements were performed at a location near to the south-western boundary of the site between 11 and 18 December 2019. Details of the measurement location and measurement methodology are presented in Appendix B.

Table 5 presents a summary of the measured sound pressure levels. Hourly sound pressure levels and a graph showing the variation in noise level over the full measurement period are presented in Appendix C.

Table 5 Summary of Measured Road Traffic Noise Levels

Date	Measured Sound Pressure Level, dB(A)					
	Day Period			Night Period		
	$L_{A10,18hr}$ (6 am to 12 am)	$L_{Aeq,16hr}$ (6 am to 10 pm)	Max $L_{Aeq,1hr}$ (6 am to 10 pm)	$L_{A10,6hr}$ (12 am to 6 am)	$L_{Aeq,8hr}$ (10 pm to 6 am)	Max $L_{Aeq,1hr}$ (10 pm to 6 am)
Wednesday, 11 December 2019	64*	62*	64*	61	58	63
Thursday, 12 December 2019	66	64	67	62	59	64
Friday, 13 December 2019	66	64	66	61	58	61
Saturday, 14 December 2019	64	63	65	56	53	56
Sunday, 15 December 2019	62	62	66	61	58	63
Monday, 16 December 2019	62	61	65	63	59	65
Tuesday, 17 December 2019	61	60	66	64	61	66
Wednesday, 18 December 2019	66**	63**	66**	-	-	-
Adopted Design Sound Level	**66**	**64**	**67**	**64**	**61**	**66**

* Partial measurement period: 12 pm to 10 pm / 12 am only

** Partial measurement period: 6 am to 12 pm only.

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6 Design Criteria

6.1 Macedon Ranges Planning Scheme Clause 21.11-1

Macedon Ranges Planning Scheme Clause 21.11-1 prescribes the following acoustic criteria for an application for land within 100 metres of the Calder Highway and Calder Freeway:

- Dwellings should be designed and constructed to acoustic standards as set out in AS 3671:1989 – Acoustics – Road Traffic Noise Intrusion – Building Siting and Construction (Standards Australia, 1989) where the noise level is in excess of 60 dB(A). (Note: Noise levels quoted are free field $L_{10[18hr]}$).
- Other buildings providing for noise sensitive uses, should be designed and constructed to acoustic standards with interior noise levels not greater than those set out in AS/NZS 2107:2016 Acoustics – Design Sound Levels and Reverberation Times for Building Interiors[1] (Standards Australia, 2016).
- Subdivision of land that creates a lot for a dwelling should have sufficient space for a dwelling to be sited where noise does not exceed 70 dB(A).

6.2 VicRoads Requirements of Developers – Noise Sensitive Uses

VicRoads Requirements of Developers – Noise Sensitive Uses (VicRoads, 2004) provides guidelines on methods to minimise road noise impacts to noise sensitive uses within developments near a freeway. It is noted that VicRoads Requirements of Developers prescribes similar, if slightly less stringent, acoustic criteria to Clause 21.11-1 of the Macedon Ranges Planning Scheme.

On this basis, the acoustic criteria in Macedon Ranges Planning Scheme Clause 21.11-1 will therefore be adopted for the purpose of this assessment. However, VicRoads Requirements of Developers does prescribe additional requirements relevant to the project, as follows:

- Two options for noise attenuation of traffic noise from a freeway may be considered:
  - Construction of a noise barrier between the freeway and noise sensitive uses; or
  - Where the developer decides, in consultation with VicRoads and Council, that it is not desirable to erect high noise barriers, then the noise sensitive buildings adjacent to the freeway must be designed and constructed with regards to the acoustic guidelines prescribed by AS/NZS 2107:2016 and AS 3671:1989.
- The adopted noise attenuation requirements will be met for 10 years after finalisation of the development. In consideration that the development has an estimated finalisation date in 2025, the noise attenuation target should be met up to the year 2035.

[1] Macedon Ranges Planning Scheme refers to AS 2107:1987 which has now been superseded.

- The noise barrier should have a design life of not less than 25 years.

6.3 Australian Standard AS/NZS 2107:2016

Australian Standard AS/NZS 2107:2016 (Standards Australia, 2016) provides recommended internal noise levels for various types of spaces. To achieve acceptable overall internal noise levels within the development, it is considered that:

- Buildings should be designed to achieve the middle to lower end of the range recommended by AS/NZS 2107:2016 for average internal noise levels during the daytime and night-time (i.e. $L_{Aeq,16hr}$ (6 am to 10 pm) and $L_{Aeq,8hr}$ (10 pm to 6 am) respectively).
- Buildings should be designed to achieve noise levels no greater than the upper end of the range recommended by AS/NZS 2107:2016 during the loudest hour that the rooms are typically occupied.

Table 6 presents the adopted internal noise level design criteria based on the above approach:

Table 6 AS/NSZ 2107:2016 Recommended Internal Noise Levels

Type of Occupancy / Activity	AS/NZS 2107:2016 Recommended Design Noise Level Range, L_{Aeq}, dB(A)	Adopted Project Design Criteria, dB(A)	
		Day or Night Average	Loudest Hour
Houses and apartments in inner city areas or entertainment districts or near major roads			
Living areas	35 to 45	$L_{Aeq,16hr} \leq 40$	$L_{Aeq,1hr} \leq 45$
Sleeping areas (night-time)*	35 to 40	$L_{Aeq,8hr} \leq 35$	$L_{Aeq,1hr} \leq 40$

* The noise criteria for sleeping areas have been taken to apply during the night-time (10 pm to 6 am) only. Higher noise levels in sleeping areas are considered to be acceptable during the daytime when occupants would generally not be sleeping, provided that the daytime noise levels in sleeping areas do not exceed the adopted criteria for living areas. The noise criteria for living areas has therefore also been adopted for sleeping areas during the daytime.

6.4 Australian Standard AS 3671:1989

Australian Standard AS 3671:1989 (Standards Australia, 1989) provides recommended building construction to reduce road traffic noise intrusion.

AS 3671:1989 provides recommendations based on the required Traffic Noise Reduction (TNR) which is the difference between the external noise level and AS/NZS 2107:2016 design internal noise level. Depending on the required TNR, the recommended building construction will be categorised into one of four categories ranging from standard construction to where specialist acoustic advice should be sought.

Table 7 presents details of the AS 3671:1989 required Construction Categories.

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Table 7 AS 3671:1989 Required Construction Categories for Residential Buildings

External Traffic Noise Level, $L_{Aeq,T}$, dB(A)	Traffic Noise Reduction, dB(A)	AS 3671:1989 Construction Category	AS 3671:1989 Construction Category Details
≤45	≤10	1	▪ Standard exterior façade construction acceptable. ▪ Openings including open windows and doors may comprise up to 10% of the exposed façade.
46 to 60	11 to 25	2	▪ Standard exterior façade construction acceptable, except for lightweight elements such as fibre cement, metal cladding or all glass façades. ▪ Windows, door, and other openings must be closed to achieve the required TNR.
61 to 75	25 to 35	3	▪ Special exterior façade construction. ▪ Specialist acoustic advice should be sought. ▪ Acoustic performance of façade must account for the type of room, number, type, and direction of the façade and any openings.
>75	>35	4	▪ As per Construction Category 3. ▪ Masonry construction, wide air gap double glazing, and fully insulated external facades are likely to be required to achieve this level of TNR.

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7 Road Traffic Noise

7.1 Noise Modelling

SoundPLAN version 7.4 environmental noise modelling software was used to calculate the existing and future traffic noise levels at the development.

Full details of noise modelling input parameters and data sources are presented in Appendix D.

7.2 Noise Model Validation

To validate the noise model, a version of the model representing the existing scenario (year 2019) was generated and used to calculate the road traffic noise levels at the noise logging position. The traffic noise levels calculated by the model were then validated against the measured road traffic noise levels, as shown in Table 8.

Table 8 Traffic Noise Model Validation Results

Noise Logger Location	Sound Pressure Level Parameter	Measured Sound Pressure Level, dB(A)	Modelled Year 2019 Sound Pressure Level, dB(A)	Deviation, dB
1	$L_{A10,18hr}$	66	70	+4
	$L_{Aeq,16hr}$	64	68	+4
	$L_{Aeq,8hr}$	61	66	+5

The noise model validation results show that a deviation of between +4 and +5 dB(A) was calculated between the measured and modelled noise levels.

Therefore, a -4 dB(A) adjustment will be applied to all modelled noise levels.

7.3 Calculated Year 2035 Traffic Noise Levels

Year 2035 traffic noise levels were calculated by increasing the traffic volumes by the current (year 2019) annual growth rate. All other modelling parameters were unchanged. Full details of noise modelling input parameters and data sources are presented in Appendix D.

Figure 3 presents a noise contour map showing the calculated $L_{A10,18hr}$ traffic noise contours in year 2035 without noise attenuation measures. The presented Sound Pressure Levels include the -4 dB(A) adjustment.

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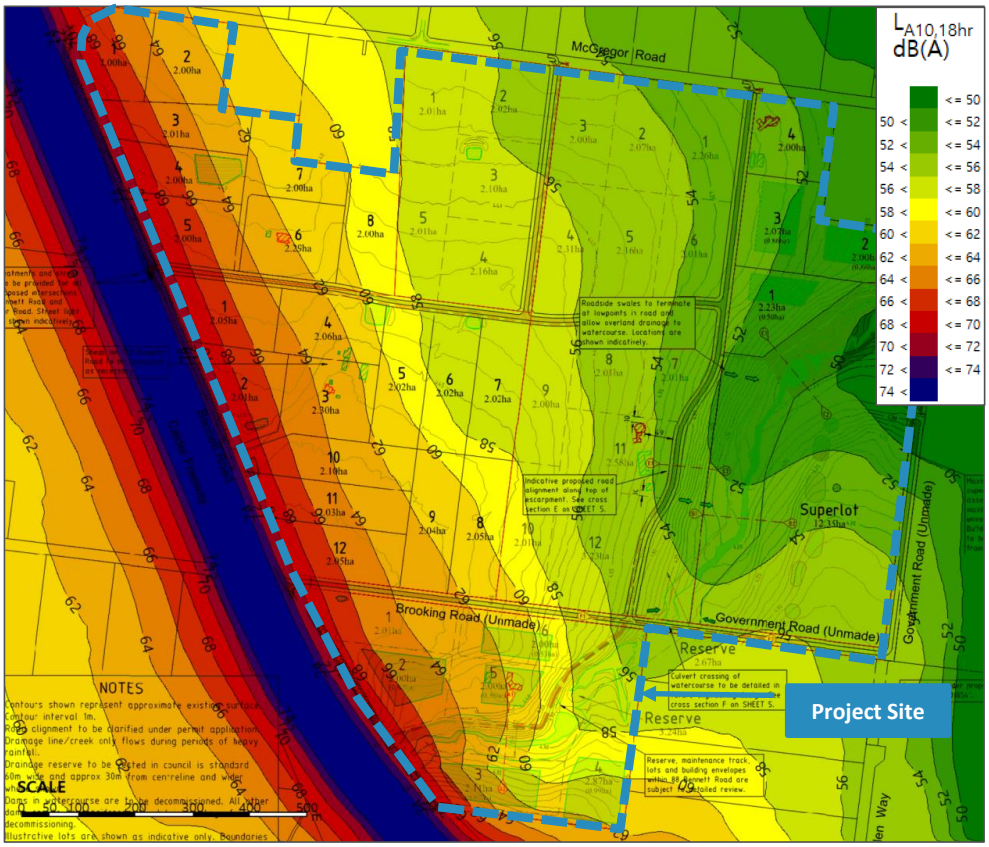

Figure 3 Calculated Year 2035 $L_{A10,18hr}$ Traffic Noise Contours

The noise modelling results indicate that noise levels at the lots adjacent to Bennett Road (and nearest to Calder Freeway) will be up to $L_{A10,18hr}$ 72 dB(A) in year 2035 without noise attenuation measures.

The minimum noise level at lots within the project site will be $L_{A10,18hr}$ 47 dB(A), which has been calculated to occur at the lots furthest from Calder Freeway.

On the above basis, noise attenuation measures will be required to satisfy the VicRoads Requirements of Developers.

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8 Recommended Noise Attenuation Measures

The following noise attenuation measures are recommended:

- Residential buildings constructed within the lots highlighted in Figure 4 should be constructed in accordance with Construction Category 3 as prescribed in AS 3671:1989; and
- Residential buildings constructed within the lots highlighted in Figure 4 should have building layouts where the service areas (laundry, bathroom, garage, etc.) face Calder Freeway whilst the noise sensitive uses (bedrooms, living areas, etc.) are located away from the Calder Freeway side of the building; and
- Residential buildings constructed within the lots fronting Bennett Road should be setback no less than 30 meters from the Bennett Road lot boundary (with the 30 meter setback, the highest Sound Pressure Level at the most affected residential buildings is calculated to be $L_{A10,18hr}$ 70 dB(A)); and
- Residential buildings constructed within all remaining lots (not highlighted in Figure 4) should be constructed in accordance with Construction Category 2 as prescribed in AS 3671:1989.
- Where Construction Category 3 is recommended, specialist acoustic advice should be obtained during planning permit stage. The acoustic specialist should take into account the guidelines prescribed by AS/NZS 2107:2016 and AS 3671:1989. The sound insulation performance of each façade should account for the location of each room, their intended occupancy, and exposure to traffic noise.

  Indicatively, Construction Category 3 will require masonry external façade construction, double glazed window units, and walls and ceilings complete with bulk insulation. Openable windows and exterior doors should be fitted with rubber-type acoustic seals. Fresh air intake or exhaust systems should be ducted, and consideration should be given to fitting acoustic attenuators or internal acoustic lining to the ductwork.
- Where Construction Category 2 is recommended, specialist acoustic advice is not required. However, lightweight external façade elements such as fibre cement, metal cladding, or all glass façades will not provide sufficient sound insulation. External façades should be of masonry construction, such as brickwork, to provide sufficient sound insulation.
- These requirements and this report shall be referenced on future subdivision permits.

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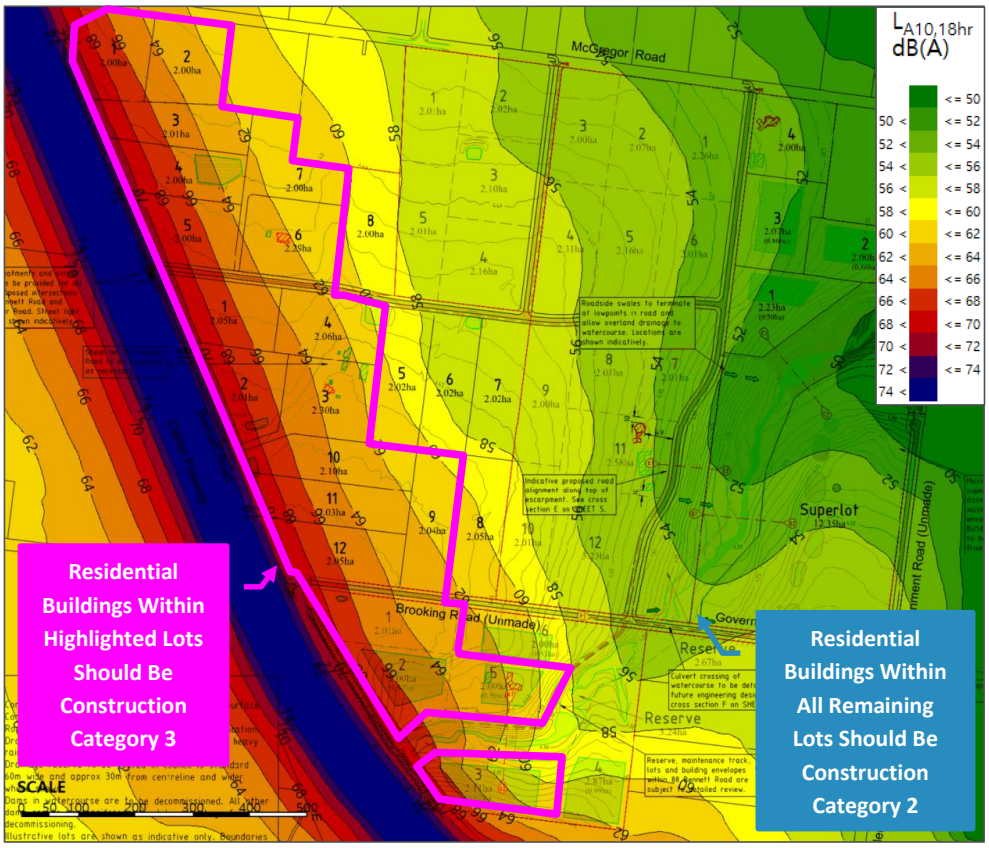

Figure 4 Recommended AS 3671:1989 Construction Categories for Residential Buildings

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9 Conclusion

This report has presented a road traffic noise assessment for the proposed residential subdivision development at Bennett Road, Gisborne.

The assessment has been undertaken with regard to the acoustic criteria prescribed in Macedon Ranges Planning Scheme Clause 21.11-1 (Macedon Ranges Shire Council, 2019), VicRoads Requirements of Developers – Noise Sensitive Uses (VicRoads, 2004), AS/NZS 2107:2016 Acoustics – Design Sound Levels and Reverberation Times for Building Interiors (Standards Australia, 2016), and AS 3671:1989 – Acoustics – Road Traffic Noise Intrusion – Building Siting and Construction (Standards Australia, 1989).

Acoustic engineering advice for the proposed development has been presented in Section 8.

Subject to the advice presented in this report, it is considered that the Development Plan and future rural residential development will satisfy the applicable acoustic criteria.

Cogent Acoustics

10 References

Macedon Ranges Shire Council. (2019). Macedon Ranges Planning Scheme.

Standards Australia. (1989). AS 3671:1989 Acoustics – Road Traffic Noise Intrusion – Building Siting and Construction.

Standards Australia. (2016). AS/NZS 2107:2016 Acoustics - Recommended Design Sound Levels and Reverberation Times for Building Interiors.

UK DoT. (1988). Calculation of Road Traffic Noise (CoRTN). Department of Transport, Welsh Office.

VicRoads. (2004). VicRoads Requirements of Developers - Noise Sensitive Uses. Roads Corporation of Victoria, Kew.

VicRoads. (2005). VicRoads Requirements for Acoustic Consultants. Roads Corporation of Victoria, Kew.

VicRoads. (2010, July). Road Design Note (RDN 06-01). *Interpretation and Application of VicRoads Traffic Noise Reduction Policy 2005*. Roads Corporation of Victoria, Kew.

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Appendix A Glossary of Acoustic Terms

dB / dB(A)

Decibels or 'A'-weighted Decibels, the units of Sound Pressure Level and Sound Power Level. 'A'-weighting adjusts the levels of frequencies within the sound spectrum to better reflect the sensitivity of the human ear to different frequencies at sound pressure levels typical of everyday sounds. [Unit: dB / dB(A)]

The following are examples of the decibel readings of every day sounds;

- 0 dB The faintest sound we can hear
- 30 dB A quiet library or in a quiet location in the country
- 45 dB Typical office space. Ambience in the city at night
- 60 dB The sound of a vacuum cleaner in a typical lounge room
- 70 dB The sound of a car passing on the street
- 80 dB Loud music played at home
- 90 dB The sound of a truck passing on the street
- 100 dB The sound of a rock band
- 120 dB Deafening

$L_{A10,T}$

The value of A-weighted Sound Pressure Level which is exceeded for 10 percent of the time during given measurement period T. This is commonly used to provide an indication of the upper limit of fluctuating noise, such as characteristic of music or moderately busy traffic. [Unit: dB / dB(A)]

$L_{Aeq,T}$

The Equivalent Continuous A-weighted Sound Pressure Level measured over the period T (also known as Time-Average Sound Pressure Level). The Equivalent Continuous A-weighted Sound Pressure Level is the constant value of A-weighted Sound Pressure Level for a given period that would be equivalent in sound energy to the time-varying A-Weighted Sound Pressure Level measured over the same period. In simple terms, this can be thought of as the average sound pressure level. [Unit: dB / dB(A)]

Sound Pressure Level

A measure of the magnitude of a sound wave. Mathematically, it is twenty times the logarithm to the base ten of the ratio of the root mean square sound pressure at a point in a sound field, to the reference sound pressure; where sound pressure is defined as the alternating component of the pressure (Pa) at the point, and the reference sound pressure is $2x10^{-5}$ Pa. [Unit: dB]

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Appendix B Noise Measurement Methodology

Measurement Location

Table 9 presents details of the noise measurement location. Figure 5 and Figure 6 present a map and a photograph of the noise measurement location.

Table 9 Noise Measurement Location Details

Location Reference	Measurement Description	Microphone Height Above Ground Level
1	Traffic noise logging	1.5 m

Figure 5 Noise Measurement Locations (Image Source: VicPlan)

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Figure 6 Noise Measurement Location 1 – Photo Facing South-West

Measurement Procedure

Unattended environmental noise logging was performed at the site to establish the environmental noise levels. Table 10 presents details of the measurement:

Table 10 Details of Measurement Period

Location Ref.	Measurement Type		Start Time	Start Date	End Time	End Date
	Attended	Unattended				
1	☐	☒	11:20 AM	Wednesday 11/12/2019	12:00 PM	Wednesday 18/12/2019

The equipment was configured to provide the measurement results as a continuous series of 1 second A- and Z-weighted sound pressure levels. Metrics used for the assessment were then post-processed from this data.

A 60 mm diameter foam windscreen was installed on the microphone to minimise the effect of wind-induced pressure fluctuations on the measurements.

Instrumentation

All acoustic instrumentation used for the measurements held a current certificate of calibration from a National Association of Testing Authorities (NATA) accredited laboratory or from the manufacturer at the time of the measurements.

A field check to confirm correct calibration of the instrumentation was performed at the beginning and end of the measurement period using a laboratory calibrated portable Sound Level Calibrator. At the time of each check the instrumentation was found to be reading correctly and the deviation between consecutive checks was found to be less than 1 dB.

Details of the acoustic instrumentation used for measurements are presented in Table 11.

Table 11 Acoustic Instrumentation Details

Location Reference	Instrument Description	Serial No.	Date of Last Laboratory Calibration*
1	Convergence Instruments NSRT_mk3 Type 1 Sound Level Meter	Cnp0DtU4cVUfChtCQ6hxlD	14/05/2019
-	Svantek SV35 Portable Sound Level Calibrator	58054	13/05/2019

* In accordance with AS 1055.1-1997 and National Association of Testing Authorities Guidelines, Sound Level Meters and Environmental Noise Loggers are required to have comprehensive laboratory calibration checks carried out at intervals not exceeding two years. Sound Level Calibrators require calibration annually.

Meteorological Data

Weather observations during the monitoring period were taken from the Bureau of Meteorology Weather Station at Melbourne Airport, approximately 25 km away.

A maximum of 0.2 mm of rainfall was recorded on Wednesday 11 December 2019. No rainfall was recorded on any other day during the measurement period. The noise measurements are therefore not considered to have been affected by rain noise.

It is noted that for most of the measurement period, the wind speed at the Melbourne Airport Weather Station exceeded the 3 m/s limit as prescribed by the VicRoads Requirements for Acoustic Consultants (VicRoads, 2005). Local wind speed measurements were conducted near to the noise measurement location using a Kestrel 5500 Weather Meter. Table 12 presents the measured wind speed.

Table 12 Measured Wind Speed at Noise Logging Location

Location Reference	Measurement Time	Measurement Date	Measured Wind Speed, m/s
1	11:30 AM to 11:45 AM	Wednesday 11/12/2019	3.1
1	11:45 AM to 12:00 PM	Wednesday 18/12/2019	1.8

An average wind speed of 3.1 m/s was measured at the noise logging location between 11:30 am and 11:45 am on Wednesday 11 December 2019. On the same day, the Melbourne Airport Weather Station measured an average wind speed of between 4.7 m/s and 6.1 m/s (reported at 9 am and 3 pm).

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An average wind speed of 1.8 m/s was measured between 11:30 am and 11:45 am on Wednesday 18 December 2019. On the same day, the Melbourne Airport Weather Station measured an average wind speed of between 2.5 m/s and 7.2 m/s (reported at 9 am and 3 pm).

On the above basis, it is considered that the wind speed measured at the Bureau of Meteorology Weather Station at Melbourne Airport is higher than the wind speed at the noise logging location. However, it is likely that the wind speed will have still exceeded 3 m/s at the measurement position for a prolonged period on one or more occasions. As such, the measurement results may have been affected by wind noise, but the impact is not considered to be significant.

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Appendix C Noise Measurement Results

Hourly Measurement Results

Location:	Bennett Road, Gisborne	**Microphone Location:**	South-Western Boundary	**Calibration Start:**	114 dB(A)
Measurement Period:	Wednesday 11/12/2019 to Wednesday 18/12/2019	**Instrument:**	Convergence Instruments NSRT_mk3	**Calibration End:**	114 dB(A)

Start Time	Sound Pressure Level, dB(A)																															
	11/12/2019				12/12/2019				13/12/2019				14/12/2019				15/12/2019				16/12/2019				17/12/2019				18/12/2019			
	L_{10}	L_{90}	L_{eq}	L_{max}	L_{10}	L_{90}	L_{eq}	L_{max}	L_{10}	L_{90}	L_{eq}	L_{max}	L_{10}	L_{90}	L_{eq}	L_{max}	L_{10}	L_{90}	L_{eq}	L_{max}	L_{10}	L_{90}	L_{eq}	L_{max}	L_{10}	L_{90}	L_{eq}	L_{max}	L_{10}	L_{90}	L_{eq}	L_{max}
0:00					60	41	56	71	60	41	56	69	62	49	58	70	57	43	53	66	60	44	56	69	60	41	56	72	61	41	56	71
1:00					57	34	53	66	59	37	54	69	60	38	56	70	56	34	52	67	57	33	53	70	58	36	55	67	60	35	55	70
2:00					57	32	53	75	57	33	52	70	57	34	53	70	53	30	48	64	57	31	53	79	59	34	54	68	61	33	56	72
3:00					59	37	54	68	60	36	55	70	58	35	54	70	50	30	46	66	59	37	54	68	61	34	57	69	63	37	59	70
4:00					63	41	59	71	63	45	59	69	61	37	56	70	55	33	50	64	62	47	58	67	63	47	59	69	65	49	62	74
5:00					66	57	63	71	66	58	64	72	63	47	59	74	59	40	55	67	65	57	63	70	68	60	65	75	69	61	66	74
6:00					66	59	64	72	67	61	65	75	65	56	62	72	56	43	53	64	66	61	64	71	68	63	66	73	68	63	66	73
7:00					69	63	67	73	68	62	66	73	66	59	63	72	54	44	51	67	67	62	65	76	66	60	64	70	67	61	65	74
8:00					68	64	66	74	68	62	66	73	67	61	65	72	62	50	58	69	66	60	63	77	64	55	61	70	65	57	62	70
9:00					68	62	66	73	67	61	65	72	67	61	65	72	59	51	56	75	64	56	61	71	57	51	55	65	63	55	60	70
10:00					68	62	66	82	66	59	63	72	67	62	65	74	56	51	54	66	62	55	60	77	56	50	54	65	64	56	61	73
11:00					67	61	65	76	64	57	62	81	68	61	65	73	61	53	58	67	61	55	60	81	56	49	54	65	66	58	63	77
12:00	65	58	62	80	67	61	65	77	65	58	63	77	66	59	63	72	62	56	59	69	60	53	58	71	57	50	54	70				
13:00	64	57	61	70	67	61	64	73	65	57	62	72	64	56	61	73	60	51	57	75	60	52	57	73	58	50	55	70				
14:00	64	59	62	72	67	62	65	74	66	58	63	71	64	56	61	69	65	55	62	87	59	53	58	88	59	51	56	67				
15:00	65	60	63	71	67	61	65	74	67	61	65	80	65	58	63	71	66	59	63	73	60	53	57	71	60	52	57	69				
16:00	66	60	64	72	67	61	65	73	68	63	66	73	65	59	63	72	69	62	66	74	61	55	59	68	61	55	59	68				
17:00	66	61	64	75	65	60	63	83	68	63	66	72	65	59	63	71	68	62	66	74	62	56	60	82	63	57	61	71				
18:00	65	60	63	70	64	59	62	70	68	63	66	72	64	58	61	70	67	60	64	72	62	57	60	68	63	57	61	70				
19:00	64	57	61	77	63	57	61	69	67	60	64	73	64	56	61	71	66	60	64	73	62	56	60	69	63	56	61	80				
20:00	64	56	61	79	64	56	61	70	65	59	63	71	60	53	58	67	65	59	63	71	62	54	59	68	63	55	60	73				
21:00	63	55	60	70	63	54	60	71	65	58	62	71	60	53	58	65	62	54	60	73	63	55	60	69	62	55	59	70				
22:00	62	50	58	73	63	53	60	71	64	55	61	73	59	52	56	64	61	51	58	70	62	52	59	70	64	53	60	70				
23:00	61	46	58	70	61	47	57	68	64	53	60	71	58	47	55	66	59	44	55	68	61	43	57	68	62	48	58	70				
$L_{10,18hr,\ Arith\ Av,\ 6\text{-}24h}$	64				66				66				64				62				62				61				66			
$L_{eq,15hr,\ Log\ Av,\ 7\text{-}22h}$			62				64				64				63				62				60				59				58	
$L_{eq,16hr,\ Log\ Av,\ 6\text{-}22h}$			62				64				64				63				62				61				60				59	
$L_{eq,8hr,\ Log\ Av,\ 22\text{-}6h}$			58				59				58				53				58				59				59				0	
$L_{eq,9hr,\ Log\ Av,\ 22\text{-}7h}$			59				60				59				53				59				61				60				0	
Wind @0900h	4.7 m/s, S				5.6 m/s, SSW				5.6 m/s, SSW				5.3 m/s, SW				4.2 m/s, SW				3.1 m/s, SW				1.9 m/s, SW				2.5 m/s, E			
Wind @1500h	6.1 m/s, S				7.2 m/s, SSE				6.7 m/s, SSW				5.3 m/s, SW				4.7 m/s, SSW				5.3 m/s, SE				4.7 m/s, S				7.2 m/s, W			

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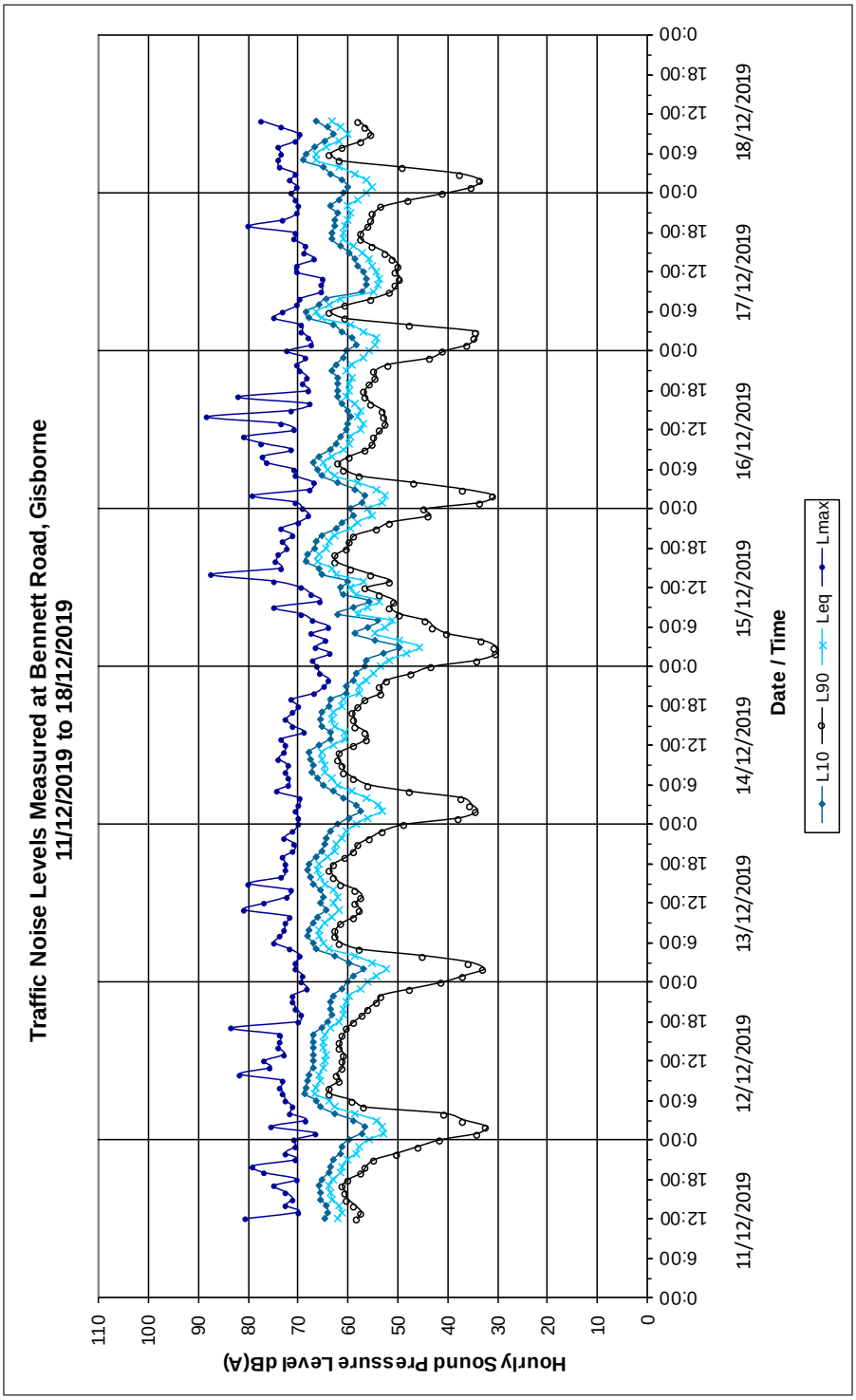

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Appendix D Modelling Parameters

General

Parameter	Description
Software	SoundPLAN Version 7.4
Calculation Method	CoRTN methodology (UK DoT, 1988)

Geometrical Parameters

Parameter	Description
Site Layout	▪ Modelled according to the documented site plan; and ▪ As per the latest VicPlan satellite image for the area in the vicinity of site.
Terrain	Digital ground map was constructed according to topographical data from the SRTM-derived Hydrological 1 Second Digital Elevation Model from the Geoscience Australia Elevation Information System (ELVIS).
Ground absorption	All surfaces have been modelled as soft ground using a ground factor of 0.5.
Buildings	No buildings were included in the modelling.
Receptor / Noise Contour Height	1.5 m above ground level.

Road Parameters

Parameter	Description
Road Geometry	▪ Calder Freeway was modelled as two double-lane carriageways separated by a grass median strip. Each lane has been modelled as 3.5 m wide. ▪ The freeway was modelled according to the elevation data from ELVIS. ▪ No other roads were included in the model.

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<table>
<tr><th>Parameter</th><th>Description</th></tr>
<tr><td>Traffic Volumes</td><td>
VicRoads Open Data provided the data used to model traffic volume along Calder Freeway. Forecast year 2035 AADT was derived based on the current annual traffic growth rate. The AADTs used in the traffic noise modelling were therefore as follows:
<table>
<tr><th>Calder Freeway</th><th>2019 All Vehicles AADT</th><th>2019 %HV</th><th>Annual Growth Rate</th><th>2035 All Vehicles AADT</th><th>2035 %HV</th></tr>
<tr><td>South-East Bound</td><td>16,000</td><td>11%</td><td>2.5%</td><td>23,752</td><td>11%</td></tr>
<tr><td>North-West Bound</td><td>16,000</td><td>8%</td><td>2.7%</td><td>24,505</td><td>8%</td></tr>
</table>
The CoRTN modelling methodology uses 18-hour traffic volumes (6 am to midnight) rather than AADT volumes. To account for this difference the 18-hour road traffic volume used in the modelling was based on 95% of AADT volume.
</td></tr>
<tr><td>Vehicle Speeds</td><td>Modelling of Calder Freeway traffic flow has been based on a posted speed limit of 110 km/h.</td></tr>
<tr><td>Road Surfaces</td><td>The road surface of the section of Calder Freeway adjacent to the project site is understood to be a 14/7 double/double seal.
This section of Freeway has therefore been modelled with a +4 dB correction in accordance with Road Design Note 06-01 (VicRoads, 2010).</td></tr>
</table>

Regional Planning & Design Pty Ltd

Sam Thompson
Director
BApp Sci (Hons)
Landscape Architecture RMIT 1986

BUSHFIRE / GRASSFIRE MANAGEMENT STATEMENT

Bennett Road Development Plan, Bennett Road Gisborne

Ref No.19.401

Prepared by Regional Planning & Design Pty Ltd
13 Bridport Street Daylesford 3460
Phone 0447 073 107

Disclaimer

This report has been made with careful consideration and with the best information available to Regional Planning and Design Pty Ltd at the time of writing. Before relying on information in this report, users should evaluate the accuracy, completeness and relevance of the information provided for their purposes. Regional Planning and Design Pty Ltd do not guarantee that it is without flaw or omission of any kind and therefore disclaim all liability for any error, loss or other consequence that may arise from you relying on any information in this report.

Requirements detailed in this document do not guarantee survival of the buildings or the occupants. The client is strongly encouraged to develop and practice a bushfire survival plan. It is also recommended CFA's Landscaping for Bushfire: Garden design and plant selection be read prior to developing the garden

Information and assistance including a template for a Bushfire Survival Plan is provided as part of the 'Fire Ready Kit' available through the CFA website at http://www.cfa.vic.gov.au or through your local CFA Regional office.

Version Control

Report Version	Description	Date Completed	Issued to
A	Issued as a draft for discussion	3/2/2020	Client
B	General revisions	15/2/2020	Client
C	General revisions	18/2/2020	Client
D	Minor revisions	19/2/2020	Client
E	Minor revisions	27/2/2020	Client
F	Minor revisions	28/2/2020	Client
G	Revisions to landscape plan	29/11/2021	Client

1 SUMMARY

Summary	
Date of site visit:	18th November 2019 and 4th February 2020
Broad landscape setting (Technical Guide Planning Permit Applications – Bushfire Management Overlay)	2 to 3
Access requirements can be met	3.5 metre wide driveways with 4m vertical and 4.5m horizontal clearance
Water Supply Requirements	10 000 litres in non combustible tank with CFA access and fittings (as the lots are larger than 1000 m2)
Defendable Space requirements can be met	BAL 12.5
Proposed BAL construction level	BAL 12.5
Is native vegetation removal required:	No

2 INTRODUCTION

This Bushfire Management Statement (BMS) has been prepared to enable G2 Urban Planning to respond to the requirements of Clause 44.06 *Bushfire Management Overlay* (known from this point on as Clause 44.06), and associated Clause 53.02 *Bushfire Protection: Planning Requirements* (known from this point on as Clause 53.02) for the proposed Development Plan at Bennett Road Gisborne. While the site is not covered by the BMO, CFA requested a Bushfire Management Statement be prepared in a letter dated 29th September 2019 to the Macedon Ranges Shire.

Methodology

Clause 53.02-4 applies to this application as subdivision is proposed.

The BMS is in two parts

Part 1 Site description , hazard assessment and locality description

Part 2 A Bushfire Management Statement describing how the proposed development responds to the requirements in Clause 53.02 and 44.06.

3 ZONING AND OVERLAYS

Clause Number	Name
35.03	Rural Living Zone
43.04	Development Plan Overlay (DPO 18)

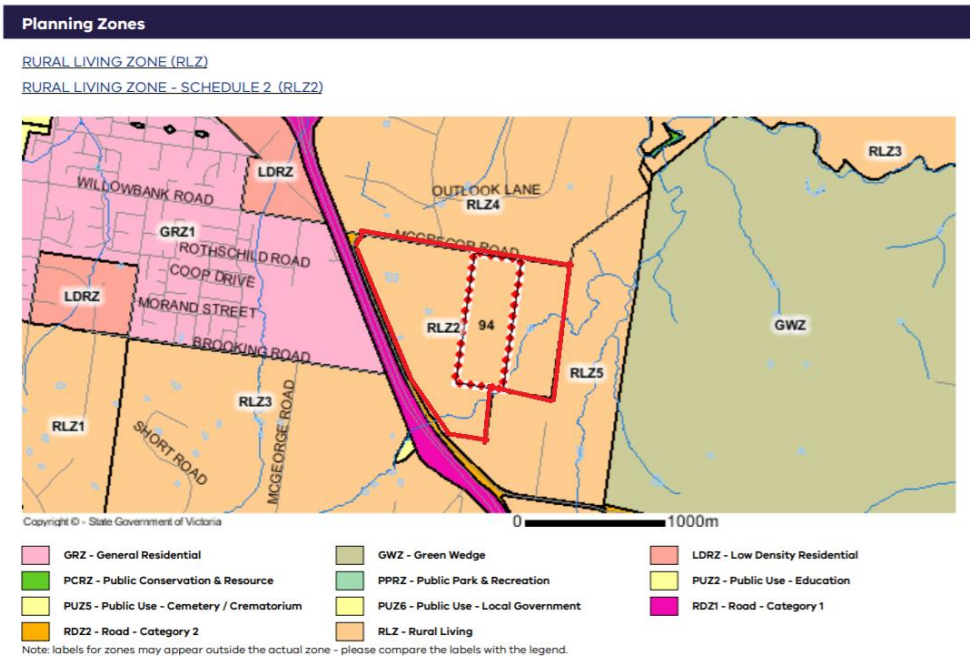

Figure 1 Zoning

4 LOCATION AND BUSHFIRE HAZARD LANDSCAPE ASSESSMENT PLAN

The site is located to the south east of Gisborne. While farmland covered in mostly low threat grassland surrounding the site will reduce the hazard ,the site could be vulnerable to long runs of grass fire from the north and north west and runs of fire from the south west following a wind change, which often occurs on high fire risk days in summer. Grassland to the east is less likely to pose a major threat as hot winds in summer are not usually experienced from this direction.

An approaching bushfire is likely to cause ember attack, increasing the fire risk. It is recommended the owners maintain land to the property boundaries to minimize ground fuel build up.

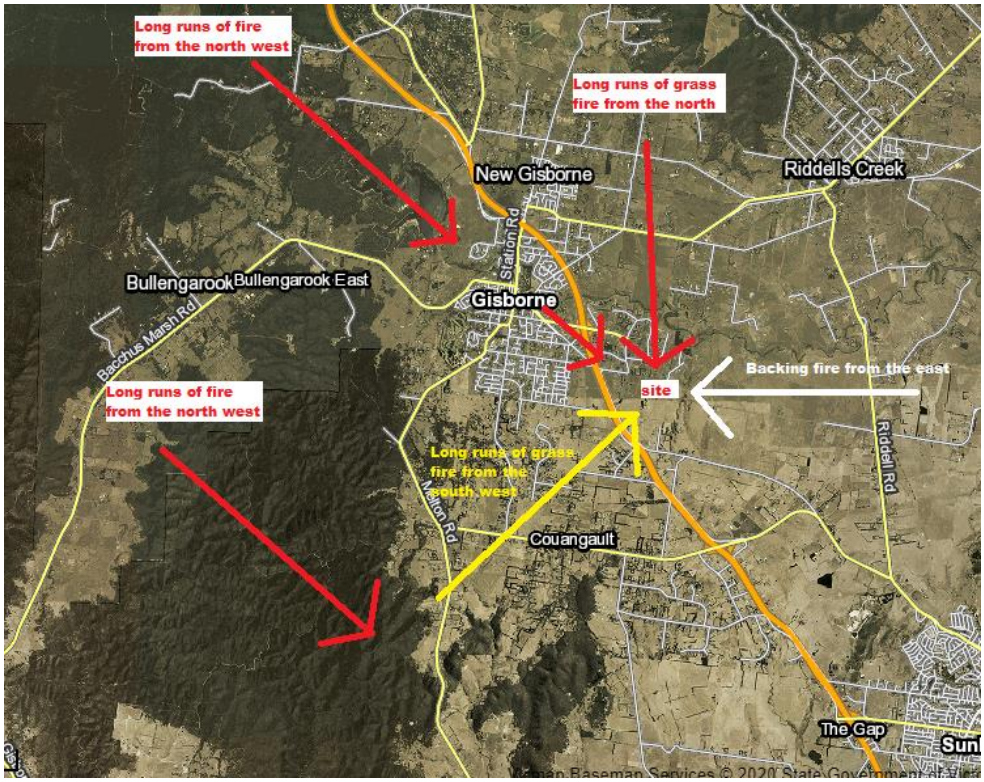

Figure 2 Location

5 SITE DESCRIPTION

Site shape, dimensions, size , existing use and buildings and works	
The shape of the site is:	Irregular.
The site has a total area of:	Approximately 130 ha
The current use of the site is	Grazing
The buildings or works located on the site are:	Five dwellings with various outbuildings
Site topography	Most of the site is gently sloping on an overall 0 to 5 degree gradients to the east. There is a drainage line in the southern part of the site with steeply sloping land on either side at overall 5 to 10 degrees slopes, with short slopes as steep as 20 degrees.
Site vegetation	The site is mostly covered in grassland (photos 1 to 5) There are rows of pine, cypress and some native windbreak plantings (photos 6 and 8). There is some woodland in the drainage line in the south west part of the site (photos 7 and 9)
Access	The site has good access to areas of open grassland to the west of the site via McGregors and Bennetts Roads

Site Photo

Photo 1 Looking north west across grassland towards neighbouring dwellings on the north eastern boundary of site

Site Photos

Photo 2 Looking south west along the drainage line from the east boundary of the site

Photo 3 Looking north west across grassland in the north eastern part of the site

Site Photos

Photo 4 Looking north across grassland in the south eastern part of the site

Photo 5 Looking east across grassland in the western part of the site

Site Photos

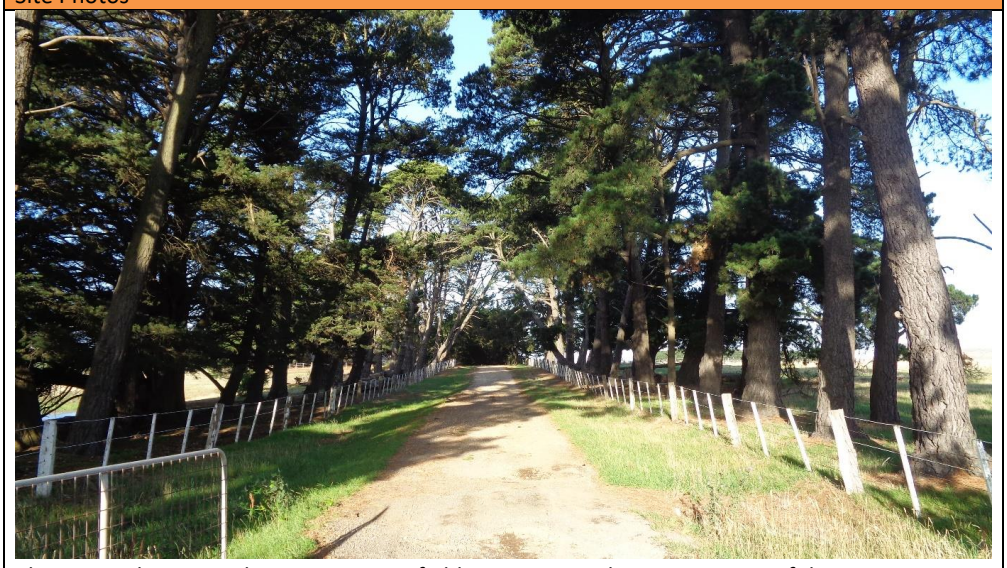

Photo 6 Looking east along an avenue of old pine trees in the western part of the site

Photo 7 Looking east across grassland and woodland along the drainage line in the south western part of the site

Site Photos

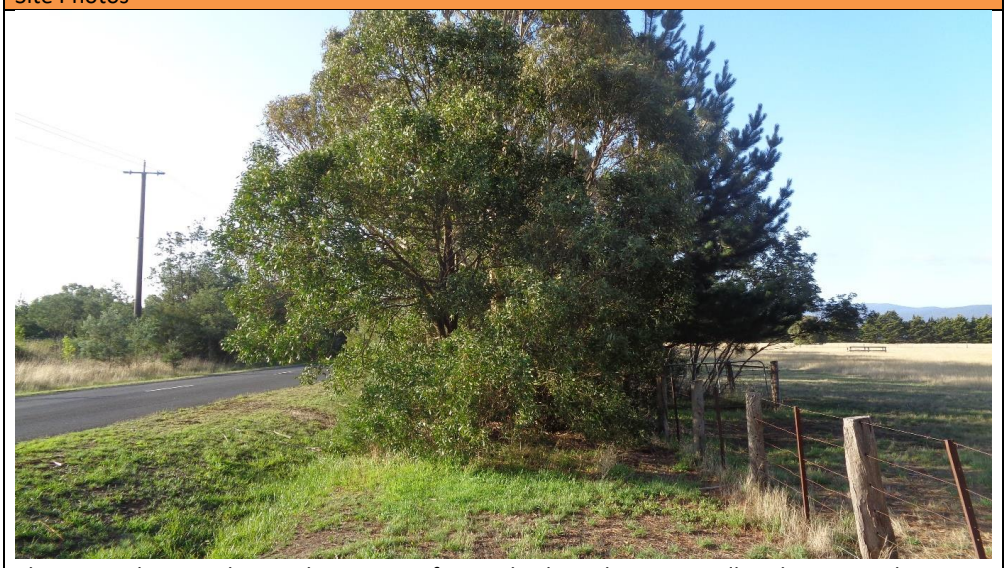

Photo 8 Looking north east along a row of recently planted native windbreak trees on the western boundary of the site

Photo 9 Looking north east across shrubland, grassland and woodland along the drainage line in the southern part of the site

Figure 3 Existing conditions

6 ACCESS

The site has vehicle access from Coney Court and McGregor Road on the north boundary (photos 10 and 11) which provide good access to open grassland to the north. The south and western parts of the site has access along an unmade Government Road (photo 12) and Bennetts Road on the west boundary (photo 13)

Access Photos

Photo 10 Looking north along Coney Court near the entry to proposed Lots 8 and 9

Photo 11 Looking west along McGregor Road on the north boundary

Access Photos

Photo 12 Looking west along the unmade Government Road (which joins the unmade Brooking Road) on the southern boundary of the site

Photo 13 Looking north east along Bennett Road on the west boundary where the unmade government and Brooking Roads will provide access from the south and western parts of the site.

7 BUSHFIRE HAZARD SITE ASSESSMENT

As shown in Figure 4 and described in Appendix 1 there is mstly a mix of grassland and managed farmland with strips of trees in windbreaks within the 150 metre assessment area around the site (photos 14 to 18). To the south west is planted woodland along the Freeway verge and along the creek line beyond the 150 metre assessment area (photo 19).

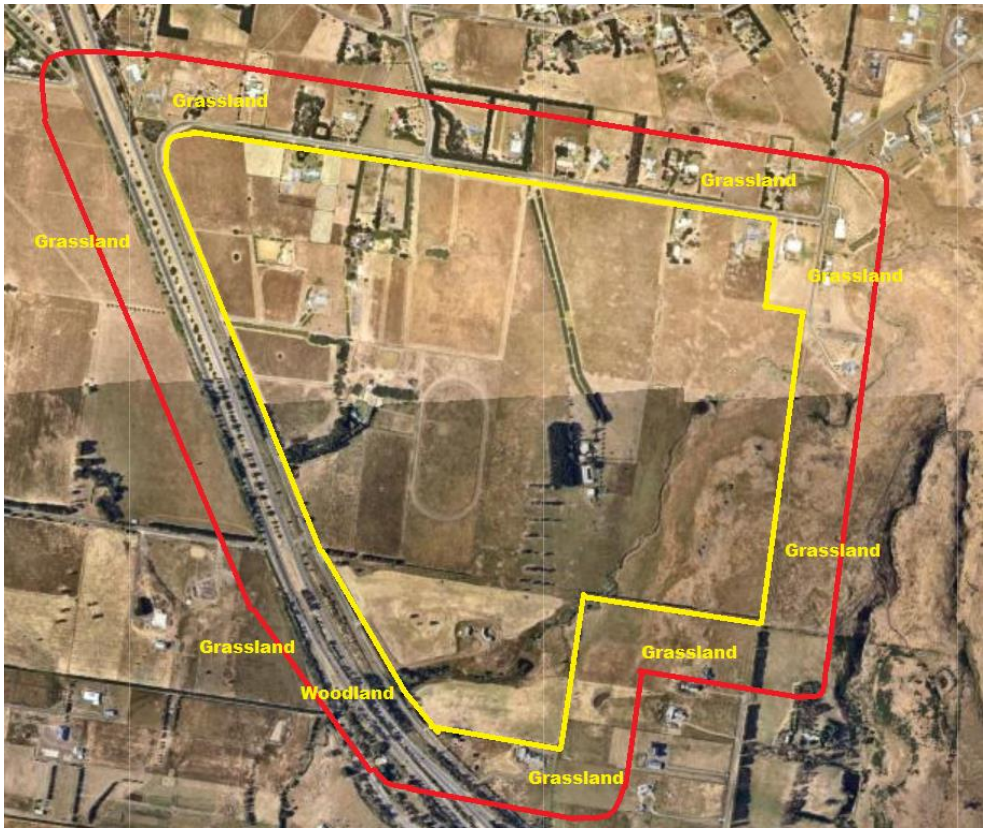

Figure 4 150 metre assessment air photo

Surrounding Landscape Photos

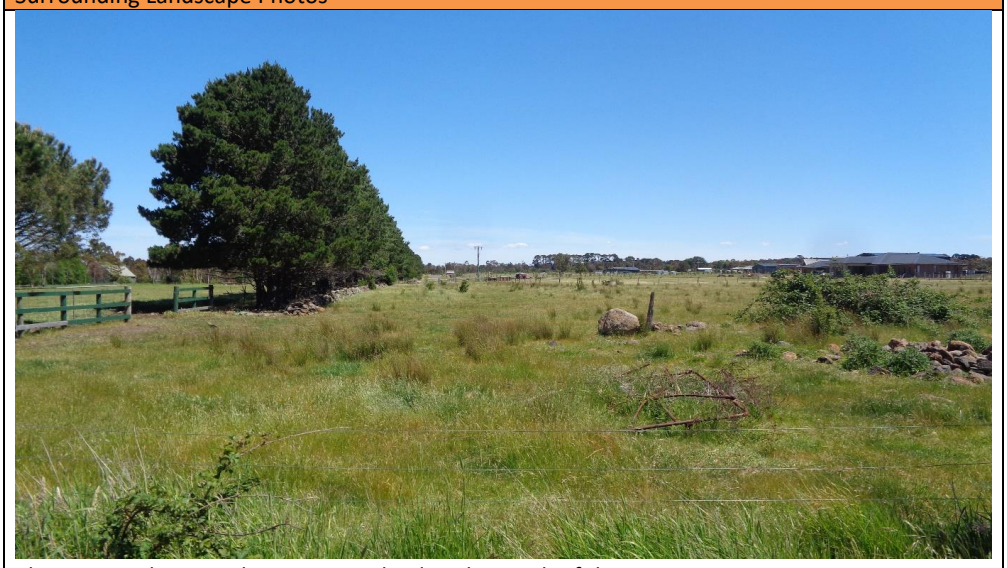

Photo 14 Looking south across grassland to the south of the site

Photo 15 Looking east across grassland to the east of the site

Surrounding Landscape Photos

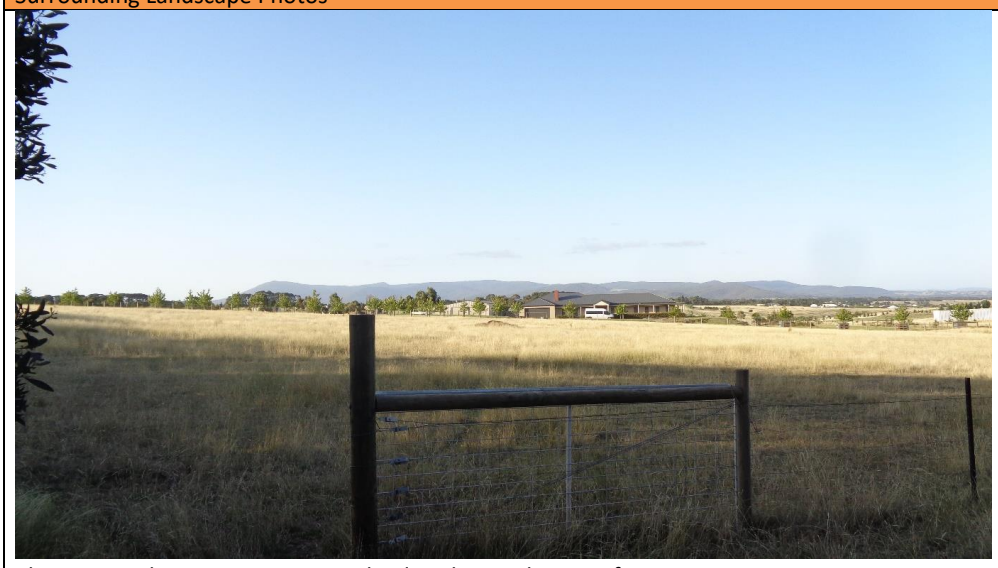

Photo 16 Looking east across grassland to the south west of site

Photo 17 Looking east across grassland and managed land towards a dwelling to the south of the site

Surrounding Landscape Photos

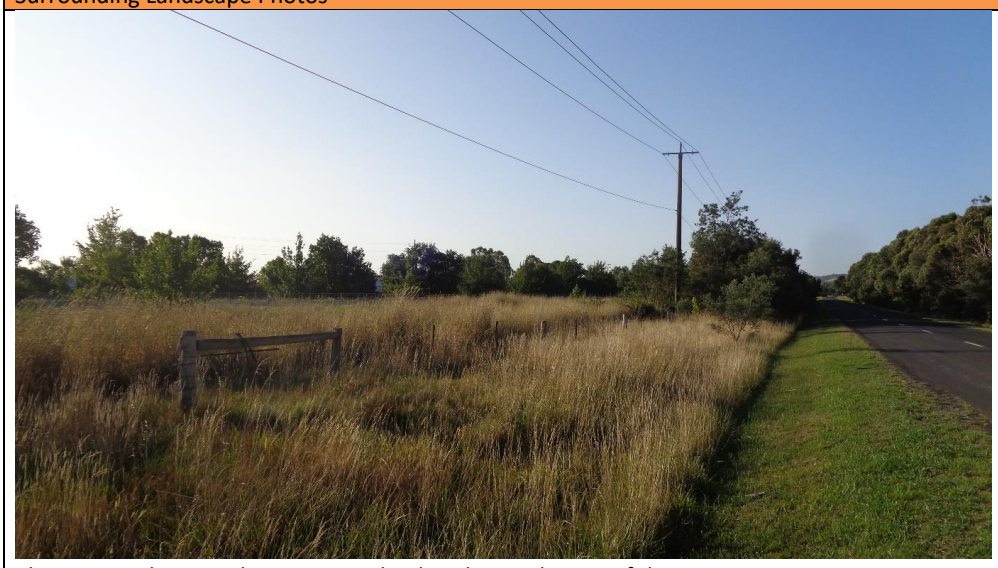

Photo 18 Looking north across grassland to the north west of the site

Photo 19 Looking south west to woodland planted along the Freeway edge to the south west of the site

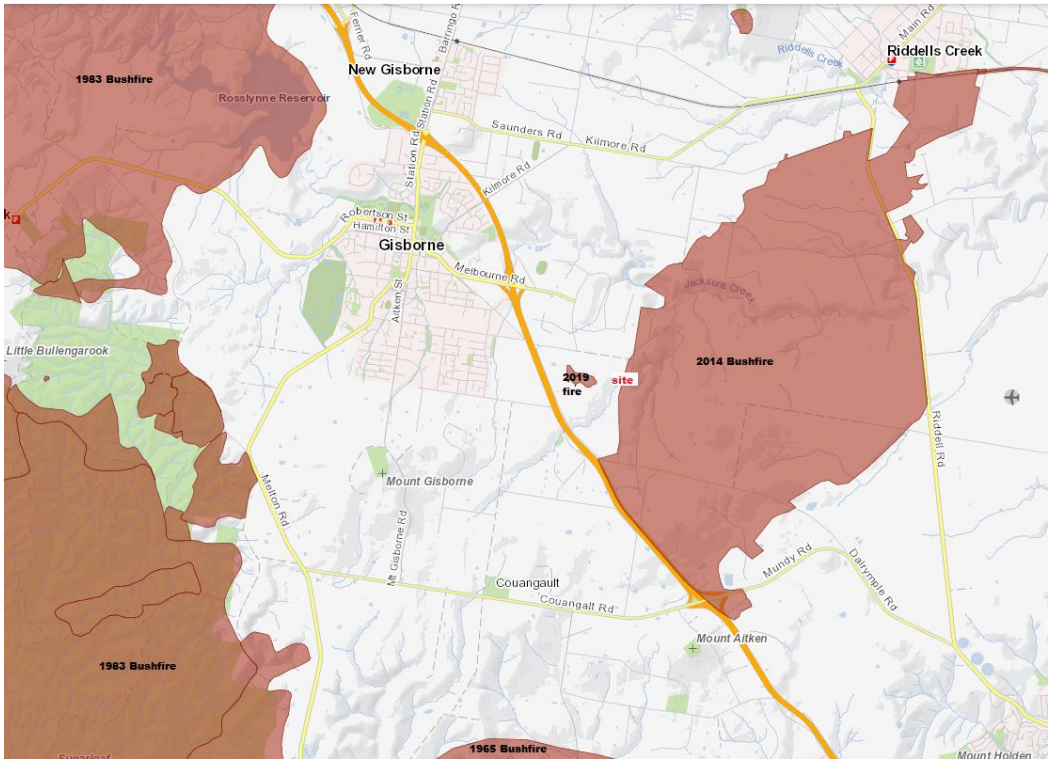

FIGURE 7 BUSHFIRE HISTORY MAP

The Fire History Map above shows there have been significant fires around the site with the 1983 Ash Wednesday Fires to the north west and a large grass fire to the south east in 2014 and a smaller fire in 2019. There have been fuel reduction burns to west and east since 2009 which will help reduce the risk to the site. There are also burns planned for forest to the north and west of the site in 2021 to 2022 (See Figure 8 on the following page)

In summary, the site is vulnerable to grassfire which could increase in intensity when reaching woodland in the drainage line to the south west. This needs to be considered in siting the houses, maximizing defendable space within property boundaries which will help reduce the fire risk.

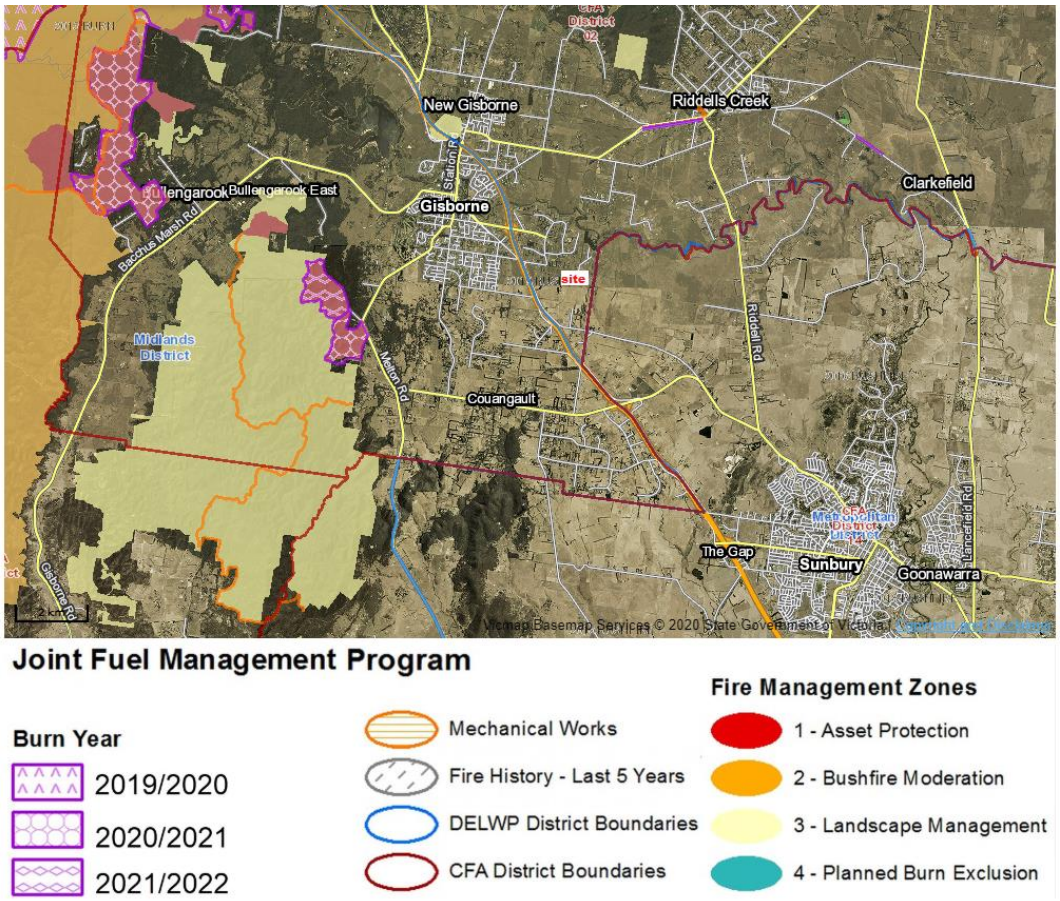

FIGURE 8 PLANNED BURNS

8 DESCRIPTION OF THE DEVELOPMENT CONCEPT

The subdivision concept plan outlines minimum 2 ha lots. While the site is not covered by the BMO, it is recommended future lots be designed to enable dwellings to achieve BAL 12.5 defendable space which should be calculated based on the hazard of grassland on a 0 to 5 degree downslope for most of the site (22 metres) . Adjacent to the drainage line it is recommended dwellings be set back up to 50 metres if there are treed areas which are likely to develop the fuel load of woodland. Non habitable outbuildings could be sited closer to the hazard providing there is 6 metres separation from the dwelling if they are smaller than 100 square metres and there is 10 metres separation if they are larger than 100 square metres. The actual building setbacks required from proposed planting should be addressed at the time of subdivision,

There are 6 separate current ownerships which will all be developed separately. For the subdivision of these lots a specific fire management plan should be proposed.

A proposed access track will provide separation between the gully and building envelopes in the north east part of the site.

The Development Plan includes a landscape concept plan (see Figure 9 on the following page) which outlines planting along the waterway and road reserves with indicative buffer planting within the site itself. The landscaping is to be detailed in the future under planning permit applications for subdivision.

It is assumed the 60 metre wide riparian planting will develop the fuel load of woodland. This could provide a pathway for a more intense fire to travel through the site. Road side and buffer plantings are narrower strips which will not burn as assumed in AS 3959 as a 100 metre wide fire front. If fine and ground fuels are managed within windbreaks, they may assist in slowing the speed and intensity of a grassfire.

The Landscape Concept Plan specifies that detailed Landscape Plans shall be prepared for each site, together with a specific Bushfire Management Statement. At this time the defendable space and set backs required shall be specified for future dwelling locations. The actual landscaping proposed, be it low groundcover or more substantial trees, will determine the defendable space required. The concept includes an access track in accordance with the Development Plan Overlay adjacent to the escarpment and connecting Coney Court with an internal road.

AS 3959-2018 (2.2.2.3) allows vegetation to be exempt from classification where it is in a strip less than 20m wide (measured perpendicular the building elevation) that is separated from other vegetation by more than 20m (including grassland) and more than 20m from the dwelling. Windbreaks are also exempt, providing they are a single row of trees. It is therefore recommended house sites be planned within the lots in the subdivision to enable at least 20m separation from any planted rows of vegetation and that strips of vegetation be generally less than 20 metres wide.

It should be noted that all dwellings will require a BAL assessment under AS 3959-2018 for the building permits as the site is designated Bushfire Prone.

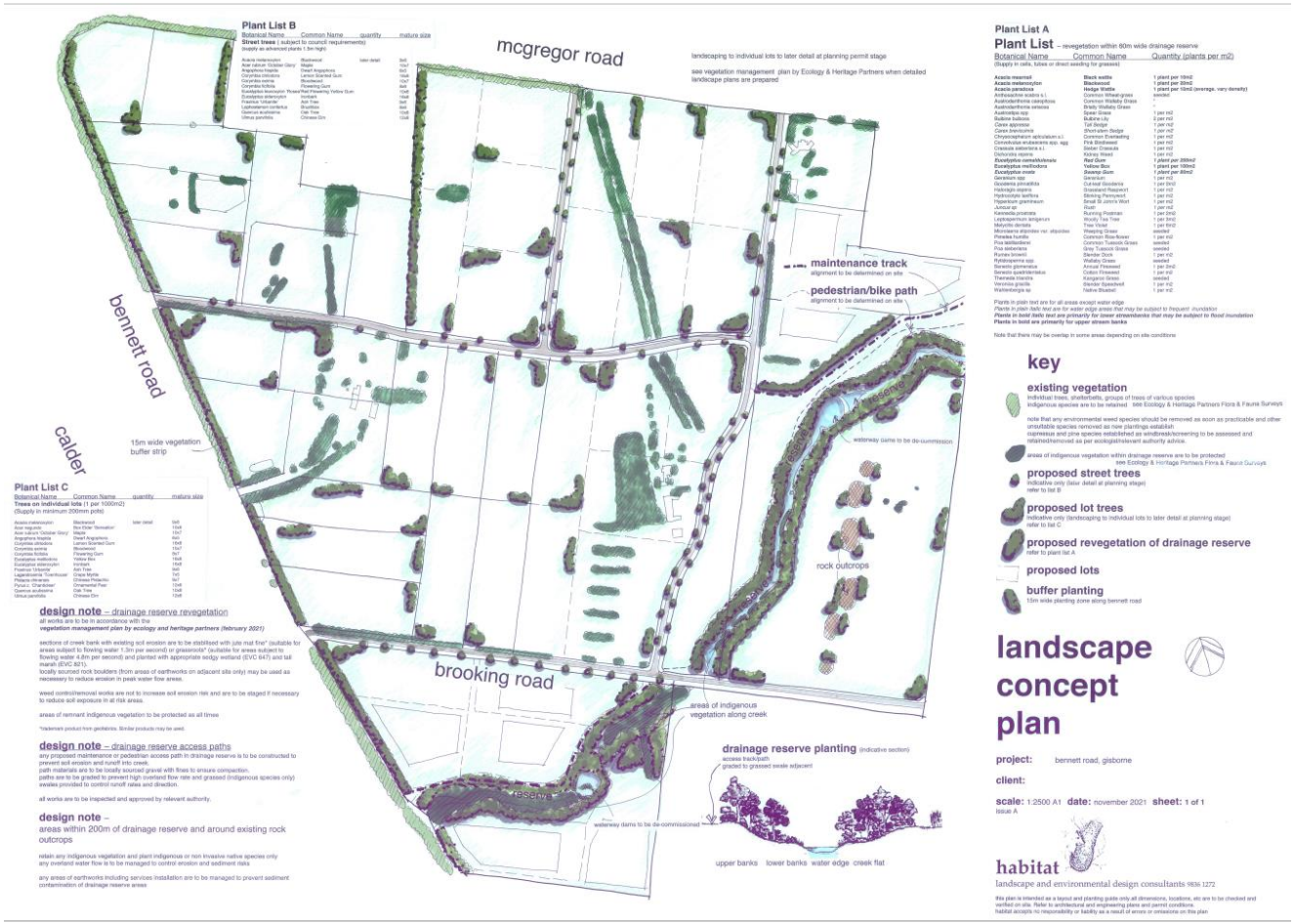

FIGURE 9 CONCEPT LANDSCAPE PLAN

Schedule of Bushfire Protection Measures

Defendable space

Defendable space will be provided extending for the distance of 22 to 50 metres or to the property boundaries from the outer edge of the dwellings and 10 metres from the edges of any non habitable outbuilding that are larger than 100 square metres. All vegetation (and other flammable materials) will be modified and managed in accordance with the following requirements:

- Grass must be short cropped and maintained during the declared fire danger period.
- All leaves and vegetation debris must be removed at regular intervals during the declared fire danger period.
- Within 10 metres of a building, flammable objects must not be located close to the vulnerable parts of the building.
- Plants greater than 10 centimetres in height must not be placed within 3m of a window or glass feature of the building.
- Shrubs must not be located under the canopy of trees.
- Individual and clumps of shrubs must not exceed 5 sq. metres in area and must be separated by at least 5 metres.
- Trees must not overhang or touch any elements of the building.
- The canopy of trees must be separated by at least 5 metres.
- There must be a clearance of at least 2 metres between the lowest tree branches and ground level.

Construction standards

Any dwellings will be designed and constructed a minimum Bushfire Attack Level of (BAL) 12.5

Water supply

A tank on each lot will hold 10 000 litres of effective water supply for fire fighting purposes which meets the following requirements:

-Is stored in an above ground water tank constructed of concrete or metal.

-All fixed above-ground water pipes and fittings required for fire fighting purposes must be made of corrosive resistant metal.

- Include a separate outlet for occupant use

The water supply must also

- Incorporate a ball or gate valve (British Standard Pipe (BSP) 65mm) and coupling (64 mm CFA 3 thread per inch male fitting).
- The outlet/s of the water tank must be within 4m of the access way and 60m of all parts of the building and be unobstructed.
- Be readily identifiable from the building or appropriate identification signage to the satisfaction of CFA must be provided.
- Any pipework and fittings must be a minimum of 65 mm (excluding the CFA coupling).

Hydrants in public roads will be provided within 120 metres of each building envelope

Access

The driveways to each dwelling and the fire access tracks will provide access for trucks for fire fighting purposes which meets the following requirements:

. A load limit of at least 15 tonnes

- Curves must have a minimum inner radius of 10m.
- The average grade must be no more than 1 in 7 (14.4 per cent) (8.1 degrees) with a maximum of no more than 1 in 5 (20 per cent) (11.3 degrees) for no more than 50m.
- Have a minimum trafficable width of 3.5m of all weather construction.
- Be clear of encroachments for at least 0.5m on each side and 4m above the access way.
- Dips must have no more than a 1 in 8 (12.5 per cent) (7.1 degrees) entry and exit angle.

9 BUSHFIRE MANAGEMENT STATEMENT

The bushfire protection measures and assessment of defendable space will form part of Bushfire Management Statements to be prepared for each site, Clause 53.02 contains a range of sub clauses with objectives, approved measures (AM), alternative measures (AltM) and decision guidelines. The table below details which clauses are relevant to this application. The following section demonstrates how the requirements have been met for the relevant standards.

Relevant clauses and measures applicable to the proposed development.

Clause	Approved Measure	Achieved / Applicable	Justification
Clause 53.02 -3 – Dwellings in existing settlements – Bushfire protection objective	AM 1.1	Not Applicable	This is a subdivision concept plan so clauses are not applicable.
	AM 1.2	Not Applicable	
	AM 1.3	Not Applicable	
Clause 53.02 -4.1 Landscape, siting and design objectives	AM 2.1	Applicable	This future development addresses this clause.
	AM 2.2	Applicable	
	AM 2.3	Applicable	
Clause 53.02 -4.2 Defendable space and construction objectives	AM 3.1	Applicable	.
	AM 3.2	Not Applicable	Applies to proposed dwellings
	AltM 3.3	Not Applicable	This is a rural living subdivision concept plan and not applicable.
	AltM 3.4	Not Applicable	
	AltM 3.5	Not Applicable	
	AltM 3.6	Not Applicable	
Clause 53.02 -4.3 Water supply and access objectives	AM 4.1	Applicable	This development shall address this clause.
	AM 4.2	Not Applicable	This is a rural living subdivision concept plan and not applicable.
Clause 53.02 -4.4 Subdivision objectives	AM 5.1	Not Applicable	The site is zoned RLZ
	AM 5.2	Applicable	This development shall address this clause.
	AM 5.3	Applicable	More than 9 lots are proposed
	AM 5.4	Applicable	Applies to the common property
	AM 5.5	Applicable	More than 9 lots are proposed

9.1.1 53.02-4.1 Landscape, siting and design objectives

Development is appropriate having regard to the nature of the bushfire risk arising from the surrounding landscape.
Development is sited to minimise the risk from bushfire.
Development is sited to provide safe access for vehicles, including emergency vehicles.
Building design minimises vulnerability to bushfire attack.

Approved Measure	Requirement
AM 2.1	**The bushfire risk to the development from the landscape beyond the site can be mitigated to an acceptable level.** **Response:** The site is located on the edge of Gisborne's rural living area .There are dwellings constructed on managed lots to the north west and west and there are large lots to the south west that support areas of managed grazed grassland . There is good access to the Calder Freeway to the west. The proposed lots shall be able to meet the defendable space requirements for a BAL 12.5 as per the Method 1 assessment of AS 3959-2009 within the property boundaries, to be addressed at the time of the subdivision applications
AM 2.2	**Buildings are sited to ensure the site best achieves the following:** **The maximum separation distance between the building and the bushfire hazard.** • **The building is in close proximity to a public road.** • **Access can be provided to the building for emergency service vehicles.** **Response:** The dwelling sites shall enable enough defendable space surrounding the dwellings to achieve BAL 12.5 defendable space . The proposed dwellings will have short driveways connecting to existing roads and the proposed roads within the development, providing adequate access. The proposed driveways will allow for CFA vehicles to access each dwelling. Additional access will be provided between lots and vegetation along the creek line.
AM 2.3	**A building is designed to be responsive to the landscape risk and reduce the impact of bushfire on the building** **Response:** The new dwellings will be required to meet a BAL of 12.5 according to the construction requirements of AS 3959-2009. The construction requirements minimise the ability for ember penetration and radiant heat exposure to compromise the building integrity.

9.1.1 53.02-4.2 Defendable space and construction objective

Defendable space and building construction mitigate the effect of flame contact, radiant heat and embers on buildings.

Approved Measure	Requirement
AM 3.1	**A building used for a dwelling (including an extension or alteration to a dwelling), a dependant person's unit, industry, office or retail premises is provided with defendable space in accordance with:** • **Column A, B or C of Table 2 to Clause 53.02-5 wholly within the title boundaries of the land; or** • **If there are significant siting constraints, Column D of Table 2 to Clause 53.02-5.** **The building is constructed to the bushfire attack level that corresponds to the defendable space provided in accordance with Table 2 to Clause 53.02-5.** **Response:** The dwelling envelopes can be sited to achieve BAL 12.5 defendable space for proposed dwellings (in accordance with Column A of Table 2 to Clause 53.02) within the property boundaries . Defendable space is based on the hazard of woodland on a 5 to 10 degree downslope (50 metres) between house sites and the creek line and grassland on a 0 – 5 degree down slope (22 metres) in all other areas. This will be specified at the time of subdivision. A shed that is larger than 100m2 and ancillary to a dwelling in the BMO needs to be surrounded by 10m defendable space (Table 7 to Clause 53.02) and be separated from any dwellings by 10 metres (Cl 44.06 and 66.03). A non habitable outbuilding that is smaller than 100m2 needs to be separated from the dwelling by 6 metres under Clause 3.2.3 of AS 3959-2018.

9.1.2 53.02-2.3 Water supply and access objectives

A static water supply is provided to assist in protecting property.
Vehicle access is designed and constructed to enhance safety in the event of a bushfire.

Approved Measure	Requirement
AM 4.1	**A building used for a dwelling (including an extension or alteration to a dwelling), a dependant person's unit, industry, office or retail premises is provided with:** • **A static water supply for fire fighting and property protection purposes specified in Table 4 to Clause 53.02-5.** • **Vehicle access that is designed and constructed as specified in Table 5 to Clause 53.02-5.** • **The water supply may be in the same tank as other water supplies provided that a separate outlet is reserved for fire fighting water supplies.** **Response:** The lots shall provide a 10 000 litre fire resistant (concrete or steel tank) to be kept full of water for fire fighting purposes for each lot. A CFA truck will be able to drive to within 4 metres of the outlets which are positioned within 60 metres of all parts of proposed dwellings. The site will be serviced via existing 150 and 100mm PVC water mains and hydrants will be provided along public roads with 120 metres of each building envelope.

53.02 -2.4 Subdivision objectives

To provide lots that are capable of being developed in accordance with the objectives of Clause 53.02 .
To specify at the subdivision stage before protection measures to develop a lot with a single dwelling on land zoned for residential or rural residential purposes.

Approved Measure	Requirement
AM 5.1	NA as the site is zoned GRZ
AM 5.2	**An application to subdivide land zoned for residential or rural residential purposes must be accompanied by a plan that shows:** **Each lot satisfies the approved measure in AM 2.1.** **A building envelope for a single dwelling on each lot that complies with AM 2.2 and provides defendable space in accordance with:** **Columns A or B of Table 2 to Clause 52.47-5 for a subdivision that creates 10 or more lots; or** **Columns A, B or C of Table 2 to Clause 52.47-5 for a subdivision that creates less than 10 lots. The bushfire attack level that corresponds to the defendable space provided in accordance with Table 2 to Clause 52.47-5 must be noted on the building envelope.** **Defendable space wholly contained within the boundaries of the proposed subdivision.** **Defendable space may be shared between lots within the subdivision. Defendable space for a lot may utilse communal areas, such as roads, where that land can meet the requirements for defendable space.** **Vegetation management requirements in accordance with Table 6 to implement and maintain the defendable space required under this approved measure.** **Water supply and vehicle access that complies with AM 4.1** **Response:** Lots can achieve minimum BAL 12.5 defendable space within the boundaries, as described under AM 3.1. Water supply and access requirements can be met, as previously described under AM 4.1.

10 CONCLUSION

53.02 -4.5 Decision guidelines
The proposed development meets the decision guidelines as follows:

The State Planning Policy Framework (SPPF) outlines the broad framework for bushfire protection policy and provisions in the planning scheme. The following policy is included in this;

Clause 13.02-1 S *Bushfire planning*
Objective
To strengthen the resilience of settlements and communities to bushfire through risk-based planning that prioritises the protection of human life.

Strategies
Protection of human life
Give priority to the protection of human life by:

Prioritising the protection of human life over all other policy considerations.

Directing population growth and development to low risk locations and ensuring the availability of, and safe access to, areas where human life can be better protected from the effects of bushfire.

Reducing the vulnerability of communities to bushfire through the consideration of bushfire risk in decision making at all stages of the planning process

This proposal has been prepared having regard for this over arching policy

The bushfire hazard landscape and site assessment, and bushfire management statement submitted with the application meets the objectives of Clause 53.02.

Land surrounding the site is a mix of woodland, scrub, grassland and modified vegetation. The proper establishment and maintenance of defendable space on site will reduce the overall bushfire risk.

The proposed measures can be practically implemented and maintained in conjunction with the ongoing use of the land for rural living purposes. The directions of this statement shall form parts of Bushfire Management Statements prepared for each of the existing lots under the Development Plan at the time of their subdivision.

11 REFERENCES

CFA (2014). *Vegetation Classes: Victorian Bushfire Management Overlay*. Country Fire Authority, Burwood East, Victoria.

CFA (2011). *Landscaping for Bushfire: Garden design and plant selection*. Country Fire Authority, Burwood East, Victoria.

CFA (2012). *FSG LUP 0002 Requirements for water supply and access in the Bushfire Management Overlay (BMO).* Country Fire Authority, Burwood East, Victoria.

Standards Australia (2009). *AS 39359-2018 Construction of Buildings in Bushfire Prone Areas.* Standards Australia, North Sydney, New South Wales.

DELWP (2017) *Planning Permit Applications – Bushfire Management Overlay Technical Guide* Department of Environment, Land, Water and Planning

DELWP (2018) *Clause 13.02-1S Bushfire planning* Department of Environment, Land, Water and Planning
http://planning-schemes.delwp.vic.gov.au/schemes/vpps/13_02-1S.pdf

DELWP (2018) *Clause 44.06 Bushfire Management Overlay* Department of Environment, Land, Water and Planning
http://planning-schemes.delwp.vic.gov.au/schemes/vpps/44_06.pdf

DELWP (2018) *Clause 53.02 Bushfire Planning* Department of Environment, Land, Water and Planning
http://planning-schemes.delwp.vic.gov.au/schemes/vpps/53_02.pdf

DELWP (2018) Bushfire Fuel and Risk Management
https://www.ffm.vic.gov.au/bushfire-fuel-and-risk-management/joint-fuel-management-program

Nearmap
http://maps.au.nearmap.com

DELWP (2017) *Outbuildings in the Bushfire Management Overlay*
https://www.planning.vic.gov.au/__data/assets/pdf_file/0020/107660/Outbuildings-in-the-Bushfire-Management-Overlay.pdf

APPENDIX 3 ACCESS AND WATER SUPPLY REQUIREMENTS

Table 4 Water supply requirements

Capacity, fittings and access

Lot sizes (square meters)	Hydrant available	Capacity (litres)	Fire authority fittings and access required
Less than 500	Not applicable	2,500	No
500-1,000	Yes	5,000	No
500-1,000	No	10,000	Yes
1,001 and above	Not applicable	10,000	Yes

Note 1: A hydrant is available if it is located within 120 metres of the rear of the building

Fire Authority requirements

Unless otherwise agreed in writing by the relavant fire authority, the water supply must:

- Be stored in an above ground water tank constructed of concrete or metal.
- Have all fixed above ground water pipes and fittings required for firefighting purposes made of corrosive resistant metal.
- Include a seperate outlet for occupant use.

Where a 10,000 litre water supply is required, fire authority fittings and access must be provided as follows:

- Be readily identifiable from the building or appropriate identification signage to the satisfaction of the relevant fire authority.
- Be located within 60 metres of the outer edge of the approved building.
- The outlet/s of the water tank must be within 4 metres of the accessway and unobstructed.
- Incorporate a separate ball or gate valve (British Standard Pipe (BSP 65 millimetre) and coupling (64 millimetre CFA 3 thread per inch male fitting).
- Any pipework and fittings must be a minimum of 65 millimetres (excluding the CFA coupling).

Table 5 Vehicle access design and construction

Vehicle access (or part thereof) of a length specified in Column A implements the design and construction requirements specified in Column B.

Column A	Column B
Length of access is less than 30 metres	There are no design and construction requirements if fire authority access to the water supply is not required under **AM4.1**.
Length of access is less than 30 metres	Where fire authority access to the water supply is required under **AM4.1** fire authority vehicles should be able to get within 4 metres of the water supply outlet.
Length of access is greater than 30 metres	The following design and construction requirements apply: ▪ All-weather construction. ▪ A load limit of at least 15 tonnes. ▪ Provide a minimum trafficable width of 3.5 metres. ▪ Be clear of encroachments for at least 0.5 metres on each side and at least 4 metres vertically. ▪ Curves must have a minimum inner radius of 10 metres. ▪ The average grade must be no more than 1 in 7 (14.4%) (8.1°) with a maximum grade of no more than 1 in 5 (20%) (11.3°) for no more than 50 metres. ▪ Dips must have no more than a 1 in 8 (12.5 per cent) (7.1 degrees) entry and exit angle.
Length of access is greater than 100 metres	A turning area for fire fighting vehicles must be provided close to the building by one of the following: ▪ A turning circle with a minimum radius of eight metres. ▪ A driveway encircling the dwelling. ▪ The provision of other vehicle turning heads – such as a T or Y head – which meet the specification of Austroad Design for an 8.8 metre Service Vehicle.
Length of access is greater than 200 metres	▪ Passing bays must be provided at least every 200 metres. ▪ Passing bays must be a minimum of 20 metres long with a minimum trafficable width of 6 metres.

Note 1: The length of access should be measured from a public road to either the building or the water supply outlet, whichever is longer.

Archaeo-Environments Pty Ltd
heritage soils and landscape

ABN 89 119 932 437

HERITAGE AND ARCHAEOLOGICAL ASSESSMENT (Aboriginal and European)

BENNETT ROAD DEVELOPMENT PLAN
GISBORNE SOUTH

Heritage Assessor
Dr Chris Day
Archaeo-Environments Pty Ltd
ABN 89 119 932 437

Rev4 5 August 2021

Prepared for Client
G2 Urban Planning
670 Mt Alexander Road
Moonee Ponds VIC 3039 AUSTRALIA

1

INTRODUCTION

Archaeo-Environments Ltd (AE Ltd) were engaged by several landowners under the Bennett Road Development Plan (BRDP) to prepare a heritage and archaeological assessment for proposed future subdivision and development at Bennett Road, Gisborne South (the subject property). It is understood that the land is subject to Macedon Ranges Planning Scheme Development Plan Overlay 18 (DPO18) and also the Rural Living Zone Schedule 2 under the recent C110 Planning Scheme Amendment. A Development Plan is required for the property and will provide an overview document for a future planning permit application. We understand the subject property occupies an area of approx. 130ha to the south-east of Gisborne township (Fig 1 and 2).

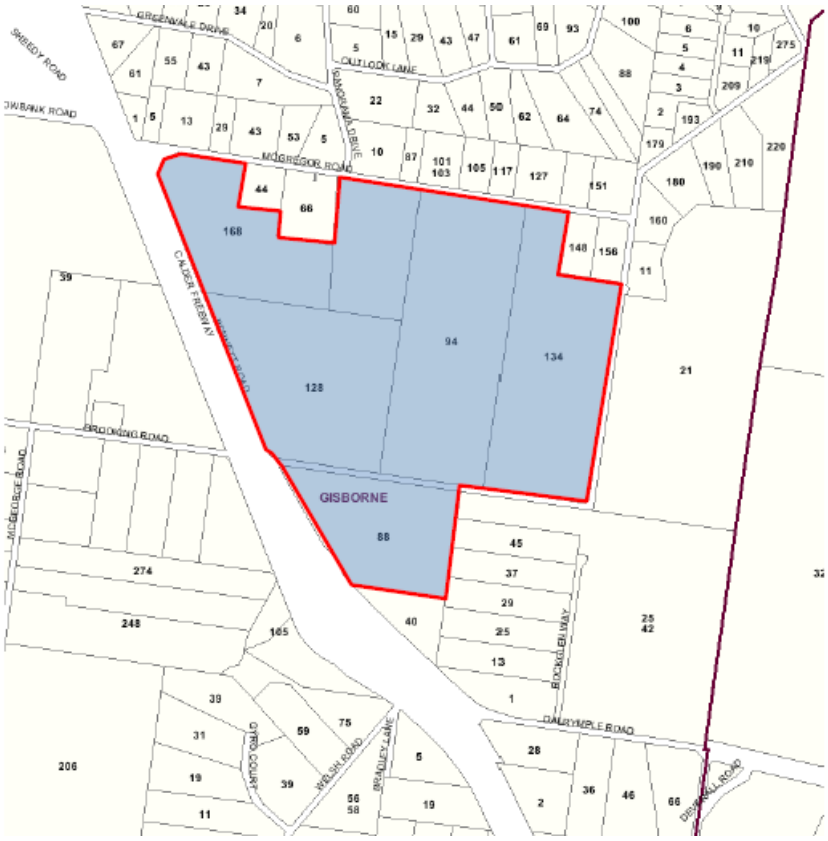

Fig 1 Location of the development area at Bennett Road, Gisborne South.

The heritage and archaeological assessment is undertaken as an overview document for a future Planning Permit Application to the Macedon Ranges Shire. The purpose of the assessment is to determine future requirements, notably protection of European heritage and/or a Cultural Heritage Management Plan (CHMP) is mandatory in accordance with the requirements of the *Victorian Heritage Act* (2007) or the *Aboriginal Heritage Act 2006* and the *Aboriginal Heritage Regulations 2007* (hereafter referred to as 'the Act' and 'the Regulations'). The BRDP area is within the boundary of the Wurundjeri Tribe Land Council and Compensation Registered Aboriginal Party (RAP) area.

The assessment consists of :

* a summary of obligations under the *Aboriginal Heritage Act* 2006 and the *Aboriginal Heritage Regulations 2018* and a definition and assessment guidelines for significant ground disturbance (SGD).
* An assessment of geological, archaeological and historic information, including :
  -a search of the Aboriginal heritage mapping via Government sources to identify whether any Aboriginal places or sites have been recorded on or near the subject property;
* An assessment of the Victorian Heritage Register and Victorian Heritage Inventory
  -a review of historical and current aerial photographs to determine the level of prior ground disturbance and landscape modification that has occurred within the subject property, and;
  - a site inspection to observe potential heritage features, ground conditions and in particular evidence of ground disturbance.
* a summary of the recommendations of the above, notably whether an Aboriginal CHMP is mandatory for the planned development.

Fig 2 Aerial map of the subject property at Bennett Road, Gisborne South.

1.0 STATUTORY OVERVIEW AND REQUIREMENTS

A review of the Aboriginal Heritage Act and Regulations provides a statutory framework for the purpose of determining whether a CHMP is mandatory for the BRDP.

1.1 Regulations

It is noted that a review of the Aboriginal Heritage Regulations effective May 23 1, 2018 produced some amendments relevant to CHMPs and compliance. Those amendments included the following :

- A removal of a mandatory CHMP for small lot sub-divisions (<1100m^2) in most situations.
- A process for amendment of CHMPs
- An increase of fees and penalties for non-compliance
- Introduction of a Preliminary Aboriginal Heritage Test (PAHT) to determine whether a CHMP is mandatory. A PAHT is a tool in the form of a heritage assessment, prepared in standard format and evaluated by Aboriginal Victoria (AV). The purpose of the PAHT is not to replace a heritage due diligence assessment, but to provide Councils/sponsors with a formal process via Aboriginal

Victoria (AV) for whether a CHMP was mandatory or not. Discussion with AV confirmed that a PAHT was not to be used automatically if a Council or sponsor is otherwise equipped to make a CHMP decision according to their statutory decision-making role. In the case of the current development a PAHT was deemed not necessary.

1.2 Is a CHMP mandatory at Bennett Road Gisborne South?

Under the AHR (2007), a CHMP is required if a development is considered to be a **high impact activity** and is located within an area of **cultural heritage sensitivity**.

1.2.1 Is the activity a high impact activity ?

A High Impact Activity

It is our opinion that future subdivision and development of the subject property could be interpreted to be a high impact activity according to Section 46 (AHR 2007) Subdivision of land

46 Subdivision of land

(1) The subdivision of land into three or more lots is a high impact activity if –

(a) The planning scheme that applies to the activity area in which the land to be subdivided is located provides that at least three of the lots may be used for a dwelling or may be used for a dwelling subject to the grant of a permit: and

(b) The area of each of at least three of the lots is less than 8ha

It is emphasised that the current assessment and Development Plan is not part of any permit or statutory authorization and therefore a CHMP is not triggered at this stage.

1.2.2 Does the activity lie within an area of cultural heritage sensitivity (CHS) ?

Regulation 26 Areas of Cultural Heritage Sensitivity : Waterways states:

(1) Subject to sub regulation (2), a waterway or land within 200 metres of a waterway is an area of cultural heritage sensitivity
(2) If part of a waterway or part of the land within 200m of a waterway has been subject to significant ground disturbance, that part is not an area of cultural heritage sensitivity.

The subject property lies within Djirri Djirri Creek – a tributary of Jacksons Creek and mapped area of CHS – which extends across the south-west part of the property (Figure 3 and Plate 1).

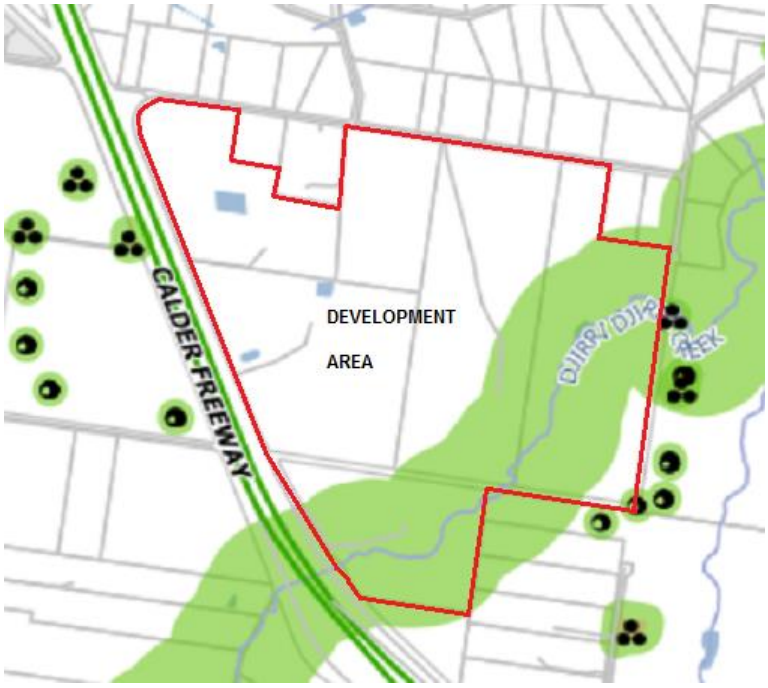

Fig 3 Map showing location of Djirri Djirri Creek and 200m buffer (area of cultural heritage sensitivity).as well as surrounding artefact scatters located during recent CHMP surveys

Plate 1 View to south along Djirri Djirri Creek within the eastern part of the development area.

1.2.3 Is the development exempt from a CHMP on the basis of significant ground disturbance ?

Under Regulation 22 (3), the proposed activity would not require a CHMP if the *'area of cultural sensitivity'* has been subject to prior *'significant ground disturbance'*. Significant ground disturbance is defined in the Regulations as follows:

'Disturbance of –
(a) the topsoil or surface rock layer of the ground, or
(b) waterway by machinery in the course of digging, dredging, or deep ripping, but does not include ploughing other than deep ripping'.

1.2.4 Assessing Significant Ground Disturbance

Aboriginal Victoria (AV) has produced a Practice Note for Significant Ground Disturbance Practice Note which is available on their website and which supports a staged approach as follows :

Level 1 – Common knowledge

The fact that land has been subject to significant ground disturbance may be common knowledge. Very little or no additional information should be required from the responsible authority. For example, common knowledge about the redevelopment of a petrol station with extensive underground storage tanks.

Level 2 – Publicly available records

If the existence of significant ground disturbance is not common knowledge, a responsible authority may be able to provide assistance from its own records about prior development and use of land, or advise the applicant about other publicly available records, including aerial photographs.

These documents may allow a reasonable inference to be made that the land has been subject to significant ground disturbance. In such event, no further inquiries or information would be needed by the responsible authority. The particular records and facts relied upon should be noted by the responsible authority as a matter of record. For example, a former quarry site subsequently filled, but where the public records show the area of past excavation.

Level 3 – Further information

If 'common knowledge' or 'publicly available records' do not provide sufficient information about the occurrence of significant ground disturbance, the applicant may need to present further evidence either voluntarily or following a formal request from the responsible authority. Further evidence could consist of land use history documents, old maps or photographs of the land or statements by former landowners or occupiers. Statements should be provided by statutory declaration or similar means; for example, the construction of a former dam on a farm.

Level 4 – Expert advice or opinion

If these levels of inquiry do not provide sufficient evidence of significant ground disturbance (or as an alternative to level 3), the applicant may submit or be asked to submit a professional report with expert advice or opinion from a person with appropriate skills and experience. Depending on the circumstances, this may involve a site inspection and/or a review of primary documents. If there is sufficient uncertainty some preliminary sub-surface excavation or geotechnical investigation may be warranted.

2.0 ASSESSMENT

The BRDP area lies within an area of CHS, however an assessment is necessary to determine whether the area of CHS has been subject to significant ground disturbance. For this purpose we undertook a review of historical information, historic maps and aerial photographs to identify evidence of landscape modification and ground disturbance. A site visit was also undertaken to document site condition and evidence of ground disturbance. The various levels of evidence for significant ground disturbance above are addressed in turn below.

2.1 Historical setting

Accounts and maps of settlement and historic pastoral use would constitute Level 1 (common knowledge) and Level 2 (publically available information) evidence for significant ground disturbance. On this basis it appears unlikely that Djirri Djirri Creek - the area of CHS - has been subject to SGD.

2.2 Review of Aerial Photography

An aerial image from 2019 shows Djirri Djirri Creek - the area of cultural heritage sensitivity which overlaps with the BRDP area (Fig 4). There does not appear to be evidence of significant ground disturbance from aerial imagery.

Fig 4 Aerial photo (2019) showing the course of Djirri Djirri Creek and surrounds across the eastern part of the BRDP area.

2.3 Site Inspection

A site inspection of the subject property was conducted by Dr Chris Day (AE Ltd Cultural Heritage Advisor) on the 17th May 2018. The purpose of the inspection was to observe site conditions, notably evidence of past land use and ground disturbance. No Aboriginal artefacts or sites were identified during the inspection.

The Djirri Djirri Creek and surrounds within the development area features a gentle valley with areas of bedrock outcrop. Apart from implied original tree clearance and presence of several dams, the subject area did not show evidence of disturbance in the form of significant earthworks or deep ripping. Evidence from

a site inspection would constitute Level 4 (Expert advice/opinion and site inspection) evidence for significant ground disturbance.

3.0 ABORIGINAL CULTURAL HERITAGE POTENTIAL

A review of ACHRIS, the registry of Aboriginal cultural heritage held by Aboriginal Victoria indicates that several CHMP studies have been prepared in the area surrounding the development area in the past 18 months. These include CHMP 15832 approved in Nov 2019 west of the Calder Freeway and a CHMP to the immediate east which is currently in progress. Aboriginal cultural heritage in the form of stone artefact scatters have been recorded during these surveys (Fig 3) and indicate that the development area would have potential for Aboriginal heritage.

4.0 SUMMARY AND CONCLUSIONS

Level 1 Common Knowledge

A review of regional land use history indicates that the subject property was part of early 19C agricultural development. The area of CHS (Djirri Djirri Creek) extends across the eastern part of the development area and – apart from several dams – is not expected to have been subject to disturbance which might be common knowledge.

Level 2 Publicly Available Records and Level 3 Additional information

In addition to published maps and reports about 19C farming activity, there is insufficient local evidence to imply significant ground disturbance across the area of CHS. The landscape shown in Plate 1 shows that the area surrounding Djirri Djirri Creek has been dammed in some areas but is for the most part under pastoral use without evidence of SGD.

Level 4 Expert Opinion/Site Inspection & subsurface investigation

Site inspection of Djirri Djirri Creek and surrounds indicated presence of several dams but overall negligible evidence of SGD.

5.0 FUTURE MANAGEMENT

The Djirri Djirri Creek is the area of highest Aboriginal cultural heritage potential within the Development area. Regional predictive models have established that Aboriginal sites generally have a focus on waterways with lesser frequency > 200m from these features. Djirri Djirri Creek will not be subject to residential development.

The 2ha lot size under the current Development Plan will mitigate against high risk of impact to Aboriginal cultural heritage, certainly compared with smaller lot subdivision. In other words the relatively small development footprint (dwelling, outbuildings, driveway etc) will allow for a large proportion of the lot to remain undisturbed. The large lot sizes when compared to a standard intensive residential subdivision such as to the west side of the Calder Freeway allow considerable capacity for potential sensitive sites to be avoided.

The upgrade of the Development Area as a landscape resource will require compliance with the Aboriginal Heritage Act (2006) and Aboriginal Heritage Regulations (2018) and will include preparation of a Cultural Heritage Management Plan (CHMP) - desktop and field assessment of Aboriginal archaeological potential - across required development parcels.

As a guide to future works, the Djirri Djirri Creek is an area of mapped Aboriginal Cultural Heritage sensitivity and under current legislation, a Cultural Heritage Management Plan (CHMP) will be mandatory for lots at 88 Bennett Road and 94 and 134 McGregor Road. It is expected that any CHMP would follow standard practice in accord with AHR (2018) and include a desktop review, field walkover and test pit excavation work where necessary. Fieldwork would be focused on areas of identified Aboriginal cultural heritage potential and likely areas of impact. The results of the CHMP(s) will inform future management of any identified Aboriginal sites and might include areas of set aside or managed open space.

Preliminary discussion with the local Registered Aboriginal Party (Wurundjeri and Woi Wurrung Cultural Heritage Aboriginal Corporation) in July 2021 advised of the Development Plan and future subdivision, Liaison with the RAP group will be included as part of any future CHMP process.

The future subdivision lot development of the area is directed away from the area of prime potential sensitivity, being the waterway with areas away from the water way having lesser potential for artefact presence. An aim will be to retain the current form of this area, with low impact paths and additional scattered vegetation. A detailed assessment will not be required for those parts of the reserve that are not altered. Assessment will be require around reinstated dams.

A CHMP will be undertaken for the affected areas prior to subdivision permit applications being formalised.

6.0 EUROPEAN HERITAGE ASSESSMENT

An inspection of the Victorian Heritage Register or Victorian Heritage Inventory indicated that there are no registered heritage sites or features within the BRDP. A preliminary field survey (17 May 2018) did not observe features of potential European heritage value. On this basis the potential for European heritage potential across the BRDP is expected to be low.

7.0 RECOMMENDATIONS

1. It is our opinion that there is no evidence of significant ground disturbance within the areas of CHS (Djirri Djirri Creek) which overlaps with the eastern part of the BRDP area – according to level 1, 2, 3 and 4 criteria of AV guidelines (Section 1.2.4). On this basis and with reference to Reg 26 (2) of the AHR (2018) (1) *If part of a waterway or part of the land within 200m of a waterway has been subject to significant ground disturbance, that part is not an area of cultural heritage sensitivity*. It is our opinion that an Aboriginal Cultural Heritage Management Plan will be mandatory for the proposed activity.

2 It is our opinion – on the basis of a review of recent CHMP studies from the surrounding region – that the Djirri Djirri Creek area would have some potential for Aboriginal Cultural Heritage.

3 A CHMP is not mandatory under the Development Plan process as this stage does not propose development itself. A CHMP will be mandatory under a permit application for subdivision which is a CHMP trigger according to AHR (2018) (discussed in Section 1.2.1).

4. Aboriginal cultural heritage is provided with blanket protection in Victoria under the Aboriginal Heritage Act 2006. If any Aboriginal artefacts or sites are found during development works or at any other time, excavation must cease immediately and the local RAP (WLCCHC) should be notified for advice before work can re-commence.

5. There are no registered European heritage sites or features within the BRDP. A preliminary field survey (17 May 2018) did not observe features of potential European heritage value. The Victorian Heritage Act

(2007) provides protection for sites of heritage value and a process of management or consent should sites or features be found during development works.

Author

Dr. Chris Day
Director
Archaeo-Environments Ltd
Registered Heritage Advisor (Victoria).
2 Chaucer Street
Box Hill South VIC 3128

PROFILE

Dr Chris Day Director, Archaeo-Environments Ltd
MIFA
Honorary Research Associate (Latrobe University)
Cultural Heritage Advisor (Victoria)

PROFESSIONAL HISTORY

2014 – present Director, Archaeo-Environments Pty Ltd - a heritage soils and landscape consultancy. Chris brings to the position over 30 years of experience in archaeology, geo-archaeological research and natural resource management.

2007 - 2014 Principal Archaeologist, Golder Associates – Management of a cultural heritage team at Golder Associates which included Aboriginal and European heritage work throughout Australia and management of large-scale EIA cultural and heritage impact assessments throughout Hong Kong, S Pacific and SE Asia.

Chris has prepared over 70 Aboriginal Cultural Heritage Management Plans, impact assessments and due diligence surveys in Australia including indigenous heritage consultation and survey work on both brown and greenfield sites throughout Victoria. Chris has also supervised indigenous heritage surveys and impact assessments on large energy projects in South Australia and Victoria and a heritage management plan for Hyde Park, WA. In addition Chris has overseas cultural heritage experience (field survey and community consultation) of large EIA projects in Hong Kong as well as mine feasibility assessments in Tibet, Philippines, Fiji and PNG.

Bennett Road Precinct Development Plan

Ver	Revision Description	Date
23	Minor Amendments	22/09/2021
22	Addressed Council Feedback	25/06/2021
21	Minor Amendments	29/07/2020
20	Addressed Council Feedback	21/07/2020
19	Amended Notations	21/02/2020
18	Amended Notations and Layout	13/12/2019
17	Amended Drainage Line Details	25/10/2019

Drafted J.Sens Sep 2021 | Checked P.Bowe Sep 2021 | Approved

Notes/Legend

TERRACO Civil Engineers Project Managers Development Consultants

Terraco P/L
ABN 12 681 695 776
9 Jewell Court
East Bendigo, Vic 3550
Ph: 03 5442 5799
Fax: 03 5441 5506
E: info@terraco.com.au
Web: www.terraco.com.au

Scale (m) NTS
All lengths are in metres and all levels are to Australian Height Datum (Original Sheet Size is A3)

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Macedon Ranges Shire Council - Gisborne
Bennett Road Precinct

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McGregor Road
168 Bennett Rd
16.61ha
15 McGregor Rd
11.11ha
94 McGregor Rd
31.88ha
128 Bennett Rd
25.77ha
134 McGregor Rd
31.77ha
88 Bennett Rd
16.25ha
Bennett Road
Calder Freeway
Brooking Road (Unmade)
Government Road (Unmade)
Government Road (Unmade)
Coney Court
Rockglen Way
Dalrymple Road
N
LEGEND
-Trees within road reserve
-Dwelling
-Outbuilding
-Dam
-Drainage line
NOTES
* Contours shown represent approximate existing surface.
* Contour interval 1m.
* Drainage line only flows during periods of heavy rainfall.
* Total Area = 132.62 hectares.
* Original sheet size is A1.
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Bennett Road Precinct: Site Context
23 Minor Amendments 22/09/2021
22 Addressed Council Feedback 25/06/2021
21 Minor Amendments 29/07/2020
20 Addressed Council Feedback 21/07/2020
19 Amended Notations 21/02/2020
18 Amended Notations and Layout 13/12/2019
17 Amended Drainage Line Details 25/10/2019
Ver Revision Description Date
Drafted J.Sens Sep 2021
Checked P.Bowe Sep 2021
Approved
Notes/Legend
TERRACO
Civil Engineers
Project Managers
Development Consultants
Terraco P/L
ABN 12 681 695 776
9 Jewell Court
East Bendigo, Vic 3550
Ph: 03 5442 5799
Fax: 03 5441 5506
E: info@terraco.com.au
Web: www.terraco.com.au
Scale (m) 1:4000 0 40 80
All lengths are in metres
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(Original Sheet Size is A3)
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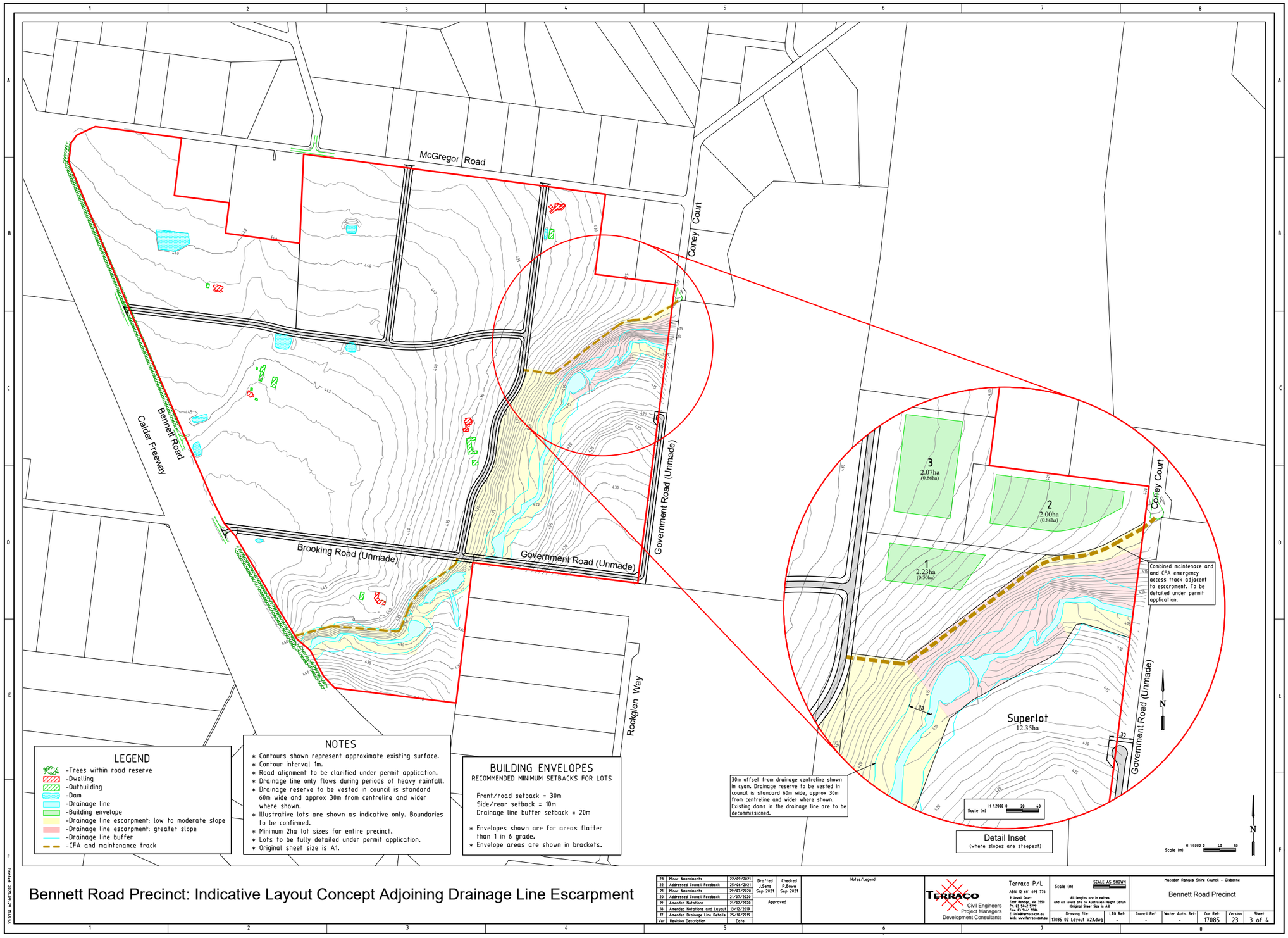
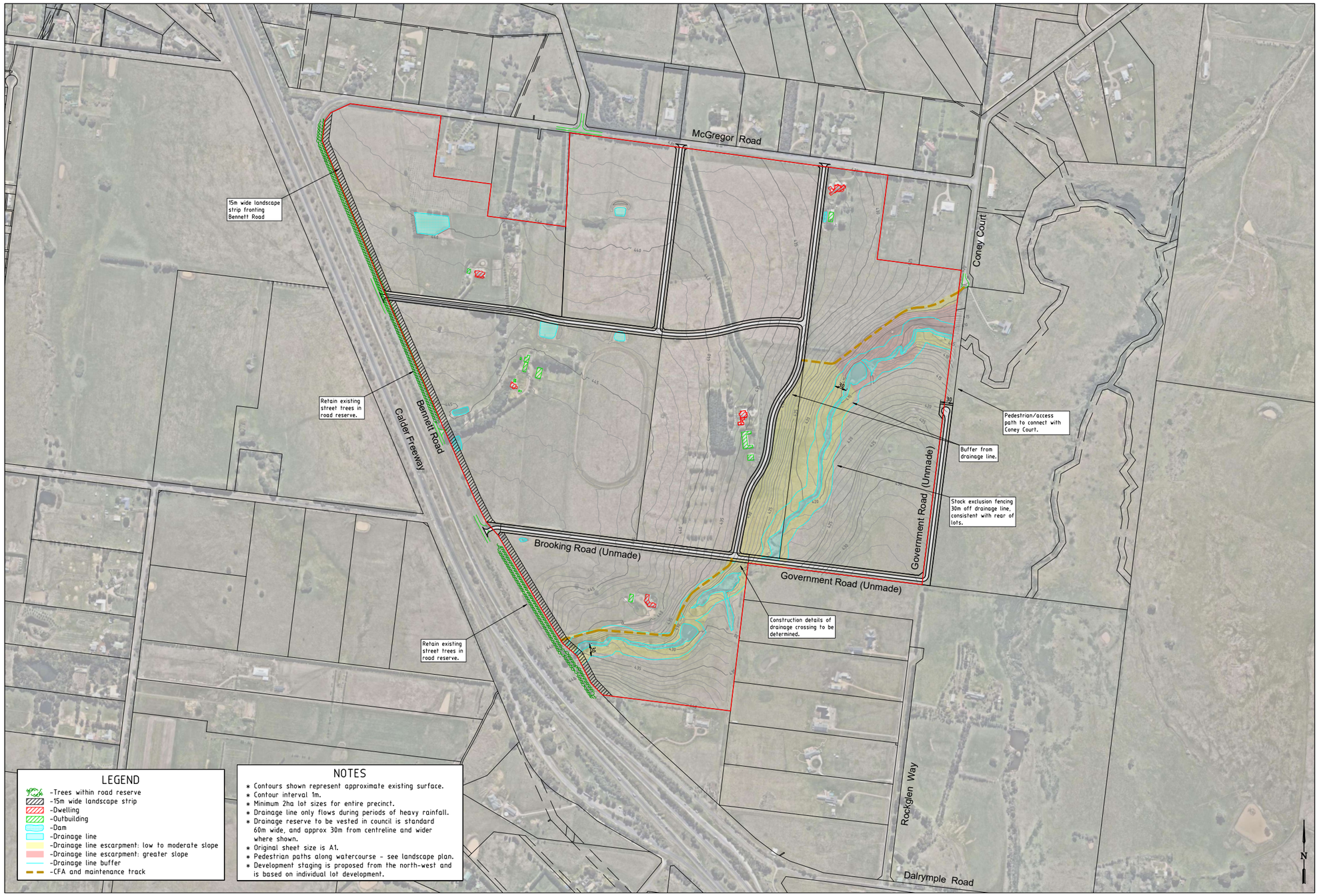
LTO Ref: -
Macedon Ranges Shire Council - Gisborne
Bennett Road Precinct
Council Ref: -
Water Auth. Ref: -
Our Ref: 17085
Version 23
Sheet 2 of 4


McGregor Road
Coney Court
Bennett Road
Calder Freeway
Brooking Road (Unmade)
Government Road (Unmade)
Government Road (Unmade)
Rockglen Way
3
2.07ha
(0.86ha)
2
2.00ha
(0.86ha)
1
2.23ha
(0.50ha)
Superlot
12.35ha
Combined maintenance and and CFA emergency access track adjacent to escarpment. To be detailed under permit application.
30m offset from drainage centreline shown in cyan. Drainage reserve to be vested in council is standard 60m wide, approx 30m from centreline and wider where shown. Existing dams in the drainage line are to be decommissioned.
Detail Inset
(where slopes are steepest)
LEGEND
-Trees within road reserve
-Dwelling
-Outbuilding
-Dam
-Drainage line
-Building envelope
-Drainage line escarpment: low to moderate slope
-Drainage line escarpment: greater slope
-Drainage line buffer
-CFA and maintenance track
NOTES
* Contours shown represent approximate existing surface.
* Contour interval 1m.
* Road alignment to be clarified under permit application.
* Drainage line only flows during periods of heavy rainfall.
* Drainage reserve to be vested in council is standard 60m wide and approx 30m from centreline and wider where shown.
* Illustrative lots are shown as indicative only. Boundaries to be confirmed.
* Minimum 2ha lot sizes for entire precinct.
* Lots to be fully detailed under permit application.
* Original sheet size is A1.
BUILDING ENVELOPES
RECOMMENDED MINIMUM SETBACKS FOR LOTS
Front/road setback = 30m
Side/rear setback = 10m
Drainage line buffer setback = 20m
* Envelopes shown are for areas flatter than 1 in 6 grade.
* Envelope areas are shown in brackets.
Bennett Road Precinct: Indicative Layout Concept Adjoining Drainage Line Escarpment
Terraco P/L
Civil Engineers
Project Managers
Development Consultants
Macedon Ranges Shire Council - Gisborne
Bennett Road Precinct
17085
23
3 of 4



Bennett Road Precinct: Development Plan - Roads

Ver	Revision Description	Date	Drafted	Checked
23	Minor Amendments	22/09/2021	J.Sens Sep 2021	P.Bove Sep 2021
22	Addressed Council Feedback	25/06/2021	Approved	
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TERRACO Civil Engineers Project Managers Development Consultants

Terraco P/L
ABN 12 681 695 776
9 Jewell Court
East Bendigo, Vic 3550
Ph 03 5441 5086
Fax 03 5441 5086
E: info@terraco.com.au
Web: www.terraco.com.au

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Macedon Ranges Shire Council - Gisborne
Bennett Road Precinct

Council Ref.	Water Auth. Ref.	Our Ref.	Version	Sheet
-	-	17085	23	4 of 4

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Plant List B

Botanical Name	Common Name	quantity	mature size
Street trees (subject to council requirements) (supply as advanced plants 1.5m high)			
Acacia melanoxylon	Blackwood	later detail	9x6
Acer rubrum 'October Glory'	Maple		10x7
Angophora hispida	Dwarf Angophora		6x5
Corymbia citriodora	Lemon Scented Gum		16x8
Corymbia eximia	Bloodwood		10x7
Corymbia ficifolia	Flowering Gum		8x6
Eucalyptus leucoxylon 'Rosea'	Red Flowering Yellow Gum		10x6
Eucalyptus sideroxylon	Ironbark		16x8
Fraxinus 'Urbanite'	Ash Tree		9x6
Lophostemon confertus	Brushbox		8x6
Quercus acutissima	Oak Tree		10x8
Ulmus parvifolia	Chinese Elm		12x8

Plant List C

Botanical Name	Common Name	quantity	mature size
Trees on individual lots (1 per 1000m2) (Supply in minimum 200mm pots)			
Acacia melanoxylon	Blackwood	later detail	9x8
Acer negundo	Box Elder 'Sensation'		10x8
Acer rubrum 'October Glory'	Maple		10x7
Angophora hispida	Dwarf Angophora		6x5
Corymbia citriodora	Lemon Scented Gum		16x8
Corymbia eximia	Bloodwood		10x7
Corymbia ficifolia	Flowering Gum		8x7
Eucalyptus melliodora	Yellow Box		16x8
Eucalyptus sideroxylon	Ironbark		16x8
Fraxinus 'Urbanite'	Ash Tree		9x6
Lagerstroemia 'Townhouse'	Crepe Myrtle		7x5
Pistacia chinensis	Chinese Pistachio		9x7
Pyrus c. 'Chanticleer'	Ornamental Pear		12x6
Quercus acutissima	Oak Tree		10x8
Ulmus parvifolia	Chinese Elm		12x8

design note – drainage reserve revegetation

all works are to be in accordance with the
vegetation management plan by ecology and heritage partners (february 2021)

sections of creek bank with existing soil erosion are to be stabilised with jute mat fine* (suitable for areas subject to flowing water 1.3m per second) or grassroots* (suitable for areas subject to flowing water 4.8m per second) and planted with appropriate sedgy wetland (EVC 647) and tall marsh (EVC 821).
locally sourced rock boulders (from areas of earthworks on adjacent site only) may be used as necessary to reduce erosion in peak water flow areas.

weed control/removal works are not to increase soil erosion risk and are to be staged if necessary to reduce soil exposure in at risk areas.

areas of remnant indigenous vegetation to be protected as all times

*trademark product from geofabrics. Similar products may be used.

design note – drainage reserve access paths

any proposed maintenance or pedestrian access path in drainage reserve is to be constructed to prevent soil erosion and runoff into creek.
path materials are to be locally sourced gravel with fines to ensure compaction.
paths are to be graded to prevent high overland flow rate and grassed (indigenous species only) swales provided to control rainfall rates and direction.

all works are to be inspected and approved by relevant authority.

design note –

areas within 200m of drainage reserve and around existing rock outcrops

retain any indigenous vegetation and plant indigenous or non invasive native species only
any overland water flow is to be managed to control erosion and sediment risks

any areas of earthworks including services installation are to be managed to prevent sediment contamination of drainage reserve areas

Plant List A

Plant List – revegetation within 60m wide drainage reserve

Botanical Name	Common Name	Quantity (plants per m2)
(Supply in cells, tubes or direct seeding for grasses)		
Acacia mearnsii	**Black wattle**	**1 plant per 10m2**
Acacia melanoxylon	**Blackwood**	**1 plant per 20m2**
Acacia paradoxa	**Hedge Wattle**	**1 plant per 10m2 (average. vary density)**
Arthrosachne scabra s.l.	Common Wheat-grass	seeded
Austrodanthonia caespitosa	Common Wallaby Grass	"
Austrodanthonia setacea	Bristly Wallaby Grass	"
Austrostipa spp	Spear Grass	1 per m2
Bulbine bulbosa	Bulbine Lily	2 per m2
Carex appressa	*Tall Sedge*	*1 per m2*
Carex breviculmis	*Short-stem Sedge*	*1 per m2*
Chrysocephalum apiculatum s.l.	Common Everlasting	1 per m2
Convolvulus erubescens spp. agg	Pink Bindiweed	1 per m2
Crassula sieberiana s.l.	Sieber Crassula	1 per m2
Dichondra repens	Kidney Weed	1 per m2
Eucalyptus camaldulensis	***Red Gum***	***1 plant per 200m2***
Eucalyptus melliodora	**Yellow Box**	**1 plant per 100m2**
Eucalyptus ovata	***Swamp Gum***	***1 plant per 80m2***
Geranium spp	Geranium	1 per m2
Goodenia pinnatifida	Cut-leaf Goodenia	1 per 2m2
Haloragis aspera	Grassland Raspwort	1 per m2
Hydrocotyle laxiflora	Stinking Pennywort	1 per m2
Hypericum gramineum	Small St John's Wort	1 per m2
Juncus sp	*Rush*	*1 per m2*
Kennedia prostrata	Running Postman	1 per 2m2
Leptospermum lanigerum	Woolly Tea Tree	1 per 3m2
Melyotis dentata	Tree Violet	1 per 6m2
Microlaena stipoides var. stipoides	Weeping Grass	seeded
Pimelea humilis	Common Rice-flower	1 per m2
Poa labilliardierei	Common Tussock Grass	seeded
Poa sieberiana	Grey Tussock Grass	seeded
Rumex brownii	Slender Dock	1 per m2
Rytidosperma spp.	Wallaby Grass	seeded
Senecio glomeratus	Annual Fireweed	1 per 2m2
Senecio quadridentatus	Cotton Fireweed	1 per m2
Themeda triandra	Kangaroo Grass	seeded
Veronica gracilis	Slender Speedwell	1 per m2
Wahlenbergia sp	Native Bluebell	1 per m2

Plants in plain text are for all areas except water edge
Plants in plain italic text are for water edge areas that may be subject to frequent inundation
Plants in bold italic text are primarily for lower streambanks that may be subject to flood inundation
Plants in bold are primarily for upper stream banks

Note that there may be overlap in some areas depending on site conditions

key

existing vegetation
individual trees, shelterbelts, groups of trees of various species
indigenous species are to be retained see Ecology & Heritage Partners Flora & Fauna Surveys

note that any environmental weed species should be removed as soon as practicable and other unsuitable species removed as new plantings establish
cupressus and pine species established as windbreak/screening to be assessed and retained/removed as per ecologist/relevant authority advice.

areas of indigenous vegetation within drainage reserve are to be protected
see Ecology & Heritage Partners Flora & Fauna Surveys

proposed street trees
indicative only (later detail at planning stage)
refer to list B

proposed lot trees
indicative only (landscaping to individual lots to later detail at planning stage)
refer to list C

proposed revegetation of drainage reserve
refer to plant list A

proposed lots

buffer planting
15m wide planting zone along bennett road

landscape concept plan

project: bennett road, gisborne

client:

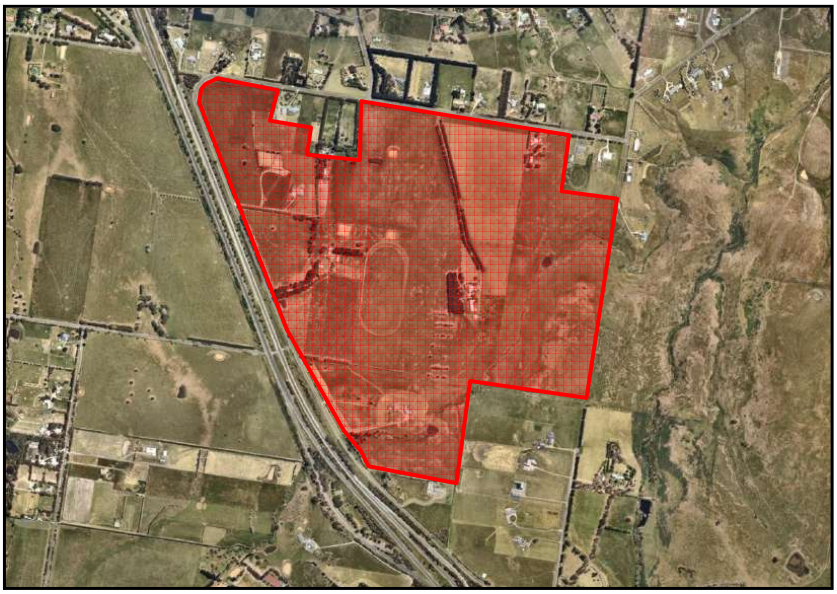
scale: 1:2500 A1 **date:** november 2021 **sheet:** 1 of 1
issue A

habitat
landscape and environmental design consultants 9836 1272

this plan is intended as a layout and planting guide only.all dimensions, locations, etc are to be checked and verified on site. Refer to architectural and engineering plans and permit conditions.
habitat accepts no responsibility or liability as a result of errors or omissions on this plan

TERRACO Civil Engineers Project Managers Development Consultants

Terraco Ref: 17085



Bennett Road Precinct, Gisborne
Development Plan

Servicing and Utilities Infrastructure
September 2021

Version 4

Terraco Pty Ltd – ABN 12 681 695 776
e: info@terraco.com.au
PO Box 5077, Bendigo East, Vic 3550
9 Jewell Court, East Bendigo, Vic 3550
www.terraco.com.au
Ph: (03) 5442 5799
Fax: (03) 5441 5506

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Terraco Pty Ltd – ABN 12 681 695 776 PO Box 5077, Bendigo East, Vic 3550 Ph: (03) 5442 5799
e: info@terraco.com.au 9 Jewell Court, East Bendigo, Vic 3550 Fax: (03) 5441 5506
www.terraco.com.au

Introduction

This report is to provide details in relation to servicing of a future development under the Macedon Ranges Planning Scheme Development Plan Overlay Schedule 18 (DPO18). The information provided assumes development of approximately 50 allotments within the precinct.

This report is to assist the following parcels of land to be subdivided in accordance with the attached proposed layout plan.

- 88 Bennett Road (Lot 1, PS343448), Gisborne
- 128 Bennett Road (Lot 1, PS343449), Gisborne
- 168 Bennett Road (Lot 2, PS627007), Gisborne
- 15 McGregor Road (Lot 1, TP886104), Gisborne
- 94 McGregor Road (Lot 1, LP134525), Gisborne
- 134 McGregor Road (Lot 1, PS633404), Gisborne

The combined properties have an approximate area of 132 hectares all within the Rural Living Zone (RLZ2).

All land parcels have existing permanent structures (dwellings and sheds), with the exception of 15 McGregor Road (Lot 1, TP886104), which remains unoccupied.

There is no infrastructure provision external to the Development Plan area and all infrastructure required will be contributed by each landholder as necessary as it is developed. Headworks charges as necessary to connect existing service locations to each lot will be borne by the individual developer in agreement with the particular servicing authority.

There shall be no appointment of charges between development sites. Each developer will be solely responsible for the provision of all required infrastructure to service each proposed subdivision. This includes provision of landscaping, paths and roads within and fronting each development parcel and any necessary extension of roads and other servicing infrastructure such as water, electricity or telecommunications required to service the subdivision.

There is no staging plan for commencement of development. Each parcel shall be developed depending upon required infrastructure of items being met as conditions of a subdivision approval.

Drainage – Macedon Ranges Shire Council / Melbourne Water

Both McGregor Road and Bennett Road are rural type sealed roads with table drains on both sides. No other formalised drainage infrastructure is available in the surrounding area. A natural watercourse flows in a north-east direction through 88 Bennett Road, 94 McGregor Road and 134 McGregor Road.

Being large lots under the DPO18 (minimum 2Ha), any development will have negligible affect in relation to increased runoff. Typically, any structure (dwelling/shed) shall be connected to stormwater tanks for onsite use, which may be connected to toilets and will generally provide for some stormwater detention.

Discussions with Melbourne Water confirm that due to the large allotments any runoff will generally be overland flow to swale drains within the roads which are likely to satisfy the requirements for Water Sensitive Design (WSUD).

Roads – Macedon Ranges Shire Council

The site is bordered by McGregor Road (to the north), Bennett Road (to the west) and Coney Court (to the east). Both McGregor Road and Bennett Road are sealed rural type roads with seal width of approximately 6m with table drains either side. Coney Court terminates at the site's north-east corner with a seal width of approximately 4m. Access to existing lots is via culverts within the table drains. None of the surrounding roads include kerb and channel or footpaths and none is justified for this rural residential subdivision.

The additional proposed roads are to be constructed in accordance with Council's Engineering Requirements for Infrastructure Construction. Typically, that includes 20m road reserves with 6.6m wide seal width (2 coat sprayed) and 1.0m wide unsealed shoulders (see attached cross section).

TraffixGroup has completed a Traffic Management and Impact Plan which further outlines that a roundabout is not required at the McGregor Road / Panorama Drive intersection. Alternatively a T-intersection will be provided further along McGregor Road to maintain traffic paths towards the township via Panorama Drive in line with the ODP requirements. The proposed intersections to external roads (4No. T-intersections), internal roads (3No. T-intersections) and the court bowl will be provided in accordance with the relevant standards and are sufficient for the projected traffic volumes.

All roadworks necessary to service a parcel of land including cycle and access paths will be undertaken at the cost of that developer at the time. At the time of development of 134 McGregor Road the individual developer shall provide a culvert crossing of the Djirri Djirri Creek at Brooking Road.

Water – Western Water

There is an existing 150mm PVC water main coming off the Calder Freeway and running along McGregor Road. This main reduces to a 100mm PVC water main at Panorama Drive which continues along the northern side of McGregor Road and into Coney Court.
The proposed allotments will be serviced via the existing 150mm and 100mm PVC water mains. Mains extensions and upgrades will be carried out as required to service all proposed allotments.

Adam Heaton (Western Water Land Development Coordinator) advised in June 2018 that this area is supplied from the South Gisborne Storage Tank. This tank currently has a capacity of 1 Megalitre and is scheduled to be increased to 2.6 Megalitre in the future as demand warrants.

Currently the system has sufficient capacity and pressure to provide adequate supply to this proposed development.

An extension to service a parcel will be undertaken at the cost of the developer in a works agreement with Western Water.

Sewer – Western Water

There is no existing gravity sewer available to service this proposed development. All lots will be serviced by individual on site treatment systems.

Telecommunications – Telstra / NBN

Existing Telstra services are located along McGregor Road, Coney Court and at the intersection of Bennett Road and the unmade Brooking Road.

The site will be serviced via connections off the existing infrastructure with upgrades and extensions carried out as required to service all proposed allotments. NBN is currently unavailable in the area and is expected to be available via fixed wireless between April-June 2020. We expect development will occur after that time.

Each developer will enter into an agreement for servicing infrastructure to be delivered.

Electricity – Powercor / Jemena

The separation boundary between two power Authorities (Powercor and Jemena) occurs within the proposed development. Powercor services 95% of the subdivision with Jemena servicing the balance of the site to the south.

There are existing overhead power supplies within the McGregor and Bennett Road reserves. Existing dwellings are serviced via overhead power connections from poles within the road reserves. Some of these supplies will be modified as part of the future development.

Upgrades to the network will be required to satisfy new demand and will be in accordance with the relevant Authority requirements.

Each developer will be required to ender into an agreement for infrastructure to be connected and delivered.

Gas – AusNet

There is no existing gas network in the area.

Residents may install bottled gas at their discretion.

Landscaping / Creek Reserve

Any landscaping to Bennett Road is to be undertaken by the developer of the land that fronts the road. Landscaping and improvement of the Djirri Djirri Creek reserve generally within a 60m wide creek alignment and wider where specified as indicated in the subdivision concept plan is to be undertaken at the cost of the affected landowner as detailed below. It is yet to be determined if the cost associated with the works will be considered as contribution towards public open space and to what extent. Overall, public open space contributions will apply of up to 5% of the land value, through monetary contribution or works in kind, to be administered by Macedon Ranges Shire Council. Landowners that do not abut the reserve will provide cash contributions or works in kind, as may be specified by Macedon Ranges Shire Council. This will be specified in the subdivision permit for each site.

Treatment within the Djirri Djirri Creek waterway is to be undertaken at the cost of the affected landowner, which will include;

- Dam removal and creek reinstatement as required
- Weed removal
- Council maintenance / CFA track as required
- Preparation of a landscape plan, planting of vegetation in accordance with the plan and means of retaining significant vegetation.
- Fencing as required.

Conclusion

All essential services and utilities are available nearby to fully cater for future subdivisions of approximately 50 lots.

Attachments

- Proposed Development Plan
- Table 6 Rural Road Characteristics – Infrastructure Design Manual.
- Western Water Sewer and Water Asset Plans
- Telstra and NBN Asset Plans
- Powercor and Jemena Asset Plans

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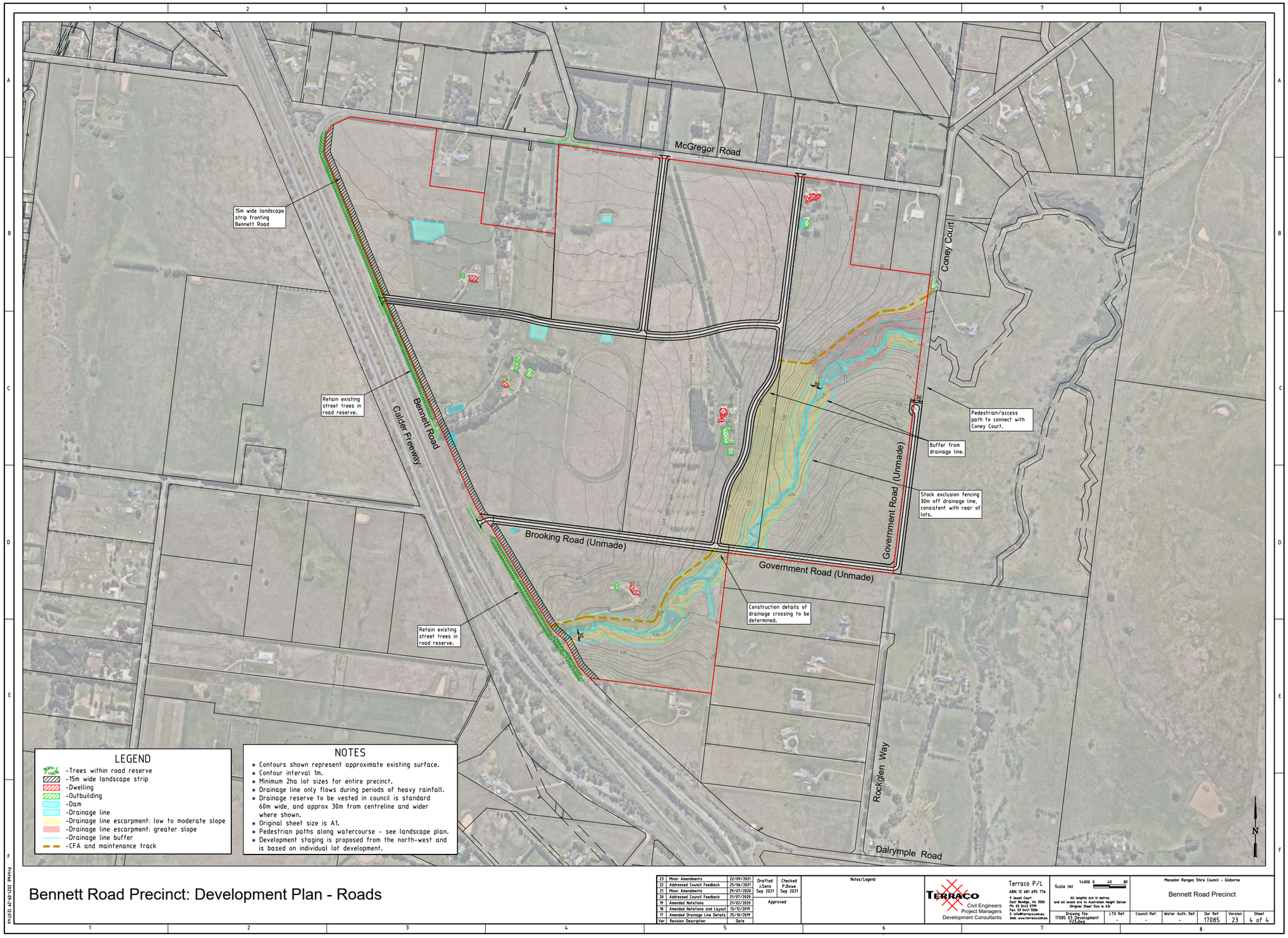

McGregor Road
Coney Court
Bennett Road
Calder Freeway
Brooking Road (Unmade)
Government Road (Unmade)
Government Road (Unmade)
Rockglen Way
Dalrymple Road
15m wide landscape strip fronting Bennett Road
Retain existing street trees in road reserve.
Retain existing street trees in road reserve.
Pedestrian/access path to connect with Coney Court.
Buffer from drainage line.
Stock exclusion fencing 30m off drainage line, consistent with rear of lots.
Construction details of drainage crossing to be determined.
LEGEND
-Trees within road reserve
-15m wide landscape strip
-Dwelling
-Outbuilding
-Dam
-Drainage line
-Drainage line escarpment: low to moderate slope
-Drainage line escarpment: greater slope
-Drainage line buffer
-CFA and maintenance track
NOTES
* Contours shown represent approximate existing surface.
* Contour interval 1m.
* Minimum 2ha lot sizes for entire precinct.
* Drainage line only flows during periods of heavy rainfall.
* Drainage reserve to be vested in council is standard 60m wide, and approx 30m from centreline and wider where shown.
* Original sheet size is A1.
* Pedestrian paths along watercourse - see landscape plan.
* Development staging is proposed from the north-west and is based on individual lot development.
N
Bennett Road Precinct: Development Plan - Roads
23 Minor Amendments 22/09/2021
22 Addressed Council Feedback 25/06/2021
21 Minor Amendments 29/07/2020
20 Addressed Council Feedback 21/07/2020
19 Amended Notations 21/02/2020
18 Amended Notations and Layout 13/12/2019
17 Amended Drainage Line Details 25/10/2019
Ver Revision Description Date
Drafted J.Sens Sep 2021
Checked P.Bowe Sep 2021
Approved
Notes/Legend
TERRACO Civil Engineers Project Managers Development Consultants
Terraco P/L
ABN 12 681 695 776
9 Jewell Court
East Bendigo, Vic 3550
Ph: 03 5442 5799
Fax: 03 5441 5506
E: info@terraco.com.au
Web: www.terraco.com.au
Scale (m) 1:4000 0 40 80
All lengths are in metres and all levels are to Australian Height Datum (Original Sheet Size is A3)
Drawing file: 17085 03 Development V23.dwg
LTO Ref: -
Macedon Ranges Shire Council - Gisborne
Bennett Road Precinct
Council Ref: -
Water Auth. Ref: -
Our Ref: 17085
Version 23
Sheet 4 of 4
Printed: 2021-09-29 12:07:46

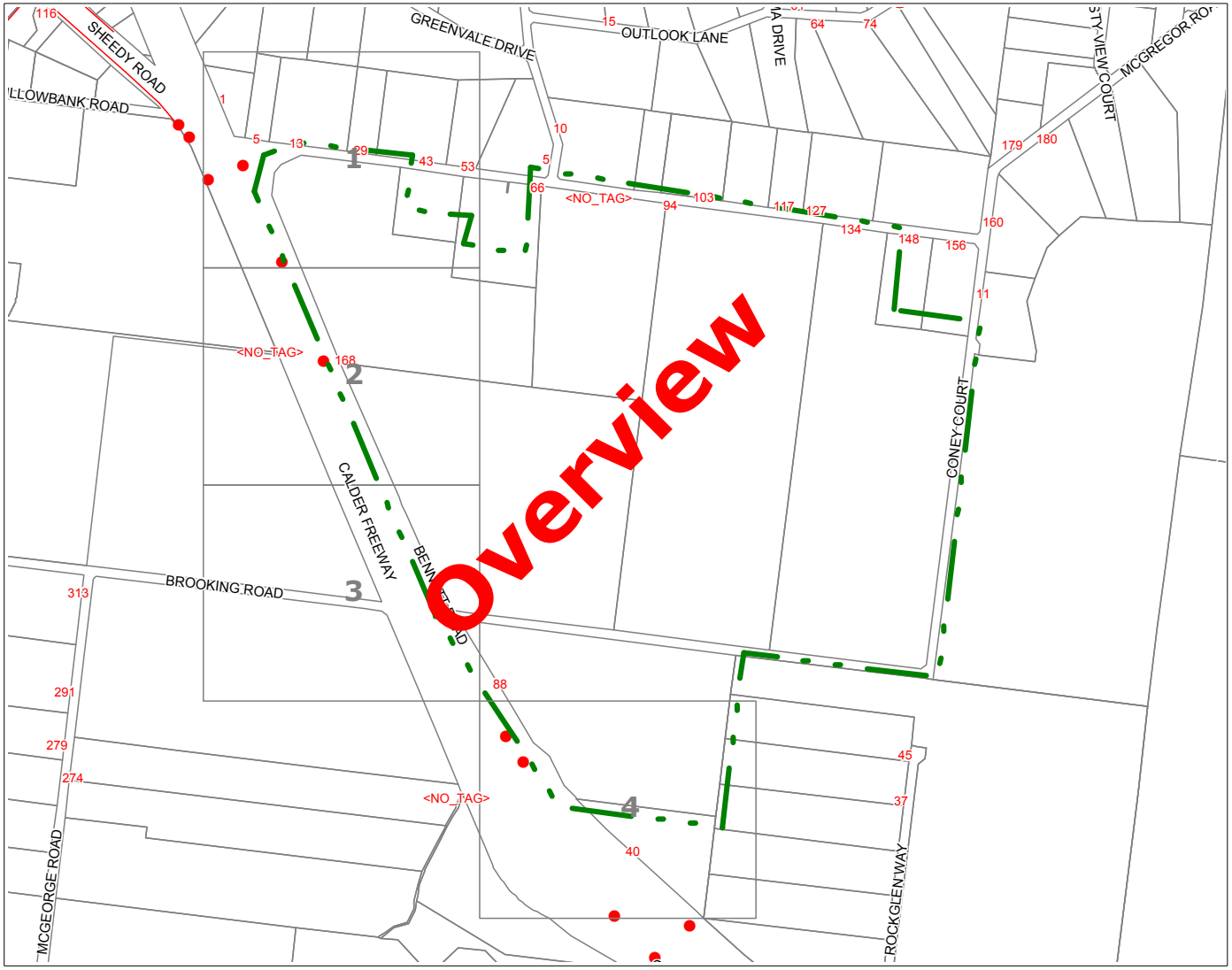
Street Type	Carriageway Width	Parking	Edge Treatment	Drainage	Footpath/Cycle Provision	Surface Treatment
Low Density Residential						
Up to 8 lots	6.0m (20m reserve)	Not required	1.5m Shoulder	Table drains/WSUD	Generally not required	Prime and two coat seal, Final coat in 12 months
Over 8 lots	6.6m with 1.0m shoulder (20m reserve)	Not required	1.5m Shoulder	Table drains/WSUD	Generally not required	Prime and two coat seal, Final coat in 12 months
Rural Type (including Farming, Rural Conservation, Rural Living and Rural Activity Zones)						
Up to 8 lots	6.0m (20m reserve)	Not required	1.5m Shoulder	Table drains/WSUD	Generally not required	Prime and two coat seal, Final coat in 12 months
Over 8 lots	6.6m with 1.0m shoulder (20m reserve)	Not required	1.5m Shoulder	Table drains/WSUD	Generally not required	Prime and two coat seal, Final coat in 12 months

If development is off, or an extension to, an existing road then new road construction must match the existing road if greater than requirement called for in above table.

Street Type	Carriageway Width	Parking	Edge Treatment	Drainage	Footpath/Cycle Provision	Surface Treatment
Industrial (All Zones)						
Industrial Roads	8.5m (20m reserve)	No parking on carriageway or road reserve	Barrier kerb	Underground/WSUD treatment as agreed by Council	Shared path 2.5m wide One side only	Asphalt
Business (All Zones)						
Roads (20m reserve)	8.5m (20m reserve)	Allowed on road or reserve by agreement	Barrier kerb or semi mountable	Underground/WSUD treatment as agreed by Council	Both sides 2m wide	Asphalt

(Street types are defined in terms of length and speed, refer to Planning Scheme for definitions).
* In some cases an edge strip may be acceptable to Council.

Western Water : Sewer Asset Plan



WESTERN WATER

Date:
11/06/2019

Sequence No:
84303253

Job No:
16441205

Location:
Bennett Road & McGregor Rc
Gisborne
VIC, 3437

LEGEND

SEWER

ABANDONED MAIN

Disclaimer:

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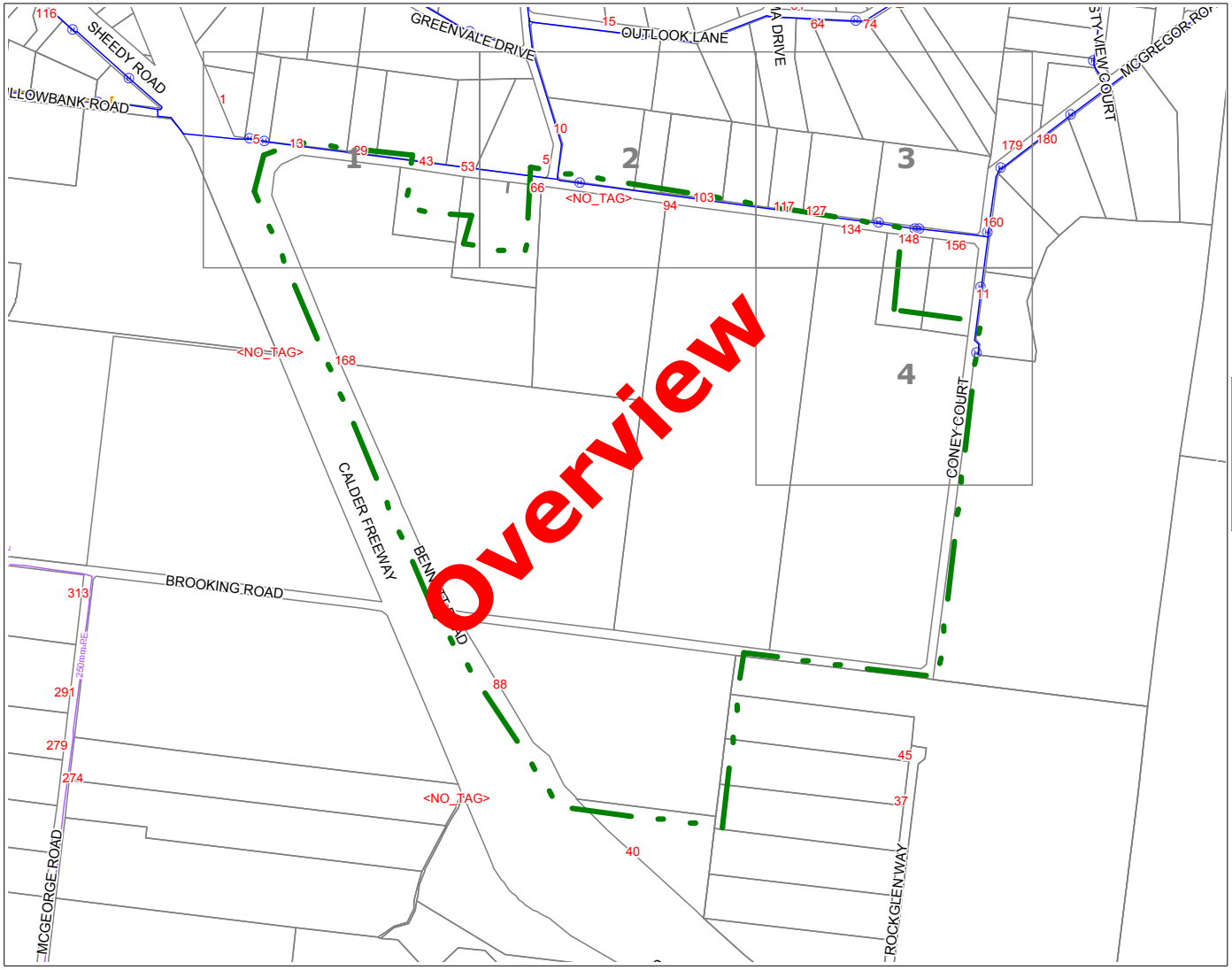
Note:
Assets labelled "AC" may contain asbestos material and therefore any works near these assets must be undertaken in accordance with OHS (Asbestos) Regulations 2007.

Western Water : Water Asset Plan



WESTERN WATER

Date:
11/06/2019

Sequence No:
84303253

Job No:
16441205

Location:
Bennett Road & McGregor Rc
Gisborne
VIC, 3437

LEGEND

- POTABLE WATER
- RECYCLED WATER
- ABANDONED MAIN

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Due to the placement of potable and recycled pipes in the same trench, it may be difficult to distinguish the two asset types where they have been superimposed on the plans.

Western Water : Water Asset Plan

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Job No:
16441205

Location:
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Gisborne
VIC, 3437

LEGEND

POTABLE WATER
RECYCLED WATER
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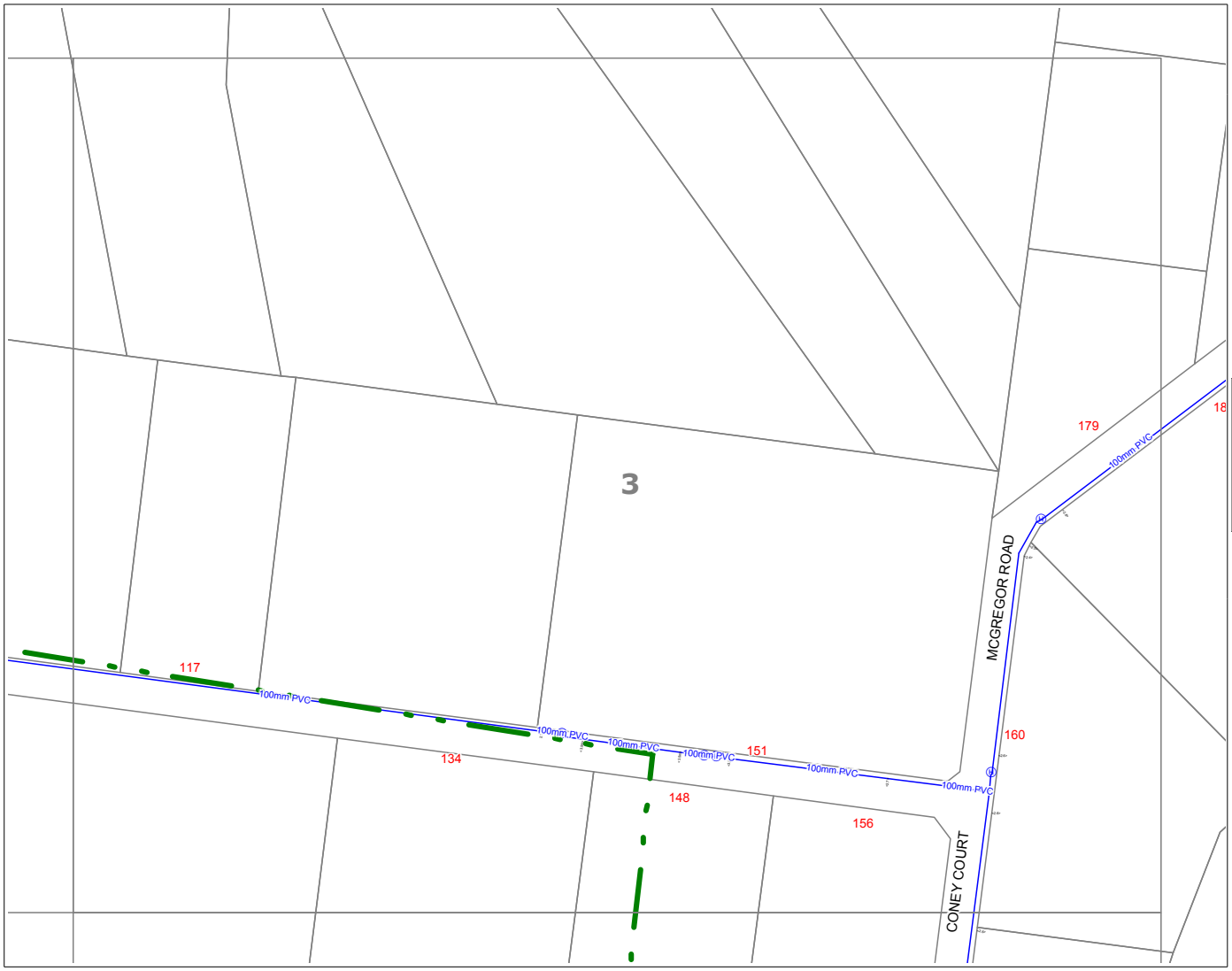
Western Water : Water Asset Plan



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RECYCLED WATER
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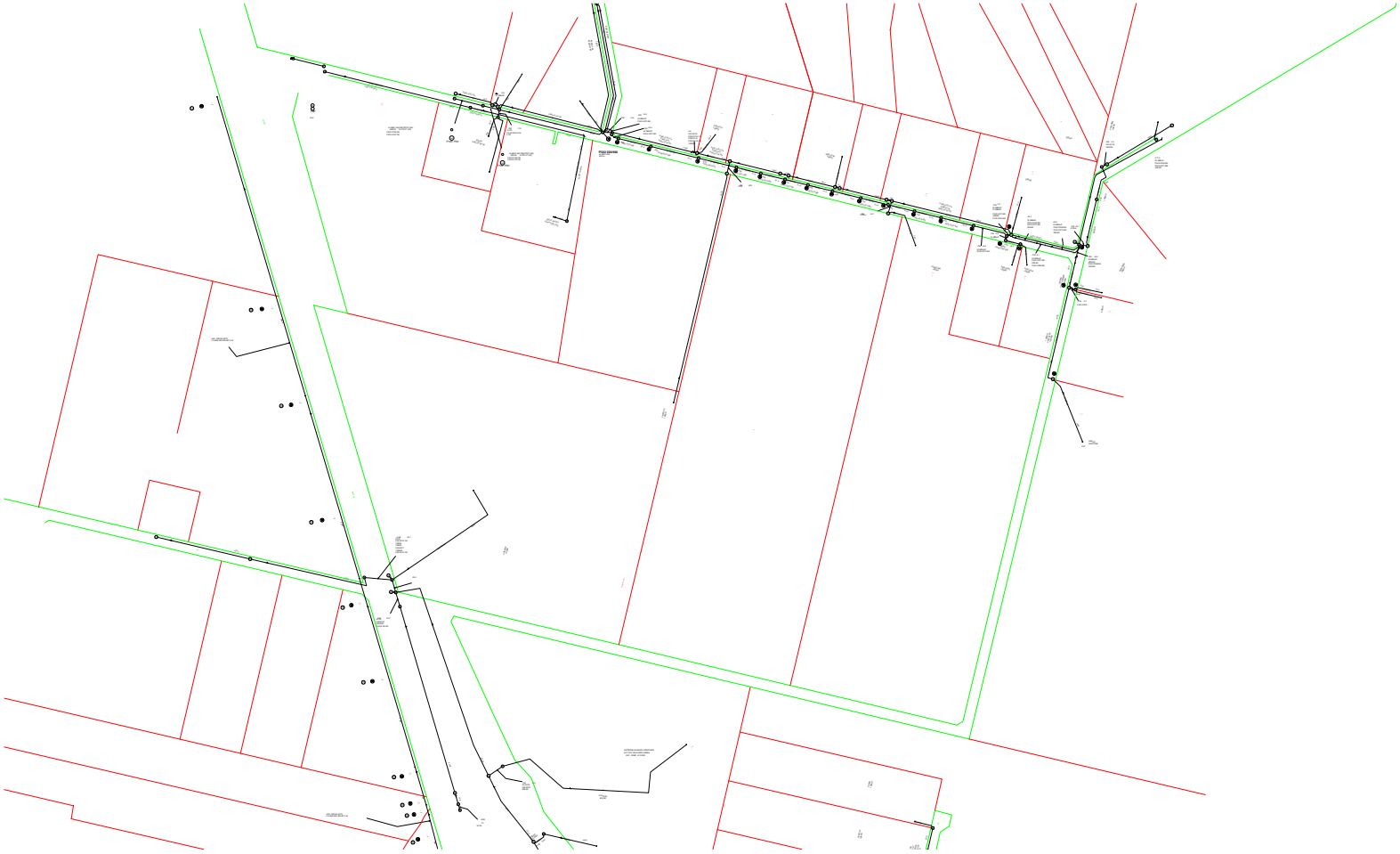


nbn

Register for alerts

128 Bennett Rd, Gisborne, VIC

128 BENNETT RD GISBORNE VIC 3437
Australia

Planned to be available from
Apr-Jun 2020*

Note: Some premises may require more work before they are ready to connect.

Register for email alerts

Planned technology
nbn™ Fixed Wireless (FW)*

More address information

- [x] Service available
- [x] Other fibre provider
- [x] Build commenced

Disclaimer

*This date and technology is based on **nbn**'s current deployment plans and is subject to change. Network rollout information is accurate as at 10/7/2019 and is updated weekly. Rollout areas and boundaries are subject to change as construction planning is finalised.

Services provided over the **nbn**™ broadband access network will be replacing phone and internet services provided over most of the existing landline networks, including copper and the majority of HFC networks within the fixed line footprint. Services provided over existing fibre networks (including in-building, health and education networks) and some special and business services may not be affected. To find out if your services will be affected, please contact your current phone or internet provider. For more information, visit www.nbnco.com.au/switchoff or call 1800 687 626.

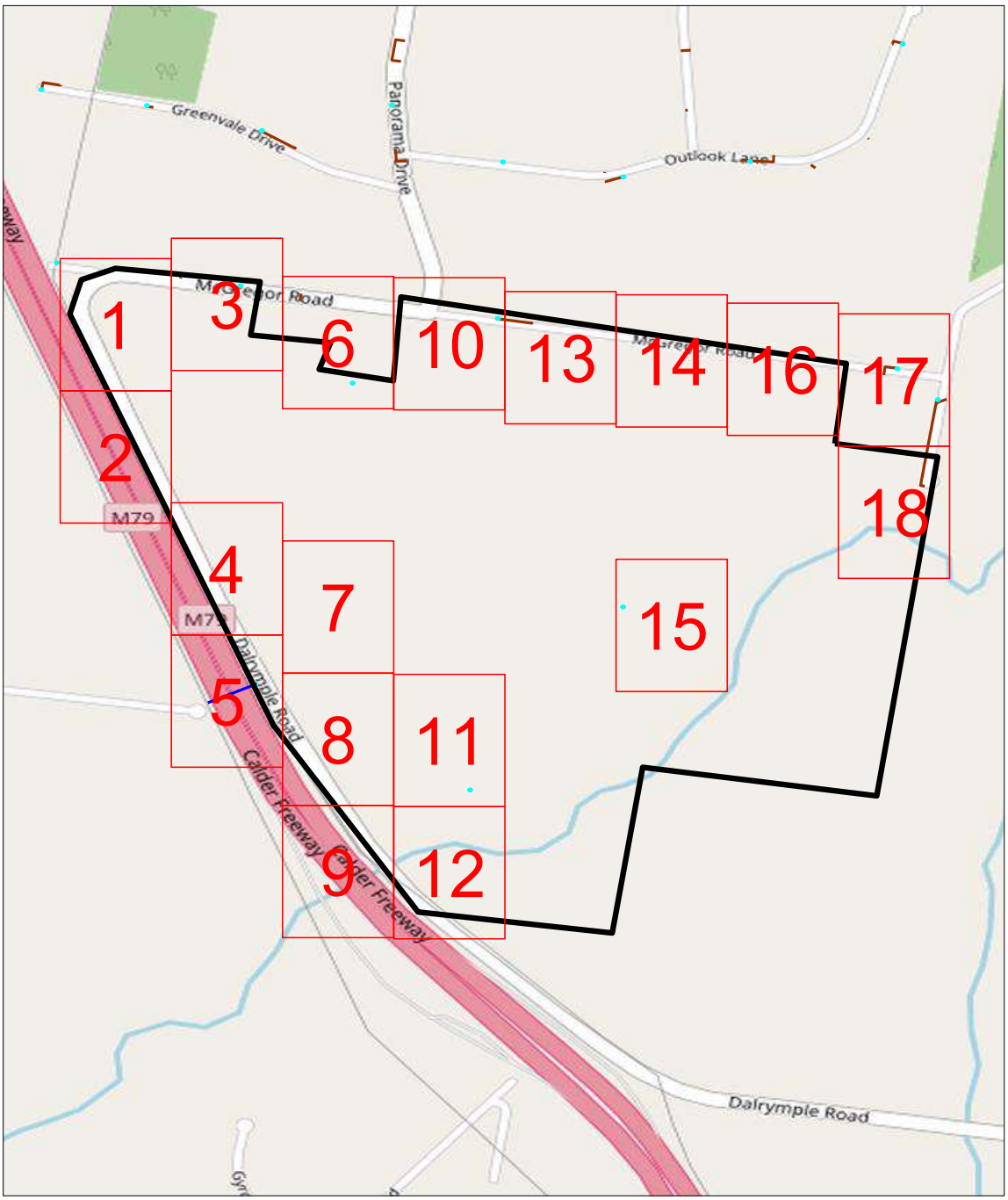
Date: 11/06/2019

Locality Map

Sequence No: 84303250

Bennett Road & McGregor Road Gisborne

MAP IS A GUIDE ONLY- REFER TO CABLE PLANS FOR ACCURATE ASSET LOCATIONS



LEGEND:

- DBYD Work Area
- SWER Substation
- High Voltage Cable
- Communication Cable
- Zone Substation
- Distribution Substation
- Low Voltage Cable
- Earth Cable

This map represents the location of the submitted DBYD Work Area and all CitiPower/Powercor responses are based on this location. It is the responsibility of the enquirer to ensure the accuracy of the DBYD Work Area.

0 0.1km

N

Imagery sourced from Open StreetMaps

Powered by dbyd

3

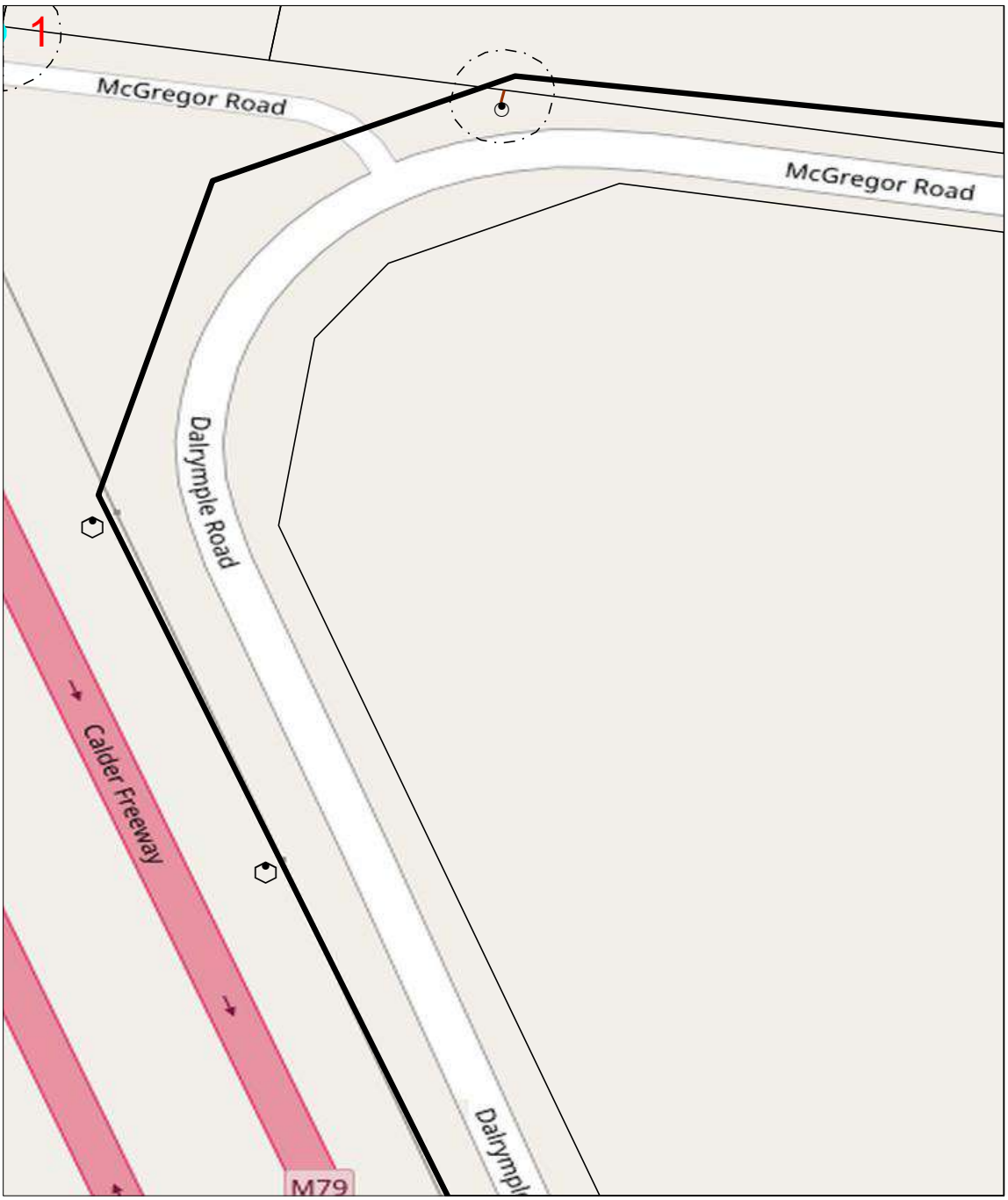
Date: 11/06/2019

Map 1

Sequence No: 84303250

Bennett Road & McGregor Road Gisborne

MAP IS A GUIDE ONLY- REFER TO CABLE PLANS FOR ACCURATE ASSET LOCATIONS



LEGEND:

DBYD Work Area | SWER Substation | High Voltage Cable | Communication Cable | Pole (Subtransmission) | Pole (LV)

Zone Substation | Distribution Substation | Low Voltage Cable | Earth Cable | Pole (HV) | Property Boundary

This map represents the location of the submitted DBYD Work Area and all CitiPower/Powercor responses are based on this location. It is the responsibility of the enquirer to ensure the accuracy of the DBYD Work Area.

0 0.01km

N

Imagery sourced from Open StreetMaps

Powered by dbyd

4

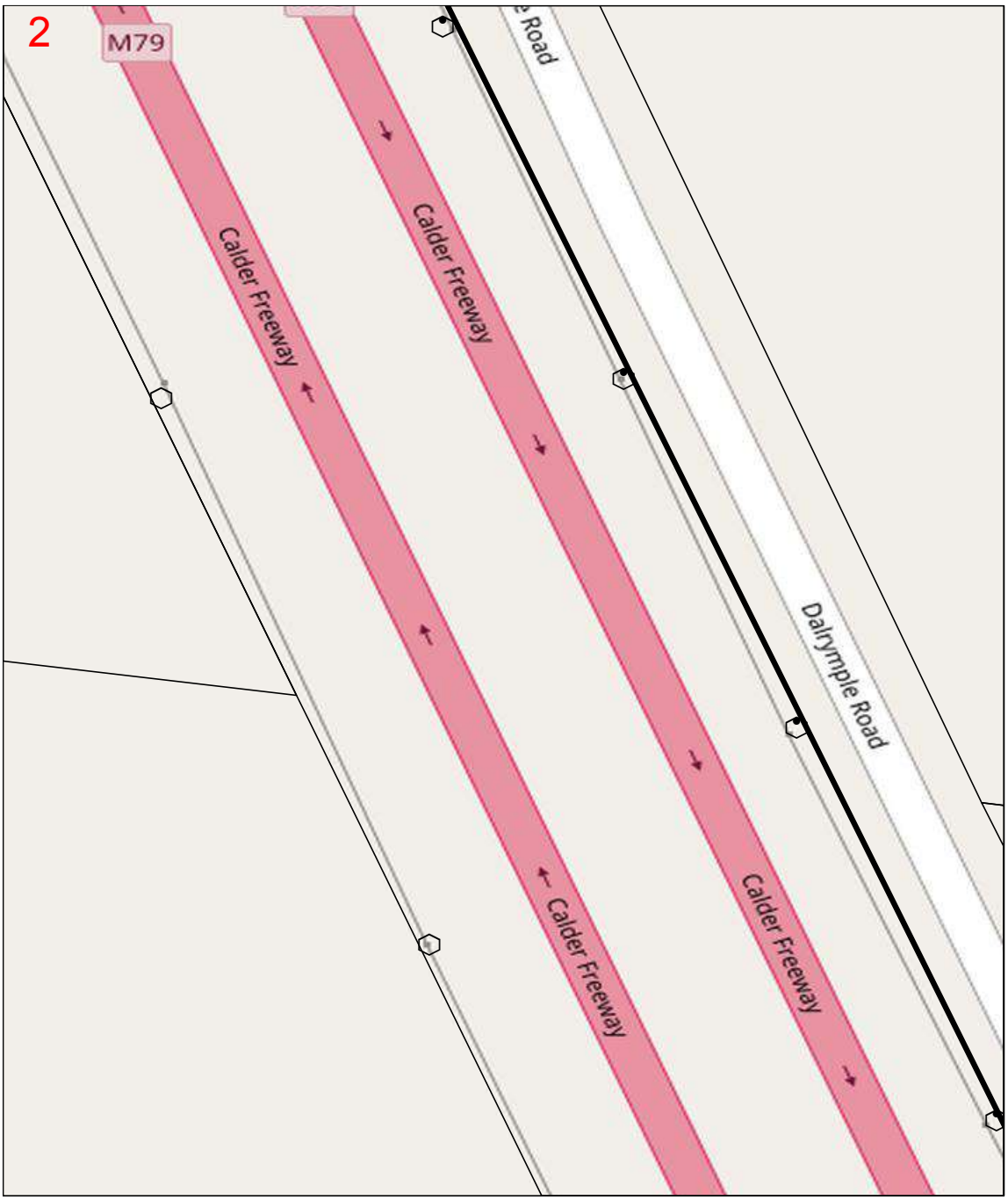
Date: 11/06/2019

Map 2

Sequence No: 84303250

Bennett Road & McGregor Road Gisborne

MAP IS A GUIDE ONLY- REFER TO CABLE PLANS FOR ACCURATE ASSET LOCATIONS



LEGEND:

DBYD Work Area | SWER Substation | High Voltage Cable | Communication Cable | Pole (Subtransmission) | Pole (LV)

Zone Substation | Distribution Substation | Low Voltage Cable | Earth Cable | Pole (HV) | Property Boundary

This map represents the location of the submitted DBYD Work Area and all CitiPower/Powercor responses are based on this location. It is the responsibility of the enquirer to ensure the accuracy of the DBYD Work Area.

Imagery sourced from Open StreetMaps

0 0.01km

N

Powered by dbyd

4

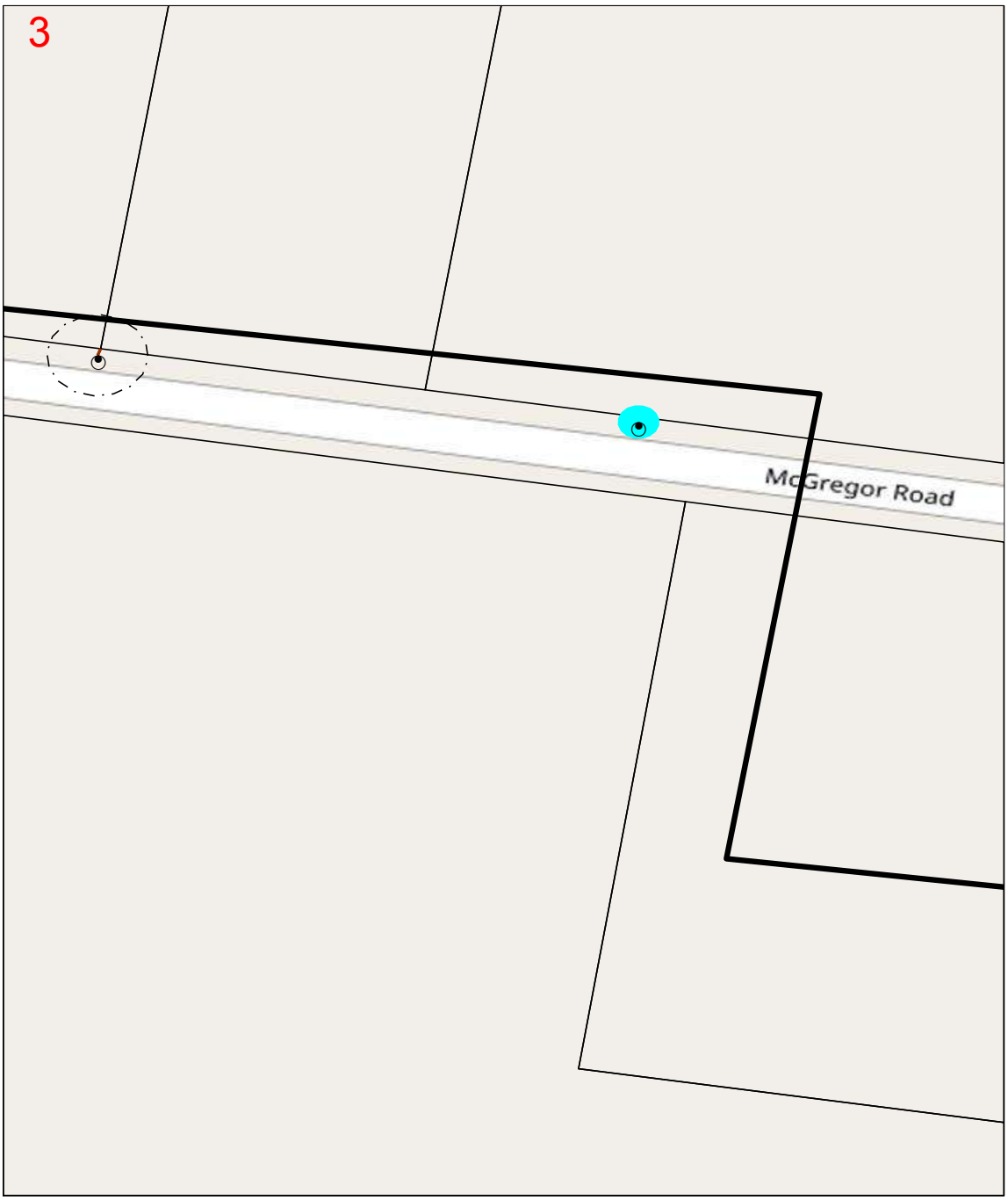
Date: 11/06/2019

Map 3

Sequence No: 84303250

Bennett Road & McGregor Road Gisborne

MAP IS A GUIDE ONLY- REFER TO CABLE PLANS FOR ACCURATE ASSET LOCATIONS



LEGEND:

DBYD Work Area | SWER Substation | High Voltage Cable | Communication Cable | Pole (Subtransmission) | Pole (LV)

Zone Substation | Distribution Substation | Low Voltage Cable | Earth Cable | Pole (HV) | Property Boundary

This map represents the location of the submitted DBYD Work Area and all CitiPower/Powercor responses are based on this location. It is the responsibility of the enquirer to ensure the accuracy of the DBYD Work Area.

0 0.01km

N

Imagery sourced from Open StreetMaps

Powered by dbyd

4

Date: 11/06/2019

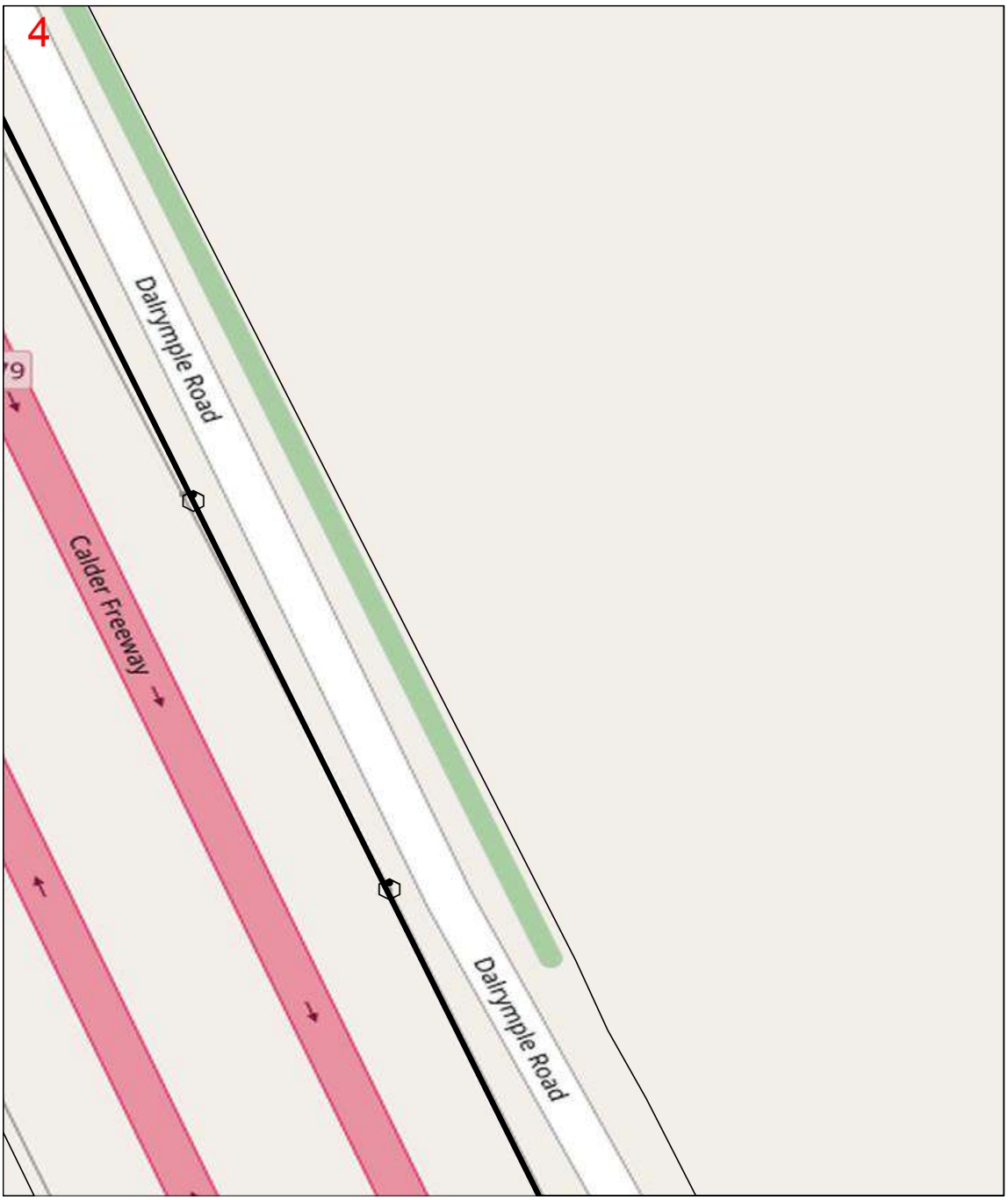
CITIPOWER Powercor AUSTRALIA

Map 4

Sequence No: 84303250

Bennett Road & McGregor Road Gisborne

MAP IS A GUIDE ONLY- REFER TO CABLE PLANS FOR ACCURATE ASSET LOCATIONS



LEGEND:

DBYD Work Area | SWER Substation | High Voltage Cable | Communication Cable | Pole (Subtransmission) | Pole (LV)

Zone Substation | Distribution Substation | Low Voltage Cable | Earth Cable | Pole (HV) | Property Boundary

This map represents the location of the submitted DBYD Work Area and all CitiPower/Powercor responses are based on this location. It is the responsibility of the enquirer to ensure the accuracy of the DBYD Work Area.

0 0.01km

N

Imagery sourced from Open StreetMaps

Powered by dbyd

4

Date: 11/06/2019

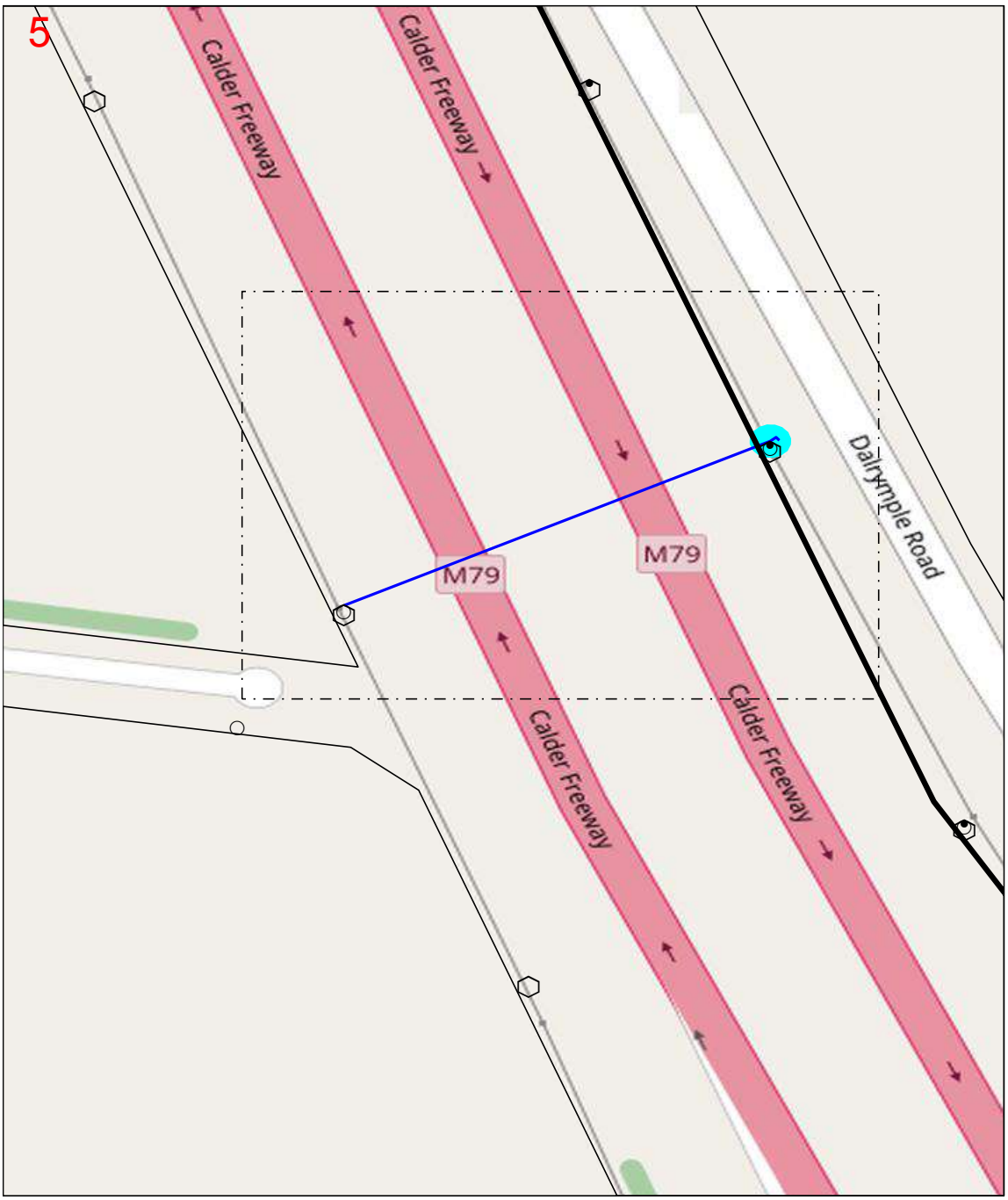
CITIPOWER Powercor AUSTRALIA

Map 5

Sequence No: 84303250

Bennett Road & McGregor Road Gisborne

MAP IS A GUIDE ONLY- REFER TO CABLE PLANS FOR ACCURATE ASSET LOCATIONS



LEGEND:

DBYD Work Area | SWER Substation | High Voltage Cable | Communication Cable | Pole (Subtransmission) | Pole (LV)

Zone Substation | Distribution Substation | Low Voltage Cable | Earth Cable | Pole (HV) | Property Boundary

This map represents the location of the submitted DBYD Work Area and all CitiPower/Powercor responses are based on this location. It is the responsibility of the enquirer to ensure the accuracy of the DBYD Work Area.

0 0.01km

N

Imagery sourced from Open StreetMaps

Powered by dbyd

4

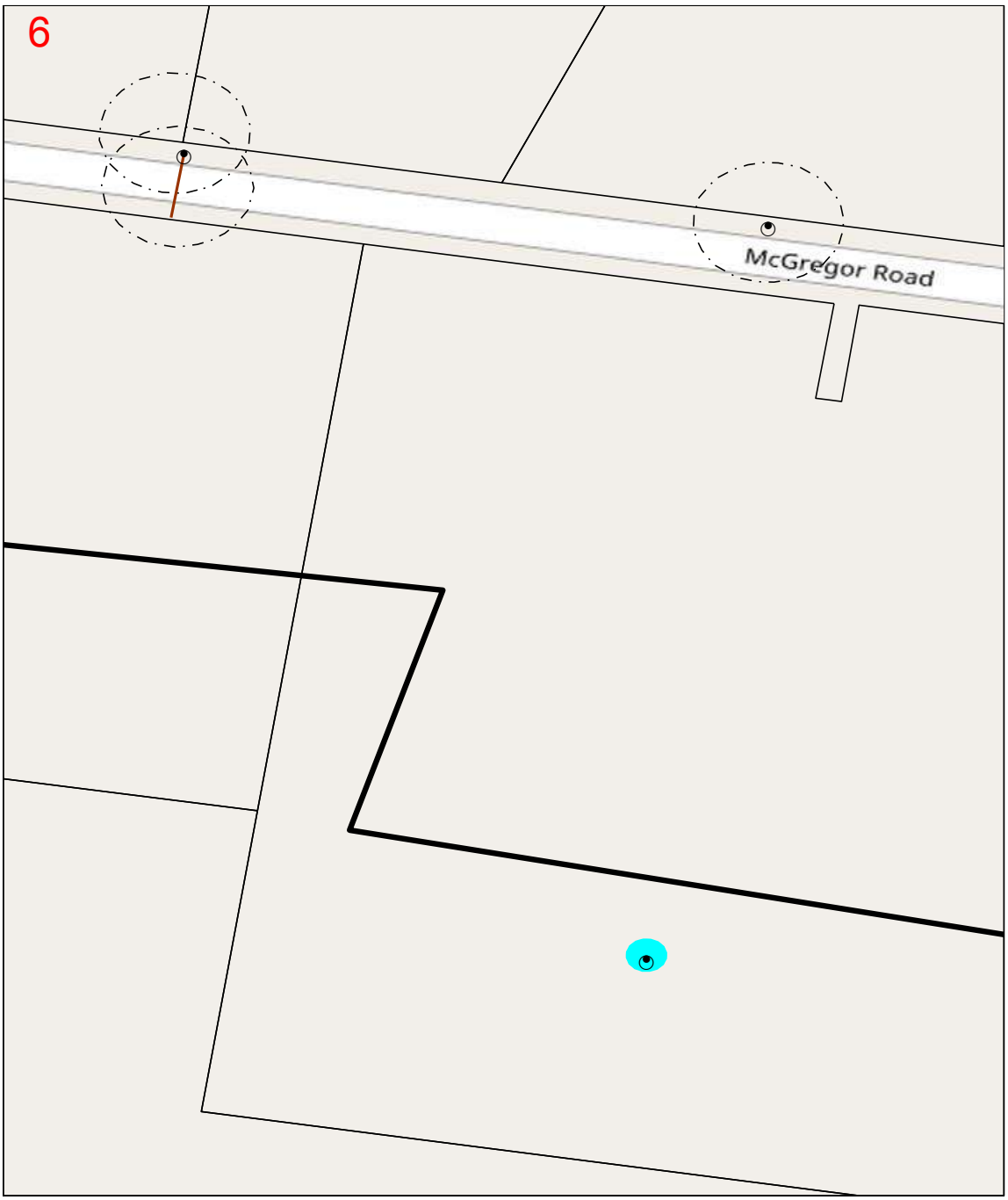
Date: 11/06/2019

Map 6

Sequence No: 84303250

Bennett Road & McGregor Road Gisborne

MAP IS A GUIDE ONLY- REFER TO CABLE PLANS FOR ACCURATE ASSET LOCATIONS



LEGEND:

DBYD Work Area
Zone Substation
SWER Substation
Distribution Substation
High Voltage Cable
Low Voltage Cable
Communication Cable
Earth Cable
Pole (Subtransmission)
Pole (HV)
Pole (LV)
Property Boundary

This map represents the location of the submitted DBYD Work Area and all CitiPower/Powercor responses are based on this location. It is the responsibility of the enquirer to ensure the accuracy of the DBYD Work Area.

0 0.01km

N

Imagery sourced from Open StreetMaps

Powered by dbyd

4

Date: 11/06/2019

Map 7

Sequence No: 84303250

Bennett Road & McGregor Road Gisborne

MAP IS A GUIDE ONLY- REFER TO CABLE PLANS FOR ACCURATE ASSET LOCATIONS

7

LEGEND:

DBYD Work Area
Zone Substation
SWER Substation
Distribution Substation
High Voltage Cable
Low Voltage Cable
Communication Cable
Earth Cable
Pole (Subtransmission)
Pole (HV)
Pole (LV)
Property Boundary

This map represents the location of the submitted DBYD Work Area and all CitiPower/Powercor responses are based on this location. It is the responsibility of the enquirer to ensure the accuracy of the DBYD Work Area.

0 0.01km

N

Imagery sourced from Open StreetMaps

Powered by dbyd

4

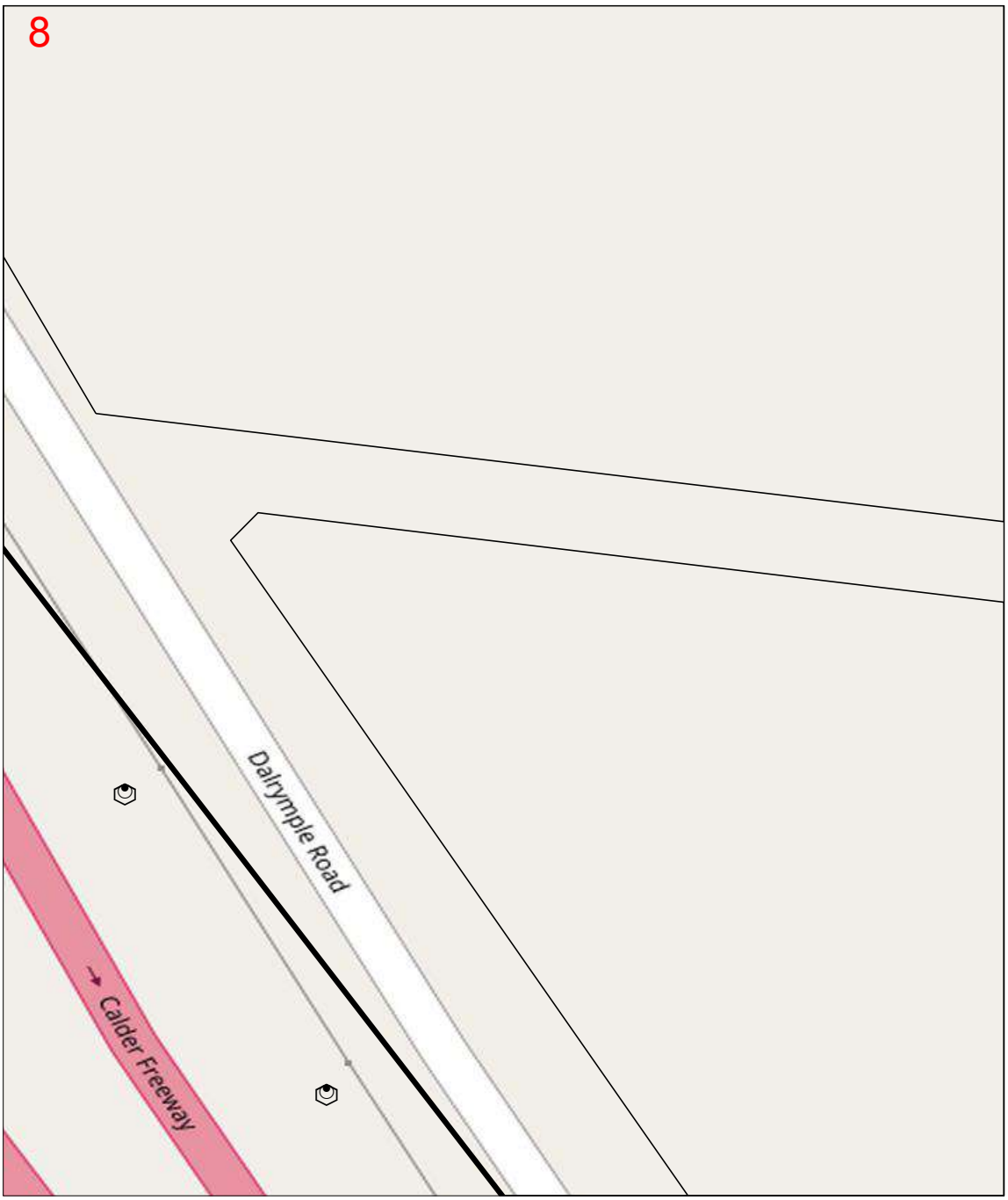
Date: 11/06/2019

Map 8

Sequence No: 84303250

Bennett Road & McGregor Road Gisborne

MAP IS A GUIDE ONLY- REFER TO CABLE PLANS FOR ACCURATE ASSET LOCATIONS



LEGEND:

DBYD Work Area
Zone Substation
SWER Substation
Distribution Substation
High Voltage Cable
Low Voltage Cable
Communication Cable
Earth Cable
Pole (Subtransmission)
Pole (HV)
Pole (LV)
Property Boundary

This map represents the location of the submitted DBYD Work Area and all CitiPower/Powercor responses are based on this location. It is the responsibility of the enquirer to ensure the accuracy of the DBYD Work Area.

0 0.01km

N

Imagery sourced from Open StreetMaps

Powered by dbyd

4

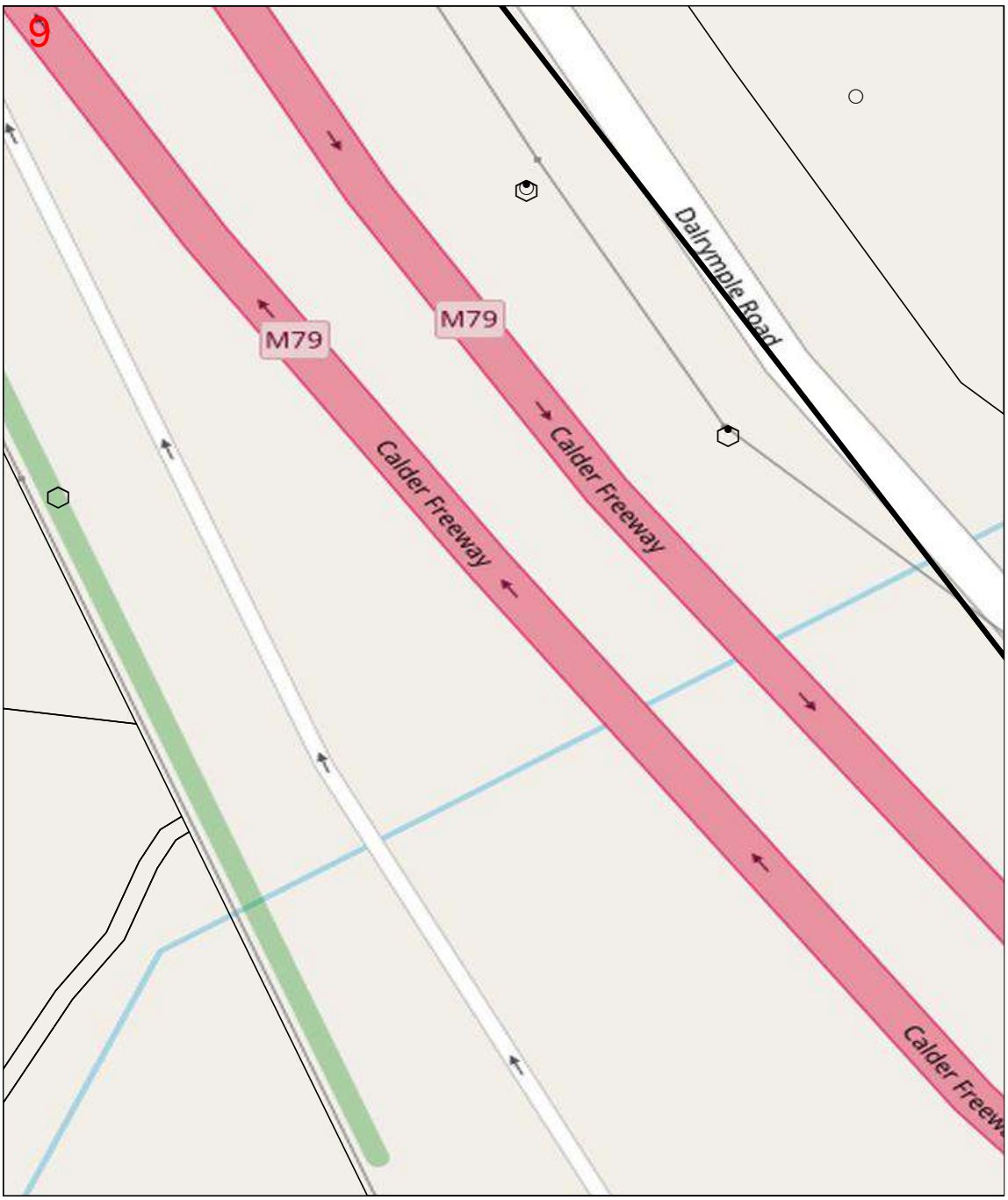
Date: 11/06/2019

Map 9

Sequence No: 84303250

Bennett Road & McGregor Road Gisborne

MAP IS A GUIDE ONLY- REFER TO CABLE PLANS FOR ACCURATE ASSET LOCATIONS



LEGEND:

DBYD Work Area | SWER Substation | High Voltage Cable | Communication Cable | Pole (Subtransmission) | Pole (LV)

Zone Substation | Distribution Substation | Low Voltage Cable | Earth Cable | Pole (HV) | Property Boundary

This map represents the location of the submitted DBYD Work Area and all CitiPower/Powercor responses are based on this location. It is the responsibility of the enquirer to ensure the accuracy of the DBYD Work Area.

0 0.01km

N

Imagery sourced from Open StreetMaps

Powered by dbyd

4

Date: 11/06/2019

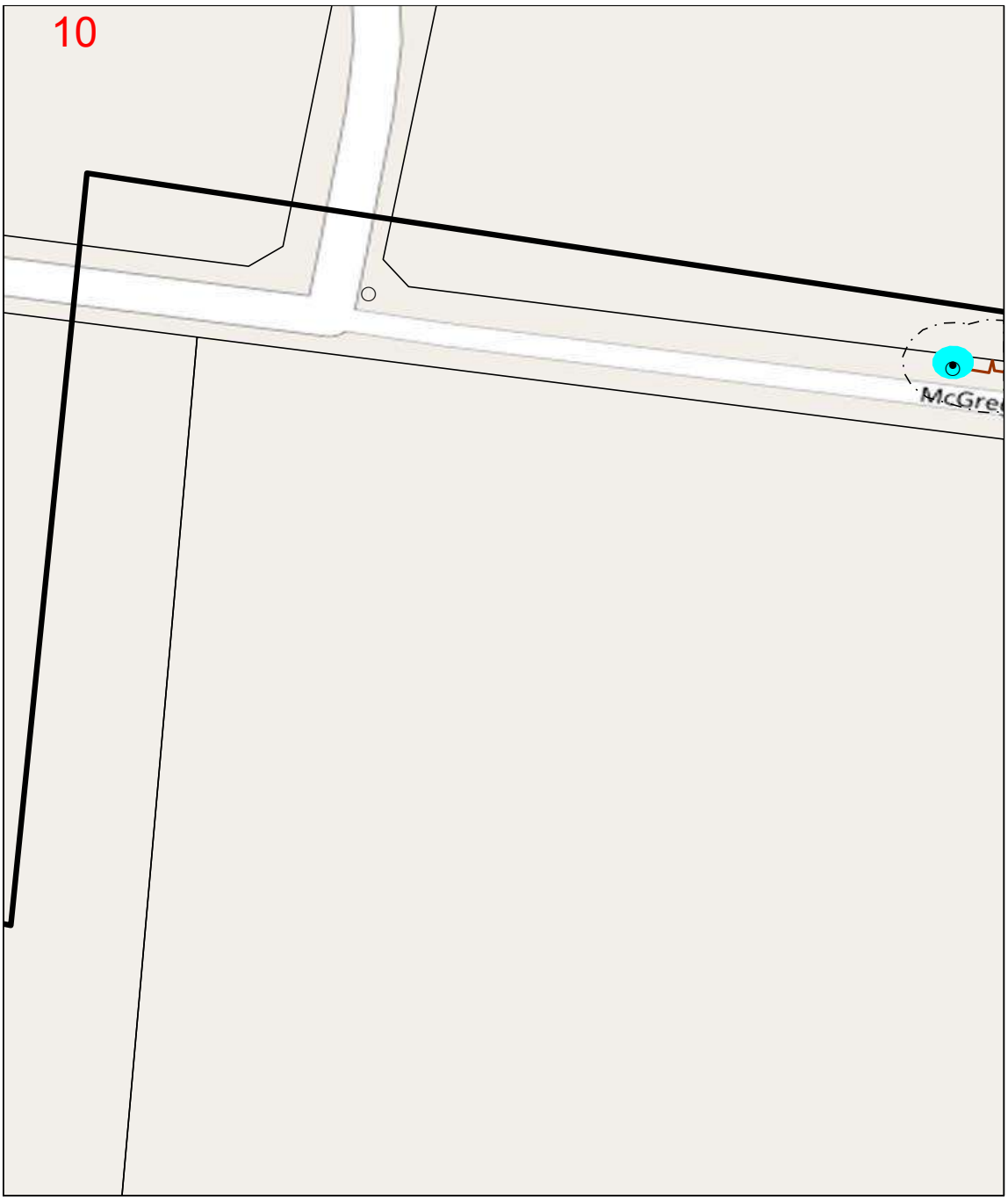
CITIPOWER Powercor AUSTRALIA

Map 10

Sequence No: 84303250

Bennett Road & McGregor Road Gisborne

MAP IS A GUIDE ONLY- REFER TO CABLE PLANS FOR ACCURATE ASSET LOCATIONS



LEGEND:

DBYD Work Area
Zone Substation
SWER Substation
Distribution Substation
High Voltage Cable
Low Voltage Cable
Communication Cable
Earth Cable
Pole (Subtransmission)
Pole (HV)
Pole (LV)
Property Boundary

This map represents the location of the submitted DBYD Work Area and all CitiPower/Powercor responses are based on this location. It is the responsibility of the enquirer to ensure the accuracy of the DBYD Work Area.

0 0.01km

N

Imagery sourced from Open StreetMaps

Powered by dbyd

4

Date: 11/06/2019

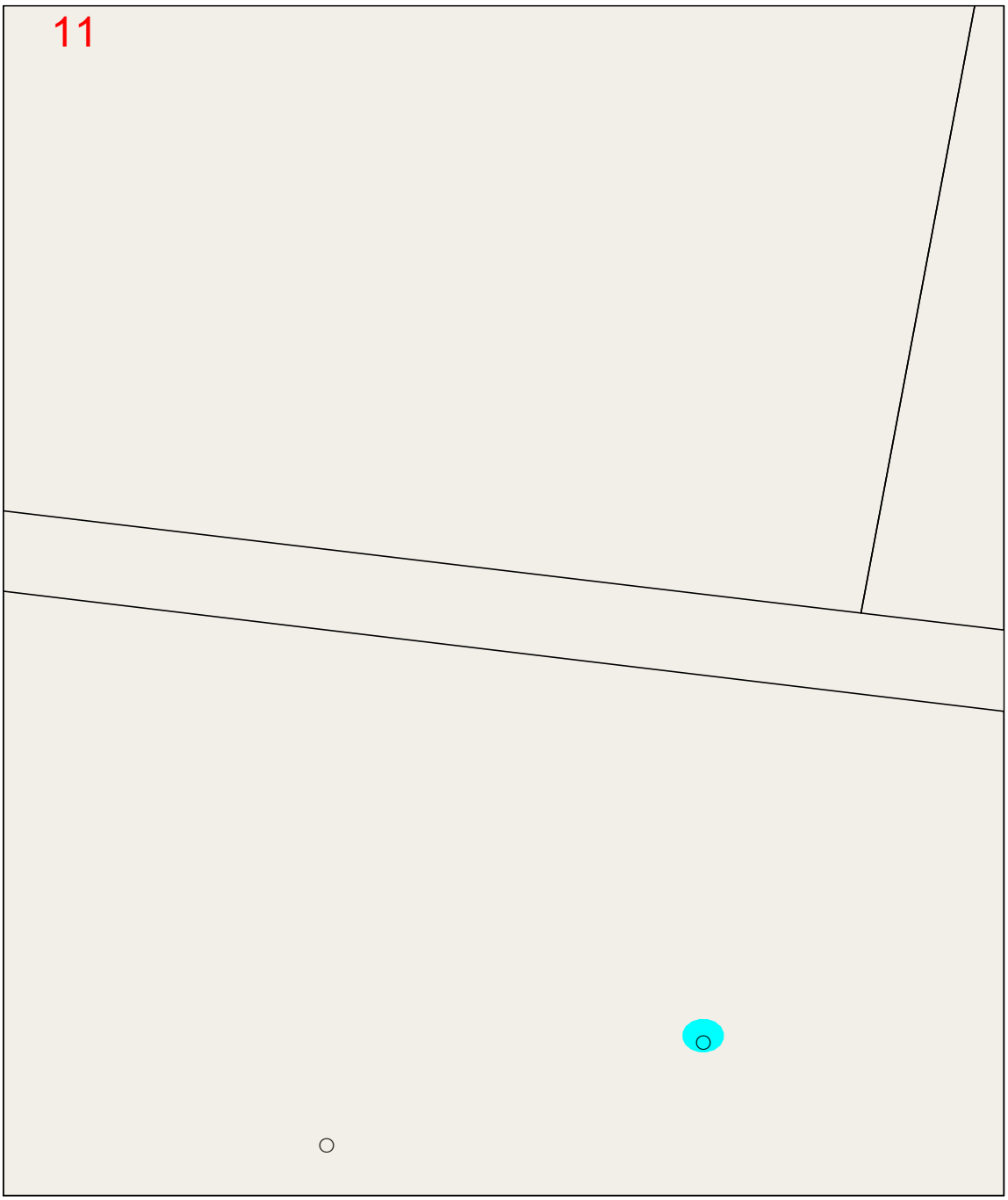
CITIPOWER Powercor AUSTRALIA

Map 11

Sequence No: 84303250

Bennett Road & McGregor Road Gisborne

MAP IS A GUIDE ONLY- REFER TO CABLE PLANS FOR ACCURATE ASSET LOCATIONS



LEGEND:

DBYD Work Area
SWER Substation
High Voltage Cable
Communication Cable
Pole (Subtransmission)
Pole (LV)
Zone Substation
Distribution Substation
Low Voltage Cable
Earth Cable
Pole (HV)
Property Boundary

This map represents the location of the submitted DBYD Work Area and all CitiPower/Powercor responses are based on this location. It is the responsibility of the enquirer to ensure the accuracy of the DBYD Work Area.

0 0.01km

N

Imagery sourced from Open StreetMaps

Powered by dbyd

4

Date: 11/06/2019

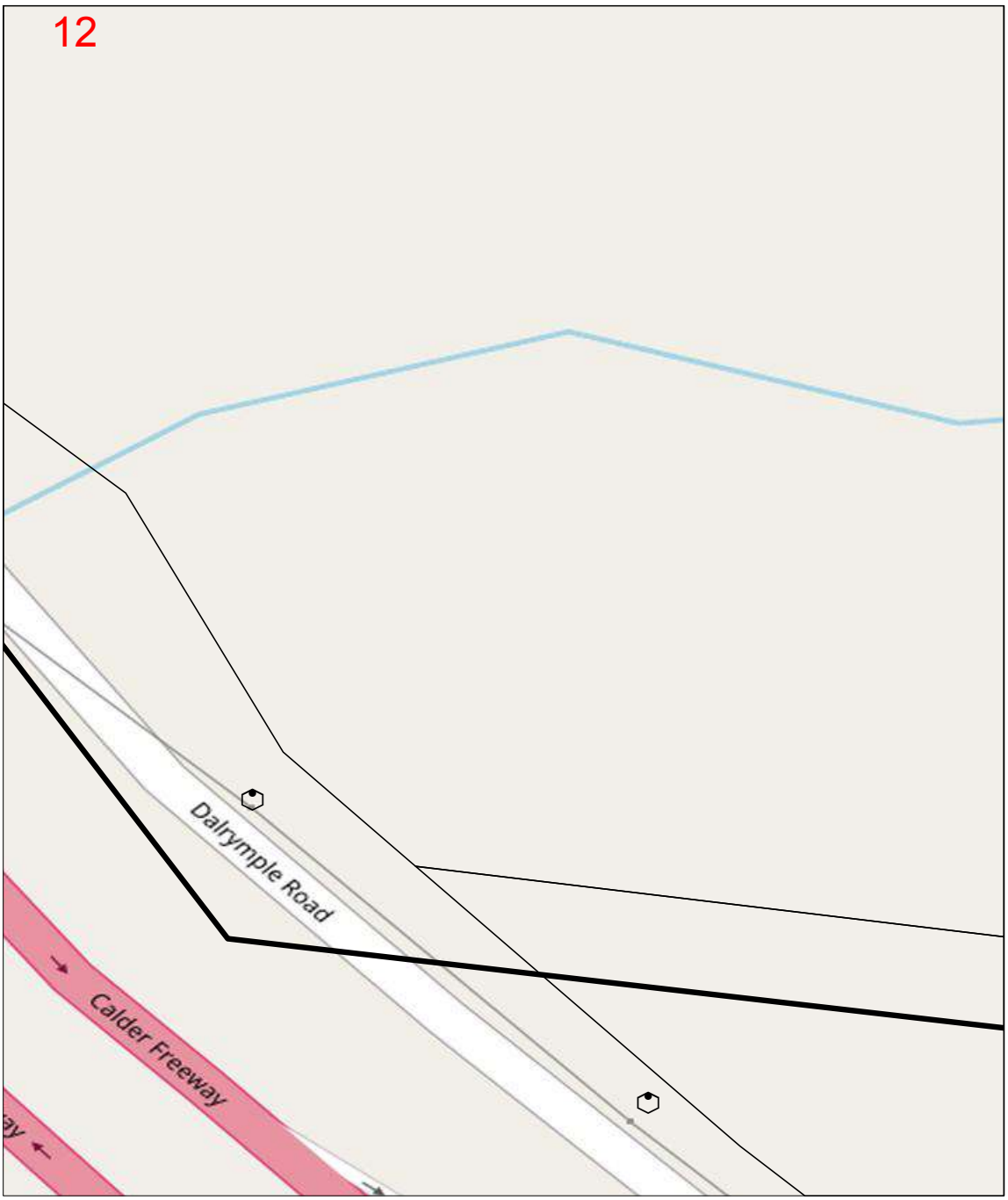
CITIPOWER Powercor AUSTRALIA

Map 12

Sequence No: 84303250

Bennett Road & McGregor Road Gisborne

MAP IS A GUIDE ONLY- REFER TO CABLE PLANS FOR ACCURATE ASSET LOCATIONS



LEGEND:

DBYD Work Area | SWER Substation | High Voltage Cable | Communication Cable | Pole (Subtransmission) | Pole (LV)

Zone Substation | Distribution Substation | Low Voltage Cable | Earth Cable | Pole (HV) | Property Boundary

This map represents the location of the submitted DBYD Work Area and all CitiPower/Powercor responses are based on this location. It is the responsibility of the enquirer to ensure the accuracy of the DBYD Work Area.

0 0.01km

N

Imagery sourced from Open StreetMaps

Powered by dbyd

4

Date: 11/06/2019

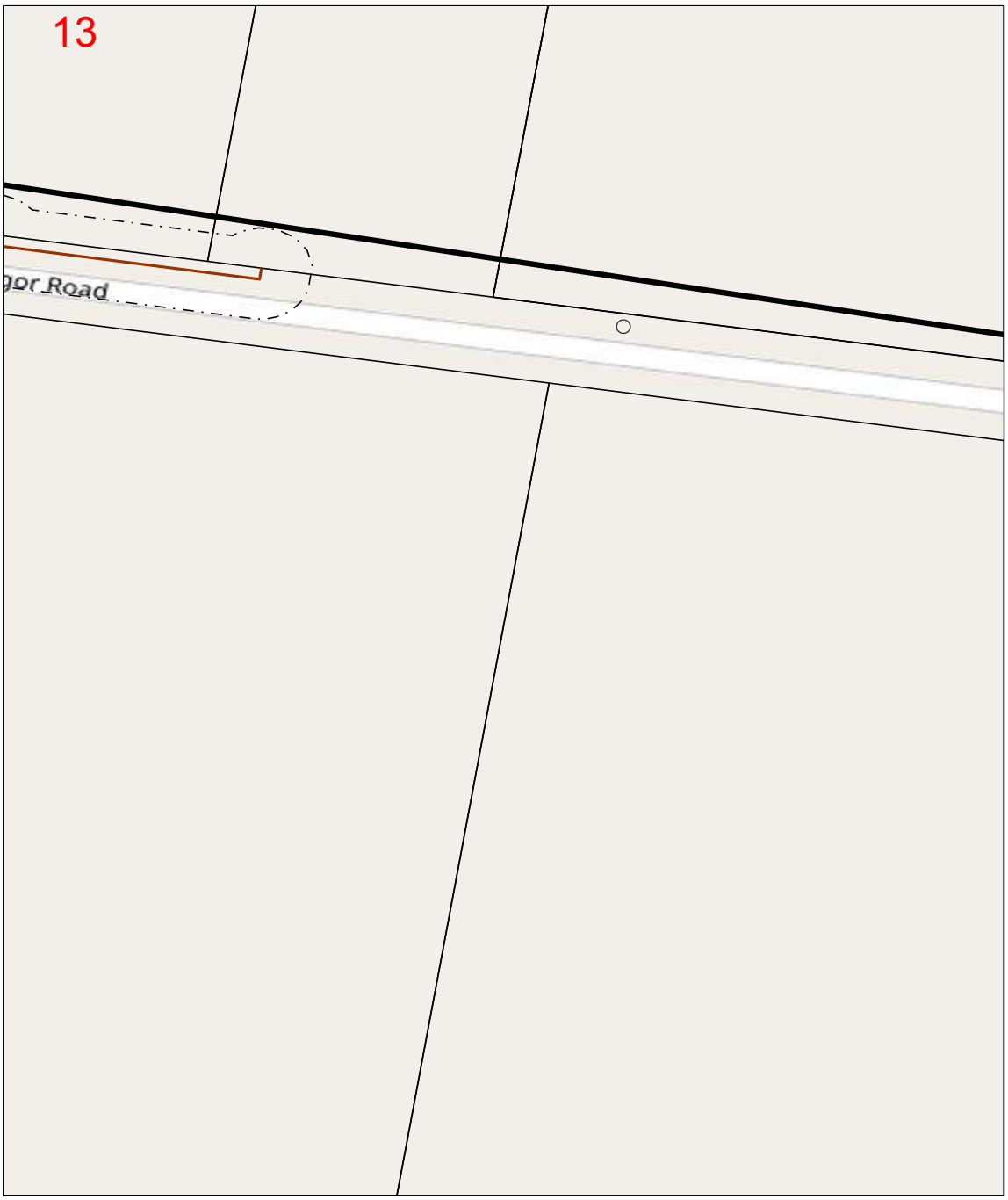
CITIPOWER Powercor AUSTRALIA

Map 13

Sequence No: 84303250

Bennett Road & McGregor Road Gisborne

MAP IS A GUIDE ONLY- REFER TO CABLE PLANS FOR ACCURATE ASSET LOCATIONS



LEGEND:

DBYD Work Area | SWER Substation | High Voltage Cable | Communication Cable | Pole (Subtransmission) | Pole (LV)

Zone Substation | Distribution Substation | Low Voltage Cable | Earth Cable | Pole (HV) | Property Boundary

This map represents the location of the submitted DBYD Work Area and all CitiPower/Powercor responses are based on this location. It is the responsibility of the enquirer to ensure the accuracy of the DBYD Work Area.

0 0.01km

N

Imagery sourced from Open StreetMaps

Powered by dbyd

4

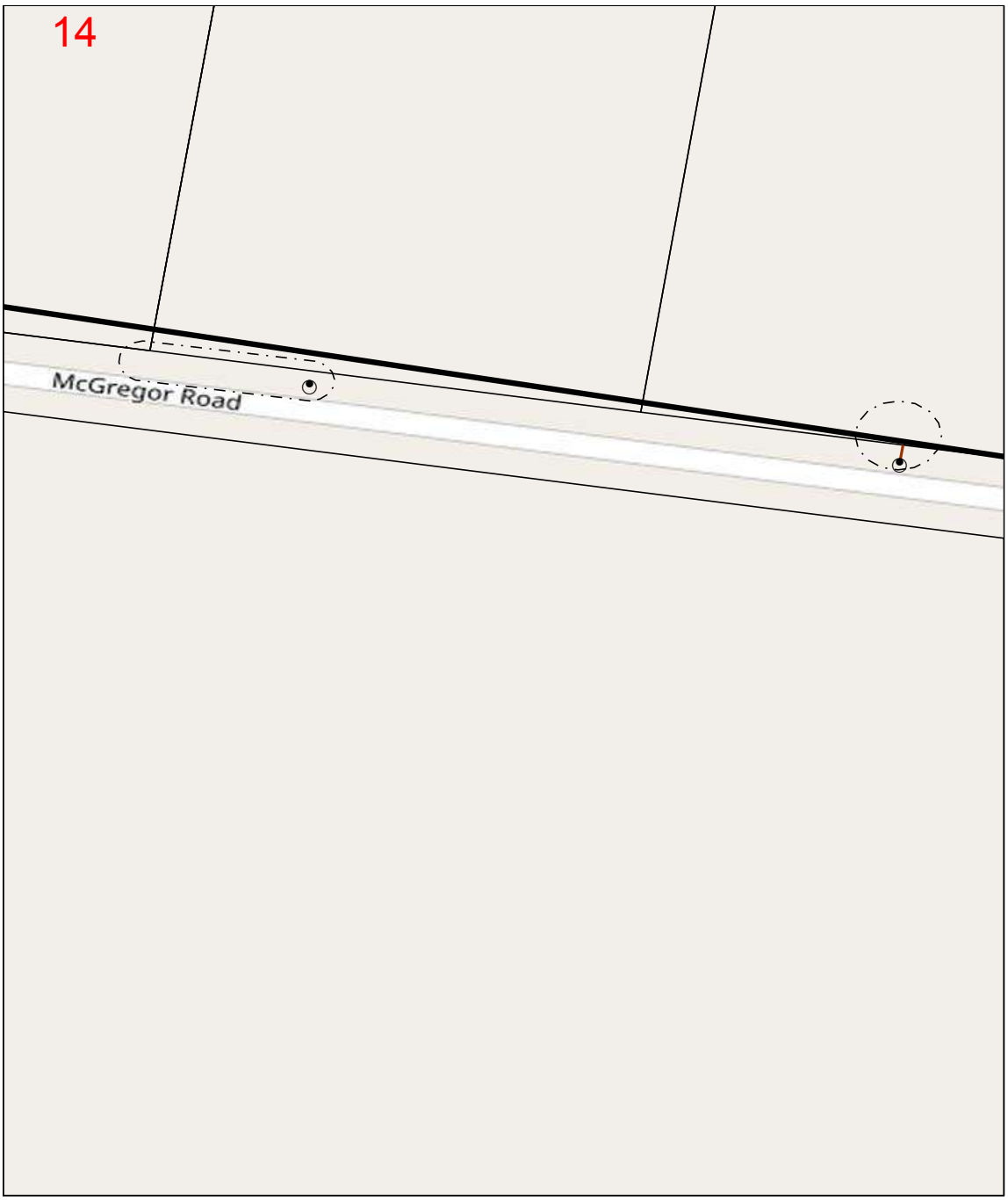
Date: 11/06/2019

Map 14

Sequence No: 84303250

Bennett Road & McGregor Road Gisborne

MAP IS A GUIDE ONLY- REFER TO CABLE PLANS FOR ACCURATE ASSET LOCATIONS



LEGEND:

DBYD Work Area
Zone Substation
SWER Substation
Distribution Substation
High Voltage Cable
Low Voltage Cable
Communication Cable
Earth Cable
Pole (Subtransmission)
Pole (HV)
Pole (LV)
Property Boundary

This map represents the location of the submitted DBYD Work Area and all CitiPower/Powercor responses are based on this location. It is the responsibility of the enquirer to ensure the accuracy of the DBYD Work Area.

0 0.01km

N

Imagery sourced from Open StreetMaps

Powered by dbyd

4

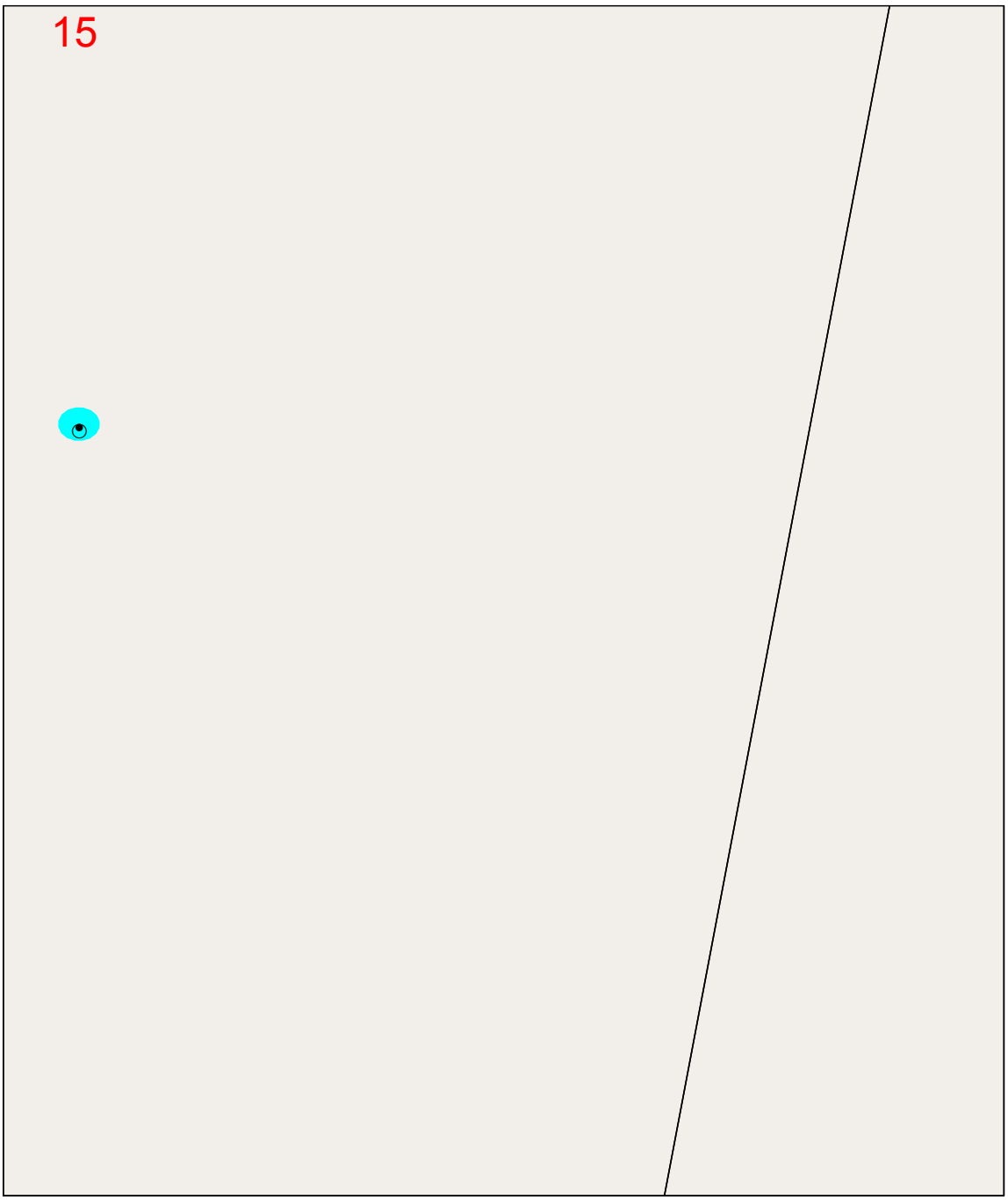
Date: 11/06/2019

Map 15

Sequence No: 84303250

Bennett Road & McGregor Road Gisborne

MAP IS A GUIDE ONLY- REFER TO CABLE PLANS FOR ACCURATE ASSET LOCATIONS



LEGEND:

DBYD Work Area
SWER Substation
High Voltage Cable
Communication Cable
Pole (Subtransmission)
Pole (LV)
Zone Substation
Distribution Substation
Low Voltage Cable
Earth Cable
Pole (HV)
Property Boundary

This map represents the location of the submitted DBYD Work Area and all CitiPower/Powercor responses are based on this location. It is the responsibility of the enquirer to ensure the accuracy of the DBYD Work Area.

0 0.01km

N

Imagery sourced from Open StreetMaps

Powered by dbyd

4

Date: 11/06/2019

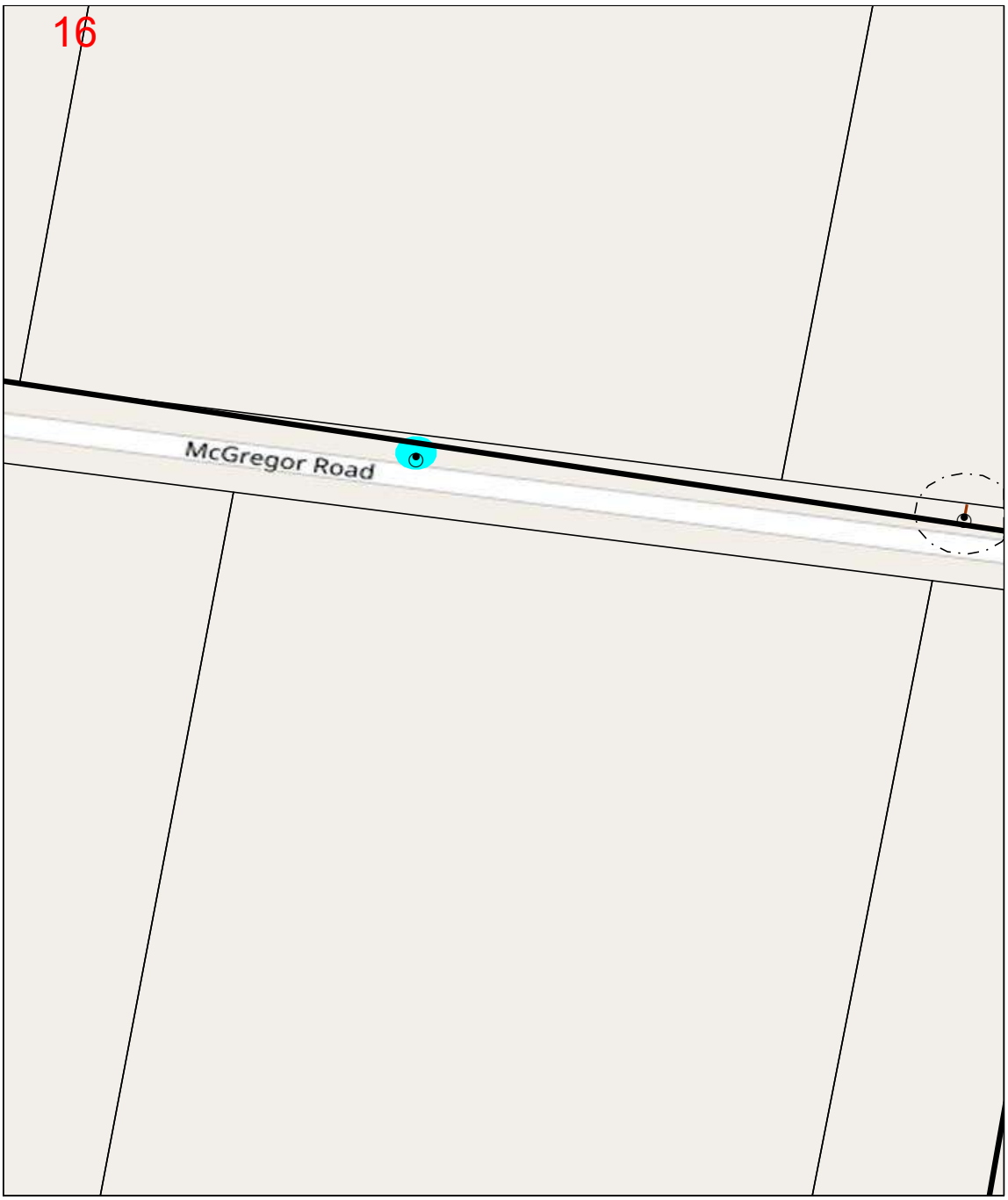
CITIPOWER Powercor AUSTRALIA

Map 16

Sequence No: 84303250

Bennett Road & McGregor Road Gisborne

MAP IS A GUIDE ONLY- REFER TO CABLE PLANS FOR ACCURATE ASSET LOCATIONS



LEGEND:

DBYD Work Area
Zone Substation
SWER Substation
Distribution Substation
High Voltage Cable
Low Voltage Cable
Communication Cable
Earth Cable
Pole (Subtransmission)
Pole (HV)
Pole (LV)
Property Boundary

This map represents the location of the submitted DBYD Work Area and all CitiPower/Powercor responses are based on this location. It is the responsibility of the enquirer to ensure the accuracy of the DBYD Work Area.

0 0.01km

N

Imagery sourced from Open StreetMaps

Powered by dbyd

4

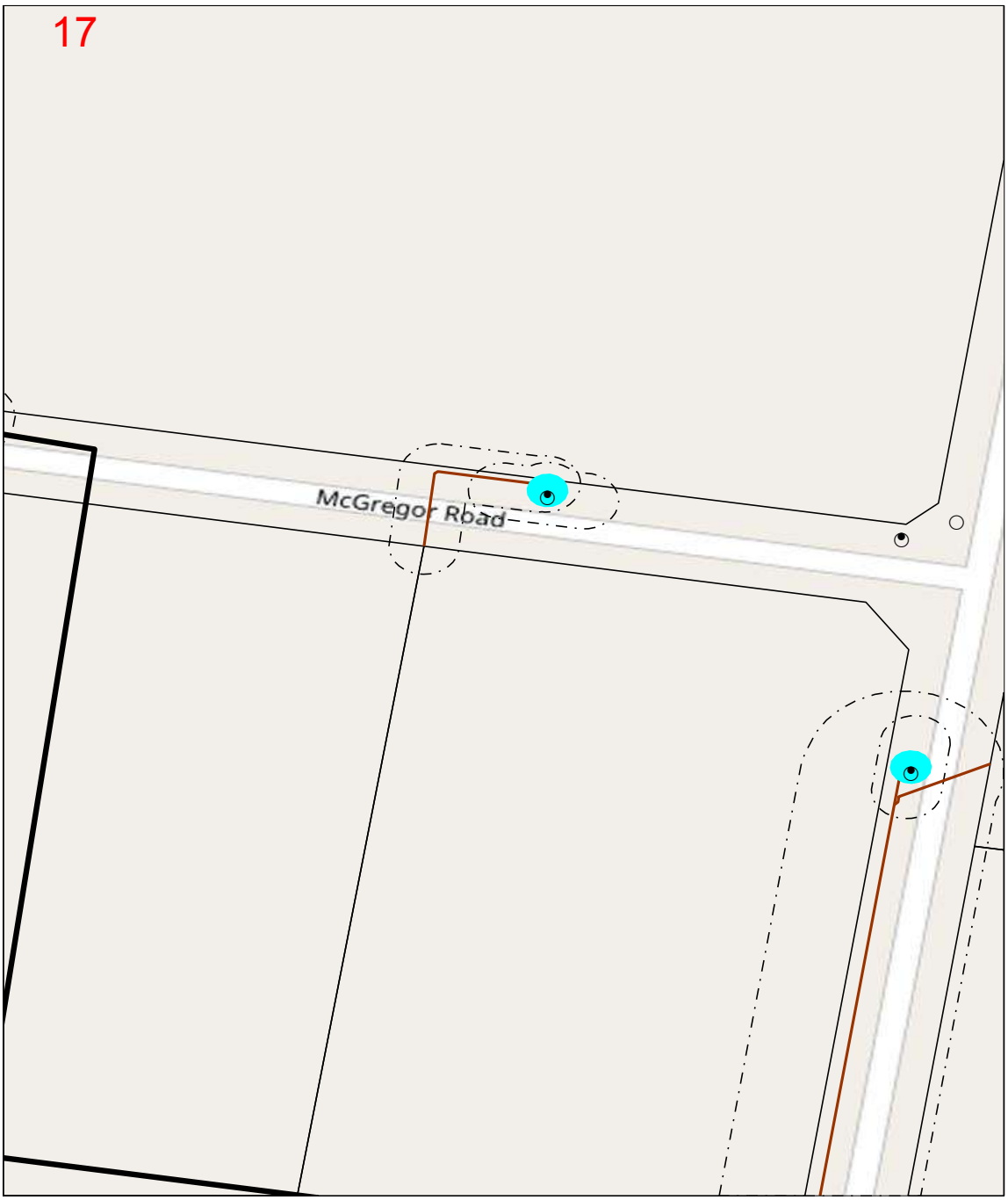
Date: 11/06/2019

Map 17

Sequence No: 84303250

Bennett Road & McGregor Road Gisborne

MAP IS A GUIDE ONLY- REFER TO CABLE PLANS FOR ACCURATE ASSET LOCATIONS



LEGEND:

DBYD Work Area
Zone Substation
SWER Substation
Distribution Substation
High Voltage Cable
Low Voltage Cable
Communication Cable
Earth Cable
Pole (Subtransmission)
Pole (HV)
Pole (LV)
Property Boundary

This map represents the location of the submitted DBYD Work Area and all CitiPower/Powercor responses are based on this location. It is the responsibility of the enquirer to ensure the accuracy of the DBYD Work Area.

0 0.01km

N

Imagery sourced from Open StreetMaps

Powered by dbyd

4

Date: 11/06/2019

CITIPOWER Powercor AUSTRALIA

Map 18

Sequence No: 84303250

Bennett Road & McGregor Road Gisborne

MAP IS A GUIDE ONLY- REFER TO CABLE PLANS FOR ACCURATE ASSET LOCATIONS

LEGEND:

DBYD Work Area
SWER Substation
High Voltage Cable
Communication Cable
Pole (Subtransmission)
Pole (LV)
Zone Substation
Distribution Substation
Low Voltage Cable
Earth Cable
Pole (HV)
Property Boundary

This map represents the location of the submitted DBYD Work Area and all CitiPower/Powercor responses are based on this location. It is the responsibility of the enquirer to ensure the accuracy of the DBYD Work Area.

0 0.01km

N

Imagery sourced from Open StreetMaps

Powered by dbyd

4

DBYD Authority: Jemena Electricity Networks (Vic) **DBYD Location:** Brooking Road, Gisborne, VIC 3437

Jemena
ABN 82 064 651 083

Legend

LV Cable	Conduit	Drawing Boundary	LV / Lighting Pole	LV / Subtrans. Pole
HV Cable	Asbestos Conduit	Zone Sub. / Terminal Station	LV / HV Pole	LV / HV / Subtrans. Pole
Subtransmission Cable	DBYD Search Area	Distribution Substation	HV Pole	HV / Subtrans. Pole
Fibre Optic / Auxiliary Cable	Connection			Subtrans. Pole

Scale: 1:11968

Issue Date: 24/05/2018
DBYD Seq. No: 71805162
DBYD Job No: 14278709
Overview

WARNING: This is a representation of Jemena Electricity Networks underground assets only and may not indicate all assets in the area. It must not be used for the purpose of exact asset location in order to undertake any type of excavation. Please read all conditions and information on the attached information sheet. This extract is subject to those conditions. The information contained on this plan is only valid for 28 days from the Date of Issue.

DBYD Authority: Jemena Electricity Networks (Vic) **DBYD Location:** Brooking Road, Gisborne, VIC 3437

Jemena
ABN 82 064 651 083

Legend

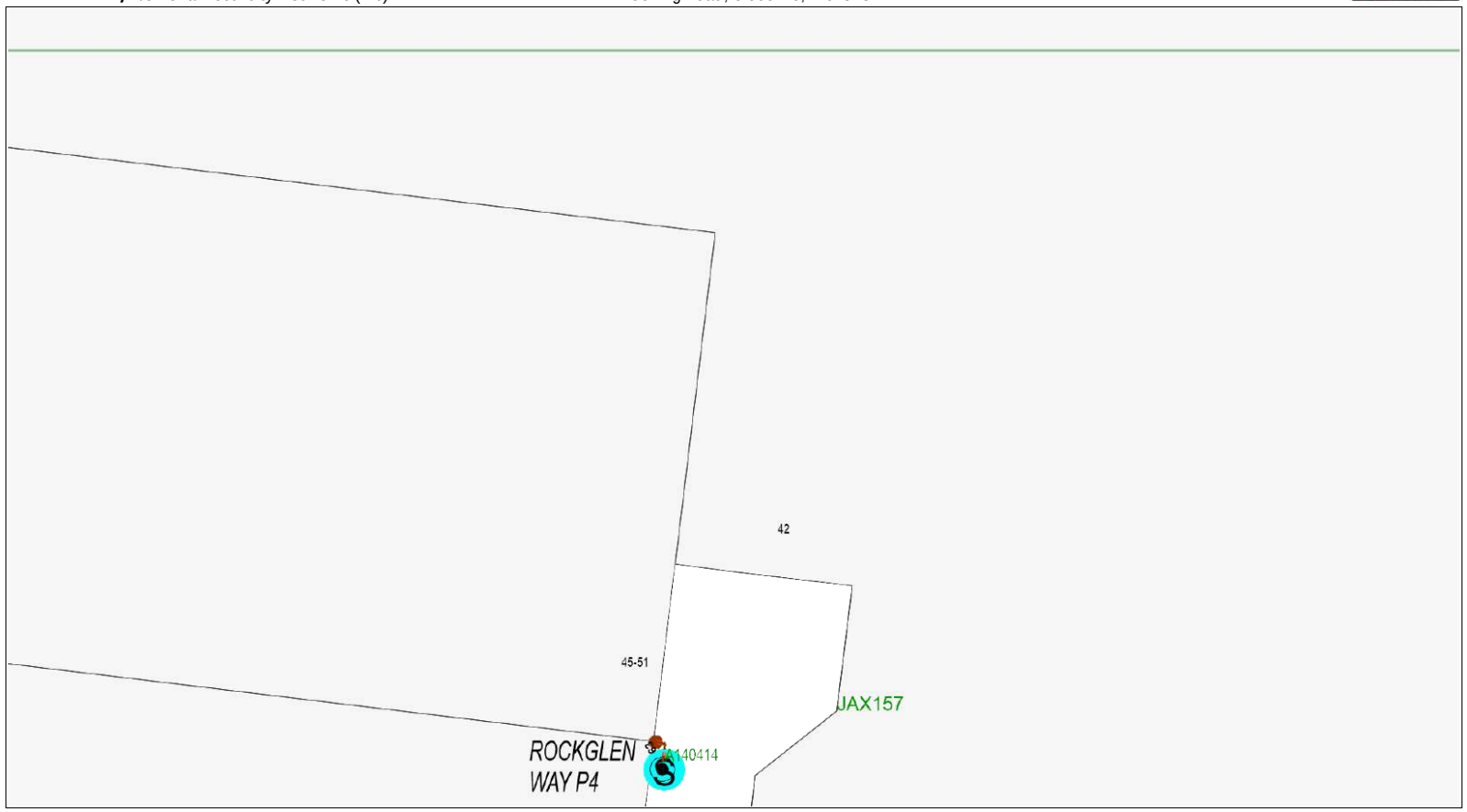
LV Cable
HV Cable
Subtransmission Cable
Fibre Optic / Auxiliary Cable
Conduit
Asbestos Conduit
DBYD Search Area
Connection
Drawing Boundary
Zone Sub. / Terminal Station
Distribution Substation
LV / Lighting Pole
LV / HV Pole
HV Pole
LV / Subtrans. Pole
LV / HV / Subtrans. Pole
HV / Subtrans. Pole
Subtrans. Pole

Scale: 1:1000

Issue Date: 24/05/2018
DBYD Seq. No: 71805162
DBYD Job No: 14278709
Tile No: 1

WARNING: This is a representation of Jemena Electricity Networks underground assets only and may not indicate all assets in the area. It must not be used for the purpose of exact asset location in order to undertake any type of excavation. Please read all conditions and information on the attached information sheet. This extract is subject to those conditions. The information contained on this plan is only valid for 28 days from the Date of Issue.

DBYD Authority: Jemena Electricity Networks (Vic) **DBYD Location:** Brooking Road, Gisborne, VIC 3437



Jemena
ABN 82 064 651 083

Legend

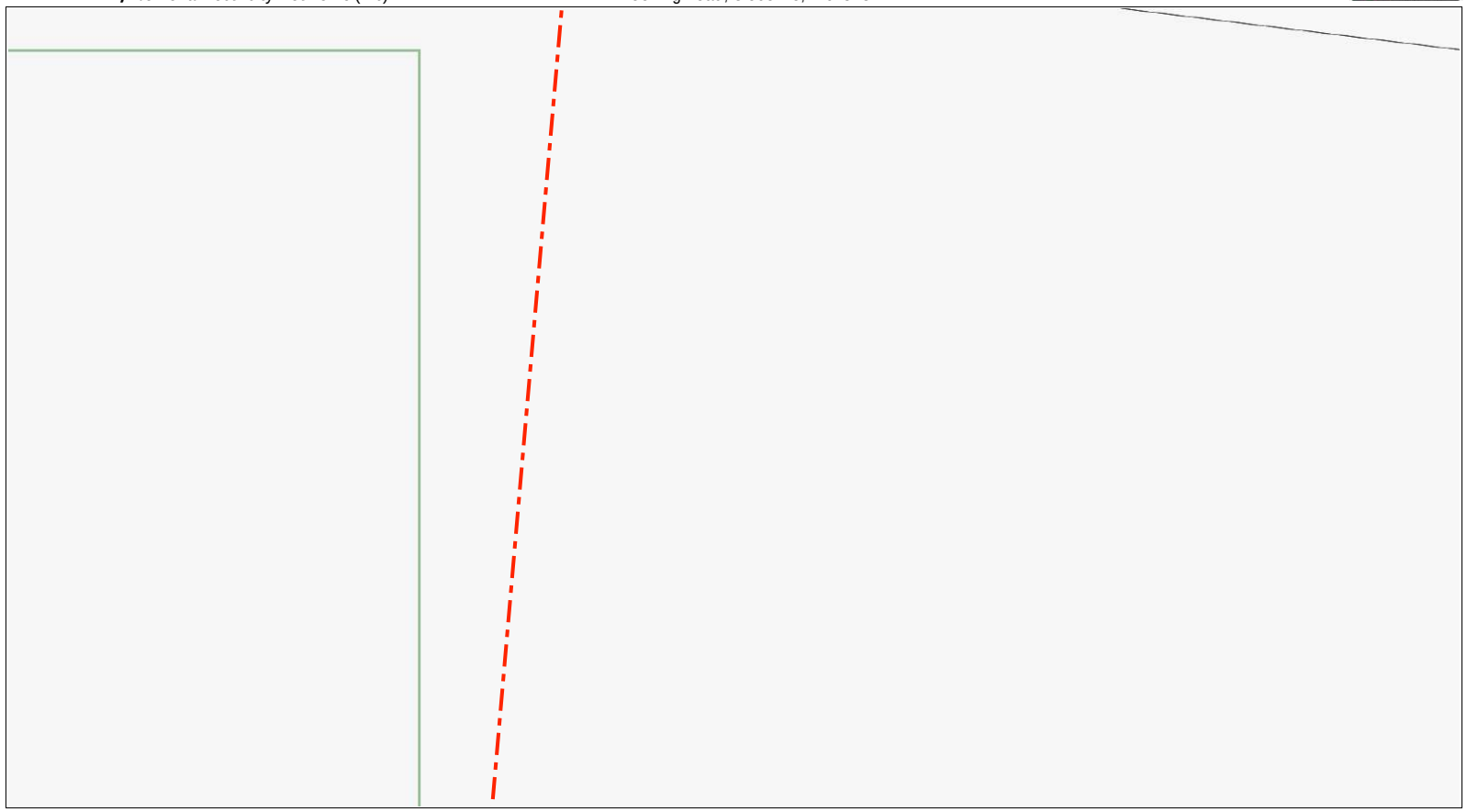
LV Cable, Conduit, Drawing Boundary, LV / Lighting Pole, LV / Subtrans. Pole
HV Cable, Asbestos Conduit, Zone Sub. / Terminal Station, LV / HV Pole, LV / HV / Subtrans. Pole
Subtransmission Cable, DBYD Search Area, Distribution Substation, HV Pole, HV / Subtrans. Pole
Fibre Optic / Auxiliary Cable, Connection, Subtrans. Pole

Scale: 1:1000

Issue Date: 24/05/2018
DBYD Seq. No: 71805162
DBYD Job No: 14278709
Tile No: 2

WARNING: This is a representation of Jemena Electricity Networks underground assets only and may not indicate all assets in the area. It must not be used for the purpose of exact asset location in order to undertake any type of excavation. Please read all conditions and information on the attached information sheet. This extract is subject to those conditions. The information contained on this plan is only valid for 28 days from the Date of Issue.

DBYD Authority: Jemena Electricity Networks (Vic) **DBYD Location:** Brooking Road, Gisborne, VIC 3437



Jemena
ABN 82 064 651 083

Legend

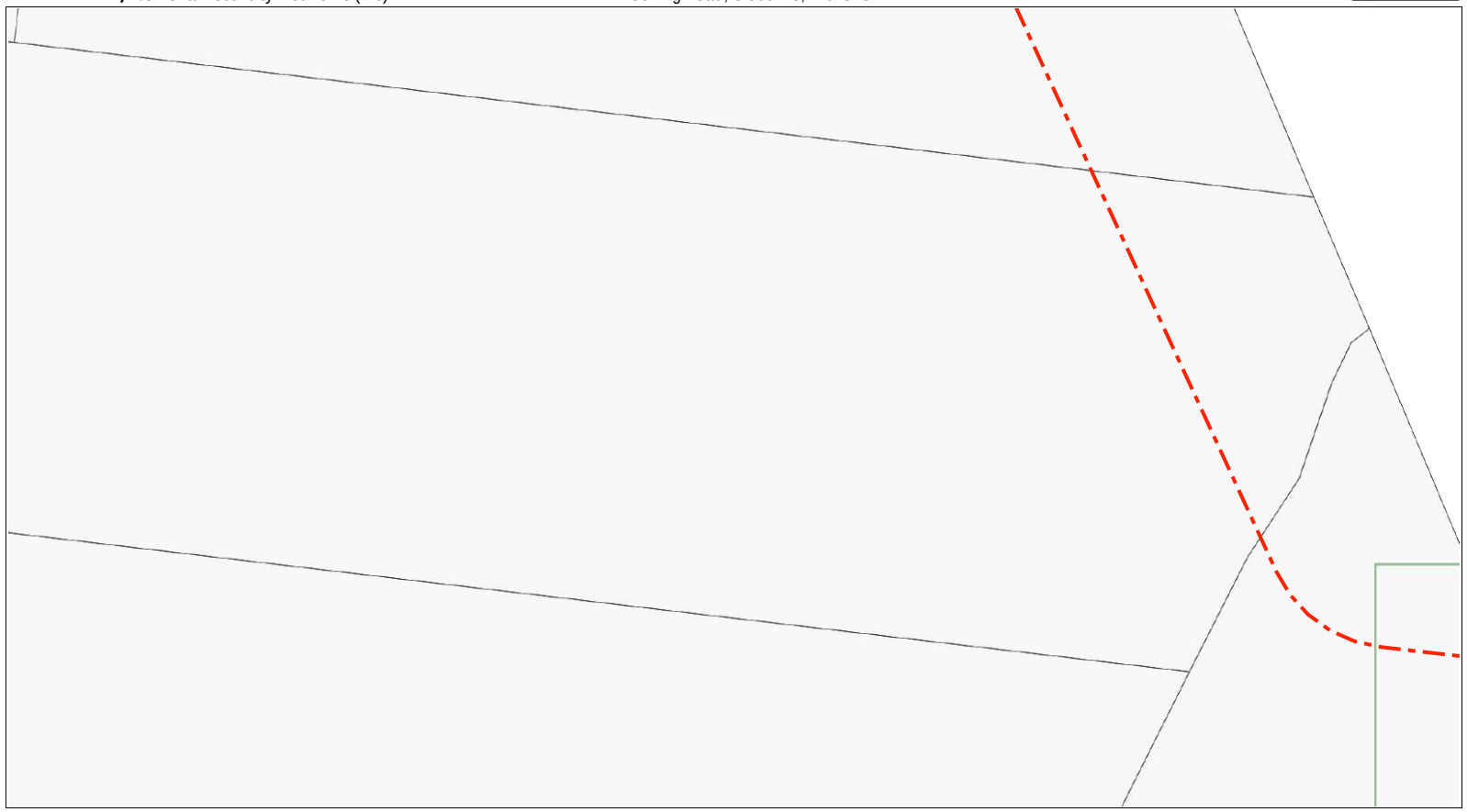
LV Cable
HV Cable
Subtransmission Cable
Fibre Optic / Auxiliary Cable
Conduit
Asbestos Conduit
DBYD Search Area
Connection
Drawing Boundary
Zone Sub. / Terminal Station
Distribution Substation
LV / Lighting Pole
LV / HV Pole
HV Pole
LV / Subtrans. Pole
LV / HV / Subtrans. Pole
HV / Subtrans. Pole
Subtrans. Pole

Scale: 1:1000

Issue Date: 24/05/2018
DBYD Seq. No: 71805162
DBYD Job No: 14278709
Tile No: 3

WARNING: This is a representation of Jemena Electricity Networks underground assets only and may not indicate all assets in the area. It must not be used for the purpose of exact asset location in order to undertake any type of excavation. Please read all conditions and information on the attached information sheet. This extract is subject to those conditions. The information contained on this plan is only valid for 28 days from the Date of Issue.

DBYD Authority: Jemena Electricity Networks (Vic) **DBYD Location:** Brooking Road, Gisborne, VIC 3437



Jemena
ABN 82 064 651 083

Legend

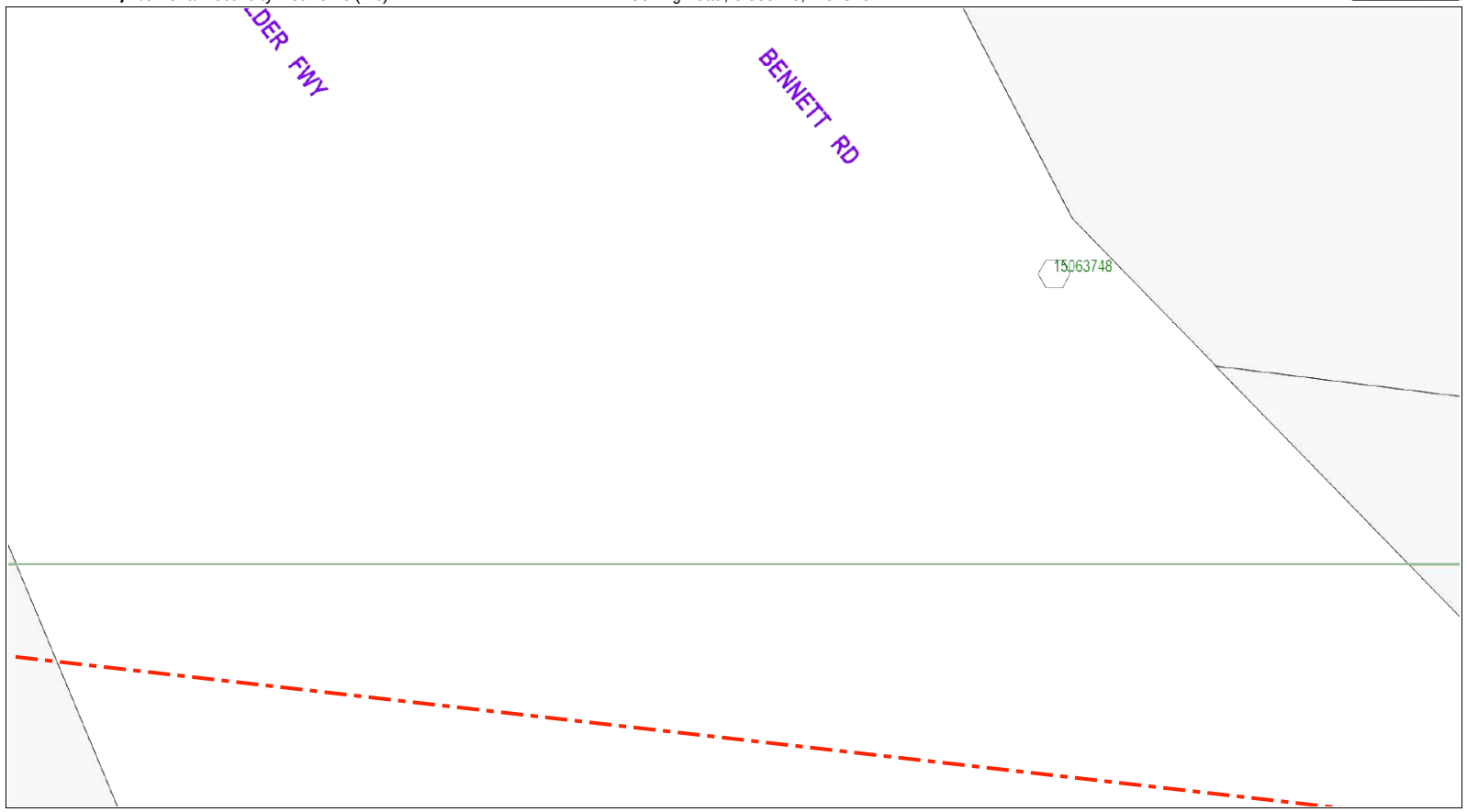
LV Cable
HV Cable
Subtransmission Cable
Fibre Optic / Auxiliary Cable
Conduit
Asbestos Conduit
DBYD Search Area
Connection
Drawing Boundary
Zone Sub. / Terminal Station
Distribution Substation
LV / Lighting Pole
LV / HV Pole
HV Pole
LV / Subtrans. Pole
LV / HV / Subtrans. Pole
HV / Subtrans. Pole
Subtrans. Pole

Scale: 1:1000

Issue Date: 24/05/2018
DBYD Seq. No: 71805162
DBYD Job No: 14278709
Tile No: 4

WARNING: This is a representation of Jemena Electricity Networks underground assets only and may not indicate all assets in the area. It must not be used for the purpose of exact asset location in order to undertake any type of excavation. Please read all conditions and information on the attached information sheet. This extract is subject to those conditions. The information contained on this plan is only valid for 28 days from the Date of Issue.

DBYD Authority: Jemena Electricity Networks (Vic) **DBYD Location:** Brooking Road, Gisborne, VIC 3437



Jemena
ABN 82 064 651 083

Legend

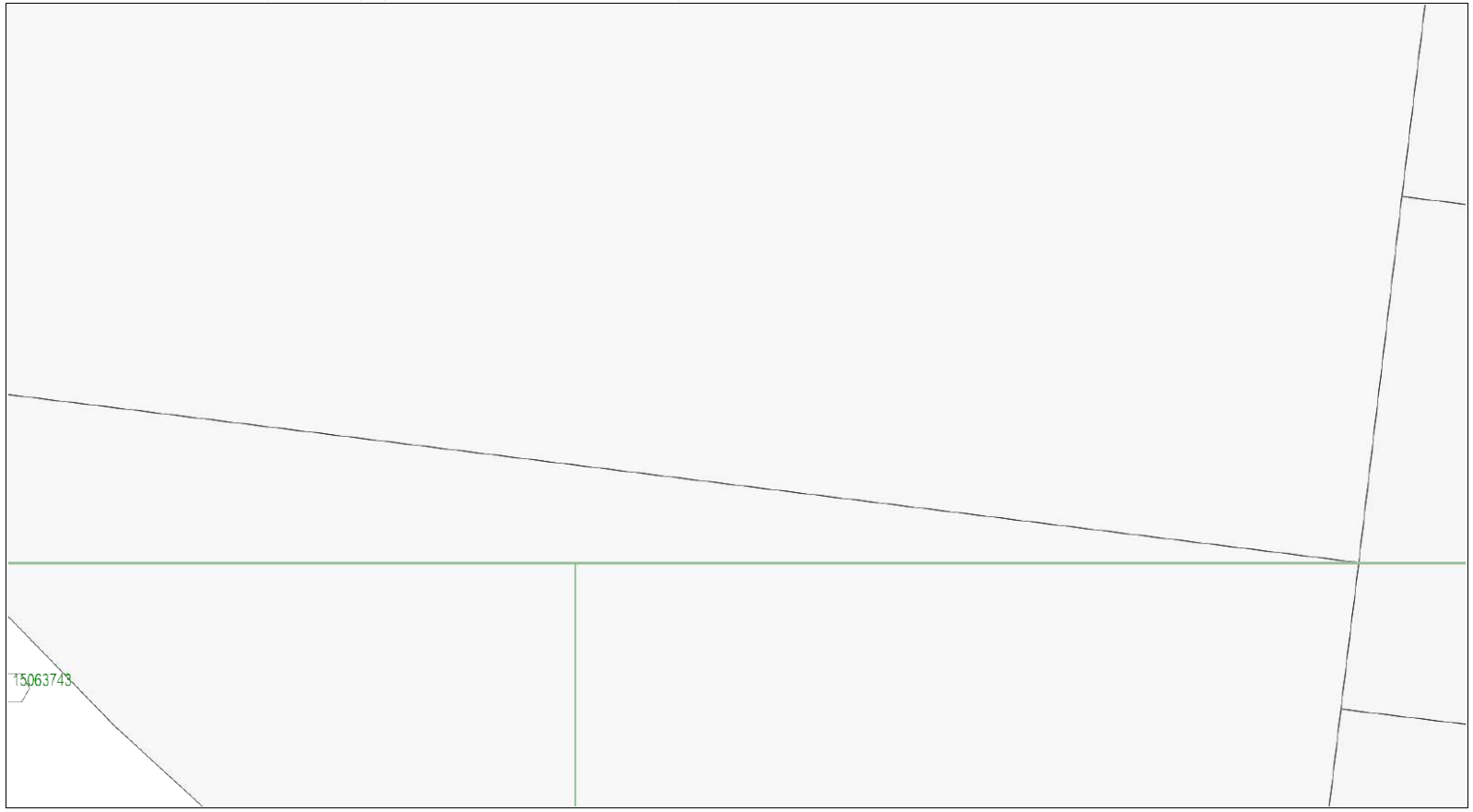
LV Cable, Conduit, Drawing Boundary, LV / Lighting Pole, LV / Subtrans. Pole
HV Cable, Asbestos Conduit, Zone Sub. / Terminal Station, LV / HV Pole, LV / HV / Subtrans. Pole
Subtransmission Cable, DBYD Search Area, Distribution Substation, HV Pole, HV / Subtrans. Pole
Fibre Optic / Auxiliary Cable, Connection, Subtrans. Pole

Scale: 1:1000

Issue Date: 24/05/2018
DBYD Seq. No: 71805162
DBYD Job No: 14278709
Tile No: 5

WARNING: This is a representation of Jemena Electricity Networks underground assets only and may not indicate all assets in the area. It must not be used for the purpose of exact asset location in order to undertake any type of excavation. Please read all conditions and information on the attached information sheet. This extract is subject to those conditions. The information contained on this plan is only valid for 28 days from the Date of Issue.

DBYD Authority: Jemena Electricity Networks (Vic) **DBYD Location:** Brooking Road, Gisborne, VIC 3437



Jemena
ABN 82 064 651 083

Legend

LV Cable
HV Cable
Subtransmission Cable
Fibre Optic / Auxiliary Cable
Conduit
Asbestos Conduit
DBYD Search Area
Connection
Drawing Boundary
Zone Sub. / Terminal Station
Distribution Substation
LV / Lighting Pole
LV / HV Pole
HV Pole
LV / Subtrans. Pole
LV / HV / Subtrans. Pole
HV / Subtrans. Pole
Subtrans. Pole

Scale: 1:1000

Issue Date: 24/05/2018
DBYD Seq. No: 71805162
DBYD Job No: 14278709
Tile No: 6

WARNING: This is a representation of Jemena Electricity Networks underground assets only and may not indicate all assets in the area. It must not be used for the purpose of exact asset location in order to undertake any type of excavation. Please read all conditions and information on the attached information sheet. This extract is subject to those conditions. The information contained on this plan is only valid for 28 days from the Date of Issue.

DBYD Authority: Jemena Electricity Networks (Vic) **DBYD Location:** Brooking Road, Gisborne, VIC 3437

Jemena
ABN 82 064 651 083

Legend

LV Cable
HV Cable
Subtransmission Cable
Fibre Optic / Auxiliary Cable
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Issue Date: 24/05/2018
DBYD Seq. No: 71805162
DBYD Job No: 14278709
Tile No: 7

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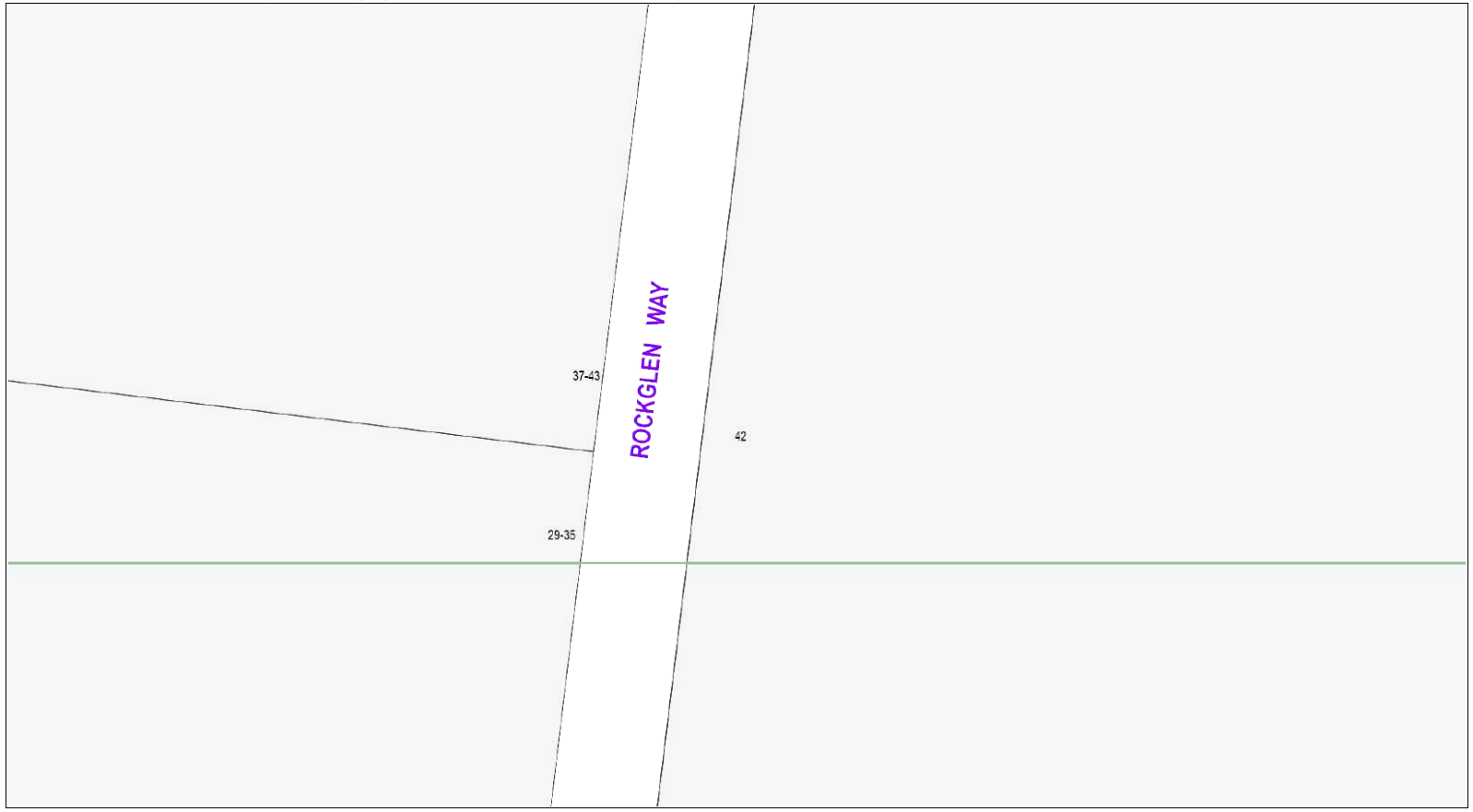

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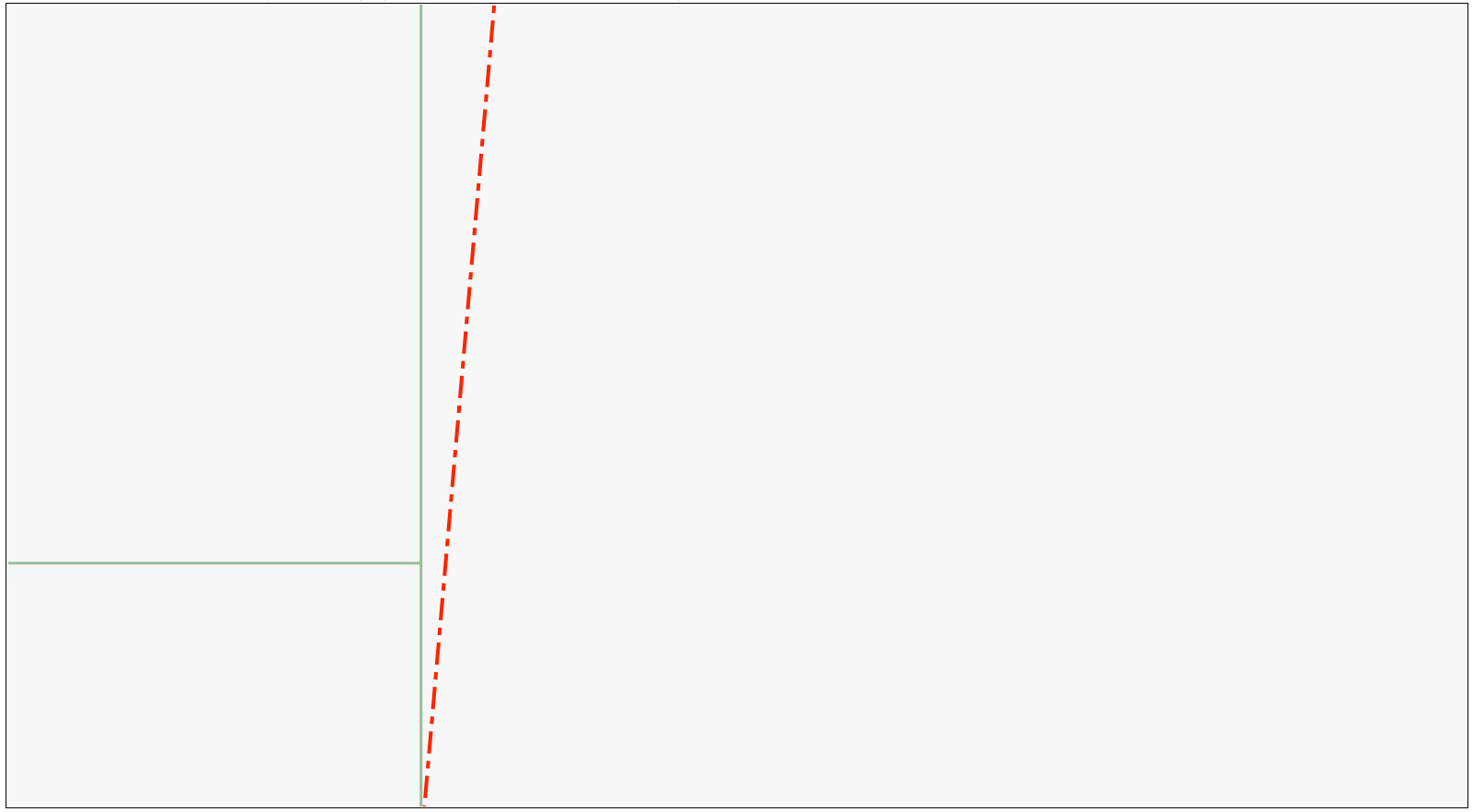

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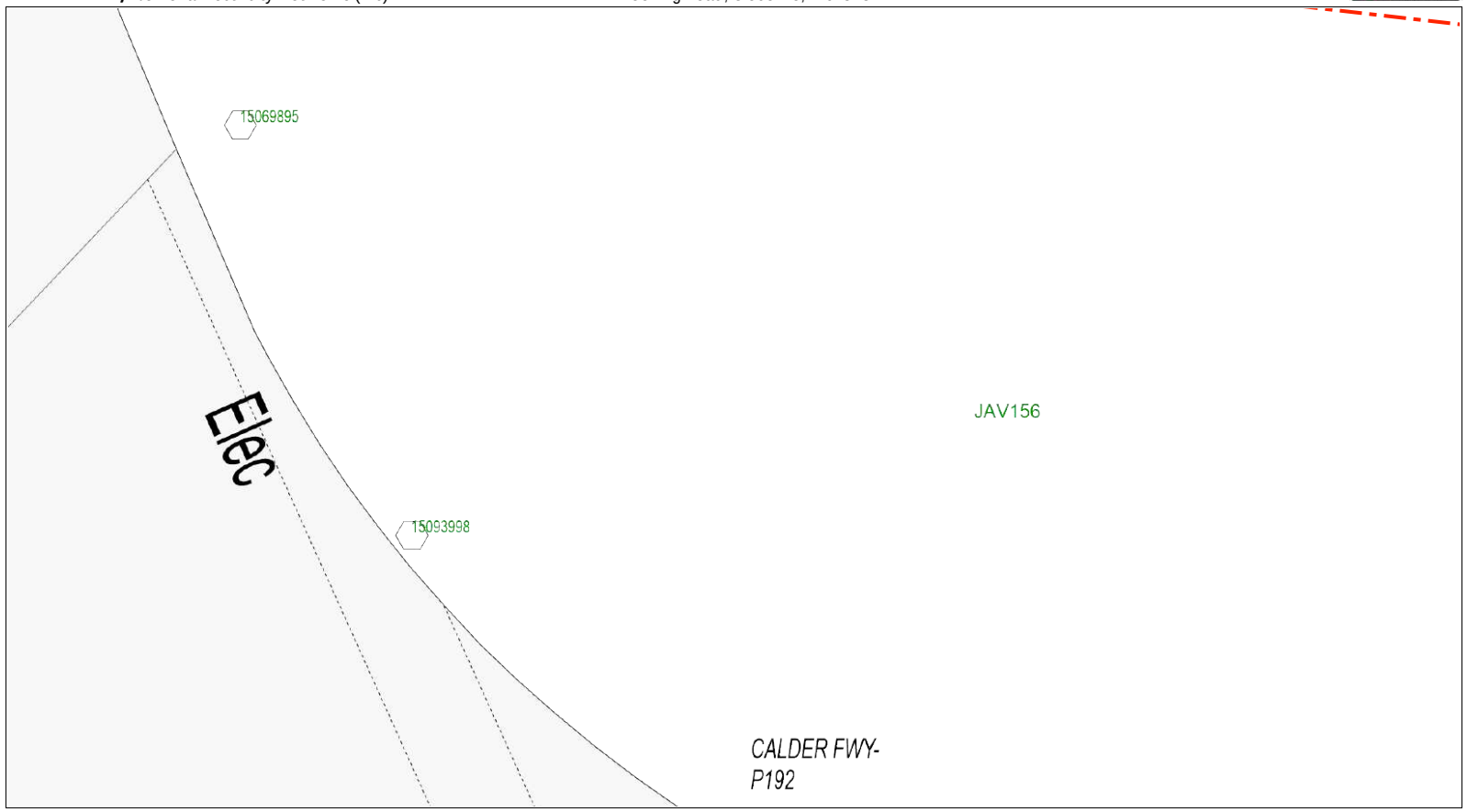

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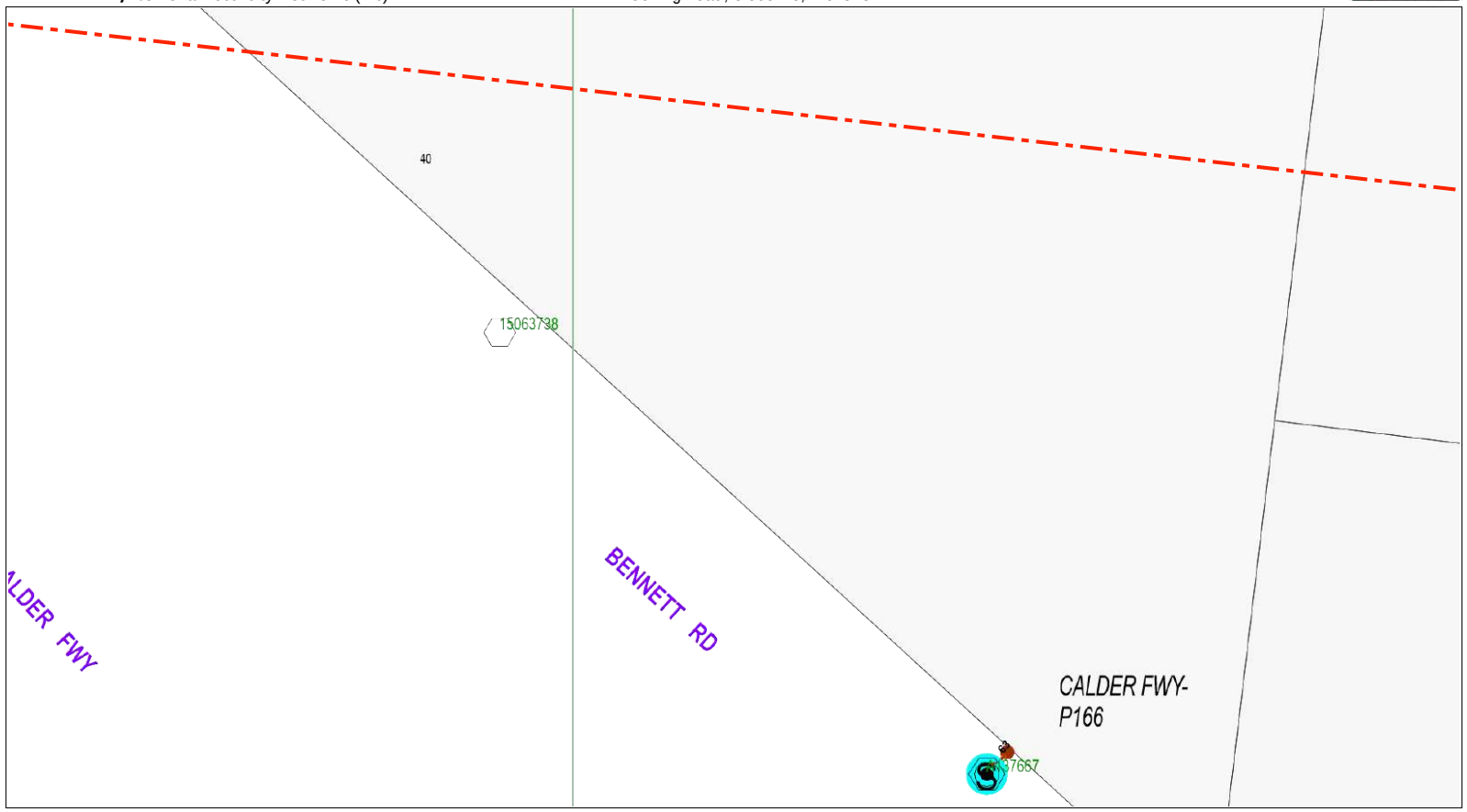

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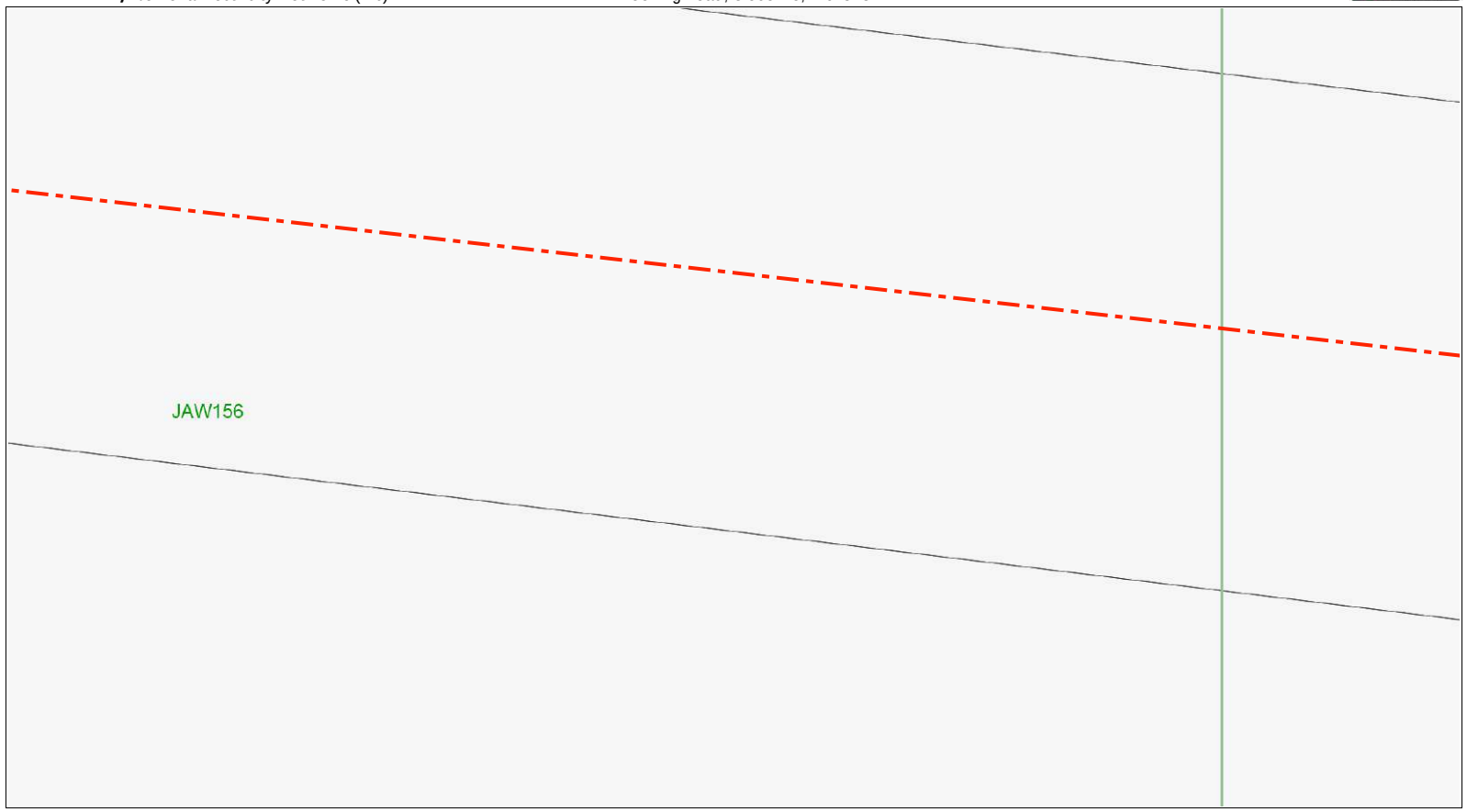

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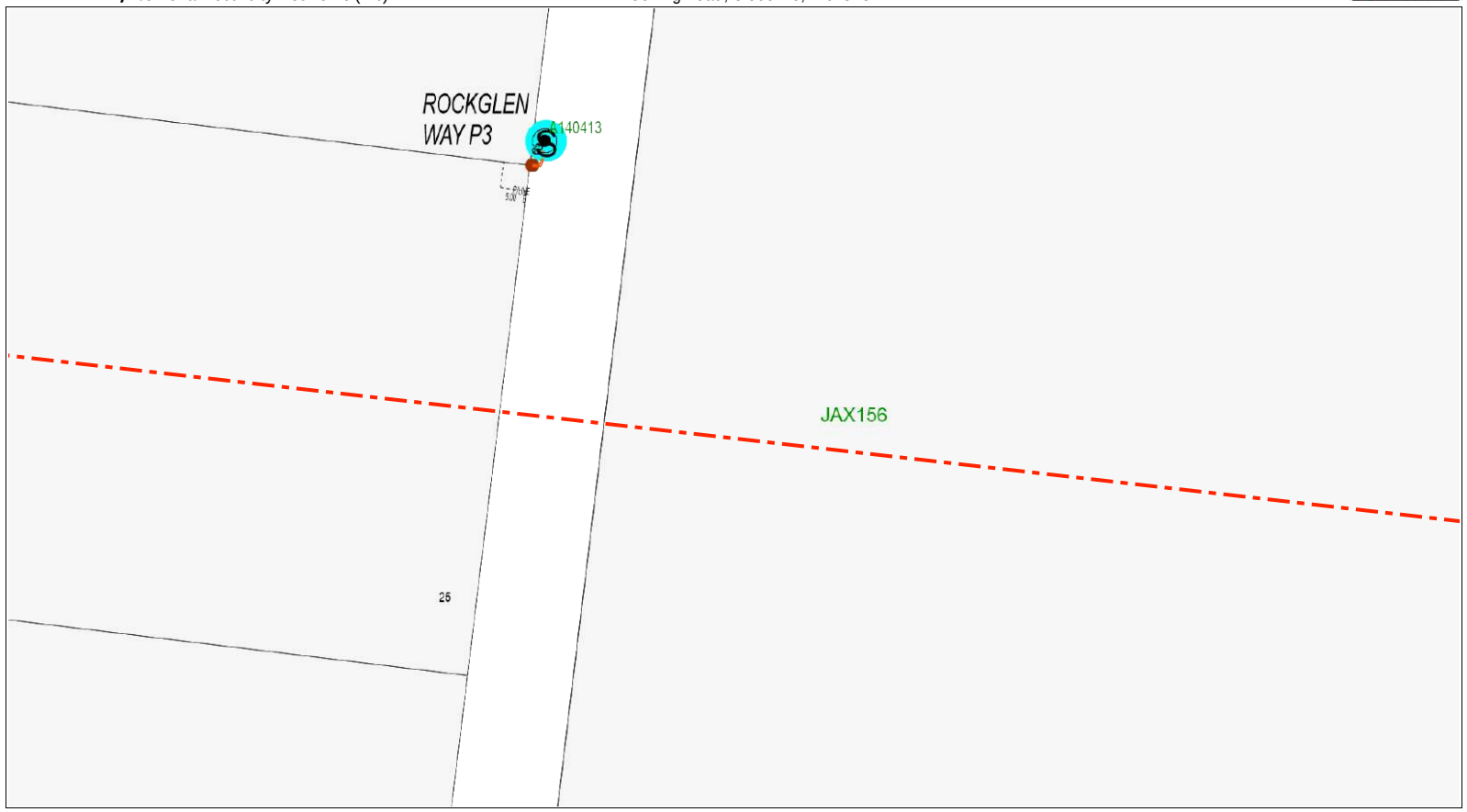

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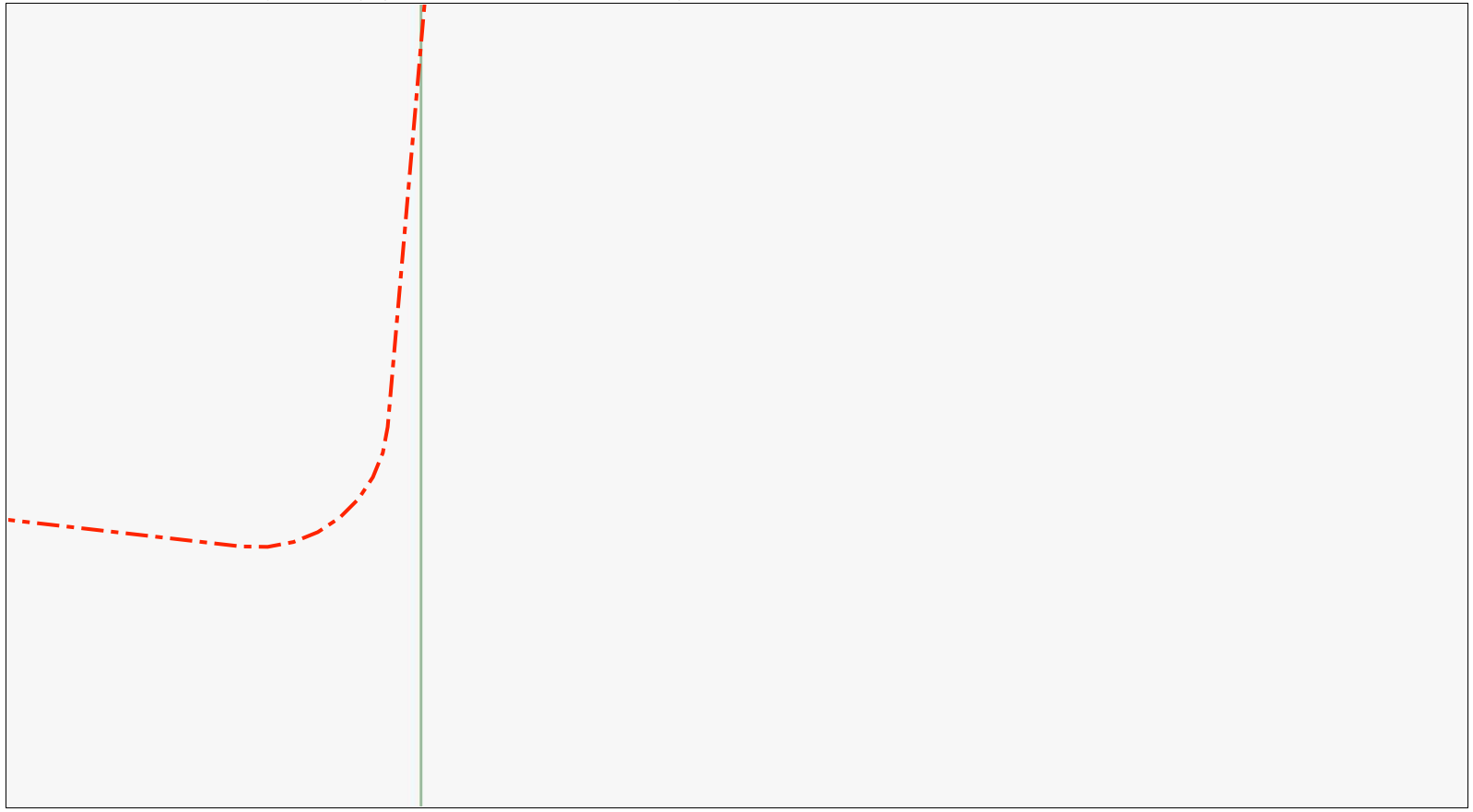

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Archaeo-Environments Pty Ltd
heritage soils and landscape

Bennett Road Development Plan
Gisborne South

LAND CAPABILITY & STORM WATER REVIEW

Land Capability Assessor
Dr Chris Day
Archaeo-Environments Pty Ltd
ABN 89 119 932 437

Rev 5 December 4 2021

LAND CAPABILITY AND STORM WATER REPORT
Bennett Road Development Plan, Gisborne South

ABOUT THE AUTHORS

Dr Chris Day DPhil, MIFA Director, Archaeo-Environments Ltd
Chris has over 35 years experience in geology, geomorphology, soils and heritage work which included 12 years in Bendigo and Benalla with DSE. This included management of catchment and salinity research teams and soil and soil permeability (recharge) mapping as a basis for Dryland Salinity Management Plans across the Avoca, Loddon, Campaspe and Goulburn Broken Catchments.

Larry White B Agr Sc., $CPSS_3$, CPAg, CENVP
Larry has over 45 years of experience in land and soils management with preparation of land capability assessment and land management plans throughout Victoria since 1990.
Larry has held senior research positions with Victorian Land Protection and Department of Conservation as well as EPA and Golder Associates. Larry has prepared over 500 land capability and land management plans, VCAT hearings and consulting work with various Shires throughout Victoria

1 INTRODUCTION

A land capability and storm water review has been commissioned by various landowners for a Development Plan for 130ha at Bennett Road, Gisborne. The land is subject to Macedon Ranges Planning Scheme Development Plan Overlay 18 (DPO18) and also the Rural Living Zone Schedule 2 under the recent C110 Planning Scheme Amendment. A Development Plan is required and will provide an overview document for a future planning permit application.

The land is not within a Declared Water Supply Catchment. The aim of this report is to identify the various issues which will inform sub-division and a planning permit application to Macedon Ranges Shire Council.

1.1 SCOPE OF WORKS

The land capability and storm water review will include a summary of potential site issues relevant to local planning requirements as follows :

> To demonstrate the capacity of infrastructure to service the proposed lot density of the development ; retain waste water on site; treat, retard and reduce stormwater; and reduce any impacts on soil and water downstream of the development

The scoping study is conservative, aimed at the protection of environmental and human health. It is not intended to support a particular proposal, but rather to describe the existing land parcels and suggest how adverse environmental impacts of the proposal may be minimised. Field work was conducted on March 24, 2018.

2.0 DATA SCOPE AND LIMITATIONS

The land planning assessment has been prepared by Dr. Chris Day (Archaeo-Environments Ltd) and Larry White (Paladin White Pty Ltd). Mapping and assessment has been conducted at a scale of 1 : 2500 and provides a guide and professional overview of site conditions. Terrain mapping, soil properties, climatic and botanical data are based on reconnaissance field-work and regional data sources for the purpose of reasonable and relevant estimates. As physical conditions, soils and local hydrology may vary over time, the overview assessment on which estimates are made in this report are limited to 18 months. This assessment is sufficient for a broad assessment within DPO18. The report should be used within the scope and scale of the brief and not for detailed design or property layout works or for any development beyond those of the brief. The scope of the Development Plans and more detailed assessment would occur at the time of development of the future lots. The report and recommendations therein are to be used to provide guidance toward - but do not guarantee – planning permission. It is not to be used, in full or in part, by any other party without written permission from the author.

3 LOCATION AND PROPERTY BACKGROUND

3.1 LOCATION

The subject block is composed of 6 properties. The site occupies approximately 130ha in and around Bennett Rd Gisborne. Located within Macedon Ranges Planning Scheme Development Plan Overlay (DPO18) and Rural Living Zone Schedule 2 under the recent C110 Planning Scheme Amendment. Both the Zone and DPO refer to a minimum lot size of 2ha.

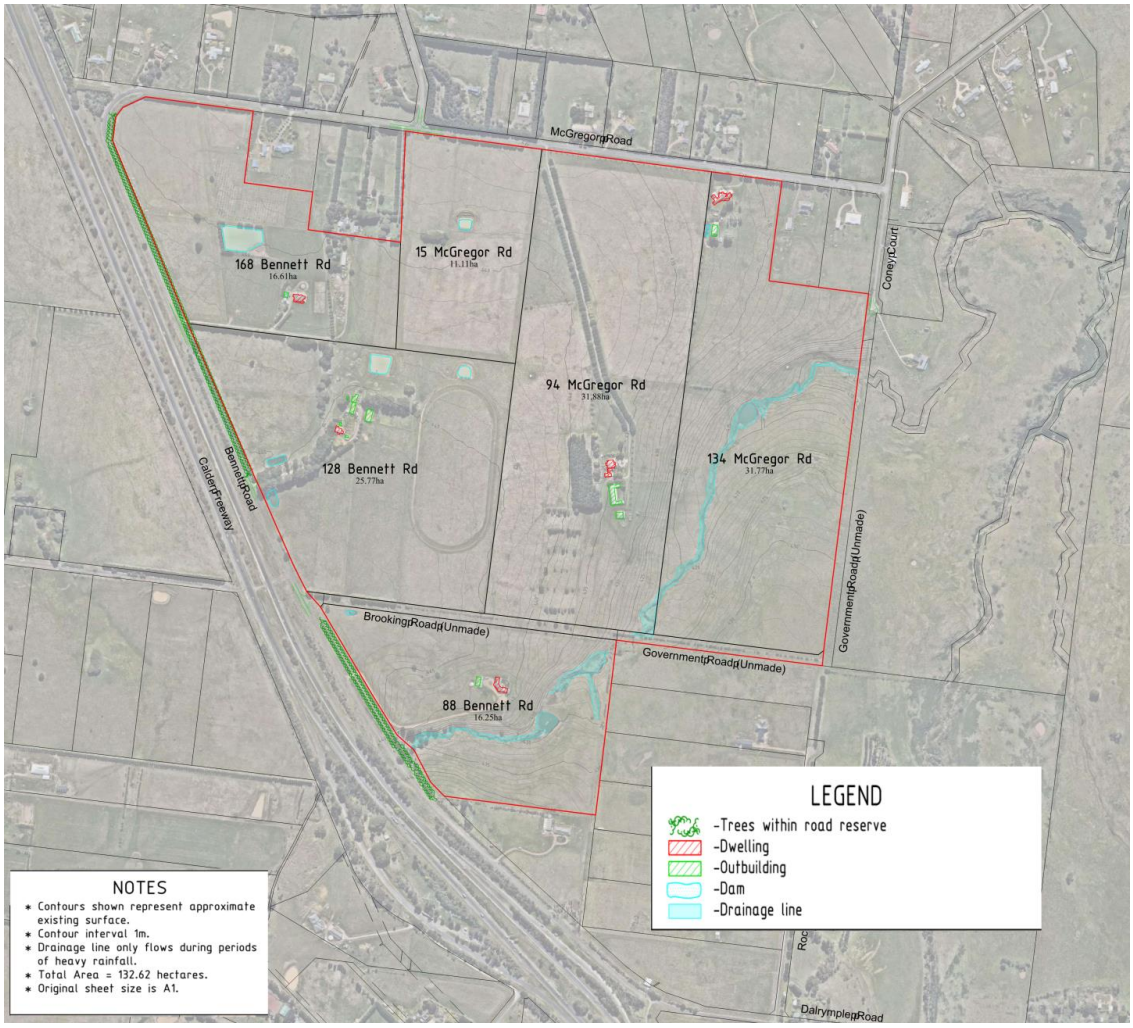

Fig 1 Location Map : Aerial view (courtesy : Terraco Ltd)

3.2 GENERAL SETTING/SITE CONDITION

The property is characterised by a broad and open volcanic plain which includes an incised waterway across the south-west. The block has been almost entirely cleared of native vegetation, with minor clumps of eucalypts (predominantly grey box) and tree plantations, with the main vegetation existing as exotic plantings as driveway avenues and some cypress windbreaks and boundary plantings. There are 10 dams which are for the most part across gentle drainage depressions. The property is fenced throughout with a range of horse property and lifestyle properties.

3.3 USE OF ADJOINING LAND

The subject property is bounded to the west by Bennett Road and the Calder Freeway to the west, McGregor Road to the north and Dalrymple Road to the south with developed blocks to the north and sloping terrain toward Jacksons Creek to the east.

3.4 FACILITIES/INFRASTRUCTURE

3.4.1 Mains Power

Mains power will be available to properties within the site.

3.4.2 Water

Reticulated potable water will be connected to the development area.

3.4.3 Bores and Dams

There are no bores onsite. There are 10 dams on the property. A series of stand-alone dams are situated across the open plain with two dams located across the waterway (Djirri Djirri Creek) to the east. These two dams will be removed under development plans. It is expected that other dams will be seasonal or have minimal volumes in the summer. At the time of inspection most of the dams were essentially dry.

3.4.4 Watertable depth

No groundwater bores were observed on the block. Registered bores are located within 200m of the site boundary to the north and south. Reference was made to the VVS (Visualising Victorias Groundwater) website which interpolates regional bore data. On this basis the watertable depth across the development area varies between 10 and 30m with watertable depth becoming shallower toward the north-west. Groundwater salinity varies between 1-3500mgl and is classed as (b) level beneficial use. On the basis of the VVG website, watertable depth will not be at high risk from effluent disposal across the development area.

3.4.5 Climate

Average annual rainfall is in the order of 750-800mm. A one-in-ten year rain is ~750mm. Average estimated annual evapo-transpiration is in the order of ~1350mm. Evaporation may exceed rainfall for 8 months (September to April) in an “average” year and these dry months may be challenging for agricultural production. The district can experience significant variations in rainfall and temperature and can have very cool winters & warm to hot and windy summers (which can

have implications for vegetation establishment).

3.5 TOPOGRAPHY AND DRAINAGE

The land encompasses a gently undulating volcanic terrain which falls toward the north and north-east. Water flow and local drainage is predominantly toward an incised waterway (Djirri Djirri Creek) which extends across the south-east corner of the property. Otherwise drainage across the property is via very gentle drainage swales and undefined drainage depressions. There is rock outcrop along the edge of low escarpments above the main drainage line to the east as well as within a stoney rise in the south-east part of the block.
Land form and soil description is based on field inspection and reference to the report : A Study of the Land in the Catchments to the North of Melbourne (Jeffrey P J 1981) SCA. Fig 2 shows general landform and land units across the development area.

Five main land units have been mapped across the development area.

LU 1 Open plain
LU2 Gentle-moderate slopes
LU3 Steep slopes
LU4 Valley floor
LU5 Stoney rise (o/c)

3.6 SOILS-LANDFORMS and WASTE WATER MANAGEMENT

Geology across the development area has been described in Section 3.5 as undulating volcanic terrain. The pattern of soils across this landscape reflects soil development across the large and predominant volcanic plain land unit with smaller soil units within valley edge and drainage features to the east of the property. Soils have been mapped for each land unit as follows :

LAND UNIT 1

Land Unit 1 is the predominant land type occupying the majority (73%) of the development area. Soils are typically deep volcanic silty clay (Plate 1) with soil profile described in Table 1 below

<u>Soil profile</u>
Yellow-grey sodic duplex soils, coarse structure clay loam
Moderate-low permeability – 5-10cm/day
Soil depth 1-1.5m deep.
Land Capability Rating Fair
Design loading rate (DLR) 2.5L/m^2/day
Constraints : Localised area of flat-gentle slopes, poor drainage or floaters will require site by site investigation.

<u>Summary (on-site WW disposal):</u>
Soils across land unit 1 would present generally suitable conditions for effluent disposal with estimated waste water envelopes at 300-450m^2 in area for 3-5 bedroom dwellings. At individual 2ha block level some localised conditions may require lot by lot assessment and design subject to location of building envelopes etc..

Plate 1 Typical deep yellow-grey clay loam across land unit 1

Plate 2 View to south across land unit 1 and location of auger hole

LAND UNIT 2

Land unit 2 occupies (16%) gentle-moderate slopes along Djirri Djirri Creek to the east of the development area. Soils are typically reddish-brown volcanic silty clay, stoney in part (Plate 1) with soil profile described :

<u>Soil profile</u>
Reddish-brown duplex soils, coarse structure clay loam. Some basalt floaters within the profile.
Moderate-low permeability – 5-10cm/day
Soil depth 0.5-0.8m deep.
Land Capability Rating Fair
Design loading rate (DLR) 3L/m^2/day
Constraints : Localised areas of shallow soils and stoney subsoils will require site by site investigation.

Summary (on site WW disposal) :
Soils across land unit 2 would present generally suitable conditions for effluent disposal with estimated waste water envelopes at 300-400m^2 in area for 3-5 bedroom dwellings.
At individual 2ha block level some localised conditions may require lot by lot assessment.

Plate 3 View to south across mid-slope soil exposure

Plate 4 View to north-east across Land Unit 2

LAND UNIT 3

Land unit 3 occupies 2% of the development area, small areas of steep and stoney ground (2%) commonly along the edge of Djirri Djirri Creek across the eastern part of the development area. Soils are typically shallow reddish-brown clay loam with common basalt outcrop (Plate 1) with soil profile described :

Soil profile
Reddish-brown duplex soils, coarse structure clay loam. Common basalt floaters and outcrop within the profile.
Moderate permeability – 10-30cm/day
Soil depth 0.2 – 0.8m deep.

Land Capability Rating Very poor
Design loading rate (DLR) 3L/m^2/day
Constraints : Common areas of bedrock outcrop and shallow stoney subsoils.

Summary (on site WW disposal):
Soils across land unit 3 would present poor conditions for effluent disposal with waste water disposal considered high risk in this area. These areas will be included within the drainage line reserve and will therefore be exempt from development.

Plate 5 View to south across Land unit 3 (to north of Djirri Djirri Creek).

LAND UNIT 4

Land unit 4 occupies 6% and includes Djirri Djirri Creek and surrounding low slopes to the eastern part of the development area. Soils are typically dark grey-black uniform clay soils of low permeability with soil profile described :

Soil profile
Dark grey-black clay soils with heavy clay subsoils.
Low permeability – 1-10mm/day
Soil depth 1.0 – 1.5m deep.
Land Capability Rating Very poor
Design loading rate (DLR) 2L/m^2/day
Constraints : Common areas of waterlogging and poor drainages.

Summary (on site WW disposal):
Soils across land unit 4 would present poor conditions for effluent disposal with estimated waste water envelopes at 450-550m^2 in area for 3-5 bedroom dwellings. Heavy clay soils and occasional waterlogging risk may require additional management measures. Much of Land Unit 4 lies within the drainage line reserve and will be exempt from development.

Plate 6 Soil profile (Land Unit 4) showing deep clay subsoil.

Plate 7 View to south-east across land unit 4.

LAND UNIT 5

Land unit 5 (5%) is located on a gentle hillcrest in the south-east part of the development area. Bedrock outcrop is high in this area with shallow stoney soils. Soils are typically dark grey-black uniform clay soils of low permeability with soil profile described :

<u>Soil profile</u>
Dark grey-black clay soils with heavy clay subsoils.
Low permeability – 1-10mm/day
Soil depth 1.0 – 1.5m deep.
Land Capability Rating Very poor
Design loading rate (DLR) 2L/m^2/day
Constraints : Common areas of waterlogging and poor drainage.

Summary (on site WW disposal):
Soils across land unit 5 would present poor conditions for effluent disposal with likely additional management design and estimated waste water envelopes at 450-550m^2 in area for 3-5 bedroom dwellings. Presence of bedrock outcrop would require careful design of WW envelope and additional excavation work or adoption of secondary treatment and subsurface irrigation for example. However the large size (2ha) of lots within Land unit 5 would be expected to include parts of Land unit 2 which provides suitable conditions for waste water disposal.

Plate 8 View to south across land unit 5 showing common bedrock outcrop

3.7 SETBACKS

A 60m waste water envelope setback from the (non-potable) waterway (Djirri Djirri Creek) across the eastern part of the development area is shown in Fig 2 and is in accord with Table 5 (EPA Septic Code 2016) with use of a primary system. As the development area is not part of a declared water supply catchment final setback requirements will be subject to advice from MRSC with possible referral to Western Water. The EPA Code (2016) also allows a 30m setback with use of a secondary system. A 30m setback is recommended around isolated dams should they be retained. The dams located along Djirri Djirri Creek will be decommissioned.

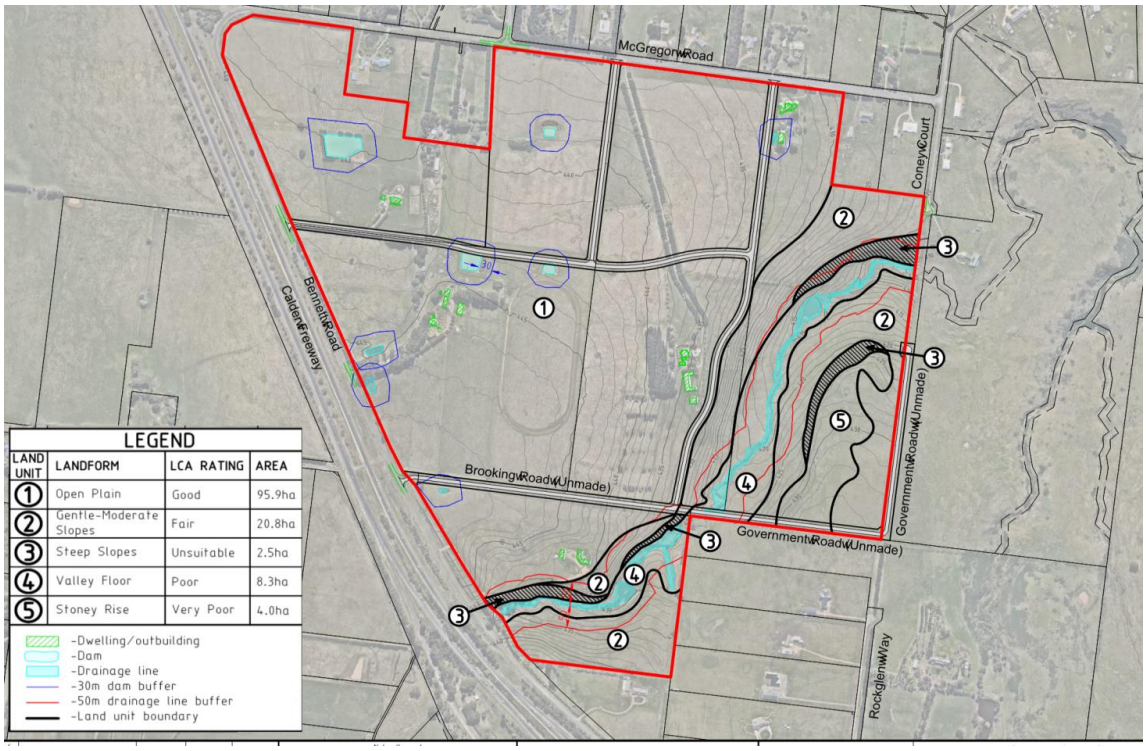

Fig 2 Land Unit Map (Courtesy Terraco Ltd)

4.0 WASTE WATER MANAGEMENT – LAND CAPABILITY

A summary of soil and environmental properties across the subject property is described in Section 3 above. It is expected that there would be few constraints to wastewater disposal across the majority (73%) of the subject property. Djirri Djirri Creek and areas of rock outcrop to the east of the development area include some areas which will constrain waste water disposal. The concept plan specifies a maximum of 6 lots in this area and subject to detailed assessment under subdivision application. The EPA Septic Code (2016) recommends setbacks from waterways and features and this will include a 60m buffer of the waterway and 30m from various scattered dams in accord with Table 5 (EPA Septic Code 2016).

For each subdivision application for the land an effluent envelope or treatment area must be designated and shown on the proposed lots. The envelopes shall be at least 60 metres or greater from the watercourse top of bank, and created on the plan of subdivision as a restriction or as agreed with the Responsible Authority. EPAs Code of Practice – Onsite Wastewater Management determines septic field setbacks required from waterways, at 60 metres for a primary treatment system and 30 metres for a secondary treatment system.

4.1 LAND CAPABILITY SUMMARY TABLE

Table 1 presents a summary of landform, soil and land capability values across the development area with suggested constraints and WW management for planned 2ha lot development. The summary of information is in general compliance with the EPA Septic Code and general MAV standards.

Table 1 Land capability summary

Land Unit	Landform	Area (ha)	Soil type	Slope %	Percolation (est) cm/day	LCA rating	On site WW comment (2ha lots)
1	Open Plain	73	Yellow-grey clay loam	0-2	5-10	Good	Few constraints. Subject to individual assessment.
2	Gentle-Mod plain	16	Reddish-brown silty clay (floaters)	7-10	10-20	Fair	Few constraints. Subject to individual assessment
3	Steep slopes	2	Reddish brown clay and common bedrock outcrop	12-25	20-50	Very poor	Highly constrained. No development likely
4	Valley floor	6	Dark grey-black heavy clay	1-3	0.5-1.0	Poor	Heavy soils and low permeability. Some waterlogging risk. Most of the area within 60m buffer.
5	Stoney rise	3	Shallow stoney soil and bedrock outcrop	2-4	20-50	Very Poor – additional WW management required.	Constrained by bedrock outcrop. Secondary treatment and additional excavation work necessary.

4.2 EXAMPLE OF SIZING OF WASTE WATER ENVELOPE (CASE STUDY)

While the sizing of waste water envelopes on individual lots is beyond the scope of this study, an indicative sizing of a WWE is summarised below. There are commonly two methods for assigning the size of WWEs which incorporate (i) design loading rates which use soil permeability and daily effluent volumes and (ii) a water-nitrogen balance.

An example of sizing of waste water envelopes across 2ha lots for Land Unit 1 which occupies the largest part of the development area uses an assumption of a 4 bedroom dwelling and 750 litres/day effluent volumes and adoption of a conventional trench septic system.

4.2.1 Waste water envelope – land application

(i) DESIGN LOADING RATE

The critical time for wastewater application will be during the winter period. Based upon the estimated household discharge for a 4BR house (up to 750L/day) and with an application rate (DLR) of 3.0L/m^2/day (based on low-moderate percolation rates on deep volcanic sub-soils onto a series of raised, disposal areas (garden or treed), there would be a requirement for an area of 250m^2 to address the wastewater disposal needs for any new dwelling on this property. It is expected that this estimate of WWE area would be increased to 300m2 to provide an additional buffer. It is expected that within Land Unit 1 that there would be ample room for design of a waste water field of these dimensions within the 2ha lots across the development area.

A conventional trench system of 120-150m would appear to be sufficient to carry the hydraulic load from the new dwelling. Layout design may vary, with 3 trenches (such as 40-50m long, 70cm wide and 60cm deep) with appropriate setbacks. Other configurations may suit, subject to individual site conditions, owner preference, site design and plumbing contractor advice.

(ii) WATER – NITROGEN BALANCE

A water-nitrogen balance using various rainfall, environmental and effluent volumes has been generated for proposed discharge from a 4 bedroom dwelling (Table 1 below)

As a general guide to sizing waste water envelopes within the 2ha lots the following water-nitrogen balance has incorporated various parameters (rainfall Macedon station, estimated discharge from a 4br home, evapotranspiration and nitrogen factors). The water-nitrogen balance incorporates rainfall and evapotranspiration data and various soil properties.

TABLE 2 Water – nitrogen balance assuming 4br dwelling on Land Unit 1.

(Template supplied courtesy P Williams)

Paul Williams & Associates Pty Ltd CD00002

WATER/NITROGEN BALANCE (20/30/10): With no wet month storage.

Rainfall Station: Macedon Forestry/ Evaporation Station: Malmsbury

Location: LAURISTON

Date: #####

Client: Chris Day

ITEM	UNIT	#	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Days in month:		D	31	28	31	30	31	30	31	31	30	31	30	31
Evaporation (Mean)	mm	A	205	176	124	75	47	27	27	43	66	105	126	152
Mean Rainfall	mm	B1	79	98	91	104	139	139	132	138	129	125	114	108
Effective rainfall	mm	B2	71	88	82	94	125	125	119	124	116	113	103	97
Peak seepage Loss[1]	mm	B3	171	154	171	165	171	165	171	171	165	171	165	171
Evapotranspiration(IXA)	mm	C1	92	79	56	34	21	12	12	19	30	47	57	68
Waste Loading(C1+B3-B2)	mm	C2	192	145	144	105	67	52	64	66	79	105	119	142
Net evaporation from lagoons (10(0.8A-B1xlagoon area(ha)))	L	NL	0	0	0	0	0	0	0	0	0	0	0	0
Volume of Wastewater	L	E	23250	21000	23250	22500	23250	22500	23250	23250	22500	23250	22500	23250
Total Irrigation Water(E-NL)/G	mm	F	66	60	66	64	66	64	66	66	64	66	64	66
Irrigation Area(E/C2)annual.	m^2	G												
Surcharge	mm	H	-125	-85	-78	-41	0	12	3	1	-14	-39	-55	-75
Actual seepage loss	mm	J	45	69	93	124	170	177	173	171	151	132	110	95
Direct Crop Coefficient:		I	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45
Rainfall Retained: 90	%	K	1. Seepage loss (peak) equals deep seepage plus lateral flow: 5.4mm (<10% ksat)											
Lagoon Area: 0	ha	L	CROP FACTOR											
Wastewater(Irrigation): 750	L	M	0.7	0.7	0.7	0.6	0.5	0.45	0.4	0.45	0.55	0.65	0.7	0.7
Seepage Loss (Peak): 5.5	mm	N	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45
Irrig'n Area(No storage): 350	m^2	P2	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
Application Rate: 3.0	mm	Q	1	1	1	1	1	1	1	1	1	1	1	1
Nitrogen in Effluent: 30	mg/L	R												
Denitrification Rate: 20	%	S												
Plant Uptake: 220	kg/ha/y	T												
Average daily seepage: 4.1	mm	U												
Annual N load: 6.57	kg/yr	V												
Area for N uptake: 299	m^2	W												
Application Rate: 2.5	mm	X												
Irrig'n Area (adjusted for slope) 420	m^2	Z												
Application Rate (Design): 1.8	mm	Z1												

NITROGEN UPTAKE:

Species:	Kg/ha.yr	pH	Species:	Kg/ha.yr	pH	Species:	Kg/ha.yr
Ryegrass	200	5.6-8.5	Bent grass	170	5.6-6.9	Grapes	200
Eucalyptus	90	5.6-6.9	Couch grass	280	6.1-6.9	Lemons	90
Lucerne	220	6.1-7.9	Clover	180	6.1-6.9	C cunn'a	220
Tall fescue	150-320	6.1-6.9	Buffalo (soft)	150-320	5.5-7.5	P radiata	150
Rye/clover	220		Sorghum	90	5.6-6.9	Poplars	115

1.2 x hydraulic area (10% to 20% slope)

Based on Water-Nitrogen Balance Calculations shown above which assume 600L/day waste water use and effective rainfall, evapotranspiration and soil seepage parameters, the irrigation area (no wet month storage) = **350m²**

NOMINATED WW APPLICATION AREA

(i) According to DLR estimates cited above, the estimated irrigation area = 250m2 upgraded to 300m².

(ii) According to Water - Nitrogen Balance* above the estimated irrigation area (no storage) = 350m²

*This value is highly dependent on (conservative) soil percolation estimates and an overestimate of monthly rainfall.

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Accounting for both methods of WWE approximation, the more conservative estimate from the Water Balance indicates the area required for land application (350m^2).

4.2.3 Conventional Waste Water System (example)

A conventional system is a passive system, which does not require connection to electricity. If carefully located, installed and routinely inspected there should be a low risk of failure or break down. A conventional system can also be used for intermittent occupancy patterns.

Treatment

- Treatment should be via a septic tank having an EPA Certificate of Approval and with fittings meeting Australian Standards AS1546.
- The tank should be inspected annually and pumped out every three years or earlier if required. Pump outs should be reported to Council.

Disposal Field

- Disposal field will be designed within the 2ha lot area according to various setback requirements and individual site design.
- The chosen disposal field should be planted out in the early stages of development to allow establishment of vegetation such as trees and shrubs.
- Beds could be built up with mulch to a depth of at least 100mm.
- Vegetation across the WWE will assist with water and nutrient uptake.

4.2.4 General waste water management per 2ha lot

Local soils across Land Unit 1 are deep and relatively well-drained.
The WWE should be re-vegetated with shrubs and trees to enhance transpiration and maximize soil-water storage, particularly during winter months. .
To ensure the viability of the vegetation on a disposal field, it may occasionally be necessary for supplementary watering in very dry times.
The active disposal field should be restricted from access by vehicles, children, pets and visitors.
New owner/occupants should be made familiar with management and permit requirements
If there are plans for house extensions, the wastewater management program should be reviewed by Council.

5.0 SUMMARY

It is emphasised that the development area is not part of a declared water supply catchment. Given proposed 2ha lot size it is expected that building and waste water envelopes could be assigned to adequately managed waste water disposal. There may be localised constraints which would be identified at individual lot resolution. On this basis, waste water could be retained and treated on site.

Areas where land is steep, mainly within the 60m drainage line buffer, will not require WW service. Land Unit 4 and Land Unit 5 will be constrained by poor soils and rock outcrop with a lesser yield as indicated in the concept plan.

An example of sizing of waste water envelope and waste water management across Land Unit 1 is presented above.

For each subdivision application for the land an effluent envelope or treatment area must be designated and shown on the proposed lots. The envelopes shall be at least 60 metres or greater from the watercourse top of bank, and created on the plan of subdivision as a restriction or as agreed with the Responsible Authority. EPAs Code of Practice – Onsite Wastewater Management determines septic field setbacks required from waterways, at 60 metres for a primary treatment system and 30 metres for a secondary treatment system.

6.0 STORM-WATER ASSESSMENT AND RECOMMENDATIONS

INTRODUCTION

The storm water assessment aims at identifying land constraints associated with the development area and to recommend management programs to address these constraints and thereby reduce the environmental impact of the proposed changed land use. Emphasis of the assessment is on internal management of storm water within the individual lots.

The emphasis is on soil-water management issues as follows :

- *Management of soil and water impacts so that the water quality of Jacksons Creek is not affected.*
- *The capacity of all drainage infrastructure to service the development.*
- *The methods for the treatment and retardation of all stormwater.*
- *The methods for sediment control*

6.1 DRAINAGE INFRASTRUCTURE and STORMWATER MANAGEMENT

The development property is not connected to sewer. A land capability assessment above has identified general land units within which waste water disposal is suitable or constrained. Within a minimum 2ha lot size, the proposed residential dwellings will be designed to harvest rainwater to water tanks. Engineering design plans will include retarding and management of runoff from driveways and paved surfaces. Rain water that is not

harvested from the dwelling and sheds as well as rain water from access roads etc shall be retarded on site to maintain flow at current conditions.

At an individual lot level, it is expected that rain water runoff from dwellings and shedding would be managed to reduce run-off and retain rain water on site. It is recommended that each block will be landscaped and planted to reduce/retard run-off.

6.2 STORM WATER MANAGEMENT RECOMMENDATIONS

The assessed environmental risk indicates that residential development on this land will need moderate management programs in place to address Storm water management on the property.

A) Design of drainage areas : driveways, paved area to mitigate off-site drainage.

B) Harvesting of rainwater from dwelling and sheds to large water tanks as well as retarding basins

C) Construction of contour banks to mitigate run-off where necessary

D) Establishment of tree/vegetation belts to minimise risk of overland flow.

E) Sediment control

6.3 DRAINAGE DESIGN

The development will include approximately 50x 2ha blocks which will be large enough to incorporate storm water management measures for dwellings and garage/outbuildings with access driveway and internal paths.

Recommendations

Engineering design to manage/reduce run-off from driveways and paved areas. Potential design might include direction of excess runoff toward either a sump or area of tree planting aimed at reducing ponding / mitigating off-site runoff.

6.4 STORM WATER AND HARVESTING RAINWATER

Recommendations

Stormwater will be harvested to large rainwater tanks. Overflow pipes will be directed toward treed areas or off-site drainage to avoid ponding.

6.5 SOIL EROSION AND SEDIMENT MANAGEMENT

ROADS and ACCESS

Access to the proposed dwellings will be via new driveways and upgraded access roads. It is expected that new access roads or driveways will need to be constructed and maintained to prevent erosion.

Recommendations

- *Drainage of new driveways should be designed to accommodate heavy and potentially erosive rainfall events. This would include effective grading and use of concrete and gravel batters designed to avoid gullying during storm events.*
- *Track runoff should be very carefully controlled, with well formed and maintained drainage structures (eg table drains, under road drainage etc*
- *Erosion management measures would include establishment of vegetation or geotextile along the exposed edges of the driveway.*
- *It is a general recommendation that future plans for access road throughout the block recognize soil erosion risk and implement measures to avoid soil exposure.*
- *During short-term construction works for any dwelling, impacts on shallow soils should be minimized.*

6.6 SOIL EROSION/SEDIMENT CONTROL MANAGEMENT

Local volcanic soils have an organic topsoil which can be susceptible to erosion when exposed. Local areas of poor drainage within each lot could be drained/vegetated to avoid ponding. Overall erosion risk is however low across the development area block. Soils are of low-moderate erosion risk following construction of the new driveway and other earthworks allied with development of the new dwelling.

Recommendations

- *During house, shed and infrastructure works, minimize soil exposure and potential soil erosion during wet periods by staged works and use of gravel cover where necessary.*
- *Establishment of contour tree planting to minimize overland flow*
- *Construction of a dam in suitable part of the property could be used to harvest stormwater and site drainage.*
- *Construction and maintenance of any access roads should be designed for optimal drainage with stone/gravel cover to reduce erosion risk.*
- *.Maintain vegetative cover over undeveloped parts of the property - avoid areas of exposed soil.*
- *Minimize "off-track" use of vehicles (including motor bikes) on the property.*
- *Sediment from driveways and exposed areas should be minimize by the above soil management measures. Construction of a sediment/sump (subject to engineering design) could be constructed to retard sediment on-site for potential redistribution.*

Fig 3 presents a conceptual land management plan for management and mitigation of storm water, sediment and erosion control across a typical residential property.

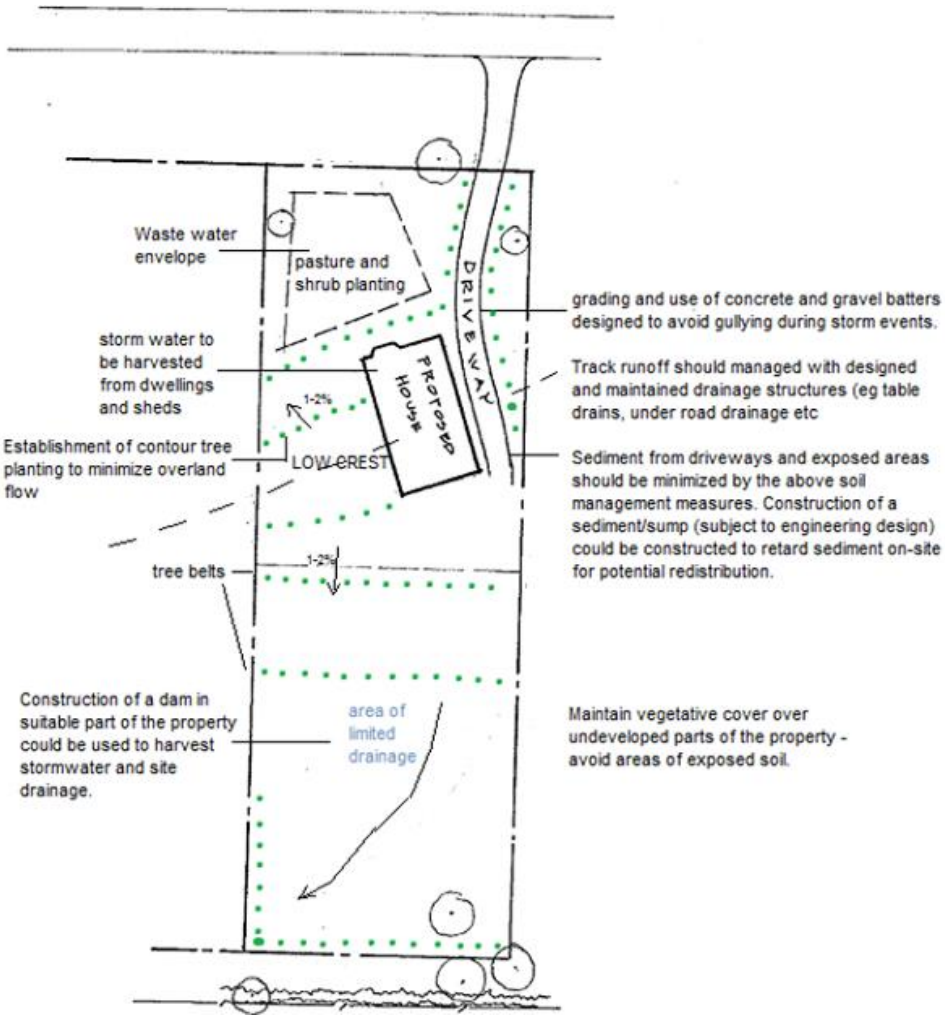

Fig 3 Storm water management map of typical 2ha lot within development area showing location of proposed dwelling (BE) and waste water envelope WWE with general land and storm water management recommendations.

APPENDIX A
LIMITATIONS

This report is solely for the use of the Client (various owner-landholders) and any reliance of this report by third parties shall be at such party's sole risk and may not contain sufficient information for purposes of other parties or for other uses. This report shall only be presented in full and may not be used to support any other objective than those set out in the report, except where written approval with comments are provided by Archaeo-Environments Pty Ltd.

This document is not intended to reduce the level of responsibility accepted by Archaeo-Environments Pty Ltd but rather to ensure that all parties who may rely on this report are aware of the responsibilities each assumes in so doing.
This report has been prepared for the specific purpose outlined in the proposal and no responsibility is accepted for the use of this document, in whole or part, in other purposes or contexts.

The scope and period of services are as described in the proposal. Conditions may exist which were undetectable given the limited nature of the enquiry AE ltd was engaged to assess with respect to the site. Conditions may vary between sample sites, with special conditions within the study area not revealed by the assessment and which have therefore not been accounted for in the report. Additional studies and actions may therefore be required.

It is recognised that time affects the information and assessment provided in this report. The opinions of AE Ltd are based on information current at the time the report was produced. It is understood that the services provided by AE Ltd lead to opinions based on the actual conditions of the study area at the time the study area was visited. These opinions cannot be used to assess effects of any subsequent changes in the quality of the site or its surroundings or any laws and regulations.

Any advice made in this report, are based on conditions from published sources and the investigation described herein. Where information provided by the client or other sources have been used, it is assumed that the information is correct unless otherwise stated. No responsibility is accepted by AE Ltd for incomplete or inaccurate data supplied by others.

This report is provided for the sole use by the client. Any use a third party makes of this report or any reliance on decisions made based on it is the sole responsibility of such third parties. AE Ltd accepts no responsibility for any damages incurred by a third party as a result of decisions made based on this report.

Archaeo-Environments Pty Ltd
heritage soils and landscape

Sustainability Report
Bennett Road Development Plan
Gisborne South

Land Capability Assessor
Dr Chris Day
Archaeo-Environments Pty Ltd
ABN 89 119 932 437

Rev 5 Dec 4 2021

LAND CAPABILITY AND STORM WATER REPORT
Bennett Road Development Plan, Gisborne South

ABOUT THE AUTHOR

Dr Chris Day DPhil, MIFA Director, Archaeo-Environments Ltd
Chris has over 35 years experience in geology, geomorphology, soils and heritage work which included 12 years in Bendigo and Benalla with DSE. This included management of catchment and salinity research teams and soil and soil permeability (recharge) mapping as a basis for Dryland Salinity Management Plans across the Avoca, Loddon, Campaspe and Goulburn Broken Catchments.

1 INTRODUCTION

A sustainability report has been commissioned by several landowners for input to a Development Plan for a 130ha property at Bennett Road, Gisborne (the study area). The land is subject to Macedon Ranges Planning Scheme Development Plan Overlay 18 (DPO18) and also the Rural Living Zone Schedule 2 under the recent C110 Planning Scheme Amendment. A Development Plan is required for the entire 130ha (estimated 50 lots) and will provide an overview document for future planning permit applications.

The proposed development will provide for lots consistent with the Panorama Dr estate to the north, which appears to function well in terms of "sustainability" / environmental considerations. The aim of this report is to identify sustainability issues which will enhance sub-division and planning permit applications to Macedon Ranges Shire Council.

1.1 SCOPE OF WORKS

The sustainability report will include a summary of potential site issues relevant to DPO18 :

A sustainability plan will identify environmental assets and initiatives to be implemented as part of development activities on the site including but not limited to : how the principles of water sensitive design are to be achieved in subdivision and development activities and how flora/fauna/biodiversity/revegetation may be integrated into the overall development plan.

The sustainability study is conservative, aimed at the protection of environmental and human health. It is not intended to support a particular proposal, but rather to describe the existing land parcels and suggest how adverse environmental impacts of the proposal may be minimised. Field work was conducted on March 24, 2018.

2.0 DATA SCOPE AND LIMITATIONS

The land planning assessment has been prepared by Dr. Chris Day (Archaeo-Environments Ltd) Assessment has been conducted at a scale of 1 : 2500 and provides a guide and professional overview of site conditions. Terrain mapping, soil properties, climatic and botanical data are based on reconnaissance field-work and regional data sources for the purpose of reasonable and relevant estimates. As physical conditions, soils and local hydrology may vary over time, the overview assessment on which estimates are made in this report should be reassessed if natural conditions change. This assessment is sufficient for a broad assessment within DPO18. The report should be used within the scope and scale of the brief and not for detailed design or property layout works or for any development beyond those of the brief. The report and recommendations therein are to be used to provide guidance toward - but do not guarantee – planning permission. It is not to be used, in full or in part, by any other party without written permission from the author.

3 LOCATION AND PROPERTY BACKGROUND

3.1 LOCATION

The study area is composed of 6 properties and 6 individual landowners. The site occupies approximately 130ha in and around Bennett Rd Gisborne. Located within Macedon Ranges Planning Scheme Development Plan Overlay (DPO18) and Rural Living Zone Schedule 2 under the recent C110 Planning Scheme Amendment. Both the Zone and DPO refer to a minimum lot size of 2ha.

Fig 1 Location Map : Aerial view

3.2 GENERAL SETTING/SITE CONDITION

The study area is characterised by a broad and open volcanic plain which includes an incised waterway across the south-west. The area has been almost entirely cleared of native vegetation, with minor clumps of eucalypts (predominantly grey box) and tree plantations, with the main vegetation existing as exotic plantings as driveway avenues and some cypress windbreaks and boundary plantings. There are 10 dams which are for the most part across gentle drainage depressions. The study area is fenced throughout with a range of grazing property and lifestyle properties.

3.3 USE OF ADJOINING LAND

The study area is bounded to the west by Bennett Road with the Calder Freeway to the west, McGregor Road to the north and Dalrymple Road to the south with developed blocks to the north and sloping terrain toward Jacksons Creek to the east.

3.4 CLIMATE

Average annual rainfall is in the order of 750-800mm. A one-in-ten year rain is ~750mm. Average estimated annual evapo-transpiration is in the order of ~1350mm. Evaporation may exceed rainfall for 8 months (September to April) in an "average" year and these dry months may be challenging for agricultural production. The district can experience significant variations in rainfall and temperature and can have very cool winters & warm to hot and windy summers (which can have implications for vegetation establishment).

3.5 TOPOGRAPHY AND DRAINAGE

The land encompasses a gently undulating volcanic terrain which falls toward the north and north-east. Water flow and local drainage is predominantly toward a defined waterway (Djirri Djirri Creek) which extends across the south-west corner of the property. Otherwise drainage across the property is via very gentle drainage swales and undefined drainage depressions. There is rock outcrop along the edge of low escarpments above the main drainage line to the east as well as within a stoney rise in the south-east part of the block.

Land form and soil description is based on field inspection and reference to the report : A Study of the Land in the Catchments to the North of Melbourne (Jeffrey P J 1981) SCA. Fig 2 shows general landform and land units across the development area.

Five main land units have been mapped across the development area.

LU 1 Open plain
LU2 Gentle-moderate slopes
LU3 Steep slopes
LU4 Valley floor
LU5 Stoney rise (o/c)

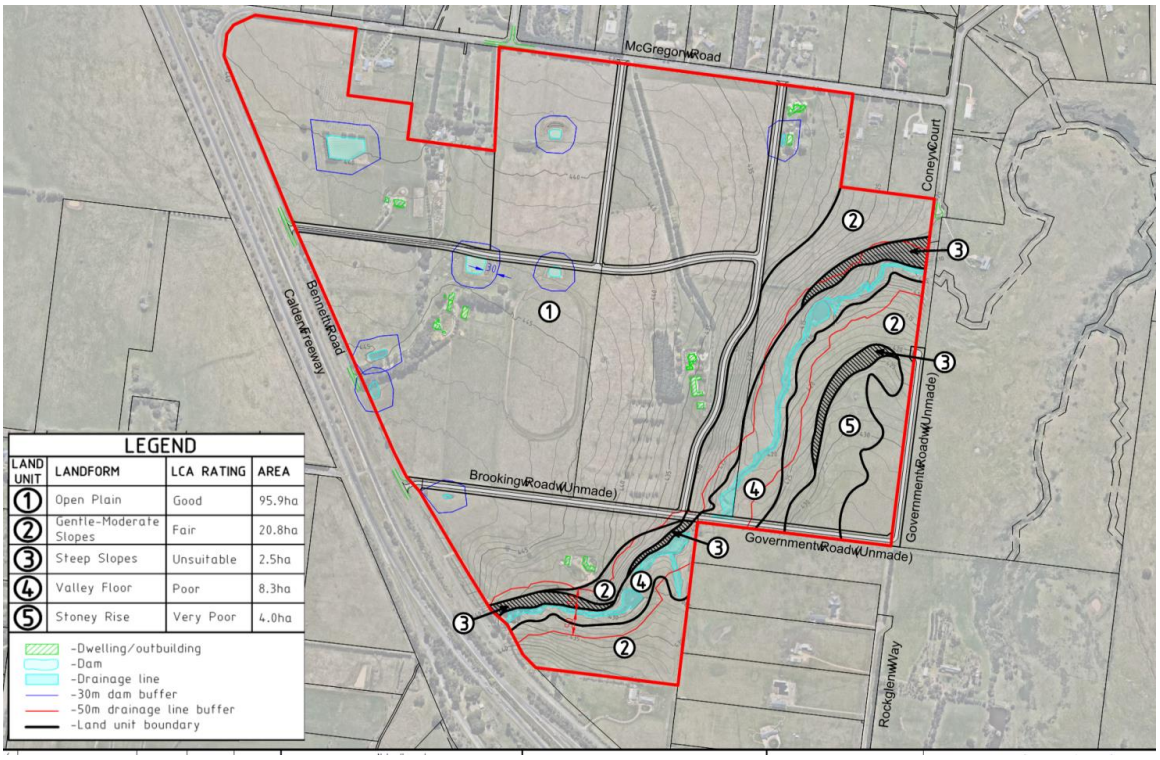

Fig 2 Land Unit Map (Courtesy Terraco Ltd)

Table 1 presents a summary of soil and landform values across the study area as background for the sustainability assessment.

Table 1 Land capability summary

Land Unit	Landform	Area (ha)	Soil type	Slope %
1	Open Plain	73	Yellow-grey clay loam	0-2
2	Gentle-Mod plain	16	Reddish-brown silty clay (floaters)	7-10
3	Steep slopes	2	Reddish brown clay and common bedrock outcrop	12-25
4	Valley floor	6	Dark grey-black heavy clay	1-3
5	Stoney rise	3	Shallow stoney soil and bedrock outcrop	2-4

4.0 ENVIRONMENTAL ASSETS (input included from Ecology and Heritage Partners)

4.1 FLORA AND FAUNA

Native vegetation in the study area is representative of four Environmental Vegetation Classes (EVCs) characteristic of the Victorian Volcanic Plains: Plains Grassland Heavier-soils (EVC 132_61), Plains Sedgy Wetland (EVC 647), Tall Marsh (EVC 821) and Stony Knoll Shrubland (EVC 649). The presence of these EVCs is generally consistent with the modelled pre-1750s native vegetation mapping (DELWP 2017b).

The remainder of the study area comprises introduced and planted vegetation, present as stands of non-Victorian eucalypt species, pasture and Victorian Eucalypts. Targeted surveys have indicated that there are no Matted Flax-lily (May – August), Swamp Everlasting (November – March) and Swamp Fireweed (November – March) on the land.

Plate 1 View to north toward example of introduced vegetation/windbelt within the study area.

Despite current land uses the study area contains patches of native vegetation, scattered trees and some introduced vegetation that is of value to fauna. There are patches of Plains Grassland and remnant riparian vegetation along the creek line. Targeted surveys by Ecology and Heritage Partners have indicated no presence of Golden Sun Moth or Growling Grass Frog across the study area.

4.2 FLORA AND FAUNA MANAGEMENT and INTEGRATION

The primary protection of environmental assets will include protection of native vegetation up to a minimum of 30 metres either side of the Djirri Djirri Creek line which will be retained and stock excluded. Dwellings will be set back from the drainage line buffer by at least 20 metres. Trees within the road reserve, including revegetation, will be retained where possible (Appendix 1)

There are potential remnants of native vegetation and fauna which have been addressed in the environmental report (Ecology and Heritage Partners). Targeted surveys of flora and fauna species were undertaken and no remnant species were recorded. It is understood that the creek line and immediate surrounds – which will be preserved via a minimum of 30m buffer from stock – will be the corridor within which significant environmental assets will be preserved and managed. These will be appropriately assessed at the planning permit stage.

As described above, trees will be retained within road reserves where possible and removal or lopping of native trees will require a planning permit.

A program of revegetation of Djirri Djirri Creek will provide habitat, erosion and flood mitigation as well as an area of passive recreation (Plate 2). In addition the wider Development Area will retain original vegetation where possible and establish a program of buffer/corridor planting, road reserve and habitat planting (Fig 3) with the aim of retaining existing assets and improving shelter, screening, microclimate, fauna habitat and general amenity.

Plate 2 View to south across Djirri Djirri Creek planned for revegetation

The study area is located within the Macedon Ranges municipality and is zoned Rural Living Zone 2 (RLZ2). Development Plan Overlay (DPO18) applies to the land proposed for subdivision.

A Planning Permit from Macedon Ranges Council will be required to remove, destroy or lop any native vegetation on site. A Planning Permit will be assessed in accordance with the 'The Guidelines for the removal, destruction or lopping of native vegetation' (Guidelines) and Clause 52.17 of the Whittlesea Planning Scheme.

Any persons engaged to remove, salvage, hold or relocate native fauna during construction must hold a current Management Authorisation under the *Wildlife Act 1975*, issued by DELWP.

Weeds listed as noxious under the *Catchment and Land Protection Act 1994* (CaLP Act) (Artichoke Thistle, Fennel, Paterson's Curse, African Box-thorn, Blackberry, Chilean Needle-grass and Serrated Tussock) were recorded during the assessment. Weeds should be managed in accordance with the Act.

4.3 WATER

4.3.1 STORM WATER AND WATER SENSITIVE DESIGN

While domestic water use will be via reticulated supply from Western Water, supply will be enhanced by harvesting of rainwater via rainwater tanks. Otherwise storm water retention dams can harvest run-off from hard surfaces, roads etc.

Rainwater shall be retarded on site to maintain flow at current conditions. Maintaining a vegetative cover will be part of management recommendations to avoid erosion and soil loss. The existing dams and additional dams will retain water supply on site.

The primary focus of water management is within the individual lots in the form of water sensitive design as follows :

- Promotion of water conservation fittings within domestic and gardens as well as public space and infrastructure.
- Revegetation programs within any public areas and along road reserves to improve habitat, shade biodiversity and soil stability.
- The study area is not connected to sewer. There is also ample capacity for management of waste water

At an individual lot level, it is expected that rain water runoff from dwellings and shedding would be managed to reduce run-off and retain rain water on site. It is recommended that each block will be landscaped and planted to reduce/retard run-off off-site.

4.3.2 WATER MANAGEMENT RECOMMENDATIONS

Water management across the study area might include :

A) Design of drainage areas : driveways, paved area to mitigate off-site drainage.

B) Harvesting of rainwater from dwelling and sheds to large water tanks as well as retarding basins

C) Construction of contour banks to mitigate run-off where necessary

D) Establishment of tree/vegetation belts to minimise risk of overland flow.

E) Sediment control

Recommendation

Engineering design to manage/reduce run-off from driveways and paved areas. Potential design might include direction of excess runoff toward either a sump or area of tree planting aimed at reducing ponding / mitigating off-site runoff.

Recommendation

Stormwater will be harvested to rainwater tanks and overflow pipes will be directed toward treed areas or off-site drainage to avoid ponding.

4.4 SOIL EROSION/SEDIMENT CONTROL MANAGEMENT

Local volcanic soils have an organic topsoil which can be susceptible to erosion when exposed. Local areas of poor drainage within each lot could be drained/vegetated to avoid ponding. Overall erosion risk is however low across the study area.
Soils are of low-moderate erosion risk following construction of the new driveway and other earthworks allied with development of new dwellings. To the south-east of the Djirri Djirri Creek where there is a stony rise a detailed site assessment at the time of subdivision shall inform lot yield and lot configuration.

Recommendations

- *During house, shed and infrastructure works, minimize soil exposure and potential soil erosion during wet periods by staged works and use of gravel cover where necessary.*
- *Establishment of contour tree planting to minimize overland flow*
- *Construction of a dam in suitable part of the property could be used to harvest stormwater and site drainage.*
- *Construction and maintenance of any access roads should be designed for optimal drainage with stone/gravel cover to reduce erosion risk.*
- *Maintain vegetative cover over undeveloped parts of the property - avoid areas of exposed soil.*

Fig 3 below presents a storm water management map of typical 2ha lot.

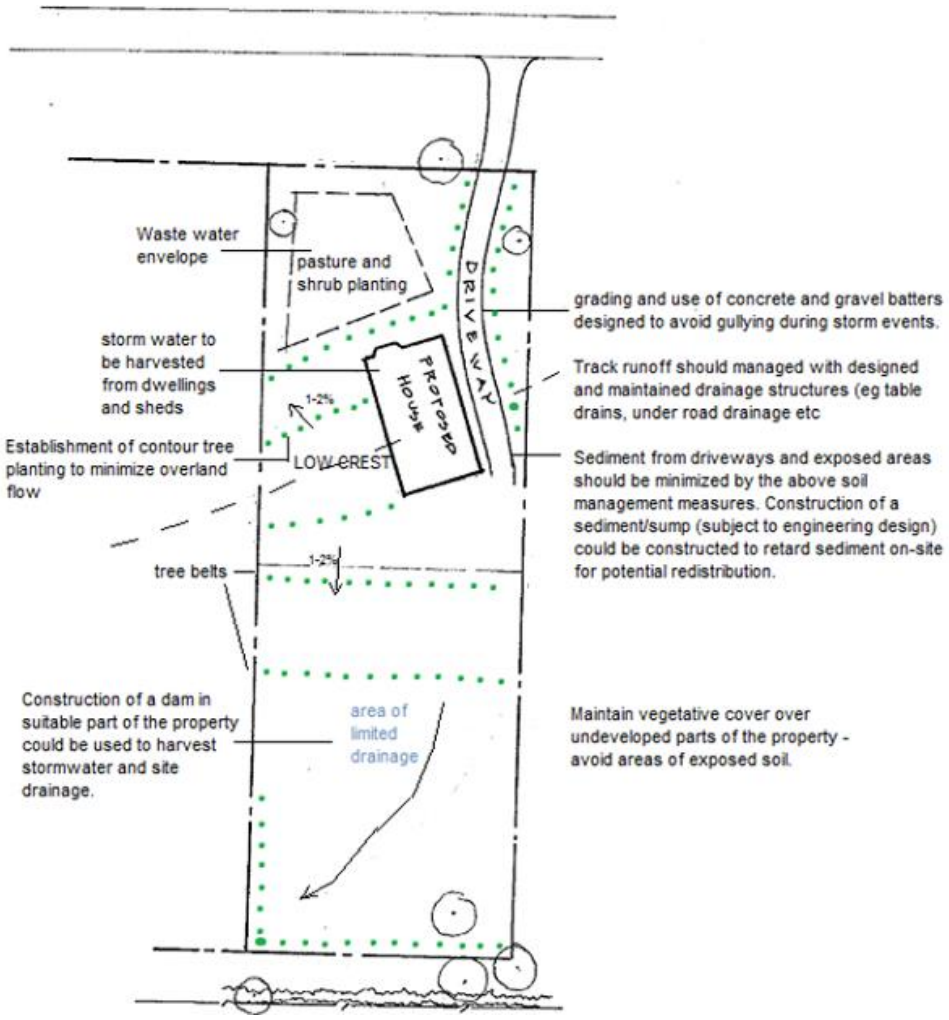

Fig 3 Storm water management map of typical 2ha lot within the study area showing location of proposed dwelling (BE) and waste water envelope WWE with general land and storm water management recommendations.

4.4 STOCK MANAGEMENT

It is expected that some properties will have limited stock such as horses or sheep at a rural "domestic scale". It is expected that this could be successfully undertaken as is the case in the 2 lot subdivision at the Panorama Drive Estate to the north.

Fig 4 below presents the concept landscape plan which shows current and planned vegetation planting / habitat corridors.

Plant List B

Botanical Name	Common Name	quantity	mature size
Street trees (subject to council requirements) (supply as advanced plants 1.5m high)			
Acacia melanoxylon	Blackwood	later detail	9x6
Acer rubrum 'October Glory'	Maple		10x7
Angophora hispida	Dwarf Angophora		6x5
Corymbia citriodora	Lemon Scented Gum		16x8
Corymbia eximia	Bloodwood		10x7
Corymbia ficifolia	Flowering Gum		8x6
Eucalyptus leucoxylon 'Rosea'	Red Flowering Yellow Gum		10x6
Eucalyptus sideroxylon	Ironbark		16x8
Fraxinus 'Urbanite'	Ash Tree		9x6
Lophostemon confertus	Brushbox		8x6
Quercus acutissima	Oak Tree		10x8
Ulmus parvifolia	Chinese Elm		12x8

Plant List C

Botanical Name	Common Name	quantity	mature size
Trees on individual lots (1 per 1000m2) (Supply in minimum 200mm pots)			
Acacia melanoxylon	Blackwood	later detail	9x8
Acer negundo	Box Elder 'Sensation'		10x8
Acer rubrum 'October Glory'	Maple		10x7
Angophora hispida	Dwarf Angophora		6x5
Corymbia citriodora	Lemon Scented Gum		16x8
Corymbia eximia	Bloodwood		10x7
Corymbia ficifolia	Flowering Gum		8x7
Eucalyptus melliodora	Yellow Box		16x8
Eucalyptus sideroxylon	Ironbark		16x8
Fraxinus 'Urbanite'	Ash Tree		9x6
Lagerstroemia 'Townhouse'	Crepe Myrtle		7x5
Pistacia chinensis	Chinese Pistachio		9x7
Pyrus c. 'Chanticleer'	Ornamental Pear		12x6
Quercus acutissima	Oak Tree		10x8
Ulmus parvifolia	Chinese Elm		12x8

design note – drainage reserve revegetation

all works are to be in accordance with the
vegetation management plan by ecology and heritage partners (february 2021)

sections of creek bank with existing soil erosion are to be stabilised with jute mat fine* (suitable for areas subject to flowing water 1.3m per second) or grassroots* (suitable for areas subject to flowing water 4.8m per second) and planted with appropriate sedgy wetland (EVC 647) and tall marsh (EVC 821).
locally sourced rock boulders (from areas of earthworks on adjacent site only) may be used as necessary to reduce erosion in peak water flow areas.

weed control/removal works are not to increase soil erosion risk and are to be staged if necessary to reduce soil exposure in at risk areas.

areas of remnant indigenous vegetation to be protected as all times

*trademark product from geofabrics. Similar products may be used.

design note – drainage reserve access paths

any proposed maintenance or pedestrian access path in drainage reserve is to be constructed to prevent soil erosion and runoff into creek.
path materials are to be locally sourced gravel with fines to ensure compaction.
paths are to be graded to prevent high overland flow rate and grassed (indigenous species only) swales provided to control runoff rates and direction.

all works are to be inspected and approved by relevant authority.

design note –

areas within 200m of drainage reserve and around existing rock outcrops

retain any indigenous vegetation and plant indigenous or non invasive native species only
any overland water flow is to be managed to control erosion and sediment risks

any areas of earthworks including services installation are to be managed to prevent sediment contamination of drainage reserve areas

Plant List A

Plant List – revegetation within 60m wide drainage reserve

Botanical Name	Common Name	Quantity (plants per m2)
(Supply in cells, tubes or direct seeding for grasses)		
Acacia mearnsii	**Black wattle**	**1 plant per 10m2**
Acacia melanoxylon	**Blackwood**	**1 plant per 20m2**
Acacia paradoxa	**Hedge Wattle**	**1 plant per 10m2 (average. vary density)**
Arthosachne scabra s.l.	Common Wheat-grass	seeded
Austrodanthonia caespitosa	Common Wallaby Grass	"
Austrodanthonia setacea	Bristly Wallaby Grass	"
Austrostipa spp	Spear Grass	1 per m2
Bulbine bulbosa	Bulbine Lily	2 per m2
Carex appressa	*Tall Sedge*	*1 per m2*
Carex breviculmis	*Short-stem Sedge*	*1 per m2*
Chrysocephalum apiculatum s.l.	Common Everlasting	1 per m2
Convolvulus erubescens spp. agg	Pink Bindiweed	1 per m2
Crassula sieberiana s.l.	Sieber Crassula	1 per m2
Dichondra repens	Kidney Weed	1 per m2
Eucalyptus camaldulensis	***Red Gum***	***1 plant per 200m2***
Eucalyptus melliodora	**Yellow Box**	**1 plant per 100m2**
Eucalyptus ovata	***Swamp Gum***	***1 plant per 80m2***
Geranium spp	Geranium	1 per m2
Goodenia pinnatifida	Cut-leaf Goodenia	1 per 2m2
Haloragis aspera	Grassland Raspwort	1 per m2
Hydrocotyle laxiflora	Stinking Pennywort	1 per m2
Hypericum gramineum	Small St John's Wort	1 per m2
Juncus sp	*Rush*	*1 per m2*
Kennedia prostrata	Running Postman	1 per 2m2
Leptospermum lanigerum	Woolly Tea Tree	1 per 3m2
Melyotis dentata	Tree Violet	1 per 6m2
Microlaena stipoides var. stipoides	Weeping Grass	seeded
Pimelea humilis	Common Rice-flower	1 per m2
Poa labilliardierei	Common Tussock Grass	seeded
Poa sieberiana	Grey Tussock Grass	seeded
Rumex brownii	Slender Dock	1 per m2
Rytidosperma spp.	Wallaby Grass	seeded
Senecio glomeratus	Annual Fireweed	1 per 2m2
Senecio quadridentatus	Cotton Fireweed	1 per m2
Themeda triandra	Kangaroo Grass	seeded
Veronica gracilis	Slender Speedwell	1 per m2
Wahlenbergia sp	Native Bluebell	1 per m2

Plants in plain text are for all areas except water edge
Plants in plain italic text are for water edge areas that may be subject to frequent inundation
Plants in bold italic text are primarily for lower streambanks that may be subject to flood inundation
Plants in bold are primarily for upper stream banks

Note that there may be overlap in some areas depending on site conditions

key

existing vegetation
individual trees, shelterbelts, groups of trees of various species
indigenous species are to be retained see Ecology & Heritage Partners Flora & Fauna Surveys

note that any environmental weed species should be removed as soon as practicable and other unsuitable species removed as new plantings establish
cupressus and pine species established as windbreak/screening to be assessed and retained/removed as per ecologist/relevant authority advice.

areas of indigenous vegetation within drainage reserve are to be protected
see Ecology & Heritage Partners Flora & Fauna Surveys

proposed street trees
indicative only (later detail at planning stage)
refer to list B

proposed lot trees
indicative only (landscaping to individual lots to later detail at planning stage)
refer to list C

proposed revegetation of drainage reserve
refer to plant list A

proposed lots

buffer planting
15m wide planting zone along bennett road

landscape concept plan

project: bennett road, gisborne

client:

scale: 1:2500 A1 **date:** november 2021 **sheet:** 1 of 1
issue A

habitat
landscape and environmental design consultants 9836 1272

this plan is intended as a layout and planting guide only.all dimensions, locations, etc are to be checked and verified on site. Refer to architectural and engineering plans and permit conditions.
habitat accepts no responsibility or liability as a result of errors or omissions on this plan

APPENDIX A
LIMITATIONS

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Traffix Group

Traffic Management and Impact Plan

Proposed Development Plan
at
88-168 Bennett Road and 15 & 94-134 McGregor Road, Gisborne

October, 2021
G24605R-01F

Traffix Group Pty Ltd (ABN: 32 100 481 570)
Level 28, 459 Collins Street, Melbourne VIC 3000
9822 2888 / admin@traffixgroup.com.au

Level 28, 459 Collins St
Melbourne Victoria 3000
T: 03 9822 2888
admin@traffixgroup.com.au
Traffix Group Pty Ltd
ABN: 32 100 481 570
traffixgroup.com.au

Traffic Management and Impact Plan

Proposed Development Plan
at
88-168 Bennett Road and 94-134 McGregor Road, Gisborne

Document Control

Issue No.	Type	Date	Prepared By	Approved By
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D	Amended Final	14/02/2020	D. Robertson	N. Woolcock
E	Amended Final	31/07/2020	N. Woolcock	A. Mian
F	Amended Final	12/10/2021	N. Woolcock	A. Mian

Our Reference: G24605R-01F

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G24605R-01F

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G24605R-01F

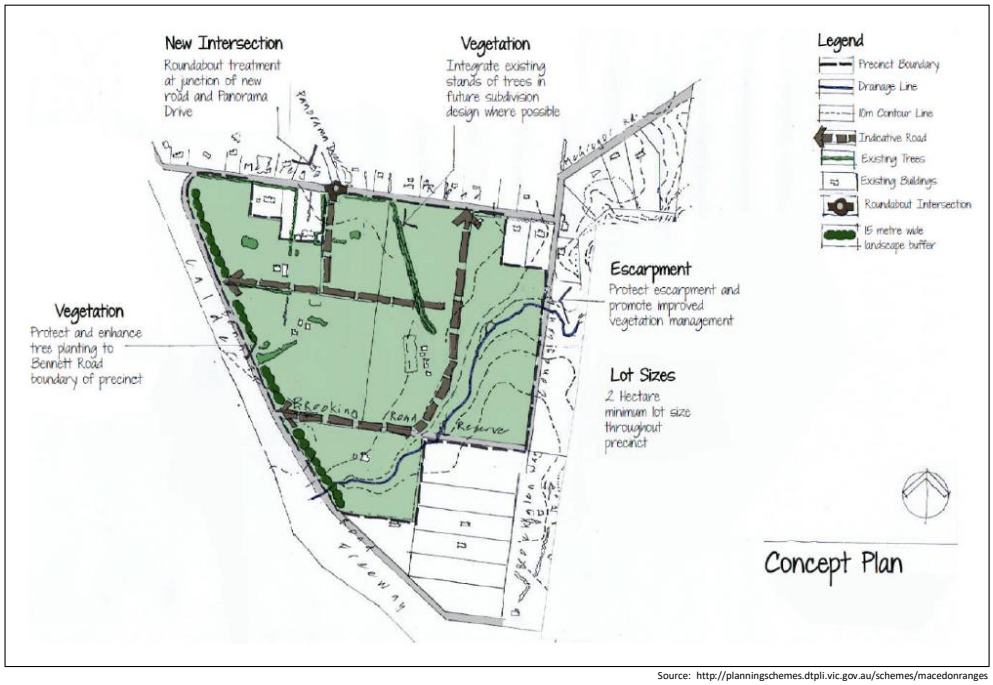
1 Introduction

Traffix Group has been engaged to prepare a Traffic Management and Impact Plan for the proposed Development Plan at 88-168 Bennett Road and 15 & 94-134 McGregor Road, Gisborne.

This report responds to the access and traffic aspects of the requirements under Schedule 18 to the Development Plan Overlay (DPO18) of the Macedon Ranges Planning Scheme, i.e. the preparation of a Traffic Management and Impact Plan.

2 DPO18 Bennett Road, Gisborne, Rural Living Area

DPO18 of the Macedon Ranges Planning Scheme requires a Development Plan to be prepared that is generally in accordance with the concept plan under Sub-Clause 5.0 (Map 1) of the DPO. This concept plan is reproduced at Figure 1.



Source: http://planningschemes.dtpli.vic.gov.au/schemes/macedonranges

Figure 1: Development Plan Concept

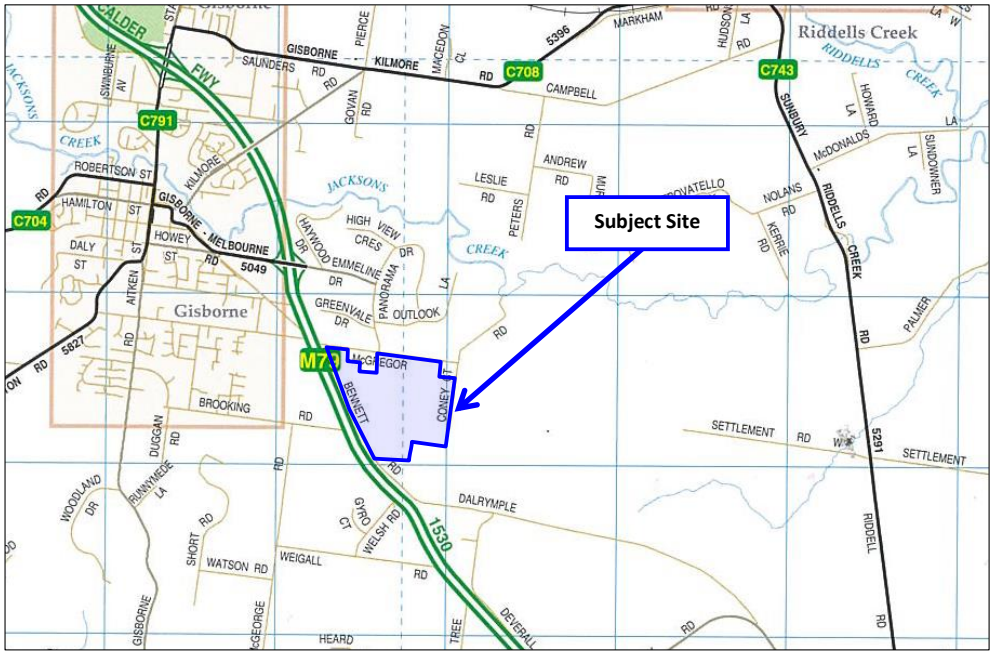
DPO18 requires that any proposed development plan must include, amongst other plans, a Traffic Management and Impact Plan which includes:

- *A well defined, appropriately designed, convenient and safe internal road, cycling and pedestrian network.*
- *Appropriate access points and circulation areas for vehicles, cyclists and pedestrians on the existing and future road network.*
- *Upgrade works necessary to accommodate traffic generated by the development and to mitigate the impact of the development on the surrounding area.*
- *East-west and north-south road connections, including the construction of the Brooking Road extension, all with a minimum width of 20 metres.*
- *Roundabout intersection treatment at the Panorama Drive intersection.*

3 Existing Conditions

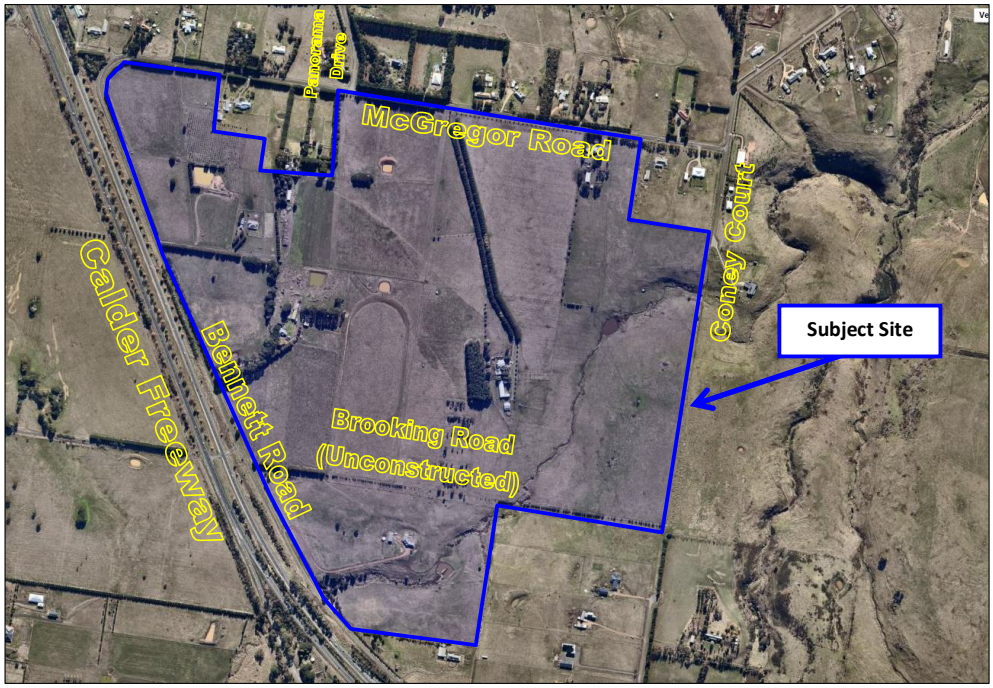
3.1 Subject Site

The subject site is bound by Bennett Road to the west, McGregor Road and abutting land to the north, Coney Court, an unmade road and abutting land to the east and an unmade road and abutting land to the south. A locality plan and an aerial photograph of the site are presented at Figure 2 and Figure 3 respectively.



Source: RACV VicRoads Country Street Directory

Figure 2: Locality Plan



Source: Nearmap.com

Figure 3: Aerial Photograph

Specifically, the subject site comprises various properties located in Gisborne, as follows:

- 88, 128 and 168 Bennett Road;
- 94 and 134 McGregor Road; and
- A parcel known as Lot 1 TP886104 (understood to be 15 McGregor Road).

Vehicle access for the site to/from the Gisborne township to the northwest is available via Panorama Drive and Emmeline Drive. Access to/from areas to the north of the site and Melbourne city to the southeast is available via Calder Freeway, which can also be accessed via the Panorama Drive/Emmeline Drive route, and approximately 3.5km from the south via local roads to the Coangualt Road/Mundy Road freeway interchange.

The site has good access to central Sunbury to the southeast via two primary route options as follows:

- Via Dalrymple Road (to the southeast) which connects with Bennett Road directly; and
- Via Calder Freeway (via access ramps to the northwest).

Both existing route options are estimated to take approximately the same time to travel.

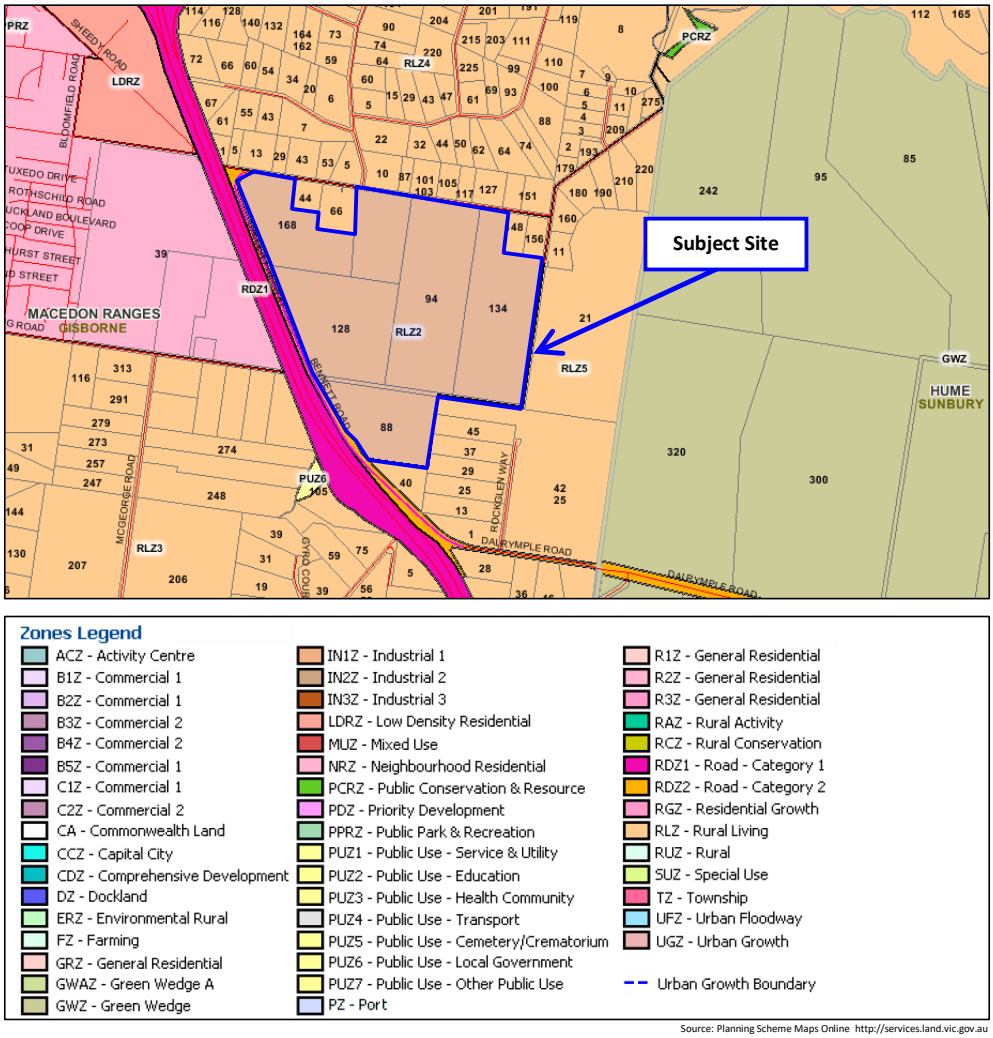
It is noted that no formal pedestrian or cyclist provisions, i.e. footpaths, on-road bicycle lanes or off-road bicycle paths, are constructed in the area surrounding the site, consistent with the rural nature of the area.

The site is irregular in shape and has a total site area of approximately 132 ha.

Each property/lot is largely free of structures, with the majority of properties currently accommodating a single residential dwelling and associated structures, except for the land parcel known as Lot 1 TP886104 which does not currently have a dwelling on it.

Formal vehicle access is provided to each property via McGregor Road or Bennett Road, except for Lot 1 TP886104 which does not currently have formal vehicle access.

The subject site is located within a Rural Living Zone - Schedule 2 (RLZ2), as shown in Figure 4.



Source: Planning Scheme Maps Online http://services.land.vic.gov.au

Figure 4: Land Use Zoning Map

Land use in the immediate vicinity of the site is predominantly rural residential. A green wedge zone is located to the east of the site.

3.2 Road Network

3.2.1 Existing Roads

Bennett Road is in the Road Zone - Category 2 (RDZ2) and is under the control of Council. Bennett Road is generally aligned in a northwest-southeast orientation between McGregor Road in the northwest (where it continues in an east-west orientation as McGregor Road) and Dalrymple Road in the southwest (where it continues in an east-west orientation as Dalrymple Road). Bennett Road is a sealed road and has a carriageway width of approximately 6.35m, which accommodates a single lane of traffic in each direction.

The default rural speed limit of 100km/h applies to Bennett Road.

Calder Freeway abuts the southwestern side of Bennett Road. One emergency vehicle connection is provided to Calder Freeway near the middle of the site's Bennett Road frontage. No public vehicle access is permitted at this connection.

Bennett Road is shown in Figure 5 and Figure 6.

Figure 5: Bennett Road (View North)

Figure 6: Bennett Road (View South)

McGregor Road in the vicinity of the subject land is generally aligned in an east-west orientation between Bennett Road in the west and Coney Court in the east. McGregor Road is a sealed road and has a carriageway width of approximately 7.0m, which accommodates a single lane of traffic in each direction.

A speed limit of 100km/h applies to McGregor Road.

McGregor Road, west of its intersection with Panorama Drive, is shown in Figure 7 and Figure 8.

Figure 7: McGregor Road (View East)

Figure 8: McGregor Road (View West)

Coney Court is a cul-de-sac road which extends to the south from McGregor Road. Coney Court is a sealed road and has a carriageway width of approximately 3.9m. Coney Court has grass verges on either side of the carriageway which are used by vehicles to facilitate passing other vehicles.

Coney Court, near its court bowl termination, is shown in Figure 9 and Figure 10.

At the time of writing this report, permit application PLN/2018/541 has been lodged for a ten-lot subdivision of 21 Coney Court. The application proposes an access link with Rockglen Way to the south of the subject land.

Figure 9: Coney Road (View North)

Figure 10: Coney Road (View South)

Panorama Drive is generally aligned in a north-south 'loop' between McGregor Road and Outlook Lane. Panorama Drive is a sealed road and has a carriageway width of approximately 5.5m, which accommodates a single lane of traffic in each direction.

Mitchel Shire Council has advised that Panorama Drive is subject to a speed limit of 80km/h.

The Panorama Drive/McGregor Road intersection is an unsignalised T-intersection that operates under standard give-way conditions, with priority afforded to motorists along McGregor Road.

No designated turn lanes are provided on any of the legs of the Panorama Drive/McGregor Road intersection.

Panorama Drive, at its intersection with McGregor Road, is shown in Figure 11 and Figure 12.

Figure 11: Panorama Drive (View North)

Figure 12: Panorama Drive (View South)

The road reserve of ***Brooking Road*** within the subject land is generally aligned in an east-west direction along the northern boundary of 88 Bennett Road and has an existing connection with Bennett Road. It is currently unconstructed within the site, i.e. no public access is currently provided.

3.2.2 Existing Traffic Conditions

Traffix Group has undertaken the following traffic counts:

- Automatic tube counts from Thursday 24 May, 2018 to Wednesday 30 May, 2018 along McGregor Road between:
  - Panorama Drive and Bennett Road, and
  - Panorama Drive and Coney Court.
- Turning movement counts on Wednesday 23 May, 2018 from 4:30pm to 6:30pm and Thursday 24 May, 2018 from 7:00am to 9:00am at the Panorama Drive/McGregor Road intersection.

A summary of the tube count results is presented in Table 1.

Table 1: Traffic Count Summary

Direction	Weekday Daily Average	AM Peak Hour	PM Peak Hour
McGregor Road between Panorama Drive and Bennett Road (May, 2018)			
Eastbound	153 vpd	18 vph 8:00am-9:00am	22 vph 4:00pm-5:00pm
Westbound	142 vpd	18 vph 10:00am-11:00am	17 vph 3:00pm-4:00pm
Two-Way	294 vpd	32 vph 8:00am-9:00am	36 vph 4:00pm-5:00pm
McGregor Road between Panorama Drive and Coney Court (May, 2018)			
Eastbound	115 vpd	15 vph 10:00am-11:00am	21 vph 5:00pm-6:00pm
Westbound	114 vpd	22 vph 8:00am-9:00am	16 vph 2:00pm-3:00pm
Two-Way	229 vpd	32 vph 8:00am-9:00am	31 vph 5:00pm-6:00pm

The results of the turning movement counts are shown in Figure 13.

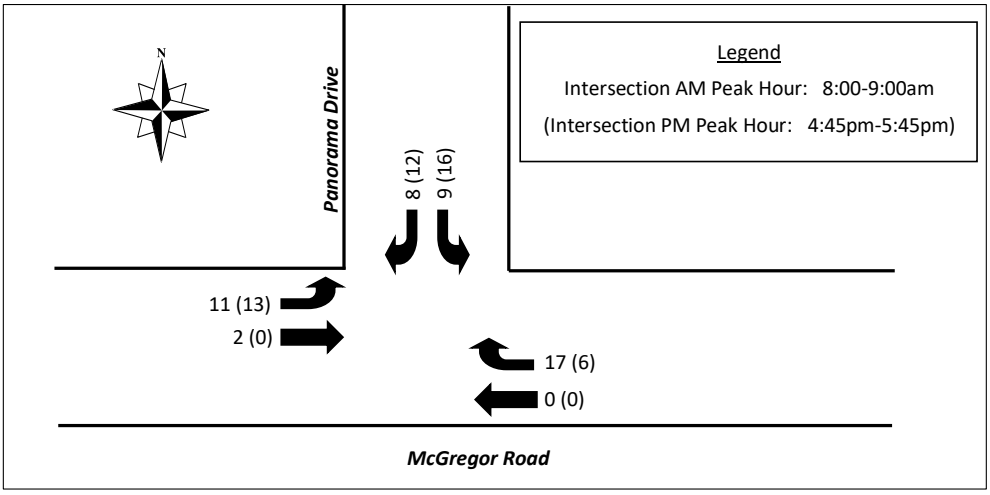


Figure 13: Peak Hour Traffic Counts Summary - Panorama Drive/McGregor Road

Full output of the tube counts and turning movement counts are attached at Appendix A and Appendix B respectively.

3.3 Public Transport

The site is not currently serviced by public transport services, which is consistent with the relatively low density of residential dwellings in the vicinity of the site. However, private school buses operate in the vicinity of the site, with an informal bus pick up/drop off location at the Panorama Drive/McGregor Road intersection.

The nearest public transport service (Bus Route 473) is located approximately 2.9km northwest of the site at Howey Street, closer to the centre of the Gisborne township.

4 Proposed Development Plan

The proposed Development Plan for the 'Bennett Road Precinct' is attached at Appendix C and includes the following key features:

- Approximately 50 future allotments provided within the subject site with a minimum lot area of 2 hectares (ha), in accordance with the requirements of DPO18;
- Four unsignalised T-intersections with the existing external road network, comprising two connections with Bennett Road and two connections with McGregor Road; and
- Vehicle access for the future allotments to be provided as follows:
  - Direct access via a number of new roads within the future subdivision, including via:
    - The formal construction of the existing Brooking Road road reserve, consistent with the DPO18 requirements; and
    - A currently unconstructed Government road along the southern boundary of 94 and 134 McGregor Road and part of the eastern boundary of 134 McGregor Road; and
  - Direct access for the future allotments that are to abut Bennett Road and McGregor Road, consistent with current access arrangements for existing allotments abutting these roads.

5 Panorama Drive/McGregor Road Intersection

As shown in Figure 1, Map 1 of DPO18 shows an indicative north-south aligned road on the west boundary of the property that abuts east boundaries of 66 McGregor Road and 168 Bennett Road, intersecting with McGregor Road opposite Panorama Drive. Map 1 of DPO18 also shows a roundabout at the Panorama Drive/McGregor Road intersection.

The proposed Development Plan shows this indicative north-south aligned road along the east boundary of the property that abuts the west boundary of 94 McGregor Road, approximately 270m east of the location shown in Map 1 of DPO18.

DPO18 requires that the Development Plan be prepared for the whole area covered by the overlay, and that the Development Plan "must be generally in accordance" with the concept plan contained in the overlay (ie Map 1 of DPO18).

The DPO concept plan shows a north-south aligned road connecting McGregor Road to an internal east-west aligned road, which in turn connects to Bennett Road to the west and another internal road to the east. The fact that the road intersects McGregor Road at a crossroad is the reason for a roundabout being shown in the DPO concept plan. The proposed Development Plan retains this north-south aligned road, albeit moved to the east. The provision of this north-south aligned road is generally in accordance with the DPO concept plan.

The proposed alignment of this north-south road removes the need for a roundabout at the McGregor Road/Panorama Drive intersection on capacity grounds given that a standard T-intersection has the capacity to accommodate the relatively low volume of traffic that will use this intersection as discussed in greater detail at Section 6.2 of this report. In turn, the proposed alignment removes the inherent land acquisition issues that would otherwise be associated with the provision of the roundabout (ie on the northeast and northwest corners of this intersection).

The location of this north-south road allows the orderly development of land covered by the proposed Development Plan.

On this basis, it is considered that the road network contained in the proposed Development Plan is generally in accordance with the concept plan contained in DPO18.

6 Traffic Considerations

6.1 Traffic Generation and Distribution

The RTA Guide to Traffic Generating Developments (2002) (RTA Guide) sets out traffic generation rates based on survey data collected in New South Wales for a range of land uses. This guide is used by VicRoads and is generally regarded as the standard for metropolitan development characteristics.

The RTA Guide sets out the following rates for standard residential dwellings:

- *daily vehicle trips = 9.0 per dwelling*
- *weekday peak hour vehicle trips = 0.85 per dwelling*

However, the RTA Guide states that ... *"The Australian Model Code for Residential Development (AMCORD) assumes a daily vehicle generation rate of 10.0 per dwelling, with 10% of that taking place in the commuter peak period. The use of these figures provides some allowance for later dual occupancy development."*

Conservatively adopting a rate of 10 vehicle trip-ends (vte) per day per lot, in the order of 500 vte per day would be generated by the future residential subdivision, including 50 vte during each of the AM and PM commuter peak hours[1]. This results in approximately in the order of one vehicle generated every 1.2 minutes, noting that the traffic generated would be less than this given that the site already generates traffic.

[1] Previous experience with residential subdivisions indicates that an upper limit of approximately 8% of daily trips are generated in each commuter peak hour in outer metropolitan areas such as this.

It is anticipated that the primary destinations for traffic generated by the site would include the Gisborne township, central Sunbury and Melbourne city, including other metropolitan suburbs.

The Gisborne township is located to the northwest of the site, and central Sunbury and Melbourne city are located to the southeast. Melbourne city (and other metropolitan suburbs) and central Sunbury are accessed via Calder Freeway to the northwest of the site, with central Sunbury also having an alternate route to/from the site via Bennett Road to the southeast. Access is also available to/from Calder Freeway at the Couangalt Road/Mundy Road freeway interchange via local roads to the south.

For the purposes of a conservative assessment, it is assumed that all traffic generated by the site will be distributed to/from the Gisborne township and Calder Freeway (which provides access with Sunbury central, Melbourne city and other metropolitan suburbs), i.e. to/from Panorama Drive to the north of the site. It is likely that some motorists intending to travel to/from central Sunbury may choose to instead travel via Bennett Road's southeast extension.

6.2 Traffic Impacts

A number of lots within the proposed Development Plan will take direct vehicle access off McGregor Road or Bennett Road. The remaining lots will utilise the internal road network to access the external road network at four locations.

Brooking Road/Bennett Road

A basic right turn (BAR) treatment is proposed at this location, given the intersection provides access to the proposed subdivision.

Rockglen Way/Dalrymple Road

It is not proposed to upgrade this intersection as part of the proposed Development Plan for the subject land. The volume of traffic generated by the existing and approved subdivisions that take access off Rockglen Way (understood to be in the order of 15 lots) will already require this intersection to be upgraded to a BAR. This is a matter to be addressed, if required, under the separate proposal which is the one that proposes to connect to Rockglen Way (not this Development Plan). The additional traffic likely to use this intersection from the land covered by the proposed Development Plan will be low and will replace a proportion of the traffic from the subdivisions abutting Rockglen Way that is redirected to the north as a result of the extension of Rockglen Way to the subject land. Hence, any additional traffic from the land subject to the proposed Development Plan will not trigger a requirement for a higher order intersection than is already required as a result of the subdivision of land abutting Rockglen Way.

New Roads Intersecting with Bennett Road and McGregor Road

Basic right turn (BAR) treatments are proposed at these locations, given the intersections provides access to the proposed subdivision.

Bennett Road/Brooking Road

The location of this intersection is fixed and is consistent with the concept plan in the overlay. Access is appropriately considered as part of any planning permit application. At that time, it would be appropriate to also consider the speed limit on Bennett Road in the vicinity of the area covered by the

development plan. It is currently 100 km/h. With the proposed subdivision there will be an increase in the number of properties taking access off Bennett Road and a reduced speed limit of 80 km/h would be more appropriate. A reduced speed limit will assist in enabling appropriate sight distances to be provided at the Bennett Road/Brooking Road intersection.

Brooking Road/Proposed North-South Orientated Road

A new road is proposed to run to the north of Brooking Road (which will be constructed as part of the Development Plan). The associated intersection will be located a minimum of approximately 80m to the west of the crossing of the Djiri Djiri Creek and future detailed design of the intersection and creek crossing should have consideration for associated sight distances which would be based on the relevant future speed limit of the relevant section of Brooking Road.

It is also noted that the southern end of the future north-south road that is to run through 94 McGregor Road is identified to connect with Brooking Road further to the west than what is identified in the DPO in order to maximise sight distance. Furthermore, no access/driveways will be provided to individual allotments in the vicinity of any critical changes in the vertical alignment of Brooking Road as a result of the creek crossing.

Panorama Drive/Emmeline Drive

This intersection operates as a standard T-intersection, with priority given to Panorama Drive traffic. From Figure 13, it is evident that Panorama Drive at McGregor Road carries the following traffic:

- AM peak hour:
  - Northbound: 28 vph
  - Southbound: 17 vph
  - Two way: 45 vph
- PM peak hour:
  - Northbound: 19 vph
  - Southbound: 28 vph
  - Two way: 47 vph

This intersection also serves 81 low density residential lots to the north, south and east of the intersection, estimated to approach and depart the intersection as shown in Figure 14.

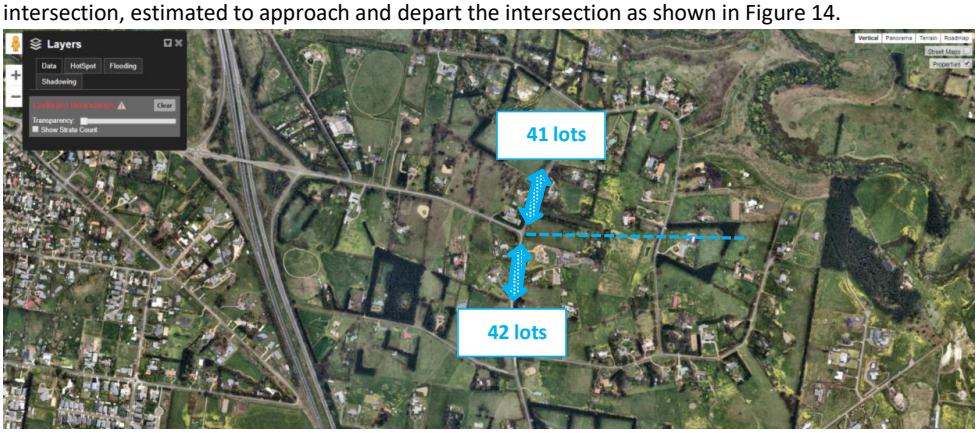


Figure 14: Panorama Drive/Emmeline Drive

Existing traffic volumes through the Panorama Drive/Emmeline Drive intersection have been estimated as follows:

- All northbound traffic on Panorama Drive at McGregor Road turns left into Emmeline Drive.
- All southbound traffic on Panorama Drive at McGregor Road turns right from Emmeline Drive.
- All traffic from properties south of a line extending east from Emmeline Drive (42 lots) travels from the south to the west and from the west to the south through the Panorama Drive/Emmeline intersection.
- All traffic from properties north of a line extending east from Emmeline Drive (41 lots) travels from the north to the west and from the west to the north through the Panorama Drive/Emmeline intersection.
- Traffic from these 83 properties is conservatively predicted to be generated at a rate of 1 vte/hour in both peak hours, split as follows:
    - AM peak hour: In: 0.2 Out: 0.8
    - PM peak hour: In: 0.6 Out: 0.4

Application of these assumptions produces the predicted existing traffic volumes through the Panorama Drive/Emmeline Drive intersection shown in Figure 15.

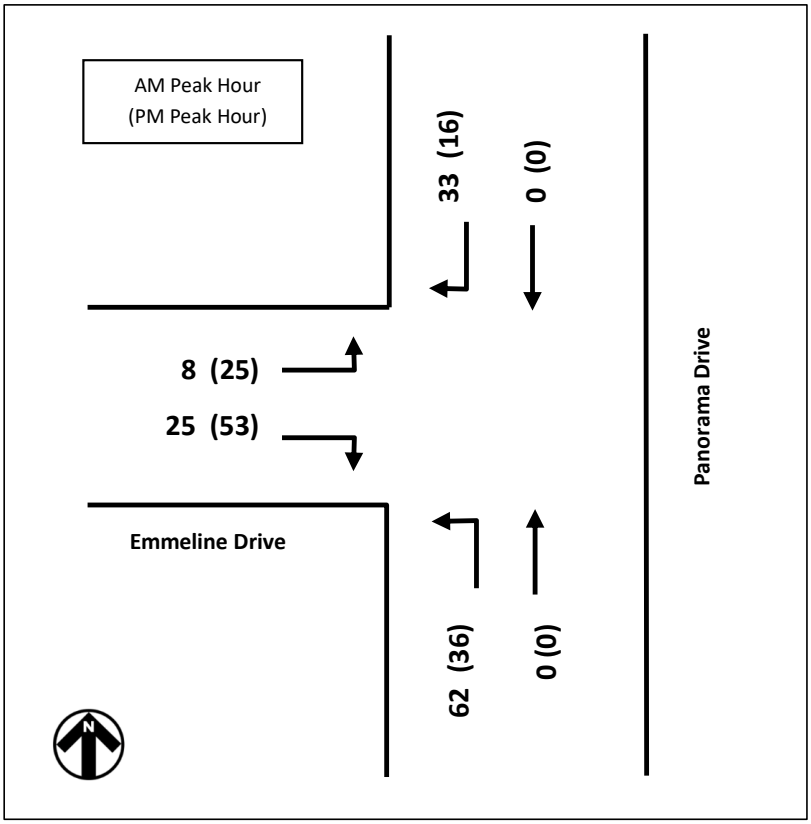


Figure 15: Panorama Drive/Emmeline Drive Existing Traffic Volumes

If all the traffic anticipated to be generated by the proposed Development Plan travelled through the Panorama Drive/Emmeline Drive intersection, this would add an additional 50 vph in both peak hours.

This T-intersection has the capacity to readily accommodate this additional traffic without the need for modification. Priority should remain with Panorama Drive traffic.

Panorama Drive/McGregor Road

Traffic generated by the proposed Development Plan is anticipated to travel via the Panorama Drive/McGregor Road intersection. As mentioned above, this conservatively equates to in the order of one vehicle being generated every 1.2 minutes at this intersection.

When combined with existing traffic at the existing Panorama Drive/McGregor Road intersection, i.e. up to 47 vehicle movements during each commuter peak hour from Figure 13, this results in approximately in the order of 97 vehicle movements during each commuter peak hour. The T-intersection at the Panorama Drive/McGregor Road intersection has the capacity to readily accommodate the additional traffic without the need for modification as detailed following.

For the purposes of an intersection analyses we have assumed the following:

- 1 vte/hour in both the AM and PM peak hours for each of the 50 lots within the Development Plan, split as follows:
  - AM peak hour: In: 0.2 Out: 0.8
  - PM peak hour: In: 0.6 Out: 0.4
- Based on the location of the proposed lots the number of movements associated with the Development Plan that would be generated to/from the east and west along McGregor Road to its intersection with Panorama Drive is as follows:
  - To/From the East: 35 lots
  - To/From the West: 15 lots

Based on the above, and when considering the existing traffic that was observed at the intersection during our associated traffic counts, the post development traffic at the intersection is estimated to be as presented in Figure 16 (note that this is conservatively based on a former potential yield of 55 lots on the subject site).

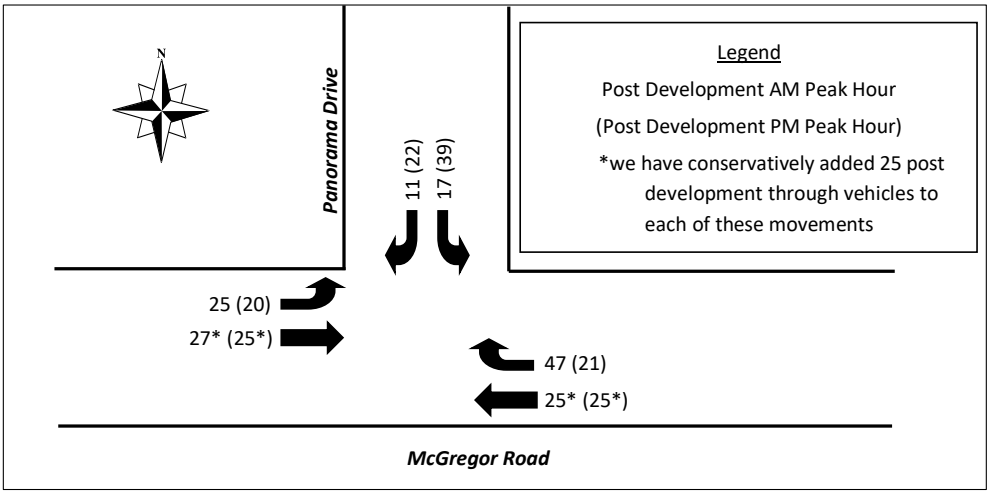


Figure 16: Post Development Peak Hour Traffic Volume Estimate (Panorama Drive/McGregor Road)

We have undertaken analysis of the post development conditions at the Panorama Drive/McGregor Road intersection using SIDRA Intersection 8 adopting all SIDRA default values including the conservative critical-gap and follow-up headway values.

Full output of the associated post development operating conditions at the intersection are attached at Appendix D which clearly show that the intersection will continue to function with abundant spare capacity even under the existing geometry with very low Degree of Saturation, Queues and Delays expected in both the AM and PM peak hours.

Accordingly, we are satisfied that it would be appropriate for nothing more than a BAR treatment to be provided at the Panorama Drive/McGregor Road intersection.

Safe Road Access to Lots

At Bend in Bennett Road and McGregor Road

This bend has a signed advisory speed of 50 km/h. The proposed Development Plan includes indicative lots. The lot on the bend in Bennett Road and McGregor Road has its eastern boundary 80m east of the bend in the property line on Bennett Road and has its southern boundary 80m south of the bend in the property line on McGregor Road. Both these bends in the property boundary are adjacent to the point where the bend in the road commences. Accordingly, there is adequate sight distances on both roads for vehicle access to be provided in the vicinity of either of the corner lots' property boundaries, given the speed of traffic exiting the bend in the road. It is noted that sight distances to the east along McGregor Road and to the south along Bennett Road are adequate.

At 88 Bennett Road

Access to 88 Bennett Road is appropriately considered as part of any planning permit application. At that stage, a range of options could be explored to ensure appropriate access is provided to this parcel of land. Sight lines at this location are affected by the horizontal and vertical geometry of Bennett Road. They are also affected by the speed limit along Bennett Road and vegetation largely within the road reserve. These can be appropriately addressed at planning permit or detailed design stage, with removal of exotic vegetation and an 80 km/h speed limit recommended.

Conclusion

Based on the preceding, we are of the opinion that there will be no unreasonable detrimental impacts to the surrounding road network as a result of a future subdivision at the subject site and that no external traffic-related works, other than at intersections of new internal roads with Bennett Road and McGregor Road, are required.

7 Other Traffic Matters

7.1 Internal Road Cross Sections

The DPO18 specifies that *"East-west and north-south road connections"*, including Brooking Road should be constructed with a *"minimum width of 20 metres"*. All road reservations within the proposed Development Plan are identified as being a minimum of 20m wide. Accordingly, the relevant requirement under DPO18 with regards to the minimum road reservation width for internal roads is met.

Council's *Engineering Requirements for Infrastructure Construction* policy document details the engineering requirements associated with infrastructure construction resulting from development within the Shire. Based on this document, it is apparent that Council considers the new roads to be "rural type". Council's engineers have advised that the following, in part, will be required:

- Carriageway width: 6.6m
- Shoulders: 0.5m both sides
- Swale drains on both sides
- 20m wide road reserve

All internal roads within the proposed Development Plan will be constructed in accordance with these requirements.

Council's *Shire Wide Footpath Plan* has prioritised the promotion of health and wellbeing and improvement of the built environment through the upgrade of walking and cycling infrastructure within the municipality". The footpath plan is in effect a 15 to 20 year plan to retrofit footpaths within the municipality.

The Shire-wide footpath plan for Gisborne is shown in Figure 17.

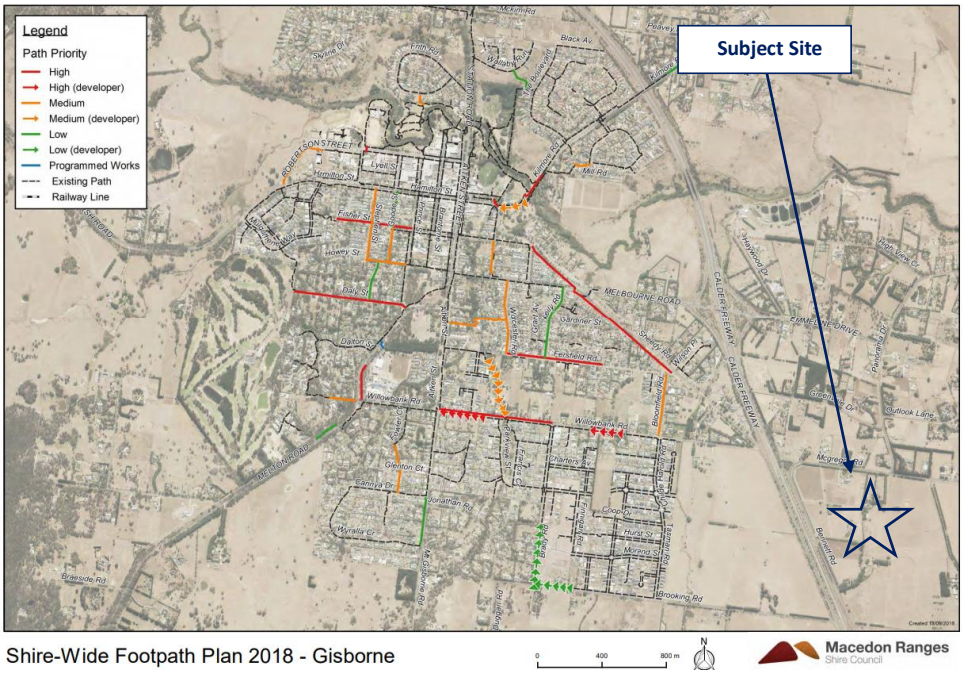


Figure 17: Shire-Wide Footpath Plan for Gisborne

The Development Plan subdivision concept plan allows for rural condition pedestrian and bike access. In particular, a 'rural pedestrian path/bike track' is proposed on the central east-west road, central north-south road and part of the north-south connection to Brooking Road, and there will also be a path along the waterway as shown in the Development Plan.

Bicycle movements can also be accommodated along the carriageway of all roads within the proposed development in a shared fashion that is consistent with typical practice.

7.2 Access for Service and Emergency Vehicles

All road carriageway widths will adequately facilitate relevant service and emergency vehicles and are consistent with the typical CFA requirements.

CFA and maintenance access is to be provided along the entire Djirri Drjirri Creek Reserve.

7.3 Pedestrian and Cycling Access

As shown in the Development Plan, a 'rural pedestrian path/bike track' is proposed on the central east-west road, central north-south road and part of the north-south connection to Brooking Road.

A path will also be provided along the waterway as also shown in the Development Plan.

Cyclists will also be able to utilise the proposed internal and abutting road carriageways in a shared fashion consistent with typical practice on access streets within a rural residential subdivision.

7.4 Public Transport Considerations

Consistent with existing dwellings in the area surrounding the site, future allotments within the subject site will not have access to public transport services in close proximity. However, it is noted that public transport services could be extended to the subject site to service the overall area if ultimately deemed necessary.

7.5 Street Lights

Street lighting is to be provided at the four intersections with the site at Bennett and McGregor Roads as identified in the Development Plan.

7.6 Gradients

The southern end of the north-south road has been located further west than identified in the DPO so as to avoid the slope and ensure that sight lines are maximised at its intersection with Brooking Road. Terraco, the civil engineering consultant undertaking assessments in association with the site, will have regard to the existing levels on the associated feature survey plan to ensure that a suitable gradient is provided at the Brooking Road culvert crossing.

The gradient of the road reservation through the land at 94 McGregor Road towards the escarpment in not particularly steep at 1 in 19.4. It is noted that the associated Development Plan cross-section as prepared by Terraco states that '*The alignment shown has been chosen to maximise the buffer from road reserve to the existing house and sheds on 94 McGregor Road, whilst maintaining a safe and practical road location above the top of escarpment. Alignment shown is indicative only and is to be detailed in engineering design*'. Significantly, the 1 in 4.6 grade is outside of the road reservation and is further offset by a flatter 1 in 8.8 grade and the Development Plan acknowledges the same. The alignment will be detailed at subdivision stage when it is most suitable.

8 Conclusions

Having undertaken a detailed traffic engineering assessment of the proposed Bennett Road Precinct Development Plan at 88-168 Bennett Road and 94-134 McGregor Road in Gisborne, we are of the opinion that:

a) The proposed road network is generally in accordance with Sub-Clause 5.0 (Map 1) of Schedule 18 to the Development Plan Overlay (DPO18) of the Macedon Ranges Planning Scheme;

b) No external traffic-related works, other than at intersections of new internal roads with Bennett Road and McGregor Road and the introduction of a BAR treatment at the existing Panorama Drive/McGregor Road intersection, are required as a result of a future subdivision at the subject site;

c) Street lighting will be provided at the four site intersections with Bennett and McGregor Roads;

d) The proposed internal road reservations and intersections are in accordance with DPO18 and will provide safe connection and permeability for pedestrians, cyclists and motor vehicles, in a fashion that is typically better than existing arrangements in the surrounding area;

e) An appropriate court bowl treatment capable of facilitating relevant service and emergency vehicles should be provided for the proposed dead-end road;

f) There will be no unreasonable detrimental impacts to the surrounding road network as a result of a future subdivision at the subject land; and

g) This Traffic Management and Impact Plan adequately addresses all associated requests of DPO18 of the Macedon Ranges Planning Scheme.

Appendix A
Tube Counts

G24605R-01F

Traffix Survey Pty Ltd
ABN 57 120 461 510

Address
Suite 8, 431 Burke Road
Glen Iris Victoria 3146

Contact
Telephone 03 9822 2888
Facsimile 03 9822 7444
survey@traffixgroup.com.au
www.traffixgroup.com.au

McGregor Road, Gisborne

Between

Panorama Drive & Bennett Road

Prepared for

Traffix Group Pty Ltd

May 2018

Reference: 38971891

Directors Henry H Turnbull Charmaine C Dunstan William D de Waard Donald J Robertson Manager Timothy S Mitchell
A Traffix Group Company

TRAFFIC COUNT SUMMARY

TraffixSurvey
Traffic Data Collection Services

McGregor Road, Gisborne

At: west of Panorama Dr

Between

Panorama Drive & Bennett Road

CUSTOMER:	Traffix Group Pty Ltd	**MAP REF:**	678 K11
TYPE COUNT:	7 days, Speed Vol Class	**ACTUAL DURATION:**	9 days
DATE START:	24/05/18	**DATE FINISH:**	30/05/18
TIME START:	0000	**TIME FINISH:**	2300
DIRECTION-1:	Eastbound	**DIRECTION-2:**	Westbound
COUNTER NO:		**SPEED LIMIT:**	80
CLASSES:	1 - 12	**SPEEDS:**	All

ALL VEHICLES	Eastbound	Westbound	COMBINED
24 Hour Week Day Average	153	142	294
24 Hour 7 Day Average	141	134	275
A.M. Peak Hour Volume	18	18	32
A.M. Peak Hour	0800-0859	1000-1059	0800-0859
P.M. Peak Hour Volume	22	17	36
P.M. Hour	1600-1659	1500-1559	1600-1659

COMMERCIAL VEHICLE	Eastbound	Westbound	COMBINED
Total Volume	86	138	224
%	8.7%	14.7%	11.6%

SPEEDS	Eastbound % Vol.	Westbound % Vol.	COMBINED % Vol.
>119km/h	0.0	0.0	0.0
>109km/h	0.0	0.0	0.0
>99km/h	0.0	0.1	0.1
>89km/h	0.6	0.7	0.7
>79km/h	4.0	4.2	4.1
>69km/h	24.9	14.5	19.8
>59km/h	64.5	47.3	56.1
>49km/h	91.5	82.4	87.1
>39km/h	97.5	95.6	96.6
>29km/h	98.8	98.3	98.5
>19km/h	99.9	99.3	99.6
85%ile	72.2	68.8	70.8
Mean	62.7	58.7	60.7

Notes

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Traffix Survey Traffic Count
Traffic Volume Analysis

TraffixSurvey
Traffic Data Collection Services

Site No: 3897189
Site location: McGregor Road, Gisborne
Between : Panorama Drive & Bennett Road
Direction : Eastbound
Time range: 0000 24/05/18 to 2300 30/05/18
Filters: Class: 1-12, Speeds: All

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Period									
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0100-0159	0	0	0	0	1	1	0	0	0
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0600-0659	4	3	4	3	3	3	1	3	3
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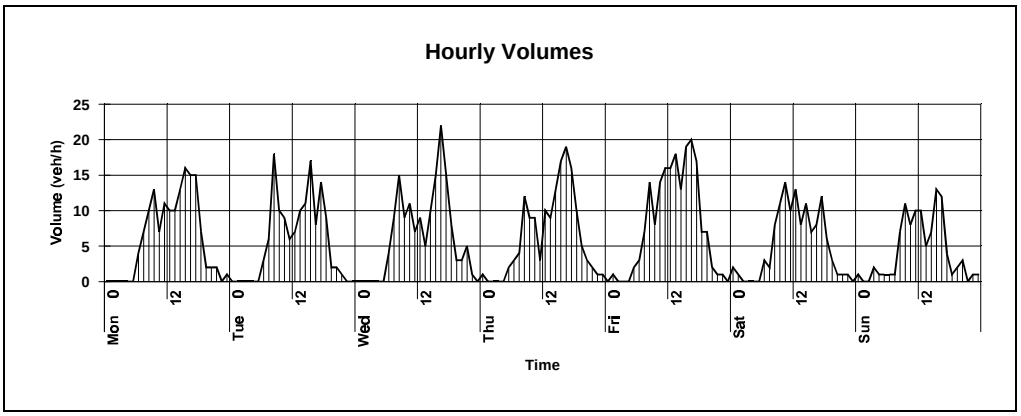
2100-2159	2	1	5	2	1	1	0	2	2
2200-2259	0	0	1	1	1	1	1	1	1
2300-2359	1	0	0	1	0	0	1	0	0
TOTALS									
12Hr 7-19	134	125	135	131	***169***	110	89	139	128
24Hr 0-24	145	133	151	149	***186***	122	102	153	141
24/12 Fact	1.08	1.06	1.12	1.14	1.10	1.11	1.15	1.10	1.11
AM HR	0900-0959	***0800-0859***	0800-0859	0800-0859	1100-1159	1000-1059	0900-0959		
PEAK	13	***18***	15	12	16	14	11		
PM HR	1500-1559	1500-1559	***1600-1659***	1600-1659	1600-1659	1200-1259	1500-1559		
PEAK	16	17	***22***	19	20	13	13		



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Traffix Survey Traffic Count
Traffic Volume Analysis

TraffixSurvey
Traffic Data Collection Services

Site No: 3897189
Site location: McGregor Road, Gisborne
Between : Panorama Drive & Bennett Road
Direction : Westbound
Time range: 0000 24/05/18 to 2300 30/05/18
Filters: Class: 1-12, Speeds: All

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0100-0159	0	1	0	0	0	0	0	0	0
0200-0259	0	0	0	0	0	0	0	0	0
0300-0359	0	0	0	0	0	0	1	0	0
0400-0459	0	1	1	0	0	0	0	0	0
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0600-0659	1	2	1	1	0	0	1	1	1
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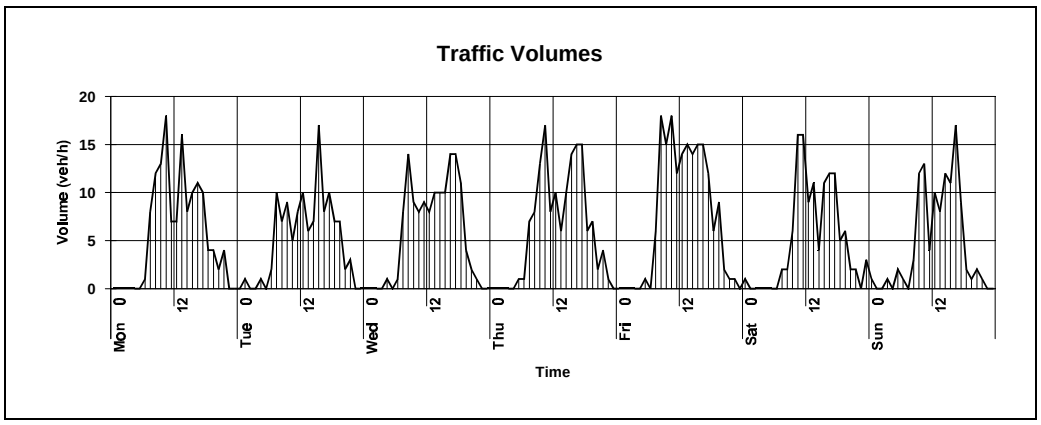
1900-1959	4	7	4	7	9	6	1	6	5
2000-2059	2	2	2	2	2	2	2	2	2
2100-2159	4	3	1	4	1	2	1	3	2
2200-2259	0	0	0	1	1	0	0	0	0
2300-2359	0	0	0	0	0	3	0	0	0
TOTALS									
12Hr 7-19	124	104	125	129	***160***	106	101	128	121
24Hr 0-24	135	120	134	145	***174***	120	110	142	134
24/12 Fact	1.09	1.15	1.07	1.12	1.09	1.13	1.09	1.10	1.10
AM HR	***1000-1059***	0700-0759	0800-0859	1000-1059	0800-0859	1000-1059	1000-1059		
PEAK	***18***	10	14	17	18	16	13		
PM HR	1300-1359	***1500-1559***	1600-1659	1600-1659	1300-1359	1600-1659	1600-1659		
PEAK	16	***17***	14	15	15	12	17		



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Traffix Survey Traffic Count

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Site No: 3897189
Site location: McGregor Road, Gisborne
Between : Panorama Drive & Bennett Road
Direction : Eastbound & Westbound
Time range: 0000 24/05/18 to 2300 30/05/18
Filters: Class: 1-12, Speeds: All

Date	28/05/18	29/05/18	30/05/18	24/05/18	25/05/18	26/05/18	27/05/18	AVERAGES	
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0100-0159	0	1	0	0	1	1	0	0	0
0200-0259	0	0	0	0	0	0	0	0	0
0300-0359	0	0	0	0	0	0	3	0	0
0400-0459	0	1	1	0	0	0	1	0	0
0500-0559	0	0	0	3	3	0	3	1	1
0600-0659	5	5	5	4	3	3	2	4	4
0700-0759	15	16	17	11	13	4	1	14	11
0800-0859	22	***25***	***29***	20	***32***	10	10	26	21
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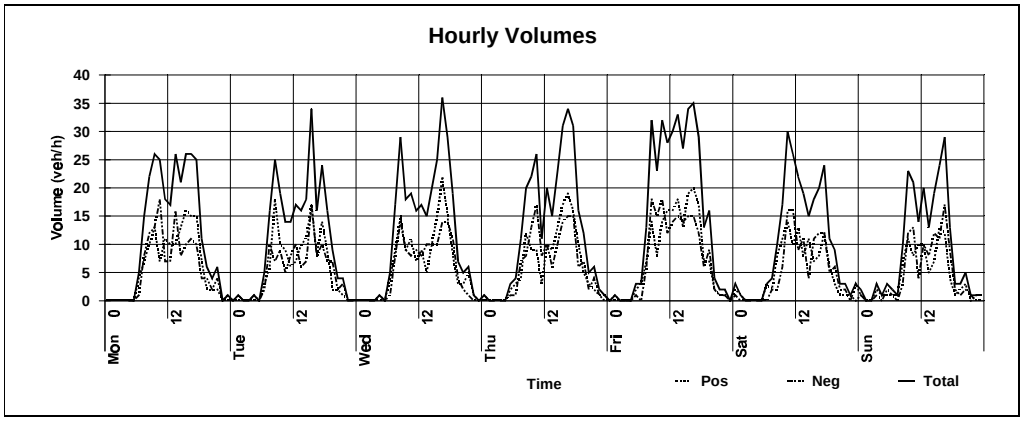
2100-2159	6	4	6	6	2	3	1	5	4
2200-2259	0	0	1	2	2	1	1	1	1
2300-2359	1	0	0	1	0	3	1	0	1
TOTALS									
12Hr 7-19	258	229	260	260	***329***	216	190	267	249
24Hr 0-24	280	253	285	294	***360***	242	212	294	275
24/12 Fact	1.09	1.10	1.10	1.13	1.09	1.12	1.12	1.10	1.11
AM HR	0900-0959	0800-0859	0800-0859	1000-1059	***0800-0859***	1000-1059	0900-0959		
PEAK	26	25	29	26	***32***	30	23		
PM HR	1300-1359	1500-1559	***1600-1659***	1600-1659	1600-1659	1700-1759	1600-1659		
PEAK	26	34	***36***	34	35	24	29		



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Traffic Data Collection Services

Traffix Survey Pty Ltd
ABN 57 120 461 510

Address
Suite 8, 431 Burke Road
Glen Iris Victoria 3146

Contact
Telephone 03 9822 2888
Facsimile 03 9822 7444
survey@traffixgroup.com.au
www.traffixgroup.com.au

McGregor Road, Gisborne

Between

Panorama Drive & Coney Court

Prepared for

Traffix Group Pty Ltd

May 2018

Reference: 38971901

Directors Henry H Turnbull Charmaine C Dunstan William D de Waard Donald J Robertson Manager Timothy S Mitchell
A Traffix Group Company

TRAFFIC COUNT SUMMARY

TraffixSurvey
Traffic Data Collection Services

McGregor Road, Gisborne

At: east of Panorama Dr

Between

Panorama Drive & Coney Court

CUSTOMER:	Traffix Group Pty Ltd	**MAP REF:**	678 K11
TYPE COUNT:	7 days, Speed Vol Class	**ACTUAL DURATION:**	9 days
DATE START:	24/05/18	**DATE FINISH:**	30/05/18
TIME START:	0000	**TIME FINISH:**	2300
DIRECTION-1:	Eastbound	**DIRECTION-2:**	Westbound
COUNTER NO:		**SPEED LIMIT:**	80
CLASSES:	1 - 12	**SPEEDS:**	All

ALL VEHICLES	Eastbound	Westbound	COMBINED
24 Hour Week Day Average	115	114	229
24 Hour 7 Day Average	110	109	219
A.M. Peak Hour Volume	15	22	32
A.M. Peak Hour	1000-1059	0800-0859	0800-0859
P.M. Peak Hour Volume	21	16	31
P.M. Hour	1700-1759	1400-1459	1700-1759

COMMERCIAL VEHICLE	Eastbound	Westbound	COMBINED
Total Volume	126	109	235
%	16.3%	14.3%	15.3%

SPEEDS	Eastbound % Vol.	Westbound % Vol.	COMBINED % Vol.
>119km/h	0.0	0.0	0.0
>109km/h	0.0	0.0	0.0
>99km/h	0.1	0.0	0.1
>89km/h	0.9	0.8	0.8
>79km/h	5.2	7.6	6.4
>69km/h	20.9	33.9	27.4
>59km/h	54.0	66.1	60.0
>49km/h	83.5	81.5	82.5
>39km/h	96.4	91.9	94.1
>29km/h	98.4	98.6	98.5
>19km/h	99.6	99.9	99.7
85%ile	72.0	75.3	73.9
Mean	60.3	62.4	61.4

Notes

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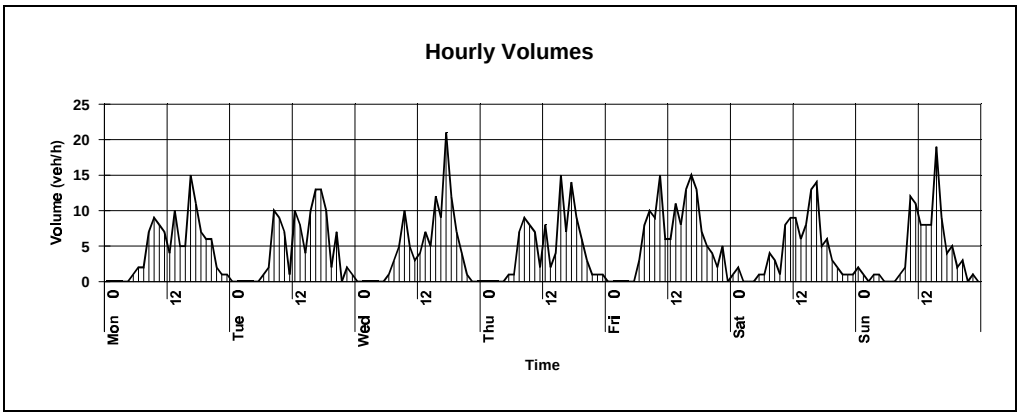
Traffix Survey Traffic Count
Traffic Volume Analysis

TraffixSurvey
Traffic Data Collection Services

Site No: 3897190
Site location: McGregor Road, Gisborne
Between : Panorama Drive & Coney Court
Direction : Eastbound
Time range: 0000 24/05/18 to 2300 30/05/18
Filters: Class: 1-12, Speeds: All

Date	28/05/18	29/05/18	30/05/18	24/05/18	25/05/18	26/05/18	27/05/18	AVERAGES	
	Mon	Tue	Wed	Thu	Fri	Sat	Sun	WEEKDAY	ALL DAYS
Period									
0000-0059	0	0	0	0	0	1	2	0	0
0100-0159	0	0	0	0	0	2	1	0	0
0200-0259	0	0	0	0	0	0	0	0	0
0300-0359	0	0	0	0	0	0	1	0	0
0400-0459	0	0	0	0	0	0	1	0	0
0500-0559	1	0	0	1	0	1	0	0	0
0600-0659	2	1	1	1	3	1	0	2	1
0700-0759	2	2	3	7	8	4	0	4	4
0800-0859	7	***10***	5	***9***	10	3	1	8	6
0900-0959	***9***	9	***10***	8	9	1	2	9	7
1000-1059	8	7	5	7	***15***	8	***12***	8	9
1100-1159	7	1	3	2	6	***9***	11	4	6
1200-1259	4	10	4	8	6	9	8	6	7
1300-1359	10	8	7	2	11	6	8	8	7
1400-1459	5	4	5	4	8	8	8	5	6
1500-1559	5	10	12	***15***	13	13	***19***	11	12
1600-1659	***15***	***13***	9	7	***15***	***14***	9	12	12
1700-1759	11	13	***21***	14	13	5	4	14	12
1800-1859	7	10	12	9	7	6	5	9	8
1900-1959	6	2	7	6	5	3	2	5	4
2000-2059	6	7	4	3	4	2	3	5	4
2100-2159	2	0	1	1	2	1	0	1	1
2200-2259	1	2	0	1	5	1	1	2	2
2300-2359	1	1	0	1	0	1	0	1	1
TOTALS									
12Hr 7-19	90	97	96	92	***121***	86	87	99	96
24Hr 0-24	109	110	109	106	***140***	99	98	115	110
24/12 Fact	1.21	1.13	1.14	1.15	1.16	1.15	1.13	1.16	1.15
AM HR	0900-0959	0800-0859	0900-0959	0800-0859	***1000-1059***	1100-1159	1000-1059		
PEAK	9	10	10	9	***15***	9	12		
PM HR	1600-1659	1600-1659	***1700-1759***	1500-1559	1600-1659	1600-1659	1500-1559		
PEAK	15	13	***21***	15	15	14	19		



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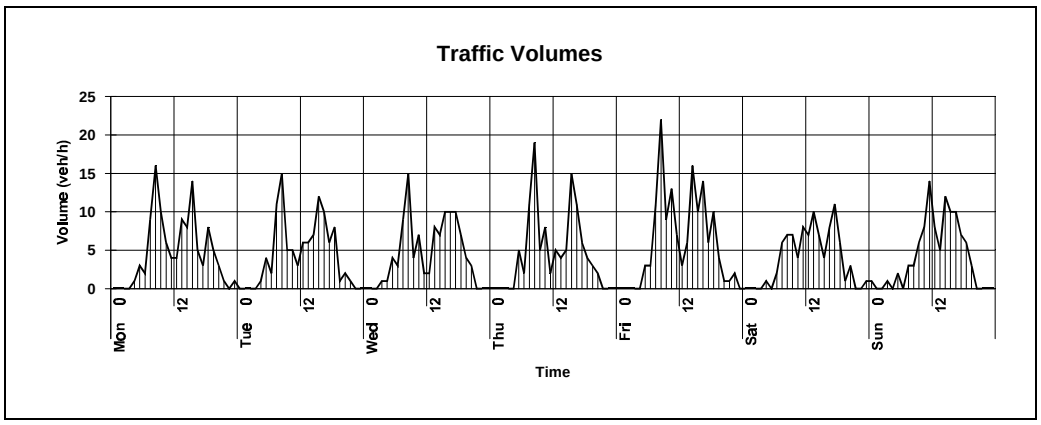
Traffix Survey Traffic Count
Traffic Volume Analysis

TraffixSurvey
Traffic Data Collection Services

Site No: 3897190
Site location: McGregor Road, Gisborne
Between : Panorama Drive & Coney Court
Direction : Westbound
Time range: 0000 24/05/18 to 2300 30/05/18
Filters: Class: 1-12, Speeds: All

Date	28/05/18	29/05/18	30/05/18	24/05/18	25/05/18	26/05/18	27/05/18	AVERAGES	
	Mon	Tue	Wed	Thu	Fri	Sat	Sun	WEEKDAY	ALL DAYS
Period									
0000-0059	0	0	0	0	0	0	1	0	0
0100-0159	0	0	0	0	0	0	0	0	0
0200-0259	0	0	0	0	0	0	0	0	0
0300-0359	0	0	1	0	0	0	1	0	0
0400-0459	1	1	1	0	0	1	0	1	1
0500-0559	3	4	4	5	3	0	2	4	3
0600-0659	2	2	3	2	3	2	0	2	2
0700-0759	9	11	9	11	11	6	3	10	9
0800-0859	***16***	***15***	***15***	***19***	***22***	7	3	17	14
0900-0959	10	5	4	5	9	7	6	7	7
1000-1059	6	5	7	8	13	4	8	8	7
1100-1159	4	3	2	2	7	***8***	***14***	4	6
1200-1259	4	6	2	5	3	7	8	4	5
1300-1359	9	6	8	4	6	10	5	7	7
1400-1459	8	7	7	5	***16***	7	***12***	9	9
1500-1559	***14***	***12***	***10***	***15***	10	4	10	12	11
1600-1659	5	10	10	11	14	8	10	10	10
1700-1759	3	6	10	6	6	***11***	7	6	7
1800-1859	8	8	7	4	10	6	6	7	7
1900-1959	5	1	4	3	4	1	3	3	3
2000-2059	3	2	3	2	1	3	0	2	2
2100-2159	1	1	0	0	1	0	0	1	0
2200-2259	0	0	0	0	2	0	0	0	0
2300-2359	1	0	0	0	0	1	0	0	0
TOTALS									
12Hr 7-19	96	94	91	95	***127***	85	92	101	97
24Hr 0-24	112	105	107	107	***141***	93	99	114	109
24/12 Fact	1.17	1.12	1.18	1.13	1.11	1.09	1.08	1.14	1.12
AM HR	0800-0859	0800-0859	0800-0859	0800-0859	***0800-0859***	1100-1159	1100-1159		
PEAK	16	15	15	19	***22***	8	14		
PM HR	1500-1559	1500-1559	1500-1559	1500-1559	***1400-1459***	1700-1759	1400-1459		
PEAK	14	12	10	15	***16***	11	12		



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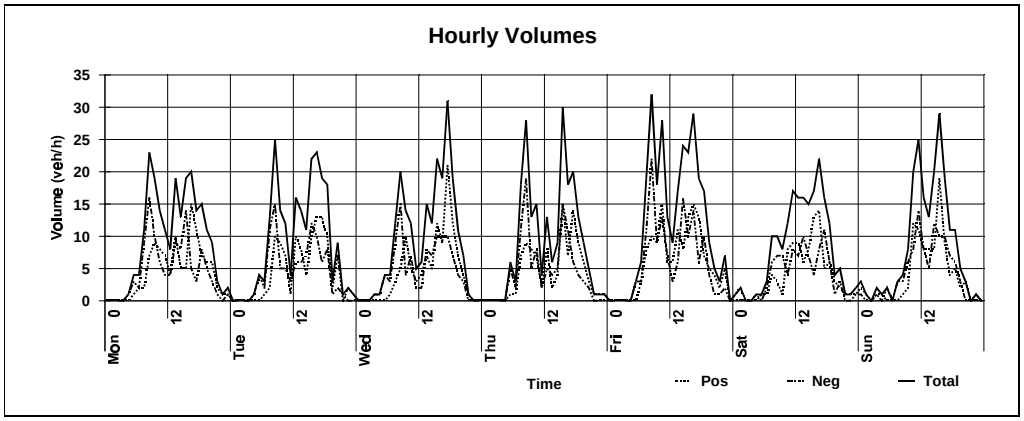
Traffix Survey Traffic Count

Traffic Volume Analysis

TraffixSurvey
Traffic Data Collection Services

Site No: 3897190
Site location: McGregor Road, Gisborne
Between : Panorama Drive & Coney Court
Direction : Eastbound & Westbound
Time range: 0000 24/05/18 to 2300 30/05/18
Filters: Class: 1-12, Speeds: All

Date	28/05/18	29/05/18	30/05/18	24/05/18	25/05/18	26/05/18	27/05/18	AVERAGES	
	Mon	Tue	Wed	Thu	Fri	Sat	Sun	WEEKDAY	ALL DAYS
Period									
0000-0059	0	0	0	0	0	1	3	0	1
0100-0159	0	0	0	0	0	2	1	0	0
0200-0259	0	0	0	0	0	0	0	0	0
0300-0359	0	0	1	0	0	0	2	0	0
0400-0459	1	1	1	0	0	1	1	1	1
0500-0559	4	4	4	6	3	1	2	4	3
0600-0659	4	3	4	3	6	3	0	4	3
0700-0759	11	13	12	18	19	10	3	15	12
0800-0859	***23***	***25***	***20***	***28***	***32***	10	4	26	20
0900-0959	19	14	14	13	18	8	8	16	13
1000-1059	14	12	12	15	28	12	20	16	16
1100-1159	11	4	5	4	13	***17***	***25***	7	11
1200-1259	8	16	6	13	9	16	16	10	12
1300-1359	19	14	15	6	17	16	13	14	14
1400-1459	13	11	12	9	24	15	20	14	15
1500-1559	19	22	22	***30***	23	17	***29***	23	23
1600-1659	***20***	***23***	19	18	***29***	***22***	19	22	21
1700-1759	14	19	***31***	20	19	16	11	21	19
1800-1859	15	18	19	13	17	12	11	16	15
1900-1959	11	3	11	9	9	4	5	9	7
2000-2059	9	9	7	5	5	5	3	7	6
2100-2159	3	1	1	1	3	1	0	2	1
2200-2259	1	2	0	1	7	1	1	2	2
2300-2359	2	1	0	1	0	2	0	1	1
TOTALS									
12Hr 7-19	186	191	187	187	***248***	171	179	200	193
24Hr 0-24	221	215	216	213	***281***	192	197	229	219
24/12 Fact	1.19	1.13	1.16	1.14	1.13	1.12	1.10	1.15	1.14
AM HR	0800-0859	0800-0859	0800-0859	0800-0859	***0800-0859***	1100-1159	1100-1159		
PEAK	23	25	20	28	***32***	17	25		
PM HR	1600-1659	1600-1659	***1700-1759***	1500-1559	1600-1659	1600-1659	1500-1559		
PEAK	20	23	***31***	30	29	22	29		



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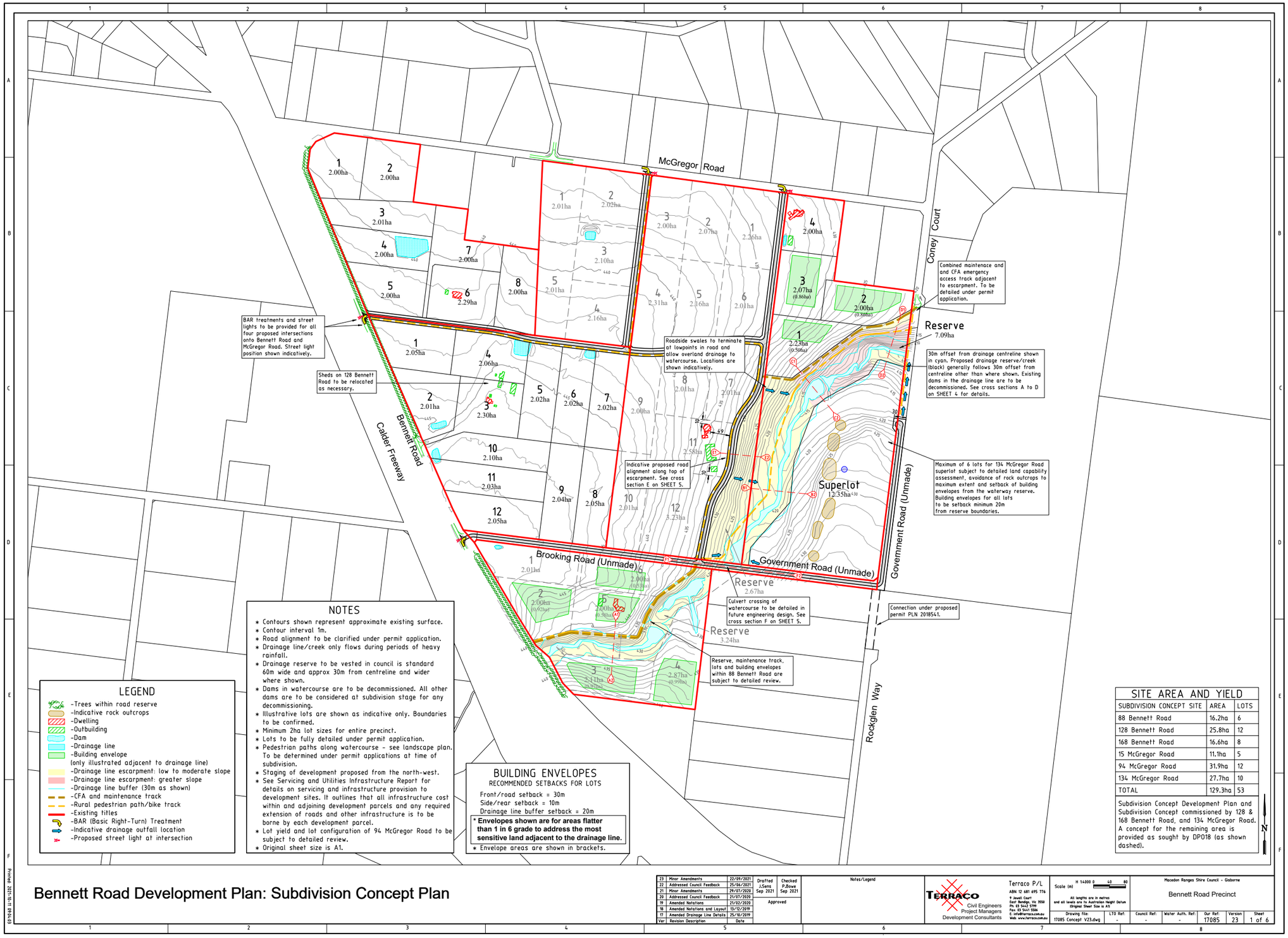
Appendix B
Turning Movement Counts

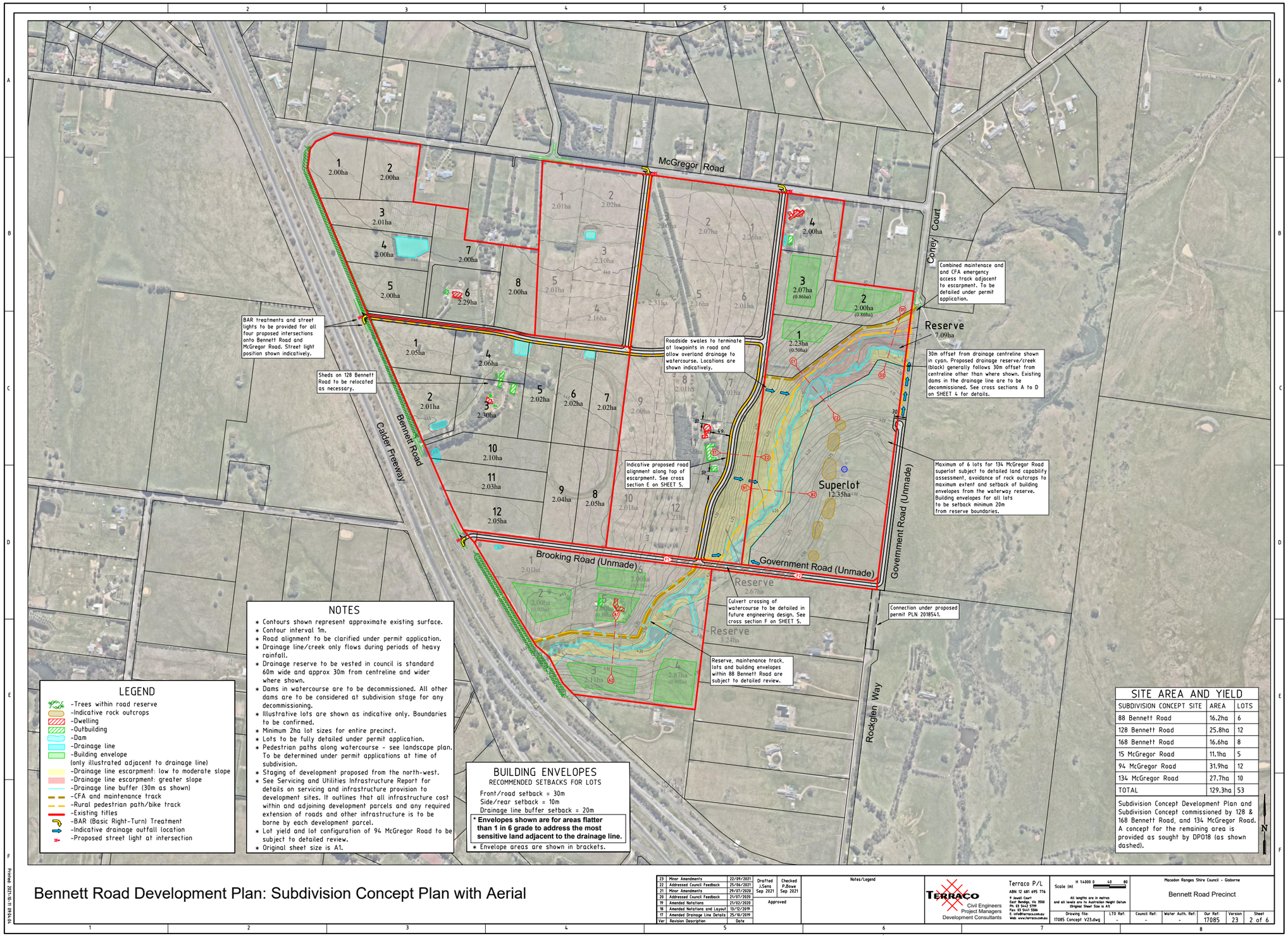
G24605R-01F

	Panorama Drive (North Approach)		McGregor Road (East Approach)		McGregor Road (West Approach)				
23/05/2018	Left	Right	Right	Through	Through	Left	Total Movements	Hourly Volume	
16:30	0	0	2	0	0	5	7	44	
16:45	5	4	2	0	0	3	14	47	4.45-5.45pm (Peak Hour)
17:00	3	2	1	0	0	5	11	43	
17:15	3	3	2	0	0	4	12	38	
17:30	5	3	1	0	0	1	10	32	
17:45	2	2	3	0	1	2	10		
18:00	2	2	1	0	0	1	6		
18:15	1	2	1	0	0	2	6		
Peak Hour Volumes	16	12	6	0	0	13	47		
24/05/2018									
7:00	1	2	1	0	0	1	5	26	
7:15	1	1	3	0	0	0	5	28	
7:30	2	1	1	1	0	2	7	34	
7:45	1	3	4	1	0	0	9	46	
8:00	1	2	2	0	1	1	7	47	8-9am (Peak Hour)
8:15	4	2	3	0	0	2	11		
8:30	2	2	8	0	1	6	19		
8:45	2	2	4	0	0	2	10		
Peak Hour Volumes	9	8	17	0	2	11	47		

Appendix C
Proposed Development Plan

G24605R-01F


McGregor Road
Coney Court
Calder Freeway
Bennett Road
Brooking Road (Unmade)
Government Road (Unmade)
Government Road (Unmade)
Rockglen Way
Reserve
7.09ha
Superlot
12.35ha
Reserve
2.67ha
Reserve
3.24ha
BAR treatments and street lights to be provided for all four proposed intersections onto Bennett Road and McGregor Road. Street light position shown indicatively.
Sheds on 128 Bennett Road to be relocated as necessary.
Roadside swales to terminate at lowpoints in road and allow overland drainage to watercourse. Locations are shown indicatively.
Combined maintenace and and CFA emergency access track adjacent to escarpment. To be detailed under permit application.
30m offset from drainage centreline shown in cyan. Proposed drainage reserve/creek (black) generally follows 30m offset from centreline other than where shown. Existing dams in the drainage line are to be decommissioned. See cross sections A to D on SHEET 4 for details.
Maximum of 6 lots for 134 McGregor Road superlot subject to detailed land capability assessment, avoidance of rock outcrops to maximum extent and setback of building envelopes from the waterway reserve. Building envelopes for all lots to be setback minimum 20m from reserve boundaries.
Indicative proposed road alignment along top of escarpment. See cross section E on SHEET 5.
Culvert crossing of watercourse to be detailed in future engineering design. See cross section F on SHEET 5.
Connection under proposed permit PLN 2018541.
Reserve, maintenance track, lots and building envelopes within 88 Bennett Road are subject to detailed review.
LEGEND
-Trees within road reserve
-Indicative rock outcrops
-Dwelling
-Outbuilding
-Dam
-Drainage line
-Building envelope
(only illustrated adjacent to drainage line)
-Drainage line escarpment: low to moderate slope
-Drainage line escarpment: greater slope
-Drainage line buffer (30m as shown)
-CFA and maintenance track
-Rural pedestrian path/bike track
-Existing titles
-BAR (Basic Right-Turn) Treatment
-Indicative drainage outfall location
-Proposed street light at intersection
NOTES
* Contours shown represent approximate existing surface.
* Contour interval 1m.
* Road alignment to be clarified under permit application.
* Drainage line/creek only flows during periods of heavy rainfall.
* Drainage reserve to be vested in council is standard 60m wide and approx 30m from centreline and wider where shown.
* Dams in watercourse are to be decommissioned. All other dams are to be considered at subdivision stage for any decommissioning.
* Illustrative lots are shown as indicative only. Boundaries to be confirmed.
* Minimum 2ha lot sizes for entire precinct.
* Lots to be fully detailed under permit application.
* Pedestrian paths along watercourse - see landscape plan. To be determined under permit applications at time of subdivision.
* Staging of development proposed from the north-west.
* See Servicing and Utilities Infrastructure Report for details on servicing and infrastructure provision to development sites. It outlines that all infrastructure cost within and adjoining development parcels and any required extension of roads and other infrastructure is to be borne by each development parcel.
* Lot yield and lot configuration of 94 McGregor Road to be subject to detailed review.
* Original sheet size is A1.
BUILDING ENVELOPES
RECOMMENDED SETBACKS FOR LOTS
Front/road setback = 30m
Side/rear setback = 10m
Drainage line buffer setback = 20m
* Envelopes shown are for areas flatter than 1 in 6 grade to address the most sensitive land adjacent to the drainage line.
* Envelope areas are shown in brackets.
SITE AREA AND YIELD
SUBDIVISION CONCEPT SITE | AREA | LOTS
88 Bennett Road | 16.2ha | 6
128 Bennett Road | 25.8ha | 12
168 Bennett Road | 16.6ha | 8
15 McGregor Road | 11.1ha | 5
94 McGregor Road | 31.9ha | 12
134 McGregor Road | 27.7ha | 10
TOTAL | 129.3ha | 53
Subdivision Concept Development Plan and Subdivision Concept commissioned by 128 & 168 Bennett Road, and 134 McGregor Road. A concept for the remaining area is provided as sought by DP018 (as shown dashed).
N
Bennett Road Development Plan: Subdivision Concept Plan
23 Minor Amendments 22/09/2021
22 Addressed Council Feedback 25/06/2021
21 Minor Amendments 29/07/2020
20 Addressed Council Feedback 31/07/2020
19 Amended Notations 21/02/2020
18 Amended Notations and Layout 13/12/2019
17 Amended Drainage Line Details 25/10/2019
Ver Revision Description Date
Drafted J.Sens Sep 2021
Checked P.Bowe Sep 2021
Approved
Notes/Legend
TERRACO Civil Engineers Project Managers Development Consultants
Terraco P/L
ABN 12 681 695 776
9 Sewell Court
East Bendigo, Vic 3550
Ph: 03 5443 5399
Fax: 03 5441 5506
E: info@terraco.com.au
Web: www.terraco.com.au
Scale (m) H 1:4000 0 40 80
All lengths are in metres and all levels are to Australian Height Datum (Original Sheet Size is A1)
Drawing file: 17085 Concept V23.dwg
LTO Ref: -
Macedon Ranges Shire Council - Gisborne
Bennett Road Precinct
Council Ref: -
Water Auth. Ref: -
Our Ref: 17085
Version 23
Sheet 1 of 6
Printed: 29/12/2021 09:43:19



Bennett Road Development Plan: Subdivision Concept Plan with Aerial

Ver	Revision Description	Date
23	Minor Amendments	22/09/2021
22	Addressed Council Feedback	25/06/2021
21	Minor Amendments	29/07/2020
20	Addressed Council Feedback	21/07/2020
19	Amended Notations	21/02/2020
18	Amended Notations and Layout	13/12/2019
17	Amended Drainage Line Details	25/10/2019

Drafted J.Sens Sep 2021 | Checked P.Bowe Sep 2021 | Approved

Notes/Legend

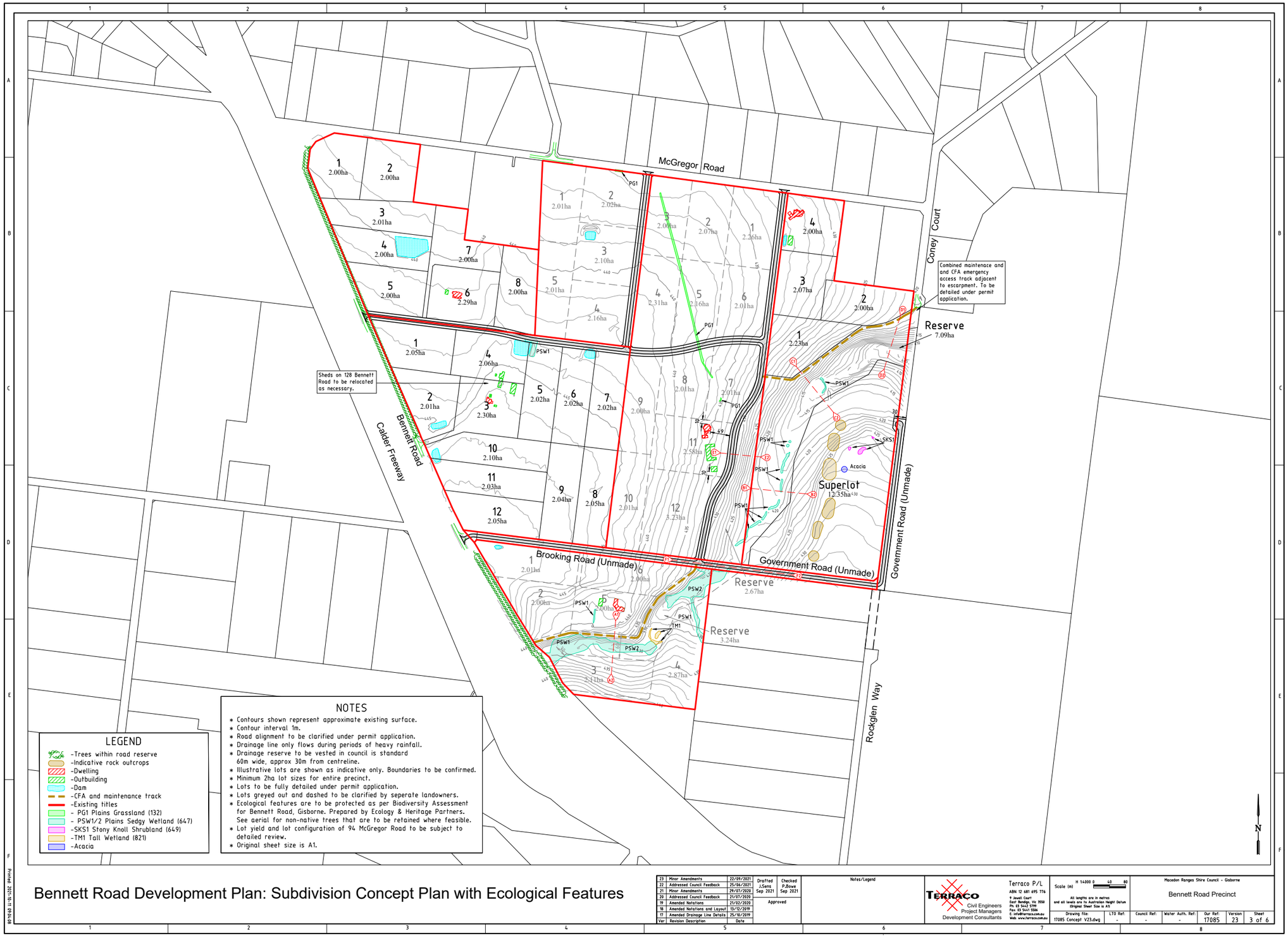
TERRACO Civil Engineers Project Managers Development Consultants

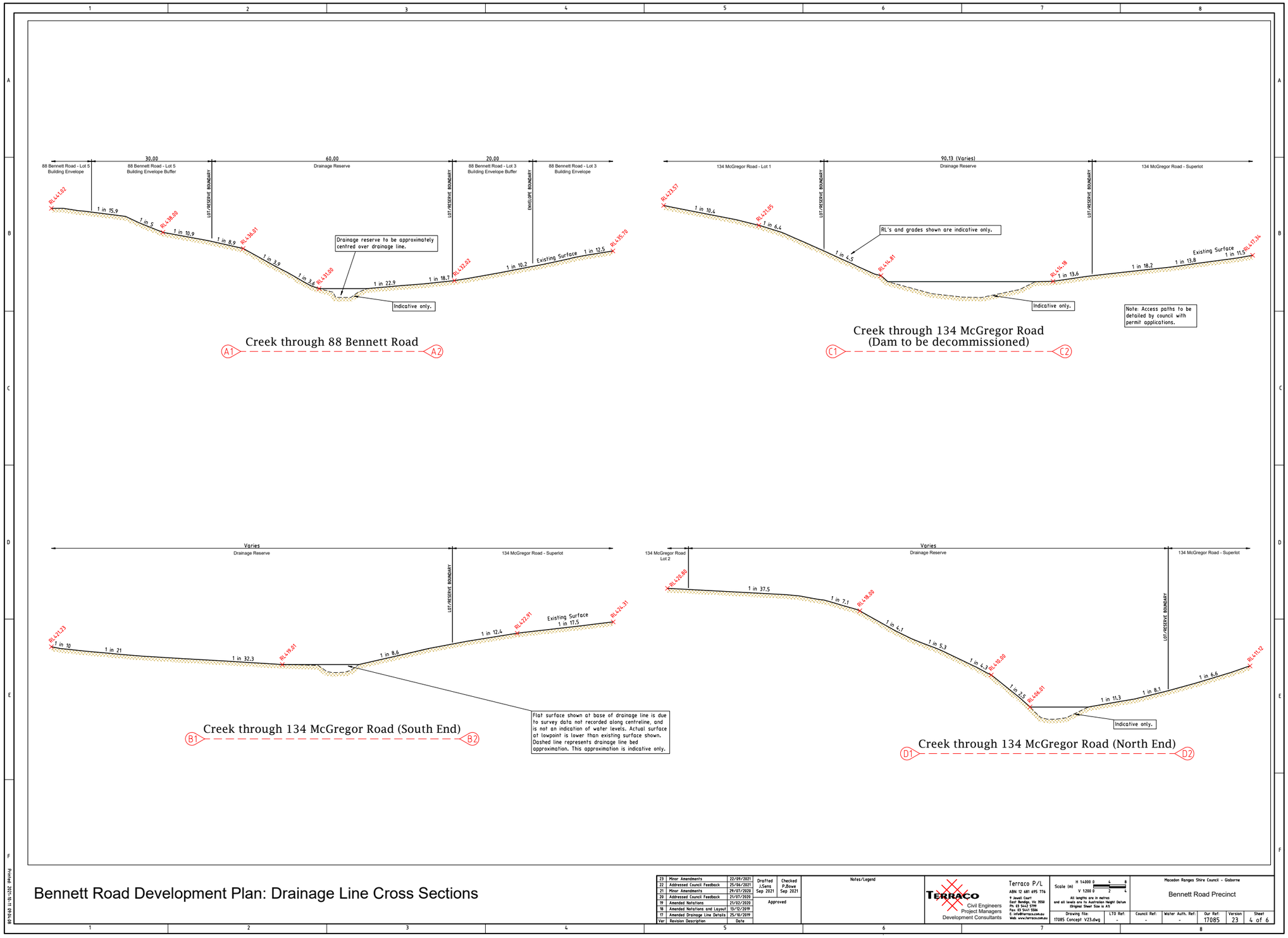
Terraco P/L
ABN 12 681 695 776
9 Jewell Court
East Bendigo, Vic 3550
Ph: 03 5442 5799
Fax: 03 5443 5506
E: info@terraco.com.au
Web: www.terraco.com.au

Scale (m) H 1:4000 0 40 80
All lengths are in metres and all levels are to Australian Height Datum (Original Sheet Size is A1)

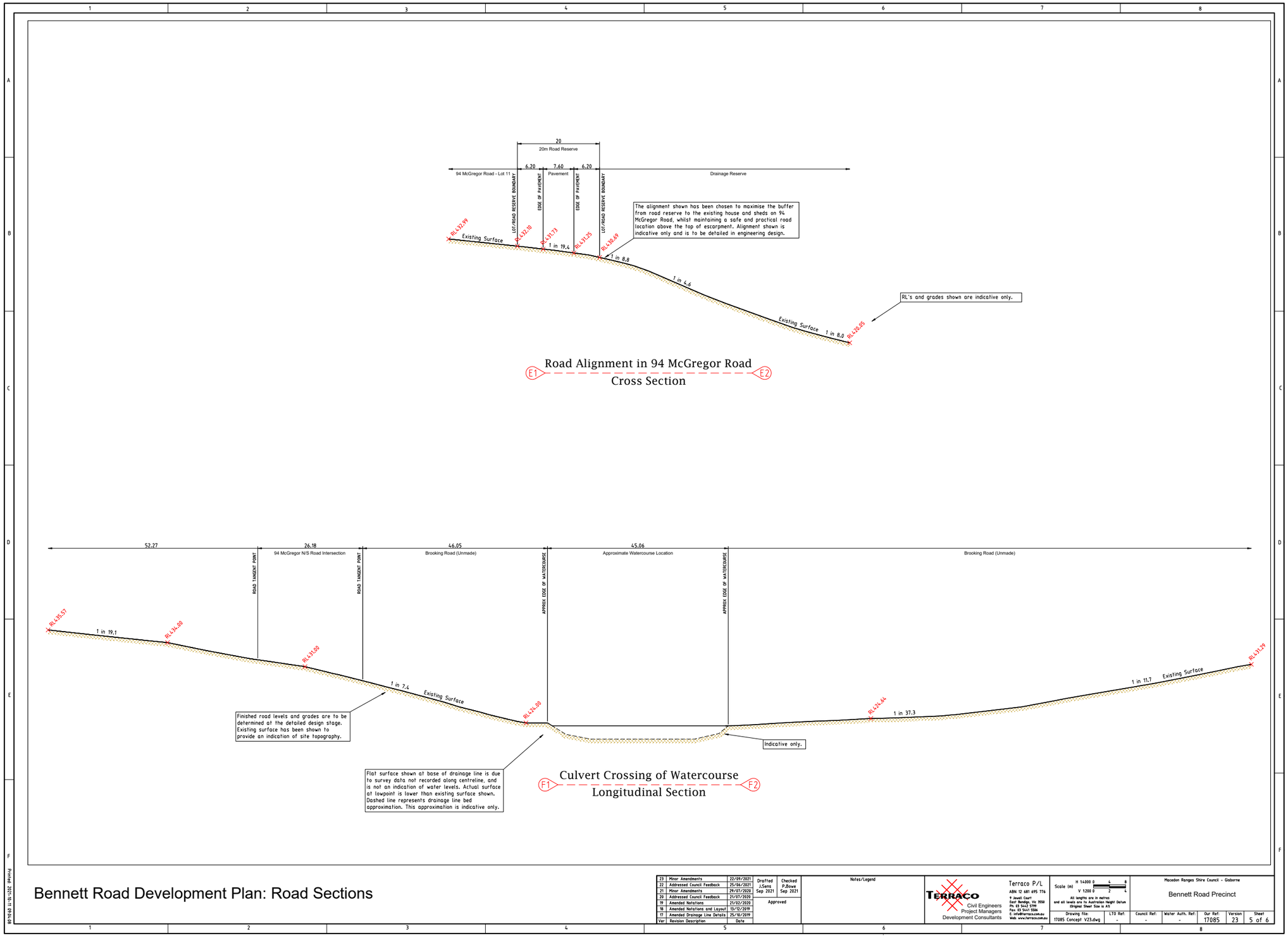
Drawing file: 17085 Concept V23.dwg | LTO Ref: - | Council Ref: - | Water Auth. Ref: - | Our Ref: 17085 | Version 23 | Sheet 2 of 6

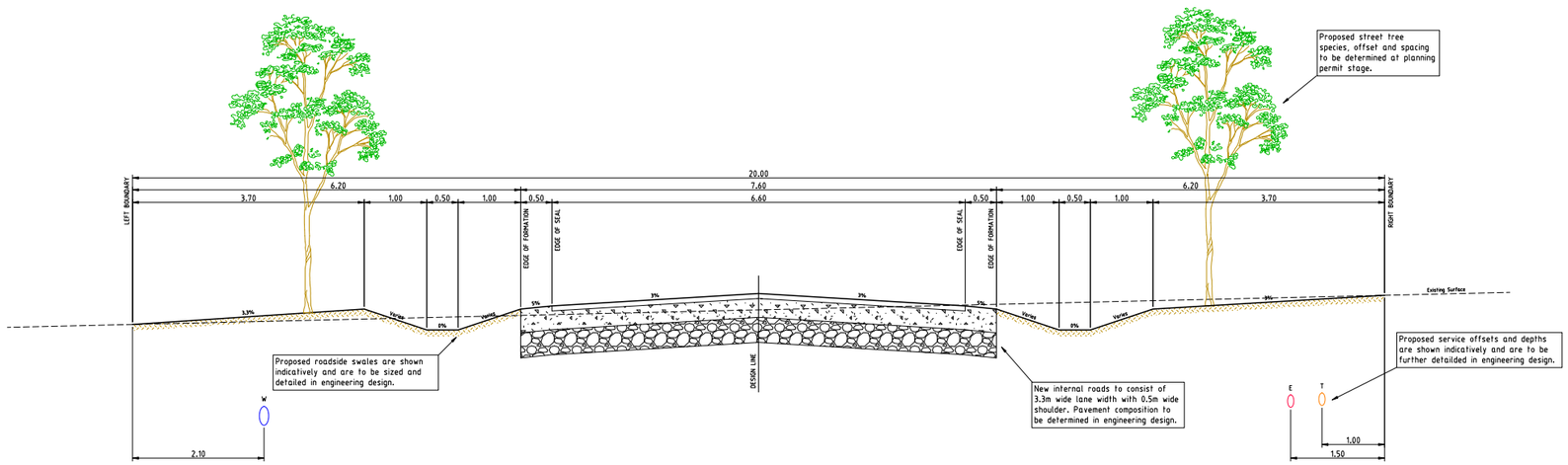
Macedon Ranges Shire Council - Gisborne
Bennett Road Precinct


McGregor Road
Coney Court
Bennett Road
Calder Freeway
Brooking Road (Unmade)
Government Road (Unmade)
Rockglen Way
Reserve
7.09ha
Superlot
12.35ha
Reserve
2.67ha
Reserve
3.24ha
Combined maintenance and and CFA emergency access track adjacent to escarpment. To be detailed under permit application.
Sheds on 128 Bennett Road to be relocated as necessary.
LEGEND
-Trees within road reserve
-Indicative rock outcrops
-Dwelling
-Outbuilding
-Dam
-CFA and maintenance track
-Existing titles
- PG1 Plains Grassland (132)
- PSW1/2 Plains Sedgy Wetland (647)
-SKS1 Stony Knoll Shrubland (649)
-TM1 Tall Wetland (821)
-Acacia
NOTES
* Contours shown represent approximate existing surface.
* Contour interval 1m.
* Road alignment to be clarified under permit application.
* Drainage line only flows during periods of heavy rainfall.
* Drainage reserve to be vested in council is standard 60m wide, approx 30m from centreline.
* Illustrative lots are shown as indicative only. Boundaries to be confirmed.
* Minimum 2ha lot sizes for entire precinct.
* Lots to be fully detailed under permit application.
* Lots greyed out and dashed to be clarified by seperate landowners.
* Ecological features are to be protected as per Biodiversity Assessment for Bennett Road, Gisborne. Prepared by Ecology & Heritage Partners. See aerial for non-native trees that are to be retained where feasible.
* Lot yield and lot configuration of 94 McGregor Road to be subject to detailed review.
* Original sheet size is A1.
Bennett Road Development Plan: Subdivision Concept Plan with Ecological Features
Terraco P/L
Civil Engineers
Project Managers
Development Consultants
Macedon Ranges Shire Council - Gisborne
Bennett Road Precinct
17085
23
3 of 6



Creek through 88 Bennett Road
A1
A2
Drainage reserve to be approximately centred over drainage line.
Indicative only.
Existing Surface
Creek through 134 McGregor Road (Dam to be decommissioned)
C1
C2
RL's and grades shown are indicative only.
Indicative only.
Note: Access paths to be detailed by council with permit applications.
Creek through 134 McGregor Road (South End)
B1
B2
Flat surface shown at base of drainage line is due to survey data not recorded along centreline, and is not an indication of water levels. Actual surface at lowpoint is lower than existing surface shown. Dashed line represents drainage line bed approximation. This approximation is indicative only.
Creek through 134 McGregor Road (North End)
D1
D2
Indicative only.
Bennett Road Development Plan: Drainage Line Cross Sections
Terraco P/L
Civil Engineers
Project Managers
Development Consultants
Macedon Ranges Shire Council - Gisborne
Bennett Road Precinct
17085
23
4 of 6


20
20m Road Reserve
6.20
7.60
6.20
94 McGregor Road - Lot 11
Pavement
Drainage Reserve
LOT/ROAD RESERVE BOUNDARY
EDGE OF PAVEMENT
EDGE OF PAVEMENT
LOT/ROAD RESERVE BOUNDARY
RL432.99
RL432.10
RL431.73
RL431.25
RL430.69
Existing Surface
1 in 19.4
1 in 8.8
1 in 4.6
Existing Surface
1 in 8.0
RL420.05
The alignment shown has been chosen to maximise the buffer from road reserve to the existing house and sheds on 94 McGregor Road, whilst maintaining a safe and practical road location above the top of escarpment. Alignment shown is indicative only and is to be detailed in engineering design.
RL's and grades shown are indicative only.
E1
E2
Road Alignment in 94 McGregor Road
Cross Section
52.27
26.18
94 McGregor N/S Road Intersection
46.05
Brooking Road (Unmade)
45.06
Approximate Watercourse Location
Brooking Road (Unmade)
ROAD TANGENT POINT
ROAD TANGENT POINT
APPROX EDGE OF WATERCOURSE
APPROX EDGE OF WATERCOURSE
RL435.57
1 in 19.1
RL434.00
RL431.00
1 in 7.4
Existing Surface
RL424.00
RL424.64
1 in 37.3
1 in 11.7
Existing Surface
RL431.29
Finished road levels and grades are to be determined at the detailed design stage. Existing surface has been shown to provide an indication of site topography.
Indicative only.
Flat surface shown at base of drainage line is due to survey data not recorded along centreline, and is not an indication of water levels. Actual surface at lowpoint is lower than existing surface shown. Dashed line represents drainage line bed approximation. This approximation is indicative only.
F1
F2
Culvert Crossing of Watercourse
Longitudinal Section
Bennett Road Development Plan: Road Sections
23 Minor Amendments 22/09/2021
22 Addressed Council Feedback 25/06/2021
21 Minor Amendments 29/07/2020
20 Addressed Council Feedback 21/07/2020
19 Amended Notations 21/02/2020
18 Amended Notations and Layout 13/12/2019
17 Amended Drainage Line Details 25/10/2019
Ver Revision Description Date
Drafted J.Sens Sep 2021
Checked P.Bowe Sep 2021
Approved
Notes/Legend
TERRACO
Civil Engineers
Project Managers
Development Consultants
Terraco P/L
ABN 12 681 695 776
9 Jewell Court
East Bendigo, Vic 3550
Ph: 03 5442 5799
Fax: 03 5441 5506
E: info@terraco.com.au
Web: www.terraco.com.au
Scale (m) H 14000 0 4 8
V 1200 0 2 4
All lengths are in metres
and all levels are to Australian Height Datum
(Original Sheet Size is A1)
Drawing file: 17085 Concept V23.dwg
LTO Ref: -
Macedon Ranges Shire Council - Gisborne
Bennett Road Precinct
Council Ref: -
Water Auth. Ref: -
Our Ref: 17085
Version 23
Sheet 5 of 6
Printed 2021-10-11 09:04:08



Typical Cross Section - Internal Roads

Bennett Road Development Plan: Typical Road Cross Sections

Ver	Revision Description	Date
23	Minor Amendments	22/09/2021
22	Addressed Council Feedback	25/06/2021
21	Minor Amendments	29/07/2020
20	Addressed Council Feedback	21/07/2020
19	Amended Notations	21/02/2020
18	Amended Notations and Layout	13/12/2019
17	Amended Drainage Line Details	25/10/2019

Drafted J.Sens Sep 2021 | Checked P.Bowe Sep 2021 | Approved

Notes/Legend

TERRACO Civil Engineers Project Managers Development Consultants

Terraco P/L
ABN 12 681 695 776
9 Jewell Court
East Bendigo, Vic 3550
Ph: 03 5442 5799
Fax: 03 5441 5506
E: info@terraco.com.au
Web: www.terraco.com.au

Scale (m) H 14000 0 4 8 V 120 0 0.2 0.4
All lengths are in metres and all levels are to Australian Height Datum (Original Sheet Size is A3)

Drawing file: 17085 Concept V23.dwg | LTO Ref: - | Council Ref: - | Water Auth. Ref: - | Our Ref: 17085 | Version 23 | Sheet 6 of 6

Macedon Ranges Shire Council - Gisborne
Bennett Road Precinct

Printed 2021-10-11 09:04:08

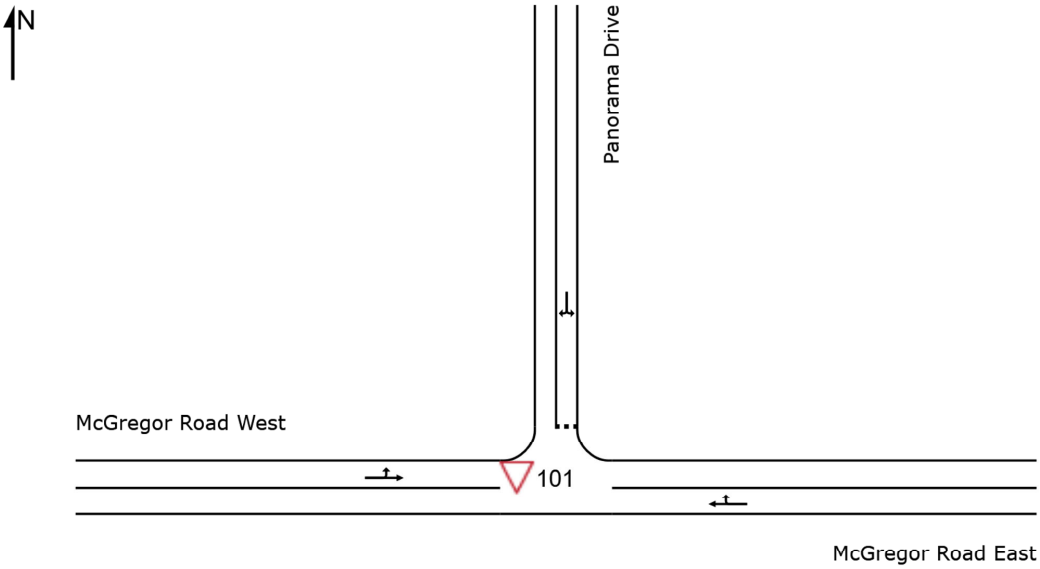
Appendix D
Post Development SIDRA Summary
Panorama Drive/McGregor Road

G24605R-01F

SITE LAYOUT

Site: 101 [Panorama Drive/McGregor Road AM Peak]

Post Develiopment AM Peak
Site Category: (None)
Giveway / Yield (Two-Way)



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Organisation: TRAFFIX GROUP PTY LTD | Created: Monday, 13 July 2020 4:42:53 PM
Project: Not Saved

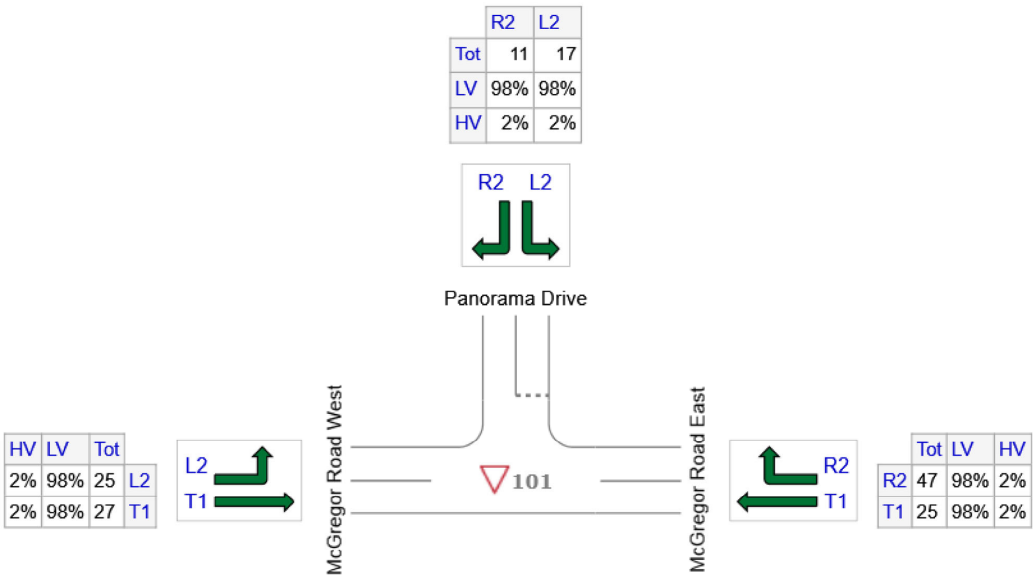
INPUT VOLUMES

Vehicles and pedestrians per 60 minutes

Site: 101 [Panorama Drive/McGregor Road AM Peak]

Post Develiopment AM Peak
Site Category: (None)
Giveway / Yield (Two-Way)

Volume Display Method: Total and %



	All MCs	Light Vehicles (LV)	Heavy Vehicles (HV)
E: McGregor Road East	72	71	1
N: Panorama Drive	28	27	1
W: McGregor Road West	52	51	1
Total	152	149	3

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Project: Not Saved

MOVEMENT SUMMARY

Site: 101 [Panorama Drive/McGregor Road AM Peak]

Post Develiopment AM Peak
Site Category: (None)
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
East: McGregor Road East												
5	T1	26	2.0	0.043	0.1	LOS A	0.2	1.4	0.14	0.41	0.14	87.1
6	R2	49	2.0	0.043	7.6	LOS A	0.2	1.4	0.14	0.41	0.14	77.1
Approach		76	2.0	0.043	5.0	NA	0.2	1.4	0.14	0.41	0.14	80.3
North: Panorama Drive												
7	L2	18	2.0	0.021	7.1	LOS A	0.1	0.5	0.09	0.61	0.09	64.5
9	R2	12	2.0	0.021	7.0	LOS A	0.1	0.5	0.09	0.61	0.09	63.9
Approach		29	2.0	0.021	7.0	LOS A	0.1	0.5	0.09	0.61	0.09	64.2
West: McGregor Road West												
10	L2	26	2.0	0.029	7.9	LOS A	0.0	0.0	0.00	0.33	0.00	80.3
11	T1	28	2.0	0.029	0.0	LOS A	0.0	0.0	0.00	0.33	0.00	90.6
Approach		55	2.0	0.029	3.8	NA	0.0	0.0	0.00	0.33	0.00	85.3
All Vehicles		160	2.0	0.043	5.0	NA	0.2	1.4	0.08	0.42	0.08	78.3

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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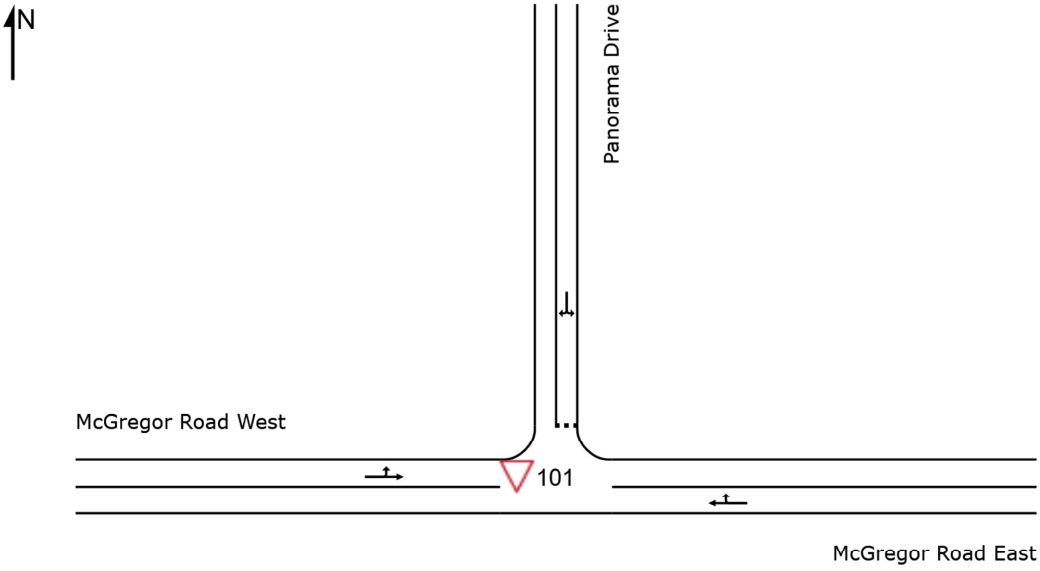
SITE LAYOUT

Site: 101 [Panorama Drive/McGregor Road PM Peak]

Post Develiopment PM Peak
Site Category: (None)
Giveway / Yield (Two-Way)



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Project: Not Saved

INPUT VOLUMES

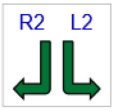
Vehicles and pedestrians per 60 minutes

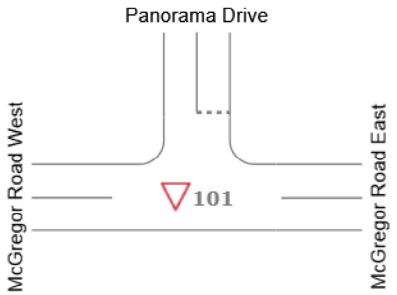
Site: 101 [Panorama Drive/McGregor Road PM Peak]

Post Develiopment PM Peak
Site Category: (None)
Giveway / Yield (Two-Way)

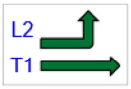
Volume Display Method: Total and %

	R2	L2
Tot	22	39
LV	98%	98%
HV	2%	2%





HV	LV	Tot	
2%	98%	20	L2
2%	98%	25	T1



	Tot	LV	HV
R2	21	98%	2%
T1	25	98%	2%

	All MCs	Light Vehicles (LV)	Heavy Vehicles (HV)
E: McGregor Road East	46	45	1
N: Panorama Drive	61	60	1
W: McGregor Road West	45	44	1
Total	152	149	3

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Project: Not Saved

MOVEMENT SUMMARY

Site: 101 [Panorama Drive/McGregor Road PM Peak]

Post Develiopment PM Peak
Site Category: (None)
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
East: McGregor Road East												
5	T1	26	2.0	0.027	0.1	LOS A	0.1	0.8	0.11	0.29	0.11	90.4
6	R2	22	2.0	0.027	7.6	LOS A	0.1	0.8	0.11	0.29	0.11	79.7
Approach		48	2.0	0.027	3.5	NA	0.1	0.8	0.11	0.29	0.11	85.2
North: Panorama Drive												
7	L2	41	2.0	0.045	7.1	LOS A	0.2	1.2	0.09	0.61	0.09	64.4
9	R2	23	2.0	0.045	6.9	LOS A	0.2	1.2	0.09	0.61	0.09	63.9
Approach		64	2.0	0.045	7.0	LOS A	0.2	1.2	0.09	0.61	0.09	64.2
West: McGregor Road West												
10	L2	21	2.0	0.025	7.9	LOS A	0.0	0.0	0.00	0.30	0.00	80.8
11	T1	26	2.0	0.025	0.0	LOS A	0.0	0.0	0.00	0.30	0.00	91.3
Approach		47	2.0	0.025	3.5	NA	0.0	0.0	0.00	0.30	0.00	86.3
All Vehicles		160	2.0	0.045	4.9	NA	0.2	1.2	0.07	0.42	0.07	75.6

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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Project: Not Saved

Archaeo-Environments Pty Ltd
heritage soils and landscape

ABN 89 119 932 437

HERITAGE AND ARCHAEOLOGICAL ASSESSMENT (Aboriginal and European)

BENNETT ROAD DEVELOPMENT PLAN
GISBORNE SOUTH

Heritage Assessor
Dr Chris Day
Archaeo-Environments Pty Ltd
ABN 89 119 932 437

Rev4 5 August 2021

Prepared for Client
G2 Urban Planning
670 Mt Alexander Road
Moonee Ponds VIC 3039 AUSTRALIA

1

INTRODUCTION

Archaeo-Environments Ltd (AE Ltd) were engaged by several landowners under the Bennett Road Development Plan (BRDP) to prepare a heritage and archaeological assessment for proposed future subdivision and development at Bennett Road, Gisborne South (the subject property). It is understood that the land is subject to Macedon Ranges Planning Scheme Development Plan Overlay 18 (DPO18) and also the Rural Living Zone Schedule 2 under the recent C110 Planning Scheme Amendment. A Development Plan is required for the property and will provide an overview document for a future planning permit application. We understand the subject property occupies an area of approx. 130ha to the south-east of Gisborne township (Fig 1 and 2).

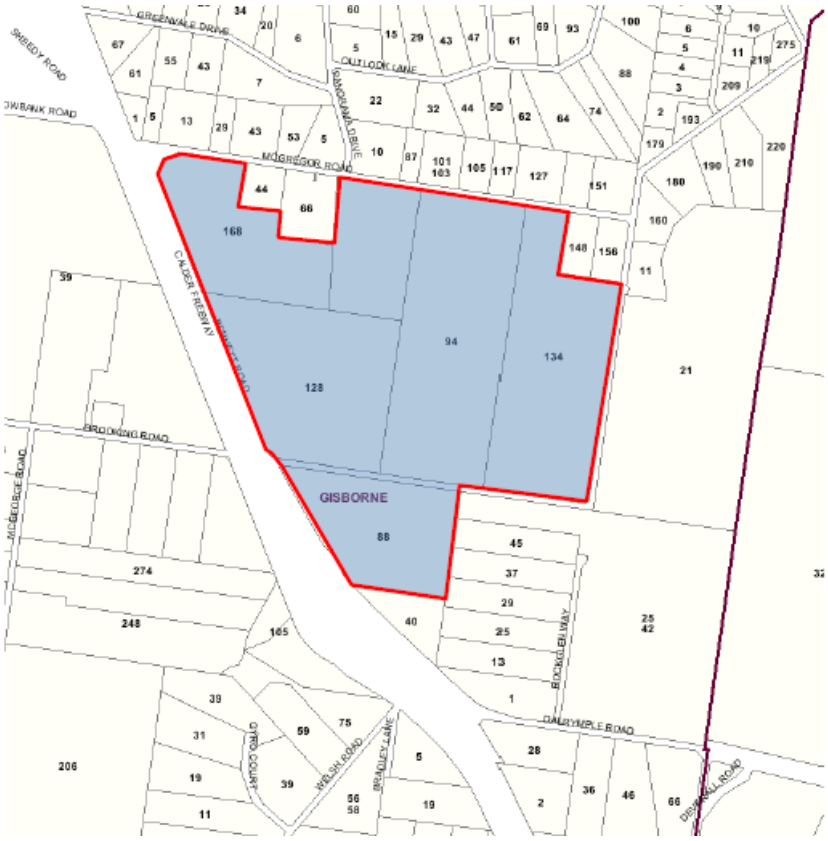

Fig 1 Location of the development area at Bennett Road, Gisborne South.

The heritage and archaeological assessment is undertaken as an overview document for a future Planning Permit Application to the Macedon Ranges Shire. The purpose of the assessment is to determine future requirements, notably protection of European heritage and/or a Cultural Heritage Management Plan (CHMP) is mandatory in accordance with the requirements of the *Victorian Heritage Act* (2007) or the *Aboriginal Heritage Act 2006* and the *Aboriginal Heritage Regulations 2007* (hereafter referred to as 'the Act' and 'the Regulations'). The BRDP area is within the boundary of the Wurundjeri Tribe Land Council and Compensation Registered Aboriginal Party (RAP) area.

The assessment consists of :

* a summary of obligations under the *Aboriginal Heritage Act* 2006 and the *Aboriginal Heritage Regulations 2018* and a definition and assessment guidelines for significant ground disturbance (SGD).
* An assessment of geological, archaeological and historic information, including :
  -a search of the Aboriginal heritage mapping via Government sources to identify whether any Aboriginal places or sites have been recorded on or near the subject property;
* An assessment of the Victorian Heritage Register and Victorian Heritage Inventory
  -a review of historical and current aerial photographs to determine the level of prior ground disturbance and landscape modification that has occurred within the subject property, and;
  - a site inspection to observe potential heritage features, ground conditions and in particular evidence of ground disturbance.
* a summary of the recommendations of the above, notably whether an Aboriginal CHMP is mandatory for the planned development.

Fig 2 Aerial map of the subject property at Bennett Road, Gisborne South.

1.0 STATUTORY OVERVIEW AND REQUIREMENTS

A review of the Aboriginal Heritage Act and Regulations provides a statutory framework for the purpose of determining whether a CHMP is mandatory for the BRDP.

1.1 Regulations

It is noted that a review of the Aboriginal Heritage Regulations effective May 23 1, 2018 produced some amendments relevant to CHMPs and compliance. Those amendments included the following :

- A removal of a mandatory CHMP for small lot sub-divisions (<1100m^2) in most situations.
- A process for amendment of CHMPs
- An increase of fees and penalties for non-compliance
- Introduction of a Preliminary Aboriginal Heritage Test (PAHT) to determine whether a CHMP is mandatory. A PAHT is a tool in the form of a heritage assessment, prepared in standard format and evaluated by Aboriginal Victoria (AV). The purpose of the PAHT is not to replace a heritage due diligence assessment, but to provide Councils/sponsors with a formal process via Aboriginal

Victoria (AV) for whether a CHMP was mandatory or not. Discussion with AV confirmed that a PAHT was not to be used automatically if a Council or sponsor is otherwise equipped to make a CHMP decision according to their statutory decision-making role. In the case of the current development a PAHT was deemed not necessary.

1.2 Is a CHMP mandatory at Bennett Road Gisborne South?

Under the AHR (2007), a CHMP is required if a development is considered to be a **high impact activity** and is located within an area of **cultural heritage sensitivity**.

1.2.1 Is the activity a high impact activity ?

A High Impact Activity

It is our opinion that future subdivision and development of the subject property could be interpreted to be a high impact activity according to Section 46 (AHR 2007) Subdivision of land

46 Subdivision of land

(1) The subdivision of land into three or more lots is a high impact activity if –

(a) The planning scheme that applies to the activity area in which the land to be subdivided is located provides that at least three of the lots may be used for a dwelling or may be used for a dwelling subject to the grant of a permit: and

(b) The area of each of at least three of the lots is less than 8ha

It is emphasised that the current assessment and Development Plan is not part of any permit or statutory authorization and therefore a CHMP is not triggered at this stage.

1.2.2 Does the activity lie within an area of cultural heritage sensitivity (CHS) ?

Regulation 26 Areas of Cultural Heritage Sensitivity : Waterways states:

(1) Subject to sub regulation (2), a waterway or land within 200 metres of a waterway is an area of cultural heritage sensitivity
(2) If part of a waterway or part of the land within 200m of a waterway has been subject to significant ground disturbance, that part is not an area of cultural heritage sensitivity.

The subject property lies within Djirri Djirri Creek – a tributary of Jacksons Creek and mapped area of CHS – which extends across the south-west part of the property (Figure 3 and Plate 1).

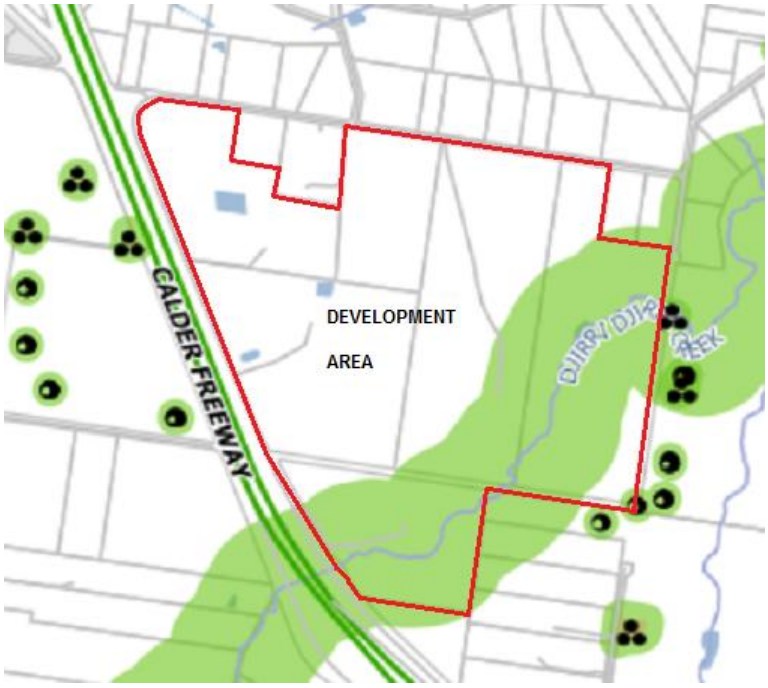

Fig 3 Map showing location of Djirri Djirri Creek and 200m buffer (area of cultural heritage sensitivity).as well as surrounding artefact scatters located during recent CHMP surveys

Plate 1 View to south along Djirri Djirri Creek within the eastern part of the development area.

1.2.3 Is the development exempt from a CHMP on the basis of significant ground disturbance ?

Under Regulation 22 (3), the proposed activity would not require a CHMP if the *'area of cultural sensitivity'* has been subject to prior *'significant ground disturbance'*. Significant ground disturbance is defined in the Regulations as follows:

'Disturbance of –
(a) the topsoil or surface rock layer of the ground, or
(b) waterway by machinery in the course of digging, dredging, or deep ripping, but does not include ploughing other than deep ripping'.

1.2.4 Assessing Significant Ground Disturbance

Aboriginal Victoria (AV) has produced a Practice Note for Significant Ground Disturbance Practice Note which is available on their website and which supports a staged approach as follows :

Level 1 – Common knowledge

The fact that land has been subject to significant ground disturbance may be common knowledge. Very little or no additional information should be required from the responsible authority. For example, common knowledge about the redevelopment of a petrol station with extensive underground storage tanks.

Level 2 – Publicly available records

If the existence of significant ground disturbance is not common knowledge, a responsible authority may be able to provide assistance from its own records about prior development and use of land, or advise the applicant about other publicly available records, including aerial photographs.

These documents may allow a reasonable inference to be made that the land has been subject to significant ground disturbance. In such event, no further inquiries or information would be needed by the responsible authority. The particular records and facts relied upon should be noted by the responsible authority as a matter of record. For example, a former quarry site subsequently filled, but where the public records show the area of past excavation.

Level 3 – Further information

If 'common knowledge' or 'publicly available records' do not provide sufficient information about the occurrence of significant ground disturbance, the applicant may need to present further evidence either voluntarily or following a formal request from the responsible authority. Further evidence could consist of land use history documents, old maps or photographs of the land or statements by former landowners or occupiers. Statements should be provided by statutory declaration or similar means; for example, the construction of a former dam on a farm.

Level 4 – Expert advice or opinion

If these levels of inquiry do not provide sufficient evidence of significant ground disturbance (or as an alternative to level 3), the applicant may submit or be asked to submit a professional report with expert advice or opinion from a person with appropriate skills and experience. Depending on the circumstances, this may involve a site inspection and/or a review of primary documents. If there is sufficient uncertainty some preliminary sub-surface excavation or geotechnical investigation may be warranted.

2.0 ASSESSMENT

The BRDP area lies within an area of CHS, however an assessment is necessary to determine whether the area of CHS has been subject to significant ground disturbance. For this purpose we undertook a review of historical information, historic maps and aerial photographs to identify evidence of landscape modification and ground disturbance. A site visit was also undertaken to document site condition and evidence of ground disturbance. The various levels of evidence for significant ground disturbance above are addressed in turn below.

2.1 Historical setting

Accounts and maps of settlement and historic pastoral use would constitute Level 1 (common knowledge) and Level 2 (publically available information) evidence for significant ground disturbance. On this basis it appears unlikely that Djirri Djirri Creek - the area of CHS - has been subject to SGD.

2.2 Review of Aerial Photography

An aerial image from 2019 shows Djirri Djirri Creek - the area of cultural heritage sensitivity which overlaps with the BRDP area (Fig 4). There does not appear to be evidence of significant ground disturbance from aerial imagery.

Fig 4 Aerial photo (2019) showing the course of Djirri Djirri Creek and surrounds across the eastern part of the BRDP area.

2.3 Site Inspection

A site inspection of the subject property was conducted by Dr Chris Day (AE Ltd Cultural Heritage Advisor) on the 17th May 2018. The purpose of the inspection was to observe site conditions, notably evidence of past land use and ground disturbance. No Aboriginal artefacts or sites were identified during the inspection.

The Djirri Djirri Creek and surrounds within the development area features a gentle valley with areas of bedrock outcrop. Apart from implied original tree clearance and presence of several dams, the subject area did not show evidence of disturbance in the form of significant earthworks or deep ripping. Evidence from

a site inspection would constitute Level 4 (Expert advice/opinion and site inspection) evidence for significant ground disturbance.

3.0 ABORIGINAL CULTURAL HERITAGE POTENTIAL

A review of ACHRIS, the registry of Aboriginal cultural heritage held by Aboriginal Victoria indicates that several CHMP studies have been prepared in the area surrounding the development area in the past 18 months. These include CHMP 15832 approved in Nov 2019 west of the Calder Freeway and a CHMP to the immediate east which is currently in progress. Aboriginal cultural heritage in the form of stone artefact scatters have been recorded during these surveys (Fig 3) and indicate that the development area would have potential for Aboriginal heritage.

4.0 SUMMARY AND CONCLUSIONS

Level 1 Common Knowledge

A review of regional land use history indicates that the subject property was part of early 19C agricultural development. The area of CHS (Djirri Djirri Creek) extends across the eastern part of the development area and – apart from several dams – is not expected to have been subject to disturbance which might be common knowledge.

Level 2 Publicly Available Records and Level 3 Additional information

In addition to published maps and reports about 19C farming activity, there is insufficient local evidence to imply significant ground disturbance across the area of CHS. The landscape shown in Plate 1 shows that the area surrounding Djirri Djirri Creek has been dammed in some areas but is for the most part under pastoral use without evidence of SGD.

Level 4 Expert Opinion/Site Inspection & subsurface investigation

Site inspection of Djirri Djirri Creek and surrounds indicated presence of several dams but overall negligible evidence of SGD.

5.0 FUTURE MANAGEMENT

The Djirri Djirri Creek is the area of highest Aboriginal cultural heritage potential within the Development area. Regional predictive models have established that Aboriginal sites generally have a focus on waterways with lesser frequency > 200m from these features. Djirri Djirri Creek will not be subject to residential development.

The 2ha lot size under the current Development Plan will mitigate against high risk of impact to Aboriginal cultural heritage, certainly compared with smaller lot subdivision. In other words the relatively small development footprint (dwelling, outbuildings, driveway etc) will allow for a large proportion of the lot to remain undisturbed. The large lot sizes when compared to a standard intensive residential subdivision such as to the west side of the Calder Freeway allow considerable capacity for potential sensitive sites to be avoided.

The upgrade of the Development Area as a landscape resource will require compliance with the Aboriginal Heritage Act (2006) and Aboriginal Heritage Regulations (2018) and will include preparation of a Cultural Heritage Management Plan (CHMP) - desktop and field assessment of Aboriginal archaeological potential - across required development parcels.

As a guide to future works, the Djirri Djirri Creek is an area of mapped Aboriginal Cultural Heritage sensitivity and under current legislation, a Cultural Heritage Management Plan (CHMP) will be mandatory for lots at 88 Bennett Road and 94 and 134 McGregor Road. It is expected that any CHMP would follow standard practice in accord with AHR (2018) and include a desktop review, field walkover and test pit excavation work where necessary. Fieldwork would be focused on areas of identified Aboriginal cultural heritage potential and likely areas of impact. The results of the CHMP(s) will inform future management of any identified Aboriginal sites and might include areas of set aside or managed open space.

Preliminary discussion with the local Registered Aboriginal Party (Wurundjeri and Woi Wurrung Cultural Heritage Aboriginal Corporation) in July 2021 advised of the Development Plan and future subdivision, Liaison with the RAP group will be included as part of any future CHMP process.

The future subdivision lot development of the area is directed away from the area of prime potential sensitivity, being the waterway with areas away from the water way having lesser potential for artefact presence. An aim will be to retain the current form of this area, with low impact paths and additional scattered vegetation. A detailed assessment will not be required for those parts of the reserve that are not altered. Assessment will be require around reinstated dams.

A CHMP will be undertaken for the affected areas prior to subdivision permit applications being formalised.

6.0 EUROPEAN HERITAGE ASSESSMENT

An inspection of the Victorian Heritage Register or Victorian Heritage Inventory indicated that there are no registered heritage sites or features within the BRDP. A preliminary field survey (17 May 2018) did not observe features of potential European heritage value. On this basis the potential for European heritage potential across the BRDP is expected to be low.

7.0 RECOMMENDATIONS

1. It is our opinion that there is no evidence of significant ground disturbance within the areas of CHS (Djirri Djirri Creek) which overlaps with the eastern part of the BRDP area – according to level 1, 2, 3 and 4 criteria of AV guidelines (Section 1.2.4). On this basis and with reference to Reg 26 (2) of the AHR (2018) (1) *If part of a waterway or part of the land within 200m of a waterway has been subject to significant ground disturbance, that part is not an area of cultural heritage sensitivity*. It is our opinion that an Aboriginal Cultural Heritage Management Plan will be mandatory for the proposed activity.

2 It is our opinion – on the basis of a review of recent CHMP studies from the surrounding region – that the Djirri Djirri Creek area would have some potential for Aboriginal Cultural Heritage.

3 A CHMP is not mandatory under the Development Plan process as this stage does not propose development itself. A CHMP will be mandatory under a permit application for subdivision which is a CHMP trigger according to AHR (2018) (discussed in Section 1.2.1).

4. Aboriginal cultural heritage is provided with blanket protection in Victoria under the Aboriginal Heritage Act 2006. If any Aboriginal artefacts or sites are found during development works or at any other time, excavation must cease immediately and the local RAP (WLCCHC) should be notified for advice before work can re-commence.

5. There are no registered European heritage sites or features within the BRDP. A preliminary field survey (17 May 2018) did not observe features of potential European heritage value. The Victorian Heritage Act

(2007) provides protection for sites of heritage value and a process of management or consent should sites or features be found during development works.

Author

Dr. Chris Day
Director
Archaeo-Environments Ltd
Registered Heritage Advisor (Victoria).
2 Chaucer Street
Box Hill South VIC 3128

PROFILE

Dr Chris Day Director, Archaeo-Environments Ltd
MIFA
Honorary Research Associate (Latrobe University)
Cultural Heritage Advisor (Victoria)

PROFESSIONAL HISTORY

2014 – present Director, Archaeo-Environments Pty Ltd - a heritage soils and landscape consultancy. Chris brings to the position over 30 years of experience in archaeology, geo-archaeological research and natural resource management.

2007 - 2014 Principal Archaeologist, Golder Associates – Management of a cultural heritage team at Golder Associates which included Aboriginal and European heritage work throughout Australia and management of large-scale EIA cultural and heritage impact assessments throughout Hong Kong, S Pacific and SE Asia.

Chris has prepared over 70 Aboriginal Cultural Heritage Management Plans, impact assessments and due diligence surveys in Australia including indigenous heritage consultation and survey work on both brown and greenfield sites throughout Victoria. Chris has also supervised indigenous heritage surveys and impact assessments on large energy projects in South Australia and Victoria and a heritage management plan for Hyde Park, WA. In addition Chris has overseas cultural heritage experience (field survey and community consultation) of large EIA projects in Hong Kong as well as mine feasibility assessments in Tibet, Philippines, Fiji and PNG.

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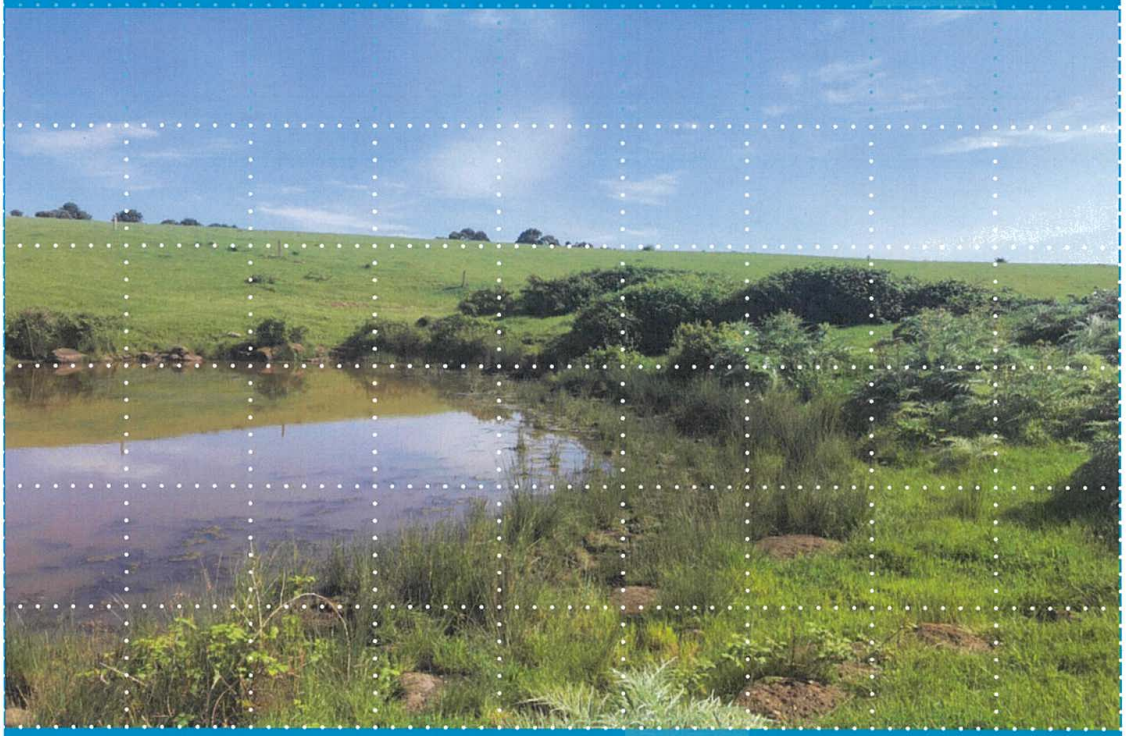
Final Report

Vegetation Management Plan for Bennett Road Development Plan, Gisborne, Victoria

Prepared for

G2 Urban Planning

February 2021



Ecology and Heritage Partners Pty Ltd

MELBOURNE: 292 Mt Alexander Road, Ascot Vale VIC 3032 **GEELONG:** 230 Latrobe Terrace, Geelong West Vic 3218
BRISBANE: Level 22, 127 Creek Street, Brisbane QLD 4000 **ADELAIDE:** 22 Greenhill Road, Wayville SA 5034
CANBERRA: PO Box 6067, O'Connor ACT 2602 **SYDNEY:** Level 5, 616 Harris Street, Ultimo, NSW, 2007
www.ehpartners.com.au | (03) 9377 0100

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1 INTRODUCTION

1.1 Background

Ecology and Heritage Partners Pty Ltd was engaged by G2 Urban Planning to prepare a Vegetation Management Plan (VMP) for the waterway reserve within the land proposed for the Bennett Road Development Plan, Gisborne, Victoria.

The VMP has been prepared in response to Point 5 of the Request for Further Information (RFI) from Melbourne Water, dated 18 November 2019. Point 5 states:

> *'Vegetation Management Plan – even in concept form must be submitted to Melbourne Water for approval, outlining vegetation and weed control works within the waterway reserve'.*

Ecology and Heritage Partners Pty Ltd previously completed a Biodiversity Assessment of the study area in July 2019 (Ecology and Heritage Partners 2019). This investigation sought to identify flora and fauna values within the study area and any potential legislative and policy requirements associated with the development.

1.2 Vegetation Management Plan Objectives

The Vegetation Management Plan has been prepared for the waterway reserve that flows from the south-west to the north-east of the study area. This plan details:

- The native vegetation to be retained and protected within the waterway reserve;
- Information relating to mitigation, monitoring and control methods to be implemented to achieve ecologically appropriate on-going management of pest species within the waterway reserve; and,
- Measures to minimise the spread of noxious weeds from the waterway reserve to the rest of the study area.

2 EXISTING CONDITIONS

2.1 Vegetation Condition

Previous and current assessments of native vegetation within the study area provide a snapshot of the existing conditions prior to the commencement of the proposed construction within the development area. All remnant native vegetation patches were previously assessed and described as part of the Biodiversity Assessment (Ecology and Heritage Partners Pty Ltd 2019) and have since been confirmed as part of the targeted spring flora surveys conducted by Ecology and Heritage Partners in November and December 2020, during an optimal surveying period for flora species.

The study area contains vegetation ranging from highly modified areas dominated by exotic vegetation (i.e. pasture grasses and invasive species) in poor condition, to relatively intact wetlands in moderate condition. The majority of the study area comprises pasture grasses, land used for agricultural purposes, planted windrows and ornamental plantings. However, the waterway that flows from the south-western corner to the north-eastern corner of the study area contains scattered Eucalypts in the southern extent, and patches of Plains Sedgy Wetland (EVC 647) of varying quality and Tall Marsh (EVC 821) throughout the creekline. There is also a linear patch of Plains Grassland Heavier-soils (EVC 132_61) within the northern extent of the study area, and several small patches of Stony Knoll Shrubland (EVC 649) within the eastern extent (Figure 2).

2.1.1 Native Vegetation within the Waterway Reserve

Plains Sedgy Wetland

The creek that runs through the southern and eastern extent of the study area contains native vegetation with the highest diversity and condition. Plains Sedgy Wetland is patchy along the creek alignment and ranges from moderate to low condition (Plate 1). Species such as Common Tussock-grass *Poa labillardierei*, Tall Rush *Juncus procerus,* Tall Sedge *Carex appressa* and Common Spike-sedge *Eleocharis acuta* were common throughout the patches of Plains Sedgy Wetland.

Grassy, herbaceous and woody weeds species were common throughout the creekline and within the patches of Plains Sedgy Wetland (Plate 2). Species such as Spiny Rush *Juncus acutus,* Toowoomba Canary-grass *Phalaris aquatica,* Cape Weed *Arctotheca calendula,* Ribwort *Plantago lanceolata,* Blackberry *Rubus fruticosus* spp. agg. and Gorse *Ulex europaeus* were common throughout the creekline (Plate 2).

Plate 1. Small patch of poor-quality Plains Sedgy Wetland along the creekline (Ecology and Heritage Partners Pty Ltd 02/11/2020).

Plate 2. Woody weeds, including Blackberry, are common along the creekline (Ecology and Heritage Partners Pty Ltd 02/11/2020).

Tall Marsh

One patch of Tall Marsh is present along the edges of a dam within the southern extent of the study area. Sedges densely populate the inflow drain to the dam, and emergent vegetation is present in the centre and around the edges (Plate 3, Plate 4). Species present include Common Reed *Phragmites Australia,* Common Spike-sedge and Narrow-leaf Cumbungi *Typha domingensis.*

Plate 3. Patch of Tall Marsh around the dam in the southern extent of the study area (Ecology and Heritage Partners Pty Ltd 05/11/2020).

Plate 4. Patch of Tall Marsh around the dam in the southern extent of the study area (Ecology and Heritage Partners Pty Ltd 05/11/2020).

Introduced and Planted Vegetation

Areas not supporting native vegetation within the creekline had a high coverage (>90%) of exotic and invasive species, including 12 species listed as noxious under the *Catchment and Land Protection Act 1994* (CaLP Act), four of which are also listed as Weeds of National Significance (WoNS); Blackberry *Rubus fruticosus* spp. agg., Gorse *Ulex europaeus,* Serrated Tussock *Nassella trichotoma* and Broom *Genista* spp (Plate 5; Plate 6; Plate 7). Many exotic grass species present have been direct-seeded for use as pasture. Disturbed areas along the creekline also had a high coverage of environmental weeds such as Toowoomba Canary-grass, Perennial Rye-

grass *Lolium perenne* and Yorkshire Fog *Holcus lanatus*. Exotic and invasive species recorded along the creekline are given below in Table 1.

Planted vegetation within and around the creekline consists of exotic and non-indigenous tree species, most commonly Radiata Pine *Pinus radiata* and Sugar Gum *Eucalyptus cladocalys* (Plate 8).

Plate 5. Large infestations of Gorse along the creekline (Ecology and Heritage Partners Pty Ltd 05/11/2020).

Plate 6. Exotic grass species are common along the creekline (Ecology and Heritage Partners Pty Ltd 05/11/2020).

Plate 7. Common weeds within the creekline, including Blackberry, Artichoke Thistle and Briar Rose (Ecology and Heritage Partners Pty Ltd 05/11/2020).

Plate 8. Planted Sugar Gum along the creekline (Ecology and Heritage Partners Pty Ltd 02/11/2020).

Table 1. Exotic and invasive species recorded along the creekline during the assessment

Scientific Name	Common Name	Status
Agapanthus spp.	Agapanthus	-
Arctotheca calendula	Cape weed	-
Avena sativa	Oat	-
Betula pendula	Silver Birch	-
Brassica spp.	Turnip	-
Cirsium vulgare	Spear Thistle	C
Crataegus monogyna	Hawthorn	C
Cynara cardunculus subsp. flavescens	Artichoke Thistle	C
Dactylis glomerata	Cocksfoot	-
Echium plantagineum	Paterson's Curse	C
Galenia pubescens var. pubescens	Galenia	-
Genista spp.	Broom	*C
Holcus lanatus	Yorkshire Fog	-
Hypochaeris spp.	Cat's Ear	-
Juncus acutus subsp. acutus	Spiny Rush	C
Lolium perenne	Perennial Rye-grass	-
Malus pumila	Apple	-
Nassella trichotoma	Serrated Tussock	*C
Oxalis pes-capre	Soursob	R
Paspalum dasypleurum	Paspalum	-
Phalaris aquatica	Toowoomba Canary-grass	-
Pinus radiata	Radiata Pine	-
Plantago lanceolata	Ribwort	-
Rosa rubiginosa	Briar Rose	C
Rubus fruticosus spp. agg.	Blackberry	*C
Rumex crispus	Curled Dock	-
Silybum marianum	Variegated Thistle	C
Sonchus oleraceus	Common Sow-thistle	-
Trifolium repens var. repens	White Clover	-
Ulex europaeus	Gorse	*C

2.3 Fauna Habitat

Native and planted vegetation within the creekline is likely to provide habitat such as nesting/roosting areas, and protective habitat for mobile fauna species such as small birds and mammals. The creekline provides habitat for common frog species, and potentially for the nationally significant Growling Grass Frog *Litoria raniformis*.

3 VEGETATION MANAGEMENT PLAN

3.1 Summary of Management Priorities and Definitions

An overview of management issues and control priorities for the study area is provided below (Table 2). Priorities have been based on the following criteria:

3.1.1 Control Priority

High priority: Issue poses a high level of threat to ecological values and needs to be addressed immediately and on a frequent basis.

Medium priority: Issue has a high to moderate threat level and needs to be addressed in the short-term or on a regular basis.

Low priority: Issue has a medium to low threat level, or low likelihood of occurrence, and needs to be addressed on an irregular basis.

Table 2. Summary of management issues within the site

Management Issue	Comments	Control Priority
Weeds (noxious and environmental)	• Adverse impacts on native flora and fauna habitat • Impacts to ecosystem services	High
Stock	• Impacts to native vegetation from overgrazing and pugging • Soil degradation	High
Degradation of native vegetation	• Loss of native vegetation extent • Impacts to ecosystem services • Increase of exotic weeds • Impacts to native fauna	High
Pest animals (rabbits, foxes, feral cats, domestic pets)	• Predation on native wildlife • Impacts on soil and vegetation health	Moderate

3.2 Overview of Key Threats

Several potential threatening ecological processes and management issues exist along the creekline, with details on the nature and extent of these are outlined below.

Management priorities (control priority and threat level) should be actively reviewed on an annual basis to allow for resources to be focussed towards management issues, which may arise throughout the duration of the construction phase of the development, and to reflect the success or otherwise of management works previously undertaken.

3.2.1 Weeds

Several noxious and environmental weeds were recorded within the study area during the site assessment. In general, the creekline is in a degraded condition, with key factors such as historical land use (agriculture) facilitating weed invasion within the study area.

Weeds often out-compete and exclude native vegetation, leading to the deterioration in fauna habitats and ecological value. Declared noxious weeds in Victoria are plants proclaimed under the *Catchment and Land Protection Act 1994* (CaLP Act) because they cause environmental or economic harm or have the potential to cause such harm (DPI 2008).

It should be noted that all land managers/persons are required under the CaLP Act to prevent the growth and spread of a Regionally Controlled weed (C) for which they are responsible. Land managers that do not control Regionally Controlled weeds may be issued with a Land Management Notice or Directions notice that requires specific control work to be undertaken. Failure to comply with the conditions of a Notice may result in court action and fines or the issuing of an infringement notice and fine (DPI 2008).

There are no legal requirements to eradicate or control Restricted Weeds (R) growing on land; however, Restricted Weeds cannot be traded, transported or knowingly spread in Victoria. Sections 70, 70A and 71 of the CaLP Act for all declared noxious weeds, irrespective of category or region, prohibits the:

- Transport of a noxious weed or its propagules within Victoria; and
- Deposition on land of a noxious weed or its seeds (DPI 2008).

Threat Level:

- **High** – Rapidly spreading species with the potential for high ecological impacts.
- **Moderate** – Moderately spreading species with the potential for high ecological impacts.
- **Low** – Slow spreading species with the potential for high ecological impacts.

Infestation level:

- **High** – Weed infestation over large areas across the site.
- **Moderate** – Weed infestation over moderate areas on the site.
- **Low** – Localised weed infestation within the site.

3.2.2 Pest Animals

Pest animals listed under the CaLP Act are likely to occur within the study area, with one species (European Rabbit) recorded with the study area during the assessment. European Rabbit is the most notable pest species within the surrounds (i.e. within 10 kilometres of the study area) and is considered the most appropriate focus for pest control efforts. Impacts associated with domestic cats and foxes are also likely to become an issue once development is established on site.

3.2.3 Native Vegetation

Without active management, areas supporting native vegetation values may be degraded over time. The main management issue for protecting retained native vegetation is weed control. Unless weed levels are low, exotic species will need to be controlled. The risk of ongoing weed invasion can be reduced by minimising disturbance in areas of retained native vegetation. Factors which promote weeds infestations include native vegetation clearance, vehicle traffic, other soil disturbance, and storage of materials and dumping of waste materials.

3.3 Management Actions

The following management actions and performance measures are detailed below to protect and enhance the creekline and to ensure the long-term functionality of the site in the future.

It should be noted that all management issues relating to the construction phase of the development are not addressed in this report and should be addressed in a Construction Environmental Management Plan prepared by the relevant contractor. Land along the creek will be managed under this report which will be trigged by a subdivision planning permit condition.

3.3.1 Weed Control

Annual, ongoing weed control is one of the primary management requirements along the creekline. The objective of weed control is to reduce weed populations to manageable levels. As with all weed control operations, it is important to establish native vegetative cover as soon as practicable within disturbed areas to prevent establishment of exotic species. It is also important that only an experienced contractor undertakes weed control works within areas of higher quality native vegetation. Licensed weed control contractors should make appropriate decisions on which technique to use based on individual situations. Contractors will also need to be aware of the potential for new outbreaks of weed species not recorded in this assessment and implement appropriate weed control techniques as necessary.

A list of priority weeds that require control within the creekline (Figure 3) and their current level of threat are listed in Table 3.

Areas comprising patches of native vegetation are under continual pressure from weed emergence from seed storage within the soil and weed invasion from adjoining areas (edge effects). Several management techniques are recommended to control weeds, including physical removal, brush cutting and herbicide application. In most cases, herbicide will only be applied to weeds by using the spot-spraying technique, to prevent death or damage to non-target species. Weed control works should seek to eliminate all declared noxious weeds and woody weeds recorded along the creekline and at a minimum reduce the cover and abundance of all other weed species. A summary of weed management techniques for priority weeds and woody weeds is provided in Table 3. Various weed control techniques are outlined in Appendix 1.

Actions

- Undertake weed control works prior to the weeds flowering and setting seed or spreading;
- Eliminate all listed noxious weeds, WONS and other woody weeds;
- Undertake weed control with sensitivity to indigenous species also present, particularly indigenous grass species;
- Where appropriate, promote persistence and expansion of indigenous species populations; and,
- Monitor for the occurrence of new weeds or the further spread of current weeds.

Performance Indicators

Key performance indicators for weed management include:

- Meeting the requirements of the CaLP Act in relation to control of listed noxious weeds within the study area;

- No new significant weed invasions occur in the study area;
- Control (<5% cover) High threat weeds and woody weeds;
- Reduce cover of Moderate threat weeds to <10%; and,
- No increase in the cover of Low threat weeds within the study area.

Table 3. Priority weeds recorded within the study area and recommended control

Scientific Name	Common Name	Weed Classification	Current Threat Level	Extent of Infestation	Control Priority	Timing	Control Method
Cirsium vulgare	Spear Thistle	R Herbaceous	Low	Low	Low	Spring/Summer	SS/HP
Crataegus monogyna	Hawthorn	C Woody	High	High	High	Spring/Summer	MR/CP
Cynara cardunculus subsp. *flavescens*	Artichoke Thistle	C Herbaceous	High	High	High	Spring/Summer	SS/HP
Echium plantagineum	Paterson's Curse	C Herbaceous	Low	Low	Low	All year	SS/HP
Genista sp.	Broom	C Woody	Low	Low	Low	Spring/Summer	MR/CP
Nassella trichotoma	Serrated Tussock	C Herbaceous	High	Low	Moderate	Winter/Spring/ Summer	SS/HP
Rosa rubiginosa	Briar Rose	C Woody	Low	Low	Moderate	Spring/Summer/ Autumn	MR/CP
Rubus fruticosus spp. agg.	Blackberry	C Woody	High	High	High	Spring/Summer/ Autumn	MR/CP
Silybum marianum	Variegated Thistle	C Herbaceous	Low	Low	Low	Spring/Summer	SS/HP
Ulex europaeus	Gorse	C Woody	Moderate	Moderate	Moderate	All year	MR/CP

Note. Weed Classification = Noxious weed classification within the Port Phillip & Westernport CMA under the CaLP Act, C = Regionally controlled weed, R = Restricted Weed. SS = Spot Spray. HP = Hand Pull. MR = Mechanical Removal. CP = Cut and Paint

3.3.2 Pest Animal Management

All domestic animals such as cats and dogs should be fed in an inside area to ensure that the food is not scavenged by pest animals.

Several pest animals listed under the CaLP Act are likely to occur within the study area. The removal of pest animal harbours (such as hard rubbish, stockpiles of building materials and woody weed infestations) is a very important aspect of pest animal control. The management procedures detailed below should be incorporated into the management strategy for the site. Table 4 provides an evaluation of management measures commonly adopted to control European Rabbits in Victoria.

Table 4. Feasibility assessment of European Rabbit control methods

Method	Feasibility
Warren fumigation	**Low** – The site inspection identified very little evidence of warrens across the site, with rabbits likely to be harbouring in woody weeds, debris and the cover provided by indigenous trees and shrubs. In the event that significant warren networks become established, this method is considered suitable for control.
Long netting and night netting	**High** – Night netting is an effective method, particularly in situations where rabbits are leaving bushland harbour to feed in areas of open space.
Warren ripping	**Low** – As above. In order to avoid impacts on native vegetation communities, ripping would be constrained to areas of exotic grassland and other non-native vegetation.
Baiting (Pindone)	**Low** – Although an antidote exists for domestic pets which have ingested Pindone (Vitamin K1), the risks associated with the poisoning of domestic and native animals is considered unreasonable. Additionally, consultation with qualified pest controllers indicated that Pindone poisoning may not be successful, as rabbits are unlikely to feed on introduced bait if an abundance of existing food sources are present.

Timing of Rabbit control

European Rabbits commence breeding in autumn and continue until vegetation dries off, which generally occurs in early summer. Rabbit mortality is particularly high during summer months due to disease, lack of food and water, and high temperatures. Late summer and early autumn is therefore the best time to control rabbits as populations are naturally low.

Preferred control methods

The ongoing replacement of woody weeds (particularly Pittosporum) with indigenous plantings is considered the primary method of reducing rabbit populations. It is recommended that weeded areas are revegetated as soon as practically possible to reduce rabbits from establishing warrens within the clearings.

The feasibility assessment of control measures summarised in Table 4 indicate that night netting is the most appropriate method for actively controlling rabbits. This method avoids the use of poisons and is effective in situations where few warrens exist or where they are in areas of dense vegetation. Depending on the level of infestation, the removal of woody weeds may be enough to maintain sustainable rabbit levels in the long-term (assuming ongoing monitoring for warren establishment).

General Pest Animal Management Actions

- Continually monitor for the presence of pest animal fauna; and
- Where appropriate, undertake preferred control methods as summarised above.

General Pest Animal Performance Indicators

Key performance indicators for pest animal management include:

- Meeting the requirements of the CaLP Act in relation to the control of listed pest animals within the study area;
- Presence of pest fauna does not increase above baseline levels of occurrence;
- Achieving control of key fauna species within the study area within the specified management timeframe; and
- No new significant pest fauna invasions occur in the study area.

3.4 Timeframes and Priorities

The VMP should be activated at the civil construction phase for the development. This will be addressed by a planning permit condition on subdivision permits for adjoining land. This will ensure that there will be appropriate vegetation management along the water course. The timing of the management actions outlined within this report is key to the successful management of the vegetation within the site into the future.

At this time, the project is still in the project planning, however all land managers/persons are required under the CaLP Act to prevent the growth and spread of a Regionally Controlled weed (C) for which they are responsible. Therefore, weed control responsibilities are triggered at the time on property acquisition. The VMP is to be implemented immediately by the developer in vegetated areas yet to be developed on the site.

All technical on-ground works (i.e. pest animal and weed control) will require the input or services of suitably qualified and experienced contractors.

Management priorities should be undertaken in accordance with the definition and timings provided in Table 3, Management priorities (control priority and threat level) should be actively reviewed every year to allow for resources to be focussed towards management issues that may arise throughout the duration of the construction phase of the development and to reflect the success or otherwise of management works previously undertaken.

3.5 Monitoring

Monitoring of weed infestations and pest animal populations is required to evaluate the success of management actions and to allow for any modifications. The frequency of weed monitoring may need to vary to allow for seasonal variations and periods of active weed growth. Similarly, pest animal monitoring should be undertaken at a time of year when target species are most active.

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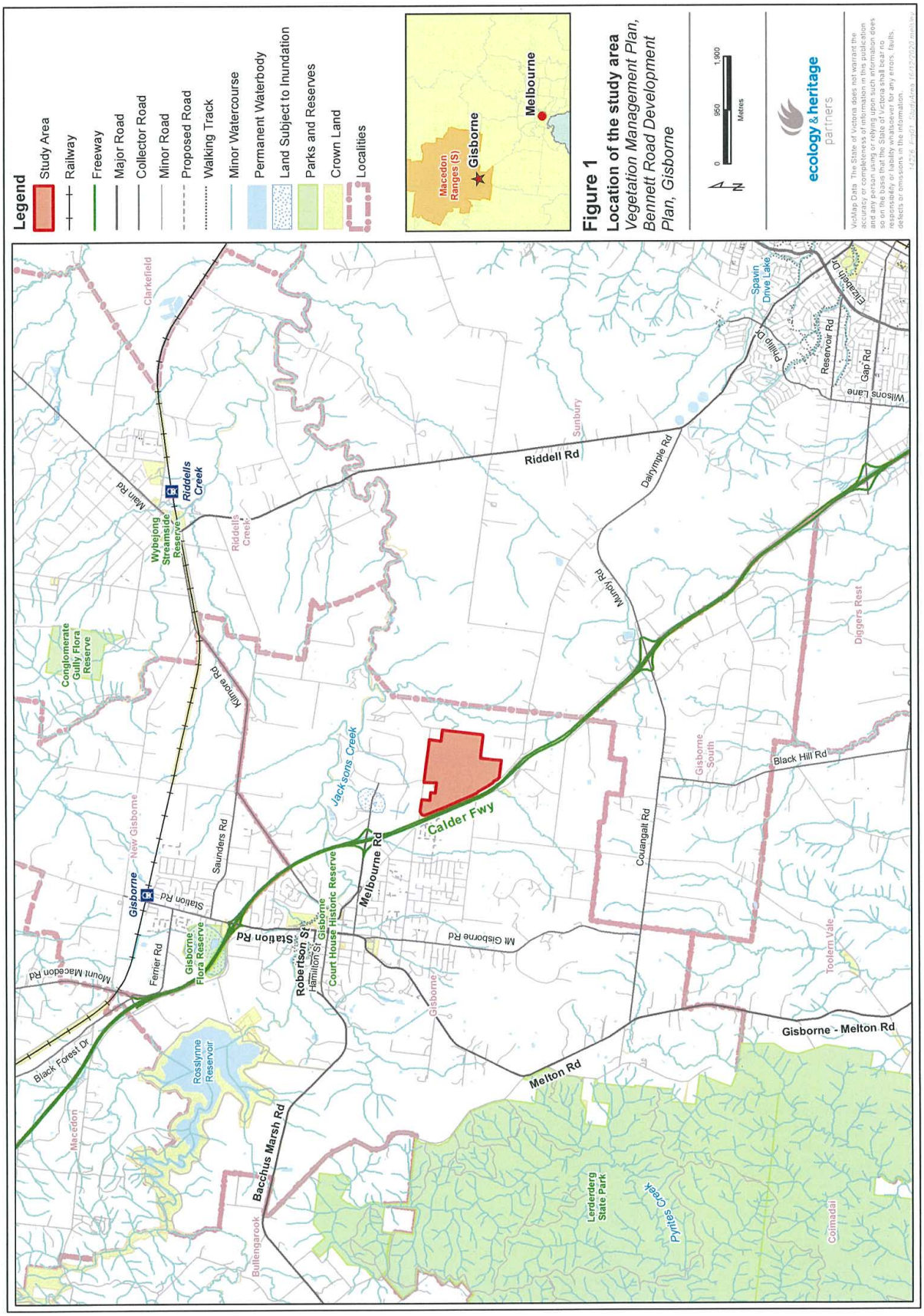
FIGURES


Legend
Study Area
Railway
Freeway
Major Road
Collector Road
Minor Road
Proposed Road
Walking Track
Minor Watercourse
Permanent Waterbody
Land Subject to Inundation
Parks and Reserves
Crown Land
Localities
Macedon Ranges (S)
Gisborne
Melbourne
Figure 1
Location of the study area
Vegetation Management Plan, Bennett Road Development Plan, Gisborne
0
950
1,900
Metres
N
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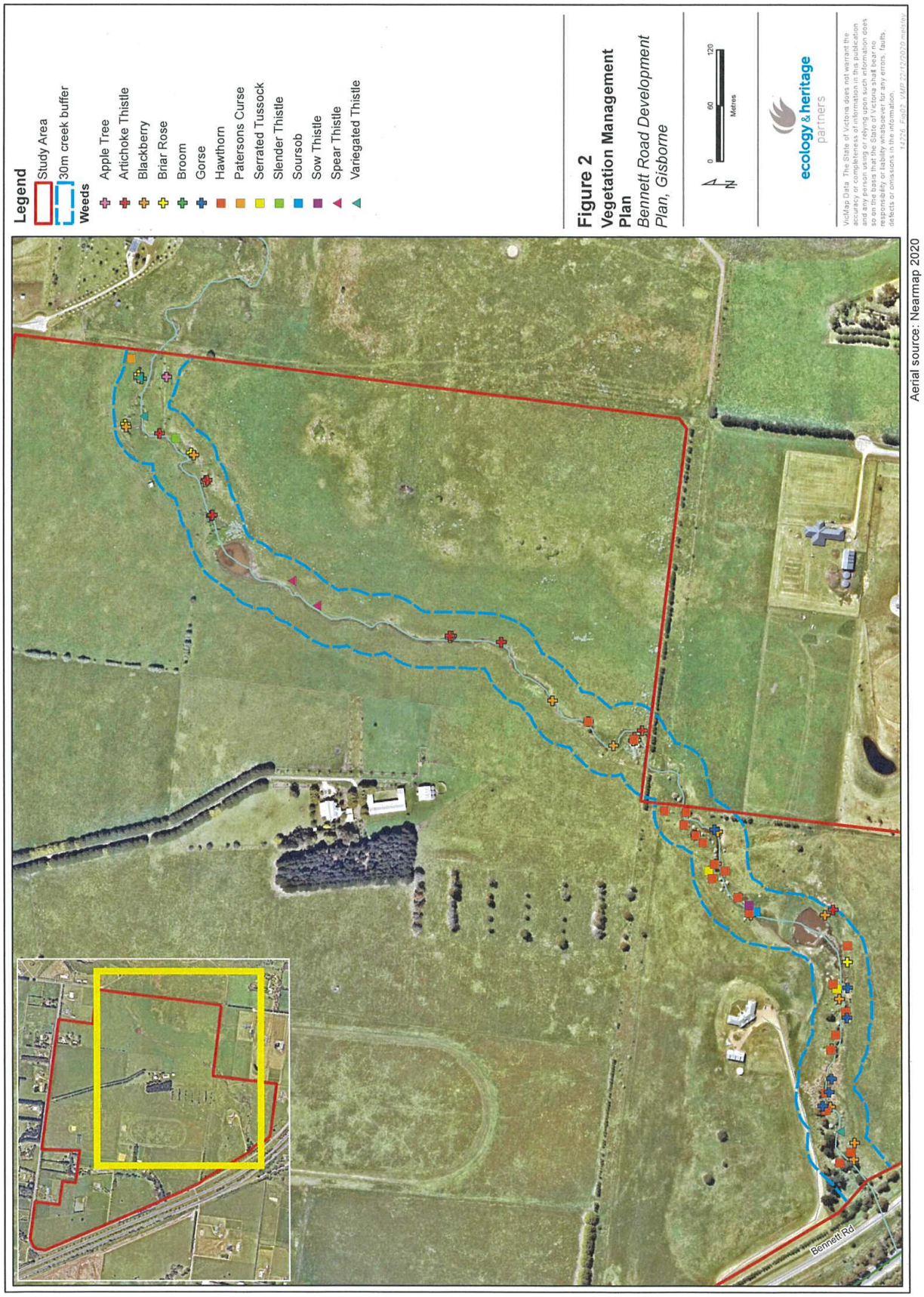
VicMap Data: The State of Victoria does not warrant the accuracy or completeness of information in this publication and any person using or relying upon such information does so on the basis that the State of Victoria shall bear no responsibility or liability whatsoever for any errors, faults, defects or omissions in the information.
Clarkefield
Riddells Creek
Wybejong Streamside Reserve
Conglomerate Gully Flora Reserve
Kilmore Rd
Main Rd
Riddell Rd
Sunbury
Dalrymple Rd
Munsy Rd
Spavin Drive Lake
Elizabeth Dr
Phillip Dr
Reservoir Rd
Gap Rd
Wilsons Lane
Diggers Rest
Jacksons Creek
Calder Fwy
Melbourne Rd
Couangalt Rd
Gisborne South
Black Hill Rd
New Gisborne
Gisborne
Station Rd
Saunders Rd
Gisborne Flora Reserve
Mt Gisborne Rd
Robertson St
Hamilton St
Court House Historic Reserve
Toolern Vale
Gisborne - Melton Rd
Mount Macedon Rd
Ferrier Rd
Black Forest Dr
Rosslynne Reservoir
Macedon
Bacchus Marsh Rd
Melton Rd
Bullengarook
Lerderderg State Park
Pyrites Creek
Coimadai



Aerial source: Nearmap 2020

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APPENDIX 1 WEED CONTROL MEASURES

Weed control measures identified in Table 2 are described in detail below. Weed control measures (including type of herbicide) should follow the guidance of an experienced contractor for the control of the weed species identified above.

Spot spraying

The application of herbicides is an effective and efficient control technique for a range of woody, herbaceous and grass weeds. The correct use and application of herbicides can provide targeted control of a range of species; however it must be stressed all use of herbicides must be used in accordance with the manufacturer's specifications and occupational health and safety policies.

Application methods for herbicides include spot spraying with a knapsack for small or sensitive areas, or for targeted species. Dabbing of species with foam tipped application device, with the herbicide applied from an attached bottle, should be used in sensitive areas or in areas where weed control is targeted to a small number of plants, especially bulbs or tuberous plants.

Timing of intervals, plant age and growth seasons, plant stress levels and climatic factors all need to be considered when develop methodologies for the application of herbicides to ensure successful outcomes. Problems exist with ongoing unsuccessful herbicide treatments, which may result in weeds developing herbicide resistance, or the build-up of chemicals in the soil. Surrounding plants' susceptibility to herbicides and ongoing uses of the treated areas should also be considered when choosing the right herbicide to be used in a weed control program, as some herbicides are residual and may persist within the soil for varying durations.

Drill and Fill

Drill and fill, also known as direct injection, is a method where the selected herbicide (usually Glyphosate) is injected though a device into a hole that has been made into the targeted plant (i.e. woody species). The hole is usually made through the use of a drill but sometimes a tomahawk or saw may be used to put small nicks into the targeted plant. It is essential that the hole or nick must always be lower than the first branch containing foliage (i.e. ideally, the lowest possible point on the plant) and also the herbicide is applied into the hole as quick as possible. The general rule of thumb is that the herbicide must be applied within 30 seconds. Holes are scattered around the main trunk at 50 millimetre intervals, depending on the diameter of the trunk and also branches or angle of the trunk. It is essential that a complete ring around the trunk of the plant be made of this herbicide filled holes to ensure plant death, as large gaps may allow sections of the target tree to survive. Generally, the holes or nicks do not need to be deeper than 20 millimetres but do need to be deep enough to penetrate the outer cambium layer of the tree. This allows the phloem to carry the herbicide into the roots, which will kill the plant over several weeks, depending on conditions.

The benefits of this method include: the retention of standing material for habitat, no costs for the removal of the plant from the site; no dragging of material across sensitive areas; and, speed, as the method is fast to execute (i.e. drill and fill and move on).

The drawbacks of this method are that if it is not executed correctly, trees may re-grow, particularly as accessing the base of the trunk of spiny plants such as Hawthorn and African Box-thorn can be difficult.

However, if the application is successful, dead standing vegetation can become a fire hazard and look aesthetically displeasing to the community.

Cut and Paint

The cut and paint method of control requires the cutting of the target species at the very base, under any foliage, and the immediate application of herbicide (usually a glyphosate, dependent on the target species). The application can be done through a 'dabber' bottle or paint brush. Care should be undertaken during application, to avoid splash of herbicide causing non-target damage. Once cut down, the biomass of the target species may sometimes be left on the ground, but usually requires removal. This is particularly necessary if it bears fertile seeds or has the potential to re-shoot from contact with moist ground (i.e. Salix sp.) or covers native vegetation.

Many herbicides are available that are very effective in the control of woody weed species. Typically, these herbicides are applied to the stem, trunk or roots of the target plant by 'drill and fill', 'cut and paint' or 'frilling' methods of application. These herbicides can be more effective than manual removal alone, as the chance of the plant re-sprouting is significantly reduced.

Manual Removal/Hand pulling

Some weed species are resilient against other methods of eradication, such as herbicides, and should be targeted by manual removal. Infestations of species such as African Box-thorn, Fennel, Serrated Tussock and Toowoomba Canary-grass should be combated by manual removal techniques.

Additionally, manual removal is a crucial technique when used in conjunction with herbicides for the control of both woody and herbaceous weed species. This combination of weed eradication is advised for almost all weed species.

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Final Report

Existing Conditions Report 128 – 168 Bennett Road, Gisborne

Prepared for

G2 Urban Planning

November 2021

Ecology and Heritage Partners Pty Ltd

MELBOURNE: 292 Mt Alexander Road, Ascot Vale VIC 3032 **GEELONG:** 230 Latrobe Terrace, Geelong West Vic 3218
BRISBANE: Level 22, 127 Creek Street, Brisbane QLD 4000 **ADELAIDE**: 22 Greenhill Road, Wayville SA 5034
CANBERRA: PO Box 6067, O'Connor ACT 2602 **SYDNEY:** Level 5, 616 Harris Street, Ultimo, NSW, 2007
www.ehpartners.com.au | (03) 9377 0100

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Project manager	Andrea Fullagar (Zoologist)
Report reviewer	Aaron Organ (Director – Principal Ecologist)
Other EHP staff	Jeremy Coyne (Zoologist); Sara Petrovic (Field Ecologist)
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Table 1. Development Plan Overlay (DPO18) requirements.

Requirement	Summary of response
Identification of any existing native or significant vegetation on the site	Native vegetation adjacent to the creek line will be retained and stock excluded. Native vegetation in the study area is representative of four EVCs characteristic of the Victorian Volcanic Plains: Plains Grassland Heavier-soils (EVC 132_61), Plains Sedgy Wetland (EVC 647), Tall Marsh (EVC 821) and Stony Knoll Shrubland (EVC 649). The presence of these EVCs is generally consistent with the modelled pre-1750s native vegetation mapping (DELWP 2017b). The remainder of the study area comprises introduced and planted vegetation, present as stands of non-Victorian eucalypt species, pasture and Victorian Eucalypts. (Section 3.1). At the time of the planning permit application (Clause 52.17), targeted surveys are recommended for Matted Flax-lily (May – August), Swamp Everlasting (November – March) and Swamp Fireweed (November – March) adjacent to the creek line/drainage line.
Identification of any significant fauna and associated habitat	Despite current land uses, the study area contains patches of native vegetation, scattered trees and some introduced vegetation that is of value to fauna. Patches of Plains Grassland and remnant riparian vegetation along the creek line may provide potential habitat for significant species. At the time of the planning permit application (Clause 52.17), targeted surveys are recommended for Golden Sun Moth across the whole study area during the summer flying season (late November – early January) (DEWHa 2009). Targeted surveys are recommended for Growling Grass Frog along the creek line during the species' breeding season (November – March) (DEWHA 2009).
Identification of the relevant legislative requirements for flora and fauna	The *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) establishes a Commonwealth process for the assessment of proposed actions likely to have a significant impact on any matters of National Environment Significance (NES). The study area is located within the Macedon Ranges municipality and is zoned Rural Living Zone 2 (RLZ2). Development Plan Overlay (DPO18) applies to the land proposed for subdivision. A Planning Permit from Macedon Ranges Council will be required to remove, destroy or lop any native vegetation on site. A Planning Permit will be assessed in accordance with the 'The Guidelines for the removal, destruction or lopping of native vegetation' (Guidelines) and Clause 52.17 of the Whittlesea Planning Scheme. Any persons engaged to remove, salvage, hold or relocate native fauna during construction must hold a current Management Authorisation under the *Wildlife Act 1975*, issued by DELWP. Weeds listed as noxious under the *Catchment and Land Protection Act 1994* (CaLP Act) (Artichoke Thistle, Fennel, Paterson's Curse, African Box-thorn, Blackberry, Chilean Needle-grass and Serrated Tussock) were recorded during the assessment. Weeds should be managed in accordance with the Act. See Section 4 for further detail on how legislative requirements will be met.
Identification of existing vegetation to be retained as per DPO18 requirements	Native vegetation up to 30 metres either side of the creek line (or drainage line) will be retained and stock excluded. Dwellings will be set back from drainage line by at least 20 metres. Trees within the road reserve, including revegetation, will be retained where possible (Appendix 1)

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1 INTRODUCTION

1.1 Background

Ecology and Heritage Partners Pty Ltd conducted and produced an Existing Conditions Report in February 2020, at the Bennett Road Precinct, to satisfy the requirements for a Development Plan Overlay – Schedule 18 (DPO18) according to the Macedon Ranges Planning Scheme.

Following the assessment detailed in the 2020 report, Ecology and Heritage Partners Pty Ltd undertook targeted surveys for significant flora and fauna species that had potential to occur in the study area based on the availability of suitable habitat (Ecology and Heritage Partners Pty Ltd 2021). The surveys indicated that there were no Matted Flax-lily, Swamp Everlasting, Swamp Fireweed, Growling Grass Frog or Golden Sun Moth in the Development Plan area.

This November 2021 version of the Existing Conditions Report, updates the discussion about significant flora, fauna and ecological communities, references the results of the targeted surveys, which are documented in (Ecology and Heritage Partners Pty Ltd 2021), and references a 2021 Development Plan.

1.2 Objectives

The objective of this assessment is to support the submission of a Development Plan, according to DPO18, which outlines the overall requirements for the proposed subdivision of 50 Lots (two hectares per Lot) to proceed.

The existing conditions assessment involved identifying the extent and type of remnant native vegetation present within the study area in accordance with Victoria's *Guidelines for the removal, destruction or lopping of native vegetation* (DELWP 2017). It also determined the likely presence of significant flora and fauna species and/or ecological communities protected under Commonwealth and State legislation and policy.

This report presents the results of the existing conditions report and discusses the potential ecological and legislative implications associated with the proposed subdivision. The report also provides recommendations to address or reduce impacts and, where necessary, highlights components that require further investigation.

1.3 Study Area

The study area is at the Bennett Road Precinct, located approximately six kilometres south of Gisborne and approximately 53 kilometres north-west of Melbourne's CBD (Figure 1). The site covers approximately 130 hectares and is bound by McGregor Road to the north, private property to the south, Coney Court to the east and the Calder Freeway to the west.

The study area is mostly undulating cleared agricultural land with introduced grasses, planted windrows of trees and some patches of native vegetation to the south of the study area trees. Patches of native vegetation, characteristic of Plains Sedgy Wetland and Tall Marsh Ecological Vegetation Classes (EVCs) are present along the creek line (Figures 2b, 2c). Patches of native vegetation (characteristic of Stony Knoll shrubland EVC) occurs in the south-east of the study area, but this has been grazed by livestock and the patches are highly degraded (Figure 2b). One continuous patch of native vegetation (characteristic of Plains Grassland EVC), is present adjacent to a driveway planted with windrow trees, in the south of the study area (Figure 2a).

According to the Department of Environment, Land, Water and Planning (DELWP) Native Vegetation Information Management (NVIM) Tool (DELWP 2018a), the study area occurs within the Victorian Volcanic Plain bioregion. It is located within the jurisdiction of the Port Philip and Westernport Catchment Management Authority (CMA) and the Macedon Ranges Shire municipality.

1.4 The Development Plan and Subdivision Concept Plan

The Development Plan prepared by Terraco Pty Ltd (2021) outlines the overall site characteristics and proposed road network to facilitate the consideration of a future subdivision application for 2-hectare residential allotments (Appendix 1.1; Appendix 1.2).

The Development Plan addresses the DPO18 requirement (Section 3.0) to identify measures for the preservation of remnant vegetation along drainage lines from the creek line to protect and manage waterway corridors. The Subdivision Concept Plan (2021) details the proposed subdivision including building envelopes within the study area.

While currently not incorporated into the Macedon Ranges Planning Scheme, the Biodiversity Strategy (2018) recommends the following urban biodiversity actions and local planning policies:

- Seek opportunities to transfer waterways and buffer areas to public ownership;
- Promote the use of native street trees in new subdivisions, and;
- Emphasise the importance of remnant native vegetation and their role in maintaining connected habitat for native flora and fauna.

2 METHODS

2.1 Desktop Assessment

Relevant literature, online-resources and numerous databases were reviewed to provide an assessment of flora and fauna values associated with the study area. The following information sources were reviewed:

- The Commonwealth Department of **the Environment and Energy (DoEE**E) Protected Matters Search Tool (PMST) for matters of National Environmental Significance (NES) protected under the Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act) (DoEE 2019) (Not updated as apart from those species already searched for during targeted surveys, no additional matters are considered relevant);
- The Native Vegetation Information Management (NVIM) Tool (DELWP 2019b) for modelled biodiversity data;
- DELWPs VicPlan Online to ascertain current zoning and environmental overlays (DELWP 2019d);
- DELWP's NatureKit mapping tool modelled mapping of 2005 extant and pre-1750's native vegetation and Ecological Vegetation Classes (EVCs) (DELWP 2019c);
- Victorian Guidelines for the Removal, Destruction or Lopping of Native Vegetation (the Guidelines) (DELWP 2017b),
- The Victorian Biodiversity Atlas (DELWP 2018a) for previously documented flora and fauna records within the project locality, and;
- Aerial photography of the study area.

2.2 Field Assessments

3.2.1 Biodiversity Assessment

A field assessment was undertaken on 17 and 21 May 2018 to obtain information on flora and fauna values within the study area. The study area was walked, with all observed vascular flora and fauna species recorded, any significant records mapped and the overall condition of vegetation and habitats noted. EVCs were determined with reference to DELWP pre-1750 and extant EVC mapping and their published descriptions (DELWP 2019c).

3.3 The Guidelines

Under the Planning and Environment Act 1987, Clause 52.17 of the Planning Schemes requires a planning permit from the relevant local Council to remove, destroy or lop native vegetation. The assessment process for the clearing of vegetation follows the *Guidelines for the removal, destruction or lopping of native vegetation* (Guidelines) (DELWP 2017b). The *Assessor's handbook – applications to remove, destroy or lop native vegetation* (Assessor's handbook) (DELWP 2017c) provides clarification regarding the application of the Guidelines.

3.3.1 Assessment Pathway

Guidelines manage the impacts on biodiversity from native vegetation removal (DELWP 2017b). The assessment pathway for an application to remove native vegetation reflects its potential impact on biodiversity and is determined from the location and extent of the native vegetation to be removed. The location risk categories (1, 2 or 3) has been determined for all areas in Victoria and is available on DELWP's NVIM Tool (DELWP 2019b). Determination of assessment pathway is summarised in Table 1.

Table 1. Assessment pathways for applications to remove native vegetation (DELWP 2017a)

Extent		Location		
		1	2	3
Native Vegetation	< 0.5 hectares, and not including any large trees	Basic	Intermediate	Detailed
	Less than 0.5 hectares, and including one or more large trees	Intermediate	Intermediate	Detailed
	0.5 hectares or more	Detailed	Detailed	Detailed

Notes: For the purpose of determining the assessment pathway of an application to remove native vegetation the extent includes any other native vegetation that was permitted to be removed on the same contiguous parcel of land with the same ownership as the native vegetation to be removed, where the removal occurred in the five year period before an application to remove native vegetation is lodged.

2.2.1 Vegetation Assessment

Native vegetation (as defined in Table 2) is assessed using two key parameters: extent (in hectares) and condition. Extent is determined through a field assessment. The condition score for Detailed Assessment pathways must be assessed through a habitat hectare1 assessment conducted by a qualified ecologist. The condition score for Basic Assessment pathways may be based on either modelled data available on the NVIM Tool (DELWP 2019b), or through a habitat hectare assessment.

Table 2. Determination of remnant native vegetation (DELWP 2017b)

Category	Definition	Extent	Condition
Remnant patch of native vegetation	An area of vegetation where at least 25 per cent of the total perennial understorey plant cover is native. OR An area with three or more native canopy trees where the drip line of each tree touches the drip line of at least one other tree, forming a continuous canopy.	Measured in hectares. Based on hectare area of the remnant patch.	Vegetation Quality Assessment Manual (DSE 2004).

[1] A 'habitat hectare' is a unit of measurement which combines the condition and extent of native vegetation.

Category	Definition	Extent	Condition
Scattered tree	A native canopy tree that does not form part of a remnant patch.	Measured in hectares. A small tree is assigned an extent of 0.031 hectares (10m radius). A large tree is assigned an extent of 0.071 hectares (15m radius).	Scattered trees are assigned a default condition score of 0.2.

Notes: Native vegetation is defined in the Victoria Planning Provisions as 'plants that are indigenous to Victoria, including trees, shrubs, herbs and grasses'.

2.2.2 Offsets

Offsets are required to compensate for the permitted removal of native vegetation. The offset requirements for Basic and Intermediate Assessment pathway applications are calculated using the NVIM Tool and the resulting Native Vegetation Removal Report will be provided as a separate report/s to accompany the planning permit application.

2.3 Assessment Qualifications and Limitations

The site assessment was undertaken during a sub-optimal season for the identification of flora and fauna species (autumn). This meant that the assessment undertaken only captured species present at the time of surveys and is not a complete representation of species diversity or extent.

Targeted flora or fauna surveys were not undertaken, as the purpose of this existing conditions assessment was to ascertain whether significant species are likely to occur based on native vegetation and habitat values at the site. If significant flora and fauna are considered by an ecologist to have a moderate – high likelihood of occurring at the site, then targeted surveys are recommended.

This assessment is considered sufficient for the purpose of the Development Plan approval, which is to provide an overview of the existing flora and fauna present in the study area and satisfy the DPO18 requirements under the Macedon Ranges planning scheme. It is appropriate that a detailed assessment, including habitat hectares and targeted surveys, are undertaken at the time of subdivision as part of a planning permit application.

3 RESULTS

3.1 Vegetation Condition

The majority of the study area comprises introduced and planted vegetation in the form of crops, pasture, windrows and ornamental plantings. However, there are some small areas of native vegetation scattered within the study area.

3.1.1 Remnant Patches

Remnant native vegetation in the study area is representative of four Ecological Vegetation Classes (EVCs) of the Victorian Volcanic Plain bioregion (Figure 2): Plains Grassland Heavier-soils (EVC 132_61), Plains Sedgy Wetland (EVC 647), Tall Marsh (EVC 821) and Stony Knoll Shrubland (EVC 649). The presence of these EVCs is generally consistent with the modelled pre-1750s native vegetation mapping (DELWP 2017b). The remainder of the study area comprises introduced and planted vegetation in the form of crops, pasture, windrows and ornamental plantings. Specific details relating to observed EVCs are provided below.

3.1.1.1 Plains Grassland

Heavier-soils Plains Grassland, associated with at least 500 mm of annual rainfall, is located beneath windrows and ornamental planting to the north of the study area (Figure 2). It has a bioregional conservation status of Endangered. The habitat zone has 40% cover of indigenous perennial grasses, in particular Spear Grass *Austrostipa* spp and Common Wallaby-grass *Rytidosperma caespitosum* (Plate 1). There is low diversity within patches, with an absence of native herb diversity (Plate 2).

Plate 1. Degraded Plains Grassland within the study area (Ecology and Heritage Partners Pty Ltd 22/05/2018).

Plate 2. Plains Grassland within the study area (Ecology and Heritage Partners Pty Ltd 22/05/2018).

Stony Knoll Shrubland

Stony Knoll Shrubland would have historically been spread widely across ridges within the study area. It has a Vulnerable bioregional conservation status. Historic clearing for pasture has limited its distribution to small patches which are of poor condition, where the cover of native grasses and sedges only reaches 25-30%.

The extant patches are characterised by the presence of Tall Rush *Juncus procerus*, and Slender Wallaby-grass *Rytidosperma racemosum* var. *racemosum* (Plate 3). Patch herb diversity is low/non-existent, most likely as a consequence of grazing by domestic livestock. The bryophyte and lichen life form component cover is high (20%) and diverse with >5 species present (Plate 4).

Plate 3. Stony Knoll Shrubland within the study area (Ecology and Heritage Partners Pty Ltd 22/05/2018).

Plate 4. Stony Knoll Shrubland within the study area (Ecology and Heritage Partners Pty Ltd 17/05/2018).

Plains Sedgy Wetland

The creek running through the south/ south-east of the study area contains native vegetation with the highest diversity and condition. Plains Sedgy Wetland is patchy along the creek alignment, ranging from moderate to low condition (Plate 5). The southern half of the creek is dominated by Common Tussock Grass *Poa labillardierei* along the slopes of the creek line (Plate 6), with a diversity of sedges and herbs being present in wetter areas. Common species in these areas include: Bidgee-widgee *Acaena novae-zelandiae,* Tall Rush *Juncus procerus,* Swamp Crane's-bill *Geranium spp.,* and Kidney-weed *Dichondra repens* (Plate 7).

Weed species, including Spiny Rush *Juncus acutus,* Toowoomba Canary-grass *Phalaris aquatica,* Large Quaking-grass *Briza maxima*, Cocksfoot *Dactylis glomerate,* Serrated Tussock *Nassella trichotoma* and Soursob *Oxalis pes-caprae* were commonly found throughout many of the remnant patches.

Plate 5. Patchy Plains Sedgy Wetland within the study area (Ecology and Heritage Partners Pty Ltd 17/05/2018).

Plate 6. Plains Sedgy Wetland dominated by Tussock Grass within the study area (Ecology and Heritage Partners Pty Ltd 21/05/2018).

Plate 7. High diversity Plains Sedgy Wetland within the study area (Ecology and Heritage Partners Pty Ltd 17/05/2018).

Tall Marsh

Tall Marsh is restricted to the artificial dam located to the south of the study area (Figure 2). It has a bioregional conservation status of Least Concern. The inflow drain is densely populated with sedges (Plate 8), with emergent vegetation occurring in the centre and perimeter of the dam (Plate 9). Condition of this vegetation is high owing to the diversity of life forms, and lack of weeds. Emergent vegetation includes Common Spike-sedge *Eleocharis acuta*, Common Reed *Phragmites australis* and Narrow-leaf Cumbungi *Typha domingensis*.

Plate 8. Tall Marsh native vegetation surrounding and emerging from dam (Ecology and Heritage Partners Pty Ltd 17/05/2018).

Plate 9. Tall Marsh lining and emerging from dam (Ecology and Heritage Partners Pty Ltd 17/05/2018).

3.1.2 Introduced and Planted Vegetation

Introduced Vegetation

Areas not supporting remnant native vegetation have a high cover (>80%) of exotic grass species, many of which have been direct-seeded for use as pasture (Plate 10). Scattered planted native grasses are generally present in these areas, however they do not have the required 25% cover to be considered a remnant patch under the Guidelines. Removal of embedded rock has also been undertaken to facilitate the direct seeding of pasture grasses in some locations.

Disturbed areas were dominated by environmental weeds such as Toowoomba Canary-grass, Rye-grass *Lolium* spp., Meadow Fox-tail *Alopecurus pratensis*, Galenia *Galenia pubescens var. pubescens*, Ribwort *Plantago lanceolata*, Couch *Cynodon dactylon var. dactylon* and Wild Oat *Avena fatua*.

Noxious weeds are present throughout the study area, with scattered occurrences of Artichoke Thistle *Cynara cardunculus*, Spiny Rush *Juncus acutus subsp. acutus*, and Spear Thistle *Cirsium vulgare*, along with the Weeds of National Significance (WONS), African Boxthorn *Lycium ferocissimum* and Serrated Tussock.

Planted Vegetation

Planted vegetation in the study area consists of exotic and non-indigenous tree species, most commonly Sugar Gum *Eucalyptus cladocalyx* and Pine *Pinus* spp. (Plate 10), which are planted in windrows around dwellings, sheds and laneways. A variety of ornamental shrubs have also been planted around sheds and dwellings.

Plate 10. Planted vegetation within the study area (Ecology and Heritage Partners Pty Ltd 21/05/2018).

3.2 Fauna Habitat

Planted native vegetation is likely to provide habitat for mobile fauna species, in the form of vantage points and nesting/ roosting areas for birds and small mammals (bats, gliders). Planted eucalypts may also provide stepping-stones for mobile species, including reptiles, small mammals and birds moving through the study area, enhancing landscape connectivity for native fauna.

The patches of Plains Grassland are characterised by native Wallaby Grass *Rytidosperma* spp. and Spear Grass *Austrostipa* spp., which are known to provide habitat for the nationally significant Golden Sun Moth *Synemon plana*. Golden Sun Moth, if present within the study area, are most likely to occur in association with native vegetation, identified to the south/ south-east of the study area, near the creek line (Figure 2b and c).

The entire reach of creek line that intersects the study area, in association with identified native vegetation (Figure 2b and c), provides potential suitable habitat for the nationally significant Growling Grass Frog *Litoria raniformis*.

The Stony Knolls, characteristic of Stony Knoll Shrubland EVC (Plates 3, 4), are highly degraded and are unlikely to provide habitat for significant species. Considering that Striped Legless Lizard *Delma impar* were not recorded within 10 kilometres of the study area, targeted surveys are not considered necessary.

3.3 The Guidelines

A planning permit will be required if any clearing of native vegetation is undertaken.

Under the *Planning and Environment Act 1987*, Clause 52.17 of the Planning Schemes requires a planning permit from the relevant local Council to remove, destroy or lop native vegetation. The assessment process for the clearing of vegetation follows the Guidelines (DELWP 2017b).

Based on the NVIM Tool (2019b), the study area is assessable under the Guidelines (DELWP 2017b) and is within Locations 1 and 2. As the Site Concept Plan for the proposed subdivision is not available at this stage, the assessment pathway (Basic/Intermediate/Detailed), based on the location and extent of native vegetation

to be cleared cannot be determined. This assessment pathway will determine the permit application requirements to remove native vegetation under the Guidelines (DELWP 2017b).

3.4 Significance Assessment

At the Development Plan stage, targeted surveys for significant species (EPBC Act 1999) are not required. The national and state legislative requirements must be addressed as part of the planning permit application, prior to any development proceeding (Section 4).

Targeted surveys are required to determine if any significant flora or fauna listed under the EPBC Act 1999 occur in the study area. If any matters of National Environmental Significance (NES) are likely to be significantly impacted by the proposed subdivision, then an EPBC Act referral is required (Section 4.1 and Section 5).

3.4.1 Flora

The VBA contains records of several National and State significant flora species within 10 kilometres of the study area (DELWP 2018a), including EPBC Act listed Matted Flax-lily *Dianella amonea*, Swamp Everlasting *Xerochrysum palustre* and Swamp Fireweed *Senecio psilocarpus* (Appendix 2.1). Recent records of Matted Flax-lily *Dianella amoena* (2016 record) were found within a five kilometre search radius, including along the Gisborne railway line and, most recently, within a few kilometres east of the study area in the Dalrymple Road Reserve (Figure 3). Swamp Everlasting *Xerochrysum palustre* and Swamp Fireweed *Senecio psilocarpus* were also found within five kilometres of the study area (2016 records), however all were found within the Gisborne Flora Reserve (Figure 3).

Due to the highly modified nature of the study area and current grazing history, the presence of Matted Flax-lily, Swamp Everlasting and Swamp Fireweed is considered unlikely across the entire study area. However, given the proximity of previous records within 5 kilometres of the study area, targeted surveys are recommended for Matted Flax-lily, Swamp Everlasting and Swamp Fireweed adjacent to the creek line in association with identified native vegetation patches (Figure 2b and 2c).

3.4.2 Fauna

The VBA contains records of a range of National, State and regionally significant fauna species within 10 kilometres of the study area (DELWP 2018a), including EPBC Act listed Growling Grass Frog, Golden Sun Moth and Australasian Bittern *Botaurus poiciloptilus* (Appendix 3.1). Of these species, only Growling Grass Frog (2000 record) and Golden Sun Moth (2006 record) are considered moderately likely to use the study area, based on land use history and available habitat.

Growling Grass Frog has a moderate likelihood of occurring in the south/ south-east of the study area, based on suitable available habitat, given their ability to persist in relatively disturbed aquatic environments including farm dams (Pyke 2002).

Golden Sun Moth has a moderate likelihood of occurring to the south/ south-east of the study area where small patches of native vegetation, including surrounding stony knolls, were identified (Figure 2a and 2b). Remnant native vegetation may provide limited food sources for Golden Sun Moth within the study area (Wallaby Grass and Spear Grass), however the diversity of grasses can be better quantified during the spring-summer seasons when grasses are in seed.

Other nationally significant fauna are considered unlikely to occur within the study area due to the lack of suitable habitat and the disturbed nature of the site. Australasian Bittern (2016 record) was recently recorded

within five kilometres of the study area. However, this species is very cryptic in nature and due to the limited vegetation cover (typically dense beds of reeds and rushes) available at the site, the species is considered unlikely to occur. Swift Parrot *Lathamus discolor* (2001 record) and Diamond Firetail *Stagonopleura guttata* (2005 record) are significant bird species that were recorded within a 10-kilometre radius but are considered unlikely to occur in the study area due to the lack of scattered large native trees and understorey habitat. Striped Legless Lizard *Delma impar* is an EPBC Act listed species known to occur on areas of the Victorian Volcanic Plain, but were not previously recorded within 10 kilometres of the study area and so are considered unlikely to occur on-site.

It is possible that other significant migratory bird species, may visit the study area occasionally or opportunistically whilst en-route to more suitable sites, however it is unlikely that they would reside within the study area.

3.4.3 Communities

Five nationally listed threatened ecological communities may occur within 10 kilometres of the study area based on the PMST (DoEE 2015) Report created, 16/05/18:

- Grassy Eucalypt Woodland of the Victorian Volcanic Plain (Critically Endangered);
- Grey Box (Eucalyptus microcarpa) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia (Endangered);
- Natural Temperate Grassland of the Victorian Volcanic Plains (Critically Endangered);
- Seasonal Herbaceous Wetlands (Freshwater) of the Temperate Lowland Plains (Critically Endangered); and,
- White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland (Critically Endangered).

However, vegetation surveyed within the study area did not meet the condition thresholds that define any national or State-significant communities.

4 LEGISLATIVE AND POLICY IMPLICATIONS

4.1 *Environment Protection and Biodiversity Conservation Act 1999* (Commonwealth)

The *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) establishes a Commonwealth process for the assessment of proposed actions likely to have a significant impact on any matters of National Environment Significance (NES).

Targeted surveys conducted for significant flora and fauna species in late 2020 (Ecology and Heritage Partners 2021) did not detect Matted Flax-lily, Swamp Everlasting, Swamp Fireweed, Golden Sun Moth or Growling Grass Frog within the study area, As a result, an EPBC Referral is not required.

4.2 *Flora and Fauna Guarantee Act 1988* (Victoria)

The FFG Act is the primary legislation dealing with biodiversity conservation and sustainable use of native flora and fauna in Victoria. Proponents are required to apply for an FFG Act Permit to 'take' listed and/or protected flora species, listed vegetation communities and listed fish species in areas of public land (i.e. within road reserves, drainage lines and public reserves). An FFG Act permit is generally not required for removal of species or communities on private land, or for the removal of habitat for a listed terrestrial fauna species.

The information presented in this report reflects the data available prior to The Flora and Fauna Guarantee Amendment Act 2019 (the Amendment Act), which came into effect on June 1st 2020, and included an updated and consolidated threatened species. As a result, the significant species data presented in Appendix 2.1 and Appendix 2.3 has been cross-referenced with the latest FFG Act threatened species list (August 2021) in order to ensure that they adequately capture any changes to recently listed species. Based upon the cross-referencing, apart from those species already searched for during targeted surveys, there are no additional species considered relevant.

One species present in the study area is protected under the FFG Act due its membership of a protected group, the Wattles (*Acacia*): Black Wattle *Acacia mearnsii*.

There is suitable habitat within the study area for several species listed or protected under the FFG Act. However, as the study area is privately owned, a permit under the FFG Act is not required.

4.3 *Planning and Environment Act 1987* (Victoria)

The *Planning and Environment Act 1987* outlines the legislative framework for planning in Victoria and for the development and administration of planning schemes. All planning schemes contain native vegetation provisions at Clause 52.17 which require a planning permit from the relevant local Council to remove, destroy or lop native vegetation on a site of more than 0.4 hectares, unless an exemption under clause 52.17-7 of the Victorian Planning Schemes applies or a subdivision is proposed with lots less than 0.4 hectares[2]. Local planning schemes may contain other provisions in relation to the removal of native vegetation (Section 4.3.1).

[2] In accordance with the Victorian Civil and Administrative Tribunal's (VCAT) decision Villawood v Greater Bendigo CC (2005) VCAT 2703 (20 December 2005) all native vegetation is considered lost where proposed lots are less than 0.4 hectares in area and must be offset at the time of subdivision.

4.3.1 Local Planning Schemes

The study area is located within the Macedon Ranges Shire Council municipality and is zoned Rural Living Zone – Schedule 2 (RLZ2). The following overlays apply:

- Development Plan Overlay – Schedule 18 (DPO18) of the Macedon Ranges Planning Scheme
    - The Development Plan requires a buffer up to 30 metres either side of the creek/drainage line, that is maintained for the purpose of protecting native vegetation and excluding stock.

4.3.2 Relevant Exemptions

Native planted vegetation in the study area is exempt from planning permit requirements under Clause 52.17-7 (Table of Exemptions) as it is planted on private land for amenity purposes (DELWP 2018f). In the study area, this includes the planted River Red Gums, Yellow Box and Red Box.

4.3.3 The Guidelines

The State Planning Policy Framework and the decision guidelines at Clause 52.17 (Native Vegetation) and Clause 12.01 require Planning and Responsible Authorities to have regard for '*The Guidelines for the removal, destruction or lopping of native vegetation*' (Guidelines) (DELWP 2017h).

4.3.4 Implications

A Planning Permit from Macedon Ranges Shire is required to remove, destroy or lop any native vegetation.

4.4 *Wildlife Act 1975* and Wildlife Regulations 2013 (Victoria)

The *Wildlife Act 1975* (and associated Wildlife Regulations 2013) is the primary legislation in Victoria providing for protection and management of wildlife. Authorisation for habitat removal may be obtained under the *Wildlife Act 1975* through a licence granted under the *Forests Act 1958*, or under any other Act such as the *Planning and Environment Act 1987*. Any persons engaged to remove, salvage, hold or relocate native fauna during construction must hold a current Management Authorisation under the *Wildlife Act 1975*, issued by DELWP.

4.5 *Catchment and Land Protection Act 1994* (Victoria)

The *Catchment and Land Protection Act 1994* (CaLP Act) contains provisions relating to catchment planning, land management, noxious weeds and pest animals. Landowners are responsible for the control of any infestation of noxious weeds and pest fauna species to minimise their spread and impact on ecological values.

Weeds listed as noxious under the CaLP Act (Artichoke Thistle, Fennel, Paterson's Curse, African Box-thorn, Blackberry, Chilean Needle-grass and Serrated Tussock) were recorded during the assessment. Weeds should be managed in accordance with the Act.

4.6 Best Practice Mitigation Measures

This assessment identifies the creek line to provide the greatest ecological value (Figure 2). In particular, the native vegetation adjacent to the creek line is in moderate-high condition and development in this area should be avoided and minimised, where possible. The linear strip of Plains Grassland and small patches of Stony Knoll Shrubland identified (Figure 2) are of lesser quality and while efforts should be made to retain this native vegetation, it is unlikely to provide important habitat for significant species.

The creek line which intersects the south/ south-east section of the study area contains patches of native vegetation. While the riparian vegetation provides potential habitat for Growling Grass Frog, targeted surveys conducted in accordance with the survey guidelines (DEWHA 2009) in late 2020 did not detect the species within the creek line habitat (Ecology and Heritage Partners 2021). Similarly, while the entire extent of the study area provides potential habitat for Golden Sun Moth, targeted surveys did not detect the species in the study area (Ecology and Heritage Partners 2021).

The mapped Stony Knoll Shrubland located to the south-east of the study area, while very degraded, is identified as native vegetation. While generally this is typical habitat for Striped Legless Lizard, given the lack of records within a 10 kilometre radius of the study area and the degraded nature of the habitat, the species is considered unlikely to occur and targeted surveys were not deemed necessary.

Recommended measures to mitigate impacts upon terrestrial and aquatic values present within the study area may include:

- Minimise impacts to native vegetation and habitats through construction and micro-siting techniques, including fencing retained areas of native vegetation. If indeed necessary, trees should be lopped or trimmed rather than removed. Similarly, soil disturbance and sedimentation within wetlands should be avoided or kept to a minimum, to avoid, or minimise impacts to fauna habitats;
- All contractors should be aware of ecologically sensitive areas to minimise the likelihood of inadvertent disturbance to areas marked for retention. Habitat Zones (areas of sensitivity) should be included as a mapping overlay on any construction plans;
- Tree Retention Zones (TRZs) should be implemented to prevent indirect losses of native vegetation during construction activities (DSE 2011). A TRZ applies to a tree and is a specific area above and below the ground, with a radius 12 x the DBH. At a minimum standard a TRZ should consider the following:
    - A TRZ of trees should be a radius no less than two metres or greater than 15 metres;
    - Construction, related activities and encroachment (i.e. earthworks such as trenching that disturb the root zone) should be excluded from the TRZ;
    - Where encroachment exceeds 10% of the total area of the TRZ, the tree should be considered as lost and offset accordingly;
    - Directional drilling may be used for works within the TRZ without being considered encroachment. The directional bore should be at least 600 millimetres deep;
    - The above guidelines may be varied if a qualified arborist confirms the works will not significantly damage the tree (including stags / dead trees). In this case the tree would be retained and no offset would be required; and,
    - Where the minimum standard for a TRZ has not been met an offset may be required.

- Where possible, construction stockpiles, machinery, roads, and other infrastructure should be placed away from areas supporting native vegetation, LOTs and/or wetlands, and;
- Ensure that best practice sedimentation and pollution control measures are undertaken at all times, in accordance with Environment Protection Authority guidelines (EPA 1991; EPA 1996; Victorian Stormwater Committee 1999) to prevent offsite impacts to waterways and wetland.

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5 FURTHER REQUIREMENTS

The DPO18 requirements to support the Development Plan, as well as further requirements associated with development of the study area, are provided in Table 3.

This assessment responds to the DPO18 requirements in support of a Development Plan and provides an overview of ecological values present or likely to occur in the study area.

Table 3. Further requirements associated with development of the study area

Relevant Legislation	Implications	Further Action
Environment Protection and Biodiversity Conservation Act 1999	Targeted surveys conducted for significant flora and fauna species in late 2020 (Ecology and Heritage Partners 2021) did not detect Matted Flax-lily, Swamp Everlasting, Swamp Fireweed, Golden Sun Moth or Growling Grass Frog within the study area, As a result, an EPBC Referral is not required.	No further action required.
Flora and Fauna Guarantee Act 1988	There is suitable habitat within the study area for several species listed or protected under the FFG Act. However, as the study area is privately owned, a permit under the FFG Act is not required.	No further action required.
Planning and Environment Act 1987	A Planning Permit from Macedon Ranges Shire is required to remove, destroy or lop any native vegetation.	Native vegetation adjacent to the creek line will be retained and stock excluded. At the time of subdivision, a planning permit is required for the removal of any native vegetation, which includes: • Demonstrated avoidance and mitigation of native vegetation (DELWP 2017) • Required state Offsets.
Catchment and Land Protection Act 1994	Several weed species listed under the CaLP Act were recorded within the study area. To meet requirements under the CaLP Act, listed noxious weeds should be appropriately controlled throughout the study area.	Manage weeds in accordance with the CaLP Act.
Wildlife Act 1975	Any persons engaged to remove, salvage, hold or relocate native fauna during construction must hold a current Management Authorisation or Research Permit under the *Wildlife Act 1975*, issued by DELWP.	No further action required.

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Terraco 2020. Bennett Road Precinct Development Plan and Subdivision Concept Plan. Version 19.

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FIGURES

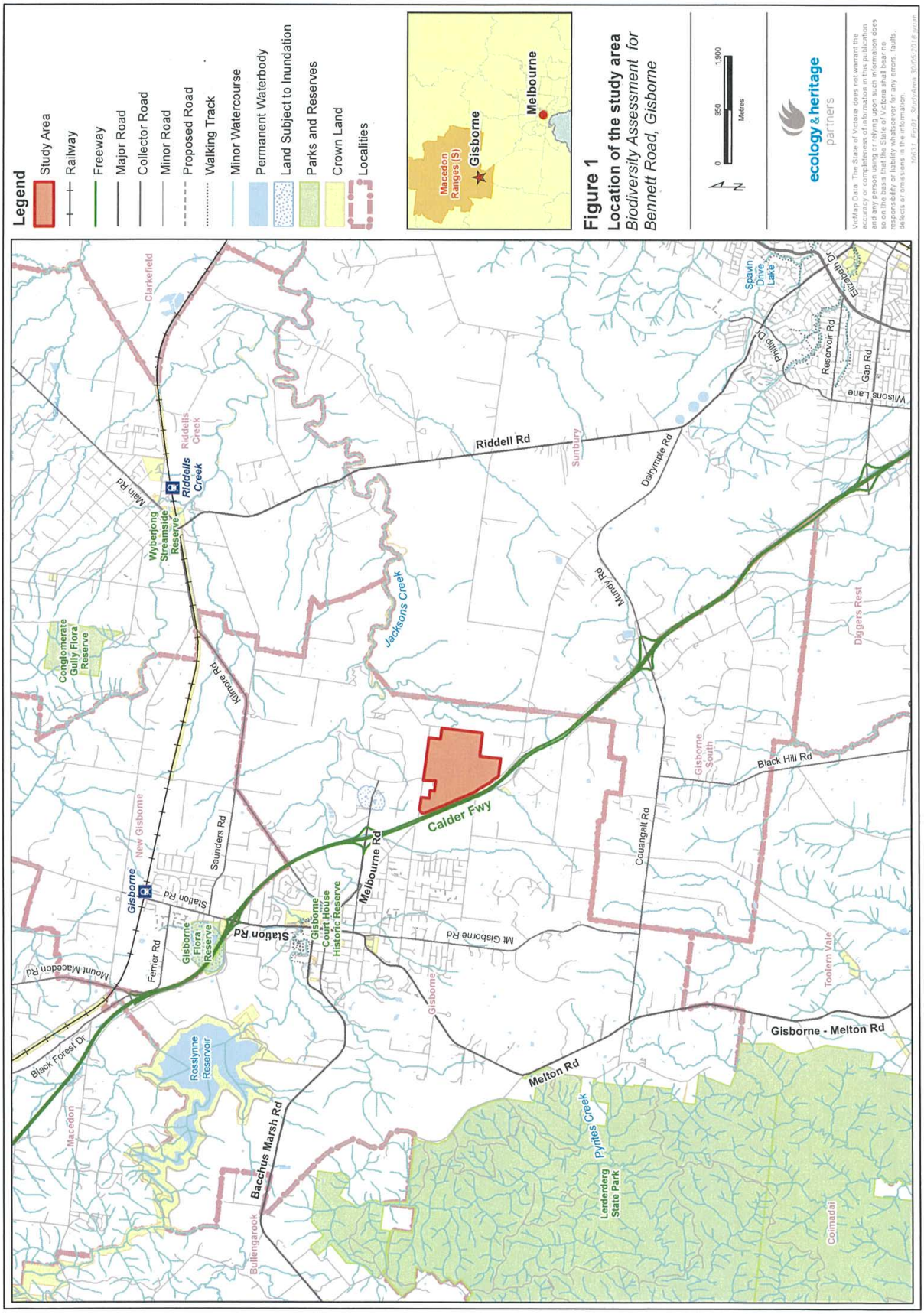

Figure 1
Location of the study area
Biodiversity Assessment for Bennett Road, Gisborne

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APPENDICES

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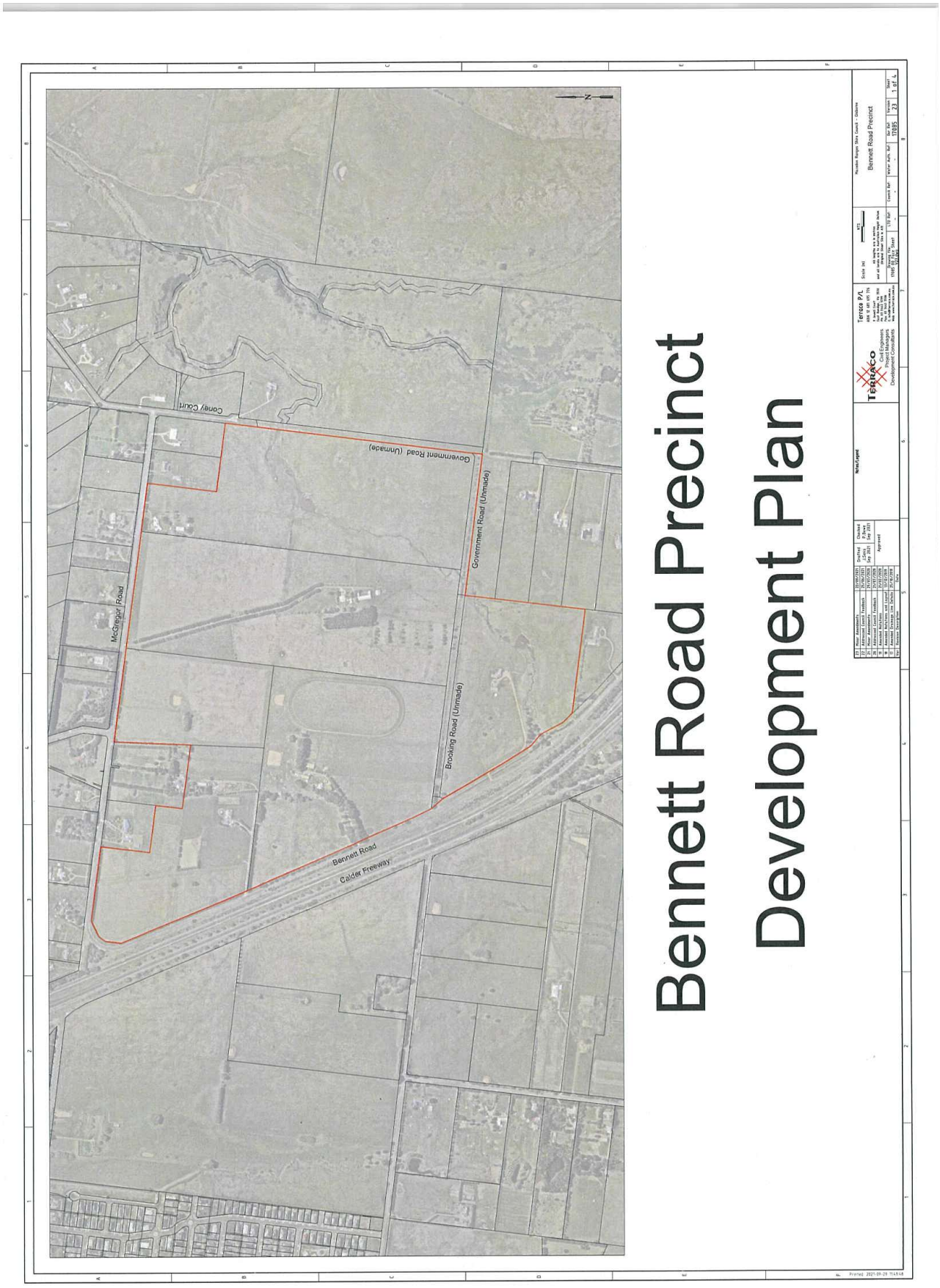
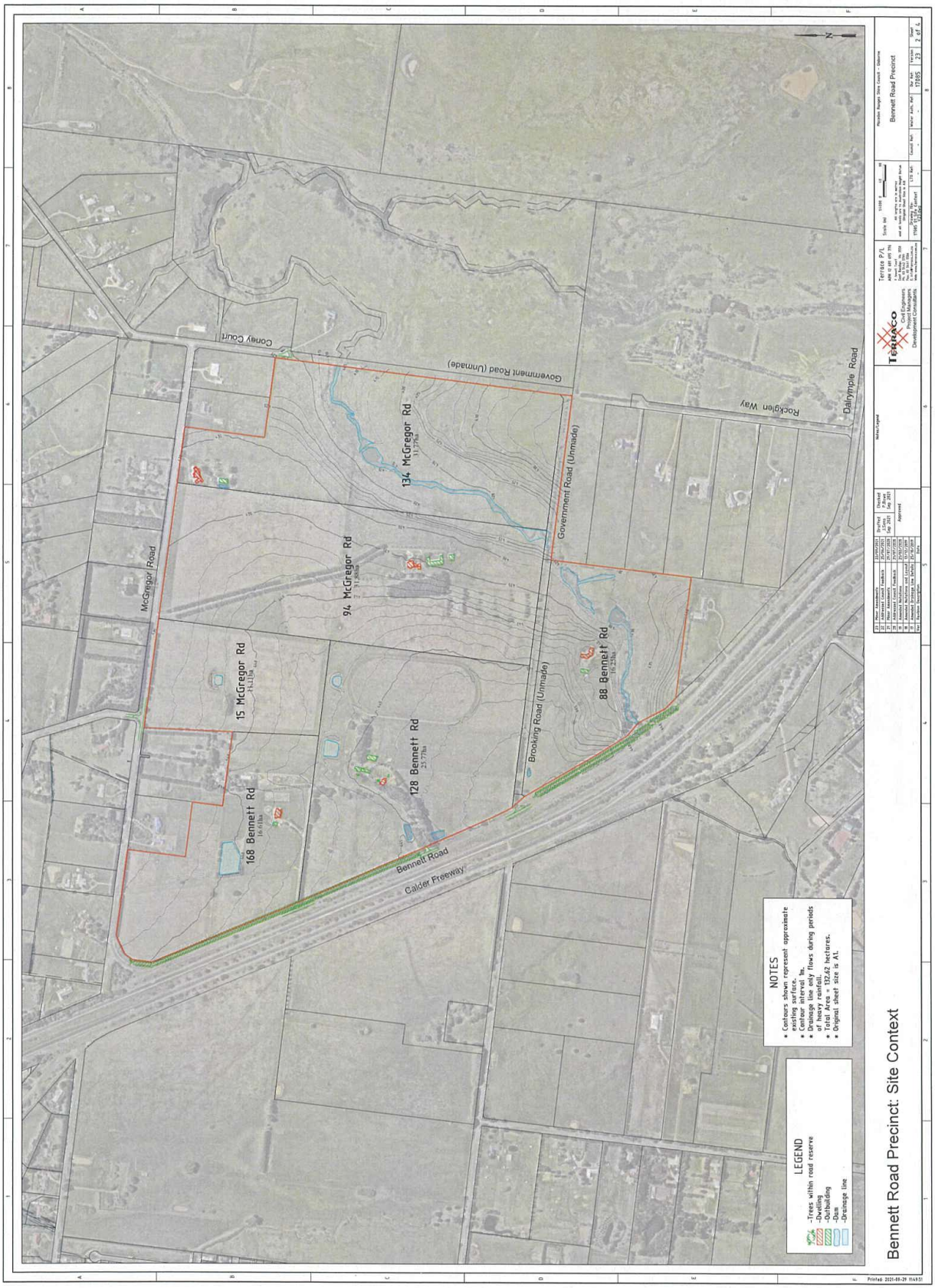
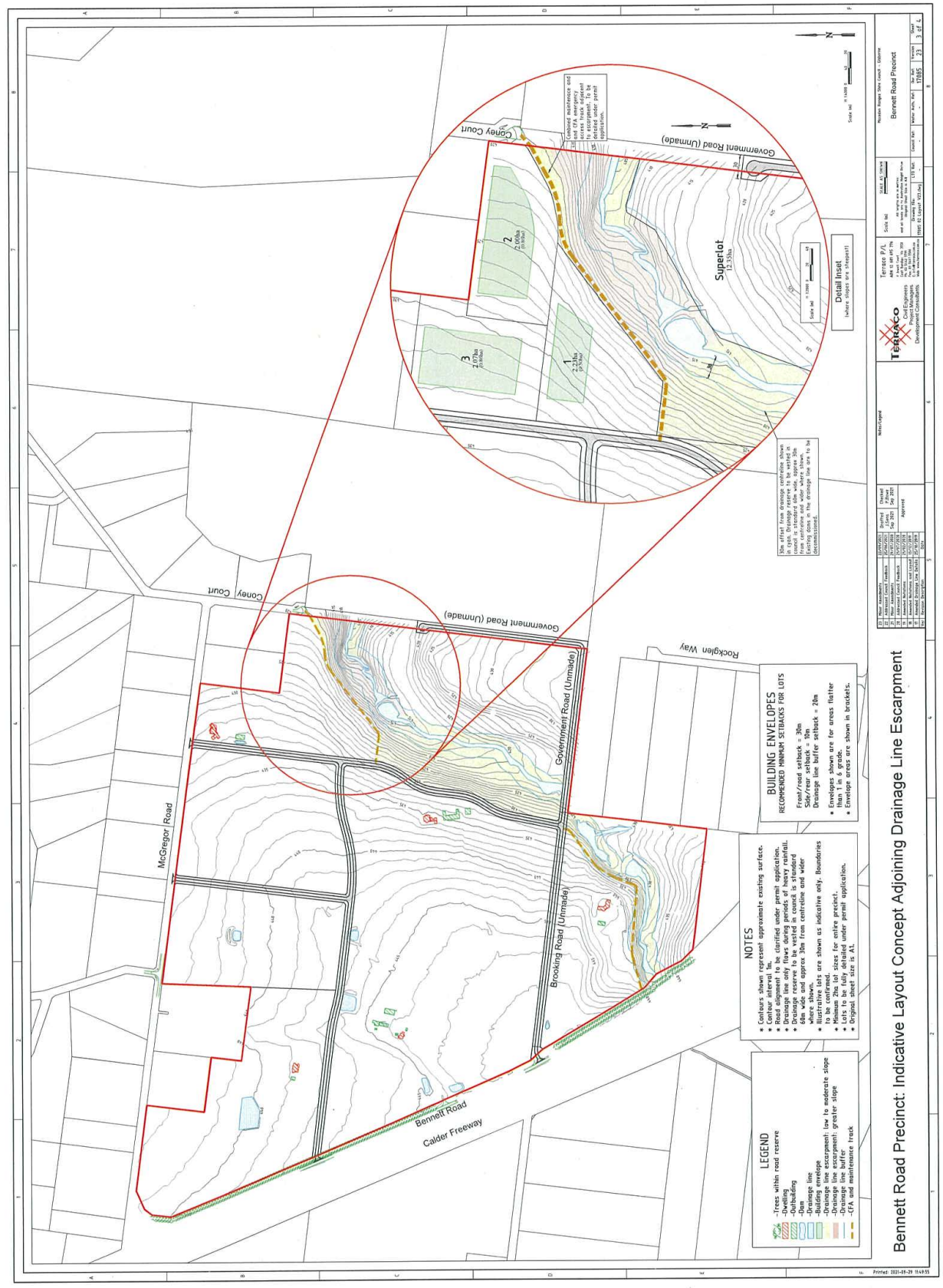
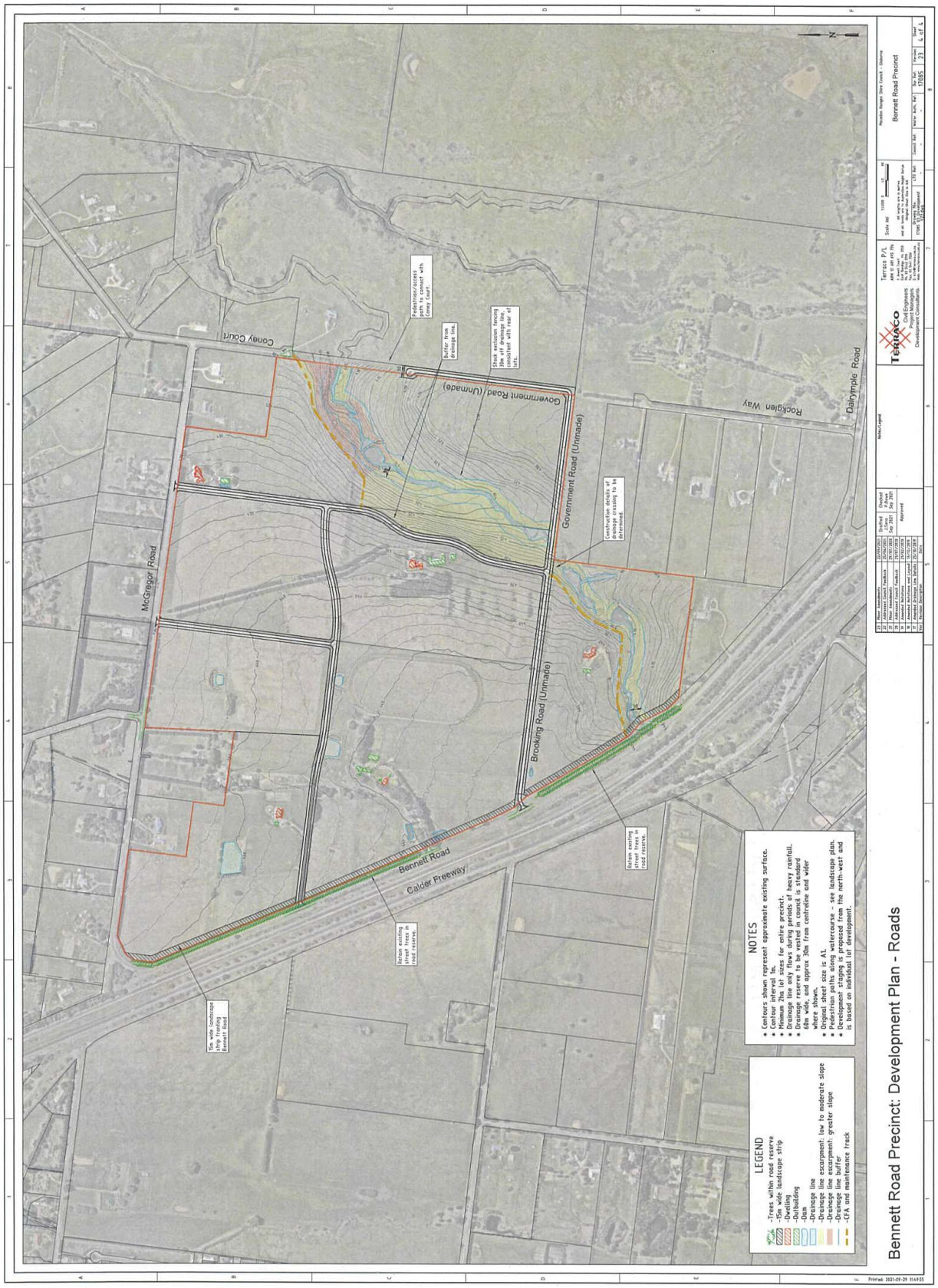
Appendix 1.1 – Development Plan


Bennett Road Precinct
Development Plan
Coney Court
Government Road (Unmade)
Government Road (Unmade)
McGregor Road
Brooking Road (Unmade)
Bennett Road
Calder Freeway
Bennett Road Precinct
TERRACO
Terraco P/L


Bennett Road Precinct: Site Context
LEGEND
-Trees within road reserve
-Dwelling
-Outbuilding
-Dam
-Drainage line
NOTES
Contours shown represent approximate existing surface.
Contour interval 1m.
Drainage line only flows during periods of heavy rainfall.
Total Area = 132.62 hectares.
Original sheet size is A1.
McGregor Road
Coney Court
Government Road (Unmade)
Rockglen Way
Dalrymple Road
Brooking Road (Unmade)
Bennett Road
Calder Freeway
134 McGregor Rd
94 McGregor Rd
15 McGregor Rd
168 Bennett Rd
128 Bennett Rd
88 Bennett Rd
TERRACO
Civil Engineers
Project Managers
Development Consultants
Terraco P/L
Bennett Road Precinct
2 of 4


Bennett Road Precinct: Indicative Layout Concept Adjoining Drainage Line Escarpment
LEGEND
-Trees within road reserve
-Dwelling
-Outbuilding
-Dam
-Drainage line
-Building envelope
-Drainage line escarpment: low to moderate slope
-Drainage line escarpment: greater slope
-Drainage line buffer
-CFA and maintenance track
NOTES
* Contours shown represent approximate existing surface.
* Contour interval 1m.
* Road alignment to be clarified under permit application.
* Drainage line only flows during periods of heavy rainfall.
* Drainage reserve to be vested in council is standard 60m wide and approx 30m from centreline and wider where shown.
* Illustrative lots are shown as indicative only. Boundaries to be confirmed.
* Minimum 2ha lot sizes for entire precinct.
* Lots to be fully detailed under permit application.
* Original sheet size is A1.
BUILDING ENVELOPES
RECOMMENDED MINIMUM SETBACKS FOR LOTS
Front/road setback = 30m
Side/rear setback = 10m
Drainage line buffer setback = 20m
* Envelopes shown are for areas flatter than 1 in 6 grade.
* Envelope areas are shown in brackets.
Detail Inset
(where slopes are steepest)
Superlot
12.35ha
Government Road (Unmade)
Coney Court
McGregor Road
Brooking Road (Unmade)
Rockglen Way
Bennett Road
Calder Freeway
Terraco P/L
Civil Engineers
Project Managers
Development Consultants
Bennett Road Precinct


Bennett Road Precinct: Development Plan - Roads
LEGEND
-Trees within road reserve
-15m wide landscape strip
-Dwelling
-Outbuilding
-Dam
-Drainage line
-Drainage line escarpment: low to moderate slope
-Drainage line escarpment: greater slope
-Drainage line buffer
-CFA and maintenance track
NOTES
* Contours shown represent approximate existing surface.
* Contour interval 1m.
* Minimum 2ha lot sizes for entire precinct.
* Drainage line only flows during periods of heavy rainfall.
* Drainage reserve to be vested in council is standard 60m wide, and approx 30m from centreline and wider where shown.
* Original sheet size is A1.
* Pedestrian paths along watercourse - see landscape plan.
* Development staging is proposed from the north-west and is based on individual lot development.
Bennett Road
Calder Freeway
Brooking Road (Unmade)
Government Road (Unmade)
McGregor Road
Coney Court
Rockglen Way
Dalrymple Road
Pedestrian/access path to connect with Coney Court.
Buffer from drainage line.
Stock exclusion fencing 50m off drainage line, consistent with rear of lots.
Construction details of drainage crossing to be determined.
Retain existing street trees in road reserve.
Retain existing street trees in road reserve.
15m wide landscape strip fronting Bennett Road
Bennett Road Precinct
TERRACO
Terraco P/L
Civil Engineers
Project Managers
Development Consultants
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Appendix 1.2 – Subdivision Concept Plan with Ecological Features

Bennett Road Development Plan: Subdivision Concept Plan
SITE AREA AND YIELD
SUBDIVISION CONCEPT SITE AREA LOTS
88 Bennett Road 16.2ha 6
128 Bennett Road 25.8ha 12
168 Bennett Road 16.6ha 8
15 McGregor Road 11.1ha 5
94 McGregor Road 31.9ha 12
134 McGregor Road 27.7ha 10
TOTAL 129.3ha 53
Subdivision Concept Development Plan and Subdivision Concept commissioned by 128 & 168 Bennett Road, and 134 McGregor Road. A concept for the remaining area is provided as sought by DP018 (as shown dashed).
BUILDING ENVELOPES
RECOMMENDED SETBACKS FOR LOTS
Front/road setback = 30m
Side/rear setback = 10m
Drainage line buffer setback = 20m
* Envelopes shown are for areas flatter than 1 in 6 grade to address the most sensitive land adjacent to the drainage line.
* Envelope areas are shown in brackets.
NOTES
* Contours shown represent approximate existing surface.
* Contour interval 1m.
* Road alignment to be clarified under permit application.
* Drainage line/creek only flows during periods of heavy rainfall.
* Drainage reserve to be vested in council is standard 40m wide and approx 30m from centreline and wider where shown.
* Dams in watercourse are to be decommissioned. All other dams are to be considered at subdivision stage for any decommissioning.
* Illustrative lots are shown as indicative only. Boundaries to be confirmed.
* Minimum 2ha lot sizes for entire precinct.
* Lots to be fully detailed under permit application.
* Pedestrian paths along watercourse - see landscape plan. To be determined under permit applications at time of subdivision.
* Staging of development proposed from the north-west.
* See Servicing and Utilities Infrastructure Report for details on servicing and infrastructure provision to development sites. It outlines that all infrastructure cost within and adjoining development parcels and any required extension of roads and other infrastructure is to be borne by each development parcel.
* Lot yield and lot configuration of 94 McGregor Road to be subject to detailed review.
* Original sheet size is A1.
LEGEND
-Trees within road reserve
-Indicative rock outcrops
-Dwelling
-Outbuilding
-Dam
-Drainage line
-Building envelope
(only illustrated adjacent to drainage line)
-Drainage line escarpment: low to moderate slope
-Drainage line escarpment: greater slope
-Drainage line buffer (30m as shown)
-CFA and maintenance track
-Rural pedestrian path/bike track
-Existing titles
-BAR (Basic Right-Turn) Treatment
-Indicative drainage outfall location
-Proposed street light at intersection
Bennett Road Precinct
Terraco
Civil Engineers
Project Managers
Development Consultants
McGregor Road
Coney Court
Government Road (Unmade)
Rockglen Way
Brooking Road (Unmade)
Bennett Road
Calder Freeway
Reserve
Superlot
Connection under proposed permit PLN 2018541.
Reserve, maintenance track, lots and building envelopes within 88 Bennett Road are subject to detailed review.
Culvert crossing of watercourse to be detailed in future engineering design. See cross section F on SHEET 5.
Reserve 2.67ha
Reserve 1.24ha
Indicative proposed road alignment along top of escarpment. See cross section E on SHEET 5.
Roadside swales to terminate at lowpoints in road and allow overland drainage to watercourse. Locations are shown indicatively.
Combined maintenance and CFA emergency access track adjacent to escarpment. To be detailed under permit application.
30m offset from drainage centreline shown in cyan. Proposed drainage reserve/creek (black) generally follows 30m offset from centreline either than where shown. Existing dam in the drainage line are to be decommissioned. See cross sections A to D on SHEET 4 for details.
Maximum of 4 lots for 134 McGregor Road superlot subject to detailed land capability assessment, avoidance of rock outcrops to maximum extent and setback of building envelopes from the waterway reserve. Building envelopes for all lots to be setback minimum 20m from reserve boundaries.
Shade on 128 Bennett Road to be relocated as necessary.
BAR treatments and street lights to be provided for all four proposed intersections onto Bennett Road and McGregor Road. Street light position shown indicatively.
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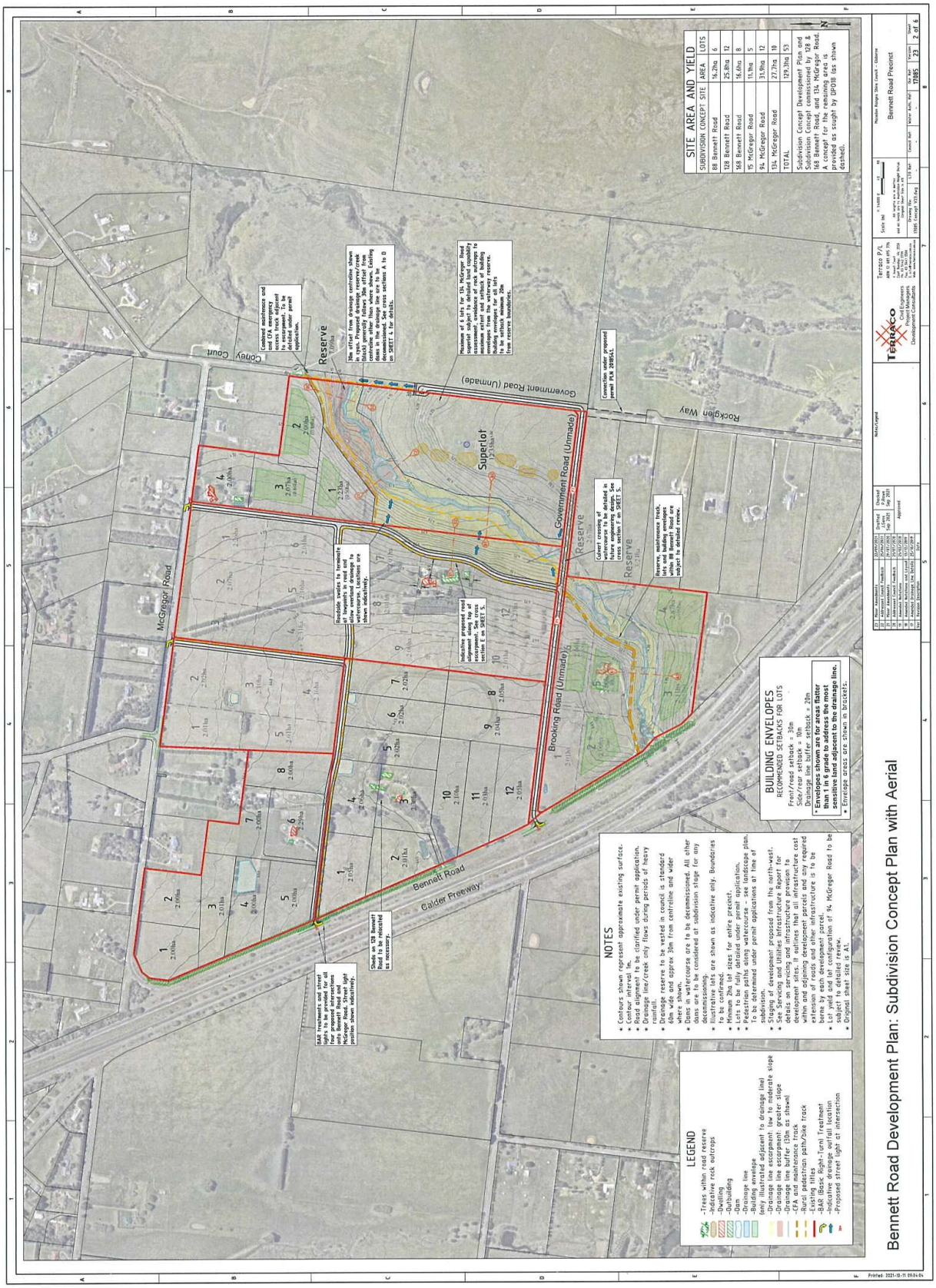
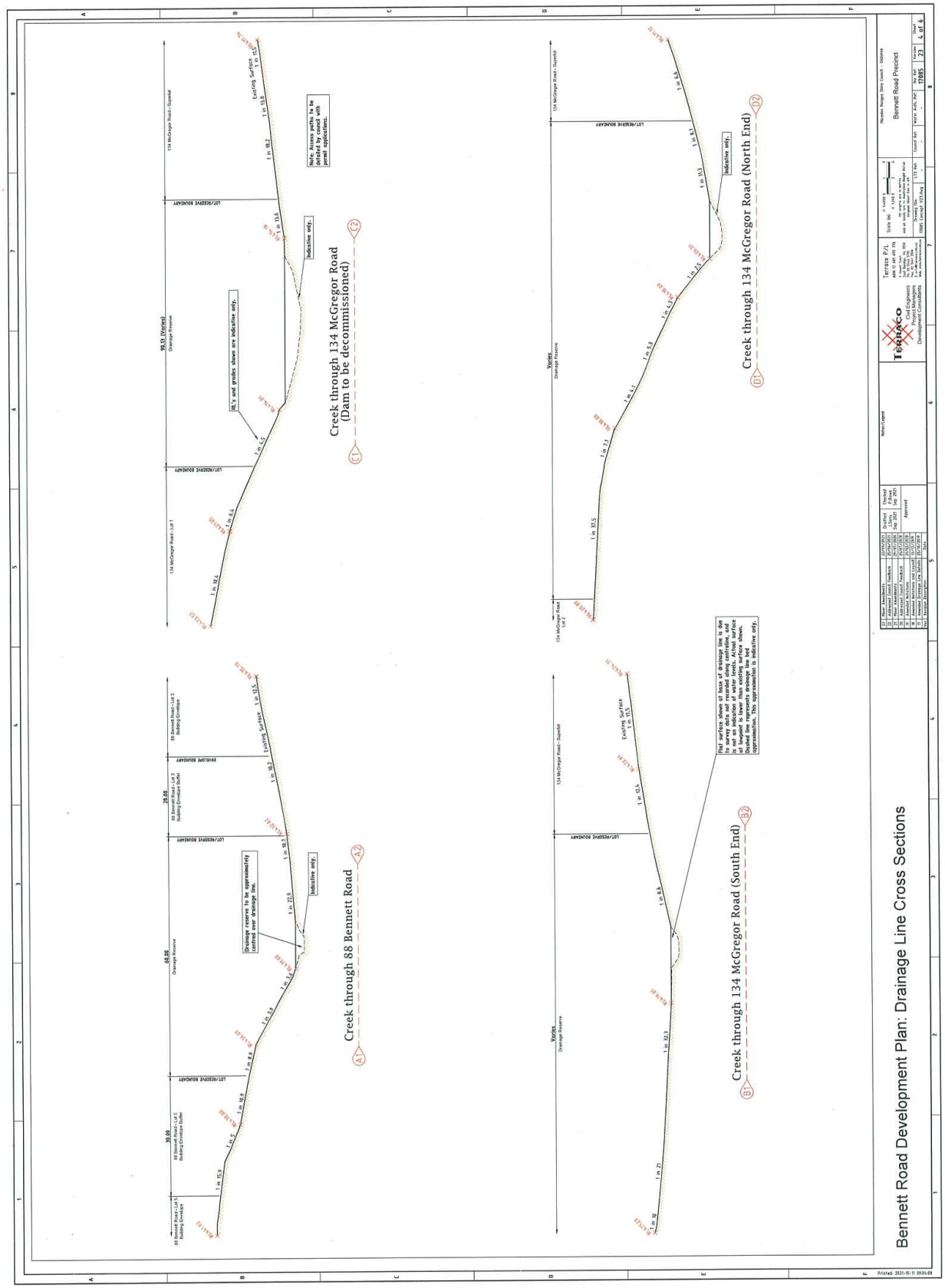
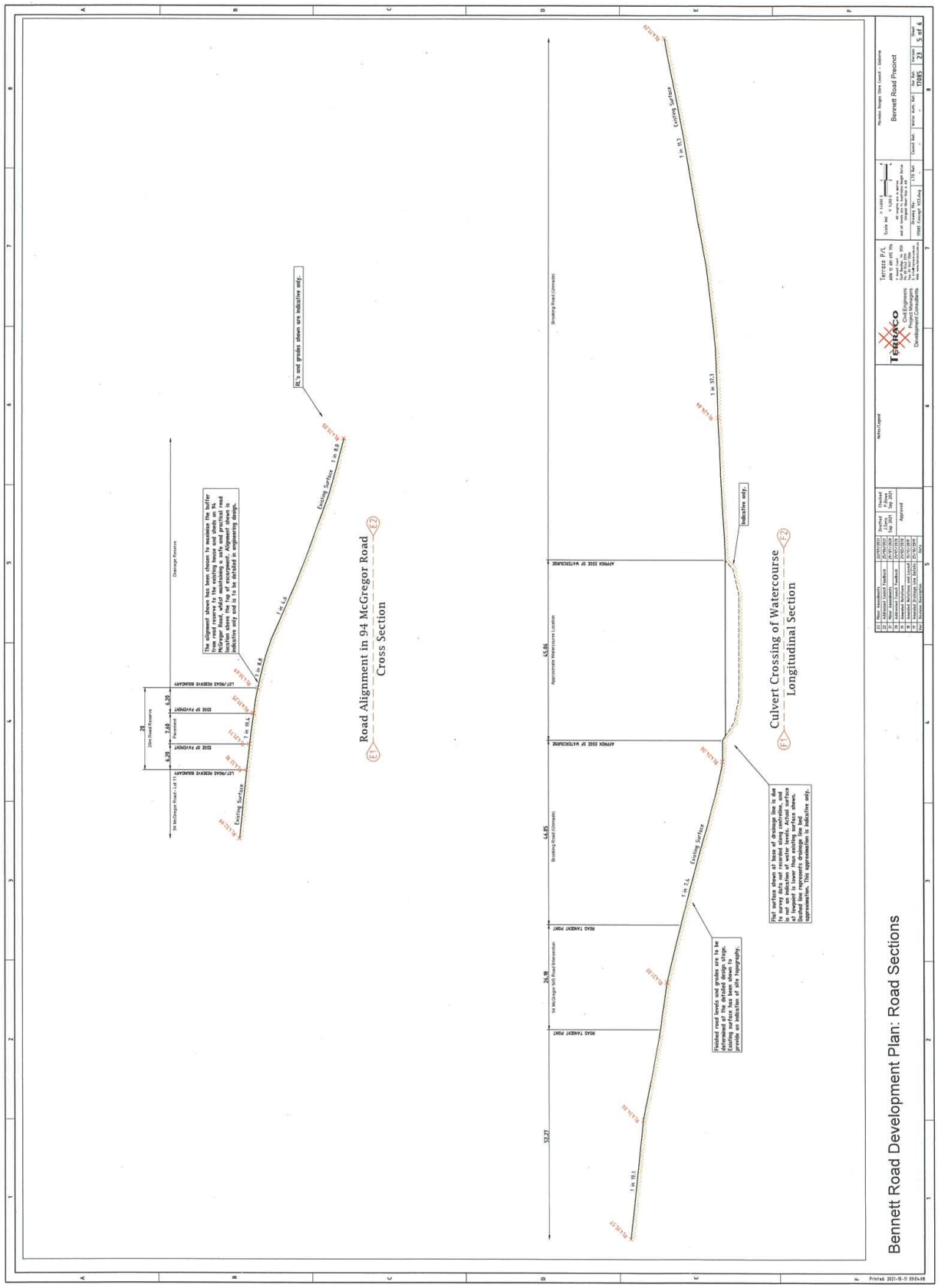
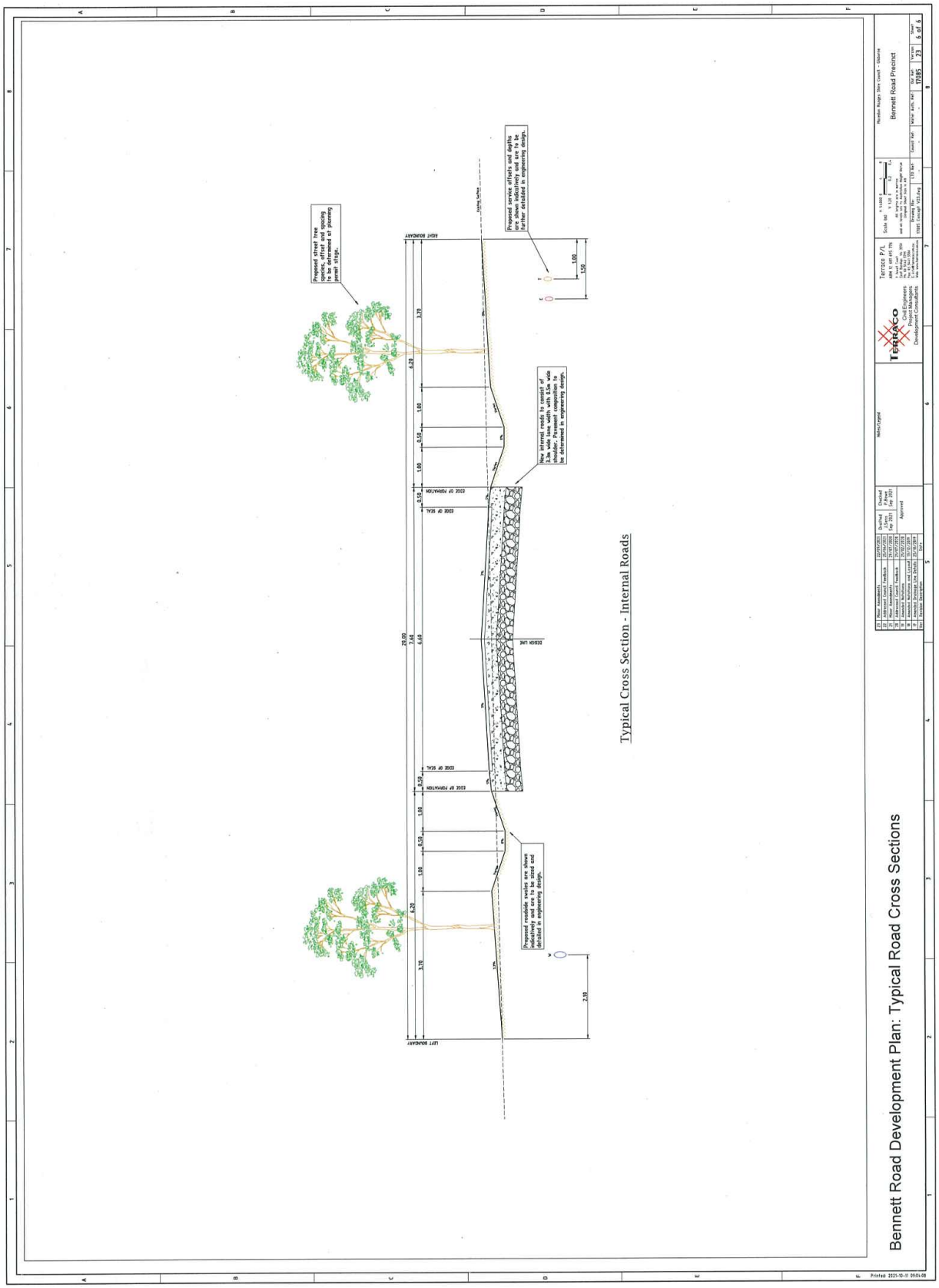

Bennett Road Development Plan: Subdivision Concept Plan with Aerial
SITE AREA AND YIELD
SUBDIVISION CONCEPT SITE AREA LOTS
88 Bennett Road 16.2ha 6
128 Bennett Road 25.8ha 12
168 Bennett Road 16.6ha 8
15 McGregor Road 11.1ha 5
94 McGregor Road 31.9ha 12
134 McGregor Road 27.7ha 10
TOTAL 129.3ha 53
Subdivision Concept Development Plan and Subdivision Concept commissioned by 128 & 168 Bennett Road, and 134 McGregor Road. A concept for the remaining area is provided as sought by DPO18 (as shown dashed).
BUILDING ENVELOPES
RECOMMENDED SETBACKS FOR LOTS
Front/road setback = 30m
Side/rear setback = 10m
Drainage line buffer setback = 20m
* Envelopes shown are for areas flatter than 1 in 6 grade to address the most sensitive land adjacent to the drainage line.
* Envelope areas are shown in brackets.
NOTES
* Contours shown represent approximate existing surface.
* Contour interval 1m.
* Road alignment to be clarified under permit application.
* Drainage line/creek only flows during periods of heavy rainfall.
* Drainage reserve to be vested in council is standard 60m wide and approx 30m from centreline and wider where shown.
* Dams in watercourse are to be decommissioned. All other dams are to be considered at subdivision stage for any decommissioning.
* Illustrative lots are shown as indicative only. Boundaries to be confirmed.
* Minimum 2ha lot sizes for entire precinct.
* Lots to be fully detailed under permit application.
* Pedestrian paths along watercourse - see landscape plan. To be determined under permit applications at time of subdivision.
* Staging of development proposed from the north-west.
* See Servicing and Utilities Infrastructure Report for details on servicing and infrastructure provision to development sites. It outlines that all infrastructure cost within and adjoining development parcels and any required extension of roads and other infrastructure is to be borne by each development parcel.
* Lot yield and lot configuration of 94 McGregor Road to be subject to detailed review.
* Original sheet size is A1.
LEGEND
-Trees within road reserve
-Indicative rock outcrops
-Dwelling
-Outbuilding
-Dam
-Drainage line
-Building envelope
(only illustrated adjacent to drainage line)
-Drainage line escarpment: low to moderate slope
-Drainage line escarpment: greater slope
-Drainage line buffer (30m as shown)
-CFA and maintenance track
-Rural pedestrian path/bike track
-Existing titles
-BAR (Basic Right-Turn) Treatment
-Indicative drainage outfall location
-Proposed street light at intersection
Reserve
Superlot
Government Road (Unmade)
Brooking Road (Unmade)
McGregor Road
Coney Court
Rockglen Way
Bennett Road
Calder Freeway
Terraco P/L
Civil Engineers
Project Managers
Development Consultants
Bennett Road Precinct
17085
23
2 of 6

Bennett Road Development Plan: Subdivision Concept Plan with Ecological Features
Bennett Road Precinct
Terraco P/L
Coney Court
Government Road (Unmade)
Rockglen Way
McGregor Road
Brooking Road (Unmade)
Bennett Road
Calder Freeway
Reserve
Superlot
Acacia
NOTES
LEGEND


Creek through 134 McGregor Road (Dam to be decommissioned)
Creek through 134 McGregor Road (North End)
Creek through 88 Bennett Road
Creek through 134 McGregor Road (South End)
Bennett Road Development Plan: Drainage Line Cross Sections
Bennett Road Precinct
TERRACO


Bennett Road Development Plan: Road Sections
Road Alignment in 94 McGregor Road
Cross Section
Culvert Crossing of Watercourse
Longitudinal Section
Existing Surface
Indicative only.
Bennett Road Precinct


Typical Cross Section - Internal Roads
Bennett Road Development Plan: Typical Road Cross Sections
Bennett Road Precinct
TERRACO

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Appendix 2.1 – Significant flora species

Table A2.2 Significant flora recorded within 10 kilometres of the study area

Key:

EPBC	*Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act)
FFG	*Flora and Fauna Guarantee Act 1988* (FFG Act)
DEPI	Advisory List of Threatened Flora in Victoria (DEPI 2014)

EX	Extinct	X	Extinct
CR	Critically endangered	e	Endangered
EN	Endangered	v	Vulnerable
VU	Vulnerable	r	Rare
K	Poorly Known (Briggs and Leigh 1996)	k	Poorly Known
#	Records identified from EPBC Act Protected Matters Search Tool.	L	Listed
*	Records identified from the FIS		

1	Known occurrence	Recorded within the study area recently (i.e. within ten years)
2	High Likelihood	Previous records of the species in the local vicinity; and/or, The study area contains areas of high quality habitat.
3	Moderate Likelihood	Limited previous records of the species in the local vicinity; and/or, The study area contains poor or limited habitat.
4	Low Likelihood	Poor or limited habitat for the species however other evidence (such as a lack of records or environmental factors) indicates there is a very low likelihood of presence.
5	Unlikely	No suitable habitat and/or outside the species range.

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Scientific name	Common name	Total # of documented records	Last documented record	EPBC	FFG	DEPI	Likely occurrence in study area
NATIONAL SIGNIFICANCE							
Amphibromus fluitans	River Swamp Wallaby-grass #	-	-	VU	-	-	4
Caladenia versicolor	Candy Spider-orchid #	-	-	VU	L	e	5
Dodonaea procumbens	Trailing Hop-bush #	-	-	VU	-	v	5
Eucalyptus aggregata	Black Gum #	-	-	VU	L	e	5
Glycine latrobeana	Clover Glycine #	-	-	VU	L	v	4
Pterostylis chlorogramma	Green-striped Greenhood	1	1990	VU	L	v	4
Senecio macrocarpus	Large-headed Fireweed	1	1984	VU	L	e	4
Senecio psilocarpus	Swamp Fireweed	3	2016	VU		v	2
Thelymitra matthewsii	Spiral Sun-orchid #	-	-	VU	L	v	5
Xerochrysum palustre	Swamp Everlasting	9	2016	VU	L	v	2
Caladenia tensa	Greencomb Spider-orchid #	-	-	EN	-	v	4
Dianella amoena	Matted Flax-lily	27	2016	EN	L	e	2
Lachnagrostis adamsonii	Adamson's Blown-grass #	-	-	EN	L	v	5
Lepidium hyssopifolium s.s.	Basalt Peppercress	1	1977	EN	L	e	4
Leucochrysum albicans var. tricolor	Hoary Sunray#	-	-	EN	-	e	5
Prasophyllum frenchii	Maroon Leek-orchid #	-	-	EN	L	e	5
Rutidosis leptorhynchoides	Button Wrinklewort #	-	-	EN	L	e	5
Pimelea spinescens subsp. *Pubiflora*	Wimmera Rice-flower #	-	-	CR	L	e	5
STATE SIGNIFICANCE							
Acacia rostriformis	Bacchus Marsh Wattle	8	2013		L	v	2
Diuris punctata	Purple Diuris	14	2001		L	v	3
Geranium sp. 1	Large-flower Crane's-bill	4	2010		L	e	3
Pterostylis truncata	Brittle Greenhood	35	2006		L	e	2

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Scientific name	Common name	Total # of documented records	Last documented record	EPBC	FFG	DEPI	Likely occurrence in study area
Stylidium armeria subsp. pilosifolium	Hairy-leaf Triggerplant	7	2014		L	e	2
REGIONAL SIGNIFICANCE							
Acacia howittii	Sticky Wattle	4	2017			r	2
Acacia leprosa s.s.	Cinnamon Wattle	1	2009			k	2
Acacia leprosa var. *uninervia*	Large-leaf Cinnamon-wattle	1	2009			r	2
Acacia nanodealbata	Dwarf Silver-wattle	10	2011			r	2
Austrostipa hemipogon	Half-bearded Spear-grass	1	1990			r	5
Bossiaea cordigera	Wiry Bossiaea	1	2011			r	2
Calochilus imberbis	Naked Beard-orchid	5	1953			r	4
Calochilus therophilus	Slender Beard-orchid	1	2014			k	3
Convolvulus angustissimus subsp. *omnigracilis*	Slender Bindweed	3	2017			k	2
Coronidium gunnianum	Pale Swamp Everlasting	5	2011			v	3
Corymbia maculata	Spotted Gum	3	2017			v	1
Desmodium varians	Slender Tick-trefoil	2	2006			k	3
Dianella callicarpa	Swamp Flax-lily	1	2005			r	3
Dianella sp. aff. *longifolia* (Benambra)	Arching Flax-lily	1	2017			v	2
Dipodium pardalinum	Spotted Hyacinth-orchid	11	2017			r	2
Diuris X palachila	Broad-lip Diuris	1	1900			r	5
Eucalyptus globulus subsp. *globulus*	Southern Blue-gum	3	2017			r	2
Eucalyptus leucoxylon subsp. *connata*	Melbourne Yellow-gum	18	2017			v	2
Eucalyptus sideroxylon subsp. *sideroxylon*	Mugga	2	2017			r	2
Eucalyptus yarraensis	Yarra Gum	3	2010			r	3
Geranium solanderi var. *solanderi* s.s.	Austral Crane's-bill	2	2017			v	2
Grevillea repens	Creeping Grevillea	1	1932			r	4
Grevillea rosmarinifolia	Rosemary Grevillea	4	2017			P	2

Scientific name	Common name	Total # of documented records	Last documented record	EPBC	FFG	DEPI	Likely occurrence in study area
Lepidium pseudohyssopifolium	Native Peppercress	1	1977			k	4
Leucopogon microphyllus var. *pilibundus*	Hairy Beard-heath	1	1980			r	4
Melaleuca armillaris subsp. *armillaris*	Giant Honey-myrtle	6	2016			r	2
Microseris scapigera s.s.	Plains Yam-daisy	2	1999			v	3
Nicotiana suaveolens	Austral Tobacco	1	1900			r	5
Nymphoides montana	Entire Marshwort	4	1985			r	4
Platylobium montanum subsp. *prostratum*	Mountain Flat-pea	4	2011			k	2
Pleurosorus subglandulosus	Glandular Blanket-fern	1	1895			k	5
Poranthera corymbosa	Clustered Poranthera	1	1982			r	4
Prostanthera saxicola var. *bracteolata*	Slender Mint-bush	3	1996			r	3
Pterostylis rubescens	Inland Red-tip Greenhood	1	2000			r	3
Pultenaea reflexifolia	Wombat Bush-pea	1	1932			r	4
Rhagodia parabolica	Fragrant Saltbush	10	2017			r	2
Sclerolaena muricata var. *muricata*	Black Roly-poly	2	1920			k	4
Senecio cunninghamii var. *cunninghamii*	Branching Groundsel	2	2010			r	3
Senecio microbasis	Slender Fireweed	1	2010			r	3
Tetratheca stenocarpa	Long Pink-bells	2	1996			r	3
Thelymitra exigua	Short Sun-orchid	1	1935			k	4

Data source: Victorian Biodiversity Atlas (DELWP 2015); Protected Matters Search Tool (DoE 2015).

Taxonomic order: Alphabetical.

Note: While the species listed in Table A3.2 . are based on VBA data from 2018, the list has been cross-referenced with the latest FFG Act Threatened species list in order to ensure it appropriately reflects significant species data for the study area and surrounds. There are no changes to the conclusions and recommendations provided in the report.

Appendix 3.1 – Significant fauna species

Table A3.2. Significant fauna within 10 kilometres of the study area.

Habitat characteristics of significant fauna species previously recorded within 10 kilometres of the study area, or that may potentially occur within the study area were assessed to determine their likelihood of occurrence. The likelihood of occurrence rankings for each of the threatened species are:

1	High Likelihood	• Known resident in the study area based on site observations, database records, or expert advice; and/or, • Recent records (i.e. within five years) of the species in the local area (VBA 2011); and/or, • The study area contains the species' preferred habitat.
2	Moderate Likelihood	• The species is likely to visit the study area regularly (i.e. at least seasonally); and/or, • Previous records of the species in the local area (DSE 2011b); and/or, • The study area contains some characteristics of the species' preferred habitat.
3	Low Likelihood	• The species is likely to visit the study area occasionally or opportunistically whilst en route to more suitable sites; and/or, • There are only limited or historical records of the species in the local area (i.e. more than 20 years old); and/or, • The study area contains few or no characteristics of the species' preferred habitat.
4	Unlikely	• No previous records of the species in the local area; and/or, • The species may fly over the study area when moving between areas of more suitable habitat; and/or, • Out of the species' range; and/or, • No suitable habitat present.

EPBC	*Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act)
FFG	*Flora and Fauna Guarantee Act 1988* (FFG Act)
DSE	Advisory List of Threatened Vertebrate Fauna in Victoria (DSE 2013); Advisory List of Threatened Invertebrate Fauna in Victoria (DSE 2009)
NAP	National Action Plan (Cogger et al 1993; Duncan et al. 1999; Garnet and Crowley 2000; Lee 1995; Maxwell et al. 1996; Sands and New 2002; Tyler 1997)

EX	Extinct
RX	Regionally extinct
CR	Critically endangered
EN	Endangered
VU	Vulnerable
RA	Rare
NT	Near threatened
CD	Conservation dependent
LC	least concern

DD	Data deficient (insufficiently or poorly known
L	Listed as threatened under FFG Act
I	Invalid or ineligible for listing under the FFG Act
#	Listed on the Protected Matters Search Tool
*	Additional information from the Victorian Fauna Database

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Common Name	Scientific Name	Last Documented Record (VBA)	# Records (VBA)	EPBC Act	FFG ACT	DSE (2013)	National Action Plan	Likelihood
NATIONAL SIGNIFICANCE								
Eastern Quoll	*Dasyurus viverrinus*	1900	1	EN	L	RX	NT	4
Greater Glider	*Petauroides volans*	1990	4	VU	-	VU	VU	4
Long-nosed Potoroo	*Potorous tridactylus tridactylus #*	-	-	VU	L	NT	EN	4
Grey-headed Flying-fox	*Pteropus poliocephalus #*	-	-	VU	L	VU	VU	4
Smoky Mouse	*Pseudomys fumeus #*	-	-	EN	L	EN	RA	4
Australasian Bittern	*Botaurus poiciloptilus*	2017	4	EN	L	EN	VU	3
Plains-wanderer	*Pedionomus torquatus #*	-	-	CR	L	CR	EN	4
Australian Painted Snipe	*Rostratula australis #*	-	-	VU	L	CR	VU	4
Eastern Curlew	*Numenius madagascariensis #*	-	-	CR	-	VU	-	4
Curlew Sandpiper	*Calidris ferruginea #*	-	-	CR	-	EN	-	4
Swift Parrot	*Lathamus discolor*	2001	4	CR	L	EN	EN	3
Regent Honeyeater	*Anthochaera phrygia*	1975	2	CR	L	CR	EN	3
Painted Honeyeater	*Grantiella picta #*	-	-	VU	L	VU	NT	4
Pink-tailed Worm-Lizard	*Aprasia parapulchella #*	-	-	VU	L	EN	-	4
Striped Legless Lizard	*Delma impar #*	-	-	VU	L	EN	VU	4
Grassland Earless Dragon	*Tympanocryptis pinguicolla#*	-	-	EN	L	CR	VU	4
Growling Grass Frog	*Litoria raniformis*	2000	8	VU	L	EN	VU	2
Dwarf Galaxias	*Galaxiella pusilla #*	-	-	VU	L	EN	VU	4
Australian Grayling	*Prototroctes maraena #*	-	-	VU	L	VU	VU	4
Murray Cod	*Maccullochella peelii*	1974	2	VU	L	VU	-	4
Macquarie Perch	*Macquaria australasica*	1970	1	EN	L	EN	DD	4
Golden Sun Moth	*Synemon plana*	2006	4	CR	L	CR	-	2
STATE SIGNIFICANCE								
Brush-tailed Phascogale	*Phascogale tapoatafa*	2016	14	-	L	VU	NT	3
Common Dunnart	*Sminthopsis murina murina*	1990	2	-	-	VU	-	4
Musk Duck	*Biziura lobata*	1977	5	-	-	VU	-	3
Australasian Shoveler	*Anas rhynchotis*	1975	2	-	-	VU	-	3

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Common Name	Scientific Name	Last Documented Record (VBA)	# Records (VBA)	EPBC Act	FFG ACT	DSE (2013)	**National Action Plan**	Likelihood
Hardhead	*Aythya australis*	1975	2	-	-	VU	-	3
White-throated Needletail	*Hirundapus caudacutus*	1990	6	-	-	VU	-	4
Eastern Great Egret	*Ardea modesta*	1977	7	-	L	VU	-	3
Intermediate Egret	*Ardea intermedia*	1975	2	-	L	EN	-	3
Black Falcon	*Falco subniger*	1975	2	-	-	VU	-	3
Lewin's Rail	*Lewinia pectoralis pectoralis*	2017	1	-	L	VU	NT	1
Baillon's Crake	*Porzana pusilla palustris*	1975	4	-	L	VU	-	3
Common Sandpiper	*Actitis hypoleucos*	1977	2	-	-	VU	-	3
Common Greenshank	*Tringa nebularia #*	-	-	-	-	VU	-	4
Caspian Tern	*Hydroprogne caspia*	1977	1	-	L	NT	-	3
Powerful Owl	*Ninox strenua*	2008	9	-	L	VU	-	3
Barking Owl	*Ninox connivens connivens*	1975	2	-	L	EN	NT	3
Masked Owl	*Tyto novaehollandiae novaehollandiae*	1975	2	-	L	EN	NT	3
Brown Treecreeper (south-eastern ssp.)	*Climacteris picumnus victoriae*	1977	3	-	-	NT	NT	3
Chestnut-rumped Heathwren	*Calamanthus pyrrhopygius*	1990	2	-	L	VU	-	4
Speckled Warbler	*Chthonicola sagittatus*	1990	8	-	L	VU	NT	4
Hooded Robin	*Melanodryas cucullata cucullata*	1990	3	-	L	NT	NT	4
Diamond Firetail	*Stagonopleura guttata*	2005	6	-	L	NT	NT	3
Tussock Skink	*Pseudemoia pagenstecheri*	2003	1	-	-	VU	-	2
Brown Toadlet	*Pseudophryne bibronii*	1989	3	-	L	EN	DD	3
REGIONAL SIGNIFICANCE								
Fat-tailed Dunnart	*Sminthopsis crassicaudata*	1967	3	-	-	NT	-	3
Pied Cormorant	*Phalacrocorax varius*	2017	3	-	-	NT	-	1
Nankeen Night Heron	*Nycticorax caledonicus hillii*	2011	5	-	-	NT	-	2
Royal Spoonbill	*Platalea regia*	1975	3	-	-	NT	-	3
Spotted Harrier	*Circus assimilis*	1977	1	-	-	NT	-	3
Latham's Snipe	*Gallinago hardwickii*	2016	7	-	-	NT	-	2
Pectoral Sandpiper	*Calidris melanotos #*	-	1	-	-	NT	-	4
Whiskered Tern	*Chlidonias hybridus javanicus*	1975	2	-	-	NT	-	3

Common Name	Scientific Name	Last Documented Record (VBA)	# Records (VBA)	EPBC Act	FFG ACT	DSE (2013)	**National Action Plan**	Likelihood
Azure Kingfisher	*Alcedo azurea*	1976	1	-	-	NT	-	3
Spotted Quail-thrush	*Cinclosoma punctatum*	1989	9	-	-	NT	-	3
Golden Perch	*Macquaria ambigua*	2012	3	-	-	NT	-	3

Data source: Victorian Biodiversity Atlas (DELWP 2015); Victorian Fauna Database (Viridans 2011b); Protected Matters Search Tool (DoE 2015).

Taxonomic order: Mammals (Strahan 1995 *in* Menkhorst & Knight 2004); Birds (Christidis & Boles, 2008); Reptiles and Amphibians (Cogger et al. 1983 *in* Cogger 1996); Fish (Nelson 1994).

Note: While the species listed in Table A3.2 . are based on VBA data from 2018, the list has been cross-referenced with the latest FFG Act Threatened species list in order to ensure it appropriately reflects significant species data for the study area and surrounds. There are no changes to the conclusions and recommendations provided in the report.

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Final Report

Targeted Significant Flora and Fauna Surveys, Bennett Road Development Plan, Victoria

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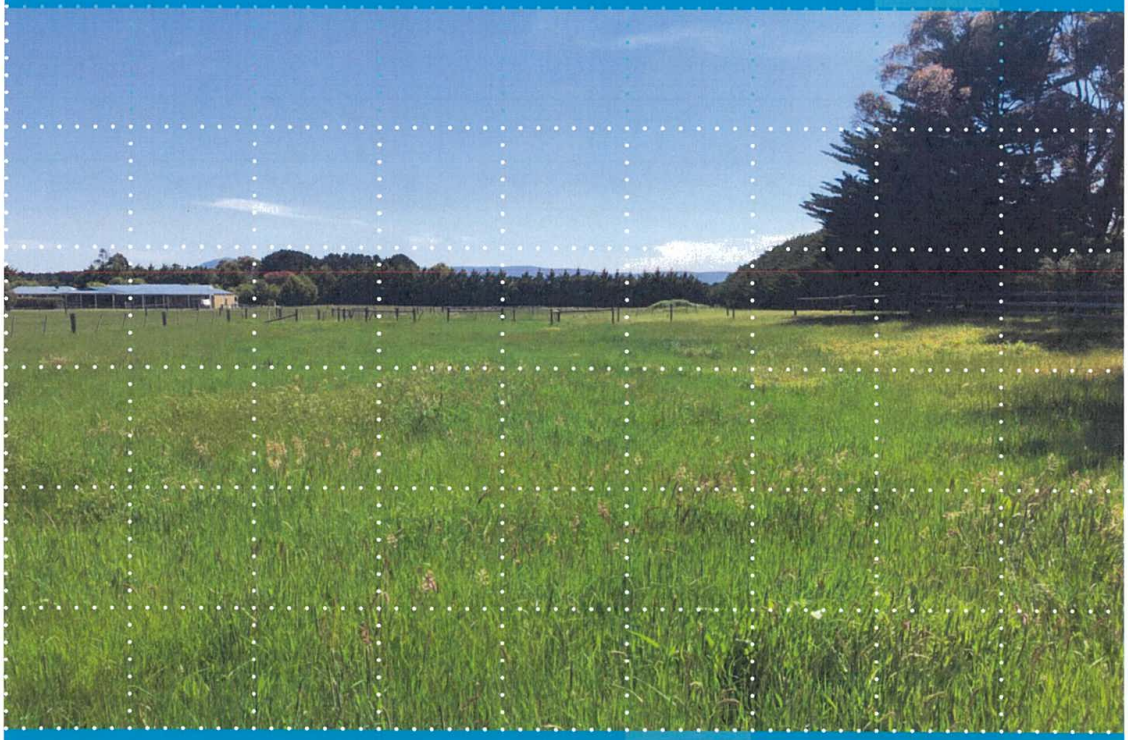
November 2021



Ecology and Heritage Partners Pty Ltd

MELBOURNE: 292 Mt Alexander Road, Ascot Vale VIC 3032 **GEELONG:** 230 Latrobe Terrace, Geelong West Vic 3218
BRISBANE: Level 22, 127 Creek Street, Brisbane QLD 4000 **ADELAIDE**: 22 Greenhill Road, Wayville SA 5034
CANBERRA: PO Box 6067, O'Connor ACT 2602 **SYDNEY:** Level 5, 616 Harris Street, Ultimo, NSW, 2007
www.ehpartners.com.au | (03) 9377 0100

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Project manager	Emma Keith (Botanist)
Report reviewer	Aaron Organ (Director / Principal Ecologist)
Other EHP staff	Jared McGuiness (Consultant Botanist), Gemma Tomkins (Botanist), Callum Luke (Consultant Zoologist); Sara Petrovic (Field Ecologist)
Mapping	Dr Monique Elsley (GIS Coordinator)
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SUMMARY

Introduction

Ecology and Heritage Partners Pty Ltd was engaged by G2 Urban Planning to undertake targeted surveys for significant flora and fauna species, including Matted Flax-lily, Swamp Everlasting, Swamp Fireweed, Growling Grass Frog and Golden Sun Moth as part of the Bennett Road Development Plan, Victoria. The targeted surveys were required to determine the presence or absence of nationally significant species to inform the preparation of the Bennett Road Development Plan and to outline any implications under Commonwealth and State environmental legislation.

Methods

Flora

Targeted surveys for nationally significant Matted Flax-lily, Swamp Everlasting and Swamp Fireweed were conducted by qualified ecologists across multiple days between 2 November 2020 and 9 December 2020. Targeted surveys focused on suitable habitat identified within the study area during the preliminary flora and fauna assessment.

Terrestrial Fauna

Targeted surveys for nationally significant Growling Grass Frog and Golden Sun Moth were conducted by qualified zoologists in November and December 2020. Surveys were conducted in accordance with approved methods identified within the Biodiversity Precinct Planning Kit, and the Commonwealth's Significant Impact Guidelines for the species, with surveys focusing on potentially suitable habitat identified within the study area during the preliminary flora and fauna assessment.

Results

Flora

Despite targeted surveys undertaken at an appropriate time of year, Matted Flax-lily, Swamp Everlasting and Swamp Fireweed were not identified within the study area. Based on targeted survey results, landscape context and the proximity of previous records, significant flora species are considered unlikely to occur within the study area.

Fauna

Golden Sun Moth

Despite targeted surveys on four separate occasions, Golden Sun Moth was not detected within the study area. The species was detected at several known sites within Greater Melbourne on the same day as the surveys were conducted, providing evidence that conditions were suitable to detect the species within the study area if an extant population was present. Based on the survey results an existing population of Golden Sun Moth is not present within the study area.

Growling Grass Frog

No Growling Grass Frogs were detected during the targeted surveys despite weather conditions being suitable to detect the species if a population was present. Based on targeted survey results, habitat conditions, and

landscape context, there is a low likelihood that the wetlands within the study area currently support a breeding population of Growling Grass Frogs or forms part of a dispersal corridor for the species.

Legislative and Policy Implications

Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act - Federal)

Based on the survey results (empirical data) the proposed future development of the area is unlikely to impact any matter of NES, and therefore a referral to the Commonwealth Environment Minister is not required for matters listed under the EPBC Act (e.g. listed species and ecological communities).

Flora and Fauna Guarantee Act 1988 (FFG Act - Victoria)

Based on the results of the targeted surveys and ecological assessment, it is unlikely that the study area supports habitat for any species listed under the FFG Act. The study area is also privately owned, therefore a permit under the FFG Act is not required.

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1 INTRODUCTION

1.1 Background

Ecology and Heritage Partners Pty Ltd was engaged by G2 Urban Planning to undertake a Spring flora survey to confirm and map patches of native vegetation within the study area and to undertake targeted significant flora and fauna surveys as part of the proposed Bennett Road Development Plan. A preliminary flora and fauna assessment has been completed within the study area (Ecology and Heritage Partners 2019) and identified suitable habitat for the following nationally significant species:

- Matted Flax Lily *Dianella amoena*
- Swamp Everlasting *Xerochrysum palustre*
- Swamp Fireweed *Senecio psilocarpus*
- Growling Grass Frog *Litoria raniformis*
- Golden Sun Moth *Synemon plana*.

As the field assessments were undertaken during a suboptimal time for flora identification (winter), confirmation of native vegetation patches within the study area was undertaken during an optimal surveying period (spring). Targeted surveys were recommended to determine the presence or absence of these species, and where possible, to ascertain their distribution and abundance within the study area. This additional information addresses Point 4 of the Request for Further Information (RFI) from Melbourne Water, dated 18 November 2019. Point 4 states:

"A Flora and fauna investigation of the waterway corridor and surrounding areas must be undertaken by an appropriated qualified consults on behalf of the proponent and submitted to Melbourne Water for approval".

The following addresses any implications under Commonwealth and State environmental legislation, and provides information on mitigation measures associated with the proposed development.

1.2 Objectives

The objectives of the targeted surveys were to:

- Confirm patches of native vegetation previously recorded by Ecology and Heritage Partners within the study area during an optimal surveying period (spring);
- Determine the presence/absence of Matted Flax Lily, Swamp Everlasting, Swamp Fireweed, Growling Grass Frog and Golden Sun Moth within the study area;
- Provide information in relation to any implications of Commonwealth and State environmental legislation and government policy associated with the proposed development;
- Determine any potential impacts on Matted Flax Lily, Swamp Everlasting, Swamp Fireweed, Growling Grass Frog and/or Golden Sun Moth and their habitats at a National and State level associated with the proposed development; and,

- Provide advice on mitigation measures that may be undertaken to avoid and/or mitigate potential adverse impacts on significant ecological values.

1.3 Study Area

The study area is located at 128-168 Bennett Road, Gisborne, approximately 53 kilometres north-west of Melbourne's CBD (Figure 1). The site covers approximately 130 hectares and is bound by McGregor Road to the north, private property to the south, Coney Court to the east and the Calder Freeway to the west.

The study area consists of six properties and contains areas of undulating topography, mostly cleared for agricultural purposes. Pasture grasses and planted windrows are most common throughout the study area with some small patches of native vegetation present. A creekline traverses the study area from the south to the north-east. The creekline was mostly dry at time of the survey, however, several farm dams are present across the study area, all of which contained water at time of the assessment. The study area has historically been used for agricultural purposes and grazing cattle, sheep and horses. Several dwellings and associated farming infrastructure are present within the properties.

According to the Department of Environment, Land, Water and Planning (DELWP) Native Vegetation Information Management (NVIM) Tool (DELWP 2021a), the study area occurs within the Victorian Volcanic Plain Bioregion. It is located within the jurisdiction of the Port Phillip and Westernport Catchment Management Authority (CMA) and the Macedon Ranges Shire Council municipality.

1.4 Targeted Flora Species

1.4.1 Matted Flax-lily *Dianella amoena*

EPBC Act Conservation Status: Critically Endangered

FFG Act Conservation Status: Threatened

Victorian Advisory List: Endangered

Matted Flax-lily is a perennial, tufted, mat-forming lily which can form patches of up to five metres wide. The plant can grow vegetatively, through sending underground rhizomatous roots, which rise above the ground with a tiller of several leaves, spread over a distance from the parent plant.

Plate 1. Matted Flax-lily *Dianella amoena*. Ecology and Heritage Partners Pty Ltd.

The leaves of the Matted Flax-lily are generally glaucous, blue in colour but may be red at the base and usually but not always having small hooks (teeth) along the margins and midrib. The leaves taper to approximately 45 centimetres long depending on site and climatic conditions and are born on tillers with the leaves arranged alternatively, with several leaves per tiller. Matted Flax-lily generally flowers between November and February but may continue flowering with summer and autumn rains. It has pale blue to violet flowers with bright yellow stamens and berries, which are generally purple in colour. The flowers and berries are born on culms extending to typically 30 cm in height but this may alter depending on location and season (Carter 2010).

Matted Flax-lily generally occurs in grassland and grassy woodland habitats, on well drained to seasonally wet fertile sandy loams to heavy cracking clay soils derived from Silurian or Tertiary sediments, or from volcanic geology (Carter 2010).

1.4.2 Swamp Everlasting *Xerochrysum palustre*

Swamp Ever-lasting is a perennial rhizomatous herb, listed as Vulnerable under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), as vulnerable under the Victorian *Flora and Fauna Guarantee Act 1988* (FFG Act) and as vulnerable under the *Advisory List of Rare and Threatened Plants in Victoria* (DEPI 2014). The species is indigenous to New South Wales, Victoria and Tasmania, and is widely distributed across the south eastern corner of Australia. The species typically occurs in wetlands including sedge-swamps and shallow freshwater marshes, as well as marginal wetland habitats such as seasonally wet areas of native grassland and heath communities (Carter and Walsh 2011).

The species grows between 30 and 100cm tall, with narrow leaves and large yellow daisy-like flowers, up to 50mm across. Flowering occurs between November and March.

1.4.3 Swamp Fireweed *Senecio psilocarpus*

Swamp Fireweed is listed as vulnerable under the EPBC act and is considered vulnerable on the DELWP Advisory List (DEPI 2014). The species is indigenous to south-eastern Australia, found within South Australia, Victoria and Tasmania. In Victoria, the species is typically distributed from the South-western corner, along the coast, within the eastern and central areas of the State. The species typically occurs in wetlands, within

the Plains Grassy Wetland Ecological Vegetation Class (EVC 125). The species is a medium-sized herb, growing to approximately 80cm tall, with yellow daisy-like flowers. Flowering occurs between November and March (Walsh and Entwisle 1999).

1.5 Targeted Fauna Species

1.5.1 Growling Grass Frog *Litoria raniformis*

EPBC Act Conservation Status: Vulnerable

FFG Act Conservation Status: Listed

Victorian Advisory List: Endangered

Although formerly widely distributed across southern eastern Australia, including Tasmania (Littlejohn 1963, 1982; Hero et al. 1991), the Growling Grass Frog has declined markedly over the past two decades and in many areas, particularly in south and central Victoria where some populations have experienced local extinction.

Plate 2. Growling Grass Frog *Litoria raniformis*. Ecology and Heritage Partners Pty Ltd.

Growling Grass Frog are largely associated with permanent or semi-permanent still or slow flowing waterbodies (i.e. streams, lagoons, farm dams and old quarry sites) (Hero et al. 1991; Barker et al. 1995; Cogger 1996; Ashworth 1998). The species can also utilise temporarily inundated waterbodies during breeding season, to facilitate reproduction (Organ 2003). The presence of key habitat attributes, primarily an extensive cover of emergent, submerged and floating vegetation (Robertson *et al.* 2002, Organ 2004, 2005), and the spatial orientation of waterbodies (Robertson et al. 2002; Heard et al. 2004; Hamer and Organ 2008) are strong determinants of the species' presence. Terrestrial vegetation (grasses, sedges), rocks and other ground debris around wetland perimeters also provide important foraging, dispersal and over-wintering sites. Dispersal is thought to occur primarily along drainage lines or other low-lying areas between waterbodies, and unhindered movement between and within waterbodies is considered important for population viability.

1.5.2 Golden Sun Moth *Synemon plana*

EPBC Act Conservation Status: Critically Endangered

FFG Act Conservation Status: Listed

Victorian Advisory List: Endangered

Plate 3. Golden Sun Moth *Synemon plana*. Ecology and Heritage Partners Pty Ltd.

Golden Sun Moth typically occur in native grassland, grassy woodland, dominated by greater than 40% cover of wallaby-grass, in particular *Rytidosperma* spp. (DSE 2004), but may also inhabit areas dominated by Kangaroo Grass *Themeda triandra* (Endersby and Koehler 2006) and introduced grassland dominated by Chilean Needle-grass Nassella neesiana and other introduced species (A. Organ pers. obs.). Male flight is typically low, to about a metre above the ground, fast and can be prolonged, but they are generally not recorded flying more than 100 metres from suitable habitat (Clarke and O'Dwyer 1999). The male of this species generally flies between 11am and 3pm on calm, warm (over 20°C), sunny days.

Prior to European settlement, the Golden Sun Moth was widespread and relatively continuous throughout its range, inhabiting grassy open woodlands and grassland, although it now mainly inhabits small isolated sites (DSE 2004a). The species is threatened by habitat loss, disturbance and fragmentation due to agricultural expansion and urbanisation. Many populations are isolated and fragmented, impeding the ability of the relatively immobile females to recolonise areas, thereby reducing the likelihood of genetic exchange (DSE 2004a). Such populations are therefore vulnerable as there is little likelihood of recolonisation in the event of a local extinction.

2 METHODS

2.1 Nomenclature

Common and scientific names of vascular plants follow the Victorian Biodiversity Atlas (VBA) (DELWP 2018) and the Census of Vascular Plants of Victoria (Walsh and Stajsic 2007). Vegetation community names follow DELWP's Ecological Vegetation Classes (EVC) benchmarks (DELWP 20201b). The names of aquatic and terrestrial vertebrate and invertebrate fauna follow the VBA (DELWP 2018).

2.2 Desktop Assessment

Relevant literature, online-resources and numerous databases were reviewed to provide an assessment of flora and fauna values associated with the study area. The following information sources were reviewed:

- The VBA (DELWP 2018), Flora Information System (FIS) (Viridans 2013a) and Atlas of Victorian Wildlife (AVW) (Viridans 2013b) for previously documented flora and fauna records within the project locality;
- The Commonwealth Department of Agriculture, Water and Environment (DAWE) (formerly Department of Environment and Energy DoEE) Protected Matters Search Tool (PMST) for matters of National Environmental Significance (NES) protected under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) (DAWE 2021);
- Relevant environmental legislation and policies pertaining to target species including: EPBC Act Policy Statements; FFG Act Action Statements, National Recovery Plans, Advisory Lists;
- Relevant biological and ecological literature pertaining to the target species.
- Previous ecological assessments within the study area;
- Aerial photography of the study area; and,
- Previous ecological reports, including:
    - Existing Conditions Report: 128-168 Bennett Road, Gisborne (Ecology and Heritage Partners 2019).

2.3 Native Vegetation Assessment

An assessment of the native vegetation recorded during the previous surveys (Ecology and Heritage Partners 2019) was conducted due to the sub-optimal conditions of the first survey (winter) for identifying cryptic flora species. Where native vegetation was identified, a habitat hectare assessment was undertaken following methodology described in the Vegetation Quality Assessment Manual (Department of Sustainability and Environment (DSE) 2004b).

Four EVCs were recorded during the assessment, in line with the previous assessment. These were Plains Sedgy Wetland (EVC 647), Tall Marsh (EVC 821), Plains Grassland Heavier-soils (EVC 132_61) and Stony Knoll Shrubland (EVC 649). Habitat hectare condition scores are given in Appendix 1.

2.4 Targeted Flora Surveys

Targeted flora surveys for three nationally significant species were undertaken within areas of potential habitat, including along the creekline and around the farm dams. Targeted flora species focussed on Matted Flax-lily, Swamp Fireweed and Swamp Everlasting.

Targeted flora surveys were undertaken on 2 and 5 November 2020 for Matted Flax-lily, Swamp Everlasting and Swamp Fireweed, by qualified botanists, to coincide with the known flowering period of the species (November to February). Areas of potential habitat, including along the creekline and around farm dams, were surveyed for the species using the following standards as outlined in the *Biodiversity Precinct Structure Planning Kit* (DSE 2010):

- Targeted surveys were conducted by people familiar with recognising the species;
- The survey effort was directed to all potential habitat areas (i.e. remnant grassland and the degraded grassy areas surrounding the remnant grassland);
- Transects were walked at five-metre grid intervals through all potential habitat; and
- Where found, locations of Matted Flax-lily were recorded by GPS (accuracy of +/- 3 metres) and the number of plants per land parcel was totalled.

2.5 Targeted Fauna Surveys

Targeted surveys for nationally significant fauna species were undertaken within areas of potential habitat during optimal surveying conditions. Surveys focussed on Growling Grass Frog and Golden Sun Moth.

2.5.1 Growling Grass Frog

Nocturnal Growling Grass Frog surveys were undertaken at eight (8) sites within the study area. Growling Grass Frog Surveys were undertaken in accordance with the methods outlined in the *Significant Impact Guidelines for the Vulnerable Growling Grass Frog* (SEWPaC 2009). The targeted surveys were completed on 18 and 19 November 2020 and were completed as follows:

- Survey sites within 30 meters of the primary water body were chosen based on the presence of supporting suitable habitat for Growling Grass Frog (i.e. moderate to good water quality, moderate to good percentage cover of fringing, emergent and floating vegetation, presence of other refuge).
- Each survey site was visited on two occasions during weather conditions considered suitable for Growling Grass Frog activity (warm, over 20 degrees, relatively still and clear).
- Two qualified zoologists, experienced in Growling Grass Frog detection, systematically walked along (or around) each watercourse (or waterbody).
- Zoologists searched fringing, emergent and floating vegetation within and adjacent to the watercourse/waterbody with 50W 12V hand-held spotlights and used call-playback to initiate a response from any males that may have been present.
- All frog species heard or seen were recorded and several site-specific habitat variables were documented including a visual assessment of water quality, flow and depth, and records of fringing, emergent, floating and submerged vegetation cover.

2.5.2 Golden Sun Moth

Targeted surveys for Golden Sun Moth were undertaken at the study area on four separate occasions on 10 and 25 November, and 4 and 10 December 2020. Areas of suitable habitat were traversed by qualified zoologists during the known flight season (i.e. November to early January). Surveys concentrated in areas identified as supporting indigenous grassland, particularly those supporting wallaby-grass *Rytidosperma* spp. and Chilean Needle-grass *Nassella Neesiana*, which are known food sources for Golden Sun Moth. Surveys were undertaken at a time which is considered suitable for detecting the Golden Sun Moth (i.e. when adult males are flying), and when the species was observed flying at nearby locations.

Survey procedures were in accordance with the *Significant Impact Guidelines for the Critically Endangered Golden Sun Moth* (DEWHA 2009), with the following tasks undertaken:

- A habitat assessment was completed detailing information on habitat quality, presence of weeds and floristic diversity;
- Surveys were conducted by ecologists experienced in the detection and identification of Golden Sun Moth;
- The study area was surveyed on four separate occasions, with at least one week between surveys where possible;
- Surveys took place during the species' flight season (generally described as late October to early January). Moths were confirmed flying at known, nearby reference sites (Broadmeadows) prior to undertaking each survey;
- Surveys were undertaken during weather conditions suitable for detecting the species (i.e. between 10am and 3pm on warm (over 20°C by 10am) days with minimal cloud cover and still conditions); and
- Surveys were conducted by qualified zoologists walking or driving (where access was permitted) 10 to 50-metre-wide parallel transects across all areas of suitable habitat.

2.6 Assessment Qualifications and Limitations

Flora and fauna data collected during the field assessment, and information obtained from relevant sources (e.g. biological databases and relevant literature) are considered adequate to provide an accurate assessment of the ecological values within the study area. Fauna surveys were conducted under the Ecology and Heritage Partners Pty Ltd research permit (#10005952) issued by DELWP under the *Wildlife Act 1975*.

3 RESULTS

3.1 Flora

3.1.1 Native Vegetation

The majority of the study area comprised introduced and planted vegetation in the form of crops, pasture, windrows and ornamental plantings. The small patches of native vegetation within the study area identified during the previous assessment are still present.

Plains Sedgy Wetland

The creek that runs through the southern and eastern extent of the study area contains native vegetation with the highest diversity and condition. Patches of Plains Sedgy Wetland are present along the creek alignment and ranges from moderate to low condition (Plate 4). Species such as Common Tussock-grass *Poa labillardierei*, Tall Rush *Juncus procerus,* Tall Sedge *Carex appressa* and Common Spike-sedge *Eleocharis acuta* were common throughout the patches of Plains Sedgy Wetland. The patches of Plains Sedgy Wetland along the creekline have reduced slightly in area since the previous assessment due to encroachment of weedy species. A small patch of Plains Sedgy Wetland was also present around the edge of a farm dam in the centre of the study area (Figure 2). This patch was not present during the previous survey.

Grassy, herbaceous and woody weeds species were common throughout the creekline and within the patches of Plains Sedgy Wetland (Plate 5). Species such as Spiny Rush *Juncus acutus,* Toowoomba Canary-grass *Phalaris aquatica,* Cape Weed *Arctotheca calendula,* Ribwort *Plantago lanceolata,* Blackberry *Rubus fruticosus* spp. agg. and Gorse *Ulex europaeus* were common throughout the creekline (Plate 5).

Plate 4. Small patch of poor-quality Plains Sedgy Wetland along the creekline (Ecology and Heritage Partners Pty Ltd 02/11/2020).

Plate 5. Woody weeds, including Blackberry, are common along the creekline (Ecology and Heritage Partners Pty Ltd 02/11/2020).

Tall Marsh

One patch of Tall Marsh was present along the edges of a dam within the southern extent of the study area. Sedges densely populated the inflow drain to the dam, and emergent vegetation was present in the centre

and around the edges (Plate 6, Plate 7). Species present included Common Reed *Phragmites Australia,* Common Spike-sedge and Narrow-leaf Cumbungi *Typha domingensis.*

Plate 6. Patch of Tall Marsh around the dam in the southern extent of the study area (Ecology and Heritage Partners Pty Ltd 05/11/2020).

Plate 7. Patch of Tall Marsh around the dam in the southern extent of the study area (Ecology and Heritage Partners Pty Ltd 05/11/2020).

Plains Grassland

One continuous long patch of *Heavier-soils* Plains Grassland was present beneath the row of planted windrows and ornamental plantings in the north of the study area (Figure 2). This EVC has a bioregional conservation status of Endangered and consists of native grasses such as Spear Grass *Austrostipa* spp. and Common Wallaby-grass *Rytidosperma caespitosum* (Plate 8 and 9). Common weeds within this patch included listed noxious weed and Weed of National Significance (WoNS) Chilean Needle Grass *Nassella neesiana*, as well as other common exotic grasses such as Perennial Rye-grass *Lolium perenne* and Yorkshire Fog *Holcus lanatus*.

Plate 8. Plains Grassland within the study area (Ecology and Heritage Partners Pty Ltd 25/11/2020).

Plate 9. Chilean Needle Grass was present within and around the patch of Plains Grassland (Ecology and Heritage Partners Pty Ltd 25/11/2020).

Stony Knoll Shrubland

Two small patches of Stony Knoll Shrubland were present within the north eastern extent of the study area. These patches were still in a poor condition, with a low diversity of herb species, likely caused by continuous grazing by cattle. However, the bryophyte and lichen life form component cover was high.

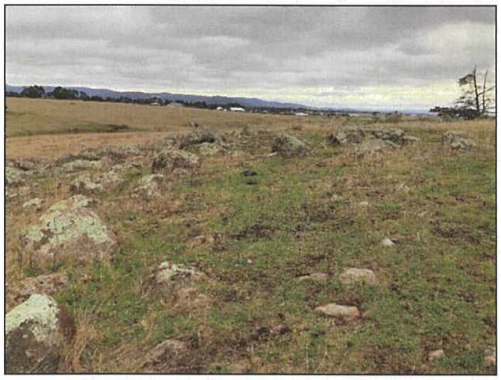

Plate 10. Stony Knoll Shrubland within the study area (Ecology and Heritage Partners Pty Ltd 25/05/2018).

Plate 11. Stony Knoll Shrubland within the study area (Ecology and Heritage Partners Pty Ltd 25/05/2018).

Introduced and Planted Vegetation

Areas not supporting native vegetation had a high coverage (>95%) of exotic species, the majority being pasture grasses such as Perennial Rye-grass and Oat *Avena* spp (Plate 12). Areas of non-native vegetation within the creekline had a high coverage (>90%) of exotic and invasive species, including 12 species listed as noxious under the *Catchment and Land Protection Act 1994* (CaLP Act), four of which are also listed as Weeds of National Significance (WoNS); Blackberry *Rubus fruticosus* spp. agg., Gorse *Ulex europaeus,* Serrated Tussock *Nassella trichotoma* and Broom *Genista* spp (Plate 13). Many exotic grass species present have been direct-seeded for use as pasture. Disturbed areas along the creekline also had a high coverage of

environmental weeds such as Toowoomba Canary-grass, Perennial Rye-grass *Lolium perenne* and Yorkshire Fog *Holcus lanatus*.

Plate 12. The majority of the study area contains pasture grasses (Ecology and Heritage Partners Pty Ltd 25/11/2020).

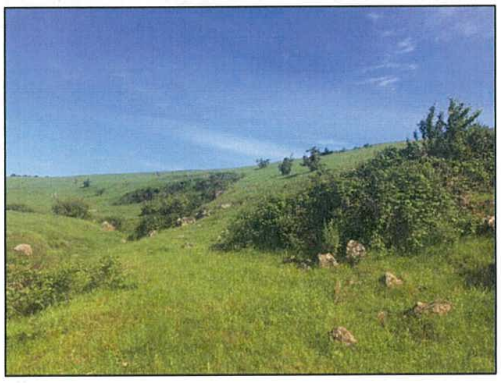

Plate 13. Weeds such as Blackberry were common along the creekline (Ecology and Heritage Partners Pty Ltd 02/11/2020).

3.1.2 Targeted Flora Surveys

Targeted surveys for significant flora species were undertaken by two qualified Botanists, experienced in searching for the target species. Surveys were undertaken across two days, 2 and 5 November 2020, during an optimal period for identification. Surveys focussed on areas of potential habitat, including the creekline and around farm dams (Figure 4).

Potential habitat for the EPBC Act-listed Matted Flax-lily, Swamp Everlasting and Swamp Fireweed was identified during previous ecological assessments (Ecology and Heritage Partners 2019). Despite the availability of potential habitat (albeit highly modified) no specimens of any of these species were detected within the study area.

3.2 Fauna

Targeted surveys for significant fauna species were undertaken by two qualified ecologists experienced in searching for the target species. Surveys were undertaken during a period optimal for identification of the species and in line with the survey guidelines. Survey effort is outlined below (Table 1 and 2).

Although the weather conditions during the site surveys were conducive for frogs to be active, no Growling Grass Frogs were detected during the targeted surveys (Table 1). During the surveys, three other species (Whistling Tree Frog *Litora verreauxii verreauxii*, Eastern Common Froglet *Crinia signifera* and Spotted Marsh Frog *Limnodynastes tasmaniensis*) were recorded throughout the study area. Based on targeted survey results and landscape context there is a low likelihood that the wetlands within the study area currently support a breeding population of Growling Grass Frogs or forms part of a dispersal corridor for the species.

Despite targeted surveys on four separate occasions, Golden Sun Moth was not detected within the study area (Table 2). The species was detected at several known sites within Greater Melbourne on the same day as the surveys were conducted, indicating that conditions were suitable for surveying and identifying the species. As such, a Golden Sun Moth population does not occur within the study area.

Table 1. Summary of Growling Grass Frog survey results

Date	Time	Survey Number	Temperature (°C)	Rain (mm)	Wind (Km/h)	Relative humidity (%)	Cloud Cover (%)	GGF Observed	Juveniles Observed	Tadpoles Observed
18/11/2020	22:00	1	23.0	0.0	20.4	25	50	0	0	0
19/11/2020	21:45	2	25.9	0.0	24.1	21	30	0	0	0

Table 2. Summary of Golden Sun Moth survey results

Date	Survey times	Reference Site	Temperature (°C)	Wind (km/hr)	Cloud cover (%)	No. of days since rain	No. GSM
10/11/2020	13:00-14:00	Confirmed flying at Broadmeadows	26.2	20.1	5	>2	0
25/11/2020	12:00-13:00	Confirmed flying at Broadmeadows	24.8	18.5	0	>2	0
04/12/2020	12:30-13:30	Confirmed flying at Broadmeadows	20.1	20.4	0	2	0
09/11/2020	12:00-13:00	Confirmed flying at Broadmeadows	20.7	5.5	10	>2	0

3.3 Habitat Assessment

The majority of the study area is highly modified as a result of current land use, being dominated by exotic grassland and cultivated land (i.e. crop) and stock. The areas of exotic grassland comprised improved pasture species, predominantly Perennial Ryegrass *Lolium perenne* and Toowoomba Canary-grass *Phalaris aquatica*. The surrounding area is also highly fragmented and predominantly consists of introduced vegetation, which lacks suitable habitat for Growling Grass Frog and Golden Sun Moth.

The linear strip of Plains Grassland was the primary focus of the targeted surveys for Golden Sun Moth as this presented the highest likelihood of supporting the species. The creekline and surrounds of farm dams were the focus areas for Growling Grass Frog and the significant flora species, as these present the highest likelihood of supporting these species. The remainder of the study area comprised introduced exotic grasses used for pasture and grazing stock, and planted windrows an ornamental species, all of which do not provide suitable habitat for significant species.

4 IMPACTS AND MITIGATION MEASURES

4.1 Known Impacts

Based on the results of the targeted surveys, the development is highly unlikely to impact on any matters of NES, including Matted Flax-lily, Swamp Everlasting, Swamp Fireweed, Growling Grass Frog and Golden Sun Moth.

It is highly unlikely that any other matters of NES [including Natural Temperate Grassland of the Victorian Volcanic Plains (NTGVVP) and Striped Legless Lizard] are present within the study area based on the current conditions and therefore will not be impacted by the proposed development.

4.2 Potential Impacts

A final Development Plan across the study area has not yet been prepared, and therefore potential impacts on native vegetation within the study area are currently unknown. However, impacts may include:

- Potential for further habitat fragmentation in a fragmented landscape and the associated creation of barriers to the movement and migration of indigenous species;
- Potential disturbance associated with increased human activity and noise during construction.
- Potential indirect impacts on adjacent areas outside of the limit of construction if activities and drainage are not appropriately managed;
- The potential for injury and/or mortality from construction activities;
- Potential for the spread of weeds and soil pathogens due to on-site activities;
- Decreased habitat quality downstream of the study area due to improper sedimentation controls and subsequent deterioration of water quality; and,
- Permanent alteration of environmental flows to aquatic habitat.

4.3 Mitigation Measures

General recommended measures to minimise impacts to ecological values present within the study area were identified and are outlined in the Existing Conditions report (Ecology and Heritage Partners 2019). A 30-metre buffer along the creekline will be implemented, with all native vegetation inside the buffer protected, and noxious weed species controlled in accordance with the Native Vegetation Management Plan which has been prepared (Ecology and Heritage Partners in 2021). Additional measures recommended to minimise potential impacts may include:

- Removal of any habitat trees or shrubs (particularly hollow-bearing trees) should be undertaken between February and September to avoid the breeding season for the majority of fauna species. If any habitat trees or shrubs are proposed to be removed, this should be undertaken under the

supervision of an appropriately qualified zoologist to salvage and translocate any displaced fauna. A Fauna Management Plan may be required to guide the salvage and relocation process;

- Infrastructure removed in accordance with agreed end land use in consultation with relevant stakeholders;
- Contaminated waste dumps remediated or removed; no contaminated seepage discharges to the surrounding environment;
- A Construction Environmental Management Plan to be prepared prior to the commencement of any construction to ensure there are no adverse impacts on ecological values within the study area, particularly the creekline;
- Vegetation in rehabilitated areas demonstrate values that trend towards relevant target ecosystem sites;
- Ecosystem function in rehabilitated areas demonstrate values that trend towards relevant target ecosystem sites; and,
- Adherence to the recommendations within the Native Vegetation Management Plan (Ecology and Heritage Partners 2021) for the creekline.

Given that subdivision plans are yet to be prepared, there is potential for the native vegetation recorded within the study area, outside of the creekline buffer to be protected, thereby ensuring that proposed vegetation removal is kept to a minimum. Any impacts to native vegetation that cannot be avoided or minimised by the development must be offset accordingly prior to its removal.

5 LEGISLATIVE AND POLICY IMPLICATIONS

This section identifies biodiversity policy and legislation relevant to the proposed development.

5.1 Environment Protection and Biodiversity Conservation Act 1999 (Commonwealth)

The EPBC Act establishes a Commonwealth process for the assessment of proposed actions (i.e. project, development, undertaking, activity, or series of activities) that are likely to have a significant impact on matters of national environmental significance (NES), or on Commonwealth land.

For species listed under the EPBC Act, a 'significant impact' is defined as an impact which is important, notable, or of consequence, having regard to its context or intensity (DoE 2013). Whether an action is likely to have a significant impact depends upon the sensitivity, value, and quality of the environment, which is affected, and upon the intensity, duration, magnitude and geographic extent of the impacts. Importantly, for a 'significant impact' to be 'likely', it is not necessary for a significant impact to have a greater than 50% chance of happening; it is sufficient if a significant impact on the environment is a real or not remote chance or possibility (DoE 2013).

Given that no significant flora and fauna species were detected during the targeted surveys and no other matters of NES (e.g. NTGVVP) occur within the study area, an EPBC Act referral is not required.

5.2 Flora and Fauna Guarantee Act 1988 (Victoria)

The FFG Act is the primary legislation dealing with biodiversity conservation and sustainable use of native flora and fauna in Victoria. Proponents are required to apply for an FFG Act Permit to 'take' listed and/or protected[1] flora species, listed vegetation communities and listed fish species in areas of public land (i.e. within road reserves, drainage lines and public reserves). An FFG Act permit is generally not required for removal of species or communities on private land, or for the removal of habitat for a listed terrestrial fauna species.

Based on the results of the targeted surveys and ecological assessment, it is unlikely that the study area supports habitat for any species listed under the FFG Act. The study area is also privately owned, therefore a permit under the FFG Act is not required

5.3 Wildlife Act 1975 and Wildlife Regulations 2002 (Victoria)

The *Wildlife Act 1975* (and associated Wildlife Regulations 2002) is the primary legislation in Victoria providing for protection and management of wildlife. Authorisation for habitat removal may be obtained under the *Wildlife Act 1975* through a licence granted under the *Forests Act 1958*, or under any other Act such as the

[1] In addition to 'listed' flora species, the FFG Act identifies 'protected' flora species. This includes any of the Asteraceae (Daisies), all orchids, ferns (excluding Pteridium esculentum) and Acacia species (excluding Acacia dealbata, Acacia decurrens, Acacia implexa, Acacia melanoxylon and Acacia paradoxa), as well as any taxa that may be a component of a listed ecological community. A species may be both listed and protected.

Planning and Environment Act 1987. Any persons engaged to remove, salvage, hold or relocate native fauna during construction must hold a current Management Authorisation under the *Wildlife Act 1975*.

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6 FURTHER REQUIREMENTS

Further requirements associated with development of the study area, including relevant legislation and policy identified within the preliminary assessment report (Ecology and Heritage Partners 2019), are provided below (Table 3).

Table 3. Further requirements associated with development of the study area

Relevant Legislation	Implications	Further Action
Environment Protection and Biodiversity Conservation Act 1999	Given that no significant flora and fauna species were detected during the targeted surveys, and no other matters of NES (e.g. NTGVVP) occur within the study area and would be impacted by the future development, an EPBC Act referral is not required	No further action required.
Flora and Fauna Guarantee Act 1988	Based on the results of the targeted surveys and ecological assessment, it is unlikely that the study area supports habitat for any species listed under the FFG Act. The study area is also privately owned, therefore a permit under the FFG Act is not required.	No further action required.
Wildlife Act 1975	Any persons engaged to conduct salvage and relocation or general handling of terrestrial fauna species must hold a current Management Authorisation.	Ensure wildlife specialists hold a current Management Authorisation.
Planning and Environment Act 1987	A Planning Permit from Macedon Ranges Shire Council is required to remove, destroy or lop any native vegetation.	Prepare and submit a Planning Permit Application once impact is known.
Catchment and Land Protection Act 1994	Several weed species listed under the CaLP Act were recorded within the study area. To meet requirements under the CaLP Act, listed noxious weeds should be appropriately controlled throughout the study area.	Planning Permit conditions may include a requirement for a weed management to be incorporated into a CEMP

7 CONCLUSION

Targeted surveys of the study area were recommended based on the results of the Existing Conditions assessment of the study area (Ecology and Heritage Partners 2019). Given the presence of potentially suitable habitat identified within the study area during the previous assessment conducted by Ecology and Heritage Partners in 2018, targeted surveys were completed for Matted Flax-lily, Swamp Everlasting, Swamp Fireweed, Golden Sun Moth and Growling Grass Frog. Despite surveys following the recommended guidelines, no individuals of any of these species were recorded within the study area. Based on the survey results, the study area is highly unlikely to support populations of any of the target species.

The VBA contains records of Matted Flax-lily, Swamp Everlasting and Swamp Fireweed within five kilometres of the study area (Figure 5). However, despite several previous records within the local area, based on the results of the targeted surveys, it is unlikely that these nationally significant flora species occur within the study area.

The proposed subdivision and future development may result in the removal of remaining areas of vegetation which do not support any of the target species, therefore based on available information there are no implications under the EPBC Act or under State legislation or policy pertaining to the proposed development in terms of impacts to significant species.

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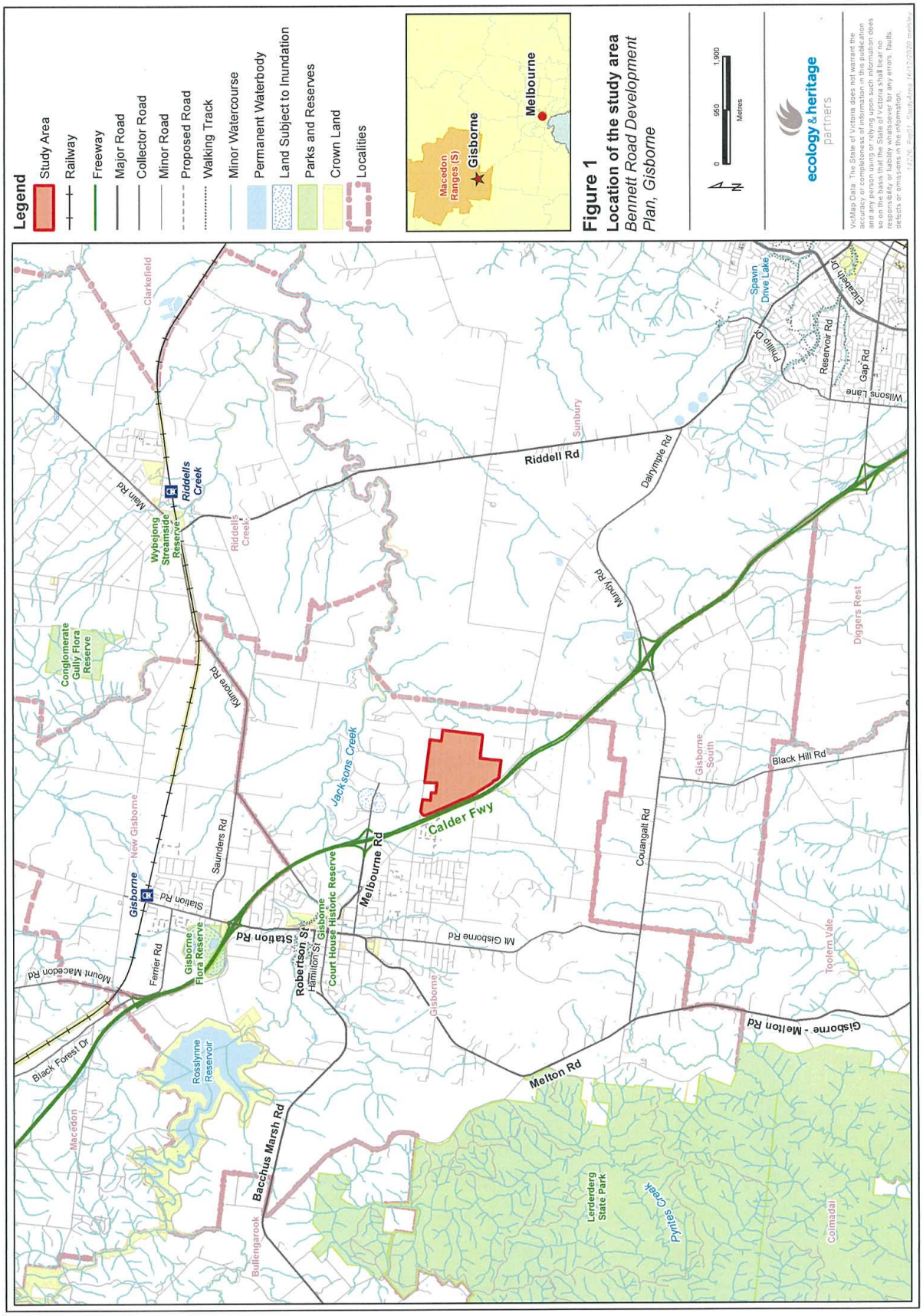
FIGURES


Legend
Study Area
Railway
Freeway
Major Road
Collector Road
Minor Road
Proposed Road
Walking Track
Minor Watercourse
Permanent Waterbody
Land Subject to Inundation
Parks and Reserves
Crown Land
Localities
Macedon Ranges (S)
Gisborne
Melbourne
Figure 1
Location of the study area
Bennett Road Development Plan, Gisborne
0
950
1,900
Metres
ecology & heritage partners
VicMap Data: The State of Victoria does not warrant the accuracy or completeness of information in this publication and any person using or relying upon such information does so on the basis that the State of Victoria shall not bear responsibility or liability whatsoever for any errors, faults, defects or omissions in the information.
14226_Fig01_StudyArea_16/12/2020 melsley
Clarkefield
Main Rd
Wybejong Streamside Reserve
Riddells Creek
Riddells Creek
Conglomerate Gully Flora Reserve
Kilmore Rd
Saunders Rd
New Gisborne
Gisborne
Station Rd
Gisborne Flora Reserve
Mount Macedon Rd
Ferrier Rd
Black Forest Dr
Rosslynne Reservoir
Macedon
Bulleingarook
Bacchus Marsh Rd
Station Rd
Robertson St
Hamilton St
Gisborne Court House Historic Reserve
Melbourne Rd
Jacksons Creek
Calder Fwy
Mt Gisborne Rd
Gisborne
Melton Rd
Lerderderg State Park
Pyrites Creek
Coimadai
Gisborne - Melton Rd
Riddell Rd
Sunbury
Dalrymple Rd
Mundy Rd
Couangalt Rd
Gisborne South
Black Hill Rd
Diggers Rest
Toolern Vale
Spawn Drive Lake
Phillip Dr
Elizabeth Dr
Reservoir Rd
Gap Rd
Wilsons Lane

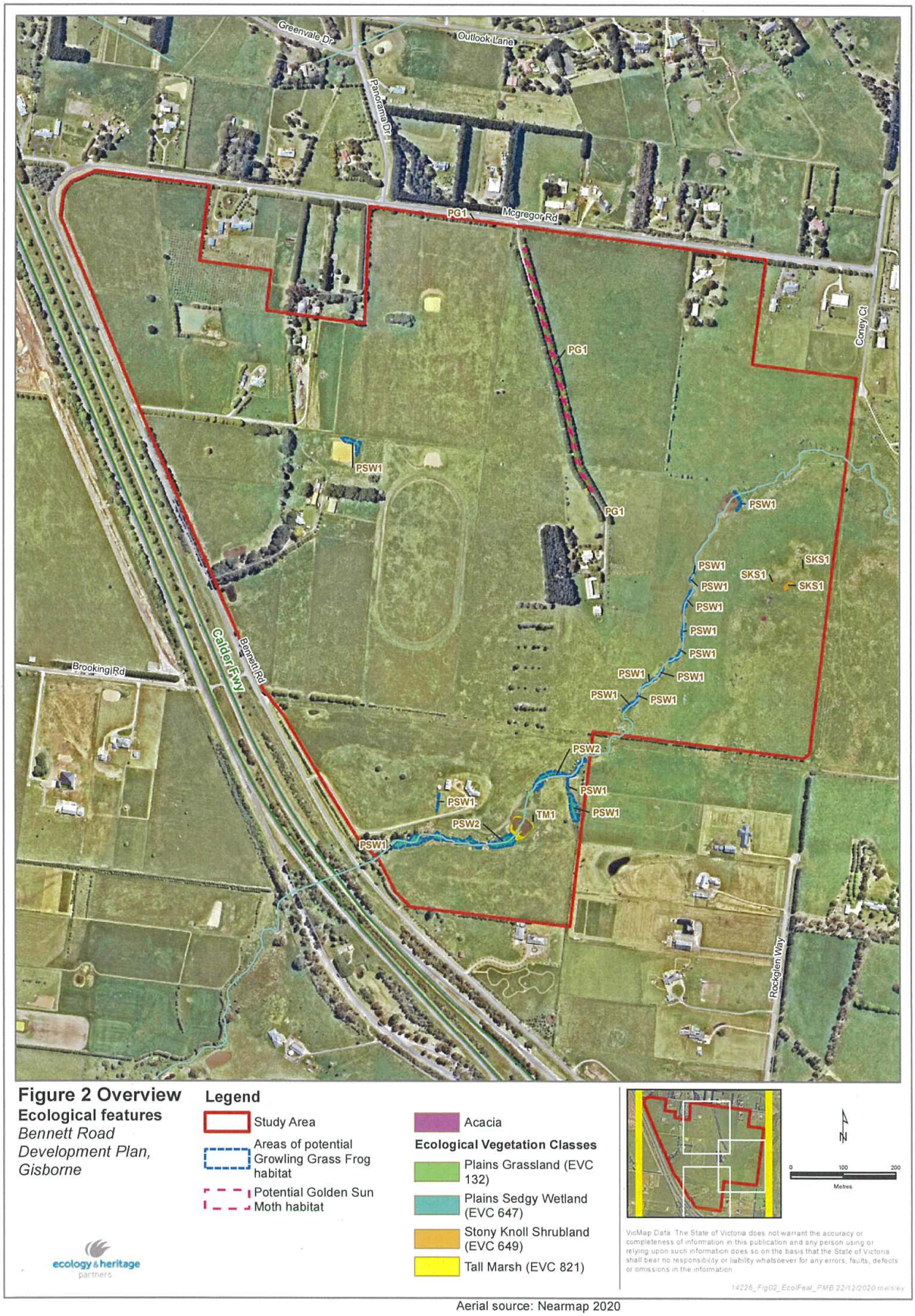


Figure 2 Overview
Ecological features
Bennett Road Development Plan, Gisborne

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14226_Fig02_EcolFeat_PMB 22/12/2020 melkley

Aerial source: Nearmap 2020

Figure 2a
Ecological features
Bennett Road Development Plan, Gisborne

Legend

- Study Area
- Areas of potential Growling Grass Frog habitat
- Potential Golden Sun Moth habitat

Ecological Vegetation Classes

- Plains Grassland (EVC 132)
- Plains Sedgy Wetland (EVC 647)

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14226_Fig02_EcolFeat_PMB 22/12/2020 meldley

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Aerial source: Nearmap 2020

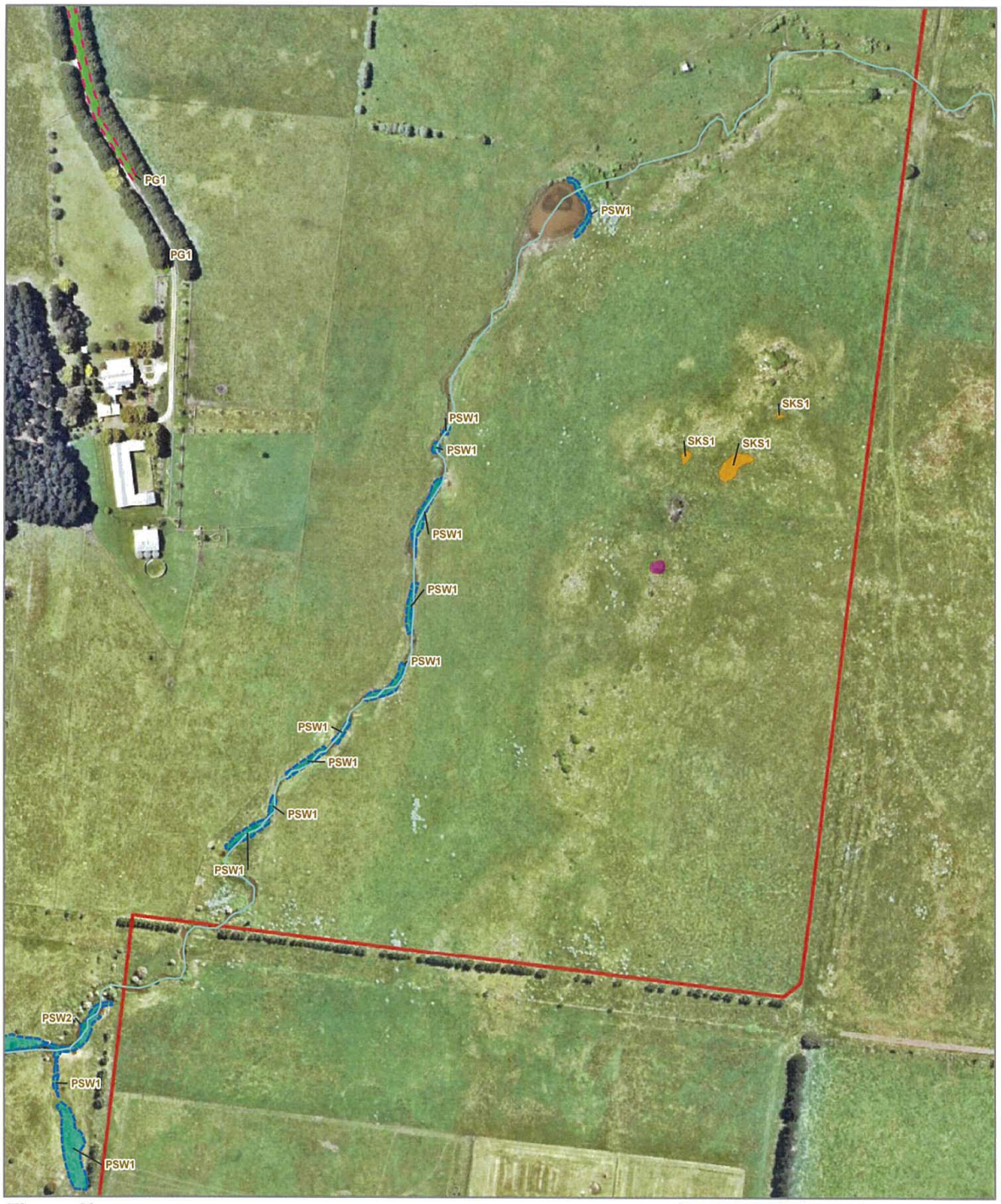

Figure 2b
Ecological features
Bennett Road Development Plan, Gisborne

Legend

- Study Area
- Areas of potential Growling Grass Frog habitat
- Potential Golden Sun Moth habitat
- Acacia

Ecological Vegetation Classes

- Plains Grassland (EVC 132)
- Plains Sedgy Wetland (EVC 647)
- Stony Knoll Shrubland (EVC 649)

N

0 35 70
Metres

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14226_Fig02_EcolFeat_PMB 22/12/2020 mel/dev

Aerial source: Nearmap 2020

Figure 2c
Ecological features
Bennett Road Development Plan, Gisborne

Legend
- Study Area
- Areas of potential Growling Grass Frog habitat

Ecological Vegetation Classes
- Plains Sedgy Wetland (EVC 647)
- Tall Marsh (EVC 821)

N

0 35 70
Metres

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14226_Fig02_EcolFeat_PMB 22/12/2020 melsley

ecology & heritage partners

Aerial source: Nearmap 2020

Figure 3
Targeted Golden Sun Moth surveys
Bennett Road Development Plan, Gisborne

Legend

Study Area

Survey tracks*

Date: 10/11/2020

Date: 25/11/2020

Date: 04/12/2020

Date: 09/12/2020

*No Golden Sun Moth were recorded during the surveys

N

0 30 60
Metres

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14226_Fig03_TargGSM_P 16/12/2020 melsley

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Aerial source: Nearmap 2020

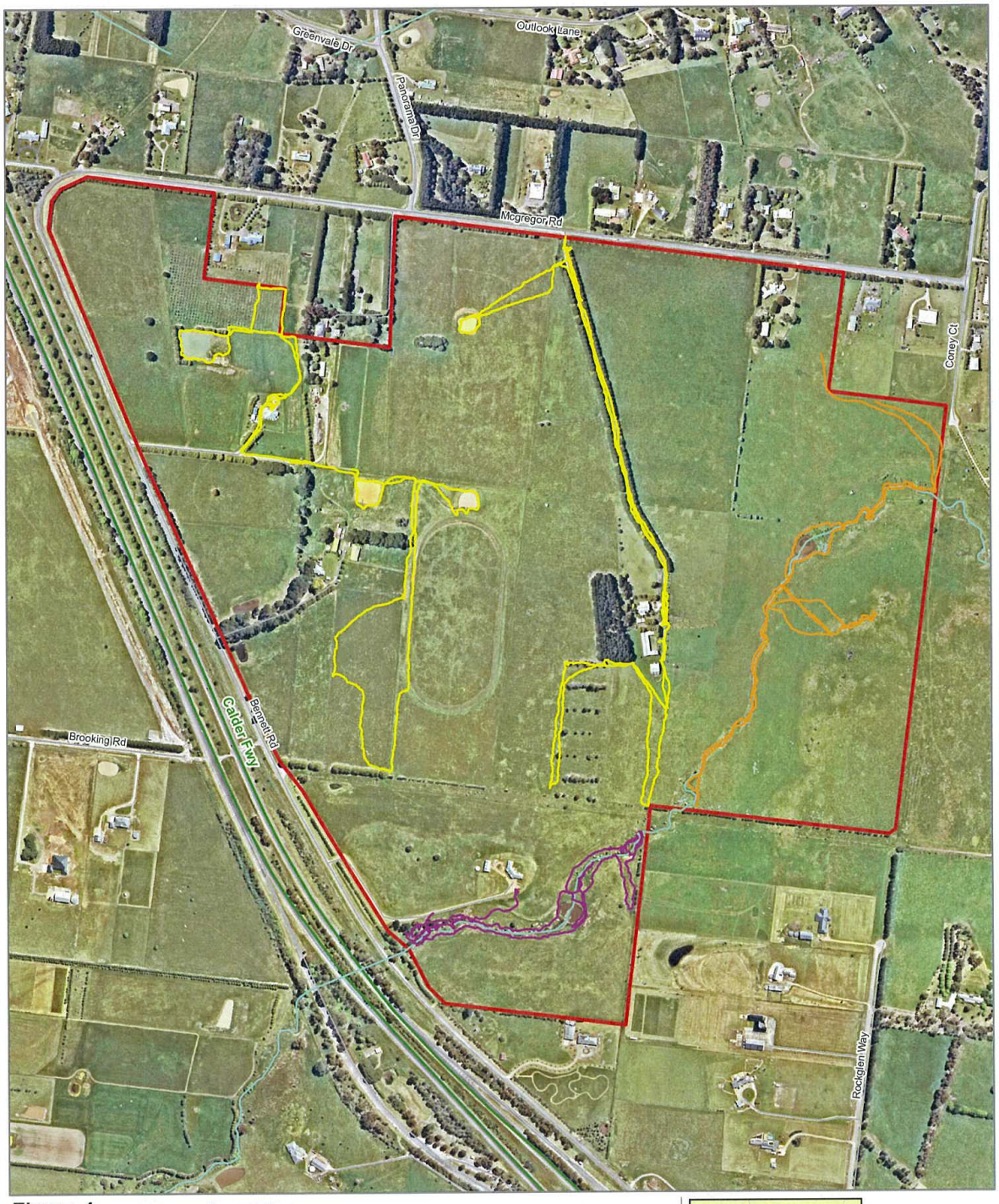

Figure 4
Targeted significant flora species surveys
Bennett Road Development Plan, Gisborne

Legend

Study Area

Survey tracks*

Track 1

Track 2

Track 3

N

0 75 150
Metres

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14226_Fig04_TargSigFlora_P 16/12/2020 melsley

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*No significant flora species were recorded during the surveys

Aerial source: Nearmap 2020

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APPENDICES

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Appendix 1.1 - Habitat Hectare Assessment

Table A1.2. Habitat Hectare Assessment Table.

Vegetation Zone		PSW1	PSW2	SKS1	TM1	PG1
Bioregion		VVP	VVP	VVP	VVP	VVP
EVC / Tree		PSWe	PSWe	SKS	TM	PG
EVC Number		647	647	649	821	132_62
EVC Conservation Status		Endangered	Endangered	Endangered	Least Concern	Endangered
Patch Condition	Large Old Trees /10	0	0	0	0	0
	Canopy Cover /5	0	0	0	0	0
	Under storey /25	5	15	5	5	5
	Lack of Weeds /15	0	9	0	9	4
	Recruitment /10	0	6	0	3	0
	Organic Matter /5	4	2	4	2	3
	Logs /5	0	0	0	0	0
	Treeless EVC Multiplier	1.36	1.36	1.36	1.36	1.36
	Subtotal =	12.24	43.52	12.24	25.84	16.32
Landscape Value /25		2	2	2	2	2
Habitat Points /100		14	46	14	28	18
Habitat Score		0.14	0.46	0.14	0.28	0.18

Note: VVP = Victorian Volcanic Plain, PSWe = Plains Sedgy Wetland, SKS – Stony Knoll Shrubland, TM = Tall Marsh, PG = Plains Grassland

GISBORNE AREA 1 DEVELOPMENT PLAN

[89 ROSS WATT ROAD]

ID Ross Watt Road Pty Ltd

8 July 2022

collie
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Collie Town Planners Pty Ltd
ABN 16 655 254 667

Level 26, 360 Collins Street
Melbourne Victoria 3000
Australia
+61 3 8698 9300
consult@collietp.com.au
www.collietp.com.au

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APPENDIX

Appendix A Tree Schedule

1 INTRODUCTION

1.1 BACKGROUND

This Gisborne Area 1 Development Plan (GA1DP) has been prepared in accordance with the requirements of the Macedon Ranges Planning Scheme (the Scheme) and in particular:

- the general residential zone (GRZ) (clause 32.08) and its schedule 1 (GRZ1) (clause 32.08);
- the development plan overlay (DPO) (clause 43.04) and its schedule 4 (DPO4) (clause 43.04);
- the development contributions plan overlay (DCPO) (clause 45.06) and its schedule 2 (DCPO2) (clause 45.06).

GA1DP covers land identified as area 1 under DPO4 in the Scheme, which is bound generally by Ross Watt Road to the north, Swinburne Avenue to the east, existing residential development to the south and southeast, a disused quarry and a drainage reserve to the southwest and rural to the northwest (refer Figure 1). The land has been used for rural purposes over many years.

As set out in the table of contents, GA1DP contains information that will assist decision-makers in considering planning permit applications and the provision of community and development infrastructure. GA1DP deals with:

- the general outline for the development of the land;
- the main land uses intended for the land;
- the general road layout and sequencing of development;
- the provision of social infrastructure;
- establishing an open space network for the land;
- landscape elements including the protection of biodiversity;
- urban design guidelines relating to future development of the land.

Figure 1 GA1DP Area

The GA1DP land is characterised by:

- an area of approximately 85.57 hectares of undulating land with road frontages to Ross Watt Road and Swinburne Avenue of 530.97 and 462.62 metres respectively;
- extensive existing residential development along its eastern flank;
- Jacksons Creek Escarpment Open Space Corridor to the west;
- Rosslynne Reservoir to the west;
- a mixture of native and exotic pasture grasses, with a number of exotic and native trees, with varying degrees of value;
- an existing dwelling and outbuildings (associated with the former use of the property) on Ross Watt Road;
- two farm dams;
- easy access to facilities and services of the Gisborne town centre (about 1.5 kilometres) and the Calder Freeway.

The GA1DP area is to be developed predominantly for residential purposes in accordance with the existing zoning of the land, with associated public open space and a local convenience centre and child care centre. The land is controlled by a single experienced developer of new master planned communities.

1.2 THE SCHEME PROVISIONS SUMMARY

The provisions of the Planning Policy Framework (PPF) in the Scheme that are of particular relevance to the GA1DP area in the context of it being identified as a residential development area under a general residential zone, include: settlement, housing and infrastructure.

The key issues and requirements under these provisions, have been considered and balanced appropriately in the preparation of GA1DP. A response to the PPF as well as the GRZ1, DPO4 and DCPO2 of the Scheme is provided in section 4.

The provisions of the Local Planning Policy Framework (LPPF) in the Scheme that are of particular relevance to the GA1DP area in the context of it being identified as a residential development area under a general residential zone, include: municipal profile (and particularly its subsections on settlement, housing and transport) and key issues and influences (and particularly its subsections on housing, economic development, transport and community development and infrastructure).

1.3 GISBORNE / NEW GISBORNE OUTLINE DEVELOPMENT PLAN

The Gisborne / New Gisborne Outline Development Plan, Revised Final Report, September 2009 (ODP) is not an incorporated document in the Scheme but rather a reference document. It is a document adopted by the Macedon Ranges Shire Council (MRSC), prepared originally in 2005. The September 2009 version has been updated in part but has numerous errors and inconsistencies. Nevertheless, DPO4 states that the ODP provides its basis.

1.4 GISBORNE FUTURES

Gisborne Futures is a draft structure plan, urban design framework and neighbourhood character study being prepared by MRSC that is intended to guide the future development of Gisborne. As the Gisborne Futures project is still in draft format, subject to continuing informal consultation phases and has not been proposed in any planning scheme amendment and thus not been tested in a statutory sense, it is likely that further changes will be made to the document. As a result, this development has been prepared on the basis that Gisborne Futures is not at a stage to be considered a seriously entertained planning document.

1.5 SUMMARY OF PROPOSED DEVELOPMENT

GA1DP sets out the development intentions for the land at a level above the detail to be expected in planning permit applications. GA1DP has been prepared in accordance with the DPO (clause 43.04 in the Scheme) and shows the land affected, the proposed development and use of each part of the land and other requirements as set out below.

The PPF, LPPF and DPO4 have had a significant bearing on the preparation of GA1DP. A balance has had to be reached with competing policies (State, regional and local) and DPO4 requirements. For example, State and local policies and DPO4, specify in various clauses the need:

- for housing choice and the development of a variety of lot sizes and types;
- for consolidation, redevelopment and intensification of existing urban areas;
- for a range of lot sizes to suit a variety of dwelling and household types to meet diverse needs, including affordability;
- to increase the supply of cost-effective housing in existing urban areas by facilitating increased housing yield in appropriate locations, including under-utilised urban land and ensure integration with infrastructure and services, including in regional towns.

Contrary to these policies however, there is another local policy that identifies conventional residential development as lots ranging from 500 to 1500 square metres but averaging 800 square metres. This average is at odds with the other policies noted in the paragraph above. It is acknowledged however, that in addition to the conventional density policy, there is one covering medium density with no specified lot sizes, although in the Gisborne / New Gisborne Outline Development Plan, they are noted as between 300 and 500 square metres.

GA1DP proposes a development characterised by:

- a mix of lot sizes to cater for residential choice and to meet a wide range of resident demographics, to implement State, regional and local policies;
- larger lots on the northern, western and southern boundaries to provide an appropriate transition from the GA1DP general residential zone to the rural conservation zoning on land as well as to Ross Watt Road and beyond that the Calder Freeway to the north;
- a possible residential village / land-lease community to provide further accommodation choice;
- medium density lots in the walkable catchment of the proposed local activity centre and public open space;
- pedestrian and vehicular connections to the existing residential development to the east with connections provided also to Ross Watt Road and Swinburne Avenue;
- a local convenience centre and childcare centre in the centre of the site co-located with public open space;
- an active public open space area co-located with the possible local convenience centre and childcare centre;
- a shared path network connecting GA1DP to existing development to the east as well as providing a connection to the Jacksons Creek Escarpment and Open Space Corridor;
- drainage reserves to accommodate stormwater flows and management;
- a total public open space area greater than the quantity specified (5 per cent) in clause 53.01 in the Scheme.

2 CONTEXT

2.1 REGIONAL AND MUNICIPAL CONTEXT

The GA1DP area sits in the wider Macedon Ranges region, which is an environmental, scenic, tourism, heritage and resource area of significance in Victoria and the region. The region has a highly attractive landscape setting with farming areas surrounding key physical features of State Forest, Mount Macedon and Hanging Rock as just some of its well-known attractions.

The rural landscape is punctuated by a series of urban settlements from larger ones such as Gisborne and Kyneton, through to those at Romsey and Riddells Creek to the smaller settlements of Lancefield, Woodend, Malmsbury and others of an even smaller size.

The planning policies aim generally to protect the rural and landscape character of the region while concentrating new development in the identified urban settlements and particularly the larger, faster growing settlements in the south. Urban development is encouraged to consolidate and intensify the urban settlements while protecting the surrounding rural and landscape character.

The GA1DP area is within the recognised development area of Gisborne / New Gisborne and within the Gisborne Town boundary, the largest and fastest growing urban settlement in the Municipality.

2.2 LOCAL CONTEXT

2.2.1 The Site and Surrounds

As noted above, the site is within the Township boundary of Gisborne. Jacksons Creek and Rosslynne Reservoir sit south and west of the site, with land on each side of Jacksons Creek identified as being within the 'Jacksons Creek Escarpment and Open Space Corridor'.

The site is bounded by Ross Watt Road to the north, with marshland associated with the Gisborne Racecourse Marshlands Reserve on the north side of Ross Watt Road, on both sides of the Calder Freeway. As a result of Ross Watt Road as well as the Marshland, the site is well removed from the Calder Freeway, which is further to the north. The Calder Freeway also acts as the divider between Gisborne to the south of the Freeway and New Gisborne to the north.

As noted in section 1, the GA1DP area adjoins existing residential development to the east that is outside the GA1DP area. The adjoining existing residential development to the east, as with much of the land surrounding the Gisborne Town Centre (to the southeast), is largely developed land comprising dwellings on lots consistent with the general residential zoning of the land.

2.3 DEMOGRAPHIC CHARACTERSTICS

The GA1DP area and its surrounds, including land within a six kilometres radius, for the purpose of this GA1DP, is known as the 'Gisborne District'. The Gisborne District comprises the following demographic characteristics.

- A total population of approximately 14,000 residents.
- A younger median age (39), compared with the Municipality as a whole.
- A lower proportion of Aboriginal and Torres Strait Islander people than in Victoria as a whole.
- A much higher percentage of couples with children, compared with the Municipality as a whole.
- A similar percentage of older couples without children, compared with the Municipality as a whole.
- A higher proportion of medium and high density housing, compared with the Municipality as a whole.
- A higher median weekly household income and weekly mortgage repayment, compared with the Municipality as a whole.

3 SITE ANALYSIS

3.1 FLORA AND FAUNA ASSESSMENT

As part of the preparation of this GA1DP, a flora and fauna assessment (*89 Ross Watt Road Gisborne Flora and Fauna Assessment, Nature Advisory, May 2022 Report No. 21137 (3.2)*) and an arborist assessment (*89 Ross Watt Road Gisborne, Galbraith and Associates, 3 February 2022*) were completed and form part of the background reports to this GA1DP.

The assessments included site surveys and the identification of existing flora and fauna. They reported also on the existence or otherwise of flora and fauna requiring protection under Commonwealth and State legislation.

In summary, the assessments concluded that:

- the majority of vegetation within the GA1DP area consists of a mixture of introduced and native grass species with numerous large scattered trees located across the site;
- fauna habitat is present within the native tree vegetation, grasslands and aquatic areas;
- the location of the GA1DP area and extent of native vegetation present is such that the removal of native vegetation from the site would be assessed under the detailed assessment pathway and would trigger a referral to the Department of Environment, Land, Water and Planning (DELWP);
- targeted surveys are recommended generally to determine if requirements are triggered under the Commonwealth EPBC Act and advised by Nature Advisory, targeted surveys were completed for the Stripped Legless Lizard, Golden Sun Moth, Swamp Everlasting and Matter Flax-lily, none of which were found on site;
- a number of landscape and tree reserves are proposed to retain large scattered trees with numerous other large scattered trees retained in the Jacksons Creek Escarpment and Open Space Corridor;
- offsets are required to compensate for the proposed native vegetation removal with 1.228 general habitant units required as compensation.

Trees to be retained will be incorporated into public open space of a sufficient size to ensure the canopy is protected (not encroached by greater than 10 per cent).

Figure 2 shows:

- trees to be removed;
- trees to be retained.

Appendix A includes the existing trees schedule, with tree numbers as mapped and numbered in Figure 2.

A response to comments from relevant authorities (*89 Ross Watt Road Gisborne, Responses to DELWP, Melbourne Water and Macedon Ranges Shire Council, May 2002 Report No. 21137.1)* has been prepared and is included as a background report for this application.

GISBORNE AREA 1 **DEVELOPMENT PLAN**

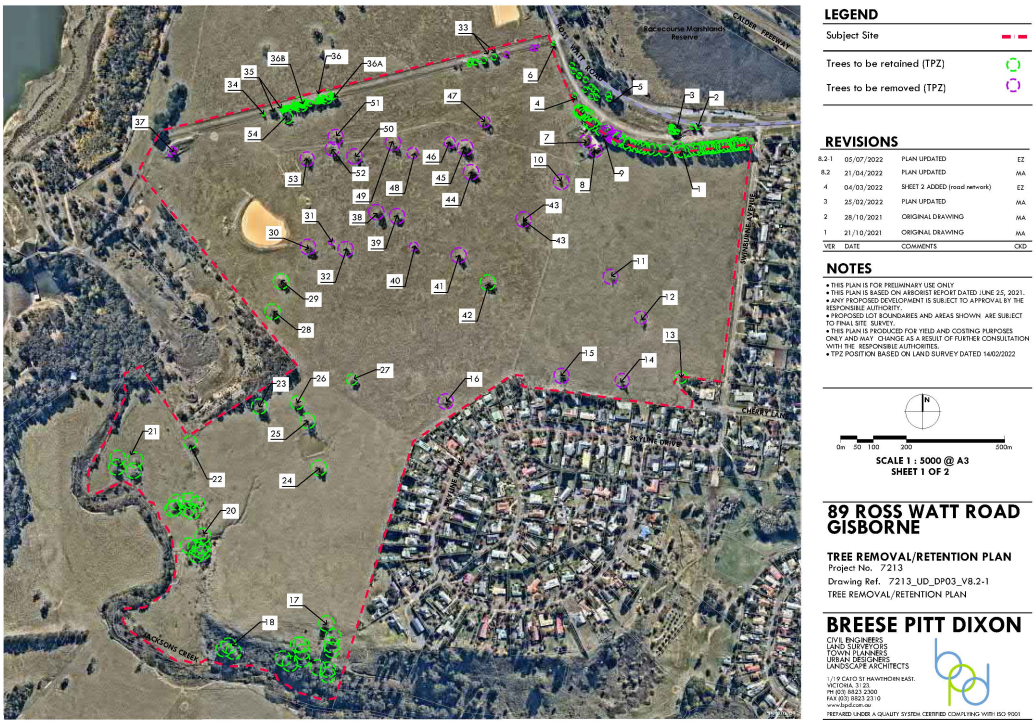


Figure 2 Tree Identification

3.2 CULTURAL HERITAGE ASSESSMENT

A preliminary Cultural Heritage report (*89 Ross Watt Road, Gisborne, Archaeology At Tardis, 5 November 2021*) has been completed and forms part of the background reports.

In summary, the key findings were that:

- preparation of a cultural heritage management plan (CHMP) is triggered by any planning permit application that proposes activity in the area of GA1DP that is within 200 metres of Jacksons Creek;
- preliminary investigations indicate that there are no previously registered Aboriginal cultural heritage places in the GA1DP area, with the nearest artefact scatter (VAHR7823-0011) being approximately 600 metres to the east;
- based on the geographic region, stone artefact scatters have the potential to occur in proximity to Jacksons Creek;
- further to the preliminary cultural heritage report two CHMPs are currently being prepared for the site, a mandatory one for the southern portion of the site and a voluntary assessment of the northern portion of the site, likely to completed and approved around October 2022.

3.3 SURFACE/STORMWATER MANAGEMENT STRATEGY

A surface / storm water management strategy (SWMS) (*89 Ross Watt Road Gisborne, Alluvium, April 2022 Version 3)* has been completed and forms part of the background reports.

The SWMS was prepared in accordance with Melbourne Water Corporation and MRSC requirements. It identified that:

- the GA1DP area is located within the Jacksons Creek catchment;
- the GA1DP area drains naturally to the south towards Jacksons Creek (and away from the Gisborne Racecourse Marshland Reserve to the north - and it does not change the existing drainage conditions of that Reserve);
- the SWMS ensures no runoff from urban development will flow into Rosslynne Reservoir, with flows from the GA1DP area discharging into Jacksons Creek, downstream from Rosslynne Reservoir;
- two main catchments are associated with the GA1DP area, the east and west catchment areas as shown in concept form in Figure 3;

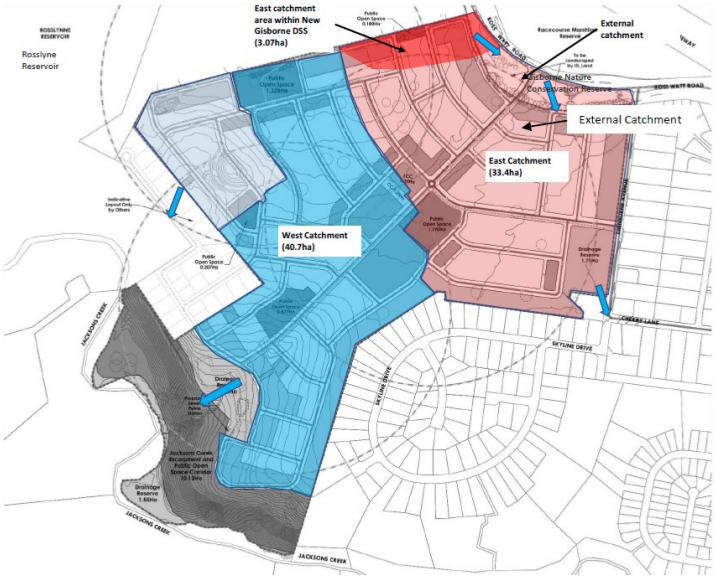


Figure 3 Main Catchment Plan

- the east catchment outlet / discharge point is at the corner of the Swinburne Avenue and Cherry Lane with an outfall pipe required to be constructed along Cherry Lane;
- the west catchment outlet / discharge point is to Jacksons Creek via the existing tributary on site;
- sediment ponds for both the east and west catchments are to be designed in accordance with Melbourne Water design guidelines;
- stormwater is to be treated to best practice quality before being discharged into Jacksons Creek.

3.4 POTENTIALLY CONTAMINATED LAND

An environmental site assessment (*Environmental Site Assessment 89 Ross Watt Road Gisborne, Golder Associates, 29 October 2021)* has been completed for the GA1DP area and forms part of the background reports.

In summary, the assessment found that:

- the site has a history of residential and agricultural use with a homestead located along the northern boundary of the site;
- the site desktop findings conclude that no contamination issues have been identified that are likely to preclude the proposed development of the GA1DP area;
- access was not available to assess the soil at the homestead site and as a result and although the potential for contaminated soils in this area is low, it is recommend that further testing be conducted;
- there is no evidence that the area has a history of use (with the homestead site still to be assessed) that would identify it as 'potentially contaminated land' and under Direction 1, section 12(2)(a) of the Planning and Environment Act 1987 and the related Planning Practice Note 30 (Potentially Contaminated Land) of July 2021 (the current version), it is classified as 'low' in terms of potential contamination.

3.5 SITE AND LANDSCAPE ASSESSMENT

As noted in part in section 1.1, the GA1DP area is characterised by a number of key site and landscape features:

- the defined Jacksons Creek watercourse along the southwest boundary of the land;
- a number of large native scattered trees across the site, many of which will be retained to add to the landscape setting of the area;
- distant views to the Macedon Ranges;
- other scattered trees that can add to the landscape setting provided they have appropriate 'worthy of retention' values as identified by the arborist.

4 THE SCHEME PROVISIONS AND RESPONSE

As outlined in section 1.2, particular policies in the Scheme of relevance to the preparation and implementation of GA1DP and commentary on how each has been addressed, is provided below.

Item	Clause	Summary	Comments
1	11.01-1S	To promote and support sustainable growth and development and deliver choice in a network of settlements including the regional centre of Gisborne.	GA1DP covers an area identified within the Gisborne town boundary, which is the primary urban area of the Municipality. It is in an identified growth area and the proposal promotes sustainability and lot choices.
2	11.02-1S	Consider opportunities for the consolidation, redevelopment and intensification of existing urban areas.	Refer to comments in item 1.
3	12.01-2S	To avoid and minimise the removal, destruction or lopping of native vegetation and to provide offset compensation where native vegetation is to be removed.	Native vegetation (including a number of large scattered trees), will be retained across the GA1DP area, where removal is unavoidable. For the native vegetation proposed for removal, appropriate offsets will be made. Furthermore, an arborist assessment (*89 Ross Watt Road Gisborne, Galbraith and Associates, 3 February 2022)* was completed and forms part of the background reports. The trees proposed for retention have been identified in conjunction with the arborist assessment, which outlines those trees across the GA1DP area which are worthy of retention.
4	13.02-1S & 21.06-3	Identify bushfire hazard and complete risk assessments at the time of any relevant application for permit.	GA1DP is in a bushfire prone area and a bushfire risk assessment (*Bushfire Development Report for 89 Ross Watt Road, Gisborne, Terramatrix, November 2021*) has been completed for the GA1DP area and forms part of the background reports. This report concludes that bushfire risk can be mitigated to an acceptable level and the development of GA1DP can protect human life if dwellings are separated from hazardous vegetation to allow an appropriate BAL construction standard and the recommendations of the bushfire risk assessment are followed in relation to appropriate buffers and management strategies.
5	13.04-1S & 21.06-2	Identify potentially contaminated land and ensure it is suitable for its intended use.	A site assessment and report has been completed and has identified the GA1DP area as 'low' in terms of potential contamination.
6	13.05-1S	Assist the control of noise effects on sensitive land uses.	As the site is well removed from Calder Freeway, it has been determined that no noise attenuation measures are required for the development of the GA1DP area.
7	15, 16 & 21.12	Encourage development and land use that fosters healthy, active living and responds to its surroundings and existing or preferred character, is sustainable and reflects good urban design.	The GA1DP proposal will implement these provisions by encouraging pedestrian and cyclist activity, outdoor recreation and community uses. It is based on good urban design principles including maximising links into neighbouring development, solar orientation, appropriate road lengths and speed control, a range of lot sizes, locating a majority of the lots within 400 metres walking distance to an area of public open space, co-located community facilities and it responds to the local and intended residential neighbourhood character.

Item	Clause	Summary	Comments
8	15, 16, 21.01, 21.02-5 & 21.09	Provide a range of lot sizes to suit a variety of dwelling and household types to meet diverse needs, including affordability.	The GA1DP proposal implements these provisions with lot size variety including the provision of more affordable housing potential on medium density lots. The range of lot sizes proposed will allow for a diversity of housing types to be constructed to cater for the needs for a variety of home buyers.
9	16.01-1S	To increase the supply of cost-effective housing in existing urban areas by facilitating increased housing yield in appropriate locations, including under-utilised urban land and ensure integration with infrastructure and services, including in regional towns.	The GA1DP area is an identified candidate to assist in implementing this provision and the proposal is entirely consistent with the provision.
10	19.02 & 19.03	Provide for required community and development infrastructure.	The GA1DP area has been the subject of detailed background studies in the preparation of the GA1DP. These studies have identified the required community and development infrastructure, which has been incorporated into the proposal.
11	21.03	Promotes Gisborne / New Gisborne as a "regional centre" in the Municipality, characterized by "a large, diverse population (10,000 plus), employment and housing base. All essential services are connected and higher order goods and services are provided . . .".	GA1DP assists in implementing this vision by proposing fully serviced housing within the Gisborne regional centre and township boundary, on land already zoned for residential development.
12	21.04	Gisborne is a specified growth area in the Municipality and the GA1DP area is recognised as an area to accommodate a portion of this growth.	Refer to comments in items 1, 8 and 9.
13	21.04	Reinforce the key urban functions and role of Gisborne as the major urban centre.	Refer to comments in item 1.
14	21.08-2	Recognise and protect Aboriginal cultural heritage places and values.	Preparation of a CHMP is triggered by any planning permit application that proposed activity in the area of GA1DP that is within 200 metres of Jacksons Creek. Any recommendation in the CHMP, once prepared, would need to be met. As mentioned previously, if any artifacts are found to occur these are likely to be confined to the watercourse corridor. Notwithstanding this, the CHMP will ensure that any artefacts found to be located on the land are recorded and protected. Two CHMP are being prepared for the north (voluntary) and south (mandatory) portions of the GA1DP area, expected to be completed and approved in October 2022.
15	21.08-3	Ensure that development and built form occurs in a sustainable manner and direct population and development to settlements where scenic landscapes will not be jeopardised.	The GA1DP proposes development: ▪ with a subdivision that implements the sustainable development of limited urban land;

Item	Clause	Summary	Comments
			▪ that directs new population and development into an identified urban settlement that is not in a scenic landscape that will be jeopardised.
16	21.09	Provide for responsive and affordable housing and a diversity of lot sizes and styles to meet the requirements of all age groups, household types, lifestyles and preference.	Refer to comments in items 1, 8 and 9.
17	21.13	Objective 1 is to reinforce the key urban functions and role of Gisborne as a major urban centre.	GA1DP implements this objective by directing new urban development and economic stimulus into the existing identified urban area of Gisborne while at the same time assisting in reducing pressure in rural areas for urban residential growth. It will be accompanied by full urban services, new public open space facilities and a proposed local activity centre.
18	21.13	Consolidate and retain a compact urban form and contain urban development within the defined township boundary and major urban centre of Gisborne thus respecting the semi-rural character of the broader area.	Refer to comments In Item 1. The GA1DP proposal provides for urban development to be consolidated in the recognised urban area of Gisborne and its Township boundary, thus respecting the semi-rural character of land outside the urban area and lessening pressure for new development into those non-urban areas.
19	21.13	Consider medium density housing near public open space and a local neighbourhood activity centre.	GA1DP implements this provision.
20	21.13	Consider in other residential areas conventional residential densities with lot sizes ranging from 500 to 1500 square metres and averaging 800 square metres.	GA1DP proposes a range of lot sizes as low, conventional and medium density. The lots are between approximately 300 square metres and over 1,500 square metres, with average sizes as depicted on the Indicative Subdivision Layout in section 6.8 in this GA1DP. Additionally, townhouse lots have been located appropriately around the public open space and local neighbourhood activity centre. The GA1DP has been prepared seeking a balance with the competing policies in items 1, 2, 8, 9, 15, 16 and 17.
21	21.13	Protect and improve areas of remnant vegetation, fauna habitat and natural drainage corridors.	Background studies have been completed and as noted earlier, have concluded that the GA1DP proposal is consistent with this provision.
22	21.13	Gisborne / New Gisborne Framework Plan	The GA1DP area is noted on the Framework Plan as "Existing Residential – short-medium term growth opportunity". This provision has been in the Scheme for many years and was tested specifically at the Amendment C67 Panel hearing. In its report of September 2010, the Panel dealt with the GA1DP area (among others) and concluded that either the GA1DP area or the Gisborne Development Plan 4a and 4b should be open to development in "3 to 5 years" (that is, 2013 at the earliest or 2015 at the latest). As the Gisborne Development Plan 4a area is complete and development / lot sales are well advanced at the Gisborne Development Plan 4b area, the development of the GA1DP area is a logical step.

Item	Clause	Summary	Comments
23	32.08	Encourage a diversity of housing types and housing growth particularly in locations offering good access to services and transport.	Refer to comments in items 1, 8 and 9. Reflected in its identification within the Gisborne town boundary, the GA1DP area is very well located in terms of access to services and transport.
24	32.08 & schedule	Provision to include in the GRZ1 schedule any neighbourhood character objectives to be achieved.	The GRZ1 schedule, which covers the GA1DP area, does not include any neighbourhood character objectives.
25	32.08	A planning permit is required for subdivision, construction (but not use) of dwellings on lots less than 300 square metres, development and use of an education centre.	Relevant planning permits will be lodged in due course under this provision.
26	43.04	Objectives enabled in the DPO and set out in DPO4, which include the specified 'key principles' of: encouraging housing choice and the development of a variety of lot sizes and types within the context of a semi-rural township"; ▪ establishing open space networks for pedestrian and cycling links, passive and active recreation needs; ▪ limiting the visual intrusion of development around key township entrances, the Calder Freeway; ▪ protecting areas of remnant vegetation; ▪ encouraging current sustainable development principles and high quality urban design" among others.	Refer to comments in items 1, 7, 8, 9, 15 to 20 and 23. Refer to Site Analysis in section 3. Larger lots are proposed along the northern, western and southern boundaries to reflect the rural or semi-rural nature of abutting land and limit any visual intrusion of the development on Township entries, the adjoining Calder Freeway, Jacksons Creek Escarpment and Rosslynne Reservoir. An open space network is proposed that implements the key principles as set out in DOO4. Existing vegetation has been studied and identified where relevant for retention or removal.
27	DPO4	A development plan must include a detailed site analysis of the natural, cultural and strategic context of the site and a subdivision layout which shows: ▪ a variety of lot sizes across the development area; ▪ how development interfaces with environmentally significant and landscape sensitive areas; ▪ transition with nearby low-density residential lots; ▪ consideration of natural features; ▪ physical infrastructure; ▪ solar orientation; ▪ movement and open space networks; ▪ landscape concepts; ▪ major drainage and infrastructure features; ▪ staging and timing;	Refer to comments in items 8, 9, 15, 17, 18 and 23. The GA1DP area does not interface with identified environmentally significant or landscape sensitive areas, in the context of the Scheme. Neither the GA1DP area nor abutting land is affected by the Significant Landscape, Heritage or Environmental Significance Overlays. Nevertheless, part of the land includes the Jacksons Creek and its escarpment and GA1DP is proposing this area as a special open space for passive public open space (part) and drainage reserve (part below the 1 in 100 flood level). GA1DP proposes a combination of open space and larger low density lots along its northern, western and southern boundaries, which is the interface with rural conservation zone further to the west and south as well as to provide a buffer form the Calder Freeway to the north. The same approach is proposed along the part of the east border with its interface with existing lots to the east.

Item	Clause	Summary	Comments
		▪ a summary of the findings of specialist studies on flora and fauna, cultural heritage, stormwater management, traffic, environmental conditions	The proposed subdivision layout has been designed to maximise solar energy capture, with lots being oriented predominantly east-west or north-south. Natural features have been identified and have informed the plan. Other aspects of the provision are addressed elsewhere in GA1DP.
28	DPO4	Specific provisions relating to GA1DP area include: ▪ providing a conceptual urban design for the local neighbourhood activity Centre; ▪ an active open space area of appropriate size ▪ a low-density interface to the Calder Freeway, Ross Watt Road; Jacksons Creek escarpment and adjoining rural land; ▪ protection of Jacksons Creek escarpment via an open space designation; consideration of drainage / other impacts on Gisborne Racecourse Marshland Reserve;	Refer to comments provided in section 4.1 further below. As stated in section 2.2.1 above, Ross Watt Road provides a significant buffer between the GA1DP development area and the Gisborne Racecourse Marshlands Reserve further to the north. As confirmed in the stormwater management investigation, the GA1DP area drains to the east and south and not to the north into the Gisborne Racecourse Marshlands Reserve. As a result of these buffer distances and drainage directions, the development of GA1DP will not adversely impact the drainage or flora and fauna within the Gisborne Racecourse Marshlands Reserve.
29	44.04	To minimise the potential flood risk to life, health and safety associated with development	The Land Subject to Inundation Overlay (LSIO) under the Scheme covers Jacksons Creek but is confined largely to land south of the Creek. Only a very small part of the subject land is affected by the LSIO. This land is proposed in a drainage reserve, to ensure flood and stormwater risks are managed appropriately.
30	45.06 & schedule 2	Meet the requirements of DCPO2	The development of GA1DP will and must meet all the mandatory requirements of DCPO2.
31	52.17	A planning permit is required to remove, destroy or lop native vegetation including dead native vegetation	Relevant planning permits will be lodged in due course under this provision, if required.
32	53.01	A public open space contribution is required of 5 per cent of the land intended to be used for residential.	The GA1DP proposes public open space which exceeds this requirement.

4.1 WEST GISBORNE AREA SPECIFIC REQUIREMENTS

The following provides a response to the 'West Gisborne area specific requirements' of DPO4.

- An indicative conceptual urban design for the development of the Local Neighbourhood Activity Centre has been prepared and is provided in Figure 4.

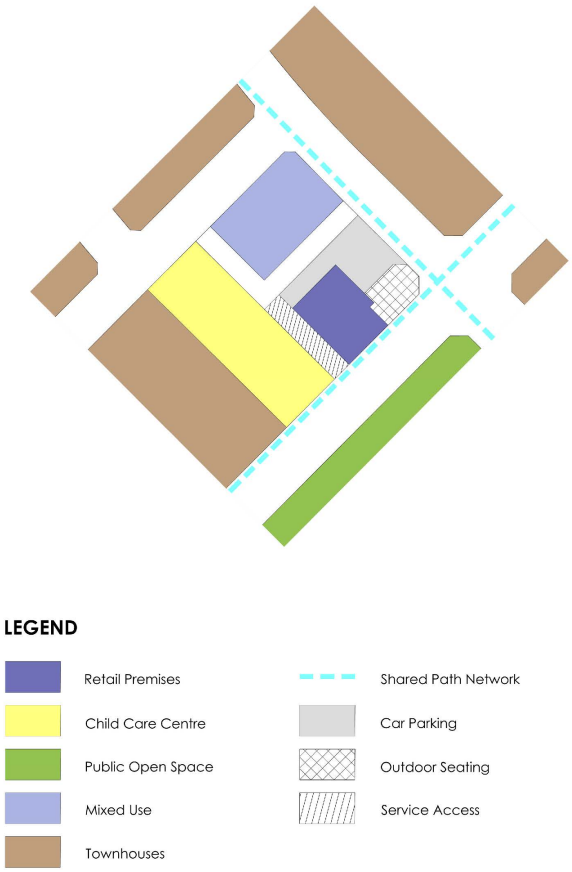


Figure 4 Indicative Local Neighbourhood Activity Centre Urban Design Framework

- As indicated in the development plan in Figure 5, shared paths link a total of 13.85 hectares of public open space through the site to the Jacksons Creek Escarpment Open Space Corridor. Furthermore and as confirmed in the *89 Ross Watt Road, Gisborne Social Infrastructure Assessment, ASR Research, May 2022*, the location, size and dimensions of the proposed public open space areas are appropriate.

- As stated throughout this document, larger lots (approximately 1,500 square metres) have been provided along the site boundaries in order to provide a low density interface to the surrounding Calder Freeway, Ross Watt Road, Jacksons Creek Escarpment Open Space Corridor and surrounding rural land.

- Drainage and stormwater issues have been considered with a number of drainage reserve provided to ensure no detrimental impacts occurs on the nearby Gisborne Racecourse Marshland Reserve to the north as a result of the development of GA1DP.

- All dwellings will be developed in accordance with the provisions of the general residential zone (GRZ) which applies to the site. It is expected therefore, that the siting, design and height of future dwellings will be appropriate and will not impact on the significant view lines from Calder Freeway or Jacksons Creek.

- Measures to protect, enhance and manage identified environmental values of Gisborne Racecourse Marshlands Reserve from impacts of the development of GA1DP area are expected to be managed in accordance with appropriately worded conditions of relevant planning permits for GA1DP.

5 GA1DP VISION AND PRINCIPLES

5.1 VISION

The vision for the GA1DP area is:

- to provide for the efficient and sustainable development of a recognised growth area in the Municipality and more particularly in the Gisborne urban area;
- to provide a range of lot sizes consistent with the vision above;
- to recognise the site opportunities and constraints and to translate them into intentions that will inform the development layout and provide a high level of amenity;
- to provide a generous supply of public open space (unencumbered and encumbered) designed in part for multi-purposes but in all cases providing attractive landscape settings and public use areas and ensuring that all a majority of lots are located within 400 metres walking distance to either passive or active areas of public open space;
- to integrate the GA1DP area with adjoining residential development and nearby services;
- to provide opportunities for community and convenience facilities to be delivered adjacent to complementary land uses and with good access to residents and other users.

5.2 PLANNING AND DESIGN PRINCIPLES

The key planning and design principles for the GA1DP are set out in section 4 and are as listed below.

- The development of a high quality urban design for this consolidation area of the Gisborne Township.
- The provision of a range of lot sizes.
- The protection and enhancement of Jacksons Creek to provide a multi-purpose function of drainage, attractive landscaped area, open space opportunity, pedestrian and cyclist link through the area and to cater for the passive recreation needs of future residents.
- The provision of interface treatments on the various boundaries, which recognise particular conditions on those boundaries and create appropriate responses.
- A road layout that includes wherever possible east-west and north-south roads (to maximise lot and house solar orientation opportunities), that provides appropriate links within and to and from the GA1DP area, that reduces risks with excessive vehicle speed through road length design and other calming treatments and the provision of frontage roads to areas of public open space to encourage lots to front or side onto these public spaces.
- The provision of community and convenience facilities in locations that are accessible to intended users on foot, bicycle or vehicle; co-located wherever appropriate; of sufficient land area to accommodate the facility size required and to fill a demonstrated need for the GA1DP area and surrounds.

The GA1DP Future Urban Structure is shown in Figure 5.

GISBORNE AREA 1 **DEVELOPMENT PLAN**

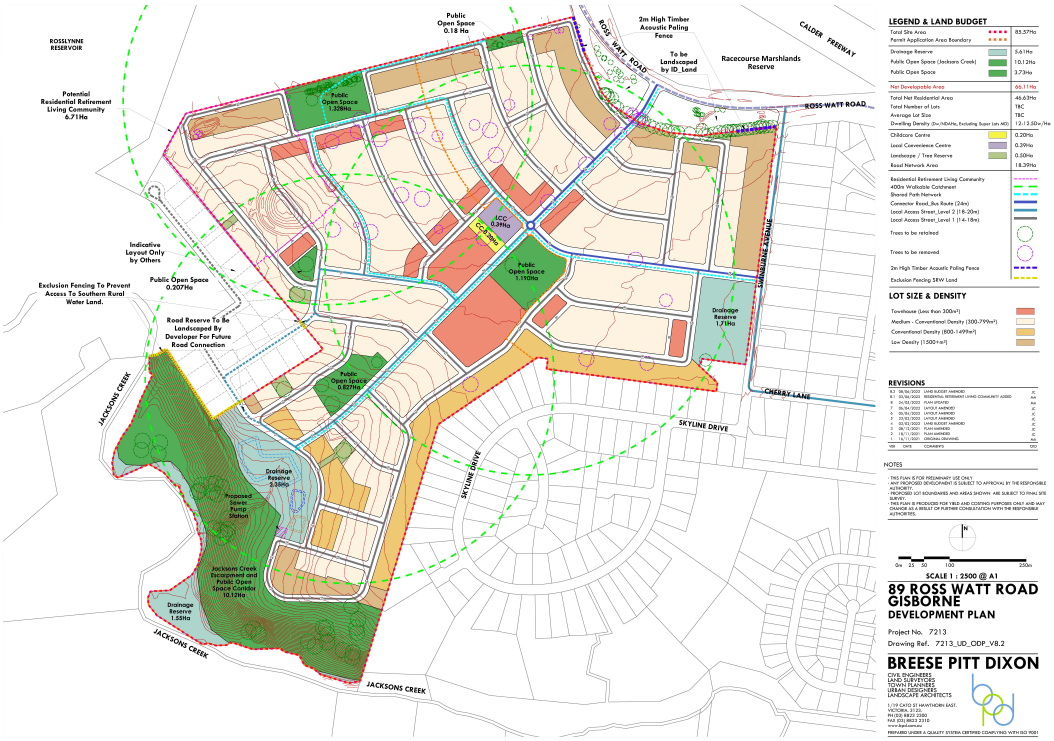


Figure 5 GA1DP Development Plan

6 GA1DP KEY ELEMENTS

6.1 SOCIAL INFRASTRUCTURE

A social infrastructure assessment (*89 Ross Watt Road, Gisborne Social Infrastructure Assessment, ASR Research, May 2022)* was completed and forms part of the background reports. The key findings of the report in relation to the proposed GA1DP and required social infrastructure include:

- provision of 13.85 hectares of unencumbered passive public open space in addition to the encumbered areas of open space along Jacksons Creek and the drainage reserve, which will provide recreational facilities through the provision of shared pedestrian and cycling pathways, satisfying the requirements of DPO4 in relation to public open space;
- the availability of existing indoor recreation facilities across Gisborne is sufficient in that no provision for further facilities is required in the GA1DP area;
- the proposed provision of a childcare centre site will satisfy the needs for long day child care services in the area;
- the proposed dwelling yield does not justify the provision of a community centre;
- the availability of the existing Gisborne Library and neighbourhood house in combination with the limited increase in demand for these services from the development of GA1DP, leads to the conclusion that additional library or neighbourhood house facilities are not required for the GA1DP area;
- the GA1DP area does not have locational attributes that allow for the provision of health services;
- there is potential for a residential aged care facility but it is likely as a commercial operation and subject to market demand for such a facility;
- the availability of existing schools, as well as the Willowbank Primary School under construction, is such that no schools are required for the GA1DP area.

6.2 PHYSICAL INFRASTRUCTURE AND SERVICING

A servicing report (*Infrastructure Servicing Report, 89 Ross Watt Road Gisborne, Breese Pitt Dixon, 5 July 2022*) was completed and forms part of the background reports.

The key aspects of the proposed physical infrastructure and servicing include:

- existing water mains within Ross Watt Road and Swinburne Avenue will be extended into the GA1DP area ;
- the GA1DP area is well served by existing sewers along Cherry Lane, with a pump station being required for the southern outfall of the site to connect this area to the gravity outfall for the Cherry Lane sewer;
- underground power will be provided via the existing underground and overhead network;
- a number of electrical substations will be required in the GA1DP area;
- telecommunications and the provision of fibre will be via a fibre provider.
- gas supply will not be provided to the development in line with promoting more sustainable renewable energy options.

An infrastructure provisions plan is shown in Figure 6.

GISBORNE AREA 1 **DEVELOPMENT PLAN**

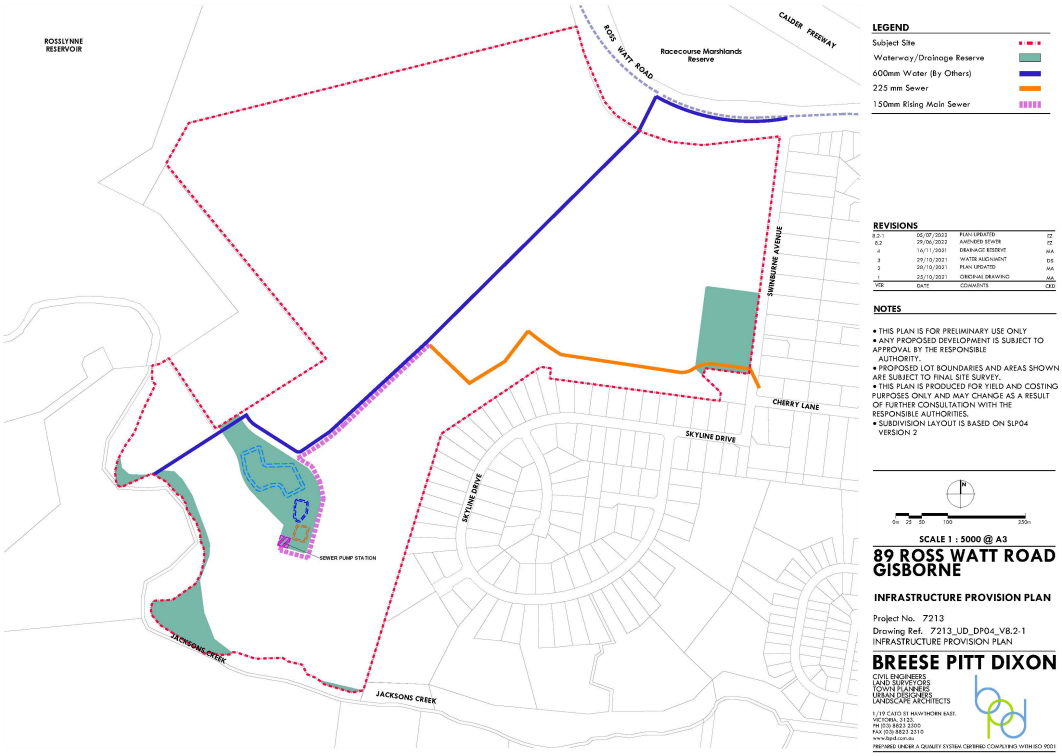


Figure 6 Infrastructure Provisions Plan

6.3 STORMWATER MANAGEMENT

As summarised in section 3.3 of this GA1DP, a SWMS was prepared for the GA1DP area and sets out the proposed surface/stormwater strategy, in accordance with Melbourne Water Corporation and MRSC requirements.

6.4 PUBLIC OPEN SPACE NETWORK

A public open space network is proposed through the GA1DP area with several main nodal points or links:

- the landscaped and enhanced watercourse - encumbered but with a clear additional recreation function and co-located with additional encumbered drainage area;
- a larger public open space area co-located with the potential child care centre and local convenience centre;
- several parks that provide for tree retention, passive recreation and pedestrian connections.

These nodes / links will be connected by pedestrian and cyclist paths (on and off-road) as well as local roads. They will be inter-connected with existing development east of the GA1DP area.

The proposed public open space exceeds the Scheme requirement for 5 per cent of the land proposed for residential purposes. The public open space is provided as follows:

- 5.61 hectares (6.5 per cent of total site area) encumbered;
- 13.85 hectares (20.95 per cent of net developable area) unencumbered

These elements are shown on the public open space network plan in Figure 7.

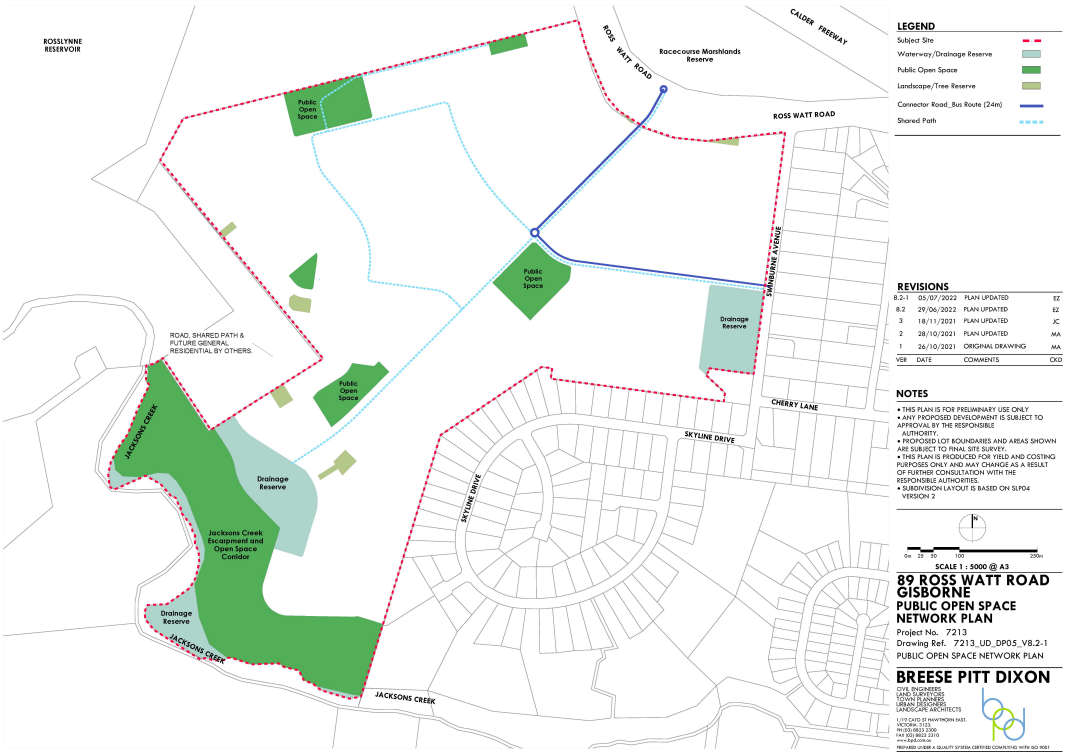


Figure 7 Public Open Space Network

6.5 MOVEMENT NETWORK

A traffic and movement assessment (*89 Ross Watt Road Gisborne Transport Impact Assessment, 3 June 2022, One Mile Grid,*) has been prepared as one of the background reports for GA1DP.

The movement network through and beyond the GA1DP area is characterised by:

- pedestrian and cyclist paths linking nodes and access points, as shown in Figure 8;

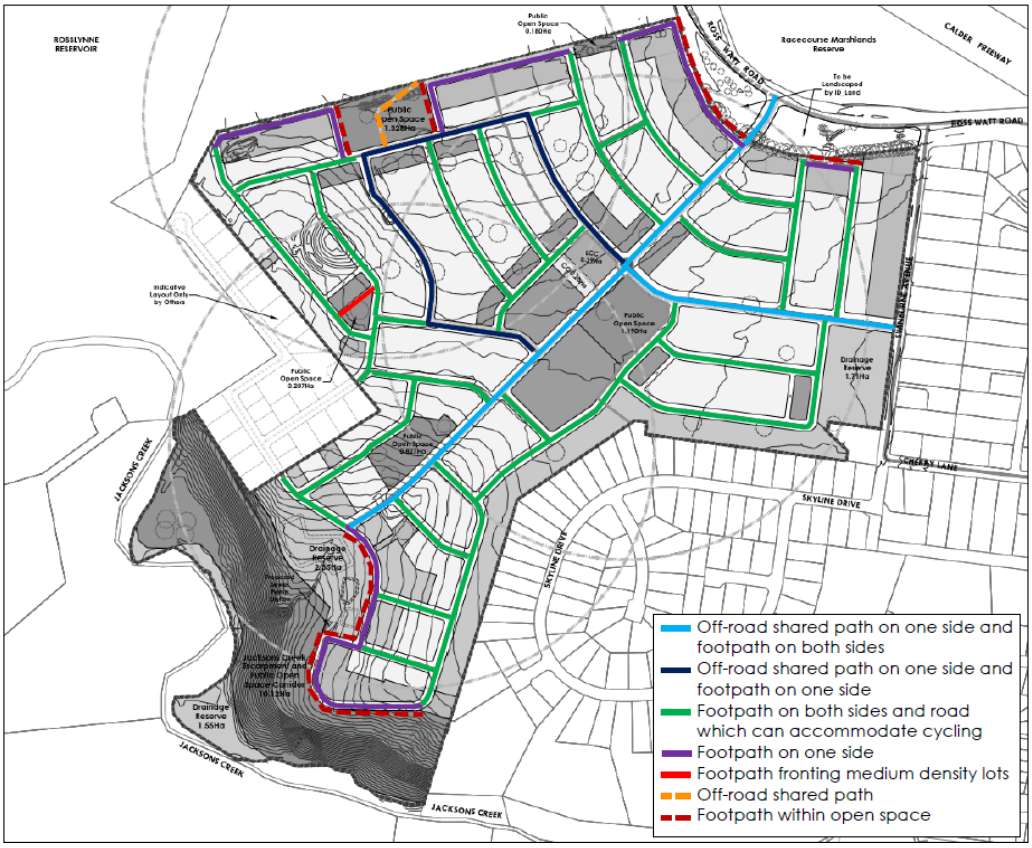


Figure 8 Indicative Internal Pedestrian and Cyclist Network

- primary links to Ross Watt Road and Swinburne Avenue;
- a road system incorporating roads of different order on alignments that foster a north-south connection via a primary connector street through the GA1DP area to Ross Watt Road with a secondary east-west connector street providing a connection from the primary connector street to the existing residential area to the east, as shown in Figure 9;

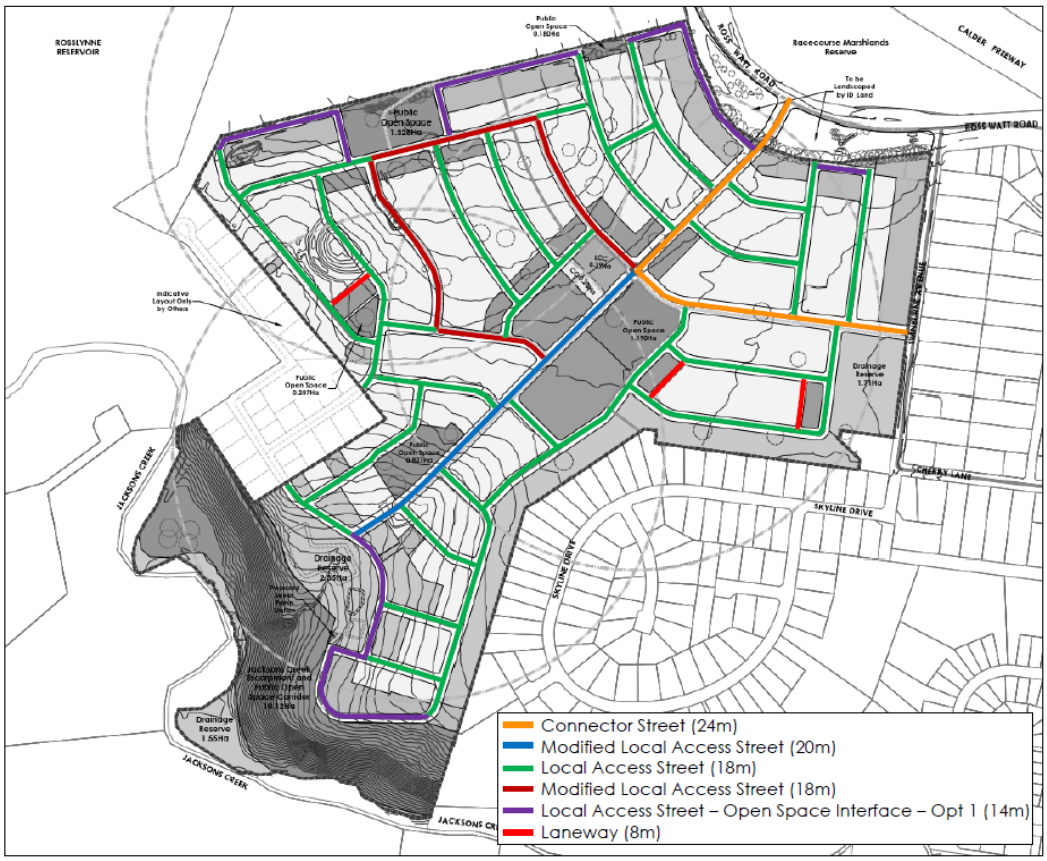


Figure 9 Indicative Internal Road Network

- each connector road reserve to be 24 metres, for bus capability;
- a number of typical and modified road cross-sections (Figures 10 to 15); in the modified cases to allow for the provision of shared path links in the broader network;

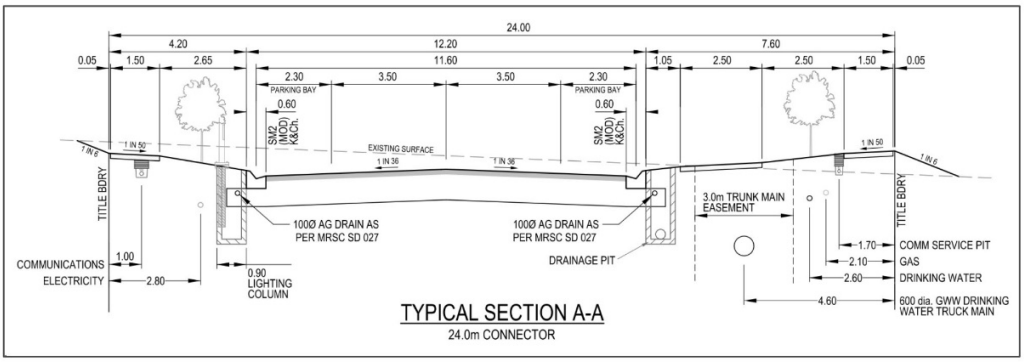


Figure 10 Typical Connector Street Cross Section

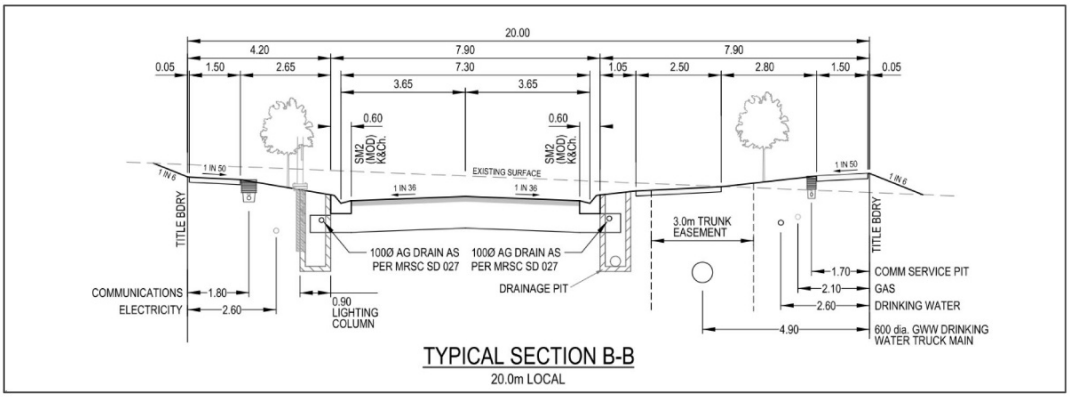


Figure 11 Modified 20m Access Street Cross Section

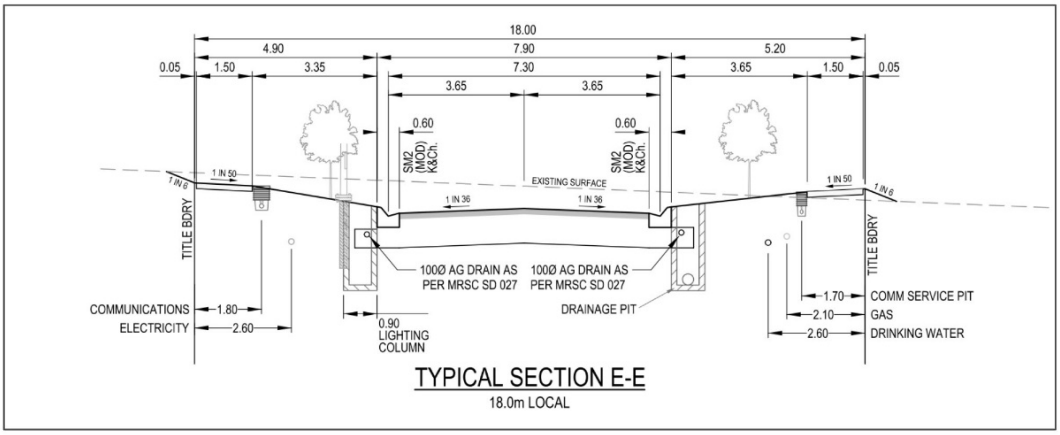


Figure 12 Typical 18m Access Street Cross Section

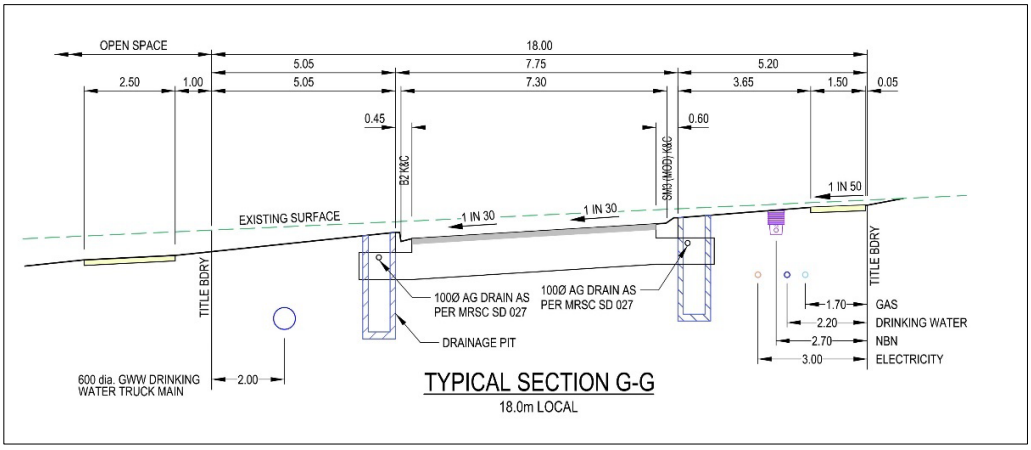


Figure 13 Modified Access Street Cross Section beside Public Open Space

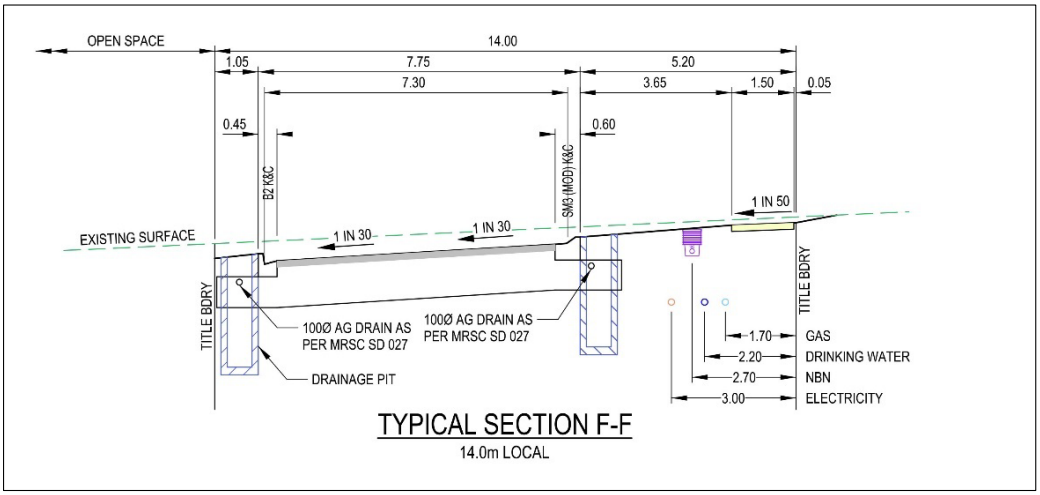


Figure 14 Typical Access Street Cross Section beside Public Open Space

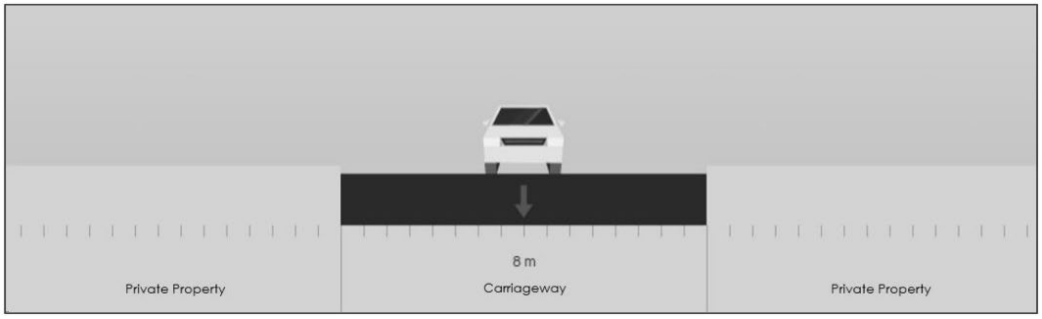


Figure 15 Typical Access Lane Cross Section

- upgrades to Cherry Lane to allow for a 7.3 metres wide carriageway with kerb and channel on both sides of the road;
- partial upgrade of the western side of Swinburne Avenue fronting the site to accommodate a sealed pavement with kerb and channel consistent with the existing Swinburne Avenue treatment to the south of the site as well as a 1.5 metres wide footpath;

- roundabouts at the intersections of Cherry Lane / Station Road and Ross Watt Road / Station Road, generally in accordance with the layout plan in Figure 16;

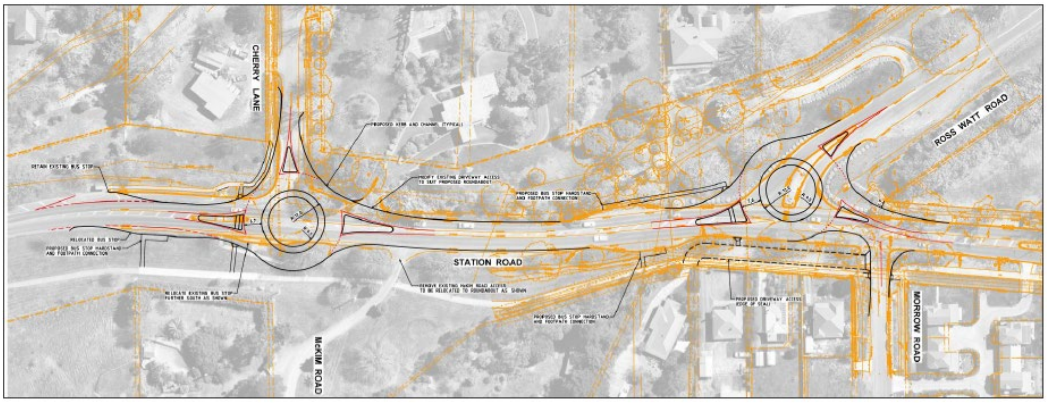


Figure 16 Ross Watt Road / Station Street and Cherry Lane / Station Street intersections

- a permeable network of lower order streets including access streets and access lanes that provide additional connections to the existing residential area to the east;
- areas of open space and allowance for ease of movement throughout the subdivision;
- an existing bus stop on Station Road (as shown in Figure 17) located 550 metres to the east, which provides a connection to the Gisborne Town Centre and Train Station and which is proposed to be extended into the GA1DP area;
- an existing bus stop adjacent to the southeast corner of the site (near the intersection of Swinburne Avenue and Cherry Lane as shown in Figure 17), which provides a connection to the Gisborne Town Centre and Train Station, with this service being a demand response service which requires a booking the day before travel.
- no unacceptable impact on other existing intersections outside the GA1DP area.

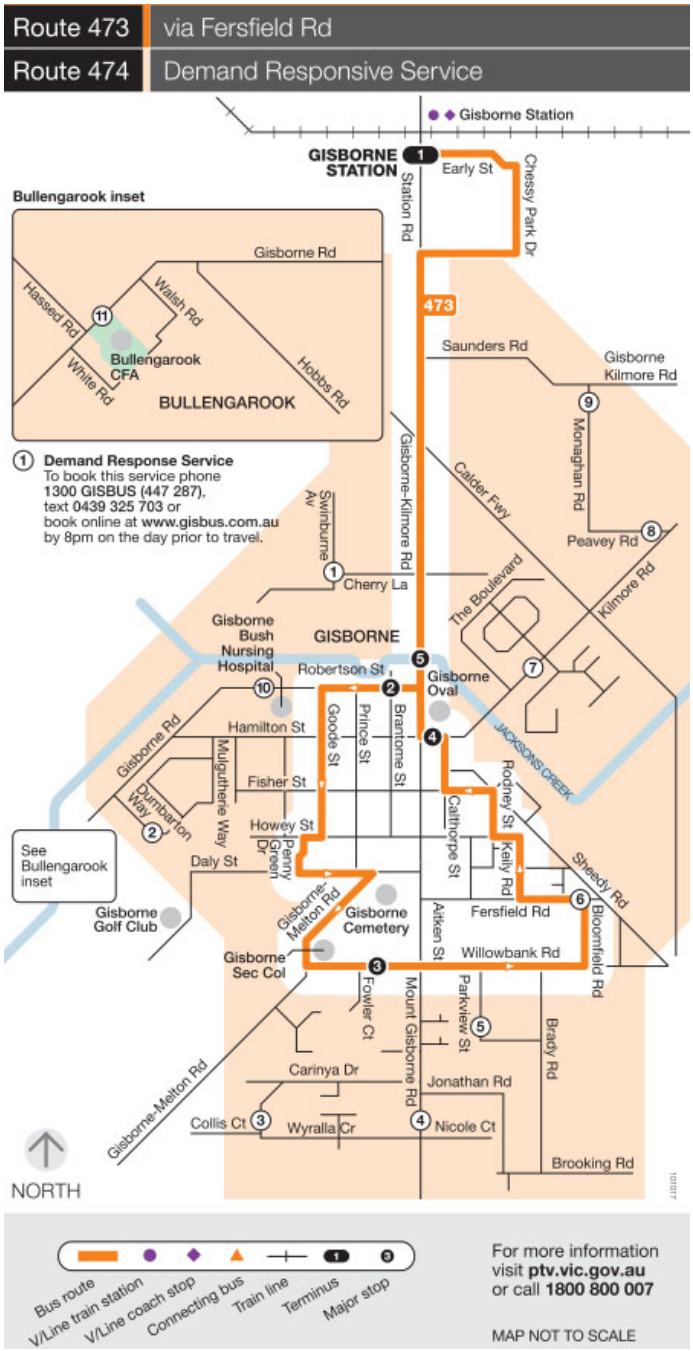


Figure 17 Existing Bus Route

6.6 LANDSCAPE CONCEPT

The landscape concept for the GA1DP area is characterised by:

- variation in street tree species to be planted within the road reserves throughout the GA1DP area to create a street network that is diverse in character, as shown in Figure 18;

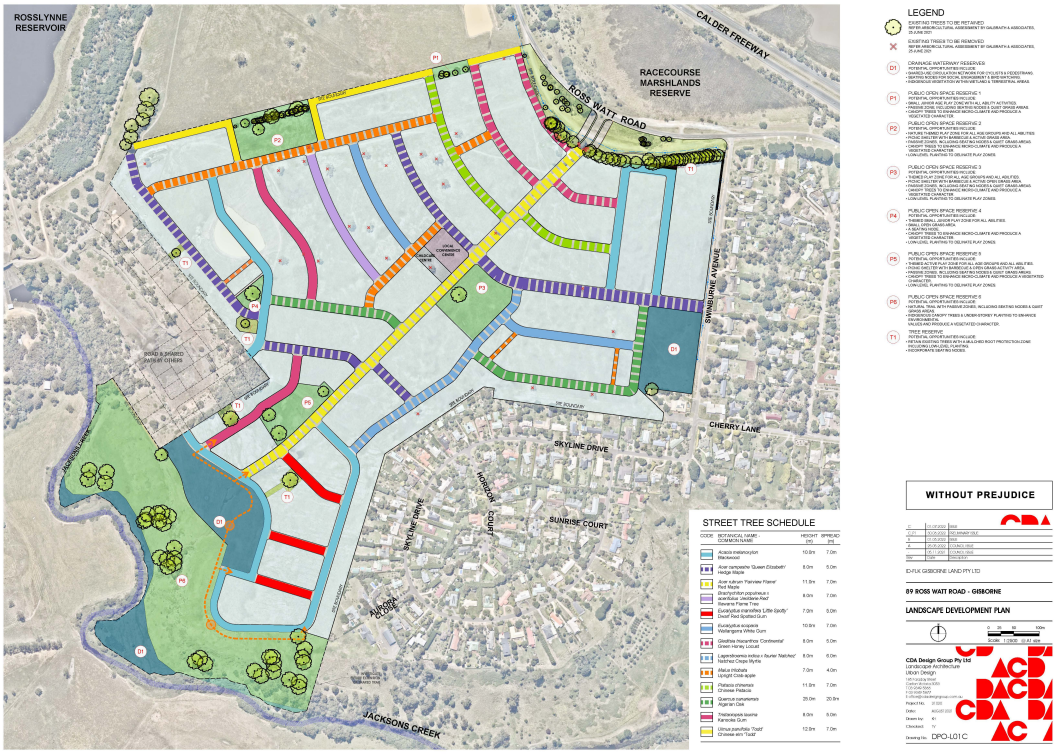


Figure 18 Landscape Concept Plan

- the larger public open space areas as well as the Jacksons Creek Escarpment Open Space Corridor and drainage reserves of the GA1DP area with landscaping of these areas to be detailed at the planning permit stage;
- small local parks throughout the GA1DP area for the purpose of passive recreation, pedestrian links and tree retention;
- possible embellishment of the large verge between the northern boundary of the site and Ross Watt Road through the landscaping of this verge area, subject to agreement from relevant authorities.

6.7 URBAN DESIGN GUIDELINES

Any future subdivision should take into consideration the following urban design guidelines.

- Lots addressing areas of public open space and community facilities to provide opportunities for passive surveillance of these spaces.
- Lots located within 800 metres walking distance of a connector street that is designed to be bus capable.
- Majority of lots within 400 metres walking distance of public open space, ensuring a healthy and active neighbourhood will be facilitated.
- Medium density lots within 400 metres walking distance of public open space and / or a proposed local neighbourhood activity centre.
- Provision of a shared path within the landscaped watercourse public open space reserve and Jacksons Creek Escarpment and Open Space Corridor to encourage recreational use and promote pedestrian and cyclists movements along the corridor.
- Potential child care and local convenience centre to be located in proximity to public open space.
- A range of lot sizes to allow for a diversity of housing types to cater for the needs of a variety of home buyers.
- Potential residential retirement living community to be located in the northern portion of the site.
- Low density lots (1,500 square metres or greater) located along the various boundaries to respond to the existing low density residential subdivision patterns and adjoining Rural Conservation Zone areas at these interfaces.
- Conventional and medium density lots interspersed through the inner GA1DP area.
- Lots to have predominantly either a north-south or east-west axis to maximise solar access.

6.8 LAND BUDGET AND INDICATIVE SUBDIVISION LAYOUT

The GA1DP land budget is as set out below.

Item	Area (hectares)
Gross GA1DP area (GDA)	85.57
less public open space (encumbered)	5.61 (6.5 per cent of gross and including areas for drainage)
Net developable area (NDA)	66.11
less public open space (unencumbered)	13.85 (20.95 per cent of NRA)
Net residential area (NRA)	46.63

An indicative subdivision layout (refer figure 19) has been prepared based on the urban design guidelines contained in this GA1DP and is shown below. It must be stressed that this layout is subject to refinement during the more detailed subdivision design and planning permit application phases of the project.

The indicative layout has the following main characteristics:

- 769 lots;
- lots generally greater than 1500 square metres on the boundaries with the adjoining Rural Conservation Zone, Ross Watt Road and Swinburne Avenue;
- lots with a minimum area of 800 square metres on the internal local access streets;

- lots of 300 to 1500 square metres internal to the GA1DP area and are mostly within 400 metres walking distance of public open space;
- lots less than 300 square metres all located directly opposite areas of public open space.

Figure 19 Indicative Subdivision Layout Plan

6.9 DEVELOPMENT SEQUENCING, STAGING AND TIMING

The indicative development sequencing is shown in the phases in Figure 20.

Individual stage sizes and timing will be determined by market conditions but with the first stage of development to commence from Swinburne Avenue. Actual stage boundaries may vary from the development phase boundaries as a result of the market conditions noted above.

Any planning permit granted for the subdivision and development of the land must include conditions requiring a staging plan for drainage requirements, including any interim drainage solutions necessary for the development of the land to proceed.

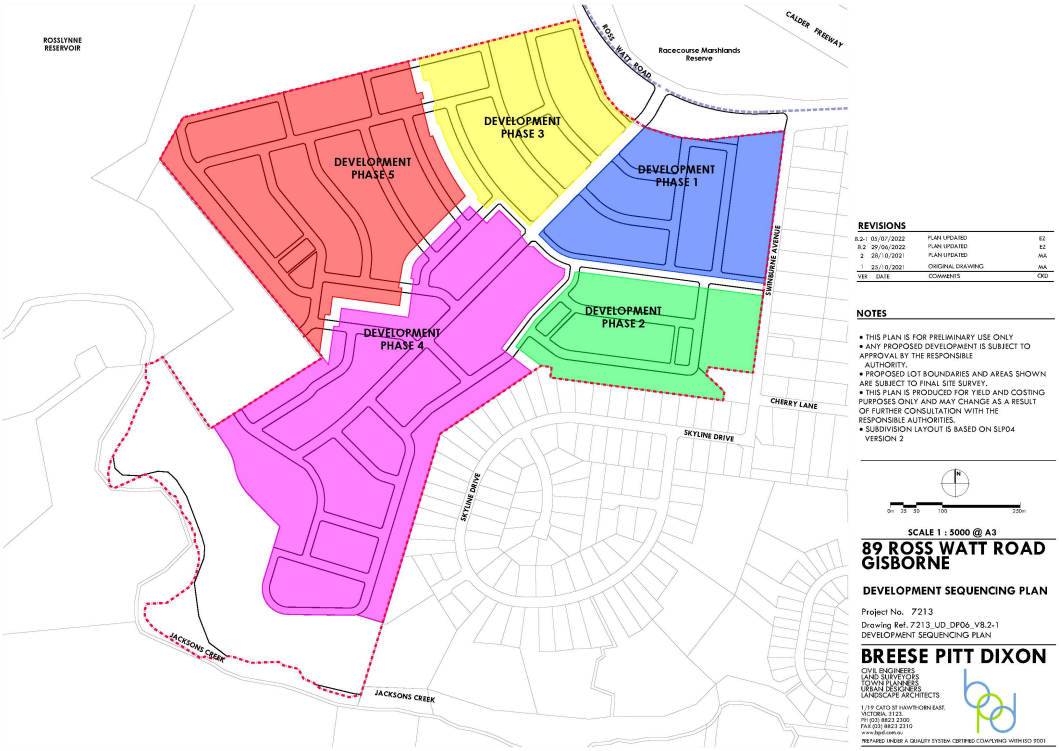


Figure 20 Development Sequencing Plan

APPENDIX A

Tree Schedule, 3 February 2022, Galbraith & Associates

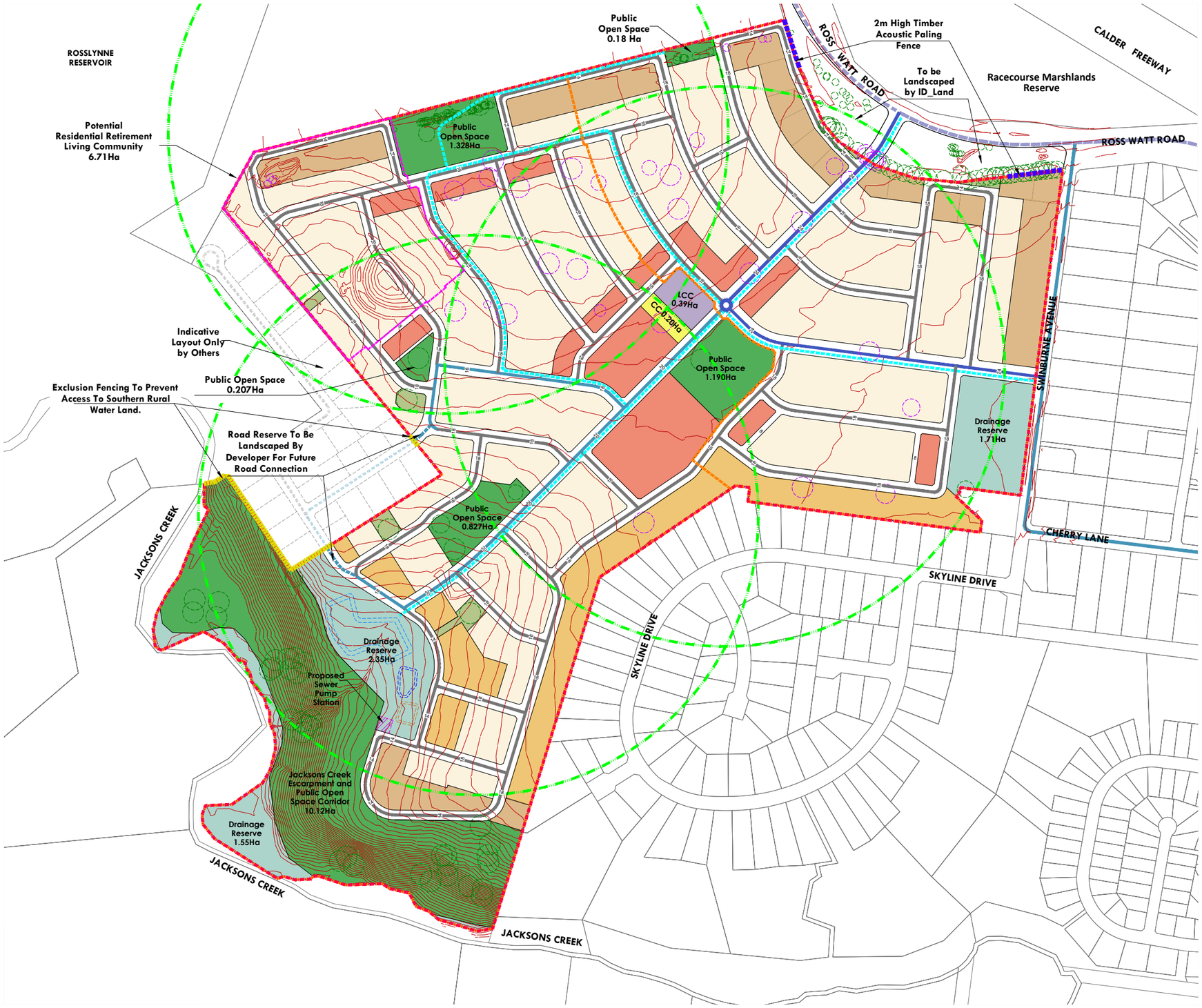
Tree	Species	Origin	DBH	HxS	Condition	W.O.R.	Comments, TPZ (m) & SRZ(m)
No.			**(cm)**	**(m)**	**G = good**	**1 to 10**	
	I: Indigenous				**F = fair**		
	V: Victorian Native				**P = poor**		
	A: Australian Native						
	E: Exotic						
	W: Weed						
1	Pinus radiata (x numerous) (Monterey Pine)	E	to 100 approx	dom ht 25m	F/P	4 (most)	Row of overmature 70 year old approx trees. TPZ to 12.0.
1A	Acacia melanoxylon (Blackwood)	I	27,14,24, 19	8x8	F		In road reserve. Apparently self sown. TPZ 5.2.
2	Quercus robur (x6) (English Oak)	E	to 35	dom ht 12m	G		Approx location added to plan. In road reserve. Roadside trees in two adjacent clumps. TPZ to 4.2.
3	Acacia mearnsii (x10 approx) (Late Black Wattle)	I	15 to 30	dom ht 13m	F/P		Approx location added to plan. In road reserve. Apparently self-sown. TPZ to 3.6.
4	Acacia melanoxylon (Blackwood)	I	38 equiv	4x7	F/P		In road reserve. Stressed. Apparently self sown. TPZ 4.6.
5	Mix of numerous trees as follows						All in road reserve.
	Pinus radiata (Monterey Pine)	E	to 50 approx	dom ht 18m	F/G		TPZ to 6.0.
	Acacia mearnsii (Late Black Wattle)	I	to 40 approx	dom ht 13m	F/P		Generally poor. Apparently self-sown. TPZ to 4.8.
	Acacia melanoxylon (Blackwood)	I	15 to 40 approx	dom ht 12m	F/G		Many healthy stems throughout area. TPZ to 4.8. Apparently self sown.
6	Acacia melanoxylon (group of 8 stems) (Blackwood)	I	to 28	4x10 (group)			In road reserve. TPZ to 3.4. Apparently self sown.
7 to 9	No tree						
10	Eucalyptus pauciflora (Snow Gum)	ISS	30,20,20 equiv	6x9	P	2	Approx location added to plan. Extensive decay. TPZ 5.0.
10A	Eucalyptus sp (Eucalypt)	I	90 approx	2x1	Dead	1	Approx location added to plan. Stump.

11	Eucalyptus ovata (Swamp Gum)	ISS	120	12x10 approx	P	2	Approx location added to plan. Dieback. Extensive decay, little live crown. TPZ 14.4.
12	Eucalyptus ovata (Swamp Gum)	ISS	104	15x11	P	2	Approx location added to plan. Massive past failure. Trunk decay, including basal. TPZ 12.5.
13	Mixed Oaks (x12 approx)	E	30 to 60 approx	dom ht 10m	G		In adjacent property, centred approx 0.6m from colourbond fence. Crown spread over subject site past fence:4m. Mostly Quercus robur (English Oak), plus a few Pin Oak (Quercus palustris). TPZ 3.6 to 7.2.
14	Eucalyptus ovata (Swamp Gum)	ISS	115	16x13	P	2	Trunk decay, dieback. TPZ 13.8.
15	Eucalyptus pauciflora (Snow Gum)	ISS	124	10x13	F/P	3	Massive trunk failure, decay. Form is OK. Could only be retained if crown is kept smallish. TPZ 14.9.
16	Eucalyptus ovata (Swamp Gum)	ISS	130 approx	7x10	P	2	Massive trunk failure. TPZ 15.0.
16A	Eucalyptus sp (Eucalypt)	ISS	100 approx	4x1	Dead	1	Approx location added to plan.
17	Eucalyptus viminalis subsp viminalis (Manna Gum)	ISS	100,40, 25,58	13x20	F/P	5	Much past dieback, but crown is regrowing well. Termite and borer evidence. Root damage by cattle. TPZ 15.0.
17A	Eucalyptus viminalis subsp viminalis (Manna Gum)	ISS	212	17x21	P	2	Basal decay (termites) may well extend the full height of the trunk. Branch failures, hollows. TPZ 15.0.
17B	Eucalyptus viminalis subsp viminalis (Manna Gum)	ISS	161	10x20	F	5	Some basal decay - extent not clear. Massive main stem failure at 5m. Foliage health and density good. TPZ 15.0.
17C	Eucalyptus viminalis subsp viminalis (Manna Gum)	ISS	89	12x16	G	7	Sound, healthy tree. Good form. TPZ 10.7.
18 to 21	No tree						
Tree	**Species**	**Origin**	**DBH**	**HxS**	**Condition**	**W.O.R.**	**Comments, TPZ (m) & SRZ(m)**
No.			**(cm)**	**(m)**	**G = good**	**1 to 10**	
21A	Eucalyptus rubida (Candlebark)	ISS	101	15x14	P	2	Lopsided to north and east with heavy lean to NE. Basal trunk decay. Fungal decay brackets (Phellinus) in main crotch at 5m. A few hollows. TPZ 12.1.
21B	Eucalyptus ovata (Swamp Gum)	ISS	121	14x24	P	2	Extensive decay - basal and beyond (termites). Beehive at 6m at recent branch failure point. TPZ 14.5.
21C	Eucalyptus rubida (Candlebark)	ISS	128	13x18	F/P	3	Massive main stem failure and hollow at 5m. "Replacement crown" of healthy foliage, also mistletoe. Some basal decay. TPZ 15.0.

21D	Eucalyptus rubida (Candlebark)	ISS	122	11x17	P	3	Much basal decay, which extends vertically to past main stem failure point at 5m. "Replacement crown" as above. Hollows, spouts. TPZ 14.6.
22	Eucalyptus ovata (Swamp Gum)	ISS	106	12x17	P	2	Approx location added to plan. Decayed base is open on two sides. TPZ 12.7.
23	Eucalyptus ovata (Swamp Gum)	ISS	126	21x20	F	5	Past main stem failure at 8m. Branch failures, some hollows. Apparently more intact than most others. TPZ 15.0.
24	Eucalyptus ovata (Swamp Gum)	ISS	142	14x21	F/P	4	Basal trunk decay. Form is OK. Recent limb failure. TPZ 15.0.
25	Eucalyptus ovata (Swamp Gum)	ISS	135	15x18	F/P	3	Basal trunk decay. Various branch failures. TPZ 15.0.
26	Eucalyptus ovata (Swamp Gum)	ISS	109	15x19	F	5	Generally compact form; has refoliated well. Hollows/spouts. Uppermost branch sparse. TPZ 13.1.
27	Eucalyptus ovata (Swamp Gum)	ISS	92	13x18	F/P	3	Basal trunk decay. Foliage is fairly healthy. Crown reasonably compact but lopsided to east. TPZ 11.0.
28	Eucalyptus ovata (Swamp Gum)	ISS	131	14x20	F/P	3	Basal decay. A couple of large branch failures. TPZ 15.0.
29	Eucalyptus ovata (Swamp Gum)	ISS	165	12x19	F/P	4	Basal trunk decay, extent unclear. Patchy crown, dead branches. Hollows. TPZ 15.0.
30	Eucalyptus ovata (Swamp Gum)	ISS	60,60 equiv	15x19	F/P	3	Lopsided to SE. Massive stem failure. TPZ 10.2
31	Eucalyptus ovata (Swamp Gum)	ISS	48 equiv	9x7	P	2	Approx location added to plan. Only stem emanates from massive decayed shell. TPZ 5.8.
32	Eucalyptus ovata (Swamp Gum)	ISS	150	11x12	P	2	Approx location added to plan. Much decay - trunk is an open hollow shell. TPZ 15.0.
33	No tree						
33A to 33H	As below						Presumably self-sown.
33A	Acacia mearnsii (x3) (Late Black Wattle)	I	to 15	dom ht 5m	F	2	Loose group of young trees. TPZ 2.0 each.
33B	Acacia mearnsii (Late Black Wattle)	I	16 equiv	5x5	F	3	TPZ 2.0.
33C	Acacia mearnsii (x3) (Late Black Wattle)	I	28,24,28 resp	dom ht 8m	F	4	Healthy close group. TPZ 2.9 to 3.4.
33D	Acacia mearnsii (Late Black Wattle)	I	55,25	10x16	F/P	2	In decline. TPZ 7.8.
33E	Acacia mearnsii (Late Black Wattle)	I	40,41	11x17	P	2	Splitting at base. TPZ 6.9.
33F	Acacia melanoxylon (Blackwood)	I	20	4x6	G	3	TPZ 2.4.

33G	Acacia melanoxylon (Blackwood)	I	19,29	6x8	G	4	TPZ 4.2.
33H	Acacia mearnsii (Late Black Wattle)	I	50,35,25	10x11	Dead	1	
34	Acacia melanoxylon (Blackwood)	I	27	7x7	F/G	4	Presumably self-sown. TPZ 3.2.
35	Acacia mearnsii (x2) (Late Black Wattle)	I	to 60	dom ht 10m	P	2	In decline. Presumably self-sown. TPZ to 7.2.
36	Eucalyptus ovata (x25 approx) (Swamp Gum)	ISS	15 to 45	dom ht 13m	F/G	6 (group)	Self sown offspring of 36A and 36B. Predominantly young mature trees in reasonably good condiiton. TPZ 2.0 to 5.4.
36A	Eucalyptus ovata (Swamp Gum)	ISS	50,50,45, 40 equiv	14x17	P	2	Similar to 36B. TPZ 11.1.
36B	Eucalyptus ovata (Swamp Gum)	ISS	135	12x16	P	2	Main stem failure, lower trunk an open hollow shell. TPZ 15.0.
36C	Acacia melanoxylon (Blackwood)	I	19	6x6	G	3	TPZ 2.3. Presumably self-sown.
37	Acacia mearnsii (x3 approx) (Late Black Wattle)	I	35 to 40	dom ht 11m	P	2	Approx location added to plan. Presumably self sown. Borers, stressed, failure prone. TPZ 4.2 to 4.8.
37A	Cupressus macrocarpa (Monterey Cypress)	E	280 approx	20x20	F		In adjacent property centred approx 1.3m from post and wire fence. Recent upper crown branch failure. TPZ 15.0.
38	Eucalyptus ovata (Swamp Gum)	ISS	136	22x20	P	2	Extensive decay through main stem. Hollows. TPZ 15.0.
Tree	**Species**	**Origin**	**DBH**	**HxS**	**Condition**	**W.O.R.**	**Comments, TPZ (m) & SRZ(m)**
No.			**(cm)**	**(m)**	**G = good**	**1 to 10**	
39	Eucalyptus ovata (Swamp Gum)	ISS	164	14x18	P	2	Extensive decay. TPZ 15.0.
40	Eucalyptus ovata (Swamp Gum)	ISS	60 equiv	9x9	P	2	Decay, main stem failure. TPZ 7.2.
41	Eucalyptus ovata (Swamp Gum)	ISS	123	17x14	F/P	3	Open chimney of trunk decay TPZ 14.8.
42	Eucalyptus ovata (Swamp Gum)	ISS	145	12x19	P	2	Main stem failure, much decay. TPZ 15.0.
43	Eucalyptus ovata (Swamp Gum)	ISS	123,40	12x17	P	2	Approx location added to plan. Massive stem failure, much decay. TPZ 15.0.
44	Eucalyptus ovata (Swamp Gum)	ISS	122	15x17	P	2	Extensive decay. At 3m trunk is an open hollow shell. TPZ 14.6.
45	Eucalyptus ovata (Swamp Gum)	ISS	85,80 equiv	16x23	F/P	3	Massive basal stem failure on north side. Patchy crown. TPZ 14.0.
46	Eucalyptus ovata (Swamp Gum)	ISS	60,35,35, 45 equiv	12x18	P	2	Main stem failure near base. Decay. TPZ 10.6.

47	Eucalyptus ovata (Swamp Gum)	ISS	93 equiv	16x121	F/P	3	Original main stem has failed and is decayed. Extent of decay in existing live stem is not visible. Crown is patchy. TPZ 11.2.
48	Eucalyptus ovata (Swamp Gum)	ISS	90 approx	7x6	Dead	1	
49	Eucalyptus ovata (Swamp Gum)	ISS	155	18x18	P	2	Exensive basal decay. TPZ 15.0.
50	Eucalyptus ovata (Swamp Gum)	ISS	161	14x18	P	2	Lowermost 5m of trunk is a decayed open shell. TPZ 15.0.
51	Eucalyptus ovata (Swamp Gum)	ISS	128	12x12	P	2	Main stem failure, all of live crown leans to east. TPZ 15.0.
52	Eucalyptus ovata (Swamp Gum)	ISS	115	22x19	P	2	Massive stem failure, extensive trunk decay. TPZ 13.8.
53	Eucalyptus ovata (Swamp Gum)	ISS	120	12x15	F/P	3	Failure wound and decay at 4m. TPZ 14.4.
54	Eucalyptus ovata (Swamp Gum)	ISS	99	13x18	F/P	3	Truk decay. Low crown. TPZ 11.9.



LEGEND & LAND BUDGET

Total Site Area	85.57Ha
Permit Application Area Boundary	
Drainage Reserve	5.61Ha
Public Open Space (Jacksons Creek)	10.12Ha
Public Open Space	3.73Ha
Net Developable Area	66.11Ha
Total Net Residential Area	46.63Ha
Total Number of Lots	TBC
Average Lot Size	TBC
Dwelling Density (Dw/NDAHa, Excluding Super Lots MD)	12-12.5Dw/Ha
Childcare Centre	0.20Ha
Local Convenience Centre	0.39Ha
Landscape / Tree Reserve	0.50Ha
Road Network Area	18.39Ha

Residential Retirement Living Community
400m Walkable Catchment
Shared Path Network
Connector Road_Bus Route (24m)
Local Access Street_Level 2 (18-20m)
Local Access Street_Level 1 (14-18m)
Trees to be retained
Trees to be removed
2m High Timber Acoustic Paling Fence
Exclusion Fencing SRW Land

LOT SIZE & DENSITY

Townhouse (Less than 300m²)
Medium - Conventional Density (300-799m²)
Conventional Density (800-1499m²)
Low Density (1500+m²)

REVISIONS

VER	DATE	COMMENTS	CKD
8.2	08/06/2022	LAND BUDGET AMENDED	JC
8.1	03/06/2022	RESIDENTIAL RETIREMENT LIVING COMMUNITY ADDED	MA
8	24/05/2022	PLAN UPDATED	MA
7	06/04/2022	LAYOUT AMENDED	JC
6	05/04/2022	LAYOUT AMENDED	JC
5	23/03/2022	LAYOUT AMENDED	JC
4	03/02/2022	LAND BUDGET AMENDED	JC
3	08/12/2021	PLAN AMENDED	JC
2	18/11/2021	PLAN AMENDED	JC
1	16/11/2021	ORIGINAL DRAWING	MA

NOTES

- THIS PLAN IS FOR PRELIMINARY USE ONLY
- ANY PROPOSED DEVELOPMENT IS SUBJECT TO APPROVAL BY THE RESPONSIBLE AUTHORITY.
- PROPOSED LOT BOUNDARIES AND AREAS SHOWN ARE SUBJECT TO FINAL SITE SURVEY.
- THIS PLAN IS PRODUCED FOR YIELD AND COSTING PURPOSES ONLY AND MAY CHANGE AS A RESULT OF FURTHER CONSULTATION WITH THE RESPONSIBLE AUTHORITIES.

N

0m 25 50 100 250m

SCALE 1 : 2500 @ A1

89 ROSS WATT ROAD GISBORNE

SUBDIVISION LAYOUT PLAN

Project No. 7213

Drawing Ref. 7213_UD_ODP_V8.2

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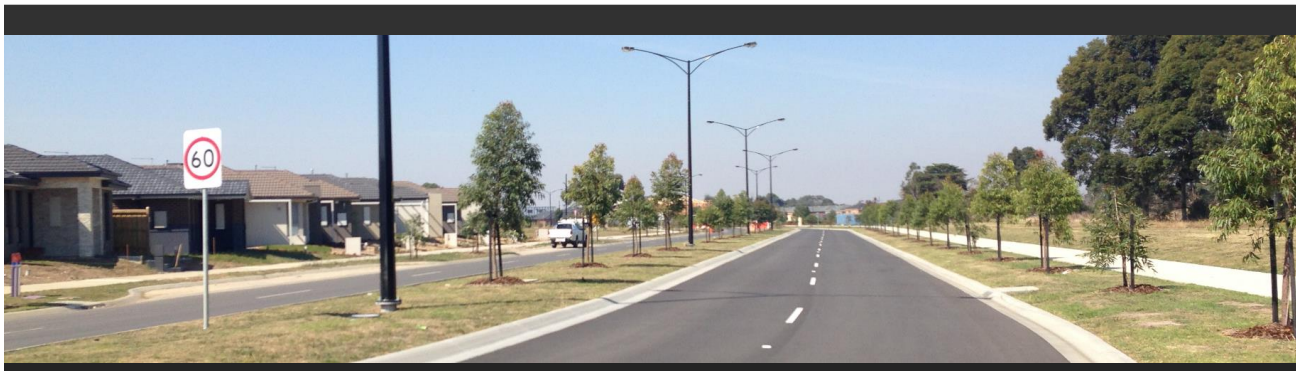
Transport Impact Assessment



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3 June 2022

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DOCUMENT INFORMATION

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Prepared by	Martin Kropiewnicki	**Reviewed by**	Valentine Gnanakone
Signature	M. Kropiewnicki	**Signature**	Valentine G

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APPENDIX A CONCEPT INTERSECTION PLANS
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1 INTRODUCTION

onemile**grid** has been requested by ID Ross Watt Pty Ltd to undertake a Transport Impact Assessment of the proposed residential subdivision at 89 Ross Watt Road, Gisborne.

As part of this assessment the subject site has been inspected with due consideration of the development proposal, traffic data has been sourced and relevant background reports have been reviewed.

This report has been prepared to undertake further traffic analysis in response to comments from Department of Transport (DoT).

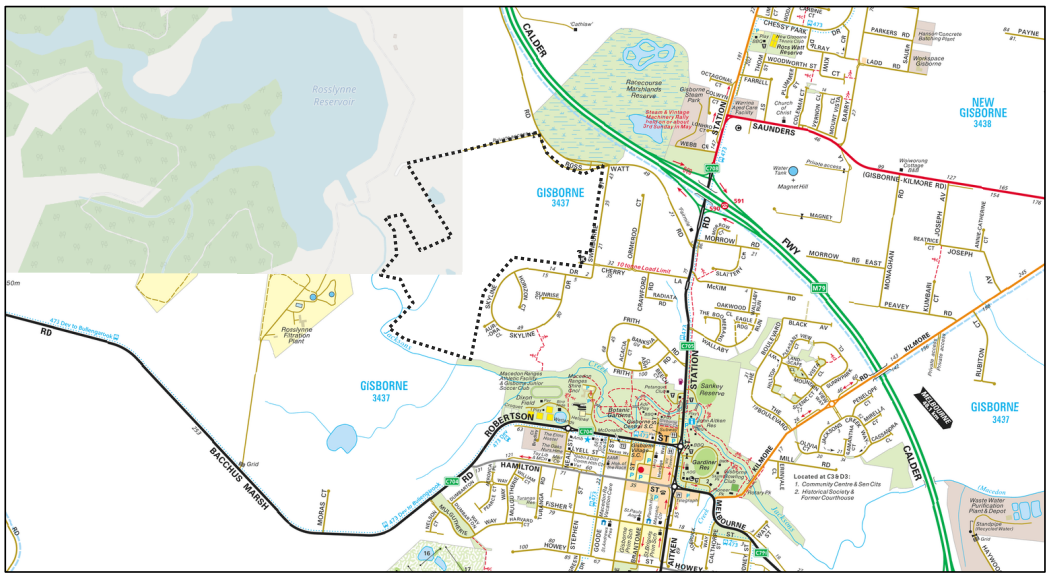
2 EXISTING CONDITIONS

2.1 Site Location

The subject site is located on the southern side of Ross Watt Road and is irregularly shaped with abuttals to Swinburne Avenue to the east, existing residential dwellings to the southeast, Jacksons Creek to the south and southwest, and rural land to the west and northwest.

A view of the site location is shown in Figure 1.

Figure 1 Site Location



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The site has a frontage to Ross Watt Road for approximately 529 metres, and a frontage to Swinburne Avenue for approximately 466 metres, with a total site area of 88.41 Ha.

The site has a dwelling located along the site's northern boundary, with the remainder of the site generally rural.

Vehicular access to the site is currently provided along the Ross Watt Road gravel service road, as summarised below:

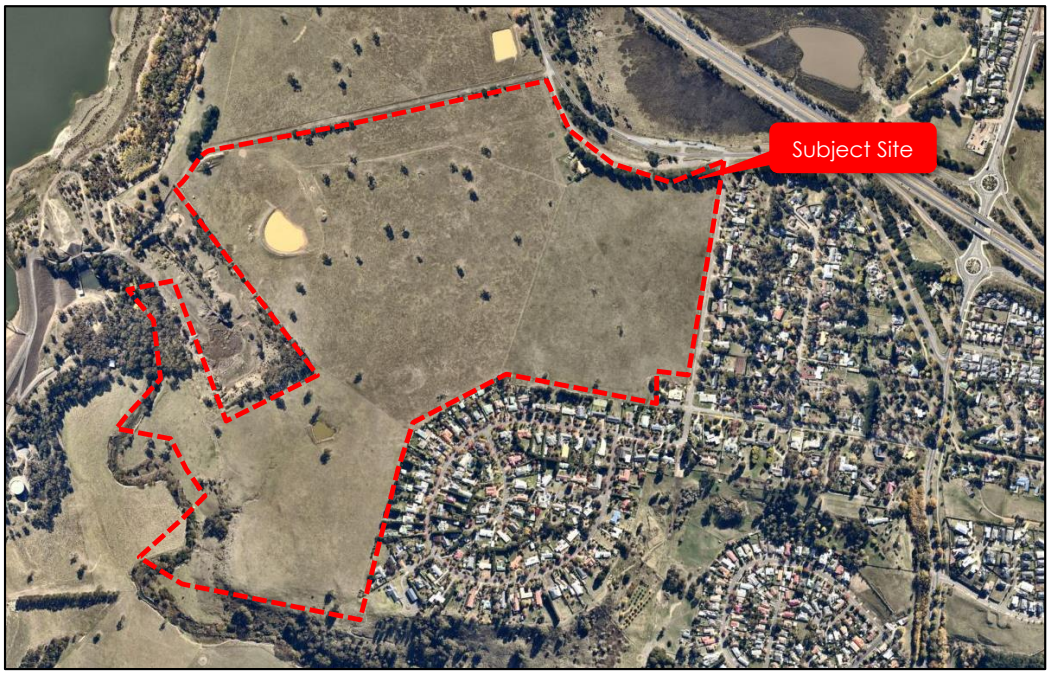
- A gravel crossover located centrally along the service road providing access to the dwelling; and
- A gravel crossover located in the northern corner providing access to an internal gravel road which runs along the site's north-western boundary.

No vehicular access is provided along the site's frontage to Swinburne Avenue.

The site abuts residential land uses, with the east being occupied by standard density residential lots and the west being occupied by rural residential lots. In addition, a child care centre is located in the southeast corner of the site, at the intersection of Swinburne Avenue and Cherry Lane.

An aerial view of the subject site is included in Figure 2 below.

Figure 2 Site Context (29 April 2021)



Copyright Nearmap

2.2 Planning Zones and Overlays

It is shown in Figure 3 that the site is located within a General Residential Zone – Schedule 1 (GRZ1). In addition, the site is subject to the following Planning Overlays:

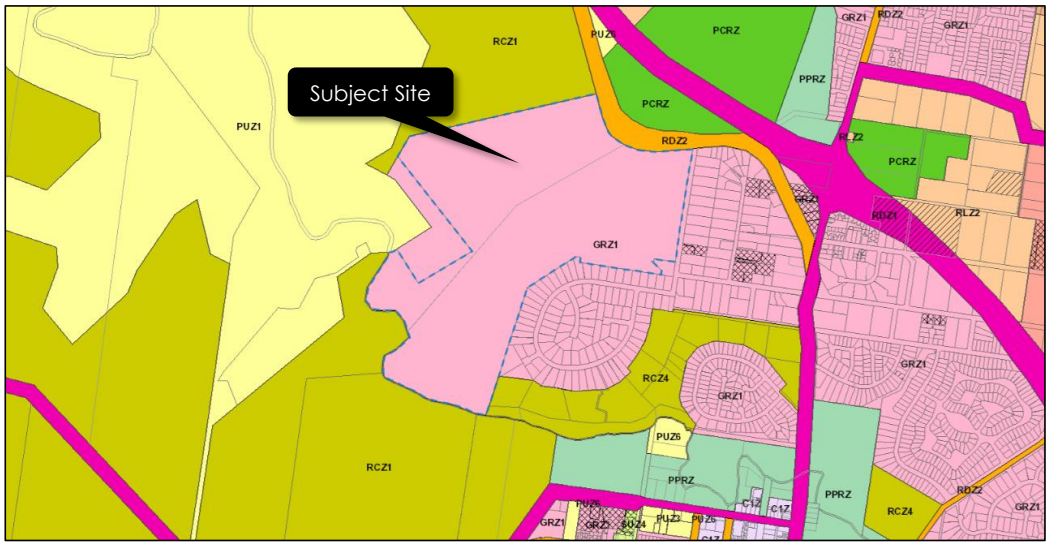
- Development Plan Overlay – Schedule 4;
- Land Subject to Inundation Overlay; and
- Development Contributions Plan Overlay – Schedule 2.

It is noted that DPO4 which applies to the subject site is required to provide the following for any proposed Development Plan's:

"A detailed traffic assessment and management plan addressing the impact of the development on the arterial and local road network, including mitigation works required on the road network in addition to funding responsibilities. The plan must show typical road cross sections and integration with the existing and proposed road, bicycle and pedestrian networks and public transport."

Additionally, the site abuts Ross Watt Road which is within a Road Zone – Category 2 (RDZ2).

Figure 3 Planning Scheme Zones



2.3 Road Network

2.3.1 Ross Watt Road

Ross Watt Road is a local Council road aligned northwest to east from Mount Macedon Road through to Station Road. Ross Watt Road currently provides a single traffic lane with grassed / gravel shoulders in each direction adjacent the site. In addition, a gravel service road is provided on the southern side of Ross Watt Road (along the site's frontage), which connects informally to the main carriageway in the northwest and east.

A signed 80km/h speed limit applies to Ross Watt Road in the vicinity of the site.

The intersection with Station Road is arranged as a T-intersection with priority provided to Station Road with fully directional movements permitted. A short right turn lane is provided for southbound motorists from Station Road into Ross Watt Road.

2.3.2 Swinburne Avenue

Swinburne Avenue is a local Council road aligned north to south from Ross Watt Road through to Cherry Lane where it continues as Skyline Drive. Swinburne Avenue currently provides a 6m wide pavement width which accommodates traffic in both directions, with the eastern side urbanised with kerb and channel, whilst the western side includes a gravel shoulder only.

The default 50km/h speed limit applies to Swinburne Avenue in the vicinity of the site.

The intersection with Ross Watt Road is arranged as a T-intersection with priority provided to Ross Watt Road.

2.3.3 Cherry Lane

Cherry Lane is a local Council road aligned east to west from Swinburne Avenue through to Station Road. Cherry Lane operates with a 6.7 metre wide pavement which offers a single traffic lane in each direction with gravel / grassed shoulders on each side. A 1.5 metre wide footpath is provided along the length of Cherry Lane on the southern side which links to a bus stop to the south of the intersection with Station Road.

The default 50km/h speed limit applies to Cherry Lane in the vicinity of the site.

The intersection with Station Road is arranged as a T-intersection with priority provided to Station Road. A short right turn lane is provided for southbound motorists and a short left turn lane is provided for northbound motorists from Station Road into Cherry Lane.

2.4 Traffic Volumes

2.4.1 Mid-Block Traffic Volumes

Traffic volume surveys were undertaken by Trans Traffic Survey on behalf of **one**mile**grid** at several locations in the vicinity of the site, for a one-week period from Wednesday 23rd February 2022 to Tuesday 1st March 2022 inclusive.

A summary of the existing traffic volumes surveyed along the road's surveyed are shown in Table 1.

Table 1 Existing Traffic Volumes

Direction	*AM Peak*	*PM Peak*	*Weekday Average*
Station Road (north of McKim Road)			
Northbound	605 vph	686 vph	8,155 vpd
Southbound	735 vph	763 vph	8,070 vpd
Total	**1,340 vph**	**1,449 vph**	**16,225 vpd**
Ross Watt Road			
North-westbound	68 vph	96 vph	953 vpd
South-eastbound	57 vph	68 vph	754 vpd
Total	**125 vph**	**164 vph**	**1,707 vpd**
Cherry Lane			
Westbound	53 vph	61 vph	591 vpd
Eastbound	64 vph	48 vph	570 vpd
Total	**117 vph**	**109 vph**	**1,161 vpd**
Swinburne Avenue			
Northbound	33 vph	17 vph	140 vpd
Southbound	13 vph	16 vph	113 vpd
Total	**46 vph**	**33 vph**	**253 vpd**

2.4.2 Turning Movement Counts

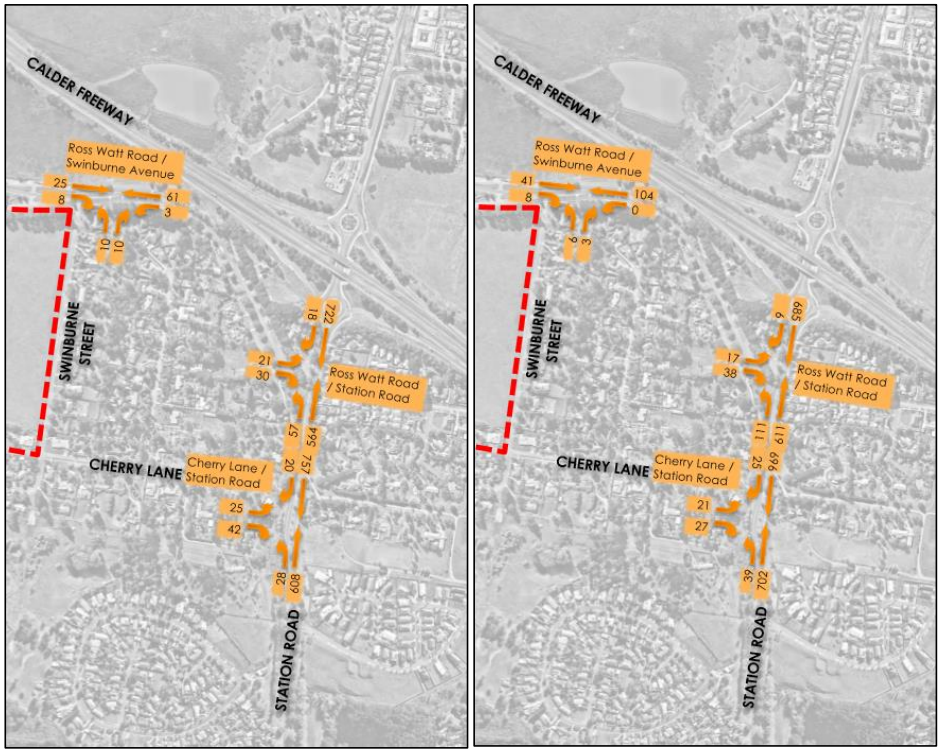
Traffic volume surveys were undertaken by Trans Traffic Survey on behalf of **one**mile**grid** on Wednesday 9th February 2022, between 7:00am and 9:30am, and between 3:00pm and 7:00pm, at the following intersections in Gisborne:

- Ross Watt Road / Swinburne Road;
- Ross Watt Road / Station Road; and
- Station Road / Cherry Lane.

The results of the above surveys are shown in Figure 4.

Figure 4 Existing Traffic Volumes – 9th February 2022

AM Peak PM Peak



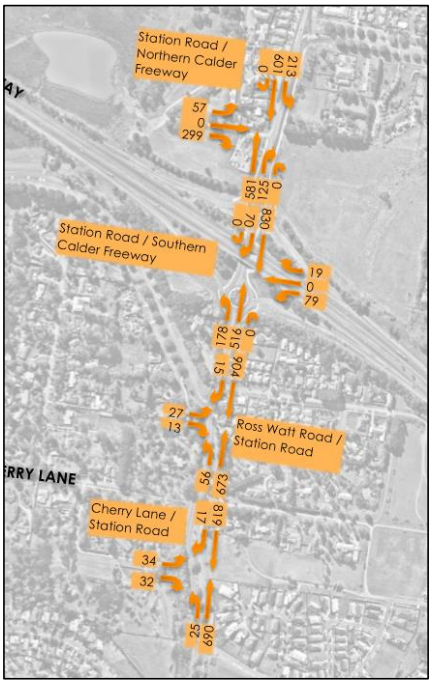
In addition, traffic volume surveys were undertaken by Trans Traffic Survey on Wednesday 9th March 2022, between 7:00am and 9:30am, and between 2:00pm and 6:30pm, at the following intersections in Gisborne:

- Station Road / Ross Watt Road;
- Station Road / Cherry Lane;
- Station Road / Calder Freeway Eastbound Lane On/Off Ramp; and
- Station Road / Calder Freeway Westbound Lane On/Off Ramp.

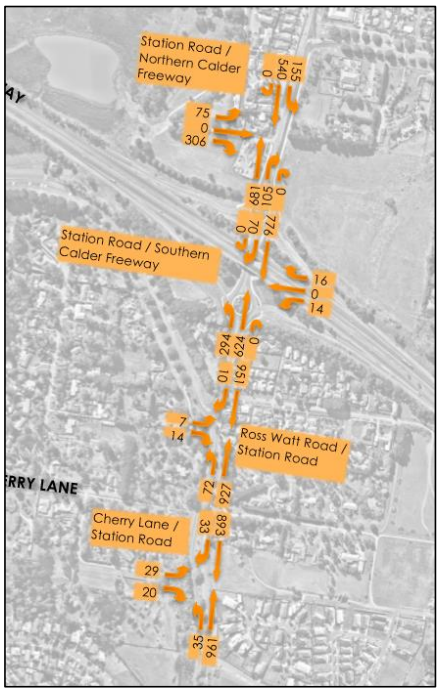
The results of the above surveys are shown in Figure 4.

Figure 5 Existing Traffic Volumes – 9th March 2022

AM Peak



PM Peak



An analysis of the February and March traffic volumes shows that there was significantly more through traffic along Station Road during both the AM and PM peak period. It was later identified that upgrade works were occurring at the intersection of Melbourne Road / Kilmore Road which involved the Kilmore Road leg being closed with a significant amount of traffic from the Gisborne township and Riddells Creek (and beyond) being diverted along Station Road as shown in Figure 6. It is understood that these works began on the 6th of March and are expected to continue until late 2022.

Figure 6 Traffic Diversion

A comparison between the Station Road traffic volumes showed that the March traffic volumes had 202 additional movements during the AM peak period and 466 additional movements during the PM peak period compared to the February volumes. Therefore, it is expected that the north-south through movements are over-represented in the March surveys, and therefore the difference between the two survey periods have been removed from the Station Road traffic volumes obtained in March. The modified traffic volumes are shown below in Figure 7.

Figure 7 Modified Traffic Volumes – 2022

AM Peak PM Peak

To confirm the validity of the above traffic volumes, **one**mile**grid** has reviewed the above Station Road traffic volumes against the tube count volumes undertaken between Wednesday 23rd February 2022 to Tuesday 1st March 2022 inclusive (previously shown in Table 1). A comparison of the Station Road traffic volumes to the north of Ross Watt Road is shown in Table 2.

Table 2 Traffic Volume Comparison – Station Road

Source	*AM Peak*	*PM Peak*
Modified Turning Movement Surveys	1,422 vph	1,462 vph
Tube Count – Weekday Average	1,340 vph	1,449 vph
Difference	**+6%**	**+1%**

As shown above, the modified turning movement volumes are marginally higher than the tube count volumes and therefore expected to be representative of typical traffic volumes in the vicinity.

2.5 Sustainable Transport

Public transport in the immediate vicinity of the subject site is limited to bus services. The 473 Gisborne – Gisborne Station bus service operates along Station Road (550 metres east of the subject site) and provides access to Gisborne Train Station and to the Gisborne township.

Gisborne Train Station is located in 'New Gisborne', approximately 2km north of the subject site, and provides access to the Melbourne CBD, as well as other regional areas by train.

In addition, areas outside of the 473 bus route benefit from a Demand Responsive Service that operates in the shaded areas in Figure 8, and includes the childcare located at the intersection of Swinburne Avenue and Cherry Lane. To use this service, it is required to book by phone or online the day before travel.

The Gisborne bus network map has been provided in Figure 8.

An off-road shared path runs along Station Road, to connect the Gisborne Township with New Gisborne.

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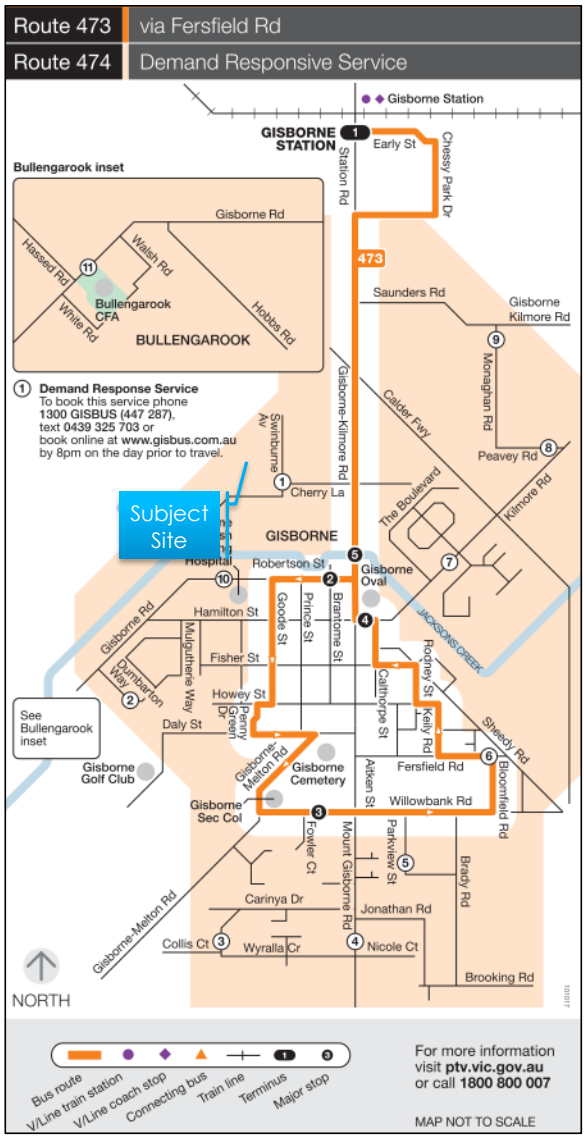
Figure 8 Gisborne Bus Network



3 PLANNING BACKGROUND

3.1 Gisborne Outline Development Plan

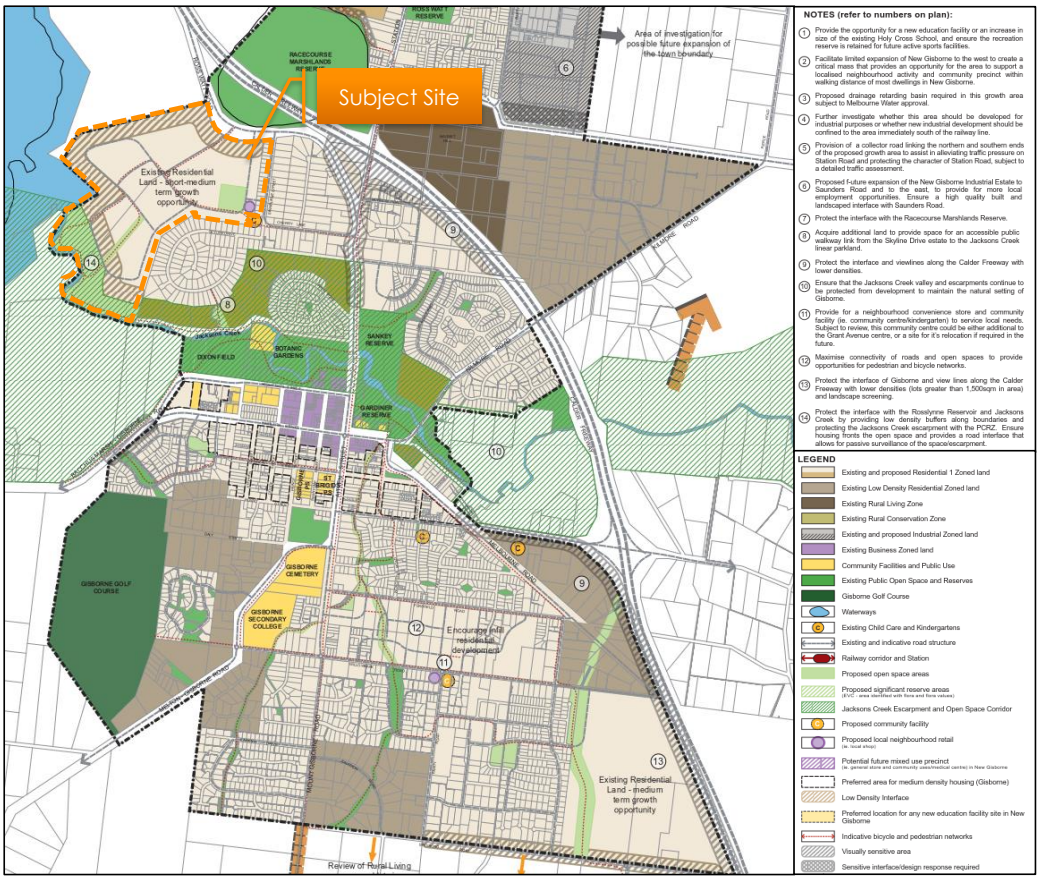
3.1.1 Overview

The site is located within the Gisborne Outline Development Plan (Amendment C67 Part 1 – September 2012) for which an extract is shown in Figure 9.

The outline development plan provides a framework for future growth and development of Gisborne, including future land uses, transport networks, open space and environmental features. As shown in the below figure, the site is located in the north-western corner of the site.

The site is nominated in the structure plan largely as residential land, with a local neighbourhood retail centre proposed in the south-eastern corner of the site.

Figure 9 Gisborne / New Gisborne Structure Plan



The ODP had recommended to realign Ross Watt Road so that it aligns with Morrow Road and it becomes a major four-leg intersection with Station Road.

A view of the ODP road network is shown in Figure 10.

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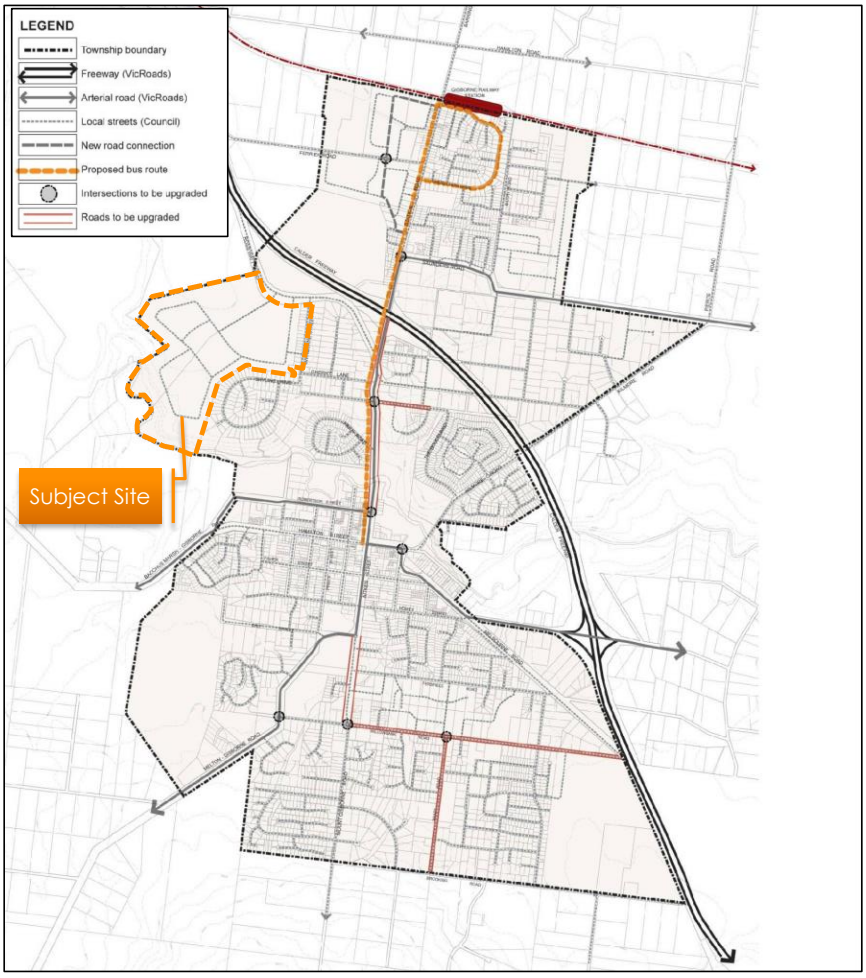
Figure 10 Structure Plan Road Network

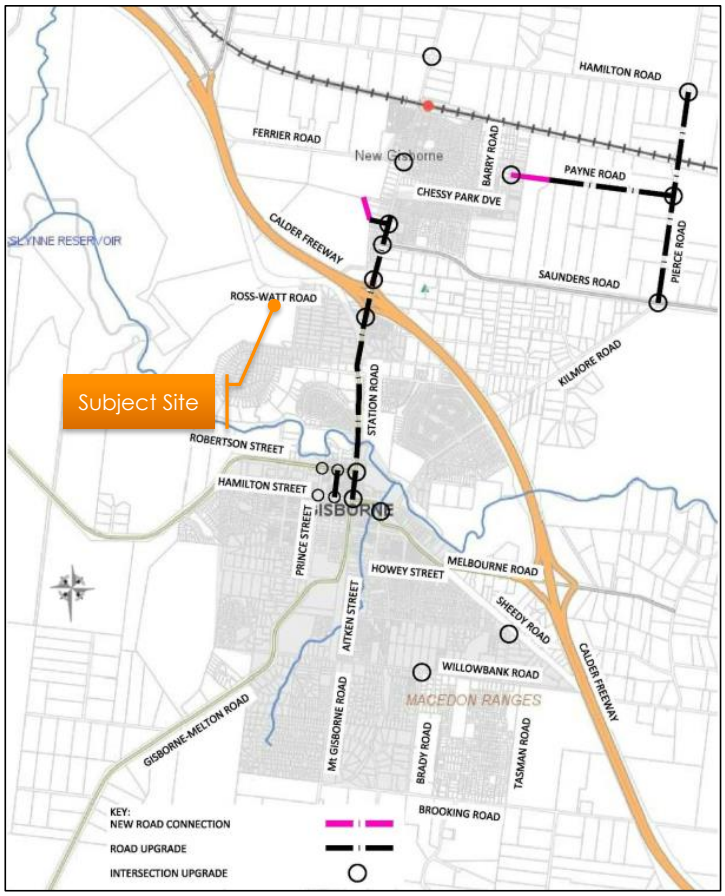


3.1.2 Gisborne Movement Network Study

In 2016 a traffic study was prepared for Macedon Ranges Shire Council for the township of Gisborne. This study was to replace the 2009 traffic study which was adopted in the above Gisborne Outline Development Plan. The updated study is based on new information regarding yields for new developments within Gisborne.

Extracts of the network study are shown below, indicating the road network, walking and cycling network proposed in the vicinity of the site.

Figure 11 Recommended Road Infrastructure Upgrades



As shown above, a major road upgrade is proposed along Station Road which is to duplicate Station Road between Robertson Street and Saunders Road.

Figure 12 Recommended Future Road Hierarchy

The recommended future road hierarchy above identifies Ross Watt Road at the frontage of the site as a 'Council Secondary Traffic Road'.

3.2 Traffic and Transport Recommendations Report

Council engaged Cardno to prepare a 'Traffic and Transport Recommendations Report' which assessed the Gisborne development area. Of relevance to the subject site, the following was noted / recommended:

Station Road does not have the capacity to manage future traffic volumes without either significantly increasing the capacity through duplication, or providing alternative routes for traffic to relieve pressure on that link. In order to operate at an acceptable level of service without full duplication, a number of additional improvements are recommended:

- Local widening to two lanes at key intersections to increase capacity, particularly on the approach to Robertson Street, including the widening of the bridge over Jackson's Creek;
- Intersection safety and capacity improvements at **Ross Watt Road / Morrow Road, Cherry Lane**, and Frith Road; and
- Improved layouts at direct property access points such as Caltex Garage and Sankey Reserve.

Cherry Lane should be upgraded to a collector road to provide access to the vacant residential land west of Swinburne Ave and Skyline Drive, and upgrade the intersection at Station Road (the upgrade of Cherry Lane has been included in future traffic model scenarios).

Ross Watt Road should be upgraded east of Swinburne Ave along with the intersection at Station Road.

3.3 Gisborne Development Contributions Plan (DCP)

The subject site is located within the Gisborne Development Contributions Plan which has been prepared by the MPA (now the VPA) in partnership with the Shire of Macedon Ranges. The DCP has been prepared to outline the projects, framework and financial contribution required to deliver the infrastructure projects necessary for future residents. It includes the land and cost to fund road network upgrades, intersection construction and community facilities. The subject site is located within Area 4.

An extract of the Gisborne DCP is provided in Figure 13.

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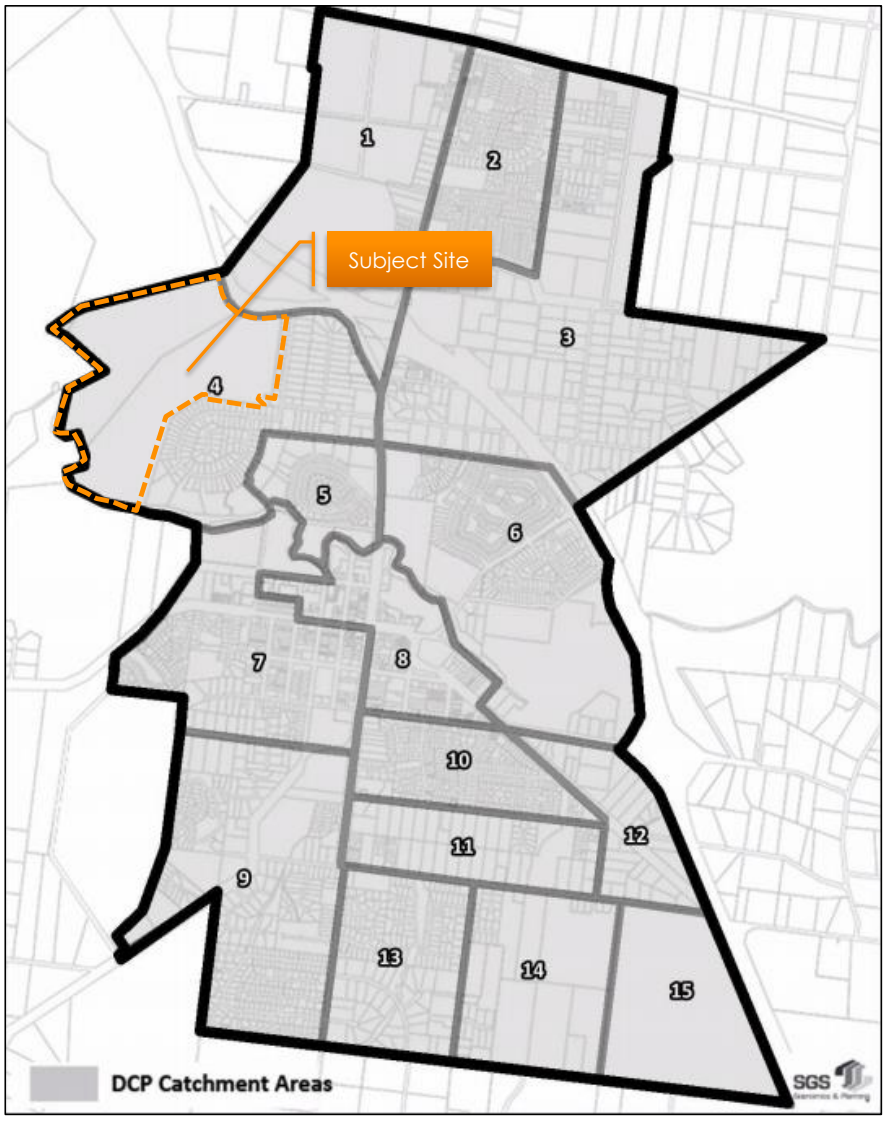
Figure 13 Gisborne DCP



4 DEVELOPMENT PROPOSAL

4.1 General

It is proposed to develop the subject site for the purposes of a residential subdivision, comprising of mixed-density residential lots (low, medium and standard density), a local convenience centre and a childcare centre, as summarised below in Table 3.

The ultimate development of the site is expected to be approximately 778 lots (yield expected to vary depending on density between 700 - 800 lots).

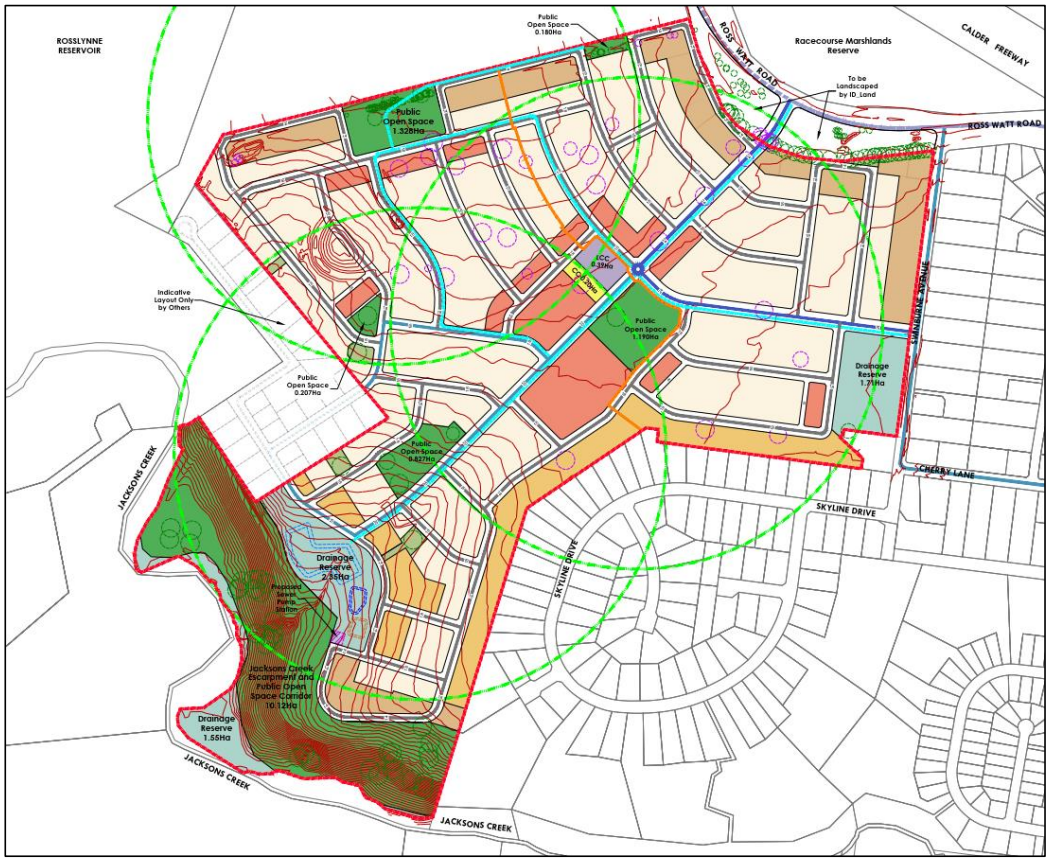
Table 3 Proposed Development

Component	No/Area
Dwellings	778 lots (67.07Ha)
Local Convenience Centre	0.39Ha
Childcare Centre	0.2Ha

It is envisaged that the residential development will be delivered in stages.

A view of the indicative lot layout is provided in Figure 14.

Figure 14 Proposed Lot Layout



4.2 Vehicle Access

Vehicular access to the subject site is to be provided at two access points along the northern and eastern boundaries, as summarised below.

- Unsignalised T-intersection to Ross Watt Road along the site's northern boundary; and
- Fully-directional unsignalised T-intersection to Swinburne Avenue along the site's eastern boundary.

4.3 Internal Road Layout

The proposed internal road network is generally consistent with that identified within the Gisborne ODP. A Connector Street with a road reserve of 24m bisects the site, running southwest from Ross Watt Road to approximately midway in the site, before realigning and running east to Swinburne Avenue.

The remainder of the site provides for a connected road network which includes Local Access Streets which link to the Connector Street network or Swinburne Avenue. Generally, all Local Access Streets have a 7.3m wide carriageway capable of providing kerbside parking and traffic in both directions within an 18 metre cross-section. In addition, a 20m modified Local Access Street with an off-road shared path is located to the south of the realigned connector street.

All internal roads fronting open spaces (including the Jacksons Creek open space) will incorporate the footpath or shared path (subject to confirmation on Council's shared path strategy) within the open space network and thus the formal road reserve will be reduced in width by up to 4 metres to acknowledge the effective verge and path within the open space area, in accordance with the cross-section shown in Figure 20.

Laneways are proposed to provide access to rear loaded lots as required.

With regard to intersections across the internal road network, a roundabout is proposed to manage movements at the 4-way intersection between the realigned connector road and the modified Local Access Streets. All other internal intersections will be controlled by unsignalised T-intersections.

Speed control measures will be required to be implemented along roads exceeding 240m in length. It is recommended that threshold treatments be proposed at the location of T-intersections as an effective means of speed control.

A view of the proposed internal road network is provided in Figure 15, with the corresponding cross-sections shown within Figure 16 to Figure 21.

Figure 15 Proposed Internal Road Layout

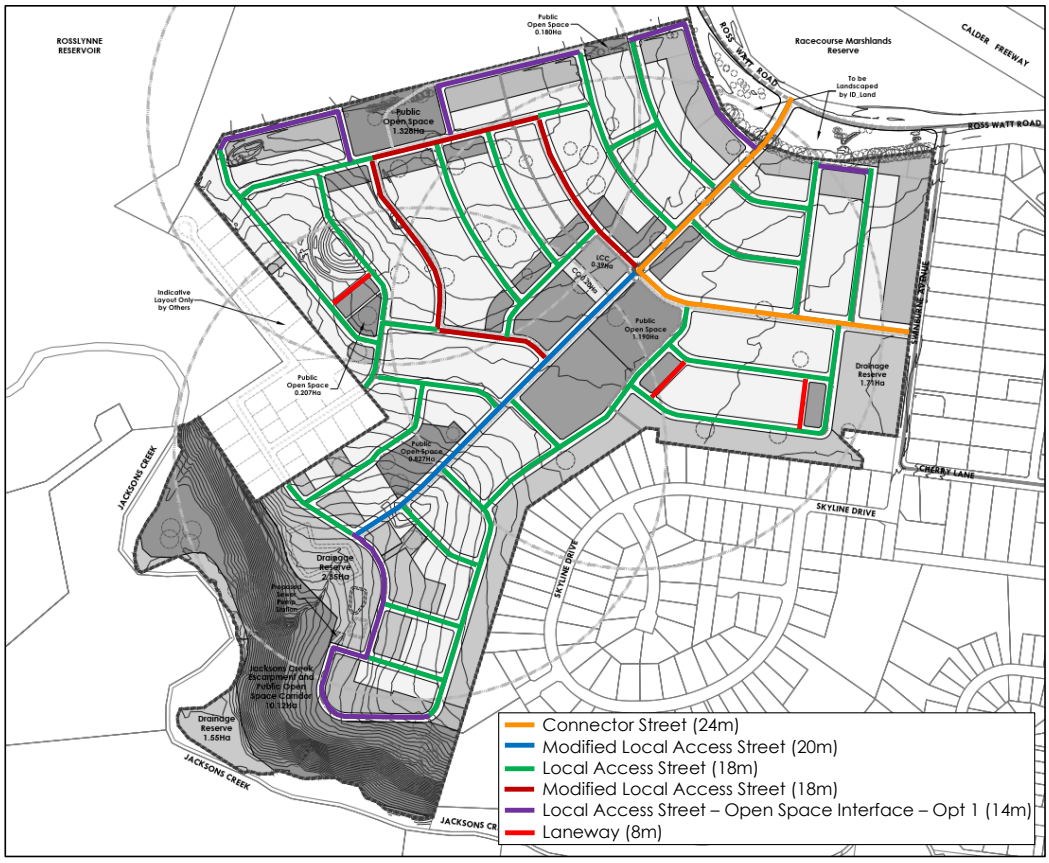


Figure 16 Connector Street Cross Section (24m)

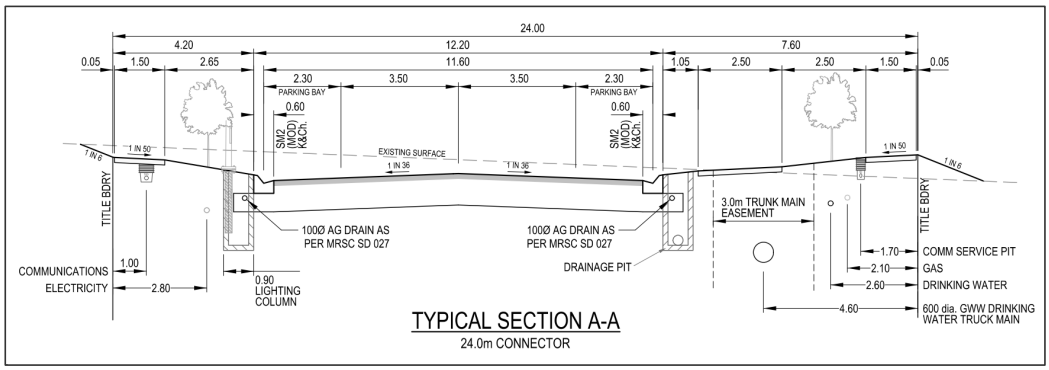


Figure 17 Modified Local Access Street Cross Section (20m)

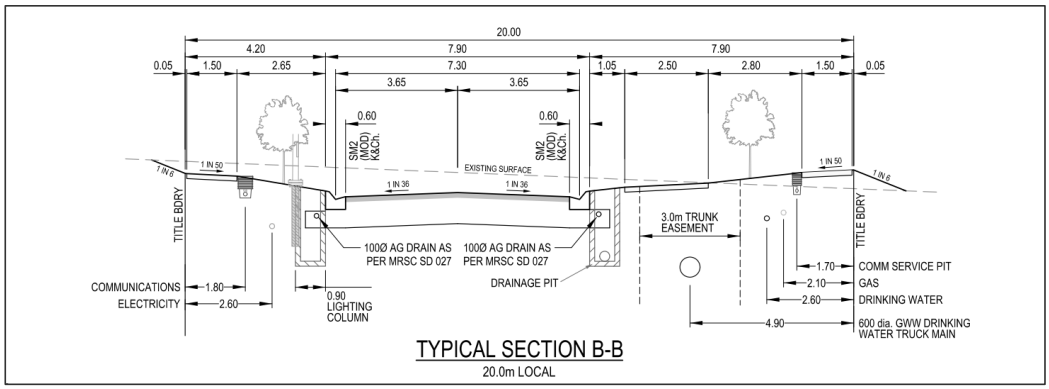


Figure 18 Local Access Street Cross Section (18m)

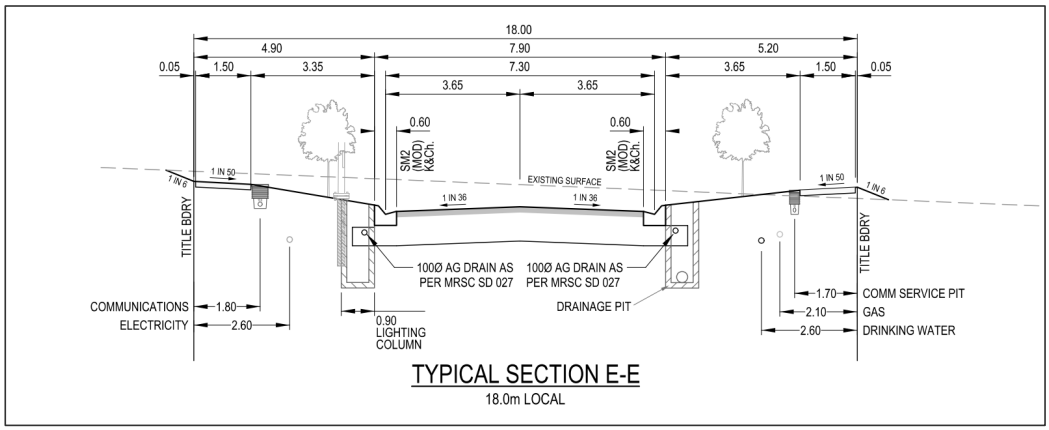


Figure 19 Modified Local Access Street Cross Section (18m)

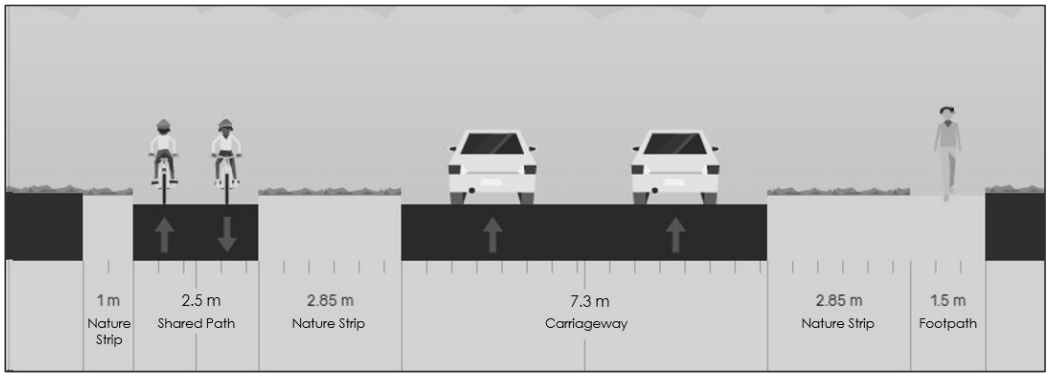


Figure 20 Local Access Street – Open Space Interface Cross Section – Opt 1 (14m)

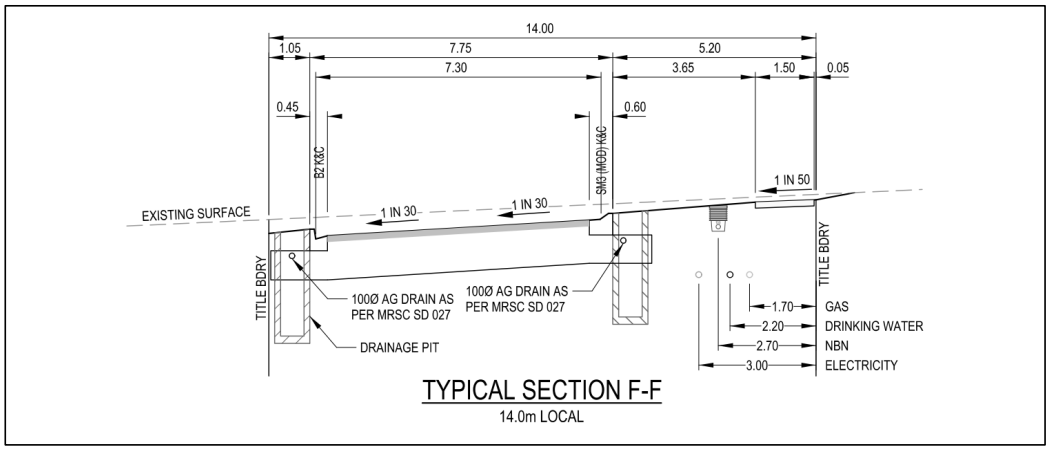
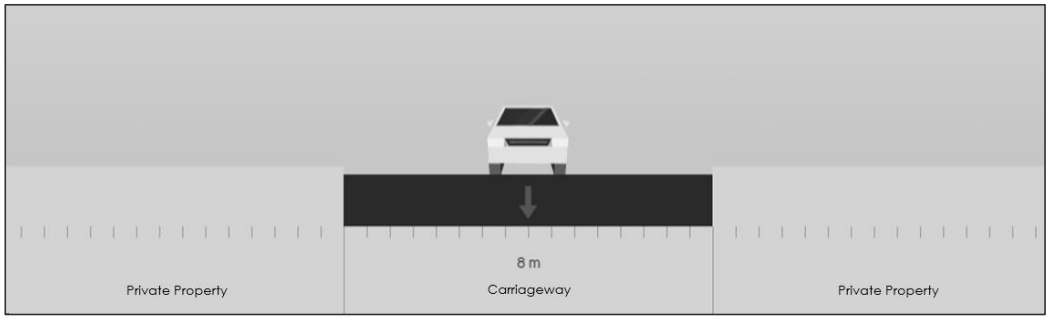


Figure 21 Laneway Cross Section (8m)



4.4 External Road Infrastructure Upgrades

4.4.1 Intersections

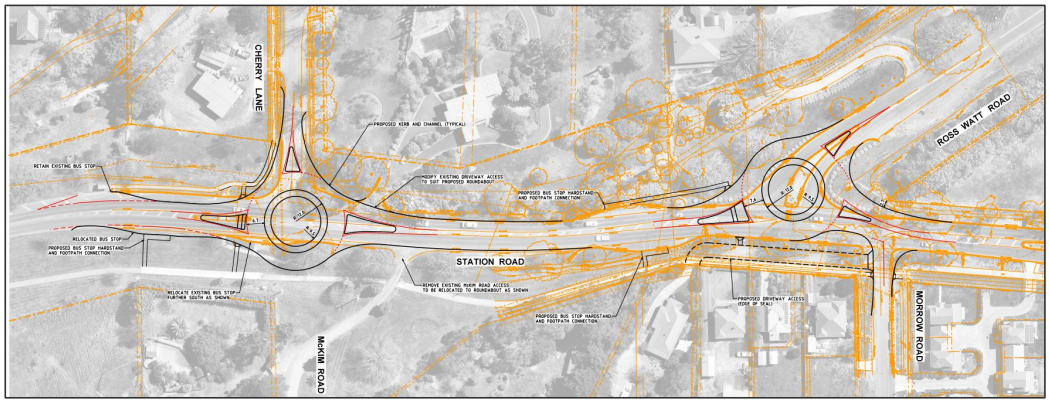
It is proposed to upgrade the intersection of Cherry Lane and Station Road from an unsignalised T-intersection to a roundabout to allow for not only traffic generated by the proposed development but also allow for the relatively high through traffic volumes on Station Road. In addition, at the intersection of Ross Watt Road with Station Road, a roundabout is proposed.

It is noted that as part of the growth in the area and to cater for turning movements, it is understood that Ross Watt Road was to be re-aligned to allow for the construction of a four-leg roundabout between Ross Watt Road / Station Road / Morrow Road as part of the McKim Road Development Plan. At this stage, the status of these works is unknown and the construction of such an intersection will require land acquisition and significant vegetation removal, which is outside the scope and capability of this application and as such an alternative arrangement is proposed as described above.

It is noted that the overall preliminary planning for the area included in the Cardno traffic report contemplates the widening of Station Road to provide additional through capacity (i.e 2 lanes in each direction). Therefore, any upgrades which are to be undertaken along Station Road to cater for through traffic will need to be considered and coordinated with the proposed roundabouts along Station Road to ensure that there are no, or limited redundancies and the most effective and functional intersection treatment is provided.

A view of the Station Road intersection works is shown below in Figure 22.

Figure 22 Proposed Roundabout Upgrades – Station Road



4.4.2 Cherry Lane

As part of the proposed development, it is proposed to upgrade Cherry Lane. The road will be upgraded to have a 7.3m carriageway with kerb and channel on both sides of the road.

The road upgrade should be undertaken prior to the 322nd lot of the proposed subdivision, as outlined in Section 7.7.2.

4.5 Pedestrian and Bicycle Network

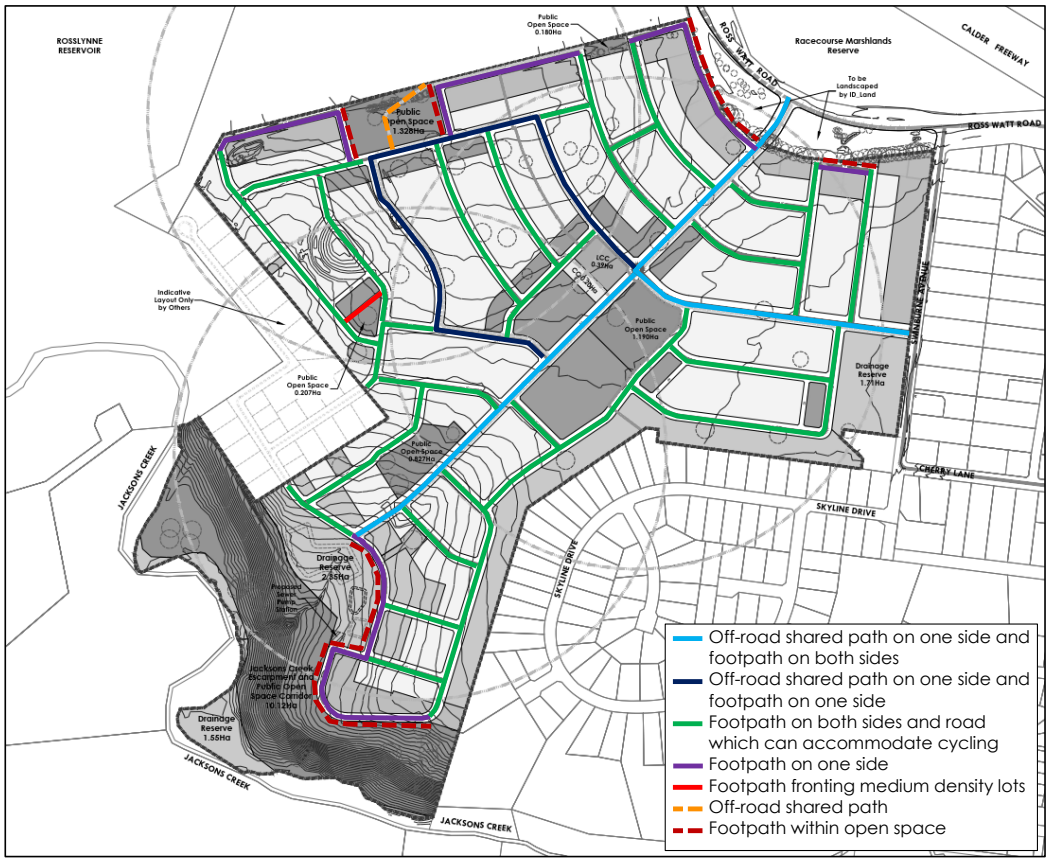
The proposed road network includes footpaths on both sides of all access streets and connector roads, with the exception of all roads adjacent to Jacksons Creek and the open spaces, where a footpath or shared path (subject to Council's shared path strategy) will be provided within the open space. In addition, the connector roads and the 20m modified local access street will be provided with an off-road shared path on one side of the road reserve which will supplement the footpaths on both sides of the road. Whilst the 18m modified local access street will be provided with an off-road shared path on one side of the road reserve in lieu of a standard footpath.

It is noted that laneways will not be provided with a dedicated footpath, as they will operate as a shared environment. At the frontage of the rear loaded lots, a footpath will be provided.

The proposed access streets are designed to form a low speed and low traffic volume network, which can comfortably accommodate bicycle movements on-road within their cross-sections.

The subject sites pedestrian and bicycle network is shown below in Figure 23.

Figure 23 Proposed Pedestrian and Bicycle Network



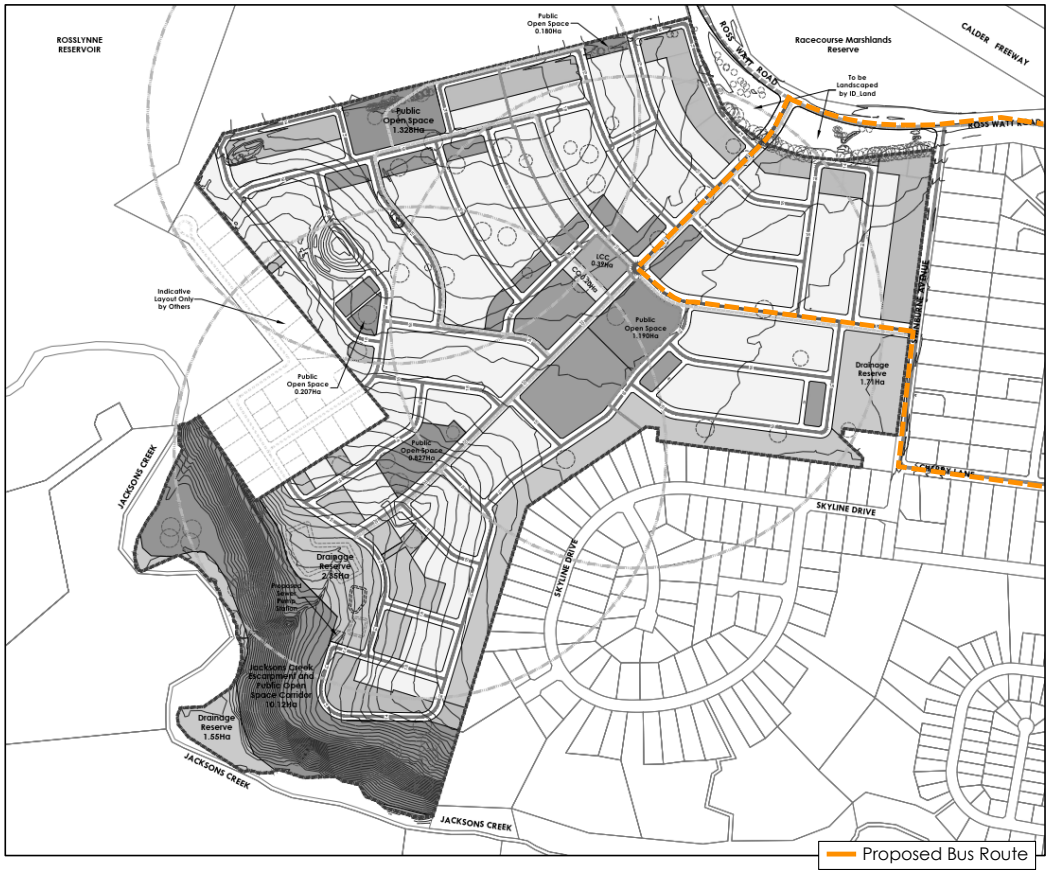
4.6 Public Transport

It is proposed for the connector road to have a 24m road reserve which is appropriately sized to accommodate any future bus routes.

The proposed bus capable connector road will provide access to Cherry Lane.

The proposed bus route will ensure that the entire development is situated within close proximity to public transport and is shown below in Figure 24.

Figure 24 Proposed Public Transport



5 ACCESS REVIEW

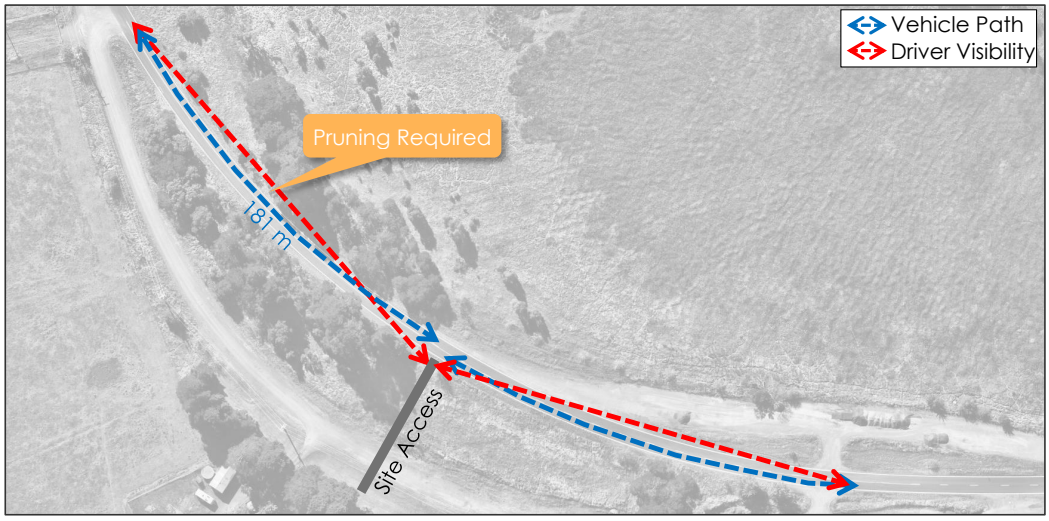
The development proposes a new intersection to Ross Watt Road which has a curved alignment in the vicinity of the subject site. To verify the suitability of the proposed T-intersection, a review has been undertaken with regard to sight distance and intersection configuration.

5.1 Sight Distances

A sight distance assessment has been undertaken with Austroads Guide to Road Design Part 4A, Table 3.2 which specifies that a 181 m safe intersection sight distance is required for an 80km/h road.

A SISD assessment is provided below for the T-intersection treatment at the Ross Watt Road site access. As shown, pruning would be required on the northern approach (within the road reserve) to meet the sight distance requirements.

Figure 25 Safe Intersection Sight Distance Assessment

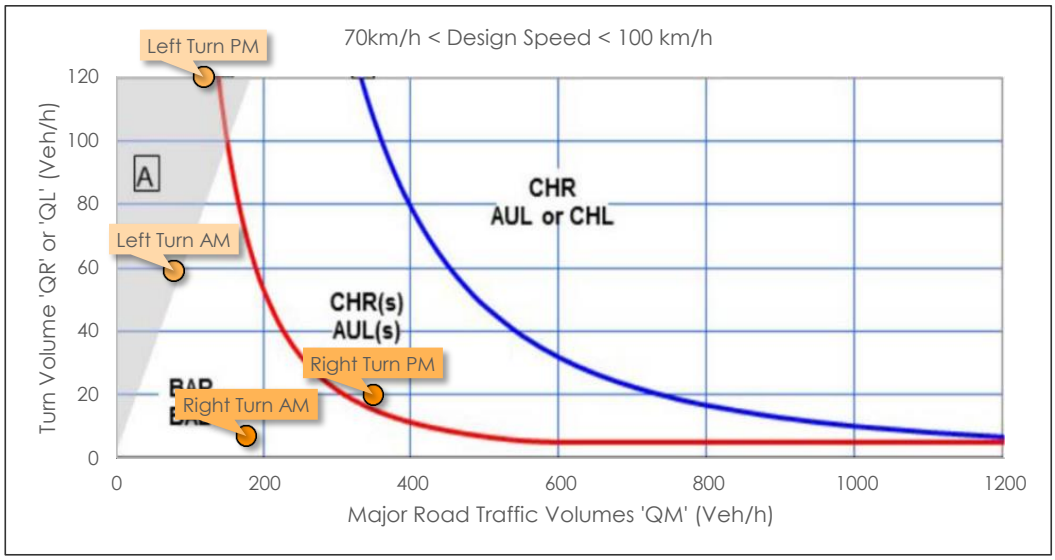


5.2 Austroads Turn Lane Warrants

In determining an appropriate intersection configuration, the anticipated post-development peak hour volumes were assessed against the turn lane treatment warrants specified in the *Austroads Guide to Traffic Management Part 6: Intersections, Interchanges and Crossings.*

Based on the anticipated post-development traffic volumes (as shown Figure 33 and Figure 34), the turn lane requirements for the Ross Watt Road access are demonstrated in Figure 26.

Figure 26 Austroads Turn Treatment Warrants



As identified in the figure above, the anticipated turning movements at the site access indicate that a short channelised right-turn treatment (CHR(S)) would be required.

Based on the above assessment, a T-intersection configuration to Ross Watt Road is considered appropriate.

6 RESIDENTIAL SUBDIVISION DESIGN ASSESSMENT

6.1 General

The design of the proposed residential subdivision has been assessed, in relation to the Gisborne/New Gisborne Outline Development Plan and the Clause 56 of the Macedon Ranges Planning Scheme (Residential Subdivision).

6.2 Gisborne/New Gisborne Outline Development Plan

In reference to the ODP documents summarised in Section 3.1, the proposed road network is generally in accordance with the ODP, with an internal road network proposed which connects to both Ross Watt Road and Cherry Lane and comprising of local streets

Based on the above, the proposed residential subdivision is considered to be generally in accordance with the ODP.

6.3 Macedon Ranges Planning Scheme – Clause 56

Clause 56.06 identifies Access and Mobility Management requirements for residential subdivisions such as that proposed at the site. The following Clauses are applicable.

6.3.1 Clause 56.06-2, Walking and cycling network objectives

Standard C15

The walking and cycling network should be designed to:

- *Implement any relevant regional and local walking and cycling strategy, plan or policy for the area set out in this scheme.*
- *Link to any existing pedestrian and cycling networks.*
- *Provide safe walkable distances to activity centres, community facilities, public transport stops and public open spaces.*
- *Provide an interconnected and continuous network of safe, efficient and convenient footpaths, shared paths, cycle paths and cycle lanes based primarily on the network of arterial roads, neighbourhood streets and regional public open spaces.*
- *Provide direct cycling routes for regional journeys to major activity centres, community facilities, public transport and other regional activities and for regional recreational cycling.*
- *Ensure safe street and road crossings including the provision of traffic controls where required.*
- *Provide an appropriate level of priority for pedestrians and cyclists.*
- *Have natural surveillance along streets and from abutting dwellings and be designed for personal safety and security particularly at night.*
- *Be accessible to people with disabilities.*

The proposed development includes footpaths on both sides of all internal roads as well as providing off-street bicycle paths along the connector roads and modified local access streets.

Access streets are expected to have minimal traffic volumes and low speeds, and are considered suitable for cyclists.

All roads and paths are provided with natural surveillance. The proposed rear access laneways are short, with side abuttals to adjacent lots, enabling appropriate surveillance.

It is therefore considered that the subdivision satisfies the objectives of Clause 56.06-2.

6.3.2 Clause 56.06-3, Public transport network objectives

Standard C16

The public transport network should be designed to:

- *Implement any relevant public transport strategy, plan or policy for the area set out in this scheme.*
- *Connect new public transport routes to existing and proposed routes to the satisfaction of the relevant public transport authority.*
- *Provide for public transport links between activity centres and other locations that attract people using the Principal Public Transport Network in Metropolitan Melbourne and the regional public transport network outside Metropolitan Melbourne.*
- *Locate regional bus routes principally on arterial roads and locate local bus services principally on connector streets to provide:*
  - *Safe and direct movement between activity centres without complicated turning manoeuvres.*
  - *Direct travel between neighbourhoods and neighbourhood activity centres.*
  - *A short and safe walk to a public transport stop from most dwellings.*

The internal connector roads are designed to accommodate future public transport routes, ensuring that the entire development is situated within close proximity to public transport. Externally to the site, Cherry Lane is slated for an upgrade to a connector road, and Ross Watt Road has a sealed road width to accommodate bus movements.

It is therefore considered that the subdivision satisfies the objectives of Clause 56.06-3.

6.3.3 Clause 56.06-4, Neighbourhood street network objective

Standard C17

The neighbourhood street network must:

- *Take account of the existing mobility network of arterial roads, neighbourhood streets, cycle paths, cycle paths, footpaths and public transport routes.*
- *Provide clear physical distinctions between arterial roads and neighbourhood street types.*
- *Comply with the Roads Corporation's arterial road access management policies.*
- *Provide an appropriate speed environment and movement priority for the safe and easy movement of pedestrians and cyclists and for accessing public transport.*
- *Provide safe and efficient access to activity centres for commercial and freight vehicles.*
- *Provide safe and efficient access to all lots for service and emergency vehicles.*
- *Provide safe movement for all vehicles.*
- *Incorporate any necessary traffic control measures and traffic management infrastructure.*

The neighbourhood street network should be designed to:

- *Implement any relevant transport strategy, plan or policy for the area set out in this scheme.*

- *Include arterial roads at intervals of approximately 1.6 kilometres that have adequate reservation widths to accommodate long term movement demand.*
- *Include connector streets approximately halfway between arterial roads and provide adequate reservation widths to accommodate long term movement demand.*
- *Ensure connector streets align between neighbourhoods for direct and efficient movement of pedestrians, cyclists, public transport and other motor vehicles.*
- *Provide an interconnected and continuous network of streets within and between neighbourhoods for use by pedestrians, cyclists, public transport and other vehicles.*
- *Provide an appropriate level of local traffic dispersal.*
- *Indicate the appropriate street type.*
- *Provide a speed environment that is appropriate to the street type.*
- *Provide a street environment that appropriately manages movement demand (volume, type and mix of pedestrians, cyclists, public transport and other motor vehicles).*
- *Encourage appropriate and safe pedestrian, cyclist and driver behaviour.*
- *Provide safe sharing of access lanes and access places by pedestrians, cyclists and vehicles.*
- *Minimise the provision of culs-de-sac.*
- *Provide for service and emergency vehicles to safely turn at the end of a dead-end street.*
- *Facilitate solar orientation of lots.*
- *Facilitate the provision of the walking and cycling network, integrated water management systems, utilities and planting of trees.*
- *Contribute to the area's character and identity.*
- *Take account of any identified significant features.*

It is considered that the layout proposed and the cross-sections of internal roads is appropriate to promote safe and easy movement throughout the subdivision for all road users.

Furthermore, the proposed road network will provide adequate clearances to cater for the access requirements of service and emergency vehicles (e.g. typically up to a 9.8m truck).

The forecast daily traffic volumes for the internal subdivision roads will be well within the recommended volume limits specified in Table C1 of Clause 56.06.

To ensure speeds are controlled, street lengths are limited and where longer streets are required speed control devices are proposed to be implemented.

It is therefore considered that the subdivision generally satisfies the objectives of Clause 56.06-4.

6.3.4 Clause 56.06-5, Walking and cycling detail network objectives

Standard C18

Footpaths, shared paths, cycle paths and cycle lanes should be designed to:

- *Be part of a comprehensive design of the road or street reservation.*
- *Be continuous and connect.*
- *Provide for public transport stops, street crossings for pedestrians and cyclists and kerb crossovers for access to lots.*
- *Accommodate projected user volumes and mix.*
- *Meet the requirements of Table C1.*
- *Provide pavement edge, kerb, channel and crossover details that support safe travel for pedestrians, footpath bound vehicles and cyclists, perform required drainage functions and are structurally sound.*

- *Provide appropriate signage.*
- *Be constructed to allow access to lots without damage to the footpath or shared path surfaces.*
- *Be constructed with a durable, non-skid surface.*
- *Be of a quality and durability to ensure:*
  - *Safe passage for pedestrians, cyclists, footpath bound vehicles and vehicles.*
  - *Discharge of urban run-off.*
  - *Preservation of all-weather access.*
  - *Maintenance of a reasonable, comfortable riding quality.*
  - *A minimum 20 year life span.*
- *Be accessible to people with disabilities and include tactile ground surface indicators, audible signals and kerb ramps required for the movement of people with disabilities.*

The proposal includes continuous footpath connections along the proposed Access Streets and Connector Roads, generally satisfying the objectives of Clause 56.06-5. In addition, the Connector Roads and modified Access Street will have a shared path on one side of the road allowing safe travel for cyclists along the primary thoroughfares.

The Access Streets will be low speed environments and suitable for on road bicycle traffic.

Additionally, a shared path network may potentially be provided along the Jacksons Creek open space (subject to confirmation on Council's shared path strategy) allowing increased pedestrian and cyclist permeability throughout the site.

It is therefore considered that the subdivision satisfies the objectives of Clause 56.06-5.

6.3.5 Clause 56.06-6, Public transport network detail objectives

Standard C19

Bus priority measures must be provided along arterial roads forming part of the existing or proposed Principal Public Transport Network in Metropolitan Melbourne and the regional public transport network outside Metropolitan Melbourne to the requirements of the relevant roads authority.

Road alignment and geometry along bus routes should provide for the efficient, unimpeded movement of buses and the safety and comfort of passengers.

The design of public transport stops should not impede the movement of pedestrians.

Bus and tram stops should have:

- *Surveillance from streets and adjacent lots.*
- *Safe street crossing conditions for pedestrians and cyclists.*
- *Safe pedestrian crossings on arterial roads and at schools including the provision of traffic controls as required by the roads authority.*
- *Continuous hard pavement from the footpath to the kerb.*
- *Sufficient lighting and paved, sheltered waiting areas for forecast user volume at neighbourhood centres, schools and other locations with expected high patronage.*
- *Appropriate signage.*

The connector roads have been designed to cater for buses, satisfying the objectives of Clause 56.06-6.

6.3.6 Clause 56.06-7, Neighbourhood street network detail objective

Standard C20

The design of streets and roads should:

- *Meet the requirements of Table C1. Where the widths of access lanes, access places, and access streets do not comply with the requirements of Table C1, the requirements of the relevant fire authority and roads authority must be met.*
- *Provide street blocks that are generally between 120 metres and 240 metres in length and generally between 60 metres to 120 metres in width to facilitate pedestrian movement and control traffic speed.*
- *Have verges of sufficient width to accommodate footpaths, shared paths, cycle paths, integrated water management, street tree planting, lighting and utility needs.*
- *Have street geometry appropriate to the street type and function, the physical land characteristics and achieve a safe environment for all users.*
- *Provide a low-speed environment while allowing all road users to proceed without unreasonable inconvenience or delay.*
- *Provide a safe environment for all street users applying speed control measures where appropriate.*
- *Ensure intersection layouts clearly indicate the travel path and priority of movement for pedestrians, cyclists and vehicles.*
- *Provide a minimum 5 metre by 5 metre corner splay at junctions with arterial roads and a minimum 3 metre by 3 metre corner splay at other junctions unless site conditions justify a variation to achieve safe sight lines across corners.*
- *Ensure streets are of sufficient strength to:*
  - Enable the carriage of vehicles.
  - Avoid damage by construction vehicles and equipment.
- *Ensure street pavements are of sufficient quality and durability for the:*
  - Safe passage of pedestrians, cyclists and vehicles.
  - Discharge of urban run-off.
  - Preservation of all-weather access and maintenance of a reasonable, comfortable riding quality.
- *Ensure carriageways of planned arterial roads are designed to the requirements of the relevant road authority.*
- *Ensure carriageways of neighbourhood streets are designed for a minimum 20 year life span.*
- *Provide pavement edges, kerbs, channel and crossover details designed to:*
  - Perform the required integrated water management functions.
  - Delineate the edge of the carriageway for all street users.
  - Provide efficient and comfortable access to abutting lots at appropriate locations.
  - Contribute to streetscape design.
- *Provide for the safe and efficient collection of waste and recycling materials from lots.*
- *Be accessible to people with disabilities.*
- *Meet the requirements of Table C1. Where the widths of access lanes, access places, and access streets do not comply with the requirements of Table C1, the requirements of the relevant fire authority and roads authority must be met. Where the widths of connector streets do not comply with the requirements of Table C1, the requirements of the relevant public transport authority must be met.*

A street detail plan should be prepared that shows, as appropriate:

- *The street hierarchy and typical cross-sections for all street types.*
- *Location of carriageway pavement, parking, bus stops, kerbs, crossovers, footpaths, tactile surface indicators, cycle paths and speed control and traffic management devices.*
- *Water sensitive urban design features.*
- *Location and species of proposed street trees and other vegetation.*
- *Location of existing vegetation to be retained and proposed treatment to ensure its health.*
- *Any relevant details for the design and location of street furniture, lighting, seats, bus stops, telephone boxes and mailboxes.*

Table C1 Design of roads and neighbourhood streets

Element	*Access Lane*	*Access Place*	*Access Street – Level 1*	*Access Street – Level 2*	*Connector Street – Level 1*	*Connector Street – Level 2*
Traffic Volume	300 vpd	300-1000 vpd	1000-2000 vpd	2000-3000 vpd	3000 vpd	3000-7000 vpd
Target Speed	10 km/h	15 km/h	30 km/h	40 km/h	50 km/h (40 km/h at schools, 20km/h at crossing points)	60 km/h or 50 km/h (40 km/h at schools)
Carriageway Width	5.5m	5.5m	5.5m	7 – 7.5m	3.5m per lane (4.0m at intersections)	3.5m per lane (4.0m at intersections)
Parking Within Street	None	1 verge space per 2 lots, or one-side on carriageway	1 verge space per 2 lots	Both sides	Dedicated lane 2.3m where required	Dedicated lane 2.3m where required
Verge Width	Not required	7.5m (3.5m / 2.5m min)	4.0 / 4.0m	4.5 / 4.5m	4.5 / 4.5m	6.0 / 6.0m
Footpath Provision	Shared Zone	1.5m (Not required if < 5 dwellings)	2 x 1.5m (2.0m at schools, shop, activity centre)	2 x 1.5m (2.0m at schools, shop, activity centre)	2 x 1.5m (2.0m at schools, shop, activity centre)	2 x 1.5m (2.0m at schools, shop, activity centre)
Cycle Path Provision	None	None	Shared Zone	Shared Zone	0.7 - 1.7m	0.7 - 1.7m or shared path

Appropriate splays are provided on the corner of intersections.

Road cross-sections are generally in accordance with Table C1 of the Planning Scheme.

It is therefore considered that the subdivision satisfies the objectives of Clause 56.06-7.

6.3.7 Clause 56.06-8, Lot access objective

Standard C21

Vehicle access to lots abutting arterial roads should be provided from service roads, side or rear access lanes, access places or access streets where appropriate and in accordance with the access management requirements of the relevant roads authority.

Vehicle access to lots of 300 square metres or less in area and lots with a frontage of 7.5 metres or less should be provided via rear or side access lanes, places or streets.

The design and construction of a crossover should meet the requirements of the relevant road authority.

No lots are provided with direct access to an arterial road, and all lots with a frontage of less than 7.5m are provided with rear access.

Whilst some lots are less than 300m^2 in area (north of the Public Open Space), they have a frontage of greater than 7.5 metres, and therefore access via the frontage road is considered to be appropriate.

It is therefore considered that the subdivision satisfies the objectives of Clause 56.06-8.

7 TRAFFIC

7.1 Traffic Generation

Considering the size of the lots proposed and the proximity of the site to public transport, it is anticipated that the proposed development may initially generate up to 9 vehicle trips per day per lot. Following full development of the area, including schools, recreational facilities, retail developments and public transport routes, a reduction in traffic generation is expected.

Application of the above traffic generation rates to the maximum lot yield of 778 lots equates to a total traffic generation of approximately 7,002 vehicle trips per day, and approximately 700 vehicle trips per hour during both the AM and PM peak hours.

Traffic volumes generated by residential uses is typically tidal, with the majority of movements generated during the AM peak hour occurring in the outbound direction and the majority of movements during the PM peak hour occurring in the inbound direction.

For the purposes of this assessment, the following directional splits will be adopted:

- AM peak hour: 70% outbound, 30% inbound; and
- PM peak hour: 40% outbound, 60% inbound.

The peak hour traffic volumes anticipated to be generated by the proposed residential subdivision are outlined in Table 4.

Table 4 Anticipated Peak Hour Traffic Generation

Period	Outbound	Inbound	Two-Way
AM Peak Hour	490	210	700
PM Peak Hour	280	420	700

7.2 Traffic Distribution

The adopted traffic distribution has been derived using the existing traffic volumes shown in 2.4.1. The traffic volumes showed that traffic along the external road network is distributed as follows:

- 5% west along Ross Watt Road;
- 51% south along Station Road; and
- 44% north along Station Road.

Furthermore, it is recognised that the existing turning movement surveys show that the majority of northbound traffic continues north along Station Road, however it is expected this is due to the road network and the other connections to the Calder Freeway. Therefore, for the purposes of the following analysis it is expected that the majority of the northbound traffic then travels east or west along the Calder Freeway.

7.3 Generated Traffic Volumes

Based on the above, the expected traffic volumes generated by the development for AM and PM peak periods are shown below in Figure 27 and Figure 28.

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Figure 27 Generated Traffic Volumes – AM Peak

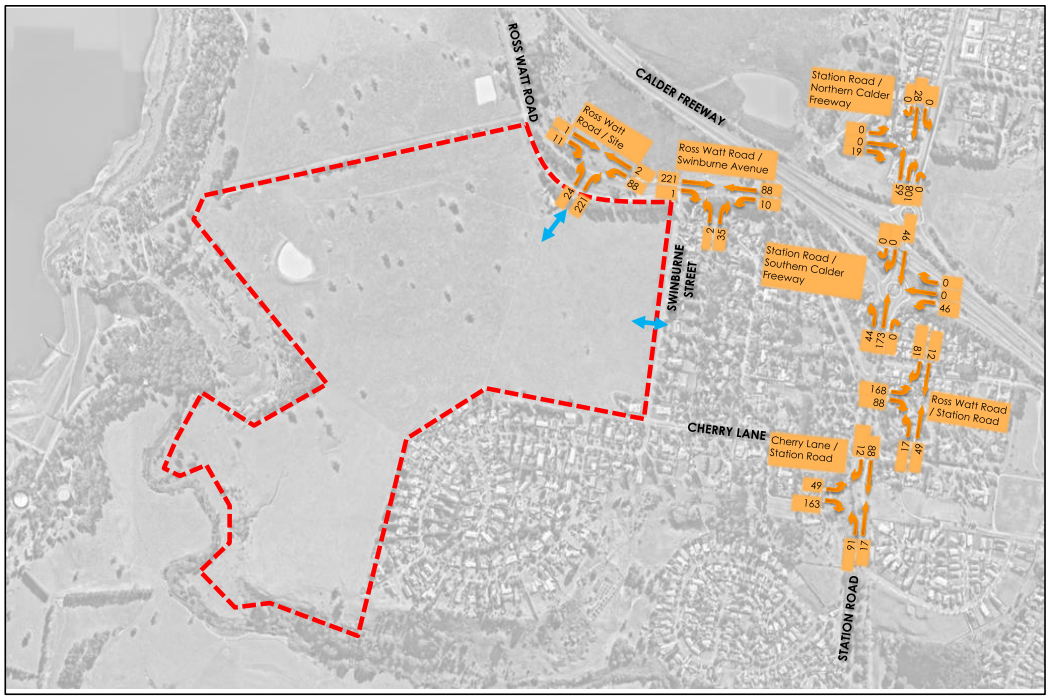
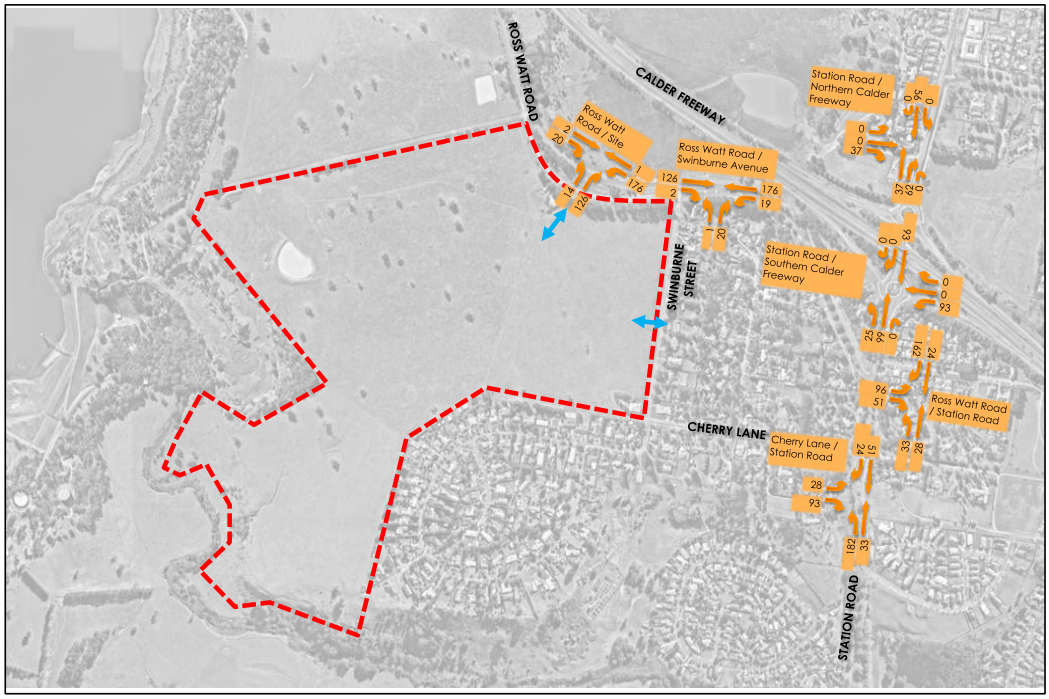


Figure 28 Generated Traffic Volumes – PM Peak



7.4 Expected Traffic Volume Growth

To confirm that the operation of surrounding intersections will operate appropriately into the future, it is considered appropriate to include future traffic volume growth.

It is noted that the Cardno report (ref: V180578) contemplates several significant road upgrades in the vicinity which will significantly impact the operation of Station Road, these include the duplication of Station Road. In addition, several other residential developments are proposed or under construction within Gisborne.

Noting the above, a growth rate of 2% per year (compound) has been applied to the existing traffic volumes along Station Road and Ross Watt Road over a 5-year period and 10-year period, equivalent to a 10.4% and 21.9% increase in traffic volumes respectively. It is expected that no traffic growth is required for Swinburne Avenue and Cherry Lane, as the area is fully developed apart from the subject site's land which will be included in the analysis regardless.

The below traffic volumes are based on the modified 2022 traffic volumes previously shown in Figure 7.

Based on the above, the existing traffic volumes with growth are shown below in the figures below.

Figure 29 Traffic Volumes with 5yr Growth – AM Peak

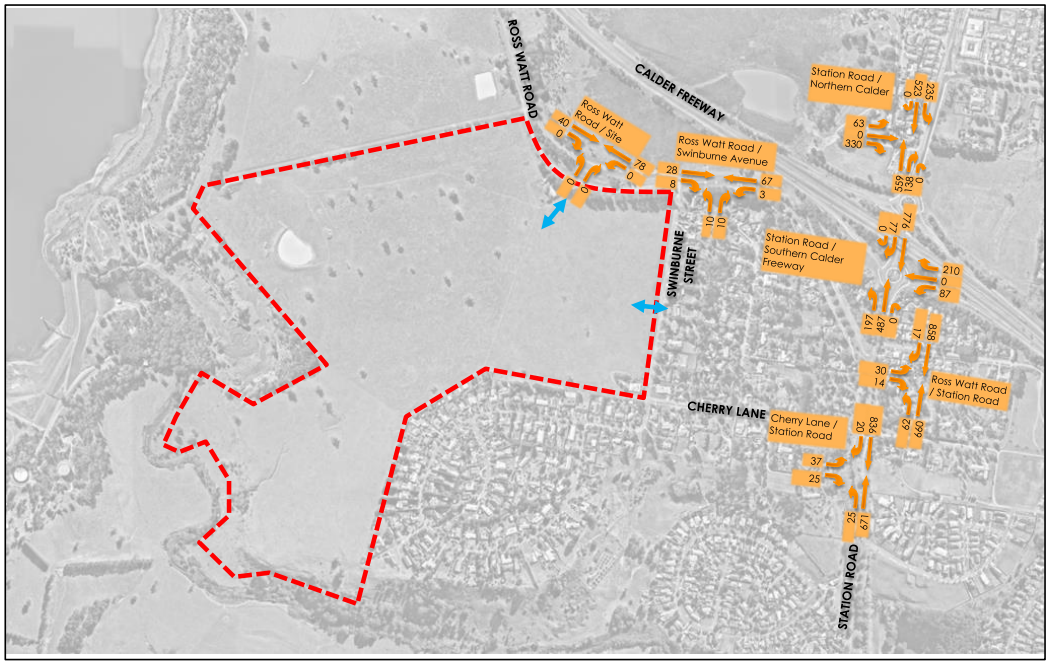


Figure 30 Traffic Volumes with 5yr Growth – PM Peak

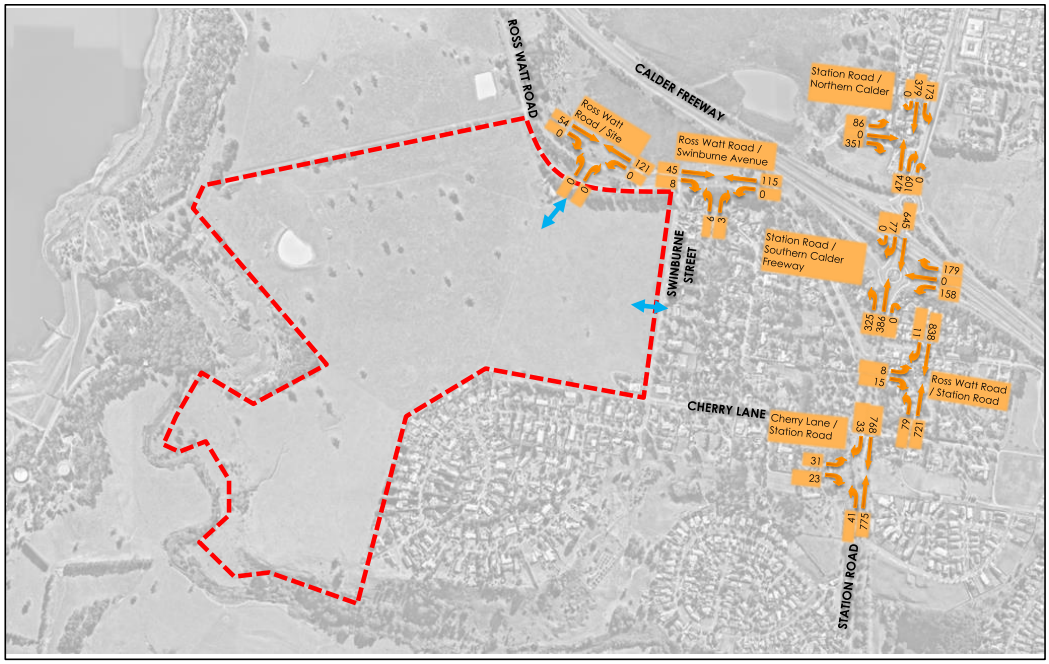


Figure 31 Traffic Volumes with 10yr Growth – AM Peak

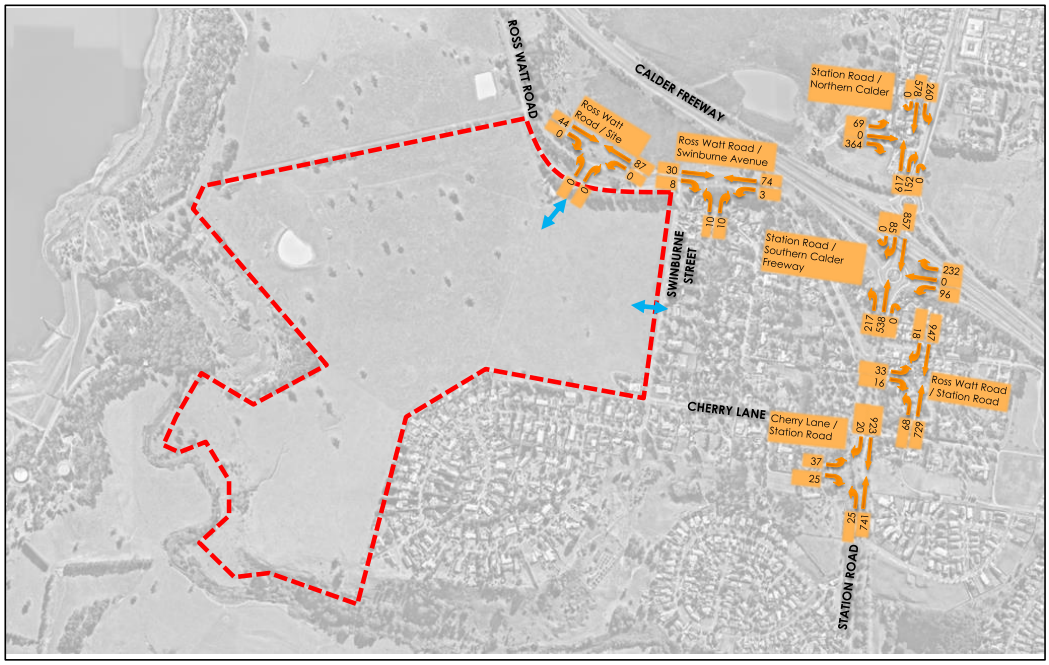
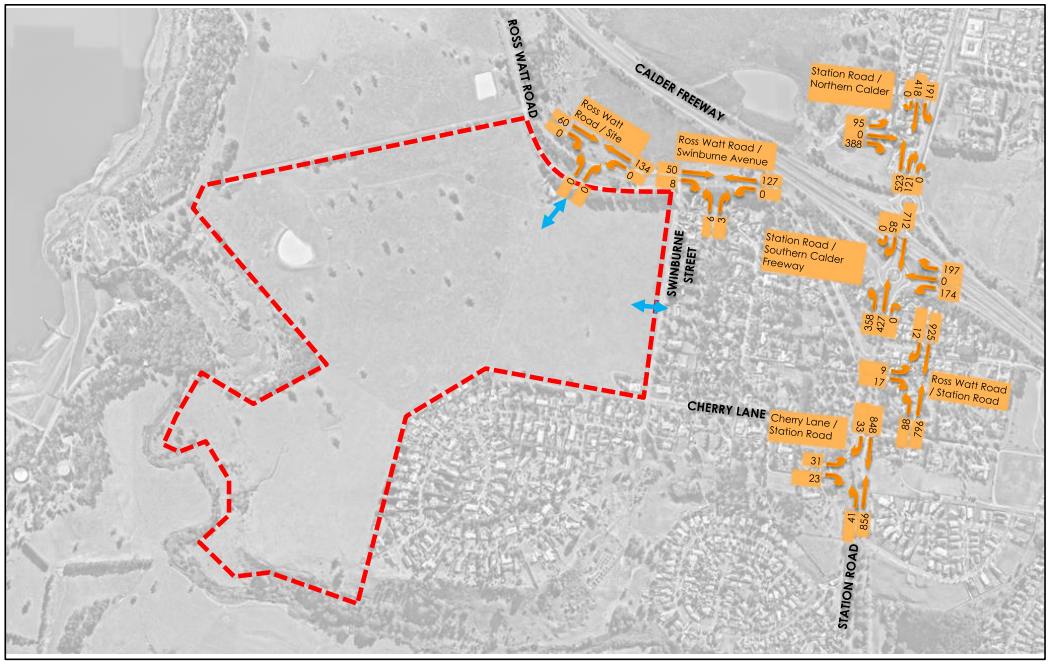


Figure 32 Traffic Volumes with 10yr Growth – PM Peak



7.5 Resultant Future Traffic Volumes

Based on the above, the future volumes at intersections within the vicinity of the site can be calculated by combining the existing volumes with the expected traffic volume growth, and superimposing the traffic anticipated to be generated by the proposed development.

The resultant peak hour traffic volumes are shown in the figure below.

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Figure 33 Resultant Future Traffic Volumes with 5yr Growth – AM Peak

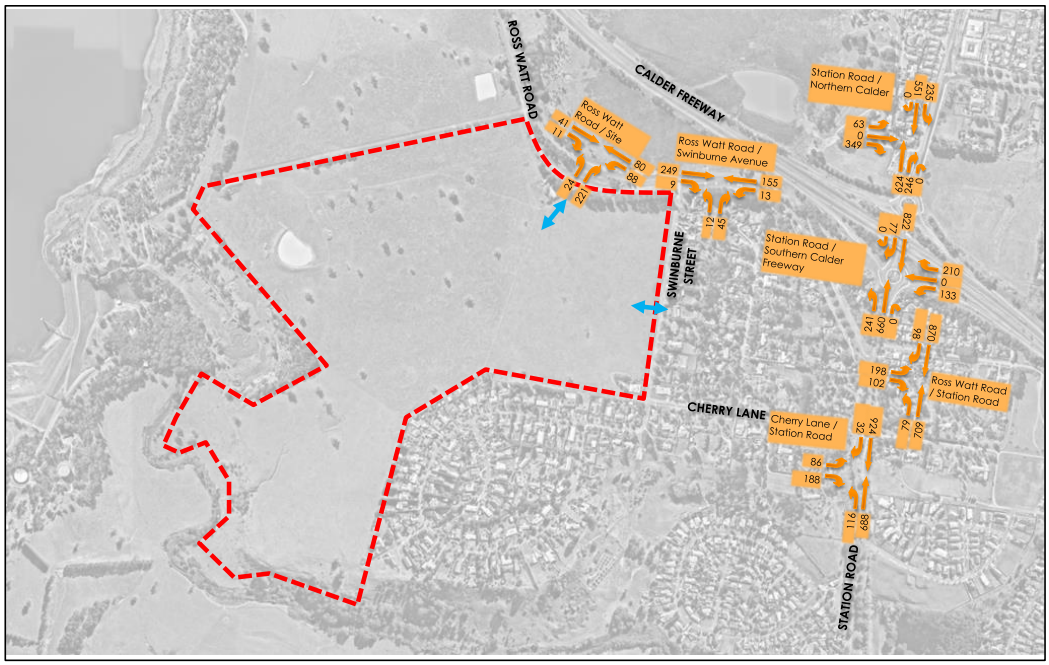


Figure 34 Resultant Future Traffic Volumes with 5yr Growth – PM Peak

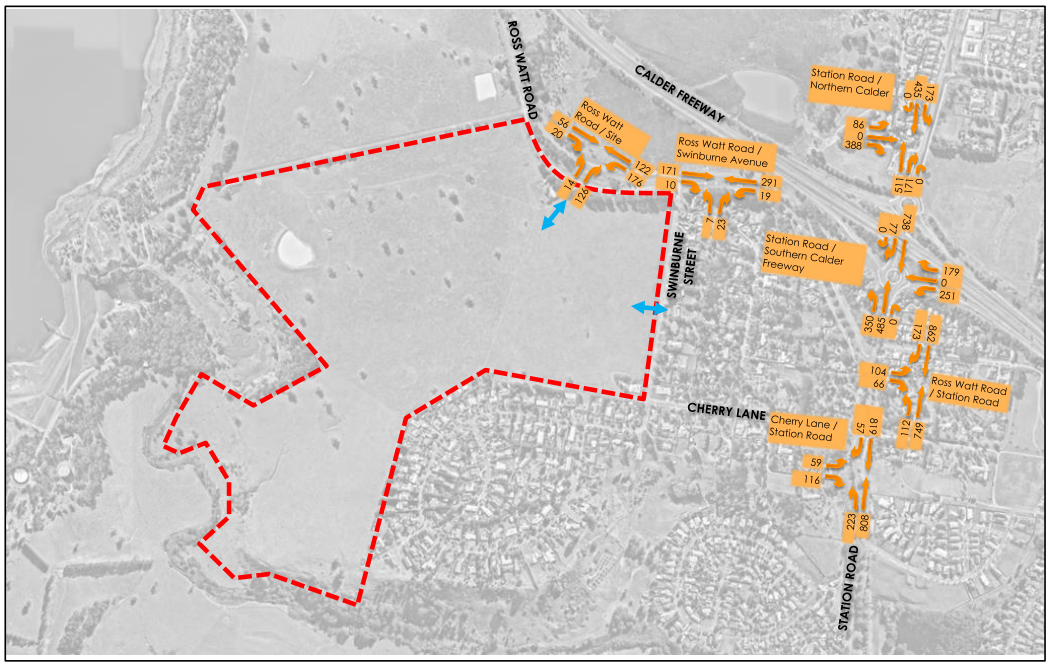


Figure 35 Resultant Future Traffic Volumes with 10yr Growth – AM Peak

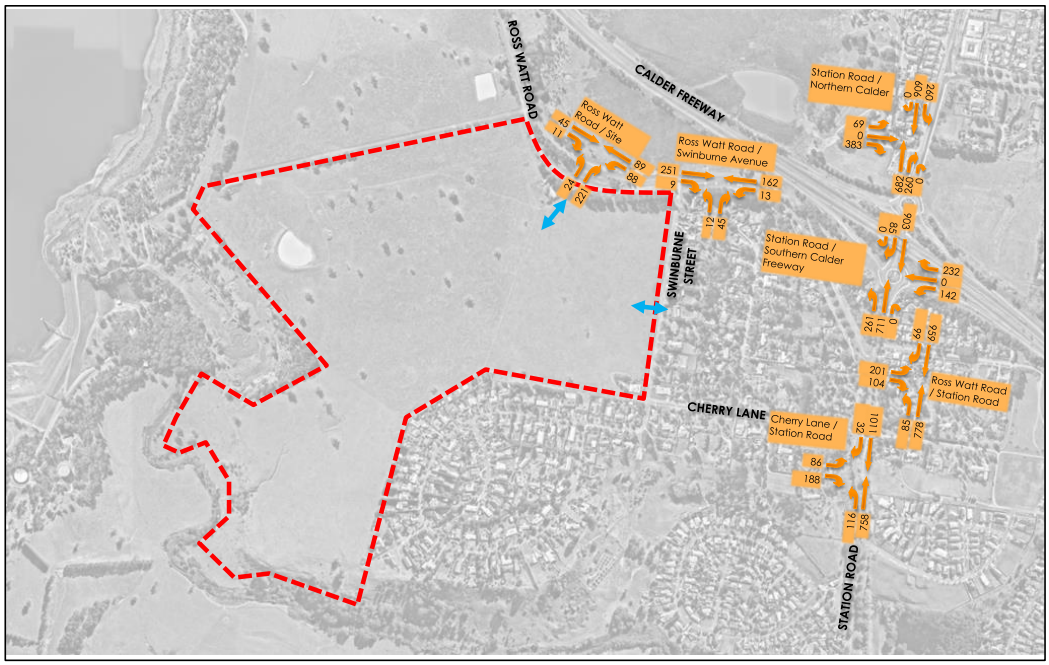
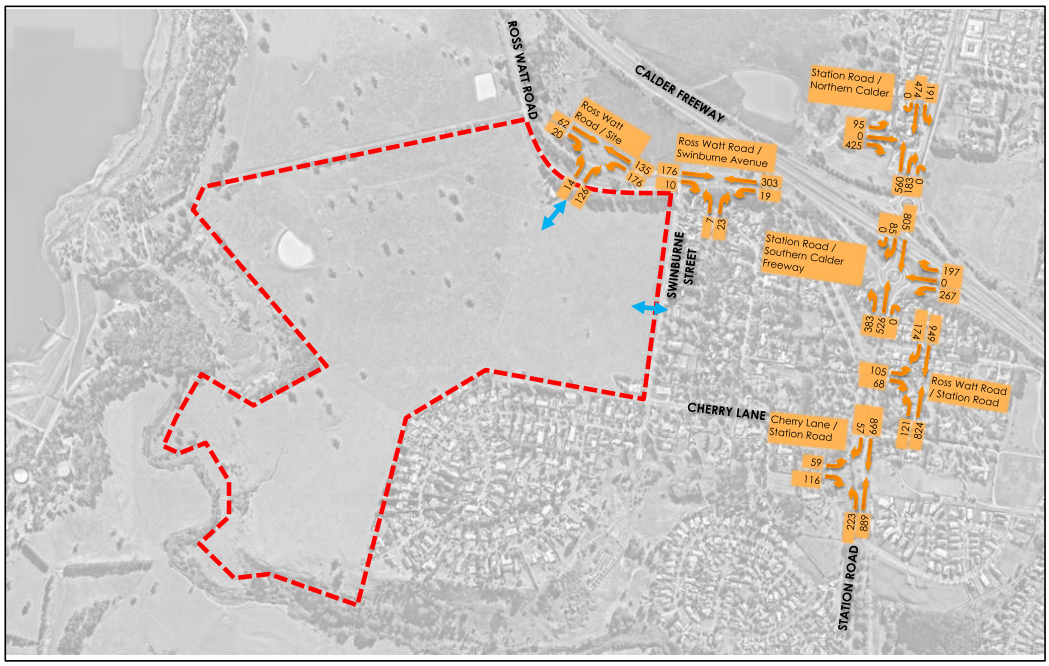


Figure 36 Resultant Future Traffic Volumes with 10yr Growth – PM Peak



7.6 Traffic Impact

7.6.1 Overview

Given the proximity of the Station Road / Cherry Lane, Station Road / Ross Watt Road and the Station Road / Calder Freeway intersections, the four intersections have been modelled as a network model to accommodate any capacity reductions caused by downstream queueing effects.

It is noted that much of the traffic travelling through these intersections are associated with background general traffic rather than specifically development generated traffic. In this regard, an assessment of the operation of the intersections in the vicinity of the site has been undertaken firstly assessing the base conditions which includes the 5 and 10 year horizons without development following by those same horizons with traffic generated by the development.

7.6.2 Intersection Capacity Assessment

To assess the operation of the intersections the future traffic volumes have been input into SIDRA Intersection, a traffic modelling software package.

The SIDRA Intersection software package has been developed to provide information on the capacity of an intersection with regard to a number of parameters. Those parameters considered relevant are, Degree of Saturation (DoS), 95th Percentile Queue, and Average Delay as described below.

Table 5 SIDRA Intersection Parameters

Parameter	Description
Degree of Saturation (DoS)	The DoS represents the ratio of the traffic volume making a particular movement compared to the maximum capacity for that particular movement. The value of the DoS has a corresponding rating depending on the ratio as shown below. **Degree of Saturation** / **Rating** Up to 0.60 – Excellent 0.61 – 0.70 – Very Good 0.71 – 0.80 – Good 0.81 – 0.90 – Fair 0.91 – 1.00 – Poor Above 1.00 – Very Poor It is noted that whilst the range of 0.91 – 1.00 is rated as 'poor', it is acceptable for critical movements at an intersection to be operating within this range during high peak periods, reflecting actual conditions in a significant number of suburban signalised intersections.
Average Delay (seconds)	Average delay is the time delay that can be expected for all vehicles undertaking a particular movement in seconds.
95th Percentile (95%ile) Queue	95%ile queue represents the maximum queue length in metres that can be expected in 95% of observed queue lengths in the peak hour

7.6.2.1 Growth Only

Prior to analysing the proposed developments impact on the existing intersections in the vicinity. It is considered necessary to analyse the existing intersections with growth applied. The results of the analysis using the 10-year growth traffic volumes shown in Figure 31 and Figure 32 are shown below for the critical intersections in the vicinity. Detailed SIDRA results are attached in Appendix B.

Table 6 SIDRA 10 Year Growth Conditions – Ross Watt Rd / Station Rd

Approach	Existing Conditions			Growth Only		
	DoS	Avg Delay (sec)	Queue (m)	DoS	Avg Delay (sec)	Queue (m)
AM Peak						
Station Road - South	0.359	0.5	0	0.443	0.5	0
Station Road – North	0.427	0.2	0.5	0.528	0.3	0.8
Ross Watt Road - West	0.131	18.5	2.7	0.401	43.8	8.1
PM Peak						
Station Road – South	0.398	0.6	0	0.491	0.6	0
Station Road - North	0.419	0.2	0.4	0.515	0.2	0.6
Ross Watt Road - West	0.151	31	3.2	0.467	90.3	9.5

Table 7 SIDRA 10 Year Growth Conditions – Station Rd / Cherry Ln

Approach	Existing Conditions			Growth Only		
	DoS	Avg Delay (sec)	Queue (m)	DoS	Avg Delay (sec)	Queue (m)
AM Peak						
Station Road - South	0.332	0.3	0	0.41	0.3	0
Station Road - North	0.417	0.3	0.8	0.516	0.3	1
Cherry Lane - West	0.398	33.8	10.1	0.954	188.9	39
PM Peak						
Station Road - South	0.384	0.4	0	0.474	0.4	0
Station Road - North	0.384	0.5	1.6	0.472	0.6	2.2
Cherry Lane - West	0.391	36.9	9.5	0.932	189.7	33.2

Table 8 SIDRA 10 Year Growth Conditions – Station Rd / Calder FWY Westbound Ramp

Approach	Existing Conditions			Growth Only		
	DoS	Avg Delay (sec)	Queue (m)	DoS	Avg Delay (sec)	Queue (m)
AM Peak						
Station Road - South	0.252	3.8	8.6	0.321	4.1	11.8
Calder Freeway Off-ramp - East	0.132	10.1	3.9	0.174	11	5.5
Station Road - North	0.305	3.9	0	0.375	4.1	0
PM Peak						
Station Road - South	0.257	3.8	8.8	0.325	4	12
Calder Freeway Off-ramp - East	0.144	8.7	4.2	0.186	9.6	5.8
Station Road - North	0.258	3.9	0	0.317	4.1	0

Table 9 SIDRA 10 Year Growth Conditions – Station Rd / Calder FWY Eastbound Ramp

Approach	Existing Conditions			Growth Only		
	DoS	Avg Delay (sec)	Queue (m)	DoS	Avg Delay (sec)	Queue (m)
AM Peak						
Station Road - South	0.195	4.2	0	0.24	4.2	0
Station Road - North	0.304	4.3	10.6	0.394	4.8	15.1
Calder Freeway Off-ramp - West	0.163	10	4.5	0.21	10.5	6.1
PM Peak						
Station Road - South	0.163	4.1	0	0.201	4.1	0
Station Road - North	0.22	4.2	7.1	0.284	4.5	9.9
Calder Freeway Off-ramp - West	0.176	9.6	4.9	0.226	10	6.6

As shown above, the majority of intersections are expected to operate under 'excellent' conditions with 10 years growth with the exception of Station Road / Cherry Lane which will operate under

'poor' conditions. The Station Road / Cherry Lane intersection will operate will a degree of saturation in excess of 0.9 in both the AM and PM peak hour, with an average delay in excess of three minutes on the western approach during both the AM and PM peak hour.

Noting the above, the Cherry Lane / Station Road intersection is unable to accommodate 10-year growth in the vicinity and should effectively be upgraded without the site generated traffic due to the high through traffic growth along Station Road which impacts the ability for motorists to exit from Cherry Lane.

7.6.2.2 Post-Development Conditions

onemile**grid** has investigated the following potential intersection upgrades along Station Road to accommodate the traffic growth in the area, as well as the subject site's development.

- Option 1 – Roundabout at the intersection of Station Road / Cherry Lane and Station Road / Ross Watt Road.
- Option 2 – Signals at the intersection of Station Road / Cherry Lane and Station Road / Ross Watt Road.
- Option 3 – Roundabout at the intersection of Station Road / Cherry Lane and signals at the intersection of Station Road / Ross Watt Road.
- Option 4 – Signals at the intersection of Station Road / Cherry Lane and roundabout at the intersection of Station Road / Ross Watt Road.

It is noted that the green split priority has been enabled for several of the through movements at the signalised intersections to prioritise through movements on the major roads.

The results of the analysis are provided below with the highest performing option for each intersection bolded. In addition, the detailed SIDRA results are attached in Appendix B.

Table 10 SIDRA Post-Development Conditions (10 Yr Growth) – Ross Watt Rd / Site Access

Approach	*Existing Conditions*			*Future Conditions (10 Year Growth)*		
	DoS	Avg Delay (sec)	Queue (m)	DoS	Avg Delay (sec)	Queue (m)
AM Peak						
Site Access - South	N/A	N/A	N/A	0.234	6.3	6.4
Ross Watt Road - East	N/A	N/A	N/A	0.099	2.8	0
Ross Watt Road - West	N/A	N/A	N/A	0.033	1.3	0.5
PM Peak						
Site Access - South	N/A	N/A	N/A	0.15	6.8	3.8
Ross Watt Road - East	N/A	N/A	N/A	0.175	3.2	0
Ross Watt Road - West	N/A	N/A	N/A	0.051	2	1.1

Table 11 SIDRA Post-Development Conditions (10 Yr Growth) – Ross Watt Rd/Swinburne Ave

Approach	*Existing Conditions*			*Future Conditions (10 Year Growth)*		
	DoS	Avg Delay (sec)	Queue (m)	DoS	Avg Delay (sec)	Queue (m)
AM Peak						
Swinburne Avenue - South	0.016	5.8	0.4	0.066	7.2	1.6
Ross Watt Road - East	0.035	0.3	0	0.096	0.4	0
Ross Watt Road - West	0.019	1.4	0.3	0.144	0.2	0.5
PM Peak						
Swinburne Avenue - South	0.007	5.9	0.2	0.038	7.5	0.9
Ross Watt Road - East	0.057	0.1	0	0.177	0.4	0
Ross Watt Road - West	0.028	1	0.4	0.105	0.5	0.7

As shown above, the site access to Ross Watt Road will operate with excellent conditions. In addition, the intersection of Ross Watt Road / Swinburne Avenue will also operate under excellent conditions.

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Table 12 SIDRA Post-Development Conditions – Ross Watt Rd / Station Rd

Approach	Existing Conditions			Future Conditions (Option 1)			Future Conditions (Option 2)			Future Conditions (Option 3)			Future Conditions (Option 4)		
	DoS	Avg Delay (sec)	Queue (m)	DoS	Avg Delay (sec)	Queue (m)	DoS	Avg Delay (sec)	Queue (m)	DoS	Avg Delay (sec)	Queue (m)	DoS	Avg Delay (sec)	Queue (m)
5 Year Growth															
AM Peak															
Station Road - South	0.359	0.5	0	**0.604**	4.9	51.6	0.655	7.8	114.6	0.644	11.2	170.4	0.606	4.8	50.3
Station Road – North	0.427	0.2	0.5	**0.76**	5.9	88.1	0.905	24.2	277.4	0.668	6.3	146.5	1.036	47.3	422.5
Ross Watt Road - West	0.131	18.5	2.7	**0.517**	15.1	34	0.941	60.9	74	0.887	57.7	75.8	0.533	15.9	37.7
PM Peak															
Station Road – South	0.398	0.6	0	**0.732**	6.3	69.6	0.676	10.1	172.7	0.676	10.1	172.7	**0.732**	6.3	65.2
Station Road - North	0.419	0.2	0.4	**0.756**	5.7	95.8	0.671	4.7	107.8	0.671	4.7	107.8	**0.756**	5.7	96.1
Ross Watt Road - West	0.151	31	3.2	**0.337**	12.7	18.4	0.759	58.3	38.7	0.759	58.3	38.7	**0.304**	13.2	18.7
10 Year Growth															
AM Peak															
Station Road - South	0.359	0.5	0	0.663	5	64	0.721	8	134.7	**0.717**	12.5	204.7	0.647	4.8	59.7
Station Road – North	0.427	0.2	0.5	0.914	6.2	114.3	1.082	125.2	277.4	**0.793**	8.1	205.4	1.2	190.9	422.5
Ross Watt Road - West	0.131	18.5	2.7	0.613	19.7	44.4	0.998	69.7	76.4	**0.894**	57.5	76.2	0.589	21	50.3
PM Peak															
Station Road – South	0.398	0.6	0	0.807	7.8	101	0.715	3.3	65.4	**0.745**	10.8	204.6	0.807	7.5	94.1
Station Road - North	0.419	0.2	0.4	0.822	5.9	127.7	0.727	3.9	129.9	**0.729**	5.3	130.8	0.849	5.9	127.7
Ross Watt Road - West	0.151	31	3.2	0.409	14.9	24.2	0.782	58.7	39.1	**0.782**	58.7	39.1	0.36	14.6	22.6

Option 1 – Roundabout at the intersection of Station Road / Cherry Lane and Station Road / Ross Watt Road.
Option 2 – Signals at the intersection of Station Road / Cherry Lane and Station Road / Ross Watt Road.
Option 3 – Roundabout at the intersection of Station Road / Cherry Lane and signals at the intersection of Station Road / Ross Watt Road.
Option 4 – Signals at the intersection of Station Road / Cherry Lane and roundabout at the intersection of Station Road / Ross Watt Road.

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Table 13 SIDRA Post-Development Conditions – Station Rd / Cherry Ln

Approach	Existing Conditions			Future Conditions (Option 1)			Future Conditions (Option 2)			Future Conditions (Option 3)			Future Conditions (Option 4)		
	DoS	Avg Delay (sec)	Queue (m)	DoS	Avg Delay (sec)	Queue (m)	DoS	Avg Delay (sec)	Queue (m)	DoS	Avg Delay (sec)	Queue (m)	DoS	Avg Delay (sec)	Queue (m)
5 Year Growth															
AM Peak															
Station Road - South	0.332	0.3	0	0.547	4.1	50.2	0.7	16.5	195.2	0.586	4.1	48.9	**0.711**	17.1	199.3
Station Road - North	0.417	0.3	0.8	0.841	9.7	123	0.755	10.3	209.4	0.842	9.3	115.3	**0.707**	11.7	219.4
Cherry Lane - West	0.398	33.8	10.1	0.414	14	22.5	0.759	56.5	118.7	0.423	14.2	22.6	**0.730**	54.5	115.7
PM Peak															
Station Road - South	0.384	0.4	0	**0.733**	4.6	86.1	0.775	11.9	202.8	0.788	4.6	86.1	0.775	11.9	202.8
Station Road - North	0.384	0.5	1.6	**0.697**	5.6	69.1	0.617	5.4	125.6	0.697	5.6	65.3	0.617	6.1	141.7
Cherry Lane - West	0.391	36.9	9.5	**0.33**	14.8	17.7	0.805	66.6	81.5	0.339	14.8	17.6	0.805	66.6	81.5
10 Year Growth															
AM Peak															
Station Road - South	0.332	0.3	0	0.593	4.1	58.8	**0.772**	17.4	229.5	0.759	4.1	58.4	**0.772**	17.4	229.5
Station Road - North	0.417	0.3	0.8	0.917	14.4	193.3	**0.727**	11	225	0.917	13.1	179.3	**0.714**	11.3	223.8
Cherry Lane - West	0.398	33.8	10.1	0.451	16	26.6	**0.759**	56.5	118.7	0.496	17	28	**0.759**	56.5	118.7
PM Peak															
Station Road - South	0.384	0.4	0	**0.789**	4.8	111.3	0.842	13.5	247.5	0.991	11.9	180.4	0.842	13.5	247.5
Station Road - North	0.384	0.5	1.6	**0.759**	5.8	85.5	0.667	5.5	145.1	0.759	5.8	82.5	0.667	6.2	162.8
Cherry Lane - West	0.391	36.9	9.5	**0.385**	16.7	21.9	0.862	71.3	85.3	0.424	17.8	22.6	0.862	71.3	85.3

Option 1 – Roundabout at the intersection of Station Road / Cherry Lane and Station Road / Ross Watt Road.
Option 2 – Signals at the intersection of Station Road / Cherry Lane and Station Road / Ross Watt Road.
Option 3 – Roundabout at the intersection of Station Road / Cherry Lane and signals at the intersection of Station Road / Ross Watt Road.
Option 4 – Signals at the intersection of Station Road / Cherry Lane and roundabout at the intersection of Station Road / Ross Watt Road.

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Table 14 SIDRA Post-Development Conditions – Station Rd / Calder FWY Westbound Ramp

Approach	Existing Conditions			Future Conditions (Option 1)			Future Conditions (Option 2)			Future Conditions (Option 3)			Future Conditions (Option 4)		
	DoS	Avg Delay (sec)	Queue (m)	DoS	Avg Delay (sec)	Queue (m)	DoS	Avg Delay (sec)	Queue (m)	DoS	Avg Delay (sec)	Queue (m)	DoS	Avg Delay (sec)	Queue (m)
5 Year Growth															
AM Peak															
Station Road - South	0.252	3.8	8.6	**0.356**	4	13.6	0.356	4	11.7	0.359	4	11.9	0.359	4	13.6
Calder Freeway Off-ramp - East	0.132	10.1	3.9	**0.169**	10.2	5.3	0.165	9.7	109.1	0.167	9.9	5	0.166	9.7	4.7
Station Road - North	0.305	3.9	0	**0.342**	4	0	0.488	4.1	212.2	0.412	4	0	0.468	4.1	0
PM Peak															
Station Road - South	0.257	3.8	8.8	0.343	4	13.3	0.343	4	12.3	**0.337**	4	11.4	0.343	4	13.3
Calder Freeway Off-ramp - East	0.144	8.7	4.2	0.229	9.6	7.4	0.229	9.6	7.4	**0.229**	9.6	7.4	0.229	9.6	7.4
Station Road - North	0.258	3.9	0	0.343	4.1	0	0.343	4.1	0	**0.343**	4.1	0	0.343	4.1	0
10 Year Growth															
AM Peak															
Station Road - South	0.252	3.8	8.6	**0.415**	4.2	16.5	0.408	4.2	14.1	0.414	4.2	14.4	0.414	4.2	16.3
Calder Freeway Off-ramp - East	0.132	10.1	3.9	**0.203**	11	6.6	0.194	10.3	133.6	0.195	10.4	5.8	0.194	10.3	81.3
Station Road - North	0.305	3.9	0	**0.394**	4.2	0	0.561	4.3	212.2	0.536	4.3	0	0.561	4.3	262.9
PM Peak															
Station Road - South	0.257	3.8	8.8	0.38	4.1	15.3	0.38	4.1	13.6	**0.335**	4.1	11.2	0.38	4.1	15.3
Calder Freeway Off-ramp - East	0.144	8.7	4.2	0.246	9.9	8	0.246	9.9	8	**0.245**	9.8	7.9	0.246	9.9	8
Station Road - North	0.258	3.9	0	0.355	4.2	0	0.355	4.2	0	**0.37**	4.2	0	0.355	4.2	0

Option 1 – Roundabout at the intersection of Station Road / Cherry Lane and Station Road / Ross Watt Road.
Option 2 – Signals at the intersection of Station Road / Cherry Lane and Station Road / Ross Watt Road.
Option 3 – Roundabout at the intersection of Station Road / Cherry Lane and signals at the intersection of Station Road / Ross Watt Road.
Option 4 – Signals at the intersection of Station Road / Cherry Lane and roundabout at the intersection of Station Road / Ross Watt Road.

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Table 15 SIDRA Post-Development Conditions – Station Rd / Calder FWY Eastbound Ramp

Approach	Existing Conditions			Future Conditions (Option 1)			Future Conditions (Option 2)			Future Conditions (Option 3)			Future Conditions (Option 4)		
	DoS	Avg Delay (sec)	Queue (m)	DoS	Avg Delay (sec)	Queue (m)	DoS	Avg Delay (sec)	Queue (m)	DoS	Avg Delay (sec)	Queue (m)	DoS	Avg Delay (sec)	Queue (m)
5 Year Growth															
AM Peak															
Station Road - South	0.195	4.2	0	**0.272**	4.7	0	0.271	4.7	0	0.272	4.7	0	0.272	4.7	0
Station Road - North	0.304	4.3	10.6	**0.384**	5.1	14.9	0.65	6.9	23.5	0.387	5.1	14.9	0.387	5.1	14.9
Calder Freeway Off-ramp - West	0.163	10	4.5	**0.206**	10.7	6	0.366	10.8	6.7	0.206	10.7	6	0.206	10.7	6
PM Peak															
Station Road - South	0.163	4.1	0	0.213	4.5	0	**0.212**	4.5	0	0.213	4.5	0	0.213	4.5	0
Station Road - North	0.22	4.2	7.1	0.302	4.7	10.7	**0.302**	4.7	10.7	0.302	4.7	10.7	0.302	4.7	10.7
Calder Freeway Off-ramp - West	0.176	9.6	4.9	0.224	10.2	6.5	**0.224**	10.2	6.5	0.224	10.2	6.5	0.224	10.2	6.5
10 Year Growth															
AM Peak															
Station Road - South	0.195	4.2	0	**0.294**	4.7	0	0.291	4.7	0	**0.294**	4.7	0	0.294	4.7	0
Station Road - North	0.304	4.3	10.6	**0.438**	5.5	18.2	0.759	8.9	83.8	**0.438**	5.5	18.2	0.594	6.6	25.4
Calder Freeway Off-ramp - West	0.163	10	4.5	**0.231**	11	6.9	0.427	11.4	46.6	**0.231**	11	6.9	0.322	10.9	7.6
PM Peak															
Station Road - South	0.163	4.1	0	0.232	4.5	0	**0.215**	4.5	0	0.212	4.5	0	0.232	4.5	0
Station Road - North	0.22	4.2	7.1	0.33	4.9	12	**0.327**	4.9	11.8	0.326	4.8	11.8	0.33	4.9	12
Calder Freeway Off-ramp - West	0.176	9.6	4.9	0.251	10.4	7.4	**0.247**	10.2	7.3	0.246	10.2	7.3	0.251	10.4	7.4

As shown above, Option 1 for the Ross Watt Road / Station Road intersection will provide the best performance for the 5-year scenario, whilst Option 3 will provide the best performance during the 10-year scenario where the intersection is expected to operate under a DoS of 0.894 during the AM peak. It is noted that whilst the DoS is higher for Option 1 in the 10-year scenario where a DoS of 0.914 is observed during the AM peak hour, the intersection generally performs better with lower average delays and queues observed on all approaches when compared to Option 3. Furthermore, Option 2 and Option 4 will operate with a DoS in excess of 1.0 and are therefore not considered appropriate intersection treatments.

In regard to the intersection of Station Road / Cherry Lane, Option 4 will provide the best performance during the PM peak hour in both the 5-year and 10-year scenario, whilst Option 1 will provide the best performance during the AM peak hour in both the 5-year and 10-year scenario. Regardless, it is noted that all four options will operate with a DoS of under 1.0 during both the AM and PM peak hours in the 10-year scenario.

Additionally, the Station Road / Calder Freeway intersections will operate under excellent conditions in both the 5-year and 10-year scenario.

Noting the above, Option 1 (roundabouts at both intersections) and Option 3 (roundabout at Station Road / Cherry Lane and signals at Station Road / Ross Watt Road) are considered the only feasible treatments as they operate with a DoS of under 1.0 at both Cherry Lane / Station Road and Ross Watt Road / Station Road. Nevertheless, Option 1 is considered the most appropriate treatment option as for the intersection of Ross Watt Road / Station Road, both Option 1 and Option 3 operate with a similar DoS, however Option 1 has significantly shorter queues and delays. Furthermore, for the intersection of Station Road / Cherry Lane, both options show similar queues and delays for the majority of approaches except for the southern leg during the PM peak where Option 1 has shorter delays, queues and DoS.

Furthermore, as mentioned in Section 4.4.1, it is understood that Station Road is envisioned to be duplicated in the future which will relieve the through-traffic issues and improve the operation of the intersections along Station Road, and therefore the proposed roundabouts are considered appropriate as an interim arrangement.

It is noted that the proposed development is generally in accordance with the development anticipated and analysed as part of the Gisborne Movement Network Study (2016) and the traffic study undertaken by Cardno (2020).

The traffic generation of the proposed development has therefore been included in the traffic modelling, intersection analysis and therefore road network design in the vicinity which was undertaken by Cardno. This would include:

- The duplication of Station Road; and
- Upgrade of Cherry Lane and Swinburne Road to a connector road.

It is noted that the Cardno VITM modelling had assumed that a total of 8,390 daily vehicle movements will be generated by the subject site. Of note, based on the residential yield prepared by Breese Pitt Dixon, it is expected that a total of 7,000 daily vehicles movements will be generated by the subject site which is approximately 17% lower than the VITM modelling.

7.6.3 Midblock Assessment

In order to assess the appropriateness of the external road network, a review of the theoretical road capacity and the expected post-development impact has been undertaken, based on the road classifications identified within the Infrastructure Design Manual and for a single carriageway arterial road accommodating two-way traffic.

Station Road and Ross Watt Road have been assessed with 5-years growth, whilst Cherry Lane and Swinburne Avenue have had no growth applied.

The 2022 traffic volumes previously shown in Section 2.4.1 have been used for the below traffic assessment.

Table 16 Midblock Capacity Assessment

Road Name	IDM Classification	Traffic Capacity (vpd)	Existing Traffic with 5yr Growth	Site Generated Traffic	Future
Station Road (North of Ross Watt Road)	Arterial Road	<18,000 vpd	17,052	+3,082	**20,134**
Ross Watt Road	Trunk Collector	6,000 – 8,000 vpd	1,794	+3,436	5,230
Cherry Lane	Access Street	<2,500 vpd	1,161[1]	+2,327	**3,488**
Swinburne Avenue (North of access)	Access Street	<2,500 vpd	253[1]	+416	669
Swinburne Avenue (South of access)	Access Street	<2,500 vpd	253[1]	+2,327	**2,580**

[1]No growth applied

As shown above, Ross Watt Road and the northern portion of Swinburne Avenue are operating within their theoretical capacity at the completion of the proposed subdivision. Whilst Cherry Lane is expected to exceed its theoretical capacity only marginally, and therefore is considered appropriate, noting that the road will be urbanised along the site's frontage. In regard to Station Road and Cherry Lane, both these roads are anticipated to operate in excess of their theoretical capacity and therefore should be upgraded prior to the completion of the full subdivision.

7.7 Timing of Road Upgrades

7.7.1 Intersections

The intersection upgrades to Station Road / Ross Watt and Station Road / Cherry Lane are recommended to occur before the degree of saturation exceeds 0.8 which is the theoretical capacity for a unsignalised intersection. It is generally accepted that an unsignalised t-intersection is at capacity when the D.o.S exceeds 0.8, a roundabout should be upgraded when the D.o.S exceeds 0.85, whilst a signalised intersection should be upgraded with mitigating works at a D.o.S of 0.9. Naturally every intersection should be assessed on an individual basis to determine the site specific upgrades that are required (if at all).

To determine when each of the above intersections should be upgraded to a roundabout, **one**mile**grid** has undertaken an analysis on the trigger points for the upgrade works and has determined that the Station Road / Ross Watt intersection should be upgraded prior to 280 lots, whilst the Station Road / Cherry Lane intersection should be upgraded prior to 40 lots.

The SIDRA analysis for both of the existing intersections is provided in Table 17 and Table 18.

To provide a conservative analysis, Station Road and Ross Watt Road have been assessed with 5-years growth, whilst Cherry Lane and Swinburne Avenue have had no growth applied.

Table 17 SIDRA Analysis – 280 Lots – Ross Watt Rd / Station Rd

Approach	*Existing Conditions*		
	DoS	Avg Delay (sec)	Queue (m)
AM Peak			
Station Road - South	0.372	0.4	0
Station Road – North	0.469	0.3	1.0
Ross Watt Road - West	0.765	90.6	23.8
PM Peak			
Station Road – South	0.430	0.5	0
Station Road - North	0.429	0.6	1.9
Ross Watt Road - West	0.696	83.1	19.0

Table 18 SIDRA Analysis – 40 Lots – Station Rd / Cherry Ln

Approach	*Existing Conditions*		
	DoS	Avg Delay (sec)	Queue (m)
AM Peak			
Station Road - South	0.415	0.6	0
Station Road – North	0.482	0.6	1.9
Cherry Lane - West	0.797	52.5	21.5
PM Peak			
Station Road – South	0.457	0.7	0
Station Road - North	0.472	0.9	3.3
Cheery Lane - West	0.672	60.8	15.8

As shown above, the existing intersection of Station Rad / Cherry Lane requires an upgrade after 40 lots are delivered. Due to the low level of lots that trigger the upgrade, it is clear that the upgrade is not required as a result of the development, however, as a result of the existing traffic along Cherry Lane and the anticipated through traffic growth along Station Road. It is recognised that the operation of this intersection will decline with the proposed subdivision traffic generation, and therefore a fair and proportional contribution to the upgrade of the intersection should be provided by the developer.

In regard to the Station Road / Ross Watt Road intersection, this intersection upgrade should be provided prior to the completion of the 280th lot. It is noted that the composition of the upgrade should be determined in consultation with Council to ensure that there are no redundant works packages constructed in light of potential duplication works of Station Road.

7.7.2 Mid-block

In order to determine when any upgrades are required Cherry Lane, the road has been assessed with the maximum number of lots that can be delivered before an upgrade is required.

Table 19 Midblock Capacity Assessment

Road Name	Road Classification	Traffic Capacity (vpd)	Existing Traffic with 5yr Growth	No. Of Lots Delivered	Site Generated Traffic	Future
Cherry Lane	Access Street	<2,500 vpd	1,161[1]	322	+1,3434	2,495

As shown above, Cherry Lane should be upgraded to an urban standard road prior to the delivery of the 322nd lot, whilst Station Road is to be upgraded by Regional Roads Victoria when the appropriate funding is allocated to the upgrade.

7.7.3 Summary

A summary of the upgrades required as a result of the proposed residential subdivision is provided in Table 20.

Table 20 Intersection/Road Upgrades

Proposed Upgrade	Lot Trigger
Upgrade Station Road / Cherry Lane intersection to roundabout	40th Lot
Upgrade Cherry Lane to an urban standard road	322nd Lot
Upgrade Station Road / Ross Watt Road intersection to roundabout	280th Lot

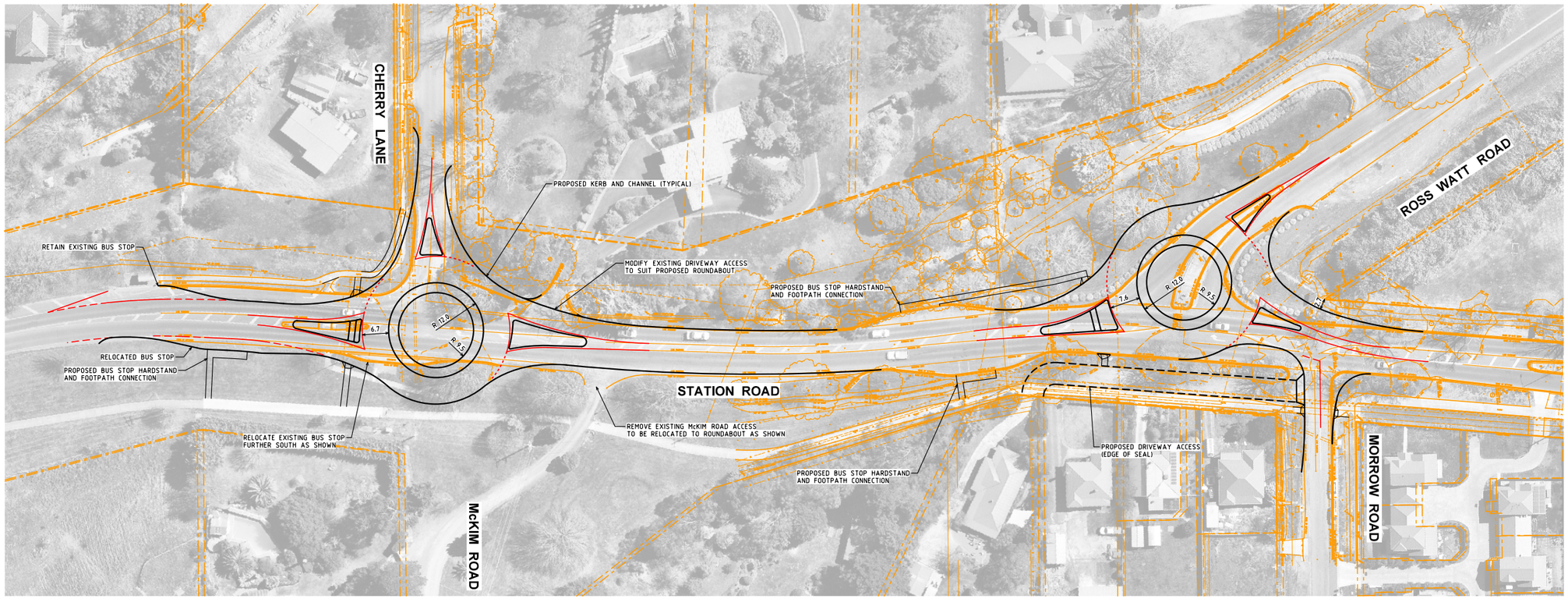
8 CONCLUSIONS

It is proposed to develop the subject site for the purposes of a residential subdivision comprising of approximately 778 residential lots, a Local Convenience Centre and a Childcare Centre.

Considering the analysis presented above, it is concluded that:

- The site is located within the Gisborne ODP, and is largely earmarked for residential land-uses;
- The site is able to gain access to Ross Watt Road via a unsignalised T-intersection;
- The design of the internal road network is generally in accordance with the Gisborne ODP and the requirements of Clause 56 of the Macedon Ranges Panning Scheme;
- The development is expected to generate 7,002 vehicles per day which will be comfortably accommodated by the proposed external road network, and is less than what was previously modelled by Cardno;
- It is proposed to upgrade Cherry Lane to an urban standard prior to the delivery of the 322nd lot, whilst Station Road is to be upgraded by Regional Roads Victoria when the appropriate funding is allocated to the upgrade;
- Is it proposed to upgrade the intersection of Station Road / Cherry Lane to a roundabout prior to the delivery of the 40th lot of the subdivision and the intersection of Ross Watt Road / Station Road (if not upgraded as part of the McKim Road DP) to a roundabout prior to the delivery of the 280th lot of the subdivision; and
- There are no traffic engineering reasons which would preclude a permit from being issued for this proposal.

Appendix A Concept Intersection Plans



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Date Plotted: 16-12-2021 2:37:24 PM

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onemilegrid
56 Down Street, Collingwood, VIC 3066
Email: Info@onemilegrid.com.au Web: www.onemilegrid.com.au
Phone (03) 9939 8250

Drawing Title
ROSS WATT ROAD SUBDIVISION
STATION ROAD ACCESS TREATMENT
FUNCTIONAL LAYOUT PLAN

Designed	Approved	Metway Ref
TCW	VG	NA

Scale	Project Number	Drawing Number	Revision
1:1000 @ A3 (0 2.5 10 20)	210473	FLP100	B

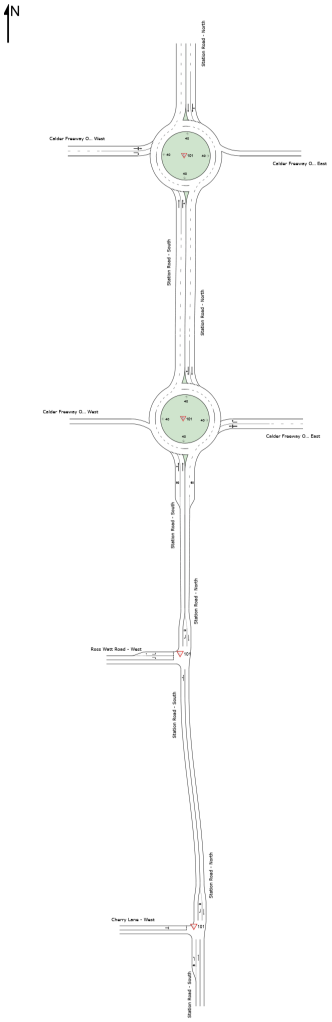
Appendix B SIDRA Results

NETWORK LAYOUT

Network: N101 [Existing (Network Folder: AM Peak)]

New Network
Network Category: (None)

Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.



SITES IN NETWORK		
Site ID	**CCG ID**	**Site Name**
▽101	NA	StatCherAMExEx
▽101	NA	StatRossAMExEx
▽101	NA	StatCaldWestAMExEx
▽101	NA	StatCaldEastAMExEx

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LANE SUMMARY

Site: 101 [StatCherAMExEx (Site Folder: Existing)]

Network: N101 [Existing (Network Folder: AM Peak)]

Station Road / Cherry Lane
AM Peak, Existing Geometry, Existing Volumes
Site Category: (None)
Give-Way (Two-Way)

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Station Road - South															
Lane 1	26	2.0	26	2.0	1831	0.014	100	5.6	LOS A	0.0	0.0	Short	50	0.0	NA
Lane 2	640	2.0	640	2.0	1925	0.332	100	0.1	LOS A	0.0	0.0	Full	500	0.0	0.0
Approach	666	2.0	666	2.0		0.332		0.3	LOS A	0.0	0.0				
North: Station Road - North															
Lane 1	797	2.0	797	2.0	1910	0.417	100	0.1	LOS A	0.0	0.0	Full	165	0.0	0.0
Lane 2	21	2.0	21	2.0	639	0.033	100	9.4	LOS A	0.1	0.8	Short	30	0.0	NA
Approach	818	2.0	818	2.0		0.417		0.3	LOS A	0.1	0.8				
West: Cherry Lane - West															
Lane 1	65	2.0	65	2.0	164	0.398	100	33.8	LOS A	1.4	10.1	Full	500	0.0	0.0
Approach	65	2.0	65	2.0		0.398		33.8	LOS A	1.4	10.1				
Intersection	1549	2.0	1549	2.0		0.417		1.7	LOS A	1.4	10.1				

Site Level of Service (LOS) Method: Degree of Saturation (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Lane LOS values are based on degree of saturation per lane.
Minor Road Approach LOS values are based on worst degree of saturation for any lane.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Approach Lane Flows (veh/h)

South: Station Road - South

Mov. From S To Exit:	L2 W	T1 N	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	26	-	26	2.0	1831	0.014	100	0.0	2
Lane 2	-	640	640	2.0	1925	0.332	100	NA	NA
Approach	26	640	666	2.0		0.332			

North: Station Road - North

Mov. From N To Exit:	T1 S	R2 W	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	797	-	797	2.0	1910	0.417	100	NA	NA
Lane 2	-	21	21	2.0	639	0.033	100	0.0	1
Approach	797	21	818	2.0		0.417			

West: Cherry Lane - West

Mov. From W To Exit:	L2 N	R2 S	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	39	26	65	2.0	164	0.398	100	NA	NA

Approach	39	26	65	2.0	0.398
	Total	%HV	Deg.Satn (v/c)		
Intersection	1549	2.0		0.417	

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

Merge Analysis

	Exit Lane Number	Short Lane Length m	Percent Opng in Lane %	Opposing Flow Rate veh/h	Opposing Flow Rate pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
South Exit: Station Road - South Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
North Exit: Station Road - North Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
West Exit: Cherry Lane - West Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										

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LANE SUMMARY

Site: 101 [StatRossAMExEx (Site Folder: Existing)]

Network: N101 [Existing (Network Folder: AM Peak)]

Station Road / Ross Watt Road
AM Peak, Existing Geometry, Existing Volumes
Site Category: (None)
Give-Way (Two-Way)

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Station Road - South															
Lane 1	839	3.8	839	3.8	1894	0.443	100	0.5	LOS A	0.0	0.0	Full	165	0.0	0.0
Approach	839	3.8	839	3.8		0.443		0.5	LOS A	0.0	0.0				
North: Station Road - North															
Lane 1	997	4.0	997	4.0	1887	0.528	100	0.1	LOS A	0.0	0.0	Full	170	0.0	0.0
Lane 2	19	2.0	19	2.0	620	0.031	100	10.4	LOS A	0.1	0.8	Short	20	0.0	NA
Approach	1016	4.0	1016	4.0		0.528		0.3	LOS A	0.1	0.8				
West: Ross Watt Road - West															
Lane 1	35	2.0	35	2.0	656	0.053	100	9.7	LOS A	0.2	1.3	Short	7	0.0	NA
Lane 2	17	2.0	17	2.0	42	0.401	100	114.0	LOS A	1.1	8.1	Full	500	0.0	0.0
Approach	52	2.0	52	2.0		0.401		43.8	LOS A	1.1	8.1				
Intersection	1906	3.9	1906	3.9		0.528		1.6	LOS A	1.1	8.1				

Site Level of Service (LOS) Method: Degree of Saturation (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Lane LOS values are based on degree of saturation per lane.
Minor Road Approach LOS values are based on worst degree of saturation for any lane.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Approach Lane Flows (veh/h)

South: Station Road - South

Mov. From S To Exit:	L2 W	T1 N	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	72	767	839	3.8	1894	0.443	100	NA	NA
Approach	72	767	839	3.8		0.443			

North: Station Road - North

Mov. From N To Exit:	T1 S	R2 W	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	997	-	997	4.0	1887	0.528	100	NA	NA
Lane 2	-	19	19	2.0	620	0.031	100	0.0	1
Approach	997	19	1016	4.0		0.528			

West: Ross Watt Road - West

Mov. From W To Exit:	L2 N	R2 S	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	35	-	35	2.0	656	0.053	100	0.0	2
Lane 2	-	17	17	2.0	42	0.401	100	NA	NA

Approach	35	17	52	2.0	0.401
	Total	%HV	Deg.Satn (v/c)		
Intersection	1906	3.9		0.528	

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

Merge Analysis

	Exit Lane Number	Short Lane Length m	Percent Opng in Lane %	Opposing Flow Rate veh/h	Opposing Flow Rate pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
South Exit: Station Road - South Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
North Exit: Station Road - North Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
West Exit: Ross Watt Road - West Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										

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LANE SUMMARY

Site: 101 [StatCaldWestAMExEx (Site Folder: Existing)] **Network: N101 [Existing (Network Folder: AM Peak)]**

Station Road / Calder Freeway Westbound Lane
AM Peak, Existing Volumes, Existing Geometry
Site Category: (None)
Roundabout

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Station Road - South															
Lane 1[d]	429	4.0	429	4.0	1336	0.321	100	4.0	LOS A	1.6	11.8	Short	50	0.0	NA
Lane 2	366	4.0	366	4.0	1138	0.321	100	4.1	LOS A	1.6	11.5	Full	170	0.0	0.0
Approach	795	4.0	795	4.0		0.321		4.1	LOS A	1.6	11.8				
East: Calder Freeway Off-ramp - East															
Lane 1[d]	197	4.0	197	4.0	1132	0.174	100	9.6	LOS A	0.8	5.5	Full	500	0.0	0.0
Lane 2	149	4.0	149	4.0	855	0.174	100	12.7	LOS A	0.7	5.2	Full	500	0.0	0.0
Approach	346	4.0	346	4.0		0.174		11.0	LOS A	0.8	5.5				
North: Station Road - North															
Lane 1	307	4.0	307	4.0	1465	0.210	56[6]	4.8	LOS A	0.0	0.0	Full	130	0.0	0.0
Lane 2[d]	684	4.0	684	4.0	1824	0.375	100	3.7	LOS A	0.0	0.0	Full	130	0.0	0.0
Approach	992	4.0	992	4.0		0.375		4.1	LOS A	0.0	0.0				
Intersection	2133	4.0	2133	4.0		0.375		5.2	LOS A	1.6	11.8				

Site Level of Service (LOS) Method: Degree of Saturation (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Roundabout LOS Method: Same as Signalised Intersections.
Lane LOS values are based on degree of saturation per lane.
Intersection and Approach LOS values are based on worst degree of saturation for any lane.
Roundabout Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

6 Lane under-utilisation due to downstream effects
d Dominant lane on roundabout approach

Approach Lane Flows (veh/h)

South: Station Road - South

Mov. From S To Exit:	L2 W	T1 N	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	228	201	429	4.0	1336	0.321	100	0.0	2
Lane 2	-	366	366	4.0	1138	0.321	100	NA	NA
Approach	228	566	795	4.0		0.321			

East: Calder Freeway Off-ramp - East

Mov. From E To Exit:	L2 S	T1 W	R2 N	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	101	1	95	197	4.0	1132	0.174	100	NA	NA
Lane 2	-	-	149	149	4.0	855	0.174	100	NA	NA
Approach	101	1	244	346	4.0		0.174			

North: Station Road - North										
Mov. From N To Exit:	T1 S	R2 W	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	307	-	307	4.0	1465	0.210	56[6]	NA	NA
Lane 2	595	89	684	4.0	1824	0.375	100	NA	NA
Approach	902	89	992	4.0		0.375			
	Total	%HV	Deg.Satn (v/c)						
Intersection	2133	4.0		0.375					

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

6 Lane under-utilisation due to downstream effects

Merge Analysis												
	Exit Lane Number	Short Lane Length m	Percent Opng in Lane %	Opposing Flow Rate veh/h	Opposing Flow Rate pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
South Exit: Station Road - South Merge Type: **Priority**												
Exit Short Lane	1	60	0.0	595	607	3.00	2.00	408	1174	0.348	1.1	1.9
Merge Lane	2	-	100.0	Merge Lane is not Opposed				595	1800	0.330	0.0	0.0
North Exit: Station Road - North Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
Full Length Lane	2	Merge Analysis not applied.										
West Exit: Calder Freeway On-ramp - West Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										

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LANE SUMMARY

Site: 101 [StatCaldEastAMExEx (Site Folder: Existing)] **Network: N101 [Existing (Network Folder: AM Peak)]**

Station Road / Calder Freeway Eastbound Lane
AM Peak, Existing Volumes, Existing Geometry
Site Category: (None)
Roundabout

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Station Road - South															
Lane 1[d]	360	4.0	360	4.0	1826	0.197	100	2.9	LOS A	0.0	0.0	Full	130	0.0	0.0
Lane 2	304	4.0	304	4.0	1543	0.197	100	5.7	LOS A	0.0	0.0	Full	130	0.0	0.0
Approach	664	4.0	664	4.0		0.197		4.2	LOS A	0.0	0.0				
North: Station Road - North															
Lane 1[d]	394	4.0	394	4.0	1283	0.307	100	4.3	LOS A	1.5	10.9	Full	500	0.0	0.0
Lane 2	329	4.0	329	4.0	1071	0.307	100	4.5	LOS A	1.5	10.6	Full	500	0.0	0.0
Approach	723	4.0	723	4.0		0.307		4.4	LOS A	1.5	10.9				
West: Calder Freeway Off-ramp - West															
Lane 1[d]	209	4.0	209	4.0	1261	0.166	100	9.1	LOS A	0.6	4.6	Full	500	0.0	0.0
Lane 2	167	4.0	167	4.0	1007	0.166	100	11.4	LOS A	0.6	4.5	Full	500	0.0	0.0
Approach	376	4.0	376	4.0		0.166		10.1	LOS A	0.6	4.6				
Intersection	1763	4.0	1763	4.0		0.307		5.5	LOS A	1.5	10.9				

Site Level of Service (LOS) Method: Degree of Saturation (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Roundabout LOS Method: Same as Signalised Intersections.
Lane LOS values are based on degree of saturation per lane.
Intersection and Approach LOS values are based on worst degree of saturation for any lane.
Roundabout Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

d Dominant lane on roundabout approach

Approach Lane Flows (veh/h)

South: Station Road - South

Mov. From S To Exit:	T1 N	R2 E	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	360	-	360	4.0	1826	0.197	100	NA	NA
Lane 2	173	132	304	4.0	1543	0.197	100	NA	NA
Approach	533	132	664	4.0		0.197			

North: Station Road - North

Mov. From N To Exit:	L2 E	T1 S	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	224	170	394	4.0	1283	0.307	100	NA	NA
Lane 2	-	329	329	4.0	1071	0.307	100	NA	NA
Approach	224	499	723	4.0		0.307			

West: Calder Freeway Off-ramp - West

Mov. From W To Exit:	L2 N	T1 E	R2 S	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	60	1	148	209	4.0	1261	0.166	100	NA	NA
Lane 2	-	-	167	167	4.0	1007	0.166	100	NA	NA
Approach	60	1	315	376	4.0		0.166			

	Total	%HV	Deg.Satn (v/c)
Intersection	1763	4.0	0.307

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

Merge Analysis

	Exit Lane Number	Short Lane Length m	Percent Opng in Lane %	Opposing Flow Rate veh/h	Opposing Flow Rate pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
South Exit: Station Road - South Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
Full Length Lane	2	Merge Analysis not applied.										
East Exit: Calder Freeway On-ramp - East Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
North Exit: Station Road - North Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
Full Length Lane	2	Merge Analysis not applied.										

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LANE SUMMARY

Site: 101 [StatCherAMExGr (Site Folder: 10yr Growth)] **Network: N101 [10yr Growth (Network Folder: AM Peak)]**

Station Road / Cherry Lane
AM Peak, Existing Geometry, 10yr Growth Only
Site Category: (None)
Give-Way (Two-Way)

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Station Road - South															
Lane 1	26	2.0	26	2.0	1831	0.014	100	5.6	LOS A	0.0	0.0	Short	50	0.0	NA
Lane 2	780	4.0	780	4.0	1901	0.410	100	0.1	LOS A	0.0	0.0	Full	500	0.0	0.0
Approach	806	3.9	806	3.9		0.410		0.3	LOS A	0.0	0.0				
North: Station Road - North															
Lane 1	972	4.0	972	4.0	1883	0.516	100	0.1	LOS A	0.0	0.0	Full	165	0.0	0.0
Lane 2	21	2.0	21	2.0	495	0.042	100	11.3	LOS A	0.1	1.0	Short	30	0.0	NA
Approach	993	4.0	993	4.0		0.516		0.3	LOS A	0.1	1.0				
West: Cherry Lane - West															
Lane 1	65	2.0	65	2.0	68	0.954	100	188.9	LOS E	5.5	39.0	Full	500	0.0	0.0
Approach	65	2.0	65	2.0		0.954		188.9	LOS E	5.5	39.0				
Intersection	1864	3.9	1864	3.9		0.954		6.9	LOS E	5.5	39.0				

Site Level of Service (LOS) Method: Degree of Saturation (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Lane LOS values are based on degree of saturation per lane.
Minor Road Approach LOS values are based on worst degree of saturation for any lane.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Approach Lane Flows (veh/h)

Mov. From S To Exit:	L2 W	T1 N	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
South: Station Road - South									
Lane 1	26	-	26	2.0	1831	0.014	100	0.0	2
Lane 2	-	780	780	4.0	1901	0.410	100	NA	NA
Approach	26	780	806	3.9		0.410			
North: Station Road - North									
Mov. From N To Exit:	T1 S	R2 W	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	972	-	972	4.0	1883	0.516	100	NA	NA
Lane 2	-	21	21	2.0	495	0.042	100	0.0	1
Approach	972	21	993	4.0		0.516			
West: Cherry Lane - West									
Mov. From W To Exit:	L2 N	R2 S	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	39	26	65	2.0	68	0.954	100	NA	NA

Approach	39	26	65	2.0	0.954
	Total	%HV	Deg.Satn (v/c)		
Intersection	1864	3.9	0.954		

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

Merge Analysis

	Exit Lane Number	Short Lane Length m	Percent Opng in Lane %	Opposing Flow Rate veh/h	Opposing Flow Rate pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
South Exit: Station Road - South Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
North Exit: Station Road - North Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
West Exit: Cherry Lane - West Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										

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LANE SUMMARY

Site: 101 [StatRossAMExGr (Site Folder: 10yr Growth)] **Network: N101 [10yr Growth (Network Folder: AM Peak)]**

Station Road / Ross Watt Road
AM Peak, Existing Geometry, 10yr growth Volumes
Site Category: (None)
Give-Way (Two-Way)

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Station Road - South															
Lane 1	839	3.8	839	3.8	1894	0.443	100	0.5	LOS A	0.0	0.0	Full	165	0.0	0.0
Approach	839	3.8	839	3.8		0.443		0.5	LOS A	0.0	0.0				
North: Station Road - North															
Lane 1	997	4.0	997	4.0	1887	0.528	100	0.1	LOS A	0.0	0.0	Full	170	0.0	0.0
Lane 2	19	2.0	19	2.0	620	0.031	100	10.4	LOS A	0.1	0.8	Short	20	0.0	NA
Approach	1016	4.0	1016	4.0		0.528		0.3	LOS A	0.1	0.8				
West: Ross Watt Road - West															
Lane 1	35	2.0	35	2.0	656	0.053	100	9.7	LOS A	0.2	1.3	Short	7	0.0	NA
Lane 2	17	2.0	17	2.0	42	0.401	100	114.0	LOS A	1.1	8.1	Full	500	0.0	0.0
Approach	52	2.0	52	2.0		0.401		43.8	LOS A	1.1	8.1				
Intersection	1906	3.9	1906	3.9		0.528		1.6	LOS A	1.1	8.1				

Site Level of Service (LOS) Method: Degree of Saturation (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Lane LOS values are based on degree of saturation per lane.
Minor Road Approach LOS values are based on worst degree of saturation for any lane.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Approach Lane Flows (veh/h)

South: Station Road - South

Mov. From S To Exit:	L2 W	T1 N	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	72	767	839	3.8	1894	0.443	100	NA	NA
Approach	72	767	839	3.8		0.443			

North: Station Road - North

Mov. From N To Exit:	T1 S	R2 W	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	997	-	997	4.0	1887	0.528	100	NA	NA
Lane 2	-	19	19	2.0	620	0.031	100	0.0	1
Approach	997	19	1016	4.0		0.528			

West: Ross Watt Road - West

Mov. From W To Exit:	L2 N	R2 S	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	35	-	35	2.0	656	0.053	100	0.0	2
Lane 2	-	17	17	2.0	42	0.401	100	NA	NA

Approach	35	17	52	2.0	0.401
	Total	%HV	Deg.Satn (v/c)		
Intersection	1906	3.9		0.528	

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

Merge Analysis

	Exit Lane Number	Short Lane Length m	Percent Opng in Lane %	Opposing Flow Rate veh/h	Opposing Flow Rate pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
South Exit: Station Road - South Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
North Exit: Station Road - North Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
West Exit: Ross Watt Road - West Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										

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LANE SUMMARY

Site: 101 [StatCaldWestAMExGr (Site Folder: 10yr Growth)] **Network: N101 [10yr Growth (Network Folder: AM Peak)]**

Station Road / Calder Freeway Westbound Lane
AM Peak, 10yr growth Volumes, Existing Geometry
Site Category: (None)
Roundabout

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Station Road - South															
Lane 1[d]	429	4.0	429	4.0	1336	0.321	100	4.0	LOS A	1.6	11.8	Short	50	0.0	NA
Lane 2	366	4.0	366	4.0	1138	0.321	100	4.1	LOS A	1.6	11.5	Full	170	0.0	0.0
Approach	795	4.0	795	4.0		0.321		4.1	LOS A	1.6	11.8				
East: Calder Freeway Off-ramp - East															
Lane 1[d]	197	4.0	197	4.0	1132	0.174	100	9.6	LOS A	0.8	5.5	Full	500	0.0	0.0
Lane 2	149	4.0	149	4.0	855	0.174	100	12.7	LOS A	0.7	5.2	Full	500	0.0	0.0
Approach	346	4.0	346	4.0		0.174		11.0	LOS A	0.8	5.5				
North: Station Road - North															
Lane 1	307	4.0	307	4.0	1465	0.210	56[6]	4.8	LOS A	0.0	0.0	Full	130	0.0	0.0
Lane 2[d]	684	4.0	684	4.0	1824	0.375	100	3.7	LOS A	0.0	0.0	Full	130	0.0	0.0
Approach	992	4.0	992	4.0		0.375		4.1	LOS A	0.0	0.0				
Intersection	2133	4.0	2133	4.0		0.375		5.2	LOS A	1.6	11.8				

Site Level of Service (LOS) Method: Degree of Saturation (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Roundabout LOS Method: Same as Signalised Intersections.
Lane LOS values are based on degree of saturation per lane.
Intersection and Approach LOS values are based on worst degree of saturation for any lane.
Roundabout Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

6 Lane under-utilisation due to downstream effects
d Dominant lane on roundabout approach

Approach Lane Flows (veh/h)

South: Station Road - South

Mov. From S To Exit:	L2 W	T1 N	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	228	201	429	4.0	1336	0.321	100	0.0	2
Lane 2	-	366	366	4.0	1138	0.321	100	NA	NA
Approach	228	566	795	4.0		0.321			

East: Calder Freeway Off-ramp - East

Mov. From E To Exit:	L2 S	T1 W	R2 N	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	101	1	95	197	4.0	1132	0.174	100	NA	NA
Lane 2	-	-	149	149	4.0	855	0.174	100	NA	NA
Approach	101	1	244	346	4.0		0.174			

North: Station Road - North										
Mov. From N To Exit:	T1 S	R2 W	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	307	-	307	4.0	1465	0.210	56[6]	NA	NA
Lane 2	595	89	684	4.0	1824	0.375	100	NA	NA
Approach	902	89	992	4.0		0.375			
	Total	%HV	Deg.Satn (v/c)						
Intersection	2133	4.0		0.375					

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

6 Lane under-utilisation due to downstream effects

Merge Analysis												
	Exit Lane Number	Short Lane Length m	Percent Opng in Lane %	Opposing Flow Rate veh/h	Opposing Flow Rate pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
South Exit: Station Road - South Merge Type: **Priority**												
Exit Short Lane	1	60	0.0	595	607	3.00	2.00	408	1174	0.348	1.1	1.9
Merge Lane	2	-	100.0	Merge Lane is not Opposed				595	1800	0.330	0.0	0.0
North Exit: Station Road - North Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
Full Length Lane	2	Merge Analysis not applied.										
West Exit: Calder Freeway On-ramp - West Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										

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LANE SUMMARY

Site: 101 [StatCaldEastAMExGr (Site Folder: 10yr Growth)] **Network: N101 [10yr Growth (Network Folder: AM Peak)]**

Station Road / Calder Freeway Eastbound Lane
AM Peak, 10yr growth Volumes, Existing Geometry
Site Category: (None)
Roundabout

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Station Road - South															
Lane 1[d]	439	4.0	439	4.0	1826	0.240	100	2.9	LOS A	0.0	0.0	Full	130	0.0	0.0
Lane 2	371	4.0	371	4.0	1543	0.240	100	5.7	LOS A	0.0	0.0	Full	130	0.0	0.0
Approach	809	4.0	809	4.0		0.240		4.2	LOS A	0.0	0.0				
North: Station Road - North															
Lane 1[d]	485	4.0	485	4.0	1231	0.394	100	4.7	LOS A	2.1	15.1	Full	500	0.0	0.0
Lane 2	397	4.0	397	4.0	1009	0.394	100	5.0	LOS A	2.0	14.5	Full	500	0.0	0.0
Approach	882	4.0	882	4.0		0.394		4.8	LOS A	2.1	15.1				
West: Calder Freeway Off-ramp - West															
Lane 1[d]	257	4.0	257	4.0	1223	0.210	100	9.4	LOS A	0.8	6.1	Full	500	0.0	0.0
Lane 2	200	4.0	200	4.0	950	0.210	100	11.9	LOS A	0.8	5.9	Full	500	0.0	0.0
Approach	457	4.0	457	4.0		0.210		10.5	LOS A	0.8	6.1				
Intersection	2148	4.0	2148	4.0		0.394		5.8	LOS A	2.1	15.1				

Site Level of Service (LOS) Method: Degree of Saturation (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Roundabout LOS Method: Same as Signalised Intersections.
Lane LOS values are based on degree of saturation per lane.
Intersection and Approach LOS values are based on worst degree of saturation for any lane.
Roundabout Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

d Dominant lane on roundabout approach

Approach Lane Flows (veh/h)

South: Station Road - South

Mov. From S To Exit:	T1 N	R2 E	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	439	-	439	4.0	1826	0.240	100	NA	NA
Lane 2	211	160	371	4.0	1543	0.240	100	NA	NA
Approach	649	160	809	4.0		0.240			

North: Station Road - North

Mov. From N To Exit:	L2 E	T1 S	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	274	211	485	4.0	1231	0.394	100	NA	NA
Lane 2	-	397	397	4.0	1009	0.394	100	NA	NA
Approach	274	608	882	4.0		0.394			

West: Calder Freeway Off-ramp - West

Mov. From W To Exit:	L2 N	T1 E	R2 S	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	73	1	183	257	4.0	1223	0.210	100	NA	NA
Lane 2	-	-	200	200	4.0	950	0.210	100	NA	NA
Approach	73	1	383	457	4.0		0.210			

	Total	%HV	Deg.Satn (v/c)
Intersection	2148	4.0	0.394

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

Merge Analysis

	Exit Lane Number	Short Lane Length m	Percent Opng in Lane %	Opposing Flow Rate veh/h	Opposing Flow Rate pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
South Exit: Station Road - South Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
Full Length Lane	2	Merge Analysis not applied.										
East Exit: Calder Freeway On-ramp - East Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
North Exit: Station Road - North Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
Full Length Lane	2	Merge Analysis not applied.										

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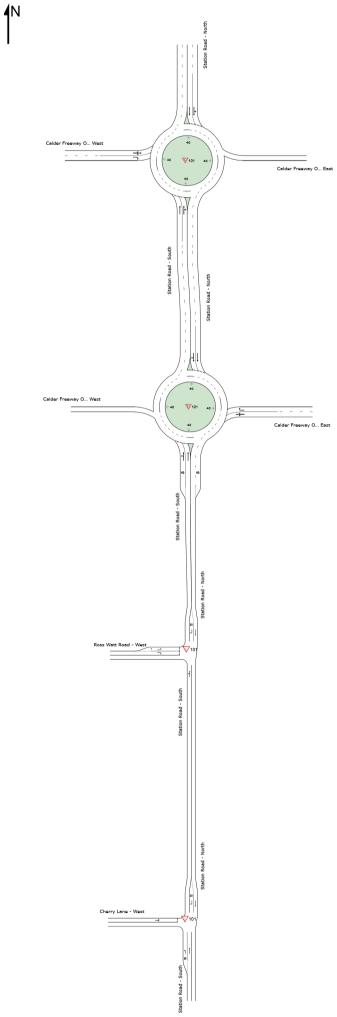
NETWORK LAYOUT

Network: N101 [Existing (Network Folder: PM Peak)]

New Network
Network Category: (None)

Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.



SITES IN NETWORK		
Site ID	**CCG ID**	**Site Name**
101	NA	StatCherPMExEx
101	NA	StatRossPMExEx
101	NA	StatCaldWestPMExEx
101	NA	StatCaldEastPMExEx

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LANE SUMMARY

Site: 101 [StatCherPMExEx (Site Folder: Existing)]

Network: N101 [Existing (Network Folder: PM Peak)]

Station Road / Cherry Lane
PM Peak, Existing Geometry, Existing Volumes
Site Category: (None)
Give-Way (Two-Way)

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Station Road - South															
Lane 1	43	2.0	43	2.0	1831	0.024	100	5.6	LOS A	0.0	0.0	Short	50	0.0	NA
Lane 2	739	4.0	739	4.0	1901	0.389	100	0.1	LOS A	0.0	0.0	Full	500	0.0	0.0
Approach	782	3.9	782	3.9		0.389		0.4	LOS A	0.0	0.0				
North: Station Road - North															
Lane 1	733	4.0	733	4.0	1884	0.389	100	0.0	LOS A	0.0	0.0	Full	165	0.0	0.0
Lane 2	35	2.0	35	2.0	524	0.066	100	11.0	LOS A	0.2	1.6	Short	30	0.0	NA
Approach	767	3.9	767	3.9		0.389		0.5	LOS A	0.2	1.6				
West: Cherry Lane - West															
Lane 1	57	2.0	57	2.0	141	0.404	100	38.5	LOS A	1.4	9.9	Full	500	0.0	0.0
Approach	57	2.0	57	2.0		0.404		38.5	LOS A	1.4	9.9				
Intersection	1606	3.8	1606	3.8		0.404		1.8	LOS A	1.4	9.9				

Site Level of Service (LOS) Method: Degree of Saturation (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Lane LOS values are based on degree of saturation per lane.
Minor Road Approach LOS values are based on worst degree of saturation for any lane.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Approach Lane Flows (veh/h)

South: Station Road - South

Mov. From S To Exit:	L2 W	T1 N	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	43	-	43	2.0	1831	0.024	100	0.0	2
Lane 2	-	739	739	4.0	1901	0.389	100	NA	NA
Approach	43	739	782	3.9		0.389			

North: Station Road - North

Mov. From N To Exit:	T1 S	R2 W	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	733	-	733	4.0	1884	0.389	100	NA	NA
Lane 2	-	35	35	2.0	524	0.066	100	0.0	1
Approach	733	35	767	3.9		0.389			

West: Cherry Lane - West

Mov. From W To Exit:	L2 N	R2 S	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	33	24	57	2.0	141	0.404	100	NA	NA

Approach	33	24	57	2.0	0.404
	Total	%HV	Deg.Satn (v/c)		
Intersection	1606	3.8		0.404	

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

Merge Analysis

	Exit Lane Number	Short Lane Length m	Percent Opng in Lane %	Opposing Flow Rate veh/h	Opposing Flow Rate pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
South Exit: Station Road - South Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
North Exit: Station Road - North Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
West Exit: Cherry Lane - West Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										

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LANE SUMMARY

Site: 101 [StatRossPMExEx (Site Folder: Existing)]

Network: N101 [Existing (Network Folder: PM Peak)]

Station Road / Ross Watt Road
PM Peak, Existing Geometry, Existing Volumes
Site Category: (None)
Give-Way (Two-Way)

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Station Road - South															
Lane 1	763	3.8	763	3.8	1893	0.403	100	0.6	LOS A	0.0	0.0	Full	165	0.0	0.0
Approach	763	3.8	763	3.8		0.403		0.6	LOS A	0.0	0.0				
North: Station Road - North															
Lane 1	799	4.0	799	4.0	1885	0.424	100	0.1	LOS A	0.0	0.0	Full	170	0.0	0.0
Lane 2	11	2.0	11	2.0	711	0.015	100	9.4	LOS A	0.1	0.4	Short	20	0.0	NA
Approach	809	4.0	809	4.0		0.424		0.2	LOS A	0.1	0.4				
West: Ross Watt Road - West															
Lane 1	7	2.0	7	2.0	746	0.010	100	8.8	LOS A	0.0	0.2	Short	7	0.0	NA
Lane 2	15	2.0	15	2.0	94	0.157	100	43.7	LOS A	0.5	3.3	Full	500	0.0	0.0
Approach	22	2.0	22	2.0		0.157		32.1	LOS A	0.5	3.3				
Intersection	1595	3.9	1595	3.9		0.424		0.8	LOS A	0.5	3.3				

Site Level of Service (LOS) Method: Degree of Saturation (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Lane LOS values are based on degree of saturation per lane.
Minor Road Approach LOS values are based on worst degree of saturation for any lane.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Approach Lane Flows (veh/h)

South: Station Road - South

Mov. From S To Exit:	L2 W	T1 N	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	76	687	763	3.8	1893	0.403	100	NA	NA
Approach	76	687	763	3.8		0.403			

North: Station Road - North

Mov. From N To Exit:	T1 S	R2 W	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	799	-	799	4.0	1885	0.424	100	NA	NA
Lane 2	-	11	11	2.0	711	0.015	100	0.0	1
Approach	799	11	809	4.0		0.424			

West: Ross Watt Road - West

Mov. From W To Exit:	L2 N	R2 S	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	7	-	7	2.0	746	0.010	100	0.0	2
Lane 2	-	15	15	2.0	94	0.157	100	NA	NA

Approach	7	15	22	2.0		0.157
	Total	%HV	Deg.Satn (v/c)			
Intersection	1595	3.9		0.424		

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

Merge Analysis

	Exit Lane Number	Short Lane Length m	Percent Opng in Lane %	Opposing Flow Rate veh/h	Opposing Flow Rate pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
South Exit: Station Road - South Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
North Exit: Station Road - North Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
West Exit: Ross Watt Road - West Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										

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LANE SUMMARY

Site: 101 [StatCaldWestPMExEx (Site Folder: Existing)] **Network: N101 [Existing (Network Folder: PM Peak)]**

Station Road / Calder Freeway Westbound Lane
PM Peak, Existing Volumes, Existing Geometry
Site Category: (None)
Roundabout

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Station Road - South															
Lane 1[d]	363	4.0	363	4.0	1405	0.259	100	3.9	LOS A	1.2	9.0	Short	50	0.0	NA
Lane 2	315	4.0	315	4.0	1217	0.259	100	3.8	LOS A	1.2	8.9	Full	170	0.0	0.0
Approach	678	4.0	678	4.0		0.259		3.8	LOS A	1.2	9.0				
East: Calder Freeway Off-ramp - East															
Lane 1[d]	179	4.0	179	4.0	1230	0.145	100	6.6	LOS A	0.6	4.3	Full	500	0.0	0.0
Lane 2	143	4.0	143	4.0	985	0.145	100	11.6	LOS A	0.6	4.1	Full	500	0.0	0.0
Approach	322	4.0	322	4.0		0.145		8.8	LOS A	0.6	4.3				
North: Station Road - North															
Lane 1	214	4.0	214	4.0	1470	0.145	56[6]	3.9	LOS A	0.0	0.0	Full	130	0.0	0.0
Lane 2[d]	475	4.0	475	4.0	1824	0.260	100	3.9	LOS A	0.0	0.0	Full	130	0.0	0.0
Approach	688	4.0	688	4.0		0.260		3.9	LOS A	0.0	0.0				
Intersection	1688	4.0	1688	4.0		0.260		4.8	LOS A	1.2	9.0				

Site Level of Service (LOS) Method: Degree of Saturation (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Roundabout LOS Method: Same as Signalised Intersections.
Lane LOS values are based on degree of saturation per lane.
Intersection and Approach LOS values are based on worst degree of saturation for any lane.
Roundabout Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

6 Lane under-utilisation due to downstream effects
d Dominant lane on roundabout approach

Approach Lane Flows (veh/h)

South: Station Road - South

Mov. From S To Exit:	L2 W	T1 N	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	309	54	363	4.0	1405	0.259	100	0.0	2
Lane 2	-	315	315	4.0	1217	0.259	100	NA	NA
Approach	309	368	678	4.0		0.259			

East: Calder Freeway Off-ramp - East

Mov. From E To Exit:	L2 S	T1 W	R2 N	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	151	1	27	179	4.0	1230	0.145	100	NA	NA
Lane 2	-	-	143	143	4.0	985	0.145	100	NA	NA
Approach	151	1	171	322	4.0		0.145			

North: Station Road - North										
Mov. From N To Exit:	T1 S	R2 W	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	214	-	214	4.0	1470	0.145	56[6]	NA	NA
Lane 2	401	74	475	4.0	1824	0.260	100	NA	NA
Approach	615	74	688	4.0		0.260			
	Total	%HV	Deg.Satn (v/c)						
Intersection	1688	4.0		0.260					

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

6 Lane under-utilisation due to downstream effects

Merge Analysis												
	Exit Lane Number	Short Lane Length m	Percent Opng in Lane %	Opposing Flow Rate veh/h	Opposing Flow Rate pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
South Exit: Station Road - South Merge Type: **Priority**												
Exit Short Lane	1	60	0.0	401	409	3.00	2.00	364	1382	0.264	0.6	1.0
Merge Lane	2	-	100.0	Merge Lane is not Opposed				401	1800	0.223	0.0	0.0
North Exit: Station Road - North Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
Full Length Lane	2	Merge Analysis not applied.										
West Exit: Calder Freeway On-ramp - West Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										

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LANE SUMMARY

Site: 101 [StatCaldEastPMExEx (Site Folder: Existing)] **Network: N101 [Existing (Network Folder: PM Peak)]**

Station Road / Calder Freeway Eastbound Lane
PM Peak, Existing Volumes, Existing Geometry
Site Category: (None)
Roundabout

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Station Road - South															
Lane 1[d]	301	4.0	301	4.0	1826	0.165	100	2.9	LOS A	0.0	0.0	Full	130	0.0	0.0
Lane 2	255	4.0	255	4.0	1543	0.165	100	5.6	LOS A	0.0	0.0	Full	130	0.0	0.0
Approach	556	4.0	556	4.0		0.165		4.1	LOS A	0.0	0.0				
North: Station Road - North															
Lane 1[d]	287	4.0	287	4.0	1288	0.223	100	4.2	LOS A	1.0	7.3	Full	500	0.0	0.0
Lane 2	240	4.0	240	4.0	1077	0.223	100	4.3	LOS A	1.0	7.1	Full	500	0.0	0.0
Approach	526	4.0	526	4.0		0.223		4.2	LOS A	1.0	7.3				
West: Calder Freeway Off-ramp - West															
Lane 1[d]	230	4.0	230	4.0	1294	0.178	100	8.5	LOS A	0.7	5.0	Full	500	0.0	0.0
Lane 2	188	4.0	188	4.0	1055	0.178	100	11.1	LOS A	0.7	4.9	Full	500	0.0	0.0
Approach	418	4.0	418	4.0		0.178		9.7	LOS A	0.7	5.0				
Intersection	1500	4.0	1500	4.0		0.223		5.7	LOS A	1.0	7.3				

Site Level of Service (LOS) Method: Degree of Saturation (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Roundabout LOS Method: Same as Signalised Intersections.
Lane LOS values are based on degree of saturation per lane.
Intersection and Approach LOS values are based on worst degree of saturation for any lane.
Roundabout Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

d Dominant lane on roundabout approach

Approach Lane Flows (veh/h)

South: Station Road - South

Mov. From S To Exit:	T1 N	R2 E	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	301	-	301	4.0	1826	0.165	100	NA	NA
Lane 2	150	104	255	4.0	1543	0.165	100	NA	NA
Approach	452	104	556	4.0		0.165			

North: Station Road - North

Mov. From N To Exit:	L2 E	T1 S	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	165	121	287	4.0	1288	0.223	100	NA	NA
Lane 2	-	240	240	4.0	1077	0.223	100	NA	NA
Approach	165	361	526	4.0		0.223			

West: Calder Freeway Off-ramp - West

Mov. From W To Exit:	L2 N	T1 E	R2 S	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	82	1	147	230	4.0	1294	0.178	100	NA	NA
Lane 2	-	-	188	188	4.0	1055	0.178	100	NA	NA
Approach	82	1	335	418	4.0		0.178			

	Total	%HV	Deg.Satn (v/c)
Intersection	1500	4.0	0.223

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

Merge Analysis

	Exit Lane Number	Short Lane Length m	Percent Opng in Lane %	Opposing Flow Rate veh/h	Opposing Flow Rate pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
South Exit: Station Road - South Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
Full Length Lane	2	Merge Analysis not applied.										
East Exit: Calder Freeway On-ramp - East Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
North Exit: Station Road - North Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
Full Length Lane	2	Merge Analysis not applied.										

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LANE SUMMARY

Site: 101 [StatCherPMExGr (Site Folder: 10yr Growth)] **Network: N101 [10yr Growth (Network Folder: PM Peak)]**

Station Road / Cherry Lane
PM Peak, Existing Geometry, 10yr growth Volumes
Site Category: (None)
Give-Way (Two-Way)

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Station Road - South															
Lane 1	43	2.0	43	2.0	1831	0.024	100	5.6	LOS A	0.0	0.0	Short	50	0.0	NA
Lane 2	901	4.0	901	4.0	1901	0.474	100	0.2	LOS A	0.0	0.0	Full	500	0.0	0.0
Approach	944	3.9	944	3.9		0.474		0.4	LOS A	0.0	0.0				
North: Station Road - North															
Lane 1	893	4.0	893	4.0	1891	0.472	100	0.1	LOS A	0.0	0.0	Full	165	0.0	0.0
Lane 2	35	2.0	35	2.0	381	0.091	100	14.0	LOS A	0.3	2.2	Short	30	0.0	NA
Approach	927	3.9	927	3.9		0.472		0.6	LOS A	0.3	2.2				
West: Cherry Lane - West															
Lane 1	57	2.0	57	2.0	61	0.932	100	189.7	LOS E	4.7	33.2	Full	500	0.0	0.0
Approach	57	2.0	57	2.0		0.932		189.7	LOS E	4.7	33.2				
Intersection	1928	3.9	1928	3.9		0.932		6.1	LOS E	4.7	33.2				

Site Level of Service (LOS) Method: Degree of Saturation (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Lane LOS values are based on degree of saturation per lane.
Minor Road Approach LOS values are based on worst degree of saturation for any lane.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Approach Lane Flows (veh/h)

Mov. From S To Exit:	L2 W	T1 N	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
South: Station Road - South									
Lane 1	43	-	43	2.0	1831	0.024	100	0.0	2
Lane 2	-	901	901	4.0	1901	0.474	100	NA	NA
Approach	43	901	944	3.9		0.474			
North: Station Road - North									
Mov. From N To Exit:	T1 S	R2 W	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	893	-	893	4.0	1891	0.472	100	NA	NA
Lane 2	-	35	35	2.0	381	0.091	100	0.0	1
Approach	893	35	927	3.9		0.472			
West: Cherry Lane - West									
Mov. From W To Exit:	L2 N	R2 S	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	33	24	57	2.0	61	0.932	100	NA	NA

Approach	33	24	57	2.0		0.932
	Total	%HV	Deg.Satn (v/c)			
Intersection	1928	3.9		0.932		

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

Merge Analysis

	Exit Lane Number	Short Lane Length m	Percent Opng in Lane %	Opposing Flow Rate veh/h	Opposing Flow Rate pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
South Exit: Station Road - South Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
North Exit: Station Road - North Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
West Exit: Cherry Lane - West Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										

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LANE SUMMARY

Site: 101 [StatRossPMExGr (Site Folder: 10yr Growth)] **Network: N101 [10yr Growth (Network Folder: PM Peak)]**

Station Road / Ross Watt Road
PM Peak, Existing Geometry, 10yr growth Volumes
Site Category: (None)
Give-Way (Two-Way)

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Station Road - South															
Lane 1	931	3.8	931	3.8	1893	0.491	100	0.6	LOS A	0.0	0.0	Full	165	0.0	0.0
Approach	931	3.8	931	3.8		0.491		0.6	LOS A	0.0	0.0				
North: Station Road - North															
Lane 1	974	4.0	974	4.0	1889	0.515	100	0.1	LOS A	0.0	0.0	Full	170	0.0	0.0
Lane 2	13	2.0	13	2.0	518	0.024	100	11.6	LOS A	0.1	0.6	Short	20	0.0	NA
Approach	986	4.0	986	4.0		0.515		0.2	LOS A	0.1	0.6				
West: Ross Watt Road - West															
Lane 1	9	2.0	9	2.0	579	0.016	100	10.3	LOS A	0.1	0.4	Short	7	0.0	NA
Lane 2	18	2.0	18	2.0	38	0.467	100	132.7	LOS A	1.3	9.5	Full	500	0.0	0.0
Approach	27	2.0	27	2.0		0.467		90.3	LOS A	1.3	9.5				
Intersection	1944	3.9	1944	3.9		0.515		1.7	LOS A	1.3	9.5				

Site Level of Service (LOS) Method: Degree of Saturation (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Lane LOS values are based on degree of saturation per lane.
Minor Road Approach LOS values are based on worst degree of saturation for any lane.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Approach Lane Flows (veh/h)

South: Station Road - South

Mov. From S To Exit:	L2 W	T1 N	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	93	838	931	3.8	1893	0.491	100	NA	NA
Approach	93	838	931	3.8		0.491			

North: Station Road - North

Mov. From N To Exit:	T1 S	R2 W	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	974	-	974	4.0	1889	0.515	100	NA	NA
Lane 2	-	13	13	2.0	518	0.024	100	0.0	1
Approach	974	13	986	4.0		0.515			

West: Ross Watt Road - West

Mov. From W To Exit:	L2 N	R2 S	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	9	-	9	2.0	579	0.016	100	0.0	2
Lane 2	-	18	18	2.0	38	0.467	100	NA	NA

Approach	9	18	27	2.0	0.467
	Total	%HV	Deg.Satn (v/c)		
Intersection	1944	3.9		0.515	

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

Merge Analysis

	Exit Lane Number	Short Lane Length m	Percent Opng in Lane %	Opposing Flow Rate veh/h	Opposing Flow Rate pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
South Exit: Station Road - South Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
North Exit: Station Road - North Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
West Exit: Ross Watt Road - West Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										

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LANE SUMMARY

Site: 101 [StatCaldWestPMExGr (Site Folder: 10yr Growth)] **Network: N101 [10yr Growth (Network Folder: PM Peak)]**

Station Road / Calder Freeway Westbound Lane
PM Peak, 10yr growth Volumes, Existing Geometry
Site Category: (None)
Roundabout

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Station Road - South															
Lane 1[d]	445	4.0	445	4.0	1370	0.325	100	4.0	LOS A	1.7	12.0	Short	50	0.0	NA
Lane 2	382	4.0	382	4.0	1175	0.325	100	4.0	LOS A	1.6	11.8	Full	170	0.0	0.0
Approach	826	4.0	826	4.0		0.325		4.0	LOS A	1.7	12.0				
East: Calder Freeway Off-ramp - East															
Lane 1[d]	220	4.0	220	4.0	1182	0.186	100	7.5	LOS A	0.8	5.8	Full	500	0.0	0.0
Lane 2	171	4.0	171	4.0	920	0.186	100	12.2	LOS A	0.8	5.5	Full	500	0.0	0.0
Approach	392	4.0	392	4.0		0.186		9.6	LOS A	0.8	5.8				
North: Station Road - North															
Lane 1	261	4.0	261	4.0	1470	0.177	56[6]	4.4	LOS A	0.0	0.0	Full	130	0.0	0.0
Lane 2[d]	578	4.0	578	4.0	1824	0.317	100	3.9	LOS A	0.0	0.0	Full	130	0.0	0.0
Approach	839	4.0	839	4.0		0.317		4.1	LOS A	0.0	0.0				
Intersection	2057	4.0	2057	4.0		0.325		5.1	LOS A	1.7	12.0				

Site Level of Service (LOS) Method: Degree of Saturation (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Roundabout LOS Method: Same as Signalised Intersections.
Lane LOS values are based on degree of saturation per lane.
Intersection and Approach LOS values are based on worst degree of saturation for any lane.
Roundabout Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

6 Lane under-utilisation due to downstream effects
d Dominant lane on roundabout approach

Approach Lane Flows (veh/h)

South: Station Road - South

Mov. From S To Exit:	L2 W	T1 N	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	377	68	445	4.0	1370	0.325	100	0.0	2
Lane 2	-	382	382	4.0	1175	0.325	100	NA	NA
Approach	377	449	826	4.0		0.325			

East: Calder Freeway Off-ramp - East

Mov. From E To Exit:	L2 S	T1 W	R2 N	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	183	1	36	220	4.0	1182	0.186	100	NA	NA
Lane 2	-	-	171	171	4.0	920	0.186	100	NA	NA
Approach	183	1	207	392	4.0		0.186			

North: Station Road - North										
Mov. From N To Exit:	T1 S	R2 W	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	261	-	261	4.0	1470	0.177	56[6]	NA	NA
Lane 2	489	89	578	4.0	1824	0.317	100	NA	NA
Approach	749	89	839	4.0		0.317			
	Total	%HV	Deg.Satn (v/c)						
Intersection	2057	4.0		0.325					

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

6 Lane under-utilisation due to downstream effects

Merge Analysis												
	Exit Lane Number	Short Lane Length m	Percent Opng in Lane %	Opposing Flow Rate veh/h	Opposing Flow Rate pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
South Exit: Station Road - South Merge Type: **Priority**												
Exit Short Lane	1	60	0.0	489	499	3.00	2.00	444	1288	0.345	0.8	1.5
Merge Lane	2	-	100.0	Merge Lane is not Opposed				489	1800	0.272	0.0	0.0
North Exit: Station Road - North Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
Full Length Lane	2	Merge Analysis not applied.										
West Exit: Calder Freeway On-ramp - West Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										

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LANE SUMMARY

Site: 101 [StatCaldEastPMExGr (Site Folder: 10yr Growth)] **Network: N101 [10yr Growth (Network Folder: PM Peak)]**

Station Road / Calder Freeway Eastbound Lane
PM Peak, 10yr growth Volumes, Existing Geometry
Site Category: (None)
Roundabout

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Station Road - South															
Lane 1[d]	367	4.0	367	4.0	1826	0.201	100	2.9	LOS A	0.0	0.0	Full	130	0.0	0.0
Lane 2	311	4.0	311	4.0	1543	0.201	100	5.6	LOS A	0.0	0.0	Full	130	0.0	0.0
Approach	678	4.0	678	4.0		0.201		4.1	LOS A	0.0	0.0				
North: Station Road - North															
Lane 1[d]	352	4.0	352	4.0	1238	0.284	100	4.4	LOS A	1.4	9.9	Full	500	0.0	0.0
Lane 2	289	4.0	289	4.0	1015	0.284	100	4.7	LOS A	1.3	9.5	Full	500	0.0	0.0
Approach	641	4.0	641	4.0		0.284		4.5	LOS A	1.4	9.9				
West: Calder Freeway Off-ramp - West															
Lane 1[d]	284	4.0	284	4.0	1257	0.226	100	8.8	LOS A	0.9	6.6	Full	500	0.0	0.0
Lane 2	226	4.0	226	4.0	1001	0.226	100	11.5	LOS A	0.9	6.4	Full	500	0.0	0.0
Approach	509	4.0	509	4.0		0.226		10.0	LOS A	0.9	6.6				
Intersection	1828	4.0	1828	4.0		0.284		5.9	LOS A	1.4	9.9				

Site Level of Service (LOS) Method: Degree of Saturation (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Roundabout LOS Method: Same as Signalised Intersections.
Lane LOS values are based on degree of saturation per lane.
Intersection and Approach LOS values are based on worst degree of saturation for any lane.
Roundabout Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

d Dominant lane on roundabout approach

Approach Lane Flows (veh/h)

South: Station Road - South

Mov. From S To Exit:	T1 N	R2 E	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	367	-	367	4.0	1826	0.201	100	NA	NA
Lane 2	183	127	311	4.0	1543	0.201	100	NA	NA
Approach	551	127	678	4.0		0.201			

North: Station Road - North

Mov. From N To Exit:	L2 E	T1 S	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	201	151	352	4.0	1238	0.284	100	NA	NA
Lane 2	-	289	289	4.0	1015	0.284	100	NA	NA
Approach	201	440	641	4.0		0.284			

West: Calder Freeway Off-ramp - West

Mov. From W To Exit:	L2 N	T1 E	R2 S	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	100	1	183	284	4.0	1257	0.226	100	NA	NA
Lane 2	-	-	226	226	4.0	1001	0.226	100	NA	NA
Approach	100	1	408	509	4.0		0.226			

	Total	%HV	Deg.Satn (v/c)
Intersection	1828	4.0	0.284

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

Merge Analysis

	Exit Lane Number	Short Lane Length m	Percent Opng in Lane %	Opposing Flow Rate veh/h	Opposing Flow Rate pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
South Exit: Station Road - South Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
Full Length Lane	2	Merge Analysis not applied.										
East Exit: Calder Freeway On-ramp - East Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
North Exit: Station Road - North Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
Full Length Lane	2	Merge Analysis not applied.										

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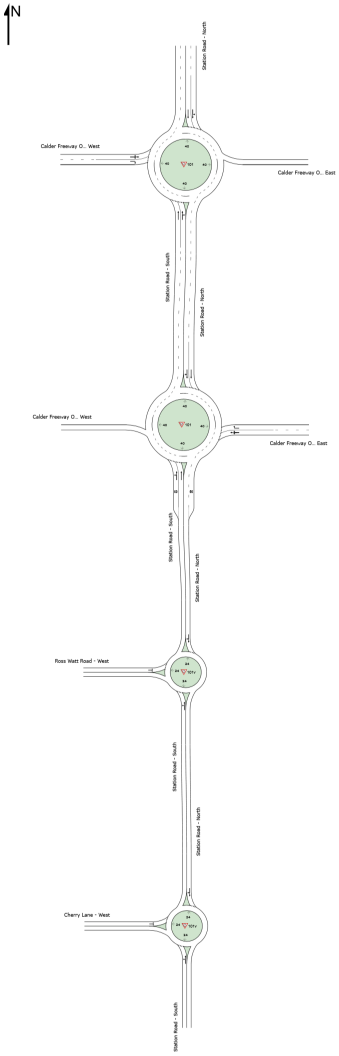
NETWORK LAYOUT

Network: N101 [Roundabout - Both (Network Folder: Post Dev - 5yr Growth - AM Peak)]

New Network
Network Category: (None)

Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.



SITES IN NETWORK		
Site ID	**CCG ID**	**Site Name**
101	NA	StatCaldEastAMFuEx
101	NA	StatCaldWestAMFuEx
101v	NA	StatRossAMExFu - Roundabout
101v	NA	StatCherAMExFu - Roundabout

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LANE SUMMARY

Site: 101 [StatCaldEastAMFuEx (Site Folder: AM - Post Dev - 5yr Growth)]

Network: N101 [Roundabout - Both (Network Folder: Post Dev - 5yr Growth - AM Peak)]

Station Road / Calder Freeway Eastbound Lane
AM Peak, Future Volumes, Existing Geometry
Site Category: (None)
Roundabout

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Station Road - South															
Lane 1[d]	496	4.0	496	4.0	1826	0.272	100	2.9	LOS A	0.0	0.0	Full	130	0.0	0.0
Lane 2	420	4.0	420	4.0	1543	0.272	100	7.0	LOS A	0.0	0.0	Full	130	0.0	0.0
Approach	916	4.0	916	4.0		0.272		4.7	LOS A	0.0	0.0				
North: Station Road - North															
Lane 1[d]	458	4.0	458	4.0	1192	0.384	100	4.9	LOS A	2.1	14.9	Full	500	0.0	0.0
Lane 2	370	4.0	370	4.0	963	0.384	100	5.3	LOS A	1.9	14.1	Full	500	0.0	0.0
Approach	827	4.0	827	4.0		0.384		5.1	LOS A	2.1	14.9				
West: Calder Freeway Off-ramp - West															
Lane 1[d]	247	4.0	247	4.0	1198	0.206	100	9.7	LOS A	0.8	6.0	Full	500	0.0	0.0
Lane 2	188	4.0	188	4.0	912	0.206	100	12.1	LOS A	0.8	5.7	Full	500	0.0	0.0
Approach	435	4.0	435	4.0		0.206		10.7	LOS A	0.8	6.0				
Intersection	2178	4.0	2178	4.0		0.384		6.1	LOS A	2.1	14.9				

Site Level of Service (LOS) Method: Degree of Saturation (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Roundabout LOS Method: Same as Signalised Intersections.
Lane LOS values are based on degree of saturation per lane.
Intersection and Approach LOS values are based on worst degree of saturation for any lane.
Roundabout Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

d Dominant lane on roundabout approach

Approach Lane Flows (veh/h)

South: Station Road - South

Mov. From S To Exit:	T1 N	R2 E	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	496	-	496	4.0	1826	0.272	100	NA	NA
Lane 2	161	259	420	4.0	1543	0.272	100	NA	NA
Approach	657	259	916	4.0		0.272			

North: Station Road - North

Mov. From N To Exit:	L2 E	T1 S	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	247	210	458	4.0	1192	0.384	100	NA	NA
Lane 2	-	370	370	4.0	963	0.384	100	NA	NA
Approach	247	580	827	4.0		0.384			

West: Calder Freeway Off-ramp - West											
Mov. From W To Exit:	L2 N	T1 E	R2 S	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.	
Lane 1	66	1	179	247	4.0	1198	0.206	100	NA	NA	
Lane 2	-	-	188	188	4.0	912	0.206	100	NA	NA	
Approach	66	1	367	435	4.0		0.206				
	Total	%HV	Deg.Satn (v/c)								
Intersection	2178	4.0		0.384							

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

Merge Analysis											
	Exit Lane Number	Short Lane Length m	Percent Opng in Lane %	Opposing Flow Rate veh/h	Opposing Flow Rate pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
South Exit: Station Road - South Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
Full Length Lane	2	Merge Analysis not applied.										
East Exit: Calder Freeway On-ramp - East Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
North Exit: Station Road - North Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
Full Length Lane	2	Merge Analysis not applied.										

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LANE SUMMARY

Site: 101 [StatCaldWestAMFuEx (Site Folder: AM - Post Dev - 5yr Growth)]

Network: N101 [Roundabout - Both (Network Folder: Post Dev - 5yr Growth - AM Peak)]

Station Road / Calder Freeway Westbound Lane
AM Peak, Future Volumes, Existing Geometry
Site Category: (None)
Roundabout

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Station Road - South															
Lane 1[d]	491	4.0	491	4.0	1378	0.356	100	3.9	LOS A	1.9	13.6	Short	50	0.0	NA
Lane 2	421	4.0	421	4.0	1182	0.356	100	4.0	LOS A	1.8	13.4	Full	170	0.0	0.0
Approach	913	4.0	913	4.0		0.356		4.0	LOS A	1.9	13.6				
East: Calder Freeway Off-ramp - East															
Lane 1[d]	196	4.0	196	4.0	1161	0.169	100	8.5	LOS A	0.7	5.3	Full	500	0.0	0.0
Lane 2	151	4.0	151	4.0	893	0.169	100	12.4	LOS A	0.7	5.0	Full	500	0.0	0.0
Approach	347	4.0	347	4.0		0.169		10.2	LOS A	0.7	5.3				
North: Station Road - North															
Lane 1	281	4.0	281	4.0	1470	0.191	56[6]	4.6	LOS A	0.0	0.0	Full	130	0.0	0.0
Lane 2[d]	623	4.0	623	4.0	1824	0.342	100	3.7	LOS A	0.0	0.0	Full	130	0.0	0.0
Approach	904	4.0	904	4.0		0.342		4.0	LOS A	0.0	0.0				
Intersection	2164	4.0	2164	4.0		0.356		5.0	LOS A	1.9	13.6				

Site Level of Service (LOS) Method: Degree of Saturation (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Roundabout LOS Method: Same as Signalised Intersections.
Lane LOS values are based on degree of saturation per lane.
Intersection and Approach LOS values are based on worst degree of saturation for any lane.
Roundabout Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

6 Lane under-utilisation due to downstream effects
d Dominant lane on roundabout approach

Approach Lane Flows (veh/h)

South: Station Road - South

Mov. From S To Exit:	L2 W	T1 N	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	243	248	491	4.0	1378	0.356	100	0.0	2
Lane 2	-	421	421	4.0	1182	0.356	100	NA	NA
Approach	243	669	913	4.0		0.356			

East: Calder Freeway Off-ramp - East

Mov. From E To Exit:	L2 S	T1 W	R2 N	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	136	1	59	196	4.0	1161	0.169	100	NA	NA
Lane 2	-	-	151	151	4.0	893	0.169	100	NA	NA

Approach	136	1	211	347	4.0		0.169			
North: Station Road - North										
Mov. From N To Exit:	T1 S	R2 W	Total	%HV		Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	281	-	281	4.0		1470	0.191	56[6]	NA	NA
Lane 2	545	78	623	4.0		1824	0.342	100	NA	NA
Approach	826	78	904	4.0			0.342			
	Total	%HV	Deg.Satn (v/c)							
Intersection	2164	4.0		0.356						

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

6 Lane under-utilisation due to downstream effects

Merge Analysis

	Exit Lane Number	Short Lane Length m	Percent Opng in Lane %	Opposing Flow Rate veh/h	Opposing Flow Rate pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
South Exit: Station Road - South Merge Type: **Priority**												
Exit Short Lane	1	60	0.0	545	556	3.00	2.00	417	1227	0.340	1.0	1.7
Merge Lane	2	-	100.0	Merge Lane is not Opposed				545	1800	0.303	0.0	0.0
North Exit: Station Road - North Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
Full Length Lane	2	Merge Analysis not applied.										
West Exit: Calder Freeway On-ramp - West Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										

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LANE SUMMARY

Site: 101v [StatRossAMExFu - Roundabout (Site Folder: AM - Post Dev - 5yr Growth)]

Network: N101 [Roundabout - Both (Network Folder: Post Dev - 5yr Growth - AM Peak)]

Station Road / Ross Watt Road
AM Peak, Existing Geometry, Future Volumes
Site Category: (None)
Roundabout

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Station Road - South															
Lane 1[d]	829	4.0	829	4.0	1373	0.604	100	4.9	LOS B	7.1	51.6	Full	165	0.0	0.0
Approach	829	4.0	829	4.0		0.604		4.9	LOS B	7.1	51.6				
North: Station Road - North															
Lane 1[d]	1019	4.0	1019	4.0	1341	0.760	100	5.9	LOS C	12.2	88.1	Full	170	0.0	0.0
Approach	1019	4.0	1019	4.0		0.760		5.9	LOS C	12.2	88.1				
West: Ross Watt Road - West															
Lane 1[d]	316	4.0	316	4.0	610	0.517	100	15.1	LOS A	4.7	34.0	Full	500	0.0	0.0
Approach	316	4.0	316	4.0		0.517		15.1	LOS A	4.7	34.0				
Intersection	2164	4.0	2164	4.0		0.760		6.9	LOS C	12.2	88.1				

Site Level of Service (LOS) Method: Degree of Saturation (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Roundabout LOS Method: Same as Signalised Intersections.
Lane LOS values are based on degree of saturation per lane.
Intersection and Approach LOS values are based on worst degree of saturation for any lane.
Roundabout Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

d Dominant lane on roundabout approach

Approach Lane Flows (veh/h)

Mov. From S To Exit:	L2 W	T1 N	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
South: Station Road - South									
Lane 1	83	746	829	4.0	1373	0.604	100	NA	NA
Approach	83	746	829	4.0		0.604			
North: Station Road - North									
Mov. From N To Exit:	T1 S	R2 W	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	916	103	1019	4.0	1341	0.760	100	NA	NA
Approach	916	103	1019	4.0		0.760			
West: Ross Watt Road - West									
Mov. From W To Exit:	L2 N	R2 S	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	208	107	316	4.0	610	0.517	100	NA	NA

Approach	208	107	316	4.0	0.517
	Total	%HV	Deg.Satn (v/c)		
Intersection	2164	4.0		0.760	

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

Merge Analysis

	Exit Lane Number	Short Lane Length m	Percent Opng in Lane %	Opposing Flow Rate veh/h	Opposing Flow Rate pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
South Exit: Station Road - South Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
North Exit: Station Road - North Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
West Exit: Ross Watt Road - West Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										

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LANE SUMMARY

Site: 101v [StatCherAMExFu - Roundabout (Site Folder: AM - Post Dev - 5yr Growth)]

Network: N101 [Roundabout - Both (Network Folder: Post Dev - 5yr Growth - AM Peak)]

Station Road / Cherry Lane
AM Peak, Existing Geometry, Future Volumes
Site Category: (None)
Roundabout

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Station Road - South															
Lane 1[d]	846	4.0	846	4.0	1548	0.547	100	4.1	LOS A	6.9	50.2	Full	500	0.0	0.0
Approach	846	4.0	846	4.0		0.547		4.1	LOS A	6.9	50.2				
North: Station Road - North															
Lane 1[d]	1006	4.0	1006	4.0	1197	0.841	100	9.7	LOS C	17.0	123.0	Full	165	0.0	0.0
Approach	1006	4.0	1006	4.0		0.841		9.7	LOS C	17.0	123.0				
West: Cherry Lane - West															
Lane 1[d]	288	4.0	288	4.0	696	0.414	100	14.0	LOS A	3.1	22.5	Full	500	0.0	0.0
Approach	288	4.0	288	4.0		0.414		14.0	LOS A	3.1	22.5				
Intersection	2141	4.0	2141	4.0		0.841		8.1	LOS C	17.0	123.0				

Site Level of Service (LOS) Method: Degree of Saturation (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Roundabout LOS Method: Same as Signalised Intersections.
Lane LOS values are based on degree of saturation per lane.
Intersection and Approach LOS values are based on worst degree of saturation for any lane.
Roundabout Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

d Dominant lane on roundabout approach

Approach Lane Flows (veh/h)

Mov. From S To Exit:	L2 W	T1 N	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
South: Station Road - South									
Lane 1	122	724	846	4.0	1548	0.547	100	NA	NA
Approach	122	724	846	4.0		0.547			
North: Station Road - North									
Mov. From N To Exit:	T1 S	R2 W	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	973	34	1006	4.0	1197	0.841	100	NA	NA
Approach	973	34	1006	4.0		0.841			
West: Cherry Lane - West									
Mov. From W To Exit:	L2 N	R2 S	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	91	198	288	4.0	696	0.414	100	NA	NA

Approach	91	198	288	4.0	0.414
	Total	%HV	Deg.Satn (v/c)		
Intersection	2141	4.0	0.841		

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

Merge Analysis

	Exit Lane Number	Short Lane Length m	Percent Opng in Lane %	Opposing Flow Rate veh/h	Opposing Flow Rate pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
South Exit: Station Road - South Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
North Exit: Station Road - North Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
West Exit: Cherry Lane - West Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										

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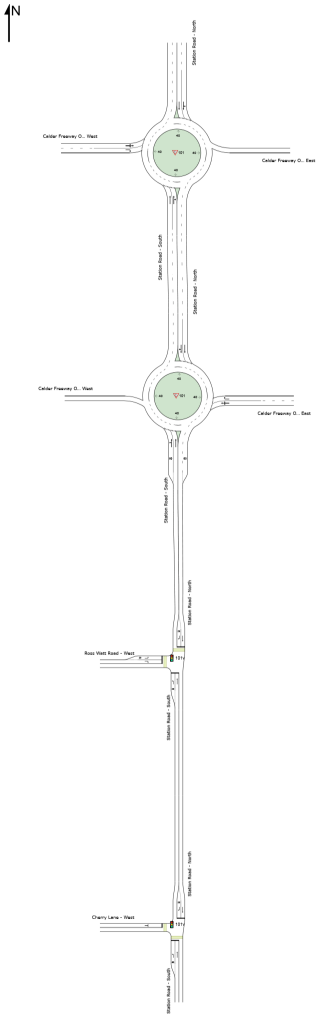
NETWORK LAYOUT

Network: N101 [Signals - Both (Network Folder: Post Dev - 5yr Growth - AM Peak)]

New Network
Network Category: (None)

Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.



SITES IN NETWORK		
Site ID	**CCG ID**	**Site Name**
101	NA	StatCaldEastAMFuEx
101	NA	StatCaldWestAMFuEx
101v	NA	StatRossAMExFu - Signals
101v	NA	StatCherAMExFu - Signals

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LANE SUMMARY

Site: 101 [StatCaldEastAMFuEx (Site Folder: AM - Post Dev - 5yr Growth)]

Network: N101 [Signals - Both (Network Folder: Post Dev - 5yr Growth - AM Peak)]

Station Road / Calder Freeway Eastbound Lane
AM Peak, Future Volumes, Existing Geometry
Site Category: (None)
Roundabout

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Station Road - South															
Lane 1[d]	497	4.0	497	4.0	1826	0.272	100	2.9	LOS A	0.0	0.0	Full	130	0.0	0.0
Lane 2	419	4.0	419	4.0	1541	0.272	100	7.0	LOS A	0.0	0.0	Full	130	0.0	0.0
Approach	916	4.0	916	4.0		0.272		4.7	LOS A	0.0	0.0				
North: Station Road - North															
Lane 1[d]	458	4.0	458	4.0	1184	0.387	100	4.9	LOS A	2.1	14.9	Full	500	0.0	0.0
Lane 2	369	4.0	369	4.0	954	0.387	100	5.3	LOS A	2.0	14.1	Full	500	0.0	0.0
Approach	827	4.0	827	4.0		0.387		5.1	LOS A	2.1	14.9				
West: Calder Freeway Off-ramp - West															
Lane 1[d]	247	4.0	247	4.0	1197	0.206	100	9.7	LOS A	0.8	6.0	Full	500	0.0	0.0
Lane 2	188	4.0	188	4.0	910	0.206	100	12.1	LOS A	0.8	5.7	Full	500	0.0	0.0
Approach	435	4.0	435	4.0		0.206		10.7	LOS A	0.8	6.0				
Intersection	2178	4.0	2178	4.0		0.387		6.1	LOS A	2.1	14.9				

Site Level of Service (LOS) Method: Degree of Saturation (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Roundabout LOS Method: Same as Signalised Intersections.
Lane LOS values are based on degree of saturation per lane.
Intersection and Approach LOS values are based on worst degree of saturation for any lane.
Roundabout Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

d Dominant lane on roundabout approach

Approach Lane Flows (veh/h)

South: Station Road - South

Mov. From S To Exit:	T1 N	R2 E	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	497	-	497	4.0	1826	0.272	100	NA	NA
Lane 2	160	259	419	4.0	1541	0.272	100	NA	NA
Approach	657	259	916	4.0		0.272			

North: Station Road - North

Mov. From N To Exit:	L2 E	T1 S	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	247	211	458	4.0	1184	0.387	100	NA	NA
Lane 2	-	369	369	4.0	954	0.387	100	NA	NA
Approach	247	580	827	4.0		0.387			

West: Calder Freeway Off-ramp - West											
Mov. From W To Exit:	L2 N	T1 E	R2 S	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.	
Lane 1	66	1	180	247	4.0	1197	0.206	100	NA	NA	
Lane 2	-	-	188	188	4.0	910	0.206	100	NA	NA	
Approach	66	1	367	435	4.0		0.206				
	Total	%HV	Deg.Satn (v/c)								
Intersection	2178	4.0		0.387							

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

Merge Analysis												
	Exit Lane Number	Short Lane Length m	Percent Opng in Lane %	Opposing Flow Rate veh/h	Opposing Flow Rate pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
South Exit: Station Road - South Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
Full Length Lane	2	Merge Analysis not applied.										
East Exit: Calder Freeway On-ramp - East Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
North Exit: Station Road - North Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
Full Length Lane	2	Merge Analysis not applied.										

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LANE SUMMARY

Site: 101 [StatCaldWestAMFuEx (Site Folder: AM - Post Dev - 5yr Growth)]

Network: N101 [Signals - Both (Network Folder: Post Dev - 5yr Growth - AM Peak)]

Station Road / Calder Freeway Westbound Lane
AM Peak, Future Volumes, Existing Geometry
Site Category: (None)
Roundabout

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Station Road - South															
Lane 1[d]	493	4.0	493	4.0	1370	0.360	100	3.9	LOS A	1.7	12.0	Short	50	0.0	NA
Lane 2	420	4.0	420	4.0	1168	0.360	100	4.0	LOS A	1.6	11.7	Full	170	0.0	0.0
Approach	913	4.0	913	4.0		0.360		4.0	LOS A	1.7	12.0				
East: Calder Freeway Off-ramp - East															
Lane 1[d]	197	4.0	197	4.0	1174	0.168	100	8.2	LOS A	0.7	5.0	Full	500	0.0	0.0
Lane 2	151	4.0	151	4.0	899	0.168	100	12.2	LOS A	0.7	4.7	Full	500	0.0	0.0
Approach	347	4.0	347	4.0		0.168		9.9	LOS A	0.7	5.0				
North: Station Road - North															
Lane 1	340	4.0	340	4.0	1503	0.227	56[6]	4.5	LOS A	0.0	0.0	Full	130	0.0	0.0
Lane 2[d]	564	4.0	564	4.0	1391	0.405	100	3.8	LOS A	0.0	0.0	Full	130	-23.7[N3]	0.0
Approach	904	4.0	904	4.0		0.405		4.0	LOS A	0.0	0.0				
Intersection	2164	4.0	2164	4.0		0.405		5.0	LOS A	1.7	12.0				

Site Level of Service (LOS) Method: Degree of Saturation (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Roundabout LOS Method: Same as Signalised Intersections.
Lane LOS values are based on degree of saturation per lane.
Intersection and Approach LOS values are based on worst degree of saturation for any lane.
Roundabout Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

6 Lane under-utilisation due to downstream effects
d Dominant lane on roundabout approach
N3 Capacity Adjustment due to downstream lane blockage determined by the program.

Approach Lane Flows (veh/h)

South: Station Road - South

Mov. From S To Exit:	L2 W	T1 N	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	243	249	493	4.0	1370	0.360	100	0.0	2
Lane 2	-	420	420	4.0	1168	0.360	100	NA	NA
Approach	243	669	913	4.0		0.360			

East: Calder Freeway Off-ramp - East

Mov. From E To Exit:	L2 S	T1 W	R2 N	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	136	1	60	197	4.0	1174	0.168	100	NA	NA
Lane 2	-	-	151	151	4.0	899	0.168	100	NA	NA

Approach	136	1	211	347	4.0		0.168			
North: Station Road - North										
Mov. From N To Exit:	T1 S	R2 W	Total	%HV		Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	340	-	340	4.0		1503	0.227	56[6]	NA	NA
Lane 2	486	78	564	4.0		1391	0.405	100	NA	NA
Approach	826	78	904	4.0			0.405			
	Total	%HV	Deg.Satn (v/c)							
Intersection	2164	4.0		0.405						

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

6 Lane under-utilisation due to downstream effects

Merge Analysis

	Exit Lane Number	Short Lane Length m	Percent Opng in Lane %	Opposing Flow Rate veh/h	Opposing Flow Rate pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
South Exit: Station Road - South Merge Type: **Priority**												
Exit Short Lane	1	60	0.0	486	496	3.00	2.00	476	1291	0.369	0.8	1.6
Merge Lane	2	-	100.0	Merge Lane is not Opposed				486	1800	0.270	0.0	0.0
North Exit: Station Road - North Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
Full Length Lane	2	Merge Analysis not applied.										
West Exit: Calder Freeway On-ramp - West Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										

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LANE SUMMARY

Site: 101v [StatRossAMExFu - Signals (Site Folder: AM - Post Dev - 5yr Growth)]

Network: N101 [Signals - Both (Network Folder: Post Dev - 5yr Growth - AM Peak)]

Station Road / Ross Watt Road
AM Peak, Existing Geometry, Future Volumes
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Coordinated Cycle Time = 120 seconds (Network User-Given Cycle Time)

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Station Road - South															
Lane 1	83	2.0	83	2.0	1495	0.056	100	7.1	LOS A	0.5	3.9	Short	20	0.0	NA
Lane 2	746	4.0	746	4.0	1140[1]	0.655	100	7.9	LOS B	15.8	114.6	Full	165	0.0	0.0
Approach	829	3.8	829	3.8		0.655		7.8	LOS B	15.8	114.6				
North: Station Road - North															
Lane 1	916	4.0	916	4.0	1012[1]	0.905	100	25.1	LOS D	38.3[N4]	277.4[N4]	Full	170	-26.6[N3]	50.0
Lane 2	103	2.0	103	2.0	447	0.231	100	16.1	LOS A	2.7	19.3	Short	20	0.0	NA
Approach	1019	3.8	1019	3.8		0.905		24.2	LOS D	38.3	277.4				
West: Ross Watt Road - West															
Lane 1	208	2.0	208	2.0	323[1]	0.646	100	46.8	LOS B	10.4	74.0	Short	20	0.0	NA
Lane 2	107	2.0	107	2.0	114[1]	0.941	100	88.2	LOS D	7.9	56.0	Full	500	-26.6[N3]	0.0
Approach	316	2.0	316	2.0		0.941		60.9	LOS D	10.4	74.0				
Intersection	2164	3.5	2164	3.5		0.941		23.3	LOS D	38.3	277.4				

Site Level of Service (LOS) Method: Degree of Saturation (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Lane LOS values are based on degree of saturation per lane.
Intersection and Approach LOS values are based on worst degree of saturation for any lane.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

1 Reduced capacity due to a short lane effect. Short lane queues may extend into the full-length lanes. Some upstream delays at entry to short lanes are not included.
N3 Capacity Adjustment due to downstream lane blockage determined by the program.
N4 Average back of queue has been restricted to the available queue storage space.

Approach Lane Flows (veh/h)

South: Station Road - South

Mov. From S To Exit:	L2 W	T1 N	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	83	-	83	2.0	1495	0.056	100	0.0	2
Lane 2	-	746	746	4.0	1140[1]	0.655	100	NA	NA
Approach	83	746	829	3.8		0.655			

North: Station Road - North

Mov. From N To Exit:	T1 S	R2 W	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	916	-	916	4.0	1012[1]	0.905	100	NA	NA
Lane 2	-	103	103	2.0	447	0.231	100	1.8	1

Approach	916	103	1019	3.8		0.905			
West: Ross Watt Road - West									
Mov. From W To Exit:	L2 N	R2 S	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	208	-	208	2.0	323[1]	0.646	100	100.0	2
Lane 2	-	107	107	2.0	114[1]	0.941	100	NA	NA
Approach	208	107	316	2.0		0.941			
	Total	%HV	Deg.Satn (v/c)						
Intersection	2164	3.5		0.941					

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

1 Reduced capacity due to a short lane effect. Short lane queues may extend into the full-length lanes. Some upstream delays at entry to short lanes are not included.

Merge Analysis

	Exit Lane Number	Short Lane Length m	Percent Opng in Lane %	Opposing Flow Rate veh/h	Opposing Flow Rate pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
South Exit: Station Road - South Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
North Exit: Station Road - North Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
West Exit: Ross Watt Road - West Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										

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LANE SUMMARY

Site: 101v [StatCherAMExFu - Signals (Site Folder: AM - Post Dev - 5yr Growth)]

Network: N101 [Signals - Both (Network Folder: Post Dev - 5yr Growth - AM Peak)]

Station Road / Cherry Lane
AM Peak, Existing Geometry, Future Volumes
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Coordinated Cycle Time = 120 seconds (Network User-Given Cycle Time)

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Station Road - South															
Lane 1	122	2.0	122	2.0	1083	0.113	100	16.8	LOS A	3.1	21.7	Short	50	0.0	NA
Lane 2	724	4.0	724	4.0	1034[1]	0.700	100	16.4	LOS C	27.0	195.2	Full	500	0.0	0.0
Approach	846	3.7	846	3.7		0.700		16.5	LOS C	27.0	195.2				
North: Station Road - North															
Lane 1	973	4.0	973	4.0	1289[1]	0.755	100	10.0	LOS C	28.9	209.4	Full	165	0.0	26.6
Lane 2	34	2.0	34	2.0	312	0.108	100	17.8	LOS A	0.6	4.0	Short	30	0.0	NA
Approach	1006	3.9	1006	3.9		0.755		10.3	LOS C	28.9	209.4				
West: Cherry Lane - West															
Lane 1	288	2.0	288	2.0	380	0.759	100	56.5	LOS C	16.7	118.7	Full	500	0.0	0.0
Approach	288	2.0	288	2.0		0.759		56.5	LOS C	16.7	118.7				
Intersection	2141	3.6	2141	3.6		0.759		19.0	LOS C	28.9	209.4				

Site Level of Service (LOS) Method: Degree of Saturation (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Lane LOS values are based on degree of saturation per lane.
Intersection and Approach LOS values are based on worst degree of saturation for any lane.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

1 Reduced capacity due to a short lane effect. Short lane queues may extend into the full-length lanes. Some upstream delays at entry to short lanes are not included.

Approach Lane Flows (veh/h)

South: Station Road - South

Mov. From S To Exit:	L2 W	T1 N	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	122	-	122	2.0	1083	0.113	100	0.0	2
Lane 2	-	724	724	4.0	1034[1]	0.700	100	NA	NA
Approach	122	724	846	3.7		0.700			

North: Station Road - North

Mov. From N To Exit:	T1 S	R2 W	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	973	-	973	4.0	1289[1]	0.755	100	NA	NA
Lane 2	-	34	34	2.0	312	0.108	100	0.0	1
Approach	973	34	1006	3.9		0.755			

West: Cherry Lane - West

Mov.	L2	R2	Total	%HV		Deg.	Lane	Prob.	Ov.

From W To Exit:	N	S			Cap. veh/h	Satn v/c	Util. %	SL Ov. %	Lane No.
Lane 1	91	198	288	2.0	380	0.759	100	NA	NA
Approach	91	198	288	2.0		0.759			
	Total	%HV	Deg.Satn (v/c)						
Intersection	2141	3.6		0.759					

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

1 Reduced capacity due to a short lane effect. Short lane queues may extend into the full-length lanes. Some upstream delays at entry to short lanes are not included.

Merge Analysis

	Exit Lane Number	Short Lane Length m	Percent Opng in Lane %	Opposing Flow Rate veh/h	Opposing Flow Rate pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
South Exit: Station Road - South Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
North Exit: Station Road - North Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
West Exit: Cherry Lane - West Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										

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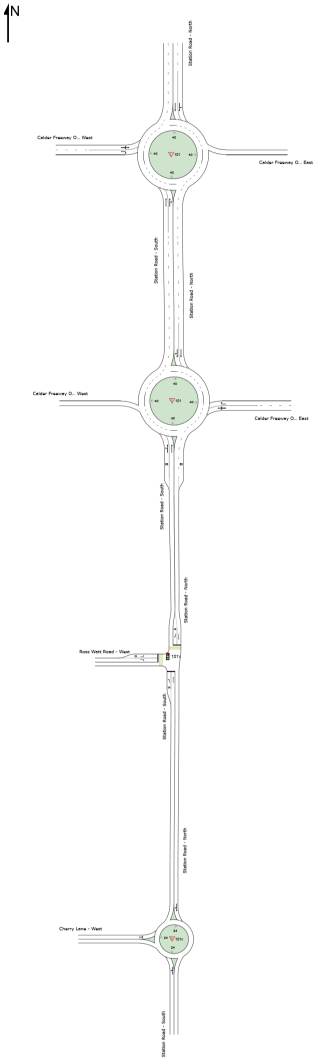
NETWORK LAYOUT

Network: N101 [Signals - Ross Watt (Network Folder: Post Dev - 5yr Growth - AM Peak)]

New Network
Network Category: (None)

Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.



SITES IN NETWORK		
Site ID	**CCG ID**	**Site Name**
101	NA	StatCaldEastAMFuEx
101	NA	StatCaldWestAMFuEx
101v	NA	StatRossAMExFu - Signals - Priority
101v	NA	StatCherAMExFu - Roundabout

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LANE SUMMARY

Site: 101 [StatCaldEastAMFuEx (Site Folder: AM - Post Dev - 5yr Growth)]

Network: N101 [Signals - Ross Watt (Network Folder: Post Dev - 5yr Growth - AM Peak)]

Station Road / Calder Freeway Eastbound Lane
AM Peak, Future Volumes, Existing Geometry
Site Category: (None)
Roundabout

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Station Road - South															
Lane 1[d]	497	4.0	497	4.0	1826	0.272	100	2.9	LOS A	0.0	0.0	Full	130	0.0	0.0
Lane 2	419	4.0	419	4.0	1541	0.272	100	7.0	LOS A	0.0	0.0	Full	130	0.0	0.0
Approach	916	4.0	916	4.0		0.272		4.7	LOS A	0.0	0.0				
North: Station Road - North															
Lane 1[d]	458	4.0	458	4.0	1184	0.387	100	4.9	LOS A	2.1	14.9	Full	500	0.0	0.0
Lane 2	369	4.0	369	4.0	954	0.387	100	5.3	LOS A	2.0	14.1	Full	500	0.0	0.0
Approach	827	4.0	827	4.0		0.387		5.1	LOS A	2.1	14.9				
West: Calder Freeway Off-ramp - West															
Lane 1[d]	247	4.0	247	4.0	1197	0.206	100	9.7	LOS A	0.8	6.0	Full	500	0.0	0.0
Lane 2	188	4.0	188	4.0	910	0.206	100	12.1	LOS A	0.8	5.7	Full	500	0.0	0.0
Approach	435	4.0	435	4.0		0.206		10.7	LOS A	0.8	6.0				
Intersection	2178	4.0	2178	4.0		0.387		6.1	LOS A	2.1	14.9				

Site Level of Service (LOS) Method: Degree of Saturation (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Roundabout LOS Method: Same as Signalised Intersections.
Lane LOS values are based on degree of saturation per lane.
Intersection and Approach LOS values are based on worst degree of saturation for any lane.
Roundabout Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

d Dominant lane on roundabout approach

Approach Lane Flows (veh/h)

South: Station Road - South

Mov. From S To Exit:	T1 N	R2 E	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	497	-	497	4.0	1826	0.272	100	NA	NA
Lane 2	160	259	419	4.0	1541	0.272	100	NA	NA
Approach	657	259	916	4.0		0.272			

North: Station Road - North

Mov. From N To Exit:	L2 E	T1 S	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	247	211	458	4.0	1184	0.387	100	NA	NA
Lane 2	-	369	369	4.0	954	0.387	100	NA	NA

Approach	247	580	827	4.0			0.387			
West: Calder Freeway Off-ramp - West										
Mov. From W To Exit:	L2 N	T1 E	R2 S	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	66	1	180	247	4.0	1197	0.206	100	NA	NA
Lane 2	-	-	188	188	4.0	910	0.206	100	NA	NA
Approach	66	1	367	435	4.0		0.206			
	Total	%HV	Deg.Satn (v/c)							
Intersection	2178	4.0		0.387						

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

Merge Analysis

	Exit Lane Number	Short Lane Length m	Percent Opng in Lane %	Opposing Flow Rate veh/h	Opposing Flow Rate pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
South Exit: Station Road - South Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
Full Length Lane	2	Merge Analysis not applied.										
East Exit: Calder Freeway On-ramp - East Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
North Exit: Station Road - North Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
Full Length Lane	2	Merge Analysis not applied.										

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LANE SUMMARY

Site: 101 [StatCaldWestAMFuEx (Site Folder: AM - Post Dev - 5yr Growth)]

Network: N101 [Signals - Ross Watt (Network Folder: Post Dev - 5yr Growth - AM Peak)]

Station Road / Calder Freeway Westbound Lane
AM Peak, Future Volumes, Existing Geometry
Site Category: (None)
Roundabout

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Station Road - South															
Lane 1[d]	493	4.0	493	4.0	1370	0.360	100	3.9	LOS A	1.7	12.0	Short	50	0.0	NA
Lane 2	420	4.0	420	4.0	1168	0.360	100	4.0	LOS A	1.6	11.6	Full	170	0.0	0.0
Approach	913	4.0	913	4.0		0.360		4.0	LOS A	1.7	12.0				
East: Calder Freeway Off-ramp - East															
Lane 1[d]	197	4.0	197	4.0	1158	0.170	100	8.5	LOS A	0.7	5.3	Full	500	0.0	0.0
Lane 2	151	4.0	151	4.0	887	0.170	100	12.4	LOS A	0.7	5.0	Full	500	0.0	0.0
Approach	347	4.0	347	4.0		0.170		10.2	LOS A	0.7	5.3				
North: Station Road - North															
Lane 1	280	4.0	280	4.0	1462	0.191	56[6]	4.6	LOS A	0.0	0.0	Full	130	0.0	0.0
Lane 2[d]	624	4.0	624	4.0	1824	0.342	100	3.7	LOS A	0.0	0.0	Full	130	0.0	0.0
Approach	904	4.0	904	4.0		0.342		4.0	LOS A	0.0	0.0				
Intersection	2164	4.0	2164	4.0		0.360		5.0	LOS A	1.7	12.0				

Site Level of Service (LOS) Method: Degree of Saturation (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Roundabout LOS Method: Same as Signalised Intersections.
Lane LOS values are based on degree of saturation per lane.
Intersection and Approach LOS values are based on worst degree of saturation for any lane.
Roundabout Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

6 Lane under-utilisation due to downstream effects
d Dominant lane on roundabout approach

Approach Lane Flows (veh/h)

South: Station Road - South

Mov. From S To Exit:	L2 W	T1 N	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	243	249	493	4.0	1370	0.360	100	0.0	2
Lane 2	-	420	420	4.0	1168	0.360	100	NA	NA
Approach	243	669	913	4.0		0.360			

East: Calder Freeway Off-ramp - East

Mov. From E To Exit:	L2 S	T1 W	R2 N	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	136	1	60	197	4.0	1158	0.170	100	NA	NA
Lane 2	-	-	151	151	4.0	887	0.170	100	NA	NA

Approach	136	1	211	347	4.0		0.170			
North: Station Road - North										
Mov. From N To Exit:	T1 S	R2 W	Total	%HV		Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	280	-	280	4.0		1462	0.191	56[6]	NA	NA
Lane 2	547	78	624	4.0		1824	0.342	100	NA	NA
Approach	826	78	904	4.0			0.342			
	Total	%HV	Deg.Satn (v/c)							
Intersection	2164	4.0		0.360						

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

6 Lane under-utilisation due to downstream effects

Merge Analysis

	Exit Lane Number	Short Lane Length m	Percent Opng in Lane %	Opposing Flow Rate veh/h	Opposing Flow Rate pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
South Exit: Station Road - South Merge Type: **Priority**												
Exit Short Lane	1	60	0.0	547	557	3.00	2.00	416	1226	0.339	1.0	1.7
Merge Lane	2	-	100.0	Merge Lane is not Opposed				547	1800	0.304	0.0	0.0
North Exit: Station Road - North Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
Full Length Lane	2	Merge Analysis not applied.										
West Exit: Calder Freeway On-ramp - West Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										

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LANE SUMMARY

Site: 101v [StatRossAMExFu - Signals - Priority (Site Folder: AM - Post Dev - 5yr Growth)]

Network: N101 [Signals - Ross Watt (Network Folder: Post Dev - 5yr Growth - AM Peak)]

Station Road / Ross Watt Road
AM Peak, Existing Geometry, Future Volumes
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 120 seconds (Site User-Given Cycle Time)

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Station Road - South															
Lane 1	83	2.0	83	2.0	1495	0.056	100	7.8	LOS A	0.9	6.4	Short	20	0.0	NA
Lane 2	746	4.0	746	4.0	1159[1]	0.644	100	11.6	LOS B	23.5	170.4	Full	165	0.0	7.9
Approach	829	3.8	829	3.8		0.644		11.2	LOS B	23.5	170.4				
North: Station Road - North															
Lane 1	916	4.0	916	4.0	1370[1]	0.668	100	4.9	LOS B	20.2	146.5	Full	170	0.0	0.0
Lane 2	103	2.0	103	2.0	421	0.245	100	19.2	LOS A	3.1	22.0	Short	20	0.0	NA
Approach	1019	3.8	1019	3.8		0.668		6.3	LOS B	20.2	146.5				
West: Ross Watt Road - West															
Lane 1	208	2.0	208	2.0	326[1]	0.639	100	48.8	LOS B	10.6	75.8	Short	20	0.0	NA
Lane 2	107	2.0	107	2.0	121[1]	0.887	100	75.2	LOS C	7.0	50.1	Full	500	0.0	0.0
Approach	316	2.0	316	2.0		0.887		57.7	LOS C	10.6	75.8				
Intersection	2164	3.5	2164	3.5		0.887		15.7	LOS C	23.5	170.4				

Site Level of Service (LOS) Method: Degree of Saturation (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Lane LOS values are based on degree of saturation per lane.
Intersection and Approach LOS values are based on worst degree of saturation for any lane.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

1 Reduced capacity due to a short lane effect. Short lane queues may extend into the full-length lanes. Some upstream delays at entry to short lanes are not included.

Approach Lane Flows (veh/h)

South: Station Road - South

Mov. From S To Exit:	L2 W	T1 N	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	83	-	83	2.0	1495	0.056	100	0.0	2
Lane 2	-	746	746	4.0	1159[1]	0.644	100	NA	NA
Approach	83	746	829	3.8		0.644			

North: Station Road - North

Mov. From N To Exit:	T1 S	R2 W	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	916	-	916	4.0	1370[1]	0.668	100	NA	NA
Lane 2	-	103	103	2.0	421	0.245	100	13.7	1
Approach	916	103	1019	3.8		0.668			

West: Ross Watt Road - West									
Mov. From W To Exit:	L2 N	R2 S	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	208	-	208	2.0	326[1]	0.639	100	100.0	2
Lane 2	-	107	107	2.0	121[1]	0.887	100	NA	NA
Approach	208	107	316	2.0		0.887			
	Total	%HV	Deg.Satn (v/c)						
Intersection	2164	3.5		0.887					

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

1 Reduced capacity due to a short lane effect. Short lane queues may extend into the full-length lanes. Some upstream delays at entry to short lanes are not included.

Merge Analysis											
	Exit Lane Number	Short Lane Length m	Percent Opng in Lane %	Opposing Flow Rate veh/h pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
South Exit: Station Road - South Merge Type: **Not Applied**											
Full Length Lane	1	Merge Analysis not applied.									
North Exit: Station Road - North Merge Type: **Not Applied**											
Full Length Lane	1	Merge Analysis not applied.									
West Exit: Ross Watt Road - West Merge Type: **Not Applied**											
Full Length Lane	1	Merge Analysis not applied.									

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LANE SUMMARY

Site: 101v [StatCherAMExFu - Roundabout (Site Folder: AM - Post Dev - 5yr Growth)]

Network: N101 [Signals - Ross Watt (Network Folder: Post Dev - 5yr Growth - AM Peak)]

Station Road / Cherry Lane
AM Peak, Existing Geometry, Future Volumes
Site Category: (None)
Roundabout

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Station Road - South															
Lane 1[d]	846	4.0	846	4.0	1445	0.586	100	4.1	LOS A	6.8	48.9	Full	500	-6.8[N3]	0.0
Approach	846	4.0	846	4.0		0.586		4.1	LOS A	6.8	48.9				
North: Station Road - North															
Lane 1[d]	1006	4.0	1006	4.0	1196	0.842	100	9.3	LOS C	15.9	115.3	Full	165	0.0	0.0
Approach	1006	4.0	1006	4.0		0.842		9.3	LOS C	15.9	115.3				
West: Cherry Lane - West															
Lane 1[d]	288	4.0	288	4.0	682	0.423	100	14.2	LOS A	3.1	22.6	Full	500	-2.6[N3]	0.0
Approach	288	4.0	288	4.0		0.423		14.2	LOS A	3.1	22.6				
Intersection	2141	4.0	2141	4.0		0.842		7.9	LOS C	15.9	115.3				

Site Level of Service (LOS) Method: Degree of Saturation (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Roundabout LOS Method: Same as Signalised Intersections.
Lane LOS values are based on degree of saturation per lane.
Intersection and Approach LOS values are based on worst degree of saturation for any lane.
Roundabout Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

d Dominant lane on roundabout approach
N3 Capacity Adjustment due to downstream lane blockage determined by the program.

Approach Lane Flows (veh/h)

South: Station Road - South

Mov. From S To Exit:	L2 W	T1 N	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	122	724	846	4.0	1445	0.586	100	NA	NA
Approach	122	724	846	4.0		0.586			

North: Station Road - North

Mov. From N To Exit:	T1 S	R2 W	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	973	34	1006	4.0	1196	0.842	100	NA	NA
Approach	973	34	1006	4.0		0.842			

West: Cherry Lane - West

Mov. From W To Exit:	L2 N	R2 S	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.

Lane 1	91	198	288	4.0	682	0.423	100	NA	NA	
Approach	91	198	288	4.0		0.423				
	Total	%HV	Deg.Satn (v/c)							
Intersection	2141	4.0		0.842						

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

Merge Analysis

	Exit Lane Number	Short Lane Length m	Percent Opng in Lane %	Opposing Flow Rate veh/h	Opposing Flow Rate pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
South Exit: Station Road - South Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
North Exit: Station Road - North Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
West Exit: Cherry Lane - West Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										

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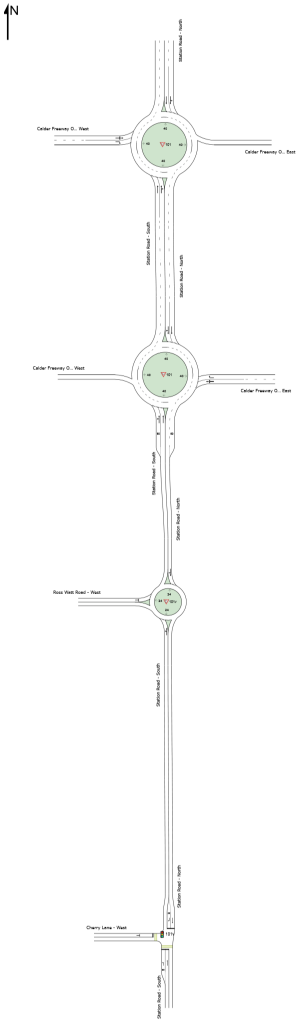
NETWORK LAYOUT

Network: N101 [Signals - Cherry (Network Folder: Post Dev - 5yr Growth - AM Peak)]

New Network
Network Category: (None)

Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.



SITES IN NETWORK		
Site ID	**CCG ID**	**Site Name**
101	NA	StatCaldEastAMFuEx
101	NA	StatCaldWestAMFuEx
101v	NA	StatRossAMExFu - Roundabout
101v	NA	StatCherAMExFu - Signals - Priority

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LANE SUMMARY

Site: 101 [StatCaldEastAMFuEx (Site Folder: AM - Post Dev - 5yr Growth)]

Network: N101 [Signals - Cherry (Network Folder: Post Dev - 5yr Growth - AM Peak)]

Station Road / Calder Freeway Eastbound Lane
AM Peak, Future Volumes, Existing Geometry
Site Category: (None)
Roundabout

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Station Road - South															
Lane 1[d]	497	4.0	497	4.0	1826	0.272	100	2.9	LOS A	0.0	0.0	Full	130	0.0	0.0
Lane 2	419	4.0	419	4.0	1541	0.272	100	7.0	LOS A	0.0	0.0	Full	130	0.0	0.0
Approach	916	4.0	916	4.0		0.272		4.7	LOS A	0.0	0.0				
North: Station Road - North															
Lane 1[d]	478	4.0	478	4.0	1082	0.442	100	5.0	LOS A	2.2	16.2	Full	500	-8.6[N7]	0.0
Lane 2	349	4.0	349	4.0	791	0.442	100	5.6	LOS A	1.9	14.1	Full	500	-16.2[N7]	0.0
Approach	827	4.0	827	4.0		0.442		5.3	LOS A	2.2	16.2				
West: Calder Freeway Off-ramp - West															
Lane 1[d]	252	4.0	252	4.0	1048	0.241	100	9.7	LOS A	0.8	6.2	Full	500	-12.4[N7]	0.0
Lane 2	183	4.0	183	4.0	759	0.241	100	12.1	LOS A	0.8	5.6	Full	500	-16.2[N7]	0.0
Approach	435	4.0	435	4.0		0.241		10.7	LOS A	0.8	6.2				
Intersection	2178	4.0	2178	4.0		0.442		6.1	LOS A	2.2	16.2				

Site Level of Service (LOS) Method: Degree of Saturation (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Roundabout LOS Method: Same as Signalised Intersections.
Lane LOS values are based on degree of saturation per lane.
Intersection and Approach LOS values are based on worst degree of saturation for any lane.
Roundabout Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

d Dominant lane on roundabout approach
N7 The capacity reduction has been determined from the queue blockage probability of a Site further downstream due to intermediate continuous lanes.

Approach Lane Flows (veh/h)

South: Station Road - South

Mov. From S To Exit:	T1 N	R2 E	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	497	-	497	4.0	1826	0.272	100	NA	NA
Lane 2	160	259	419	4.0	1541	0.272	100	NA	NA
Approach	657	259	916	4.0		0.272			

North: Station Road - North

Mov. From N To Exit:	L2 E	T1 S	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	247	231	478	4.0	1082	0.442	100	NA	NA
Lane 2	-	349	349	4.0	791	0.442	100	NA	NA

Approach	247	580	827	4.0			0.442			
West: Calder Freeway Off-ramp - West										
Mov. From W To Exit:	L2 N	T1 E	R2 S	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	66	1	185	252	4.0	1048	0.241	100	NA	NA
Lane 2	-	-	183	183	4.0	759	0.241	100	NA	NA
Approach	66	1	367	435	4.0		0.241			
	Total	%HV	Deg.Satn (v/c)							
Intersection	2178	4.0		0.442						

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

Merge Analysis												
	Exit Lane Number	Short Lane Length m	Percent Opng in Lane %	Opposing Flow Rate veh/h	pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
South Exit: Station Road - South Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
Full Length Lane	2	Merge Analysis not applied.										
East Exit: Calder Freeway On-ramp - East Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
North Exit: Station Road - North Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
Full Length Lane	2	Merge Analysis not applied.										

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LANE SUMMARY

Site: 101 [StatCaldWestAMFuEx (Site Folder: AM - Post Dev - 5yr Growth)]

Network: N101 [Signals - Cherry (Network Folder: Post Dev - 5yr Growth - AM Peak)]

Station Road / Calder Freeway Westbound Lane
AM Peak, Future Volumes, Existing Geometry
Site Category: (None)
Roundabout

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Station Road - South															
Lane 1[d]	493	4.0	493	4.0	1371	0.359	100	3.9	LOS A	1.9	13.6	Short	50	0.0	NA
Lane 2	420	4.0	420	4.0	1169	0.359	100	4.0	LOS A	1.8	13.3	Full	170	0.0	0.0
Approach	913	4.0	913	4.0		0.359		4.0	LOS A	1.9	13.6				
East: Calder Freeway Off-ramp - East															
Lane 1[d]	197	4.0	197	4.0	1195	0.165	100	7.9	LOS A	3.8[N5]	27.2[N5]	Full	500	0.0	0.0
Lane 2	150	4.0	150	4.0	912	0.165	100	12.0	LOS A	0.6	4.5	Full	500	0.0	0.0
Approach	347	4.0	347	4.0		0.165		9.7	LOS A	3.8	27.2				
North: Station Road - North															
Lane 1	420	4.0	420	4.0	1542	0.273	56[6]	4.3	LOS A	11.6[N5]	84.2[N5]	Full	130	0.0	16.2
Lane 2[d]	484	4.0	484	4.0	992	0.488	100	3.9	LOS A	11.2[N5]	81.3[N5]	Full	130	-45.6[N3]	16.2
Approach	904	4.0	904	4.0		0.488		4.1	LOS A	11.6	84.2				
Intersection	2164	4.0	2164	4.0		0.488		4.9	LOS A	11.6	84.2				

Site Level of Service (LOS) Method: Degree of Saturation (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Roundabout LOS Method: Same as Signalised Intersections.
Lane LOS values are based on degree of saturation per lane.
Intersection and Approach LOS values are based on worst degree of saturation for any lane.
Roundabout Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

6 Lane under-utilisation due to downstream effects
d Dominant lane on roundabout approach
N3 Capacity Adjustment due to downstream lane blockage determined by the program.
N5 Continuous Lane results determined by Back of Queue values of downstream lanes (proportional to lane movement flows).

Approach Lane Flows (veh/h)

South: Station Road - South

Mov. From S To Exit:	L2 W	T1 N	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	243	249	493	4.0	1371	0.359	100	0.0	2
Lane 2	-	420	420	4.0	1169	0.359	100	NA	NA
Approach	243	669	913	4.0		0.359			

East: Calder Freeway Off-ramp - East

Mov. From E To Exit:	L2 S	T1 W	R2 N	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	136	1	60	197	4.0	1195	0.165	100	NA	NA

Lane 2	-	-	150	150	4.0	912	0.165	100	NA	NA
Approach	136	1	211	347	4.0		0.165			

North: Station Road - North

Mov. From N To Exit:	T1 S	R2 W	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	420	-	420	4.0	1542	0.273	56[6]	NA	NA
Lane 2	406	78	484	4.0	992	0.488	100	NA	NA
Approach	826	78	904	4.0		0.488			

	Total	%HV	Deg.Satn (v/c)
Intersection	2164	4.0	0.488

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

6 Lane under-utilisation due to downstream effects

Merge Analysis

	Exit Lane Number	Short Lane Length m	Percent Opng in Lane %	Opposing Flow Rate veh/h	Opposing Flow Rate pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
South Exit: Station Road - South Merge Type: **Priority**												
Exit Short Lane	1	60	0.0	406	414	3.00	2.00	556	1376	0.404	0.7	1.4
Merge Lane	2	-	100.0	Merge Lane is not Opposed				406	1800	0.226	0.0	0.0
North Exit: Station Road - North Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
Full Length Lane	2	Merge Analysis not applied.										
West Exit: Calder Freeway On-ramp - West Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										

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LANE SUMMARY

Site: 101v [StatRossAMExFu - Roundabout (Site Folder: AM - Post Dev - 5yr Growth)]

Network: N101 [Signals - Cherry (Network Folder: Post Dev - 5yr Growth - AM Peak)]

Station Road / Ross Watt Road
AM Peak, Existing Geometry, Future Volumes
Site Category: (None)
Roundabout

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Station Road - South															
Lane 1[d]	829	4.0	829	4.0	1375	0.603	100	4.8	LOS B	6.9	50.0	Full	165	0.0	0.0
Approach	829	4.0	829	4.0		0.603		4.8	LOS B	6.9	50.0				
North: Station Road - North															
Lane 1[d]	1019	4.0	1019	4.0	953	1.069	100	75.0	LOS F	58.4[N4]	422.5[N4]	Full	170	-28.7[N3]	49.9
Approach	1019	4.0	1019	4.0		1.069		75.0	LOS F	58.4	422.5				
West: Ross Watt Road - West															
Lane 1[d]	316	4.0	316	4.0	593	0.532	100	15.8	LOS A	5.3	38.0	Full	500	-13.2[N3]	0.0
Approach	316	4.0	316	4.0		0.532		15.8	LOS A	5.3	38.0				
Intersection	2164	4.0	2164	4.0		1.069		39.5	LOS F	58.4	422.5				

Site Level of Service (LOS) Method: Degree of Saturation (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Roundabout LOS Method: Same as Signalised Intersections.
Lane LOS values are based on degree of saturation per lane.
Intersection and Approach LOS values are based on worst degree of saturation for any lane.
Roundabout Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

d Dominant lane on roundabout approach
N3 Capacity Adjustment due to downstream lane blockage determined by the program.
N4 Average back of queue has been restricted to the available queue storage space.

Approach Lane Flows (veh/h)

Mov. From S To Exit:	L2 W	T1 N	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
South: Station Road - South									
Lane 1	83	746	829	4.0	1375	0.603	100	NA	NA
Approach	83	746	829	4.0		0.603			
North: Station Road - North									
Mov. From N To Exit:	T1 S	R2 W	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	916	103	1019	4.0	953	1.069	100	NA	NA
Approach	916	103	1019	4.0		1.069			
West: Ross Watt Road - West									
Mov. From W To Exit:	L2 N	R2 S	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.

Lane 1	208	107	316	4.0	593	0.532	100	NA	NA	
Approach	208	107	316	4.0		0.532				
	Total	%HV	Deg.Satn (v/c)							
Intersection	2164	4.0		1.069						

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

Merge Analysis

	Exit Lane Number	Short Lane Length m	Percent Opng in Lane %	Opposing Flow Rate veh/h	Opposing Flow Rate pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
South Exit: Station Road - South Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
North Exit: Station Road - North Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
West Exit: Ross Watt Road - West Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										

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LANE SUMMARY

Site: 101v [StatCherAMExFu - Signals - Priority (Site Folder: AM - Post Dev - 5yr Growth)]

Network: N101 [Signals - Cherry (Network Folder: Post Dev - 5yr Growth - AM Peak)]

Station Road / Cherry Lane
AM Peak, Existing Geometry, Future Volumes
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 120 seconds (Site User-Given Cycle Time)

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Station Road - South															
Lane 1	122	2.0	122	2.0	1068	0.114	100	17.3	LOS A	3.1	22.2	Short	50	0.0	NA
Lane 2	724	4.0	724	4.0	1018[1]	0.711	100	17.1	LOS C	27.5	199.3	Full	500	0.0	0.0
Approach	846	3.7	846	3.7		0.711		17.1	LOS C	27.5	199.3				
North: Station Road - North															
Lane 1	973	4.0	900	4.0	1273[1]	0.707	100	11.4	LOS C	30.3	219.4	Full	165	0.0	30.9
Lane 2	34	2.0	31	2.0	305	0.102	100	18.5	LOS A	0.6	4.4	Short	30	0.0	NA
Approach	1006	3.9	931[N1]	3.9		0.707		11.7	LOS C	30.3	219.4				
West: Cherry Lane - West															
Lane 1	288	2.0	288	2.0	395	0.730	100	54.5	LOS C	16.3	115.7	Full	500	0.0	0.0
Approach	288	2.0	288	2.0		0.730		54.5	LOS C	16.3	115.7				
Intersection	2141	3.6	2066[N1]	3.7		0.730		19.9	LOS C	30.3	219.4				

Site Level of Service (LOS) Method: Degree of Saturation (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Lane LOS values are based on degree of saturation per lane.
Intersection and Approach LOS values are based on worst degree of saturation for any lane.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

1 Reduced capacity due to a short lane effect. Short lane queues may extend into the full-length lanes. Some upstream delays at entry to short lanes are not included.
N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.

Approach Lane Flows (veh/h)

South: Station Road - South

Mov. From S To Exit:	L2 W	T1 N	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	122	-	122	2.0	1068	0.114	100	0.0	2
Lane 2	-	724	724	4.0	1018[1]	0.711	100	NA	NA
Approach	122	724	846	3.7		0.711			

North: Station Road - North

Mov. From N To Exit:	T1 S	R2 W	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	900	-	900	4.0	1273[1]	0.707	100	NA	NA
Lane 2	-	31	31	2.0	305	0.102	100	0.0	1
Approach	900	31	931	3.9		0.707			

West: Cherry Lane - West

Mov. From W To Exit:	L2 N	R2 S	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	91	198	288	2.0	395	0.730	100	NA	NA
Approach	91	198	288	2.0		0.730			
	Total	%HV	Deg.Satn (v/c)						
Intersection	2066	3.7		0.730					

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

1 Reduced capacity due to a short lane effect. Short lane queues may extend into the full-length lanes. Some upstream delays at entry to short lanes are not included.

Merge Analysis

	Exit Lane Number	Short Lane Length m	Percent Opng in Lane %	Opposing Flow Rate veh/h	Opposing Flow Rate pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
South Exit: Station Road - South Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
North Exit: Station Road - North Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
West Exit: Cherry Lane - West Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										

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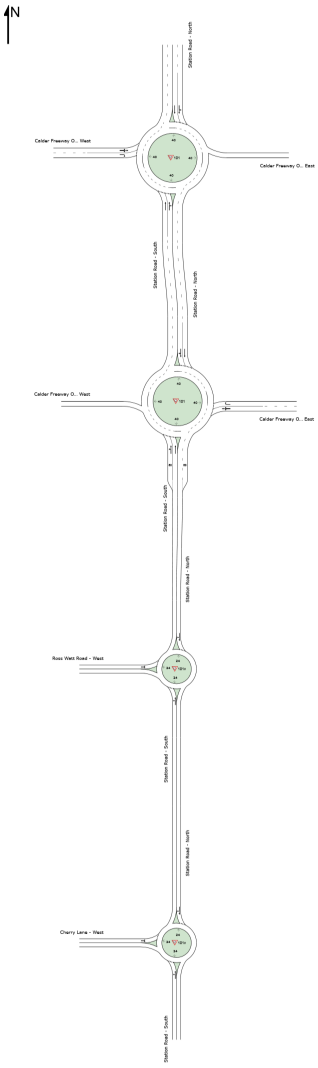
NETWORK LAYOUT

Network: N101 [Roundabout - Both (Network Folder: Post Dev - 5yr Growth - PM Peak)]

New Network
Network Category: (None)

Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.



SITES IN NETWORK		
Site ID	**CCG ID**	**Site Name**
101	NA	StatCaldEastPMFuEx
101	NA	StatCaldWestPMFuEx
101v	NA	StatRossPMExFu - Roundabout
101v	NA	StatCherPMExFu - Roundabout

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LANE SUMMARY

Site: 101 [StatCaldEastPMFuEx (Site Folder: PM - Post Dev - 5yr Growth)]

Network: N101 [Roundabout - Both (Network Folder: Post Dev - 5yr Growth - PM Peak)]

Station Road / Calder Freeway Eastbound Lane
PM Peak, Future Volumes, Existing Geometry
Site Category: (None)
Roundabout

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Station Road - South															
Lane 1[d]	389	4.0	389	4.0	1826	0.213	100	2.9	LOS A	0.0	0.0	Full	130	0.0	0.0
Lane 2	329	4.0	329	4.0	1541	0.213	100	6.5	LOS A	0.0	0.0	Full	130	0.0	0.0
Approach	718	4.0	718	4.0		0.213		4.5	LOS A	0.0	0.0				
North: Station Road - North															
Lane 1[d]	364	4.0	364	4.0	1205	0.302	100	4.6	LOS A	1.5	10.7	Full	500	0.0	0.0
Lane 2	295	4.0	295	4.0	977	0.302	100	4.9	LOS A	1.4	10.2	Full	500	0.0	0.0
Approach	659	4.0	659	4.0		0.302		4.7	LOS A	1.5	10.7				
West: Calder Freeway Off-ramp - West															
Lane 1[d]	280	4.0	280	4.0	1245	0.224	100	9.0	LOS A	0.9	6.5	Full	500	0.0	0.0
Lane 2	220	4.0	220	4.0	982	0.224	100	11.6	LOS A	0.9	6.3	Full	500	0.0	0.0
Approach	500	4.0	500	4.0		0.224		10.2	LOS A	0.9	6.5				
Intersection	1877	4.0	1877	4.0		0.302		6.1	LOS A	1.5	10.7				

Site Level of Service (LOS) Method: Degree of Saturation (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Roundabout LOS Method: Same as Signalised Intersections.
Lane LOS values are based on degree of saturation per lane.
Intersection and Approach LOS values are based on worst degree of saturation for any lane.
Roundabout Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

d Dominant lane on roundabout approach

Approach Lane Flows (veh/h)

South: Station Road - South

Mov. From S To Exit:	T1 N	R2 E	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	389	-	389	4.0	1826	0.213	100	NA	NA
Lane 2	149	180	329	4.0	1541	0.213	100	NA	NA
Approach	538	180	718	4.0		0.213			

North: Station Road - North

Mov. From N To Exit:	L2 E	T1 S	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	182	182	364	4.0	1205	0.302	100	NA	NA
Lane 2	-	295	295	4.0	977	0.302	100	NA	NA
Approach	182	477	659	4.0		0.302			

West: Calder Freeway Off-ramp - West											
Mov. From W To Exit:	L2 N	T1 E	R2 S	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.	
Lane 1	91	1	188	280	4.0	1245	0.224	100	NA	NA	
Lane 2	-	-	220	220	4.0	982	0.224	100	NA	NA	
Approach	91	1	408	500	4.0		0.224				
	Total	%HV	Deg.Satn (v/c)								
Intersection	1877	4.0		0.302							

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

Merge Analysis											
	Exit Lane Number	Short Lane Length m	Percent Opng in Lane %	Opposing Flow Rate veh/h	Opposing Flow Rate pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
South Exit: Station Road - South Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
Full Length Lane	2	Merge Analysis not applied.										
East Exit: Calder Freeway On-ramp - East Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
North Exit: Station Road - North Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
Full Length Lane	2	Merge Analysis not applied.										

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LANE SUMMARY

Site: 101 [StatCaldWestPMFuEx (Site Folder: PM - Post Dev - 5yr Growth)]

Network: N101 [Roundabout - Both (Network Folder: Post Dev - 5yr Growth - PM Peak)]

Station Road / Calder Freeway Westbound Lane
PM Peak, Future Volumes, Existing Geometry
Site Category: (None)
Roundabout

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Station Road - South															
Lane 1[d]	474	4.0	474	4.0	1379	0.343	100	4.0	LOS A	1.8	13.3	Short	50	0.0	NA
Lane 2	405	4.0	405	4.0	1181	0.343	100	4.0	LOS A	1.8	13.0	Full	170	0.0	0.0
Approach	879	4.0	879	4.0		0.343		4.0	LOS A	1.8	13.3				
East: Calder Freeway Off-ramp - East															
Lane 1[d]	265	4.0	265	4.0	1158	0.229	100	7.6	LOS A	1.0	7.4	Full	500	0.0	0.0
Lane 2	188	4.0	188	4.0	882	0.214	93[5]	12.5	LOS A	0.9	6.4	Full	500	0.0	0.0
Approach	454	4.0	454	4.0		0.229		9.6	LOS A	1.0	7.4				
North: Station Road - North															
Lane 1	280	4.0	280	4.0	1462	0.192	56[6]	5.0	LOS A	0.0	0.0	Full	130	0.0	0.0
Lane 2[d]	625	4.0	625	4.0	1824	0.343	100	3.7	LOS A	0.0	0.0	Full	130	0.0	0.0
Approach	905	4.0	905	4.0		0.343		4.1	LOS A	0.0	0.0				
Intersection	2238	4.0	2238	4.0		0.343		5.2	LOS A	1.8	13.3				

Site Level of Service (LOS) Method: Degree of Saturation (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Roundabout LOS Method: Same as Signalised Intersections.
Lane LOS values are based on degree of saturation per lane.
Intersection and Approach LOS values are based on worst degree of saturation for any lane.
Roundabout Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

5 Lane under-utilisation found by the program
6 Lane under-utilisation due to downstream effects
d Dominant lane on roundabout approach

Approach Lane Flows (veh/h)

South: Station Road - South

Mov. From S To Exit:	L2 W	T1 N	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	368	105	474	4.0	1379	0.343	100	0.0	2
Lane 2	-	405	405	4.0	1181	0.343	100	NA	NA
Approach	368	511	879	4.0		0.343			

East: Calder Freeway Off-ramp - East

Mov. From E To Exit:	L2 S	T1 W	R2 N	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	264	1	-	265	4.0	1158	0.229	100	NA	NA
Lane 2	-	-	188	188	4.0	882	0.214	93[5]	NA	NA

Approach	264	1	188	454	4.0		0.229			
North: Station Road - North										
Mov. From N To Exit:	T1 S	R2 W	Total	%HV		Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	280	-	280	4.0		1462	0.192	56[6]	NA	NA
Lane 2	544	81	625	4.0		1824	0.343	100	NA	NA
Approach	824	81	905	4.0			0.343			
	Total	%HV	Deg.Satn (v/c)							
Intersection	2238	4.0		0.343						

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

5 Lane under-utilisation found by the program
6 Lane under-utilisation due to downstream effects

Merge Analysis

	Exit Lane Number	Short Lane Length m	Percent Opng in Lane %	Opposing Flow Rate veh/h	Opposing Flow Rate pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
South Exit: Station Road - South Merge Type: **Priority**												
Exit Short Lane	1	60	0.0	544	555	3.00	2.00	544	1228	0.443	1.0	2.1
Merge Lane	2	-	100.0	Merge Lane is not Opposed				544	1800	0.302	0.0	0.0
North Exit: Station Road - North Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
Full Length Lane	2	Merge Analysis not applied.										
West Exit: Calder Freeway On-ramp - West Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										

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LANE SUMMARY

Site: 101v [StatRossPMExFu - Roundabout (Site Folder: PM - Post Dev - 5yr Growth)]

Network: N101 [Roundabout - Both (Network Folder: Post Dev - 5yr Growth - PM Peak)]

Station Road / Ross Watt Road
PM Peak, Existing Geometry, Future Volumes
Site Category: (None)
Roundabout

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Station Road - South															
Lane 1[d]	906	4.0	906	4.0	1238	0.732	100	6.3	LOS C	9.6	69.6	Full	165	0.0	0.0
Approach	906	4.0	906	4.0		0.732		6.3	LOS C	9.6	69.6				
North: Station Road - North															
Lane 1[d]	1089	4.0	1089	4.0	1441	0.756	100	5.7	LOS C	13.2	95.8	Full	170	0.0	0.0
Approach	1089	4.0	1089	4.0		0.756		5.7	LOS C	13.2	95.8				
West: Ross Watt Road - West															
Lane 1[d]	179	4.0	179	4.0	531	0.337	100	12.7	LOS A	2.5	18.4	Full	500	0.0	0.0
Approach	179	4.0	179	4.0		0.337		12.7	LOS A	2.5	18.4				
Intersection	2175	4.0	2175	4.0		0.756		6.5	LOS C	13.2	95.8				

Site Level of Service (LOS) Method: Degree of Saturation (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Roundabout LOS Method: Same as Signalised Intersections.
Lane LOS values are based on degree of saturation per lane.
Intersection and Approach LOS values are based on worst degree of saturation for any lane.
Roundabout Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

d Dominant lane on roundabout approach

Approach Lane Flows (veh/h)

Mov. From S To Exit:	L2 W	T1 N	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
South: Station Road - South									
Lane 1	118	788	906	4.0	1238	0.732	100	NA	NA
Approach	118	788	906	4.0		0.732			
North: Station Road - North									
Mov. From N To Exit:	T1 S	R2 W	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	907	182	1089	4.0	1441	0.756	100	NA	NA
Approach	907	182	1089	4.0		0.756			
West: Ross Watt Road - West									
Mov. From W To Exit:	L2 N	R2 S	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	109	69	179	4.0	531	0.337	100	NA	NA

Approach	109	69	179	4.0	0.337
	Total	%HV	Deg.Satn (v/c)		
Intersection	2175	4.0		0.756	

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

Merge Analysis

	Exit Lane Number	Short Lane Length m	Percent Opng in Lane %	Opposing Flow Rate veh/h	Opposing Flow Rate pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
South Exit: Station Road - South Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
North Exit: Station Road - North Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
West Exit: Ross Watt Road - West Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										

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LANE SUMMARY

Site: 101v [StatCherPMExFu - Roundabout (Site Folder: PM - Post Dev - 5yr Growth)]

Network: N101 [Roundabout - Both (Network Folder: Post Dev - 5yr Growth - PM Peak)]

Station Road / Cherry Lane
PM Peak, Existing Geometry, Future Volumes
Site Category: (None)
Roundabout

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Station Road - South															
Lane 1[d]	1085	4.0	1085	4.0	1481	0.733	100	4.6	LOS C	11.9	86.1	Full	500	0.0	0.0
Approach	1085	4.0	1085	4.0		0.733		4.6	LOS C	11.9	86.1				
North: Station Road - North															
Lane 1[d]	922	4.0	922	4.0	1322	0.697	100	5.6	LOS B	9.5	69.1	Full	165	0.0	0.0
Approach	922	4.0	922	4.0		0.697		5.6	LOS B	9.5	69.1				
West: Cherry Lane - West															
Lane 1[d]	184	4.0	184	4.0	557	0.330	100	14.8	LOS A	2.4	17.7	Full	500	0.0	0.0
Approach	184	4.0	184	4.0		0.330		14.8	LOS A	2.4	17.7				
Intersection	2192	4.0	2192	4.0		0.733		5.9	LOS C	11.9	86.1				

Site Level of Service (LOS) Method: Degree of Saturation (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Roundabout LOS Method: Same as Signalised Intersections.
Lane LOS values are based on degree of saturation per lane.
Intersection and Approach LOS values are based on worst degree of saturation for any lane.
Roundabout Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

d Dominant lane on roundabout approach

Approach Lane Flows (veh/h)

Mov. From S To Exit:	L2 W	T1 N	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
South: Station Road - South									
Lane 1	235	851	1085	4.0	1481	0.733	100	NA	NA
Approach	235	851	1085	4.0		0.733			
North: Station Road - North									
Mov. From N To Exit:	T1 S	R2 W	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	862	60	922	4.0	1322	0.697	100	NA	NA
Approach	862	60	922	4.0		0.697			
West: Cherry Lane - West									
Mov. From W To Exit:	L2 N	R2 S	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	62	122	184	4.0	557	0.330	100	NA	NA

Approach	62	122	184	4.0	0.330
	Total	%HV	Deg.Satn (v/c)		
Intersection	2192	4.0	0.733		

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

Merge Analysis

	Exit Lane Number	Short Lane Length m	Percent Opng in Lane %	Opposing Flow Rate veh/h	Opposing Flow Rate pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
South Exit: Station Road - South Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
North Exit: Station Road - North Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
West Exit: Cherry Lane - West Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										

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LANE SUMMARY

Site: 101 [StatCaldEastPMFuEx (Site Folder: PM - Post Dev - 5yr Growth)]

Network: N101 [Signals - Both (Network Folder: Post Dev - 5yr Growth - PM Peak)]

Station Road / Calder Freeway Eastbound Lane
PM Peak, Future Volumes, Existing Geometry
Site Category: (None)
Roundabout

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Station Road - South															
Lane 1[d]	389	4.0	389	4.0	1826	0.213	100	2.9	LOS A	0.0	0.0	Full	130	0.0	0.0
Lane 2	329	4.0	329	4.0	1541	0.213	100	6.5	LOS A	0.0	0.0	Full	130	0.0	0.0
Approach	718	4.0	718	4.0		0.213		4.5	LOS A	0.0	0.0				
North: Station Road - North															
Lane 1[d]	364	4.0	364	4.0	1205	0.302	100	4.6	LOS A	1.5	10.7	Full	500	0.0	0.0
Lane 2	295	4.0	295	4.0	977	0.302	100	4.9	LOS A	1.4	10.2	Full	500	0.0	0.0
Approach	659	4.0	659	4.0		0.302		4.7	LOS A	1.5	10.7				
West: Calder Freeway Off-ramp - West															
Lane 1[d]	280	4.0	280	4.0	1245	0.224	100	9.0	LOS A	0.9	6.5	Full	500	0.0	0.0
Lane 2	220	4.0	220	4.0	982	0.224	100	11.6	LOS A	0.9	6.3	Full	500	0.0	0.0
Approach	500	4.0	500	4.0		0.224		10.2	LOS A	0.9	6.5				
Intersection	1877	4.0	1877	4.0		0.302		6.1	LOS A	1.5	10.7				

Site Level of Service (LOS) Method: Degree of Saturation (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Roundabout LOS Method: Same as Signalised Intersections.
Lane LOS values are based on degree of saturation per lane.
Intersection and Approach LOS values are based on worst degree of saturation for any lane.
Roundabout Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

d Dominant lane on roundabout approach

Approach Lane Flows (veh/h)

South: Station Road - South

Mov. From S To Exit:	T1 N	R2 E	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	389	-	389	4.0	1826	0.213	100	NA	NA
Lane 2	149	180	329	4.0	1541	0.213	100	NA	NA
Approach	538	180	718	4.0		0.213			

North: Station Road - North

Mov. From N To Exit:	L2 E	T1 S	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	182	182	364	4.0	1205	0.302	100	NA	NA
Lane 2	-	295	295	4.0	977	0.302	100	NA	NA
Approach	182	477	659	4.0		0.302			

West: Calder Freeway Off-ramp - West										
Mov. From W To Exit:	L2 N	T1 E	R2 S	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	91	1	188	280	4.0	1245	0.224	100	NA	NA
Lane 2	-	-	220	220	4.0	982	0.224	100	NA	NA
Approach	91	1	408	500	4.0		0.224			
	Total	%HV	Deg.Satn (v/c)							
Intersection	1877	4.0		0.302						

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

Merge Analysis											
	Exit Lane Number	Short Lane Length m	Percent Opng in Lane %	Opposing Flow Rate veh/h	Opposing Flow Rate pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
South Exit: Station Road - South Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
Full Length Lane	2	Merge Analysis not applied.										
East Exit: Calder Freeway On-ramp - East Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
North Exit: Station Road - North Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
Full Length Lane	2	Merge Analysis not applied.										

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LANE SUMMARY

Site: 101 [StatCaldWestPMFuEx (Site Folder: PM - Post Dev - 5yr Growth)]

Network: N101 [Signals - Both (Network Folder: Post Dev - 5yr Growth - PM Peak)]

Station Road / Calder Freeway Westbound Lane
PM Peak, Future Volumes, Existing Geometry
Site Category: (None)
Roundabout

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Station Road - South															
Lane 1[d]	474	4.0	474	4.0	1379	0.343	100	4.0	LOS A	1.8	12.8	Short	50	0.0	NA
Lane 2	405	4.0	405	4.0	1181	0.343	100	4.0	LOS A	1.7	12.5	Full	170	0.0	0.0
Approach	879	4.0	879	4.0		0.343		4.0	LOS A	1.8	12.8				
East: Calder Freeway Off-ramp - East															
Lane 1[d]	265	4.0	265	4.0	1158	0.229	100	7.6	LOS A	1.0	7.4	Full	500	0.0	0.0
Lane 2	188	4.0	188	4.0	882	0.214	93[5]	12.5	LOS A	0.9	6.4	Full	500	0.0	0.0
Approach	454	4.0	454	4.0		0.229		9.6	LOS A	1.0	7.4				
North: Station Road - North															
Lane 1	280	4.0	280	4.0	1462	0.192	56[6]	5.0	LOS A	0.0	0.0	Full	130	0.0	0.0
Lane 2[d]	625	4.0	625	4.0	1824	0.343	100	3.7	LOS A	0.0	0.0	Full	130	0.0	0.0
Approach	905	4.0	905	4.0		0.343		4.1	LOS A	0.0	0.0				
Intersection	2238	4.0	2238	4.0		0.343		5.2	LOS A	1.8	12.8				

Site Level of Service (LOS) Method: Degree of Saturation (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Roundabout LOS Method: Same as Signalised Intersections.
Lane LOS values are based on degree of saturation per lane.
Intersection and Approach LOS values are based on worst degree of saturation for any lane.
Roundabout Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

5 Lane under-utilisation found by the program
6 Lane under-utilisation due to downstream effects
d Dominant lane on roundabout approach

Approach Lane Flows (veh/h)

South: Station Road - South

Mov. From S To Exit:	L2 W	T1 N	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	368	105	474	4.0	1379	0.343	100	0.0	2
Lane 2	-	405	405	4.0	1181	0.343	100	NA	NA
Approach	368	511	879	4.0		0.343			

East: Calder Freeway Off-ramp - East

Mov. From E To Exit:	L2 S	T1 W	R2 N	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	264	1	-	265	4.0	1158	0.229	100	NA	NA
Lane 2	-	-	188	188	4.0	882	0.214	93[5]	NA	NA

Approach	264	1	188	454	4.0		0.229			
North: Station Road - North										
Mov. From N To Exit:	T1 S	R2 W	Total	%HV		Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	280	-	280	4.0		1462	0.192	56[6]	NA	NA
Lane 2	544	81	625	4.0		1824	0.343	100	NA	NA
Approach	824	81	905	4.0			0.343			
	Total	%HV	Deg.Satn (v/c)							
Intersection	2238	4.0		0.343						

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

5 Lane under-utilisation found by the program
6 Lane under-utilisation due to downstream effects

Merge Analysis

	Exit Lane Number	Short Lane Length m	Percent Opng in Lane %	Opposing Flow Rate veh/h	Opposing Flow Rate pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
South Exit: Station Road - South Merge Type: **Priority**												
Exit Short Lane	1	60	0.0	544	555	3.00	2.00	544	1228	0.443	1.0	2.1
Merge Lane	2	-	100.0	Merge Lane is not Opposed				544	1800	0.302	0.0	0.0
North Exit: Station Road - North Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
Full Length Lane	2	Merge Analysis not applied.										
West Exit: Calder Freeway On-ramp - West Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										

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LANE SUMMARY

Site: 101v [StatRossPMExFu - Signals (Site Folder: PM - Post Dev - 5yr Growth)]

Network: N101 [Signals - Both (Network Folder: Post Dev - 5yr Growth - PM Peak)]

Station Road / Ross Watt Road
PM Peak, Existing Geometry, Future Volumes
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Coordinated Cycle Time = 120 seconds (Network User-Given Cycle Time)

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Station Road - South															
Lane 1	118	2.0	118	2.0	1434	0.082	100	6.2	LOS A	0.3	1.8	Short	20	0.0	NA
Lane 2	788	4.0	788	4.0	1243[1]	0.634	100	2.6	LOS B	7.0	50.5	Full	165	0.0	0.0
Approach	906	3.7	906	3.7		0.634		3.1	LOS B	7.0	50.5				
North: Station Road - North															
Lane 1	907	4.0	907	4.0	1351[1]	0.671	100	2.7	LOS B	14.9	107.8	Full	170	0.0	0.0
Lane 2	182	2.0	182	2.0	517	0.352	100	8.4	LOS A	1.9	13.3	Short	20	0.0	NA
Approach	1089	3.7	1089	3.7		0.671		3.7	LOS B	14.9	107.8				
West: Ross Watt Road - West															
Lane 1	109	2.0	109	2.0	335[1]	0.327	100	48.9	LOS A	5.4	38.7	Short	20	0.0	NA
Lane 2	69	2.0	69	2.0	92	0.759	100	73.1	LOS C	4.4	31.7	Full	500	0.0	0.0
Approach	179	2.0	179	2.0		0.759		58.3	LOS C	5.4	38.7				
Intersection	2175	3.6	2175	3.6		0.759		7.9	LOS C	14.9	107.8				

Site Level of Service (LOS) Method: Degree of Saturation (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Lane LOS values are based on degree of saturation per lane.
Intersection and Approach LOS values are based on worst degree of saturation for any lane.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

1 Reduced capacity due to a short lane effect. Short lane queues may extend into the full-length lanes. Some upstream delays at entry to short lanes are not included.

Approach Lane Flows (veh/h)

South: Station Road - South

Mov. From S To Exit:	L2 W	T1 N	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	118	-	118	2.0	1434	0.082	100	0.0	2
Lane 2	-	788	788	4.0	1243[1]	0.634	100	NA	NA
Approach	118	788	906	3.7		0.634			

North: Station Road - North

Mov. From N To Exit:	T1 S	R2 W	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	907	-	907	4.0	1351[1]	0.671	100	NA	NA
Lane 2	-	182	182	2.0	517	0.352	100	0.0	1
Approach	907	182	1089	3.7		0.671			

West: Ross Watt Road - West

Mov. From W To Exit:	L2 N	R2 S	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	109	-	109	2.0	335[1]	0.327	100	66.2	2
Lane 2	-	69	69	2.0	92	0.759	100	NA	NA
Approach	109	69	179	2.0		0.759			
	Total	%HV	Deg.Satn (v/c)						
Intersection	2175	3.6		0.759					

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

1 Reduced capacity due to a short lane effect. Short lane queues may extend into the full-length lanes. Some upstream delays at entry to short lanes are not included.

Merge Analysis

	Exit Lane Number	Short Lane Length m	Percent Opng in Lane %	Opposing Flow Rate veh/h pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
South Exit: Station Road - South Merge Type: **Not Applied**											
Full Length Lane	1	Merge Analysis not applied.									
North Exit: Station Road - North Merge Type: **Not Applied**											
Full Length Lane	1	Merge Analysis not applied.									
West Exit: Ross Watt Road - West Merge Type: **Not Applied**											
Full Length Lane	1	Merge Analysis not applied.									

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LANE SUMMARY

Site: 101v [StatCherPMExFu - Signals (Site Folder: PM - Post Dev - 5yr Growth)]

Network: N101 [Signals - Both (Network Folder: Post Dev - 5yr Growth - PM Peak)]

Station Road / Cherry Lane
PM Peak, Existing Geometry, Future Volumes
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Coordinated Cycle Time = 120 seconds (Network User-Given Cycle Time)

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Station Road - South															
Lane 1	235	2.0	235	2.0	1236	0.190	100	13.2	LOS A	5.0	35.6	Short	50	0.0	NA
Lane 2	851	4.0	851	4.0	1097[1]	0.775	100	11.5	LOS C	28.0	202.8	Full	500	0.0	0.0
Approach	1085	3.6	1085	3.6		0.775		11.9	LOS C	28.0	202.8				
North: Station Road - North															
Lane 1	862	4.0	862	4.0	1397[1]	0.617	100	4.7	LOS B	17.4	125.6	Full	165	0.0	0.0
Lane 2	60	2.0	60	2.0	281	0.213	100	16.2	LOS A	1.4	9.9	Short	30	0.0	NA
Approach	922	3.9	922	3.9		0.617		5.4	LOS B	17.4	125.6				
West: Cherry Lane - West															
Lane 1	184	2.0	184	2.0	229	0.805	100	66.6	LOS C	11.4	81.5	Full	500	0.0	0.0
Approach	184	2.0	184	2.0		0.805		66.6	LOS C	11.4	81.5				
Intersection	2192	3.6	2192	3.6		0.805		13.7	LOS C	28.0	202.8				

Site Level of Service (LOS) Method: Degree of Saturation (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Lane LOS values are based on degree of saturation per lane.
Intersection and Approach LOS values are based on worst degree of saturation for any lane.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

1 Reduced capacity due to a short lane effect. Short lane queues may extend into the full-length lanes. Some upstream delays at entry to short lanes are not included.

Approach Lane Flows (veh/h)

South: Station Road - South

Mov. From S To Exit:	L2 W	T1 N	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	235	-	235	2.0	1236	0.190	100	0.0	2
Lane 2	-	851	851	4.0	1097[1]	0.775	100	NA	NA
Approach	235	851	1085	3.6		0.775			

North: Station Road - North

Mov. From N To Exit:	T1 S	R2 W	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	862	-	862	4.0	1397[1]	0.617	100	NA	NA
Lane 2	-	60	60	2.0	281	0.213	100	0.0	1
Approach	862	60	922	3.9		0.617			

West: Cherry Lane - West

Mov.	L2	R2	Total	%HV		Deg.	Lane	Prob.	Ov.

From W To Exit:	N	S			Cap. veh/h	Satn v/c	Util. %	SL Ov. %	Lane No.
Lane 1	62	122	184	2.0	229	0.805	100	NA	NA
Approach	62	122	184	2.0		0.805			
	Total	%HV	Deg.Satn (v/c)						
Intersection	2192	3.6		0.805					

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

1 Reduced capacity due to a short lane effect. Short lane queues may extend into the full-length lanes. Some upstream delays at entry to short lanes are not included.

Merge Analysis

	Exit Lane Number	Short Lane Length m	Percent Opng in Lane %	Opposing Flow Rate veh/h	Opposing Flow Rate pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
South Exit: Station Road - South Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
North Exit: Station Road - North Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
West Exit: Cherry Lane - West Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										

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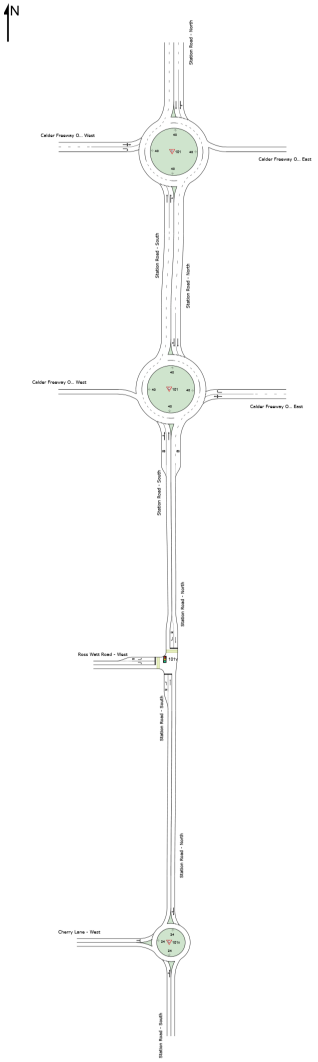
NETWORK LAYOUT

Network: N101 [Signals - Ross Watt (Network Folder: Post Dev - 5yr Growth - PM Peak)]

New Network
Network Category: (None)

Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.



SITES IN NETWORK		
Site ID	**CCG ID**	**Site Name**
101	NA	StatCaldEastPMFuEx
101	NA	StatCaldWestPMFuEx
101v	NA	StatRossPMExFu - Signals - Priority
101v	NA	StatCherPMExFu - Roundabout

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LANE SUMMARY

Site: 101 [StatCaldEastPMFuEx (Site Folder: PM - Post Dev - 5yr Growth)]

Network: N101 [Signals - Ross Watt (Network Folder: Post Dev - 5yr Growth - PM Peak)]

Station Road / Calder Freeway Eastbound Lane
PM Peak, Future Volumes, Existing Geometry
Site Category: (None)
Roundabout

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Station Road - South															
Lane 1[d]	389	4.0	389	4.0	1826	0.213	100	2.9	LOS A	0.0	0.0	Full	130	0.0	0.0
Lane 2	329	4.0	329	4.0	1541	0.213	100	6.5	LOS A	0.0	0.0	Full	130	0.0	0.0
Approach	718	4.0	718	4.0		0.213		4.5	LOS A	0.0	0.0				
North: Station Road - North															
Lane 1[d]	364	4.0	364	4.0	1205	0.302	100	4.6	LOS A	1.5	10.7	Full	500	0.0	0.0
Lane 2	295	4.0	295	4.0	977	0.302	100	4.9	LOS A	1.4	10.2	Full	500	0.0	0.0
Approach	659	4.0	659	4.0		0.302		4.7	LOS A	1.5	10.7				
West: Calder Freeway Off-ramp - West															
Lane 1[d]	280	4.0	280	4.0	1245	0.224	100	9.0	LOS A	0.9	6.5	Full	500	0.0	0.0
Lane 2	220	4.0	220	4.0	982	0.224	100	11.6	LOS A	0.9	6.3	Full	500	0.0	0.0
Approach	500	4.0	500	4.0		0.224		10.2	LOS A	0.9	6.5				
Intersection	1877	4.0	1877	4.0		0.302		6.1	LOS A	1.5	10.7				

Site Level of Service (LOS) Method: Degree of Saturation (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Roundabout LOS Method: Same as Signalised Intersections.
Lane LOS values are based on degree of saturation per lane.
Intersection and Approach LOS values are based on worst degree of saturation for any lane.
Roundabout Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

d Dominant lane on roundabout approach

Approach Lane Flows (veh/h)

South: Station Road - South

Mov. From S To Exit:	T1 N	R2 E	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	389	-	389	4.0	1826	0.213	100	NA	NA
Lane 2	149	180	329	4.0	1541	0.213	100	NA	NA
Approach	538	180	718	4.0		0.213			

North: Station Road - North

Mov. From N To Exit:	L2 E	T1 S	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	182	182	364	4.0	1205	0.302	100	NA	NA
Lane 2	-	295	295	4.0	977	0.302	100	NA	NA

Approach	182	477	659	4.0			0.302			
West: Calder Freeway Off-ramp - West										
Mov. From W To Exit:	L2 N	T1 E	R2 S	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	91	1	188	280	4.0	1245	0.224	100	NA	NA
Lane 2	-	-	220	220	4.0	982	0.224	100	NA	NA
Approach	91	1	408	500	4.0		0.224			
	Total	%HV	Deg.Satn (v/c)							
Intersection	1877	4.0		0.302						

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

Merge Analysis												
	Exit Lane Number	Short Lane Length m	Percent Opng in Lane %	Opposing Flow Rate veh/h	pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
South Exit: Station Road - South Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
Full Length Lane	2	Merge Analysis not applied.										
East Exit: Calder Freeway On-ramp - East Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
North Exit: Station Road - North Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
Full Length Lane	2	Merge Analysis not applied.										

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LANE SUMMARY

Site: 101 [StatCaldWestPMFuEx (Site Folder: PM - Post Dev - 5yr Growth)]

Network: N101 [Signals - Ross Watt (Network Folder: Post Dev - 5yr Growth - PM Peak)]

Station Road / Calder Freeway Westbound Lane
PM Peak, Future Volumes, Existing Geometry
Site Category: (None)
Roundabout

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Station Road - South															
Lane 1[d]	474	4.0	474	4.0	1379	0.343	100	4.0	LOS A	1.6	11.7	Short	50	0.0	NA
Lane 2	405	4.0	405	4.0	1181	0.343	100	4.0	LOS A	1.6	11.3	Full	170	0.0	0.0
Approach	879	4.0	879	4.0		0.343		4.0	LOS A	1.6	11.7				
East: Calder Freeway Off-ramp - East															
Lane 1[d]	265	4.0	265	4.0	1158	0.229	100	7.6	LOS A	1.0	7.4	Full	500	0.0	0.0
Lane 2	188	4.0	188	4.0	882	0.214	93[5]	12.5	LOS A	0.9	6.4	Full	500	0.0	0.0
Approach	454	4.0	454	4.0		0.229		9.6	LOS A	1.0	7.4				
North: Station Road - North															
Lane 1	280	4.0	280	4.0	1462	0.192	56[6]	5.0	LOS A	0.0	0.0	Full	130	0.0	0.0
Lane 2[d]	625	4.0	625	4.0	1824	0.343	100	3.7	LOS A	0.0	0.0	Full	130	0.0	0.0
Approach	905	4.0	905	4.0		0.343		4.1	LOS A	0.0	0.0				
Intersection	2238	4.0	2238	4.0		0.343		5.2	LOS A	1.6	11.7				

Site Level of Service (LOS) Method: Degree of Saturation (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Roundabout LOS Method: Same as Signalised Intersections.
Lane LOS values are based on degree of saturation per lane.
Intersection and Approach LOS values are based on worst degree of saturation for any lane.
Roundabout Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

5 Lane under-utilisation found by the program
6 Lane under-utilisation due to downstream effects
d Dominant lane on roundabout approach

Approach Lane Flows (veh/h)

South: Station Road - South

Mov. From S To Exit:	L2 W	T1 N	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	368	105	474	4.0	1379	0.343	100	0.0	2
Lane 2	-	405	405	4.0	1181	0.343	100	NA	NA
Approach	368	511	879	4.0		0.343			

East: Calder Freeway Off-ramp - East

Mov. From E To Exit:	L2 S	T1 W	R2 N	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	264	1	-	265	4.0	1158	0.229	100	NA	NA

Lane 2	-	-	188	188	4.0	882	0.214	93[5]	NA	NA
Approach	264	1	188	454	4.0		0.229			

North: Station Road - North

Mov. From N To Exit:	T1 S	R2 W	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	280	-	280	4.0	1462	0.192	56[6]	NA	NA
Lane 2	544	81	625	4.0	1824	0.343	100	NA	NA
Approach	824	81	905	4.0		0.343			

	Total	%HV	Deg.Satn (v/c)
Intersection	2238	4.0	0.343

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

5 Lane under-utilisation found by the program
6 Lane under-utilisation due to downstream effects

Merge Analysis

	Exit Lane Number	Short Lane Length m	Percent Opng in Lane %	Opposing Flow Rate veh/h	Opposing Flow Rate pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
South Exit: Station Road - South Merge Type: **Priority**												
Exit Short Lane	1	60	0.0	544	555	3.00	2.00	544	1228	0.443	1.0	2.1
Merge Lane	2	-	100.0	Merge Lane is not Opposed				544	1800	0.302	0.0	0.0
North Exit: Station Road - North Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
Full Length Lane	2	Merge Analysis not applied.										
West Exit: Calder Freeway On-ramp - West Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										

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LANE SUMMARY

Site: 101v [StatRossPMExFu - Signals - Priority (Site Folder: PM - Post Dev - 5yr Growth)]

Network: N101 [Signals - Ross Watt (Network Folder: Post Dev - 5yr Growth - PM Peak)]

Station Road / Ross Watt Road
PM Peak, Existing Geometry, Future Volumes
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 120 seconds (Site User-Given Cycle Time)

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Station Road - South															
Lane 1	118	2.0	118	2.0	1434	0.082	100	8.7	LOS A	1.6	11.0	Short	20	0.0	NA
Lane 2	788	4.0	788	4.0	1167[1]	0.676	100	10.3	LOS B	23.8	172.7	Full	165	0.0	9.1
Approach	906	3.7	906	3.7		0.676		10.1	LOS B	23.8	172.7				
North: Station Road - North															
Lane 1	907	4.0	907	4.0	1351[1]	0.671	100	2.7	LOS B	14.9	107.8	Full	170	0.0	0.0
Lane 2	182	2.0	182	2.0	452	0.403	100	14.5	LOS A	4.5	32.1	Short	20	0.0	NA
Approach	1089	3.7	1089	3.7		0.671		4.7	LOS B	14.9	107.8				
West: Ross Watt Road - West															
Lane 1	109	2.0	109	2.0	335[1]	0.327	100	48.9	LOS A	5.4	38.7	Short	20	0.0	NA
Lane 2	69	2.0	69	2.0	92	0.759	100	73.1	LOS C	4.4	31.7	Full	500	0.0	0.0
Approach	179	2.0	179	2.0		0.759		58.3	LOS C	5.4	38.7				
Intersection	2175	3.6	2175	3.6		0.759		11.3	LOS C	23.8	172.7				

Site Level of Service (LOS) Method: Degree of Saturation (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Lane LOS values are based on degree of saturation per lane.
Intersection and Approach LOS values are based on worst degree of saturation for any lane.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

1 Reduced capacity due to a short lane effect. Short lane queues may extend into the full-length lanes. Some upstream delays at entry to short lanes are not included.

Approach Lane Flows (veh/h)

South: Station Road - South

Mov. From S To Exit:	L2 W	T1 N	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	118	-	118	2.0	1434	0.082	100	0.0	2
Lane 2	-	788	788	4.0	1167[1]	0.676	100	NA	NA
Approach	118	788	906	3.7		0.676			

North: Station Road - North

Mov. From N To Exit:	T1 S	R2 W	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	907	-	907	4.0	1351[1]	0.671	100	NA	NA
Lane 2	-	182	182	2.0	452	0.403	100	48.4	1
Approach	907	182	1089	3.7		0.671			

West: Ross Watt Road - West									
Mov. From W To Exit:	L2 N	R2 S	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	109	-	109	2.0	335[1]	0.327	100	66.2	2
Lane 2	-	69	69	2.0	92	0.759	100	NA	NA
Approach	109	69	179	2.0		0.759			
	Total	%HV	Deg.Satn (v/c)						
Intersection	2175	3.6		0.759					

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

1 Reduced capacity due to a short lane effect. Short lane queues may extend into the full-length lanes. Some upstream delays at entry to short lanes are not included.

Merge Analysis											
	Exit Lane Number	Short Lane Length m	Percent Opng in Lane %	Opposing Flow Rate veh/h pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
South Exit: Station Road - South Merge Type: **Not Applied**											
Full Length Lane	1	Merge Analysis not applied.									
North Exit: Station Road - North Merge Type: **Not Applied**											
Full Length Lane	1	Merge Analysis not applied.									
West Exit: Ross Watt Road - West Merge Type: **Not Applied**											
Full Length Lane	1	Merge Analysis not applied.									

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LANE SUMMARY

Site: 101v [StatCherPMExFu - Roundabout (Site Folder: PM - Post Dev - 5yr Growth)]

Network: N101 [Signals - Ross Watt (Network Folder: Post Dev - 5yr Growth - PM Peak)]

Station Road / Cherry Lane
PM Peak, Existing Geometry, Future Volumes
Site Category: (None)
Roundabout

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Station Road - South															
Lane 1[d]	1085	4.0	1085	4.0	1377	0.788	100	4.6	LOS C	11.9	86.1	Full	500	-7.3[N3]	0.0
Approach	1085	4.0	1085	4.0		0.788		4.6	LOS C	11.9	86.1				
North: Station Road - North															
Lane 1[d]	922	4.0	922	4.0	1323	0.697	100	5.6	LOS B	9.0	65.3	Full	165	0.0	0.0
Approach	922	4.0	922	4.0		0.697		5.6	LOS B	9.0	65.3				
West: Cherry Lane - West															
Lane 1[d]	184	4.0	184	4.0	544	0.339	100	14.8	LOS A	2.4	17.6	Full	500	-3.3[N3]	0.0
Approach	184	4.0	184	4.0		0.339		14.8	LOS A	2.4	17.6				
Intersection	2192	4.0	2192	4.0		0.788		5.9	LOS C	11.9	86.1				

Site Level of Service (LOS) Method: Degree of Saturation (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Roundabout LOS Method: Same as Signalised Intersections.
Lane LOS values are based on degree of saturation per lane.
Intersection and Approach LOS values are based on worst degree of saturation for any lane.
Roundabout Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

d Dominant lane on roundabout approach
N3 Capacity Adjustment due to downstream lane blockage determined by the program.

Approach Lane Flows (veh/h)

South: Station Road - South

Mov. From S To Exit:	L2 W	T1 N	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	235	851	1085	4.0	1377	0.788	100	NA	NA
Approach	235	851	1085	4.0		0.788			

North: Station Road - North

Mov. From N To Exit:	T1 S	R2 W	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	862	60	922	4.0	1323	0.697	100	NA	NA
Approach	862	60	922	4.0		0.697			

West: Cherry Lane - West

Mov. From W To Exit:	L2 N	R2 S	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.

Lane 1	62	122	184	4.0	544	0.339	100	NA	NA	
Approach	62	122	184	4.0		0.339				
	Total	%HV	Deg.Satn (v/c)							
Intersection	2192	4.0		0.788						

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

Merge Analysis

	Exit Lane Number	Short Lane Length m	Percent Opng in Lane %	Opposing Flow Rate veh/h	Opposing Flow Rate pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
South Exit: Station Road - South Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
North Exit: Station Road - North Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
West Exit: Cherry Lane - West Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										

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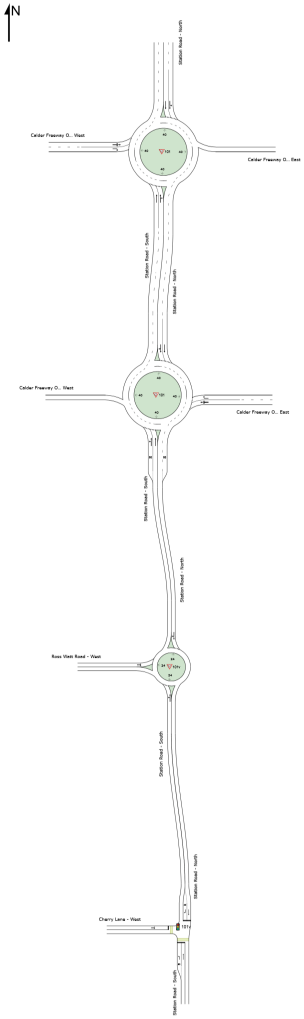
NETWORK LAYOUT

Network: N101 [Signals - Cherry (Network Folder: Post Dev - 5yr Growth - PM Peak)]

New Network
Network Category: (None)

Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.



SITES IN NETWORK		
Site ID	**CCG ID**	**Site Name**
101	NA	StatCaldEastPMFuEx
101	NA	StatCaldWestPMFuEx
101v	NA	StatRossPMExFu - Roundabout
101v	NA	StatCherPMExFu - Signals

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LANE SUMMARY

Site: 101 [StatCaldEastPMFuEx (Site Folder: PM - Post Dev - 5yr Growth)]

Network: N101 [Signals - Cherry (Network Folder: Post Dev - 5yr Growth - PM Peak)]

Station Road / Calder Freeway Eastbound Lane
PM Peak, Future Volumes, Existing Geometry
Site Category: (None)
Roundabout

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Station Road - South															
Lane 1[d]	389	4.0	389	4.0	1826	0.213	100	2.9	LOS A	0.0	0.0	Full	130	0.0	0.0
Lane 2	329	4.0	329	4.0	1541	0.213	100	6.5	LOS A	0.0	0.0	Full	130	0.0	0.0
Approach	718	4.0	718	4.0		0.213		4.5	LOS A	0.0	0.0				
North: Station Road - North															
Lane 1[d]	364	4.0	364	4.0	1205	0.302	100	4.6	LOS A	1.5	10.7	Full	500	0.0	0.0
Lane 2	295	4.0	295	4.0	977	0.302	100	4.9	LOS A	1.4	10.2	Full	500	0.0	0.0
Approach	659	4.0	659	4.0		0.302		4.7	LOS A	1.5	10.7				
West: Calder Freeway Off-ramp - West															
Lane 1[d]	280	4.0	280	4.0	1245	0.224	100	9.0	LOS A	0.9	6.5	Full	500	0.0	0.0
Lane 2	220	4.0	220	4.0	982	0.224	100	11.6	LOS A	0.9	6.3	Full	500	0.0	0.0
Approach	500	4.0	500	4.0		0.224		10.2	LOS A	0.9	6.5				
Intersection	1877	4.0	1877	4.0		0.302		6.1	LOS A	1.5	10.7				

Site Level of Service (LOS) Method: Degree of Saturation (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Roundabout LOS Method: Same as Signalised Intersections.
Lane LOS values are based on degree of saturation per lane.
Intersection and Approach LOS values are based on worst degree of saturation for any lane.
Roundabout Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

d Dominant lane on roundabout approach

Approach Lane Flows (veh/h)

South: Station Road - South

Mov. From S To Exit:	T1 N	R2 E	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	389	-	389	4.0	1826	0.213	100	NA	NA
Lane 2	149	180	329	4.0	1541	0.213	100	NA	NA
Approach	538	180	718	4.0		0.213			

North: Station Road - North

Mov. From N To Exit:	L2 E	T1 S	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	182	182	364	4.0	1205	0.302	100	NA	NA
Lane 2	-	295	295	4.0	977	0.302	100	NA	NA
Approach	182	477	659	4.0		0.302			

West: Calder Freeway Off-ramp - West											
Mov. From W To Exit:	L2 N	T1 E	R2 S	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.	
Lane 1	91	1	188	280	4.0	1245	0.224	100	NA	NA	
Lane 2	-	-	220	220	4.0	982	0.224	100	NA	NA	
Approach	91	1	408	500	4.0		0.224				
	Total	%HV	Deg.Satn (v/c)								
Intersection	1877	4.0		0.302							

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

Merge Analysis												
	Exit Lane Number	Short Lane Length m	Percent Opng in Lane %	Opposing Flow Rate veh/h	Opposing Flow Rate pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
South Exit: Station Road - South Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
Full Length Lane	2	Merge Analysis not applied.										
East Exit: Calder Freeway On-ramp - East Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
North Exit: Station Road - North Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
Full Length Lane	2	Merge Analysis not applied.										

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LANE SUMMARY

Site: 101 [StatCaldWestPMFuEx (Site Folder: PM - Post Dev - 5yr Growth)]

Network: N101 [Signals - Cherry (Network Folder: Post Dev - 5yr Growth - PM Peak)]

Station Road / Calder Freeway Westbound Lane
PM Peak, Future Volumes, Existing Geometry
Site Category: (None)
Roundabout

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Station Road - South															
Lane 1[d]	474	4.0	474	4.0	1379	0.343	100	4.0	LOS A	1.8	13.3	Short	50	0.0	NA
Lane 2	405	4.0	405	4.0	1181	0.343	100	4.0	LOS A	1.8	13.0	Full	170	0.0	0.0
Approach	879	4.0	879	4.0		0.343		4.0	LOS A	1.8	13.3				
East: Calder Freeway Off-ramp - East															
Lane 1[d]	265	4.0	265	4.0	1158	0.229	100	7.6	LOS A	1.0	7.4	Full	500	0.0	0.0
Lane 2	188	4.0	188	4.0	882	0.214	93[5]	12.5	LOS A	0.9	6.4	Full	500	0.0	0.0
Approach	454	4.0	454	4.0		0.229		9.6	LOS A	1.0	7.4				
North: Station Road - North															
Lane 1	280	4.0	280	4.0	1462	0.192	56[6]	5.0	LOS A	0.0	0.0	Full	130	0.0	0.0
Lane 2[d]	625	4.0	625	4.0	1824	0.343	100	3.7	LOS A	0.0	0.0	Full	130	0.0	0.0
Approach	905	4.0	905	4.0		0.343		4.1	LOS A	0.0	0.0				
Intersection	2238	4.0	2238	4.0		0.343		5.2	LOS A	1.8	13.3				

Site Level of Service (LOS) Method: Degree of Saturation (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Roundabout LOS Method: Same as Signalised Intersections.
Lane LOS values are based on degree of saturation per lane.
Intersection and Approach LOS values are based on worst degree of saturation for any lane.
Roundabout Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

5 Lane under-utilisation found by the program
6 Lane under-utilisation due to downstream effects
d Dominant lane on roundabout approach

Approach Lane Flows (veh/h)

South: Station Road - South

Mov. From S To Exit:	L2 W	T1 N	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	368	105	474	4.0	1379	0.343	100	0.0	2
Lane 2	-	405	405	4.0	1181	0.343	100	NA	NA
Approach	368	511	879	4.0		0.343			

East: Calder Freeway Off-ramp - East

Mov. From E To Exit:	L2 S	T1 W	R2 N	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	264	1	-	265	4.0	1158	0.229	100	NA	NA
Lane 2	-	-	188	188	4.0	882	0.214	93[5]	NA	NA

Approach	264	1	188	454	4.0		0.229			
North: Station Road - North										
Mov. From N To Exit:	T1 S	R2 W	Total	%HV		Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	280	-	280	4.0		1462	0.192	56[6]	NA	NA
Lane 2	544	81	625	4.0		1824	0.343	100	NA	NA
Approach	824	81	905	4.0			0.343			
	Total	%HV	Deg.Satn (v/c)							
Intersection	2238	4.0		0.343						

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

5 Lane under-utilisation found by the program
6 Lane under-utilisation due to downstream effects

Merge Analysis

	Exit Lane Number	Short Lane Length m	Percent Opng in Lane %	Opposing Flow Rate veh/h	Opposing Flow Rate pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
South Exit: Station Road - South Merge Type: **Priority**												
Exit Short Lane	1	60	0.0	544	555	3.00	2.00	544	1228	0.443	1.0	2.1
Merge Lane	2	-	100.0	Merge Lane is not Opposed				544	1800	0.302	0.0	0.0
North Exit: Station Road - North Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
Full Length Lane	2	Merge Analysis not applied.										
West Exit: Calder Freeway On-ramp - West Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										

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LANE SUMMARY

Site: 101v [StatRossPMExFu - Roundabout (Site Folder: PM - Post Dev - 5yr Growth)]

Network: N101 [Signals - Cherry (Network Folder: Post Dev - 5yr Growth - PM Peak)]

Station Road / Ross Watt Road
PM Peak, Existing Geometry, Future Volumes
Site Category: (None)
Roundabout

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Station Road - South															
Lane 1[d]	906	4.0	906	4.0	1238	0.732	100	6.3	LOS C	9.0	65.2	Full	165	0.0	0.0
Approach	906	4.0	906	4.0		0.732		6.3	LOS C	9.0	65.2				
North: Station Road - North															
Lane 1[d]	1089	4.0	1089	4.0	1440	0.756	100	5.7	LOS C	13.3	96.1	Full	170	0.0	0.0
Approach	1089	4.0	1089	4.0		0.756		5.7	LOS C	13.3	96.1				
West: Ross Watt Road - West															
Lane 1[d]	179	4.0	179	4.0	590	0.304	100	13.2	LOS A	2.6	18.7	Full	500	0.0	0.0
Approach	179	4.0	179	4.0		0.304		13.2	LOS A	2.6	18.7				
Intersection	2175	4.0	2175	4.0		0.756		6.6	LOS C	13.3	96.1				

Site Level of Service (LOS) Method: Degree of Saturation (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Roundabout LOS Method: Same as Signalised Intersections.
Lane LOS values are based on degree of saturation per lane.
Intersection and Approach LOS values are based on worst degree of saturation for any lane.
Roundabout Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

d Dominant lane on roundabout approach

Approach Lane Flows (veh/h)

Mov. From S To Exit:	L2 W	T1 N	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
South: Station Road - South									
Lane 1	118	788	906	4.0	1238	0.732	100	NA	NA
Approach	118	788	906	4.0		0.732			
North: Station Road - North									
Mov. From N To Exit:	T1 S	R2 W	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	907	182	1089	4.0	1440	0.756	100	NA	NA
Approach	907	182	1089	4.0		0.756			
West: Ross Watt Road - West									
Mov. From W To Exit:	L2 N	R2 S	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	109	69	179	4.0	590	0.304	100	NA	NA

Approach	109	69	179	4.0	0.304
	Total	%HV	Deg.Satn (v/c)		
Intersection	2175	4.0		0.756	

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

Merge Analysis

	Exit Lane Number	Short Lane Length m	Percent Opng in Lane %	Opposing Flow Rate veh/h	Opposing Flow Rate pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
South Exit: Station Road - South Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
North Exit: Station Road - North Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
West Exit: Ross Watt Road - West Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										

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LANE SUMMARY

Site: 101v [StatCherPMExFu - Signals (Site Folder: PM - Post Dev - 5yr Growth)]

Network: N101 [Signals - Cherry (Network Folder: Post Dev - 5yr Growth - PM Peak)]

Station Road / Cherry Lane
PM Peak, Existing Geometry, Future Volumes
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 120 seconds (Site User-Given Cycle Time)

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Station Road - South															
Lane 1	235	2.0	235	2.0	1236	0.190	100	13.2	LOS A	5.0	35.6	Short	50	0.0	NA
Lane 2	851	4.0	851	4.0	1097[1]	0.775	100	11.5	LOS C	28.0	202.8	Full	500	0.0	0.0
Approach	1085	3.6	1085	3.6		0.775		11.9	LOS C	28.0	202.8				
North: Station Road - North															
Lane 1	862	4.0	862	4.0	1397[1]	0.617	100	5.4	LOS B	19.6	141.7	Full	165	0.0	0.0
Lane 2	60	2.0	60	2.0	281	0.213	100	15.9	LOS A	1.3	9.1	Short	30	0.0	NA
Approach	922	3.9	922	3.9		0.617		6.1	LOS B	19.6	141.7				
West: Cherry Lane - West															
Lane 1	184	2.0	184	2.0	229	0.805	100	66.6	LOS C	11.4	81.5	Full	500	0.0	0.0
Approach	184	2.0	184	2.0		0.805		66.6	LOS C	11.4	81.5				
Intersection	2192	3.6	2192	3.6		0.805		14.0	LOS C	28.0	202.8				

Site Level of Service (LOS) Method: Degree of Saturation (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Lane LOS values are based on degree of saturation per lane.
Intersection and Approach LOS values are based on worst degree of saturation for any lane.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

1 Reduced capacity due to a short lane effect. Short lane queues may extend into the full-length lanes. Some upstream delays at entry to short lanes are not included.

Approach Lane Flows (veh/h)

South: Station Road - South

Mov. From S To Exit:	L2 W	T1 N	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	235	-	235	2.0	1236	0.190	100	0.0	2
Lane 2	-	851	851	4.0	1097[1]	0.775	100	NA	NA
Approach	235	851	1085	3.6		0.775			

North: Station Road - North

Mov. From N To Exit:	T1 S	R2 W	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	862	-	862	4.0	1397[1]	0.617	100	NA	NA
Lane 2	-	60	60	2.0	281	0.213	100	0.0	1
Approach	862	60	922	3.9		0.617			

West: Cherry Lane - West

Mov.	L2	R2	Total	%HV		Deg.	Lane	Prob.	Ov.

From W To Exit:	N	S			Cap. veh/h	Satn v/c	Util. %	SL Ov. %	Lane No.
Lane 1	62	122	184	2.0	229	0.805	100	NA	NA
Approach	62	122	184	2.0		0.805			
	Total	%HV	Deg.Satn (v/c)						
Intersection	2192	3.6		0.805					

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

1 Reduced capacity due to a short lane effect. Short lane queues may extend into the full-length lanes. Some upstream delays at entry to short lanes are not included.

Merge Analysis

	Exit Lane Number	Short Lane Length m	Percent Opng in Lane %	Opposing Flow Rate veh/h	Opposing Flow Rate pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
South Exit: Station Road - South Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
North Exit: Station Road - North Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
West Exit: Cherry Lane - West Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										

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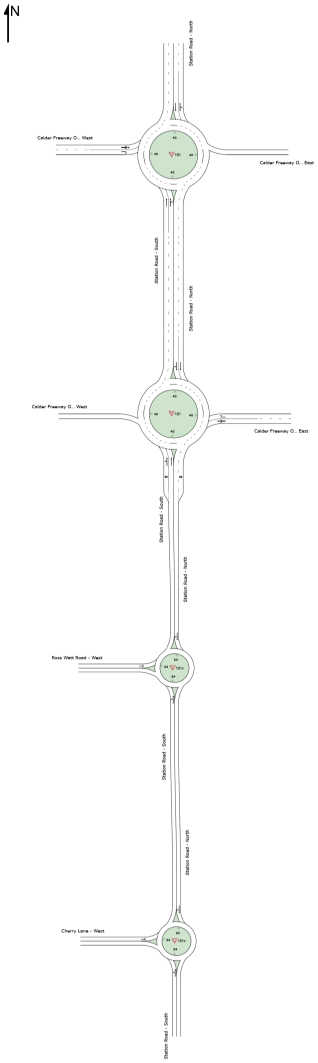
NETWORK LAYOUT

Network: N101 [Roundabout - Both (Network Folder: Post Dev - 10yr Growth - AM Peak)]

New Network
Network Category: (None)

Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.



SITES IN NETWORK		
Site ID	**CCG ID**	**Site Name**
101	NA	StatCaldEastAMFuEx
101	NA	StatCaldWestAMFuEx
101v	NA	StatRossAMExFu - Roundabout
101v	NA	StatCherAMExFu - Roundabout

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LANE SUMMARY

Site: 101 [StatCaldEastAMFuEx (Site Folder: AM - Post Dev - 10yr Growth)]

Network: N101 [Roundabout - Both (Network Folder: Post Dev - 10yr Growth - AM Peak)]

Station Road / Calder Freeway Eastbound Lane
AM Peak, Future Volumes, Existing Geometry
Site Category: (None)
Roundabout

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Station Road - South															
Lane 1[d]	538	4.0	538	4.0	1826	0.294	100	2.9	LOS A	0.0	0.0	Full	130	0.0	0.0
Lane 2	454	4.0	454	4.0	1541	0.294	100	6.9	LOS A	0.0	0.0	Full	130	0.0	0.0
Approach	992	4.0	992	4.0		0.294		4.7	LOS A	0.0	0.0				
North: Station Road - North															
Lane 1[d]	507	4.0	507	4.0	1156	0.438	100	5.2	LOS A	2.5	18.2	Full	500	0.0	0.0
Lane 2	405	4.0	405	4.0	923	0.438	100	5.9	LOS A	2.4	17.6	Full	500	0.0	0.0
Approach	912	4.0	912	4.0		0.438		5.5	LOS A	2.5	18.2				
West: Calder Freeway Off-ramp - West															
Lane 1[d]	273	4.0	273	4.0	1180	0.231	100	9.9	LOS A	1.0	6.9	Full	500	0.0	0.0
Lane 2	204	4.0	204	4.0	884	0.231	100	12.4	LOS A	0.9	6.5	Full	500	0.0	0.0
Approach	477	4.0	477	4.0		0.231		11.0	LOS A	1.0	6.9				
Intersection	2380	4.0	2380	4.0		0.438		6.3	LOS A	2.5	18.2				

Site Level of Service (LOS) Method: Degree of Saturation (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Roundabout LOS Method: Same as Signalised Intersections.
Lane LOS values are based on degree of saturation per lane.
Intersection and Approach LOS values are based on worst degree of saturation for any lane.
Roundabout Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

d Dominant lane on roundabout approach

Approach Lane Flows (veh/h)

South: Station Road - South

Mov. From S To Exit:	T1 N	R2 E	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	538	-	538	4.0	1826	0.294	100	NA	NA
Lane 2	180	274	454	4.0	1541	0.294	100	NA	NA
Approach	718	274	992	4.0		0.294			

North: Station Road - North

Mov. From N To Exit:	L2 E	T1 S	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	274	233	507	4.0	1156	0.438	100	NA	NA
Lane 2	-	405	405	4.0	923	0.438	100	NA	NA
Approach	274	638	912	4.0		0.438			

West: Calder Freeway Off-ramp - West										
Mov. From W To Exit:	L2 N	T1 E	R2 S	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	73	1	199	273	4.0	1180	0.231	100	NA	NA
Lane 2	-	-	204	204	4.0	884	0.231	100	NA	NA
Approach	73	1	403	477	4.0		0.231			
	Total	%HV	Deg.Satn (v/c)							
Intersection	2380	4.0		0.438						

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

Merge Analysis												
	Exit Lane Number	Short Lane Length m	Percent Opng in Lane %	Opposing Flow Rate veh/h	Opposing Flow Rate pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
South Exit: Station Road - South Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
Full Length Lane	2	Merge Analysis not applied.										
East Exit: Calder Freeway On-ramp - East Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
North Exit: Station Road - North Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
Full Length Lane	2	Merge Analysis not applied.										

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LANE SUMMARY

Site: 101 [StatCaldWestAMFuEx (Site Folder: AM - Post Dev - 10yr Growth)] **Network: N101 [Roundabout - Both (Network Folder: Post Dev - 10yr Growth - AM Peak)]**

Station Road / Calder Freeway Westbound Lane
AM Peak, Future Volumes, Existing Geometry
Site Category: (None)
Roundabout

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Station Road - South															
Lane 1[d]	554	4.0	554	4.0	1337	0.415	100	4.1	LOS A	2.3	16.5	Short	50	0.0	NA
Lane 2	469	4.0	469	4.0	1131	0.415	100	4.3	LOS A	2.2	16.0	Full	170	0.0	0.0
Approach	1023	4.0	1023	4.0		0.415		4.2	LOS A	2.3	16.5				
East: Calder Freeway Off-ramp - East															
Lane 1[d]	226	4.0	226	4.0	1114	0.203	100	9.5	LOS A	0.9	6.6	Full	500	0.0	0.0
Lane 2	169	4.0	169	4.0	834	0.203	100	13.0	LOS A	0.8	6.1	Full	500	0.0	0.0
Approach	395	4.0	395	4.0		0.203		11.0	LOS A	0.9	6.6				
North: Station Road - North															
Lane 1	322	4.0	322	4.0	1462	0.220	56[6]	5.2	LOS A	0.0	0.0	Full	130	0.0	0.0
Lane 2[d]	718	4.0	718	4.0	1824	0.394	100	3.7	LOS A	0.0	0.0	Full	130	0.0	0.0
Approach	1040	4.0	1040	4.0		0.394		4.2	LOS A	0.0	0.0				
Intersection	2458	4.0	2458	4.0		0.415		5.3	LOS A	2.3	16.5				

Site Level of Service (LOS) Method: Degree of Saturation (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Roundabout LOS Method: Same as Signalised Intersections.
Lane LOS values are based on degree of saturation per lane.
Intersection and Approach LOS values are based on worst degree of saturation for any lane.
Roundabout Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

6 Lane under-utilisation due to downstream effects
d Dominant lane on roundabout approach

Approach Lane Flows (veh/h)

South: Station Road - South

Mov. From S To Exit:	L2 W	T1 N	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	275	279	554	4.0	1337	0.415	100	0.0	2
Lane 2	-	469	469	4.0	1131	0.415	100	NA	NA
Approach	275	748	1023	4.0		0.415			

East: Calder Freeway Off-ramp - East

Mov. From E To Exit:	L2 S	T1 W	R2 N	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	149	1	75	226	4.0	1114	0.203	100	NA	NA
Lane 2	-	-	169	169	4.0	834	0.203	100	NA	NA

Approach	149	1	244	395	4.0		0.203			
North: Station Road - North										
Mov. From N To Exit:	T1 S	R2 W	Total	%HV		Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	322	-	322	4.0		1462	0.220	56[6]	NA	NA
Lane 2	629	89	718	4.0		1824	0.394	100	NA	NA
Approach	951	89	1040	4.0			0.394			
	Total	%HV	Deg.Satn (v/c)							
Intersection	2458	4.0		0.415						

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

6 Lane under-utilisation due to downstream effects

Merge Analysis

	Exit Lane Number	Short Lane Length m	Percent Opng in Lane %	Opposing Flow Rate veh/h	Opposing Flow Rate pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
South Exit: Station Road - South Merge Type: **Priority**												
Exit Short Lane	1	60	0.0	629	641	3.00	2.00	471	1137	0.414	1.2	2.4
Merge Lane	2	-	100.0	Merge Lane is not Opposed				629	1800	0.349	0.0	0.0
North Exit: Station Road - North Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
Full Length Lane	2	Merge Analysis not applied.										
West Exit: Calder Freeway On-ramp - West Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										

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LANE SUMMARY

Site: 101v [StatRossAMExFu - Roundabout (Site Folder: AM - Post Dev - 10yr Growth)]

Network: N101 [Roundabout - Both (Network Folder: Post Dev - 10yr Growth - AM Peak)]

Station Road / Ross Watt Road
AM Peak, Existing Geometry, Future Volumes
Site Category: (None)
Roundabout

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Station Road - South															
Lane 1[d]	908	4.0	908	4.0	1371	0.663	100	5.0	LOS B	8.8	64.0	Full	165	0.0	0.0
Approach	908	4.0	908	4.0		0.663		5.0	LOS B	8.8	64.0				
North: Station Road - North															
Lane 1[d]	1114	4.0	1114	4.0	1218	0.914	100	6.2	LOS D	15.8	114.3	Full	170	-9.0[N3]	0.0
Approach	1114	4.0	1114	4.0		0.914		6.2	LOS D	15.8	114.3				
West: Ross Watt Road - West															
Lane 1[d]	321	4.0	321	4.0	524	0.613	100	19.7	LOS B	6.1	44.4	Full	500	-3.6[N3]	0.0
Approach	321	4.0	321	4.0		0.613		19.7	LOS B	6.1	44.4				
Intersection	2343	4.0	2343	4.0		0.914		7.6	LOS D	15.8	114.3				

Site Level of Service (LOS) Method: Degree of Saturation (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Roundabout LOS Method: Same as Signalised Intersections.
Lane LOS values are based on degree of saturation per lane.
Intersection and Approach LOS values are based on worst degree of saturation for any lane.
Roundabout Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

d Dominant lane on roundabout approach
N3 Capacity Adjustment due to downstream lane blockage determined by the program.

Approach Lane Flows (veh/h)

Mov. From S To Exit:	L2 W	T1 N	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
South: Station Road - South									
Lane 1	89	819	908	4.0	1371	0.663	100	NA	NA
Approach	89	819	908	4.0		0.663			
North: Station Road - North									
Mov. From N To Exit:	T1 S	R2 W	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	1009	104	1114	4.0	1218	0.914	100	NA	NA
Approach	1009	104	1114	4.0		0.914			
West: Ross Watt Road - West									
Mov. From W To Exit:	L2 N	R2 S	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	212	109	321	4.0	524	0.613	100	NA	NA

Approach	212	109	321	4.0	0.613
	Total	%HV	Deg.Satn (v/c)		
Intersection	2343	4.0	0.914		

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

Merge Analysis

	Exit Lane Number	Short Lane Length m	Percent Opng in Lane %	Opposing Flow Rate veh/h	Opposing Flow Rate pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
South Exit: Station Road - South Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
North Exit: Station Road - North Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
West Exit: Ross Watt Road - West Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										

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LANE SUMMARY

Site: 101v [StatCherAMExFu - Roundabout (Site Folder: AM - Post Dev - 10yr Growth)]

Network: N101 [Roundabout - Both (Network Folder: Post Dev - 10yr Growth - AM Peak)]

Station Road / Cherry Lane
AM Peak, Existing Geometry, Future Volumes
Site Category: (None)
Roundabout

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Station Road - South															
Lane 1[d]	920	4.0	920	4.0	1552	0.593	100	4.1	LOS A	8.1	58.8	Full	500	0.0	0.0
Approach	920	4.0	920	4.0		0.593		4.1	LOS A	8.1	58.8				
North: Station Road - North															
Lane 1[d]	1098	4.0	1098	4.0	1197	0.917	100	14.4	LOS D	26.7	193.3	Full	165	0.0	9.9
Approach	1098	4.0	1098	4.0		0.917		14.4	LOS D	26.7	193.3				
West: Cherry Lane - West															
Lane 1[d]	288	4.0	288	4.0	640	0.451	100	16.0	LOS A	3.7	26.6	Full	500	0.0	0.0
Approach	288	4.0	288	4.0		0.451		16.0	LOS A	3.7	26.6				
Intersection	2306	4.0	2306	4.0		0.917		10.5	LOS D	26.7	193.3				

Site Level of Service (LOS) Method: Degree of Saturation (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Roundabout LOS Method: Same as Signalised Intersections.
Lane LOS values are based on degree of saturation per lane.
Intersection and Approach LOS values are based on worst degree of saturation for any lane.
Roundabout Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

d Dominant lane on roundabout approach

Approach Lane Flows (veh/h)

Mov. From S To Exit:	L2 W	T1 N	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
South: Station Road - South									
Lane 1	122	798	920	4.0	1552	0.593	100	NA	NA
Approach	122	798	920	4.0		0.593			
North: Station Road - North									
Mov. From N To Exit:	T1 S	R2 W	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	1064	34	1098	4.0	1197	0.917	100	NA	NA
Approach	1064	34	1098	4.0		0.917			
West: Cherry Lane - West									
Mov. From W To Exit:	L2 N	R2 S	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	91	198	288	4.0	640	0.451	100	NA	NA

Approach	91	198	288	4.0	0.451
	Total	%HV	Deg.Satn (v/c)		
Intersection	2306	4.0	0.917		

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

Merge Analysis

	Exit Lane Number	Short Lane Length m	Percent Opng in Lane %	Opposing Flow Rate veh/h	Opposing Flow Rate pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
South Exit: Station Road - South Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
North Exit: Station Road - North Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
West Exit: Cherry Lane - West Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										

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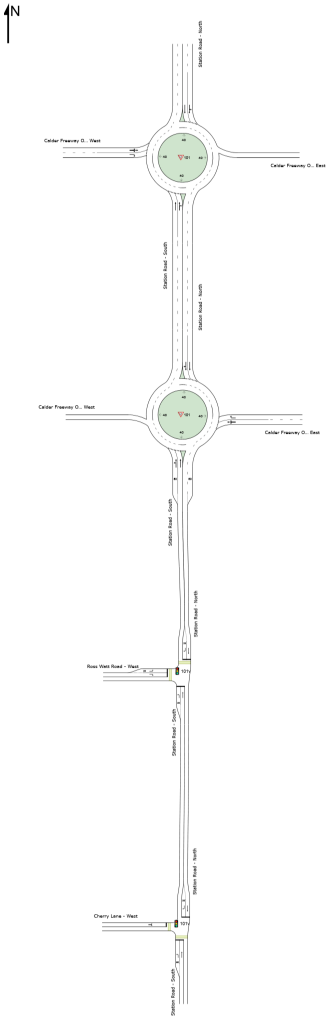
NETWORK LAYOUT

Network: N101 [Signals - Both (Network Folder: Post Dev - 10yr Growth - AM Peak)]

New Network
Network Category: (None)

Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.



SITES IN NETWORK		
Site ID	**CCG ID**	**Site Name**
101	NA	StatCaldEastAMFuEx
101	NA	StatCaldWestAMFuEx
101v	NA	StatRossAMExFu - Signals
101v	NA	StatCherAMExFu - Signals

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LANE SUMMARY

Site: 101 [StatCaldEastAMFuEx (Site Folder: AM - Post Dev - 10yr Growth)]

Network: N101 [Signals - Both (Network Folder: Post Dev - 10yr Growth - AM Peak)]

Station Road / Calder Freeway Eastbound Lane
AM Peak, Future Volumes, Existing Geometry
Site Category: (None)
Roundabout

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Station Road - South															
Lane 1[d]	538	4.0	538	4.0	1826	0.294	100	2.9	LOS A	0.0	0.0	Full	130	0.0	0.0
Lane 2	454	4.0	454	4.0	1541	0.294	100	6.9	LOS A	0.0	0.0	Full	130	0.0	0.0
Approach	992	4.0	992	4.0		0.294		4.7	LOS A	0.0	0.0				
North: Station Road - North															
Lane 1[d]	574	4.0	574	4.0	755	0.760	100	8.3	LOS C	7.0[N5]	50.5[N5]	Full	500	-34.4[N7]	0.0
Lane 2	337	4.0	337	4.0	444	0.760	100	10.1	LOS C	10.2[N5]	73.7[N5]	Full	500	-50.0[N7]	0.0
Approach	912	4.0	912	4.0		0.760		9.0	LOS C	10.2	73.7				
West: Calder Freeway Off-ramp - West															
Lane 1[d]	289	4.0	289	4.0	676	0.428	100	10.3	LOS A	5.0[N5]	36.2[N5]	Full	500	-42.7[N7]	0.0
Lane 2	188	4.0	188	4.0	438	0.428	100	13.0	LOS A	5.7[N5]	41.0[N5]	Full	500	-50.0[N7]	0.0
Approach	477	4.0	477	4.0		0.428		11.4	LOS A	5.7	41.0				
Intersection	2380	4.0	2380	4.0		0.760		7.7	LOS C	10.2	73.7				

Site Level of Service (LOS) Method: Degree of Saturation (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Roundabout LOS Method: Same as Signalised Intersections.
Lane LOS values are based on degree of saturation per lane.
Intersection and Approach LOS values are based on worst degree of saturation for any lane.
Roundabout Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

d Dominant lane on roundabout approach
N5 Continuous Lane results determined by Back of Queue values of downstream lanes (proportional to lane movement flows).
N7 The capacity reduction has been determined from the queue blockage probability of a Site further downstream due to intermediate continuous lanes.

Approach Lane Flows (veh/h)

South: Station Road - South

Mov. From S To Exit:	T1 N	R2 E	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	538	-	538	4.0	1826	0.294	100	NA	NA
Lane 2	180	274	454	4.0	1541	0.294	100	NA	NA
Approach	718	274	992	4.0		0.294			

North: Station Road - North

Mov. From N To Exit:	L2 E	T1 S	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	274	300	574	4.0	755	0.760	100	NA	NA

Lane 2	-	337	337	4.0		444	0.760	100	NA	NA
Approach	274	638	912	4.0			0.760			

West: Calder Freeway Off-ramp - West

Mov. From W To Exit:	L2 N	T1 E	R2 S	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	73	1	216	289	4.0	676	0.428	100	NA	NA
Lane 2	-	-	188	188	4.0	438	0.428	100	NA	NA
Approach	73	1	403	477	4.0		0.428			

	Total	%HV	Deg.Satn (v/c)
Intersection	2380	4.0	0.760

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

Merge Analysis

	Exit Lane Number	Short Lane Length m	Percent Opng in Lane %	Opposing Flow Rate veh/h	pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
South Exit: Station Road - South Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
Full Length Lane	2	Merge Analysis not applied.										
East Exit: Calder Freeway On-ramp - East Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
North Exit: Station Road - North Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
Full Length Lane	2	Merge Analysis not applied.										

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LANE SUMMARY

Site: 101 [StatCaldWestAMFuEx (Site Folder: AM - Post Dev - 10yr Growth)]

Network: N101 [Signals - Both (Network Folder: Post Dev - 10yr Growth - AM Peak)]

Station Road / Calder Freeway Westbound Lane
AM Peak, Future Volumes, Existing Geometry
Site Category: (None)
Roundabout

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Station Road - South															
Lane 1[d]	554	4.0	554	4.0	1339	0.414	100	4.1	LOS A	2.0	14.4	Short	50	0.0	NA
Lane 2	469	4.0	469	4.0	1133	0.414	100	4.3	LOS A	1.9	13.9	Full	170	0.0	0.0
Approach	1023	4.0	1023	4.0		0.414		4.2	LOS A	2.0	14.4				
East: Calder Freeway Off-ramp - East															
Lane 1[d]	226	4.0	226	4.0	1164	0.194	100	8.7	LOS A	19.4[N5]	140.6[N5]	Full	500	0.0	0.0
Lane 2	169	4.0	169	4.0	867	0.194	100	12.5	LOS A	0.7	5.4	Full	500	0.0	0.0
Approach	395	4.0	395	4.0		0.194		10.3	LOS A	19.4	140.6				
North: Station Road - North															
Lane 1	484	4.0	484	4.0	1542	0.314	56[6]	4.8	LOS A	29.3[N6]	212.2[N6]	Full	130	0.0	50.0
Lane 2[d]	556	4.0	556	4.0	991	0.561	100	3.9	LOS A	29.3[N6]	212.2[N6]	Full	130	-45.6[N3]	50.0
Approach	1040	4.0	1040	4.0		0.561		4.3	LOS A	29.3	212.2				
Intersection	2458	4.0	2458	4.0		0.561		5.2	LOS A	29.3	212.2				

Site Level of Service (LOS) Method: Degree of Saturation (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Roundabout LOS Method: Same as Signalised Intersections.
Lane LOS values are based on degree of saturation per lane.
Intersection and Approach LOS values are based on worst degree of saturation for any lane.
Roundabout Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

6 Lane under-utilisation due to downstream effects
d Dominant lane on roundabout approach
N3 Capacity Adjustment due to downstream lane blockage determined by the program.
N5 Continuous Lane results determined by Back of Queue values of downstream lanes (proportional to lane movement flows).
N6 Continuous Lane results determined by Back of Queue values of downstream lanes (proportional to lane movement flows) but average back of queue has been restricted to the available queue storage space.

Approach Lane Flows (veh/h)

South: Station Road - South

Mov. From S To Exit:	L2 W	T1 N	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	275	279	554	4.0	1339	0.414	100	0.0	2
Lane 2	-	469	469	4.0	1133	0.414	100	NA	NA
Approach	275	748	1023	4.0		0.414			

East: Calder Freeway Off-ramp - East

Mov. From E To Exit:	L2 S	T1 W	R2 N	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.

Lane 1	149	1	76	226	4.0	1164	0.194	100	NA	NA
Lane 2	-	-	169	169	4.0	867	0.194	100	NA	NA
Approach	149	1	244	395	4.0		0.194			

North: Station Road - North

Mov. From N To Exit:	T1 S	R2 W	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	484	-	484	4.0	1542	0.314	56[6]	NA	NA
Lane 2	467	89	556	4.0	991	0.561	100	NA	NA
Approach	951	89	1040	4.0		0.561			

	Total	%HV	Deg.Satn (v/c)
Intersection	2458	4.0	0.561

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

6 Lane under-utilisation due to downstream effects

Merge Analysis

	Exit Lane Number	Short Lane Length m	Percent Opng in Lane %	Opposing Flow Rate veh/h	Opposing Flow Rate pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
South Exit: Station Road - South Merge Type: **Priority**												
Exit Short Lane	1	60	0.0	467	476	3.00	2.00	633	1312	0.483	0.8	1.9
Merge Lane	2	-	100.0	Merge Lane is not Opposed				467	1800	0.259	0.0	0.0
North Exit: Station Road - North Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
Full Length Lane	2	Merge Analysis not applied.										
West Exit: Calder Freeway On-ramp - West Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										

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LANE SUMMARY

Site: 101v [StatRossAMExFu - Signals (Site Folder: AM - Post Dev - 10yr Growth)]

Network: N101 [Signals - Both (Network Folder: Post Dev - 10yr Growth - AM Peak)]

Station Road / Ross Watt Road
AM Peak, Existing Geometry, Future Volumes
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Coordinated Cycle Time = 120 seconds (Network User-Given Cycle Time)

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Station Road - South															
Lane 1	89	2.0	89	2.0	1495	0.060	100	7.1	LOS A	0.6	4.1	Short	20	0.0	NA
Lane 2	819	4.0	819	4.0	1136[1]	0.721	100	8.1	LOS C	18.6	134.7	Full	165	0.0	0.0
Approach	908	3.8	908	3.8		0.721		8.0	LOS C	18.6	134.7				
North: Station Road - North															
Lane 1	1009	4.0	1009	4.0	933[1]	1.082	100	136.3	LOS F	38.3[N4]	277.4[N4]	Full	170	-33.3[N3]	50.0
Lane 2	104	2.0	104	2.0	405	0.257	100	18.0	LOS A	3.0	21.6	Short	20	0.0	NA
Approach	1114	3.8	1114	3.8		1.082		125.2	LOS F	38.3	277.4				
West: Ross Watt Road - West															
Lane 1	212	2.0	212	2.0	311[1]	0.680	100	47.7	LOS B	10.7	76.4	Short	20	0.0	NA
Lane 2	109	2.0	109	2.0	110[1]	0.998	100	112.3	LOS E	9.2	65.8	Full	500	-33.3[N3]	0.0
Approach	321	2.0	321	2.0		0.998		69.7	LOS E	10.7	76.4				
Intersection	2343	3.6	2343	3.6		1.082		72.2	LOS F	38.3	277.4				

Site Level of Service (LOS) Method: Degree of Saturation (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Lane LOS values are based on degree of saturation per lane.
Intersection and Approach LOS values are based on worst degree of saturation for any lane.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

1 Reduced capacity due to a short lane effect. Short lane queues may extend into the full-length lanes. Some upstream delays at entry to short lanes are not included.
N3 Capacity Adjustment due to downstream lane blockage determined by the program.
N4 Average back of queue has been restricted to the available queue storage space.

Approach Lane Flows (veh/h)

South: Station Road - South

Mov. From S To Exit:	L2 W	T1 N	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	89	-	89	2.0	1495	0.060	100	0.0	2
Lane 2	-	819	819	4.0	1136[1]	0.721	100	NA	NA
Approach	89	819	908	3.8		0.721			

North: Station Road - North

Mov. From N To Exit:	T1 S	R2 W	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	1009	-	1009	4.0	933[1]	1.082	100	NA	NA
Lane 2	-	104	104	2.0	405	0.257	100	11.9	1

Approach	1009	104	1114	3.8		1.082			
West: Ross Watt Road - West									
Mov. From W To Exit:	L2 N	R2 S	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	212	-	212	2.0	311[1]	0.680	100	100.0	2
Lane 2	-	109	109	2.0	110[1]	0.998	100	NA	NA
Approach	212	109	321	2.0		0.998			
	Total	%HV	Deg.Satn (v/c)						
Intersection	2343	3.6		1.082					

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

1 Reduced capacity due to a short lane effect. Short lane queues may extend into the full-length lanes. Some upstream delays at entry to short lanes are not included.

Merge Analysis

	Exit Lane Number	Short Lane Length m	Percent Opng in Lane %	Opposing Flow Rate veh/h	Opposing Flow Rate pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
South Exit: Station Road - South Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
North Exit: Station Road - North Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
West Exit: Ross Watt Road - West Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										

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LANE SUMMARY

Site: 101v [StatCherAMExFu - Signals (Site Folder: AM - Post Dev - 10yr Growth)]

Network: N101 [Signals - Both (Network Folder: Post Dev - 10yr Growth - AM Peak)]

Station Road / Cherry Lane
AM Peak, Existing Geometry, Future Volumes
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Coordinated Cycle Time = 120 seconds (Network User-Given Cycle Time)

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Station Road - South															
Lane 1	122	2.0	122	2.0	1083	0.113	100	16.8	LOS A	3.1	21.7	Short	50	0.0	NA
Lane 2	798	4.0	798	4.0	1033[1]	0.772	100	17.5	LOS C	31.7	229.5	Full	500	0.0	0.0
Approach	920	3.7	920	3.7		0.772		17.4	LOS C	31.7	229.5				
North: Station Road - North															
Lane 1	1064	4.0	940	4.0	1292[1]	0.727	100	10.7	LOS C	31.1	225.0	Full	165	0.0	33.3
Lane 2	34	2.0	30	2.0	274	0.109	100	19.7	LOS A	0.6	4.3	Short	30	0.0	NA
Approach	1098	3.9	970[N1]	3.9		0.727		11.0	LOS C	31.1	225.0				
West: Cherry Lane - West															
Lane 1	288	2.0	288	2.0	380	0.759	100	56.5	LOS C	16.7	118.7	Full	500	0.0	0.0
Approach	288	2.0	288	2.0		0.759		56.5	LOS C	16.7	118.7				
Intersection	2306	3.6	2178[N1]	3.8		0.772		19.7	LOS C	31.7	229.5				

Site Level of Service (LOS) Method: Degree of Saturation (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Lane LOS values are based on degree of saturation per lane.
Intersection and Approach LOS values are based on worst degree of saturation for any lane.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

1 Reduced capacity due to a short lane effect. Short lane queues may extend into the full-length lanes. Some upstream delays at entry to short lanes are not included.
N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.

Approach Lane Flows (veh/h)

South: Station Road - South

Mov. From S To Exit:	L2 W	T1 N	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	122	-	122	2.0	1083	0.113	100	0.0	2
Lane 2	-	798	798	4.0	1033[1]	0.772	100	NA	NA
Approach	122	798	920	3.7		0.772			

North: Station Road - North

Mov. From N To Exit:	T1 S	R2 W	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	940	-	940	4.0	1292[1]	0.727	100	NA	NA
Lane 2	-	30	30	2.0	274	0.109	100	0.0	1
Approach	940	30	970	3.9		0.727			

West: Cherry Lane - West

Mov. From W To Exit:	L2 N	R2 S	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	91	198	288	2.0	380	0.759	100	NA	NA
Approach	91	198	288	2.0		0.759			
	Total	%HV	Deg.Satn (v/c)						
Intersection	2178	3.8		0.772					

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

1 Reduced capacity due to a short lane effect. Short lane queues may extend into the full-length lanes. Some upstream delays at entry to short lanes are not included.

Merge Analysis

	Exit Lane Number	Short Lane Length m	Percent Opng in Lane %	Opposing Flow Rate veh/h	Opposing Flow Rate pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
South Exit: Station Road - South Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
North Exit: Station Road - North Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
West Exit: Cherry Lane - West Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										

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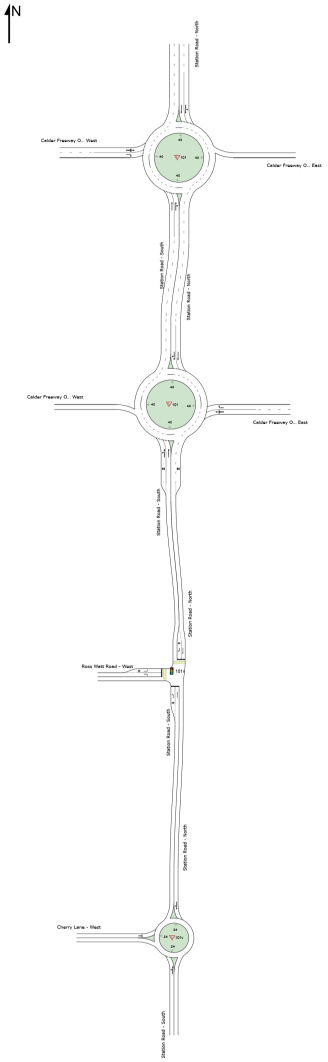
NETWORK LAYOUT

Network: N101 [Signals - Ross Watt (Network Folder: Post Dev - 10yr Growth - AM Peak)]

New Network
Network Category: (None)

Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.



SITES IN NETWORK		
Site ID	**CCG ID**	**Site Name**
101	NA	StatCaldEastAMFuEx
101	NA	StatCaldWestAMFuEx
101v	NA	StatRossAMExFu - Signals - Priority
101v	NA	StatCherAMExFu - Roundabout

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LANE SUMMARY

Site: 101 [StatCaldEastAMFuEx (Site Folder: AM - Post Dev - 10yr Growth)]

Network: N101 [Signals - Ross Watt (Network Folder: Post Dev - 10yr Growth - AM Peak)]

Station Road / Calder Freeway Eastbound Lane
AM Peak, Future Volumes, Existing Geometry
Site Category: (None)
Roundabout

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Station Road - South															
Lane 1[d]	538	4.0	538	4.0	1826	0.294	100	2.9	LOS A	0.0	0.0	Full	130	0.0	0.0
Lane 2	454	4.0	454	4.0	1541	0.294	100	6.9	LOS A	0.0	0.0	Full	130	0.0	0.0
Approach	992	4.0	992	4.0		0.294		4.7	LOS A	0.0	0.0				
North: Station Road - North															
Lane 1[d]	507	4.0	507	4.0	1156	0.438	100	5.2	LOS A	2.5	18.2	Full	500	0.0	0.0
Lane 2	405	4.0	405	4.0	923	0.438	100	5.9	LOS A	2.4	17.6	Full	500	0.0	0.0
Approach	912	4.0	912	4.0		0.438		5.5	LOS A	2.5	18.2				
West: Calder Freeway Off-ramp - West															
Lane 1[d]	273	4.0	273	4.0	1180	0.231	100	9.9	LOS A	1.0	6.9	Full	500	0.0	0.0
Lane 2	204	4.0	204	4.0	884	0.231	100	12.4	LOS A	0.9	6.5	Full	500	0.0	0.0
Approach	477	4.0	477	4.0		0.231		11.0	LOS A	1.0	6.9				
Intersection	2380	4.0	2380	4.0		0.438		6.3	LOS A	2.5	18.2				

Site Level of Service (LOS) Method: Degree of Saturation (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Roundabout LOS Method: Same as Signalised Intersections.
Lane LOS values are based on degree of saturation per lane.
Intersection and Approach LOS values are based on worst degree of saturation for any lane.
Roundabout Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

d Dominant lane on roundabout approach

Approach Lane Flows (veh/h)

South: Station Road - South

Mov. From S To Exit:	T1 N	R2 E	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	538	-	538	4.0	1826	0.294	100	NA	NA
Lane 2	180	274	454	4.0	1541	0.294	100	NA	NA
Approach	718	274	992	4.0		0.294			

North: Station Road - North

Mov. From N To Exit:	L2 E	T1 S	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	274	233	507	4.0	1156	0.438	100	NA	NA
Lane 2	-	405	405	4.0	923	0.438	100	NA	NA

Approach	274	638	912	4.0			0.438			
West: Calder Freeway Off-ramp - West										
Mov. From W To Exit:	L2 N	T1 E	R2 S	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	73	1	199	273	4.0	1180	0.231	100	NA	NA
Lane 2	-	-	204	204	4.0	884	0.231	100	NA	NA
Approach	73	1	403	477	4.0		0.231			
	Total	%HV	Deg.Satn (v/c)							
Intersection	2380	4.0		0.438						

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

Merge Analysis											
	Exit Lane Number	Short Lane Length m	Percent Opng in Lane %	Opposing Flow Rate veh/h	pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
South Exit: Station Road - South Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
Full Length Lane	2	Merge Analysis not applied.										
East Exit: Calder Freeway On-ramp - East Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
North Exit: Station Road - North Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
Full Length Lane	2	Merge Analysis not applied.										

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LANE SUMMARY

Site: 101 [StatCaldWestAMFuEx (Site Folder: AM - Post Dev - 10yr Growth)]

Network: N101 [Signals - Ross Watt (Network Folder: Post Dev - 10yr Growth - AM Peak)]

Station Road / Calder Freeway Westbound Lane
AM Peak, Future Volumes, Existing Geometry
Site Category: (None)
Roundabout

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Station Road - South															
Lane 1[d]	554	4.0	554	4.0	1338	0.414	100	4.1	LOS A	2.0	14.5	Short	50	0.0	NA
Lane 2	469	4.0	469	4.0	1132	0.414	100	4.3	LOS A	1.9	14.0	Full	170	0.0	0.0
Approach	1023	4.0	1023	4.0		0.414		4.2	LOS A	2.0	14.5				
East: Calder Freeway Off-ramp - East															
Lane 1[d]	226	4.0	226	4.0	1130	0.200	100	9.2	LOS A	0.9	6.3	Full	500	0.0	0.0
Lane 2	169	4.0	169	4.0	845	0.200	100	12.8	LOS A	0.8	5.9	Full	500	0.0	0.0
Approach	395	4.0	395	4.0		0.200		10.8	LOS A	0.9	6.3				
North: Station Road - North															
Lane 1	371	4.0	371	4.0	1492	0.249	56[6]	5.1	LOS A	0.0	0.0	Full	130	0.0	0.0
Lane 2[d]	669	4.0	669	4.0	1504	0.445	100	3.8	LOS A	0.0	0.0	Full	130	-17.5[N3]	0.0
Approach	1040	4.0	1040	4.0		0.445		4.2	LOS A	0.0	0.0				
Intersection	2458	4.0	2458	4.0		0.445		5.3	LOS A	2.0	14.5				

Site Level of Service (LOS) Method: Degree of Saturation (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Roundabout LOS Method: Same as Signalised Intersections.
Lane LOS values are based on degree of saturation per lane.
Intersection and Approach LOS values are based on worst degree of saturation for any lane.
Roundabout Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

6 Lane under-utilisation due to downstream effects
d Dominant lane on roundabout approach
N3 Capacity Adjustment due to downstream lane blockage determined by the program.

Approach Lane Flows (veh/h)

South: Station Road - South

Mov. From S To Exit:	L2 W	T1 N	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	275	279	554	4.0	1338	0.414	100	0.0	2
Lane 2	-	469	469	4.0	1132	0.414	100	NA	NA
Approach	275	748	1023	4.0		0.414			

East: Calder Freeway Off-ramp - East

Mov. From E To Exit:	L2 S	T1 W	R2 N	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	149	1	75	226	4.0	1130	0.200	100	NA	NA

Lane 2	-	-	169	169	4.0	845	0.200	100	NA	NA
Approach	149	1	244	395	4.0		0.200			

North: Station Road - North

Mov. From N To Exit:	T1 S	R2 W	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	371	-	371	4.0	1492	0.249	56[6]	NA	NA
Lane 2	580	89	669	4.0	1504	0.445	100	NA	NA
Approach	951	89	1040	4.0		0.445			

	Total	%HV	Deg.Satn (v/c)
Intersection	2458	4.0	0.445

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

6 Lane under-utilisation due to downstream effects

Merge Analysis

	Exit Lane Number	Short Lane Length m	Percent Opng in Lane %	Opposing Flow Rate veh/h	Opposing Flow Rate pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
South Exit: Station Road - South Merge Type: **Priority**												
Exit Short Lane	1	60	0.0	580	591	3.00	2.00	520	1190	0.437	1.1	2.2
Merge Lane	2	-	100.0	Merge Lane is not Opposed				580	1800	0.322	0.0	0.0
North Exit: Station Road - North Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
Full Length Lane	2	Merge Analysis not applied.										
West Exit: Calder Freeway On-ramp - West Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										

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LANE SUMMARY

Site: 101v [StatRossAMExFu - Signals - Priority (Site Folder: AM - Post Dev - 10yr Growth)]

Network: N101 [Signals - Ross Watt (Network Folder: Post Dev - 10yr Growth - AM Peak)]

Station Road / Ross Watt Road
AM Peak, Existing Geometry, Future Volumes
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 120 seconds (Site User-Given Cycle Time)

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Station Road - South															
Lane 1	89	2.0	89	2.0	1495	0.060	100	7.8	LOS A	1.0	7.0	Short	20	0.0	NA
Lane 2	819	4.0	819	4.0	1142[1]	0.717	100	13.0	LOS C	28.3	204.7	Full	165	0.0	24.6
Approach	908	3.8	908	3.8		0.717		12.5	LOS C	28.3	204.7				
North: Station Road - North															
Lane 1	1009	4.0	1009	4.0	1274[1]	0.793	100	6.5	LOS C	28.4	205.4	Full	170	-7.5[N3]	22.2
Lane 2	104	2.0	104	2.0	372	0.280	100	23.8	LOS A	3.7	26.2	Short	20	0.0	NA
Approach	1114	3.8	1114	3.8		0.793		8.1	LOS C	28.4	205.4				
West: Ross Watt Road - West															
Lane 1	212	2.0	212	2.0	331[1]	0.639	100	47.9	LOS B	10.7	76.2	Short	20	0.0	NA
Lane 2	109	2.0	109	2.0	123[1]	0.894	100	76.3	LOS C	7.3	51.8	Full	500	-7.5[N3]	0.0
Approach	321	2.0	321	2.0		0.894		57.5	LOS C	10.7	76.2				
Intersection	2343	3.6	2343	3.6		0.894		16.6	LOS C	28.4	205.4				

Site Level of Service (LOS) Method: Degree of Saturation (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Lane LOS values are based on degree of saturation per lane.
Intersection and Approach LOS values are based on worst degree of saturation for any lane.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

1 Reduced capacity due to a short lane effect. Short lane queues may extend into the full-length lanes. Some upstream delays at entry to short lanes are not included.
N3 Capacity Adjustment due to downstream lane blockage determined by the program.

Approach Lane Flows (veh/h)

South: Station Road - South

Mov. From S To Exit:	L2 W	T1 N	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	89	-	89	2.0	1495	0.060	100	0.0	2
Lane 2	-	819	819	4.0	1142[1]	0.717	100	NA	NA
Approach	89	819	908	3.8		0.717			

North: Station Road - North

Mov. From N To Exit:	T1 S	R2 W	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	1009	-	1009	4.0	1274[1]	0.793	100	NA	NA
Lane 2	-	104	104	2.0	372	0.280	100	29.4	1

Approach	1009	104	1114	3.8		0.793			
West: Ross Watt Road - West									
Mov. From W To Exit:	L2 N	R2 S	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	212	-	212	2.0	331[1]	0.639	100	100.0	2
Lane 2	-	109	109	2.0	123[1]	0.894	100	NA	NA
Approach	212	109	321	2.0		0.894			
	Total	%HV	Deg.Satn (v/c)						
Intersection	2343	3.6		0.894					

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

1 Reduced capacity due to a short lane effect. Short lane queues may extend into the full-length lanes. Some upstream delays at entry to short lanes are not included.

Merge Analysis

	Exit Lane Number	Short Lane Length m	Percent Opng in Lane %	Opposing Flow Rate veh/h	Opposing Flow Rate pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
South Exit: Station Road - South Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
North Exit: Station Road - North Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
West Exit: Ross Watt Road - West Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										

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LANE SUMMARY

Site: 101v [StatCherAMExFu - Roundabout (Site Folder: AM - Post Dev - 10yr Growth)]

Network: N101 [Signals - Ross Watt (Network Folder: Post Dev - 10yr Growth - AM Peak)]

Station Road / Cherry Lane
AM Peak, Existing Geometry, Future Volumes
Site Category: (None)
Roundabout

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Station Road - South															
Lane 1[d]	920	4.0	920	4.0	1212	0.759	100	4.1	LOS C	8.1	58.4	Full	500	-22.0[N3]	0.0
Approach	920	4.0	920	4.0		0.759		4.1	LOS C	8.1	58.4				
North: Station Road - North															
Lane 1[d]	1098	4.0	1098	4.0	1197	0.917	100	13.1	LOS D	24.8	179.3	Full	165	0.0	7.5
Approach	1098	4.0	1098	4.0		0.917		13.1	LOS D	24.8	179.3				
West: Cherry Lane - West															
Lane 1[d]	288	4.0	288	4.0	582	0.496	100	17.0	LOS A	3.9	28.0	Full	500	-9.3[N3]	0.0
Approach	288	4.0	288	4.0		0.496		17.0	LOS A	3.9	28.0				
Intersection	2306	4.0	2306	4.0		0.917		10.0	LOS D	24.8	179.3				

Site Level of Service (LOS) Method: Degree of Saturation (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Roundabout LOS Method: Same as Signalised Intersections.
Lane LOS values are based on degree of saturation per lane.
Intersection and Approach LOS values are based on worst degree of saturation for any lane.
Roundabout Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

d Dominant lane on roundabout approach
N3 Capacity Adjustment due to downstream lane blockage determined by the program.

Approach Lane Flows (veh/h)

South: Station Road - South

Mov. From S To Exit:	L2 W	T1 N	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	122	798	920	4.0	1212	0.759	100	NA	NA
Approach	122	798	920	4.0		0.759			

North: Station Road - North

Mov. From N To Exit:	T1 S	R2 W	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	1064	34	1098	4.0	1197	0.917	100	NA	NA
Approach	1064	34	1098	4.0		0.917			

West: Cherry Lane - West

Mov. From W To Exit:	L2 N	R2 S	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.

Lane 1	91	198	288	4.0	582	0.496	100	NA	NA	
Approach	91	198	288	4.0		0.496				
	Total	%HV	Deg.Satn (v/c)							
Intersection	2306	4.0		0.917						

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

Merge Analysis

	Exit Lane Number	Short Lane Length m	Percent Opng in Lane %	Opposing Flow Rate veh/h	Opposing Flow Rate pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
South Exit: Station Road - South Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
North Exit: Station Road - North Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
West Exit: Cherry Lane - West Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										

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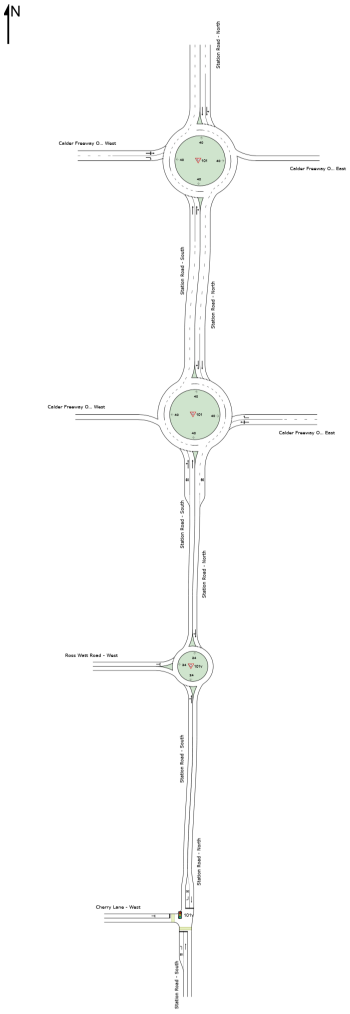
NETWORK LAYOUT

Network: N101 [Signals - Cherry (Network Folder: Post Dev - 10yr Growth - AM Peak)]

New Network
Network Category: (None)

Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.



SITES IN NETWORK		
Site ID	**CCG ID**	**Site Name**
101	NA	StatCaldEastAMFuEx
101	NA	StatCaldWestAMFuEx
101v	NA	StatRossAMExFu - Roundabout
101v	NA	StatCherAMExFu - Signals - Priority

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LANE SUMMARY

Site: 101 [StatCaldEastAMFuEx (Site Folder: AM - Post Dev - 10yr Growth)]

Network: N101 [Signals - Cherry (Network Folder: Post Dev - 10yr Growth - AM Peak)]

Station Road / Calder Freeway Eastbound Lane
AM Peak, Future Volumes, Existing Geometry
Site Category: (None)
Roundabout

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Station Road - South															
Lane 1[d]	538	4.0	538	4.0	1826	0.294	100	2.9	LOS A	0.0	0.0	Full	130	0.0	0.0
Lane 2	454	4.0	454	4.0	1541	0.294	100	6.9	LOS A	0.0	0.0	Full	130	0.0	0.0
Approach	992	4.0	992	4.0		0.294		4.7	LOS A	0.0	0.0				
North: Station Road - North															
Lane 1[d]	622	4.0	622	4.0	1144	0.543	100	6.1	LOS A	3.9	28.0	Full	500	0.0	0.0
Lane 2	290	4.0	290	4.0	533	0.543	100	6.9	LOS A	1.9	14.1	Full	500	-38.1[N7]	0.0
Approach	912	4.0	912	4.0		0.543		6.4	LOS A	3.9	28.0				
West: Calder Freeway Off-ramp - West															
Lane 1[d]	329	4.0	329	4.0	1180	0.279	100	10.3	LOS A	1.2	8.6	Full	500	0.0	0.0
Lane 2	148	4.0	148	4.0	529	0.279	100	12.4	LOS A	0.6	4.7	Full	500	-38.1[N7]	0.0
Approach	477	4.0	477	4.0		0.279		10.9	LOS A	1.2	8.6				
Intersection	2380	4.0	2380	4.0		0.543		6.6	LOS A	3.9	28.0				

Site Level of Service (LOS) Method: Degree of Saturation (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Roundabout LOS Method: Same as Signalised Intersections.
Lane LOS values are based on degree of saturation per lane.
Intersection and Approach LOS values are based on worst degree of saturation for any lane.
Roundabout Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

d Dominant lane on roundabout approach
N7 The capacity reduction has been determined from the queue blockage probability of a Site further downstream due to intermediate continuous lanes.

Approach Lane Flows (veh/h)

South: Station Road - South

Mov. From S To Exit:	T1 N	R2 E	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	538	-	538	4.0	1826	0.294	100	NA	NA
Lane 2	180	274	454	4.0	1541	0.294	100	NA	NA
Approach	718	274	992	4.0		0.294			

North: Station Road - North

Mov. From N To Exit:	L2 E	T1 S	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	274	348	622	4.0	1144	0.543	100	NA	NA
Lane 2	-	290	290	4.0	533	0.543	100	NA	NA

Approach	274	638	912	4.0			0.543			
West: Calder Freeway Off-ramp - West										
Mov. From W To Exit:	L2 N	T1 E	R2 S	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	73	1	256	329	4.0	1180	0.279	100	NA	NA
Lane 2	-	-	148	148	4.0	529	0.279	100	NA	NA
Approach	73	1	403	477	4.0		0.279			
	Total	%HV	Deg.Satn (v/c)							
Intersection	2380	4.0		0.543						

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

Merge Analysis												
	Exit Lane Number	Short Lane Length m	Percent Opng in Lane %	Opposing Flow Rate veh/h	pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
South Exit: Station Road - South Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
Full Length Lane	2	Merge Analysis not applied.										
East Exit: Calder Freeway On-ramp - East Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
North Exit: Station Road - North Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
Full Length Lane	2	Merge Analysis not applied.										

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LANE SUMMARY

Site: 101 [StatCaldWestAMFuEx (Site Folder: AM - Post Dev - 10yr Growth)]

Network: N101 [Signals - Cherry (Network Folder: Post Dev - 10yr Growth - AM Peak)]

Station Road / Calder Freeway Westbound Lane
AM Peak, Future Volumes, Existing Geometry
Site Category: (None)
Roundabout

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Station Road - South															
Lane 1[d]	554	4.0	554	4.0	1339	0.414	100	4.1	LOS A	2.3	16.3	Short	50	0.0	NA
Lane 2	469	4.0	469	4.0	1133	0.414	100	4.3	LOS A	2.2	15.9	Full	170	0.0	0.0
Approach	1023	4.0	1023	4.0		0.414		4.2	LOS A	2.3	16.3				
East: Calder Freeway Off-ramp - East															
Lane 1[d]	226	4.0	226	4.0	1164	0.194	100	8.7	LOS A	3.5[N5]	25.7[N5]	Full	500	0.0	0.0
Lane 2	169	4.0	169	4.0	867	0.194	100	12.5	LOS A	0.7	5.4	Full	500	0.0	0.0
Approach	395	4.0	395	4.0		0.194		10.3	LOS A	3.5	25.7				
North: Station Road - North															
Lane 1	483	4.0	483	4.0	1542	0.314	56[6]	4.8	LOS A	11.5[N5]	83.0[N5]	Full	130	0.0	0.0
Lane 2[d]	557	4.0	557	4.0	992	0.561	100	3.9	LOS A	11.1[N5]	80.2[N5]	Full	130	-45.6[N7]	38.6
Approach	1040	4.0	1040	4.0		0.561		4.3	LOS A	11.5	83.0				
Intersection	2458	4.0	2458	4.0		0.561		5.2	LOS A	11.5	83.0				

Site Level of Service (LOS) Method: Degree of Saturation (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Roundabout LOS Method: Same as Signalised Intersections.
Lane LOS values are based on degree of saturation per lane.
Intersection and Approach LOS values are based on worst degree of saturation for any lane.
Roundabout Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

6 Lane under-utilisation due to downstream effects
d Dominant lane on roundabout approach
N5 Continuous Lane results determined by Back of Queue values of downstream lanes (proportional to lane movement flows).
N7 The capacity reduction has been determined from the queue blockage probability of a Site further downstream due to intermediate continuous lanes.

Approach Lane Flows (veh/h)

South: Station Road - South

Mov. From S To Exit:	L2 W	T1 N	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	275	279	554	4.0	1339	0.414	100	0.0	2
Lane 2	-	469	469	4.0	1133	0.414	100	NA	NA
Approach	275	748	1023	4.0		0.414			

East: Calder Freeway Off-ramp - East

Mov. From E To Exit:	L2 S	T1 W	R2 N	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.

Lane 1	149	1	76	226	4.0	1164	0.194	100	NA	NA
Lane 2	-	-	169	169	4.0	867	0.194	100	NA	NA
Approach	149	1	244	395	4.0		0.194			

North: Station Road - North

Mov. From N To Exit:	T1 S	R2 W	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	483	-	483	4.0	1542	0.314	56[6]	NA	NA
Lane 2	467	89	557	4.0	992	0.561	100	NA	NA
Approach	951	89	1040	4.0		0.561			

	Total	%HV	Deg.Satn (v/c)
Intersection	2458	4.0	0.561

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

6 Lane under-utilisation due to downstream effects

Merge Analysis

	Exit Lane Number	Short Lane Length m	Percent Opng in Lane %	Opposing Flow Rate veh/h	Opposing Flow Rate pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
South Exit: Station Road - South Merge Type: **Priority**												
Exit Short Lane	1	60	0.0	467	476	3.00	2.00	633	1311	0.483	0.8	1.9
Merge Lane	2	-	100.0	Merge Lane is not Opposed				467	1800	0.259	0.0	0.0
North Exit: Station Road - North Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
Full Length Lane	2	Merge Analysis not applied.										
West Exit: Calder Freeway On-ramp - West Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										

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LANE SUMMARY

Site: 101v [StatRossAMExFu - Roundabout (Site Folder: AM - Post Dev - 10yr Growth)]

Network: N101 [Signals - Cherry (Network Folder: Post Dev - 10yr Growth - AM Peak)]

Station Road / Ross Watt Road
AM Peak, Existing Geometry, Future Volumes
Site Category: (None)
Roundabout

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Station Road - South															
Lane 1[d]	908	4.0	908	4.0	1405	0.646	100	4.8	LOS B	8.2	59.7	Full	165	0.0	0.0
Approach	908	4.0	908	4.0		0.646		4.8	LOS B	8.2	59.7				
North: Station Road - North															
Lane 1[d]	1114	4.0	1114	4.0	928	1.200	100	191.1	LOS F	58.4[N4]	422.5[N4]	Full	170	-30.7[N3]	49.9
Approach	1114	4.0	1114	4.0		1.200		191.1	LOS F	58.4	422.5				
West: Ross Watt Road - West															
Lane 1[d]	321	4.0	321	4.0	545	0.589	100	21.1	LOS A	7.0	50.3	Full	500	-14.3[N3]	0.0
Approach	321	4.0	321	4.0		0.589		21.1	LOS A	7.0	50.3				
Intersection	2343	4.0	2343	4.0		1.200		95.5	LOS F	58.4	422.5				

Site Level of Service (LOS) Method: Degree of Saturation (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Roundabout LOS Method: Same as Signalised Intersections.
Lane LOS values are based on degree of saturation per lane.
Intersection and Approach LOS values are based on worst degree of saturation for any lane.
Roundabout Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

d Dominant lane on roundabout approach
N3 Capacity Adjustment due to downstream lane blockage determined by the program.
N4 Average back of queue has been restricted to the available queue storage space.

Approach Lane Flows (veh/h)

Mov. From S To Exit:	L2 W	T1 N	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
South: Station Road - South									
Lane 1	89	819	908	4.0	1405	0.646	100	NA	NA
Approach	89	819	908	4.0		0.646			
North: Station Road - North									
Mov. From N To Exit:	T1 S	R2 W	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	1009	104	1114	4.0	928	1.200	100	NA	NA
Approach	1009	104	1114	4.0		1.200			
West: Ross Watt Road - West									
Mov. From W To Exit:	L2 N	R2 S	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.

Lane 1	212	109	321	4.0	545	0.589	100	NA	NA
Approach	212	109	321	4.0		0.589			
	Total	%HV	Deg.Satn (v/c)						
Intersection	2343	4.0		1.200					

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

Merge Analysis

	Exit Lane Number	Short Lane Length m	Percent Opng in Lane %	Opposing Flow Rate veh/h	Opposing Flow Rate pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
South Exit: Station Road - South Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
North Exit: Station Road - North Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
West Exit: Ross Watt Road - West Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										

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LANE SUMMARY

Site: 101v [StatCherAMExFu - Signals - Priority (Site Folder: AM - Post Dev - 10yr Growth)]

Network: N101 [Signals - Cherry (Network Folder: Post Dev - 10yr Growth - AM Peak)]

Station Road / Cherry Lane
AM Peak, Existing Geometry, Future Volumes
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 120 seconds (Site User-Given Cycle Time)

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Station Road - South															
Lane 1	122	2.0	122	2.0	1083	0.113	100	16.8	LOS A	3.1	21.7	Short	50	0.0	NA
Lane 2	798	4.0	798	4.0	1033[1]	0.772	100	17.5	LOS C	31.7	229.5	Full	500	0.0	0.0
Approach	920	3.7	920	3.7		0.772		17.4	LOS C	31.7	229.5				
North: Station Road - North															
Lane 1	1064	4.0	923	4.0	1292[1]	0.714	100	11.1	LOS C	30.9	223.8	Full	165	0.0	32.8
Lane 2	34	2.0	29	2.0	274	0.107	100	19.7	LOS A	0.6	4.5	Short	30	0.0	NA
Approach	1098	3.9	952[N1]	3.9		0.714		11.3	LOS C	30.9	223.8				
West: Cherry Lane - West															
Lane 1	288	2.0	288	2.0	380	0.759	100	56.5	LOS C	16.7	118.7	Full	500	0.0	0.0
Approach	288	2.0	288	2.0		0.759		56.5	LOS C	16.7	118.7				
Intersection	2306	3.6	2161[N1]	3.9		0.772		20.0	LOS C	31.7	229.5				

Site Level of Service (LOS) Method: Degree of Saturation (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Lane LOS values are based on degree of saturation per lane.
Intersection and Approach LOS values are based on worst degree of saturation for any lane.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

1 Reduced capacity due to a short lane effect. Short lane queues may extend into the full-length lanes. Some upstream delays at entry to short lanes are not included.
N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.

Approach Lane Flows (veh/h)

South: Station Road - South

Mov. From S To Exit:	L2 W	T1 N	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	122	-	122	2.0	1083	0.113	100	0.0	2
Lane 2	-	798	798	4.0	1033[1]	0.772	100	NA	NA
Approach	122	798	920	3.7		0.772			

North: Station Road - North

Mov. From N To Exit:	T1 S	R2 W	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	923	-	923	4.0	1292[1]	0.714	100	NA	NA
Lane 2	-	29	29	2.0	274	0.107	100	0.0	1
Approach	923	29	952	3.9		0.714			

West: Cherry Lane - West

Mov. From W To Exit:	L2 N	R2 S	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	91	198	288	2.0	380	0.759	100	NA	NA
Approach	91	198	288	2.0		0.759			
	Total	%HV	Deg.Satn (v/c)						
Intersection	2161	3.9		0.772					

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

1 Reduced capacity due to a short lane effect. Short lane queues may extend into the full-length lanes. Some upstream delays at entry to short lanes are not included.

Merge Analysis

	Exit Lane Number	Short Lane Length m	Percent Opng in Lane %	Opposing Flow Rate veh/h	Opposing Flow Rate pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
South Exit: Station Road - South Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
North Exit: Station Road - North Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
West Exit: Cherry Lane - West Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										

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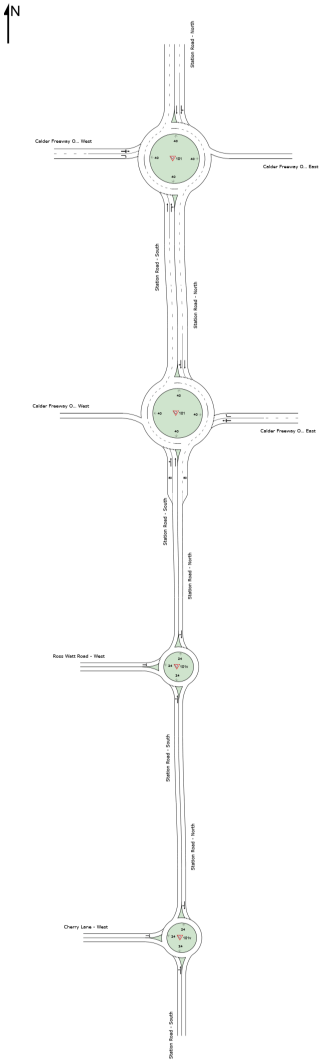
NETWORK LAYOUT

Network: N101 [Roundabout - Both (Network Folder: Post Dev - 10yr Growth - PM Peak)]

New Network
Network Category: (None)

Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.



SITES IN NETWORK		
Site ID	**CCG ID**	**Site Name**
101	NA	StatCaldEastPMFuEx
101	NA	StatCaldWestPMFuEx
101v	NA	StatRossPMExFu - Roundabout
101v	NA	StatCherPMExFu - Roundabout

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LANE SUMMARY

Site: 101 [StatCaldEastPMFuEx (Site Folder: PM - Post Dev - 10yr Growth)]

Network: N101 [Roundabout - Both (Network Folder: Post Dev - 10yr Growth - PM Peak)]

Station Road / Calder Freeway Eastbound Lane
PM Peak, Future Volumes, Existing Geometry
Site Category: (None)
Roundabout

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Station Road - South															
Lane 1[d]	424	4.0	424	4.0	1826	0.232	100	2.9	LOS A	0.0	0.0	Full	130	0.0	0.0
Lane 2	358	4.0	358	4.0	1541	0.232	100	6.4	LOS A	0.0	0.0	Full	130	0.0	0.0
Approach	782	4.0	782	4.0		0.232		4.5	LOS A	0.0	0.0				
North: Station Road - North															
Lane 1[d]	388	4.0	388	4.0	1178	0.330	100	4.7	LOS A	1.7	12.0	Full	500	0.0	0.0
Lane 2	312	4.0	312	4.0	946	0.330	100	5.1	LOS A	1.6	11.4	Full	500	0.0	0.0
Approach	700	4.0	700	4.0		0.330		4.9	LOS A	1.7	12.0				
West: Calder Freeway Off-ramp - West															
Lane 1[d]	308	4.0	308	4.0	1229	0.251	100	9.2	LOS A	1.0	7.4	Full	500	0.0	0.0
Lane 2	240	4.0	240	4.0	957	0.251	100	11.9	LOS A	1.0	7.2	Full	500	0.0	0.0
Approach	548	4.0	548	4.0		0.251		10.4	LOS A	1.0	7.4				
Intersection	2031	4.0	2031	4.0		0.330		6.2	LOS A	1.7	12.0				

Site Level of Service (LOS) Method: Degree of Saturation (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Roundabout LOS Method: Same as Signalised Intersections.
Lane LOS values are based on degree of saturation per lane.
Intersection and Approach LOS values are based on worst degree of saturation for any lane.
Roundabout Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

d Dominant lane on roundabout approach

Approach Lane Flows (veh/h)

South: Station Road - South

Mov. From S To Exit:	T1 N	R2 E	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	424	-	424	4.0	1826	0.232	100	NA	NA
Lane 2	165	193	358	4.0	1541	0.232	100	NA	NA
Approach	589	193	782	4.0		0.232			

North: Station Road - North

Mov. From N To Exit:	L2 E	T1 S	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	201	187	388	4.0	1178	0.330	100	NA	NA
Lane 2	-	312	312	4.0	946	0.330	100	NA	NA
Approach	201	499	700	4.0		0.330			

West: Calder Freeway Off-ramp - West											
Mov. From W To Exit:	L2 N	T1 E	R2 S	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.	
Lane 1	100	1	207	308	4.0	1229	0.251	100	NA	NA	
Lane 2	-	-	240	240	4.0	957	0.251	100	NA	NA	
Approach	100	1	447	548	4.0		0.251				
	Total	%HV	Deg.Satn (v/c)								
Intersection	2031	4.0		0.330							

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

Merge Analysis											
	Exit Lane Number	Short Lane Length m	Percent Opng in Lane %	Opposing Flow Rate veh/h	Opposing Flow Rate pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
South Exit: Station Road - South Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
Full Length Lane	2	Merge Analysis not applied.										
East Exit: Calder Freeway On-ramp - East Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
North Exit: Station Road - North Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
Full Length Lane	2	Merge Analysis not applied.										

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LANE SUMMARY

Site: 101 [StatCaldWestPMFuEx (Site Folder: PM - Post Dev - 10yr Growth)] **Network: N101 [Roundabout - Both (Network Folder: Post Dev - 10yr Growth - PM Peak)]**

Station Road / Calder Freeway Westbound Lane
PM Peak, Future Volumes, Existing Geometry
Site Category: (None)
Roundabout

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Station Road - South															
Lane 1[d]	517	4.0	517	4.0	1359	0.380	100	4.1	LOS A	2.1	15.3	Short	50	0.0	NA
Lane 2	440	4.0	440	4.0	1158	0.380	100	4.1	LOS A	2.0	14.8	Full	170	0.0	0.0
Approach	957	4.0	957	4.0		0.380		4.1	LOS A	2.1	15.3				
East: Calder Freeway Off-ramp - East															
Lane 1[d]	282	4.0	282	4.0	1147	0.246	100	7.9	LOS A	1.1	8.0	Full	500	0.0	0.0
Lane 2	207	4.0	207	4.0	872	0.238	97[5]	12.7	LOS A	1.0	7.2	Full	500	0.0	0.0
Approach	489	4.0	489	4.0		0.246		9.9	LOS A	1.1	8.0				
North: Station Road - North															
Lane 1	290	4.0	290	4.0	1462	0.198	56[6]	5.2	LOS A	0.0	0.0	Full	130	0.0	0.0
Lane 2[d]	647	4.0	647	4.0	1824	0.355	100	3.8	LOS A	0.0	0.0	Full	130	0.0	0.0
Approach	937	4.0	937	4.0		0.355		4.2	LOS A	0.0	0.0				
Intersection	2383	4.0	2383	4.0		0.380		5.3	LOS A	2.1	15.3				

Site Level of Service (LOS) Method: Degree of Saturation (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Roundabout LOS Method: Same as Signalised Intersections.
Lane LOS values are based on degree of saturation per lane.
Intersection and Approach LOS values are based on worst degree of saturation for any lane.
Roundabout Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

5 Lane under-utilisation found by the program
6 Lane under-utilisation due to downstream effects
d Dominant lane on roundabout approach

Approach Lane Flows (veh/h)

South: Station Road - South

Mov. From S To Exit:	L2 W	T1 N	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	403	114	517	4.0	1359	0.380	100	0.0	2
Lane 2	-	440	440	4.0	1158	0.380	100	NA	NA
Approach	403	554	957	4.0		0.380			

East: Calder Freeway Off-ramp - East

Mov. From E To Exit:	L2 S	T1 W	R2 N	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	281	1	-	282	4.0	1147	0.246	100	NA	NA
Lane 2	-	-	207	207	4.0	872	0.238	97[5]	NA	NA

Approach	281	1	207	489	4.0		0.246			
North: Station Road - North										
Mov. From N To Exit:	T1 S	R2 W	Total	%HV		Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	290	-	290	4.0		1462	0.198	56[6]	NA	NA
Lane 2	558	89	647	4.0		1824	0.355	100	NA	NA
Approach	847	89	937	4.0			0.355			
	Total	%HV	Deg.Satn (v/c)							
Intersection	2383	4.0		0.380						

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

5 Lane under-utilisation found by the program
6 Lane under-utilisation due to downstream effects

Merge Analysis

	Exit Lane Number	Short Lane Length m	Percent Opng in Lane %	Opposing Flow Rate veh/h	Opposing Flow Rate pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
South Exit: Station Road - South Merge Type: **Priority**												
Exit Short Lane	1	60	0.0	558	569	3.00	2.00	571	1214	0.470	1.0	2.3
Merge Lane	2	-	100.0	Merge Lane is not Opposed				558	1800	0.310	0.0	0.0
North Exit: Station Road - North Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
Full Length Lane	2	Merge Analysis not applied.										
West Exit: Calder Freeway On-ramp - West Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										

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LANE SUMMARY

Site: 101v [StatRossPMExFu - Roundabout (Site Folder: PM - Post Dev - 10yr Growth)]

Network: N101 [Roundabout - Both (Network Folder: Post Dev - 10yr Growth - PM Peak)]

Station Road / Ross Watt Road
PM Peak, Existing Geometry, Future Volumes
Site Category: (None)
Roundabout

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Station Road - South															
Lane 1[d]	995	4.0	995	4.0	1233	0.807	100	7.8	LOS C	13.9	101.0	Full	165	0.0	0.0
Approach	995	4.0	995	4.0		0.807		7.8	LOS C	13.9	101.0				
North: Station Road - North															
Lane 1[d]	1182	4.0	1182	4.0	1439	0.822	100	5.9	LOS C	17.6	127.7	Full	170	0.0	0.0
Approach	1182	4.0	1182	4.0		0.822		5.9	LOS C	17.6	127.7				
West: Ross Watt Road - West															
Lane 1[d]	182	4.0	182	4.0	445	0.409	100	14.9	LOS A	3.3	24.2	Full	500	0.0	0.0
Approach	182	4.0	182	4.0		0.409		14.9	LOS A	3.3	24.2				
Intersection	2359	4.0	2359	4.0		0.822		7.4	LOS C	17.6	127.7				

Site Level of Service (LOS) Method: Degree of Saturation (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Roundabout LOS Method: Same as Signalised Intersections.
Lane LOS values are based on degree of saturation per lane.
Intersection and Approach LOS values are based on worst degree of saturation for any lane.
Roundabout Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

d Dominant lane on roundabout approach

Approach Lane Flows (veh/h)

Mov. From S To Exit:	L2 W	T1 N	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
South: Station Road - South									
Lane 1	127	867	995	4.0	1233	0.807	100	NA	NA
Approach	127	867	995	4.0		0.807			
North: Station Road - North									
Mov. From N To Exit:	T1 S	R2 W	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	999	183	1182	4.0	1439	0.822	100	NA	NA
Approach	999	183	1182	4.0		0.822			
West: Ross Watt Road - West									
Mov. From W To Exit:	L2 N	R2 S	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	111	72	182	4.0	445	0.409	100	NA	NA

Approach	111	72	182	4.0	0.409
	Total	%HV	Deg.Satn (v/c)		
Intersection	2359	4.0	0.822		

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

Merge Analysis

	Exit Lane Number	Short Lane Length m	Percent Opng in Lane %	Opposing Flow Rate veh/h	Opposing Flow Rate pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
South Exit: Station Road - South Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
North Exit: Station Road - North Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
West Exit: Ross Watt Road - West Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										

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LANE SUMMARY

Site: 101v [StatCherPMExFu - Roundabout (Site Folder: PM - Post Dev - 10yr Growth)]

Network: N101 [Roundabout - Both (Network Folder: Post Dev - 10yr Growth - PM Peak)]

Station Road / Cherry Lane
PM Peak, Existing Geometry, Future Volumes
Site Category: (None)
Roundabout

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Station Road - South															
Lane 1[d]	1171	4.0	1171	4.0	1484	0.789	100	4.8	LOS C	15.4	111.3	Full	500	0.0	0.0
Approach	1171	4.0	1171	4.0		0.789		4.8	LOS C	15.4	111.3				
North: Station Road - North															
Lane 1[d]	1006	4.0	1006	4.0	1325	0.759	100	5.8	LOS C	11.8	85.5	Full	165	0.0	0.0
Approach	1006	4.0	1006	4.0		0.759		5.8	LOS C	11.8	85.5				
West: Cherry Lane - West															
Lane 1[d]	184	4.0	184	4.0	479	0.385	100	16.7	LOS A	3.0	21.9	Full	500	0.0	0.0
Approach	184	4.0	184	4.0		0.385		16.7	LOS A	3.0	21.9				
Intersection	2361	4.0	2361	4.0		0.789		6.1	LOS C	15.4	111.3				

Site Level of Service (LOS) Method: Degree of Saturation (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Roundabout LOS Method: Same as Signalised Intersections.
Lane LOS values are based on degree of saturation per lane.
Intersection and Approach LOS values are based on worst degree of saturation for any lane.
Roundabout Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

d Dominant lane on roundabout approach

Approach Lane Flows (veh/h)

Mov. From S To Exit:	L2 W	T1 N	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
South: Station Road - South									
Lane 1	235	936	1171	4.0	1484	0.789	100	NA	NA
Approach	235	936	1171	4.0		0.789			
North: Station Road - North									
Mov. From N To Exit:	T1 S	R2 W	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	946	60	1006	4.0	1325	0.759	100	NA	NA
Approach	946	60	1006	4.0		0.759			
West: Cherry Lane - West									
Mov. From W To Exit:	L2 N	R2 S	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	62	122	184	4.0	479	0.385	100	NA	NA

Approach	62	122	184	4.0	0.385
	Total	%HV	Deg.Satn (v/c)		
Intersection	2361	4.0	0.789		

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

Merge Analysis

	Exit Lane Number	Short Lane Length m	Percent Opng in Lane %	Opposing Flow Rate veh/h	Opposing Flow Rate pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
South Exit: Station Road - South Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
North Exit: Station Road - North Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
West Exit: Cherry Lane - West Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										

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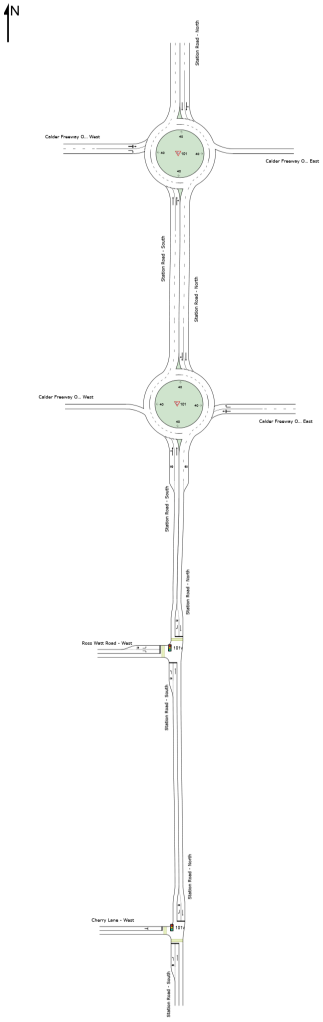
NETWORK LAYOUT

Network: N101 [Signals - Both (Network Folder: Post Dev - 10yr Growth - PM Peak)]

New Network
Network Category: (None)

Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.



SITES IN NETWORK		
Site ID	**CCG ID**	**Site Name**
101	NA	StatCaldEastPMFuEx
101	NA	StatCaldWestPMFuEx
101v	NA	StatRossPMExFu - Signals
101v	NA	StatCherPMExFu - Signals

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Project: N:\Projects\2021\210473\Sidra\210473SID004A.sip9

LANE SUMMARY

Site: 101 [StatCaldEastPMFuEx (Site Folder: PM - Post Dev - 10yr Growth)]

Network: N101 [Signals - Both (Network Folder: Post Dev - 10yr Growth - PM Peak)]

Station Road / Calder Freeway Eastbound Lane
PM Peak, Future Volumes, Existing Geometry
Site Category: (None)
Roundabout

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Station Road - South															
Lane 1[d]	424	4.0	424	4.0	1826	0.232	100	2.9	LOS A	0.0	0.0	Full	130	0.0	0.0
Lane 2	358	4.0	358	4.0	1541	0.232	100	6.4	LOS A	0.0	0.0	Full	130	0.0	0.0
Approach	782	4.0	782	4.0		0.232		4.5	LOS A	0.0	0.0				
North: Station Road - North															
Lane 1[d]	388	4.0	388	4.0	1178	0.330	100	4.7	LOS A	1.7	12.0	Full	500	0.0	0.0
Lane 2	312	4.0	312	4.0	946	0.330	100	5.1	LOS A	1.6	11.4	Full	500	0.0	0.0
Approach	700	4.0	700	4.0		0.330		4.9	LOS A	1.7	12.0				
West: Calder Freeway Off-ramp - West															
Lane 1[d]	308	4.0	308	4.0	1229	0.251	100	9.2	LOS A	1.0	7.4	Full	500	0.0	0.0
Lane 2	240	4.0	240	4.0	957	0.251	100	11.9	LOS A	1.0	7.2	Full	500	0.0	0.0
Approach	548	4.0	548	4.0		0.251		10.4	LOS A	1.0	7.4				
Intersection	2031	4.0	2031	4.0		0.330		6.2	LOS A	1.7	12.0				

Site Level of Service (LOS) Method: Degree of Saturation (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Roundabout LOS Method: Same as Signalised Intersections.
Lane LOS values are based on degree of saturation per lane.
Intersection and Approach LOS values are based on worst degree of saturation for any lane.
Roundabout Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

d Dominant lane on roundabout approach

Approach Lane Flows (veh/h)

South: Station Road - South

Mov. From S To Exit:	T1 N	R2 E	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	424	-	424	4.0	1826	0.232	100	NA	NA
Lane 2	165	193	358	4.0	1541	0.232	100	NA	NA
Approach	589	193	782	4.0		0.232			

North: Station Road - North

Mov. From N To Exit:	L2 E	T1 S	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	201	187	388	4.0	1178	0.330	100	NA	NA
Lane 2	-	312	312	4.0	946	0.330	100	NA	NA
Approach	201	499	700	4.0		0.330			

West: Calder Freeway Off-ramp - West											
Mov. From W To Exit:	L2 N	T1 E	R2 S	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.	
Lane 1	100	1	207	308	4.0	1229	0.251	100	NA	NA	
Lane 2	-	-	240	240	4.0	957	0.251	100	NA	NA	
Approach	100	1	447	548	4.0		0.251				
	Total	%HV	Deg.Satn (v/c)								
Intersection	2031	4.0		0.330							

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

Merge Analysis												
	Exit Lane Number	Short Lane Length m	Percent Opng in Lane %	Opposing Flow Rate veh/h	Opposing Flow Rate pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
South Exit: Station Road - South Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
Full Length Lane	2	Merge Analysis not applied.										
East Exit: Calder Freeway On-ramp - East Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
North Exit: Station Road - North Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
Full Length Lane	2	Merge Analysis not applied.										

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LANE SUMMARY

Site: 101 [StatCaldWestPMFuEx (Site Folder: PM - Post Dev - 10yr Growth)]

Network: N101 [Signals - Both (Network Folder: Post Dev - 10yr Growth - PM Peak)]

Station Road / Calder Freeway Westbound Lane
PM Peak, Future Volumes, Existing Geometry
Site Category: (None)
Roundabout

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Station Road - South															
Lane 1[d]	517	4.0	517	4.0	1359	0.380	100	4.1	LOS A	2.0	14.5	Short	50	0.0	NA
Lane 2	440	4.0	440	4.0	1158	0.380	100	4.1	LOS A	2.0	14.1	Full	170	0.0	0.0
Approach	957	4.0	957	4.0		0.380		4.1	LOS A	2.0	14.5				
East: Calder Freeway Off-ramp - East															
Lane 1[d]	282	4.0	282	4.0	1147	0.246	100	7.9	LOS A	1.1	8.0	Full	500	0.0	0.0
Lane 2	207	4.0	207	4.0	872	0.238	97[5]	12.7	LOS A	1.0	7.2	Full	500	0.0	0.0
Approach	489	4.0	489	4.0		0.246		9.9	LOS A	1.1	8.0				
North: Station Road - North															
Lane 1	290	4.0	290	4.0	1462	0.198	56[6]	5.2	LOS A	0.0	0.0	Full	130	0.0	0.0
Lane 2[d]	647	4.0	647	4.0	1824	0.355	100	3.8	LOS A	0.0	0.0	Full	130	0.0	0.0
Approach	937	4.0	937	4.0		0.355		4.2	LOS A	0.0	0.0				
Intersection	2383	4.0	2383	4.0		0.380		5.3	LOS A	2.0	14.5				

Site Level of Service (LOS) Method: Degree of Saturation (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Roundabout LOS Method: Same as Signalised Intersections.
Lane LOS values are based on degree of saturation per lane.
Intersection and Approach LOS values are based on worst degree of saturation for any lane.
Roundabout Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

5 Lane under-utilisation found by the program
6 Lane under-utilisation due to downstream effects
d Dominant lane on roundabout approach

Approach Lane Flows (veh/h)

South: Station Road - South

Mov. From S To Exit:	L2 W	T1 N	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	403	114	517	4.0	1359	0.380	100	0.0	2
Lane 2	-	440	440	4.0	1158	0.380	100	NA	NA
Approach	403	554	957	4.0		0.380			

East: Calder Freeway Off-ramp - East

Mov. From E To Exit:	L2 S	T1 W	R2 N	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	281	1	-	282	4.0	1147	0.246	100	NA	NA
Lane 2	-	-	207	207	4.0	872	0.238	97[5]	NA	NA

Approach	281	1	207	489	4.0		0.246			
North: Station Road - North										
Mov. From N To Exit:	T1 S	R2 W	Total	%HV		Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	290	-	290	4.0		1462	0.198	56[6]	NA	NA
Lane 2	558	89	647	4.0		1824	0.355	100	NA	NA
Approach	847	89	937	4.0			0.355			
	Total	%HV	Deg.Satn (v/c)							
Intersection	2383	4.0		0.380						

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

5 Lane under-utilisation found by the program
6 Lane under-utilisation due to downstream effects

Merge Analysis

	Exit Lane Number	Short Lane Length m	Percent Opng in Lane %	Opposing Flow Rate veh/h	Opposing Flow Rate pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
South Exit: Station Road - South Merge Type: **Priority**												
Exit Short Lane	1	60	0.0	558	569	3.00	2.00	571	1214	0.470	1.0	2.3
Merge Lane	2	-	100.0	Merge Lane is not Opposed				558	1800	0.310	0.0	0.0
North Exit: Station Road - North Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
Full Length Lane	2	Merge Analysis not applied.										
West Exit: Calder Freeway On-ramp - West Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										

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LANE SUMMARY

Site: 101v [StatRossPMExFu - Signals (Site Folder: PM - Post Dev - 10yr Growth)]

Network: N101 [Signals - Both (Network Folder: Post Dev - 10yr Growth - PM Peak)]

Station Road / Ross Watt Road
PM Peak, Existing Geometry, Future Volumes
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Coordinated Cycle Time = 120 seconds (Network User-Given Cycle Time)

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Station Road - South															
Lane 1	127	2.0	127	2.0	1434	0.089	100	6.2	LOS A	0.3	2.2	Short	20	0.0	NA
Lane 2	867	4.0	867	4.0	1214[1]	0.715	100	2.9	LOS C	9.0	65.4	Full	165	0.0	0.0
Approach	995	3.7	995	3.7		0.715		3.3	LOS C	9.0	65.4				
North: Station Road - North															
Lane 1	996	4.0	996	4.0	1370[1]	0.727	100	3.0	LOS C	17.9	129.9	Full	170	0.0	0.0
Lane 2	183	2.0	183	2.0	470	0.390	100	9.0	LOS A	2.4	17.0	Short	20	0.0	NA
Approach	1179	3.7	1179	3.7		0.727		3.9	LOS C	17.9	129.9				
West: Ross Watt Road - West															
Lane 1	111	2.0	111	2.0	332[1]	0.333	100	49.0	LOS A	5.5	39.1	Short	20	0.0	NA
Lane 2	72	2.0	72	2.0	92	0.782	100	73.7	LOS C	4.6	32.8	Full	500	0.0	0.0
Approach	182	2.0	182	2.0		0.782		58.7	LOS C	5.5	39.1				
Intersection	2356	3.6	2356	3.6		0.782		7.9	LOS C	17.9	129.9				

Site Level of Service (LOS) Method: Degree of Saturation (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Lane LOS values are based on degree of saturation per lane.
Intersection and Approach LOS values are based on worst degree of saturation for any lane.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

1 Reduced capacity due to a short lane effect. Short lane queues may extend into the full-length lanes. Some upstream delays at entry to short lanes are not included.

Approach Lane Flows (veh/h)

South: Station Road - South

Mov. From S To Exit:	L2 W	T1 N	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	127	-	127	2.0	1434	0.089	100	0.0	2
Lane 2	-	867	867	4.0	1214[1]	0.715	100	NA	NA
Approach	127	867	995	3.7		0.715			

North: Station Road - North

Mov. From N To Exit:	T1 S	R2 W	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	996	-	996	4.0	1370[1]	0.727	100	NA	NA
Lane 2	-	183	183	2.0	470	0.390	100	0.0	1
Approach	996	183	1179	3.7		0.727			

West: Ross Watt Road - West

Mov. From W To Exit:	L2 N	R2 S	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	111	-	111	2.0	332[1]	0.333	100	67.2	2
Lane 2	-	72	72	2.0	92	0.782	100	NA	NA
Approach	111	72	182	2.0		0.782			
	Total	%HV	Deg.Satn (v/c)						
Intersection	2356	3.6		0.782					

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

1 Reduced capacity due to a short lane effect. Short lane queues may extend into the full-length lanes. Some upstream delays at entry to short lanes are not included.

Merge Analysis

	Exit Lane Number	Short Lane Length m	Percent Opng in Lane %	Opposing Flow Rate veh/h pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
South Exit: Station Road - South Merge Type: **Not Applied**											
Full Length Lane	1	Merge Analysis not applied.									
North Exit: Station Road - North Merge Type: **Not Applied**											
Full Length Lane	1	Merge Analysis not applied.									
West Exit: Ross Watt Road - West Merge Type: **Not Applied**											
Full Length Lane	1	Merge Analysis not applied.									

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LANE SUMMARY

Site: 101v [StatCherPMExFu - Signals (Site Folder: PM - Post Dev - 10yr Growth)]

Network: N101 [Signals - Both (Network Folder: Post Dev - 10yr Growth - PM Peak)]

Station Road / Cherry Lane
PM Peak, Existing Geometry, Future Volumes
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Coordinated Cycle Time = 120 seconds (Network User-Given Cycle Time)

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Station Road - South															
Lane 1	235	2.0	235	2.0	1251	0.188	100	12.8	LOS A	4.9	34.7	Short	50	0.0	NA
Lane 2	936	4.0	936	4.0	1111[1]	0.842	100	13.7	LOS C	34.2	247.5	Full	500	0.0	0.0
Approach	1171	3.6	1171	3.6		0.842		13.5	LOS C	34.2	247.5				
North: Station Road - North															
Lane 1	946	4.0	946	4.0	1419[1]	0.667	100	4.7	LOS B	20.0	145.1	Full	165	0.0	0.0
Lane 2	60	2.0	60	2.0	251	0.239	100	18.2	LOS A	1.6	11.5	Short	30	0.0	NA
Approach	1006	3.9	1006	3.9		0.667		5.5	LOS B	20.0	145.1				
West: Cherry Lane - West															
Lane 1	184	2.0	184	2.0	214	0.862	100	71.3	LOS C	12.0	85.3	Full	500	0.0	0.0
Approach	184	2.0	184	2.0		0.862		71.3	LOS C	12.0	85.3				
Intersection	2361	3.6	2361	3.6		0.862		14.6	LOS C	34.2	247.5				

Site Level of Service (LOS) Method: Degree of Saturation (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Lane LOS values are based on degree of saturation per lane.
Intersection and Approach LOS values are based on worst degree of saturation for any lane.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

1 Reduced capacity due to a short lane effect. Short lane queues may extend into the full-length lanes. Some upstream delays at entry to short lanes are not included.

Approach Lane Flows (veh/h)

South: Station Road - South

Mov. From S To Exit:	L2 W	T1 N	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	235	-	235	2.0	1251	0.188	100	0.0	2
Lane 2	-	936	936	4.0	1111[1]	0.842	100	NA	NA
Approach	235	936	1171	3.6		0.842			

North: Station Road - North

Mov. From N To Exit:	T1 S	R2 W	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	946	-	946	4.0	1419[1]	0.667	100	NA	NA
Lane 2	-	60	60	2.0	251	0.239	100	0.0	1
Approach	946	60	1006	3.9		0.667			

West: Cherry Lane - West

Mov.	L2	R2	Total	%HV		Deg.	Lane	Prob.	Ov.

From W To Exit:	N	S			Cap. veh/h	Satn v/c	Util. %	SL Ov. %	Lane No.
Lane 1	62	122	184	2.0	214	0.862	100	NA	NA
Approach	62	122	184	2.0		0.862			
	Total	%HV	Deg.Satn (v/c)						
Intersection	2361	3.6		0.862					

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

1 Reduced capacity due to a short lane effect. Short lane queues may extend into the full-length lanes. Some upstream delays at entry to short lanes are not included.

Merge Analysis

	Exit Lane Number	Short Lane Length m	Percent Opng in Lane %	Opposing Flow Rate veh/h	Opposing Flow Rate pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
South Exit: Station Road - South Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
North Exit: Station Road - North Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
West Exit: Cherry Lane - West Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										

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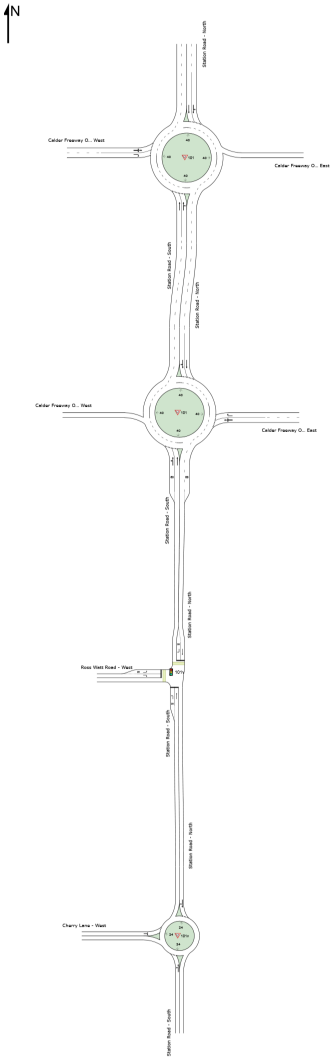
NETWORK LAYOUT

Network: N101 [Signals - Ross Watt (Network Folder: Post Dev - 10yr Growth - PM Peak)]

New Network
Network Category: (None)

Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.



SITES IN NETWORK		
Site ID	**CCG ID**	**Site Name**
101	NA	StatCaldEastPMFuEx
101	NA	StatCaldWestPMFuEx
101v	NA	StatRossPMExFu - Signals - Priority
101v	NA	StatCherPMExFu - Roundabout

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Project: N:\Projects\2021\210473\Sidra\210473SID004A.sip9

LANE SUMMARY

Site: 101 [StatCaldEastPMFuEx (Site Folder: PM - Post Dev - 10yr Growth)]

Network: N101 [Signals - Ross Watt (Network Folder: Post Dev - 10yr Growth - PM Peak)]

Station Road / Calder Freeway Eastbound Lane
PM Peak, Future Volumes, Existing Geometry
Site Category: (None)
Roundabout

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Station Road - South															
Lane 1[d]	424	4.0	424	4.0	1826	0.232	100	2.9	LOS A	0.0	0.0	Full	130	0.0	0.0
Lane 2	358	4.0	358	4.0	1541	0.232	100	6.4	LOS A	0.0	0.0	Full	130	0.0	0.0
Approach	782	4.0	782	4.0		0.232		4.5	LOS A	0.0	0.0				
North: Station Road - North															
Lane 1[d]	388	4.0	388	4.0	1178	0.330	100	4.7	LOS A	1.7	12.0	Full	500	0.0	0.0
Lane 2	312	4.0	312	4.0	946	0.330	100	5.1	LOS A	1.6	11.4	Full	500	0.0	0.0
Approach	700	4.0	700	4.0		0.330		4.9	LOS A	1.7	12.0				
West: Calder Freeway Off-ramp - West															
Lane 1[d]	308	4.0	308	4.0	1229	0.251	100	9.2	LOS A	1.0	7.4	Full	500	0.0	0.0
Lane 2	240	4.0	240	4.0	957	0.251	100	11.9	LOS A	1.0	7.2	Full	500	0.0	0.0
Approach	548	4.0	548	4.0		0.251		10.4	LOS A	1.0	7.4				
Intersection	2031	4.0	2031	4.0		0.330		6.2	LOS A	1.7	12.0				

Site Level of Service (LOS) Method: Degree of Saturation (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Roundabout LOS Method: Same as Signalised Intersections.
Lane LOS values are based on degree of saturation per lane.
Intersection and Approach LOS values are based on worst degree of saturation for any lane.
Roundabout Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

d Dominant lane on roundabout approach

Approach Lane Flows (veh/h)

South: Station Road - South

Mov. From S To Exit:	T1 N	R2 E	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	424	-	424	4.0	1826	0.232	100	NA	NA
Lane 2	165	193	358	4.0	1541	0.232	100	NA	NA
Approach	589	193	782	4.0		0.232			

North: Station Road - North

Mov. From N To Exit:	L2 E	T1 S	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	201	187	388	4.0	1178	0.330	100	NA	NA
Lane 2	-	312	312	4.0	946	0.330	100	NA	NA

Approach	201	499	700	4.0			0.330			
West: Calder Freeway Off-ramp - West										
Mov. From W To Exit:	L2 N	T1 E	R2 S	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	100	1	207	308	4.0	1229	0.251	100	NA	NA
Lane 2	-	-	240	240	4.0	957	0.251	100	NA	NA
Approach	100	1	447	548	4.0		0.251			
	Total	%HV	Deg.Satn (v/c)							
Intersection	2031	4.0		0.330						

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

Merge Analysis

	Exit Lane Number	Short Lane Length m	Percent Opng in Lane %	Opposing Flow Rate veh/h	pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
South Exit: Station Road - South Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
Full Length Lane	2	Merge Analysis not applied.										
East Exit: Calder Freeway On-ramp - East Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
North Exit: Station Road - North Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
Full Length Lane	2	Merge Analysis not applied.										

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LANE SUMMARY

Site: 101 [StatCaldWestPMFuEx (Site Folder: PM - Post Dev - 10yr Growth)]

Network: N101 [Signals - Ross Watt (Network Folder: Post Dev - 10yr Growth - PM Peak)]

Station Road / Calder Freeway Westbound Lane
PM Peak, Future Volumes, Existing Geometry
Site Category: (None)
Roundabout

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Station Road - South															
Lane 1[d]	517	4.0	517	4.0	1359	0.380	100	4.1	LOS A	1.9	13.4	Short	50	0.0	NA
Lane 2	440	4.0	440	4.0	1158	0.380	100	4.1	LOS A	1.8	12.9	Full	170	0.0	0.0
Approach	957	4.0	957	4.0		0.380		4.1	LOS A	1.9	13.4				
East: Calder Freeway Off-ramp - East															
Lane 1[d]	282	4.0	282	4.0	1147	0.246	100	7.9	LOS A	1.1	8.0	Full	500	0.0	0.0
Lane 2	207	4.0	207	4.0	872	0.238	97[5]	12.7	LOS A	1.0	7.2	Full	500	0.0	0.0
Approach	489	4.0	489	4.0		0.246		9.9	LOS A	1.1	8.0				
North: Station Road - North															
Lane 1	290	4.0	290	4.0	1462	0.198	56[6]	5.2	LOS A	0.0	0.0	Full	130	0.0	0.0
Lane 2[d]	647	4.0	647	4.0	1824	0.355	100	3.8	LOS A	0.0	0.0	Full	130	0.0	0.0
Approach	937	4.0	937	4.0		0.355		4.2	LOS A	0.0	0.0				
Intersection	2383	4.0	2383	4.0		0.380		5.3	LOS A	1.9	13.4				

Site Level of Service (LOS) Method: Degree of Saturation (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Roundabout LOS Method: Same as Signalised Intersections.
Lane LOS values are based on degree of saturation per lane.
Intersection and Approach LOS values are based on worst degree of saturation for any lane.
Roundabout Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

5 Lane under-utilisation found by the program
6 Lane under-utilisation due to downstream effects
d Dominant lane on roundabout approach

Approach Lane Flows (veh/h)

South: Station Road - South

Mov. From S To Exit:	L2 W	T1 N	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	403	114	517	4.0	1359	0.380	100	0.0	2
Lane 2	-	440	440	4.0	1158	0.380	100	NA	NA
Approach	403	554	957	4.0		0.380			

East: Calder Freeway Off-ramp - East

Mov. From E To Exit:	L2 S	T1 W	R2 N	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	281	1	-	282	4.0	1147	0.246	100	NA	NA

Lane 2	-	-	207	207	4.0	872	0.238	97[5]	NA	NA
Approach	281	1	207	489	4.0		0.246			

North: Station Road - North

Mov. From N To Exit:	T1 S	R2 W	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	290	-	290	4.0	1462	0.198	56[6]	NA	NA
Lane 2	558	89	647	4.0	1824	0.355	100	NA	NA
Approach	847	89	937	4.0		0.355			

	Total	%HV	Deg.Satn (v/c)
Intersection	2383	4.0	0.380

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

5 Lane under-utilisation found by the program
6 Lane under-utilisation due to downstream effects

Merge Analysis

	Exit Lane Number	Short Lane Length m	Percent Opng in Lane %	Opposing Flow Rate veh/h	Opposing Flow Rate pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
South Exit: Station Road - South Merge Type: **Priority**												
Exit Short Lane	1	60	0.0	558	569	3.00	2.00	571	1214	0.470	1.0	2.3
Merge Lane	2	-	100.0	Merge Lane is not Opposed				558	1800	0.310	0.0	0.0
North Exit: Station Road - North Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
Full Length Lane	2	Merge Analysis not applied.										
West Exit: Calder Freeway On-ramp - West Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										

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LANE SUMMARY

Site: 101v [StatRossPMExFu - Signals - Priority (Site Folder: PM - Post Dev - 10yr Growth)]

Network: N101 [Signals - Ross Watt (Network Folder: Post Dev - 10yr Growth - PM Peak)]

Station Road / Ross Watt Road
PM Peak, Existing Geometry, Future Volumes
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 120 seconds (Site User-Given Cycle Time)

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Station Road - South															
Lane 1	127	2.0	127	2.0	1434	0.089	100	8.7	LOS A	1.7	12.0	Short	20	0.0	NA
Lane 2	867	4.0	867	4.0	1164[1]	0.745	100	11.1	LOS C	28.3	204.6	Full	165	0.0	24.5
Approach	995	3.7	995	3.7		0.745		10.8	LOS C	28.3	204.6				
North: Station Road - North															
Lane 1	999	4.0	999	4.0	1370[1]	0.729	100	3.0	LOS C	18.1	130.8	Full	170	0.0	0.0
Lane 2	183	2.0	183	2.0	335[1]	0.547	100	17.7	LOS A	5.6	40.0	Short	20	0.0	NA
Approach	1182	3.7	1182	3.7		0.729		5.3	LOS C	18.1	130.8				
West: Ross Watt Road - West															
Lane 1	111	2.0	111	2.0	332[1]	0.333	100	49.0	LOS A	5.5	39.1	Short	20	0.0	NA
Lane 2	72	2.0	72	2.0	92	0.782	100	73.7	LOS C	4.6	32.8	Full	500	0.0	0.0
Approach	182	2.0	182	2.0		0.782		58.7	LOS C	5.5	39.1				
Intersection	2359	3.6	2359	3.6		0.782		11.7	LOS C	28.3	204.6				

Site Level of Service (LOS) Method: Degree of Saturation (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Lane LOS values are based on degree of saturation per lane.
Intersection and Approach LOS values are based on worst degree of saturation for any lane.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

1 Reduced capacity due to a short lane effect. Short lane queues may extend into the full-length lanes. Some upstream delays at entry to short lanes are not included.

Approach Lane Flows (veh/h)

South: Station Road - South

Mov. From S To Exit:	L2 W	T1 N	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	127	-	127	2.0	1434	0.089	100	0.0	2
Lane 2	-	867	867	4.0	1164[1]	0.745	100	NA	NA
Approach	127	867	995	3.7		0.745			

North: Station Road - North

Mov. From N To Exit:	T1 S	R2 W	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	999	-	999	4.0	1370[1]	0.729	100	NA	NA
Lane 2	-	183	183	2.0	335[1]	0.547	100	69.4	1
Approach	999	183	1182	3.7		0.729			

West: Ross Watt Road - West									
Mov. From W To Exit:	L2 N	R2 S	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	111	-	111	2.0	332[1]	0.333	100	67.2	2
Lane 2	-	72	72	2.0	92	0.782	100	NA	NA
Approach	111	72	182	2.0		0.782			
	Total	%HV	Deg.Satn (v/c)						
Intersection	2359	3.6		0.782					

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

1 Reduced capacity due to a short lane effect. Short lane queues may extend into the full-length lanes. Some upstream delays at entry to short lanes are not included.

Merge Analysis											
	Exit Lane Number	Short Lane Length m	Percent Opng in Lane %	Opposing Flow Rate veh/h pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
South Exit: Station Road - South Merge Type: **Not Applied**											
Full Length Lane	1	Merge Analysis not applied.									
North Exit: Station Road - North Merge Type: **Not Applied**											
Full Length Lane	1	Merge Analysis not applied.									
West Exit: Ross Watt Road - West Merge Type: **Not Applied**											
Full Length Lane	1	Merge Analysis not applied.									

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LANE SUMMARY

Site: 101v [StatCherPMExFu - Roundabout (Site Folder: PM - Post Dev - 10yr Growth)]

Network: N101 [Signals - Ross Watt (Network Folder: Post Dev - 10yr Growth - PM Peak)]

Station Road / Cherry Lane
PM Peak, Existing Geometry, Future Volumes
Site Category: (None)
Roundabout

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Station Road - South															
Lane 1[d]	1171	4.0	1171	4.0	1181	0.991	100	11.9	LOS E	24.9	180.4	Full	500	-20.6[N3]	0.0
Approach	1171	4.0	1171	4.0		0.991		11.9	LOS E	24.9	180.4				
North: Station Road - North															
Lane 1[d]	1006	4.0	1006	4.0	1325	0.759	100	5.8	LOS C	11.4	82.5	Full	165	0.0	0.0
Approach	1006	4.0	1006	4.0		0.759		5.8	LOS C	11.4	82.5				
West: Cherry Lane - West															
Lane 1[d]	184	4.0	184	4.0	434	0.424	100	17.8	LOS A	3.1	22.6	Full	500	-9.9[N3]	0.0
Approach	184	4.0	184	4.0		0.424		17.8	LOS A	3.1	22.6				
Intersection	2361	4.0	2361	4.0		0.991		9.7	LOS E	24.9	180.4				

Site Level of Service (LOS) Method: Degree of Saturation (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Roundabout LOS Method: Same as Signalised Intersections.
Lane LOS values are based on degree of saturation per lane.
Intersection and Approach LOS values are based on worst degree of saturation for any lane.
Roundabout Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

d Dominant lane on roundabout approach
N3 Capacity Adjustment due to downstream lane blockage determined by the program.

Approach Lane Flows (veh/h)

South: Station Road - South

Mov. From S To Exit:	L2 W	T1 N	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	235	936	1171	4.0	1181	0.991	100	NA	NA
Approach	235	936	1171	4.0		0.991			

North: Station Road - North

Mov. From N To Exit:	T1 S	R2 W	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	946	60	1006	4.0	1325	0.759	100	NA	NA
Approach	946	60	1006	4.0		0.759			

West: Cherry Lane - West

Mov. From W To Exit:	L2 N	R2 S	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.

Lane 1	62	122	184	4.0	434	0.424	100	NA	NA	
Approach	62	122	184	4.0		0.424				
	Total	%HV	Deg.Satn (v/c)							
Intersection	2361	4.0		0.991						

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

Merge Analysis

	Exit Lane Number	Short Lane Length m	Percent Opng in Lane %	Opposing Flow Rate veh/h	Opposing Flow Rate pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
South Exit: Station Road - South Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
North Exit: Station Road - North Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
West Exit: Cherry Lane - West Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										

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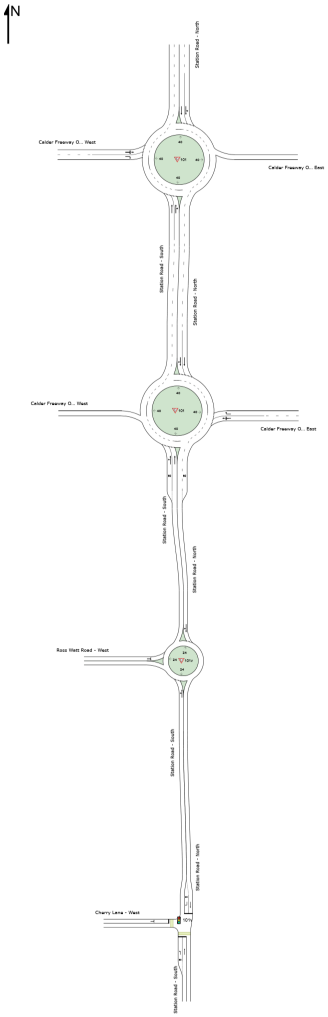
NETWORK LAYOUT

Network: N101 [Signals - Cherry (Network Folder: Post Dev - 10yr Growth - PM Peak)]

New Network
Network Category: (None)

Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.



SITES IN NETWORK		
Site ID	**CCG ID**	**Site Name**
101	NA	StatCaldEastPMFuEx
101	NA	StatCaldWestPMFuEx
101v	NA	StatRossPMExFu - Roundabout
101v	NA	StatCherPMExFu - Signals

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LANE SUMMARY

Site: 101 [StatCaldEastPMFuEx (Site Folder: PM - Post Dev - 10yr Growth)]

Network: N101 [Signals - Cherry (Network Folder: Post Dev - 10yr Growth - PM Peak)]

Station Road / Calder Freeway Eastbound Lane
PM Peak, Future Volumes, Existing Geometry
Site Category: (None)
Roundabout

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Station Road - South															
Lane 1[d]	424	4.0	424	4.0	1826	0.232	100	2.9	LOS A	0.0	0.0	Full	130	0.0	0.0
Lane 2	358	4.0	358	4.0	1541	0.232	100	6.4	LOS A	0.0	0.0	Full	130	0.0	0.0
Approach	782	4.0	782	4.0		0.232		4.5	LOS A	0.0	0.0				
North: Station Road - North															
Lane 1[d]	388	4.0	388	4.0	1178	0.330	100	4.7	LOS A	1.7	12.0	Full	500	0.0	0.0
Lane 2	312	4.0	312	4.0	946	0.330	100	5.1	LOS A	1.6	11.4	Full	500	0.0	0.0
Approach	700	4.0	700	4.0		0.330		4.9	LOS A	1.7	12.0				
West: Calder Freeway Off-ramp - West															
Lane 1[d]	308	4.0	308	4.0	1229	0.251	100	9.2	LOS A	1.0	7.4	Full	500	0.0	0.0
Lane 2	240	4.0	240	4.0	957	0.251	100	11.9	LOS A	1.0	7.2	Full	500	0.0	0.0
Approach	548	4.0	548	4.0		0.251		10.4	LOS A	1.0	7.4				
Intersection	2031	4.0	2031	4.0		0.330		6.2	LOS A	1.7	12.0				

Site Level of Service (LOS) Method: Degree of Saturation (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Roundabout LOS Method: Same as Signalised Intersections.
Lane LOS values are based on degree of saturation per lane.
Intersection and Approach LOS values are based on worst degree of saturation for any lane.
Roundabout Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

d Dominant lane on roundabout approach

Approach Lane Flows (veh/h)

South: Station Road - South

Mov. From S To Exit:	T1 N	R2 E	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	424	-	424	4.0	1826	0.232	100	NA	NA
Lane 2	165	193	358	4.0	1541	0.232	100	NA	NA
Approach	589	193	782	4.0		0.232			

North: Station Road - North

Mov. From N To Exit:	L2 E	T1 S	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	201	187	388	4.0	1178	0.330	100	NA	NA
Lane 2	-	312	312	4.0	946	0.330	100	NA	NA
Approach	201	499	700	4.0		0.330			

West: Calder Freeway Off-ramp - West											
Mov. From W To Exit:	L2 N	T1 E	R2 S	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.	
Lane 1	100	1	207	308	4.0	1229	0.251	100	NA	NA	
Lane 2	-	-	240	240	4.0	957	0.251	100	NA	NA	
Approach	100	1	447	548	4.0		0.251				
	Total	%HV	Deg.Satn (v/c)								
Intersection	2031	4.0		0.330							

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

Merge Analysis											
	Exit Lane Number	Short Lane Length m	Percent Opng in Lane %	Opposing Flow Rate veh/h	Opposing Flow Rate pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
South Exit: Station Road - South Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
Full Length Lane	2	Merge Analysis not applied.										
East Exit: Calder Freeway On-ramp - East Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
North Exit: Station Road - North Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
Full Length Lane	2	Merge Analysis not applied.										

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LANE SUMMARY

Site: 101 [StatCaldWestPMFuEx (Site Folder: PM - Post Dev - 10yr Growth)]

Network: N101 [Signals - Cherry (Network Folder: Post Dev - 10yr Growth - PM Peak)]

Station Road / Calder Freeway Westbound Lane
PM Peak, Future Volumes, Existing Geometry
Site Category: (None)
Roundabout

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Station Road - South															
Lane 1[d]	517	4.0	517	4.0	1359	0.380	100	4.1	LOS A	2.1	15.3	Short	50	0.0	NA
Lane 2	440	4.0	440	4.0	1158	0.380	100	4.1	LOS A	2.0	14.8	Full	170	0.0	0.0
Approach	957	4.0	957	4.0		0.380		4.1	LOS A	2.1	15.3				
East: Calder Freeway Off-ramp - East															
Lane 1[d]	282	4.0	282	4.0	1147	0.246	100	7.9	LOS A	1.1	8.0	Full	500	0.0	0.0
Lane 2	207	4.0	207	4.0	872	0.238	97[5]	12.7	LOS A	1.0	7.2	Full	500	0.0	0.0
Approach	489	4.0	489	4.0		0.246		9.9	LOS A	1.1	8.0				
North: Station Road - North															
Lane 1	290	4.0	290	4.0	1462	0.198	56[6]	5.2	LOS A	0.0	0.0	Full	130	0.0	0.0
Lane 2[d]	647	4.0	647	4.0	1824	0.355	100	3.8	LOS A	0.0	0.0	Full	130	0.0	0.0
Approach	937	4.0	937	4.0		0.355		4.2	LOS A	0.0	0.0				
Intersection	2383	4.0	2383	4.0		0.380		5.3	LOS A	2.1	15.3				

Site Level of Service (LOS) Method: Degree of Saturation (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Roundabout LOS Method: Same as Signalised Intersections.
Lane LOS values are based on degree of saturation per lane.
Intersection and Approach LOS values are based on worst degree of saturation for any lane.
Roundabout Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

5 Lane under-utilisation found by the program
6 Lane under-utilisation due to downstream effects
d Dominant lane on roundabout approach

Approach Lane Flows (veh/h)

South: Station Road - South

Mov. From S To Exit:	L2 W	T1 N	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	403	114	517	4.0	1359	0.380	100	0.0	2
Lane 2	-	440	440	4.0	1158	0.380	100	NA	NA
Approach	403	554	957	4.0		0.380			

East: Calder Freeway Off-ramp - East

Mov. From E To Exit:	L2 S	T1 W	R2 N	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	281	1	-	282	4.0	1147	0.246	100	NA	NA
Lane 2	-	-	207	207	4.0	872	0.238	97[5]	NA	NA

Approach	281	1	207	489	4.0		0.246			
North: Station Road - North										
Mov. From N To Exit:	T1 S	R2 W	Total	%HV		Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	290	-	290	4.0		1462	0.198	56[6]	NA	NA
Lane 2	558	89	647	4.0		1824	0.355	100	NA	NA
Approach	847	89	937	4.0			0.355			
	Total	%HV	Deg.Satn (v/c)							
Intersection	2383	4.0		0.380						

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

5 Lane under-utilisation found by the program
6 Lane under-utilisation due to downstream effects

Merge Analysis

	Exit Lane Number	Short Lane Length m	Percent Opng in Lane %	Opposing Flow Rate veh/h	Opposing Flow Rate pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
South Exit: Station Road - South Merge Type: **Priority**												
Exit Short Lane	1	60	0.0	558	569	3.00	2.00	571	1214	0.470	1.0	2.3
Merge Lane	2	-	100.0	Merge Lane is not Opposed				558	1800	0.310	0.0	0.0
North Exit: Station Road - North Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
Full Length Lane	2	Merge Analysis not applied.										
West Exit: Calder Freeway On-ramp - West Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										

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LANE SUMMARY

Site: 101v [StatRossPMExFu - Roundabout (Site Folder: PM - Post Dev - 10yr Growth)]

Network: N101 [Signals - Cherry (Network Folder: Post Dev - 10yr Growth - PM Peak)]

Station Road / Ross Watt Road
PM Peak, Existing Geometry, Future Volumes
Site Category: (None)
Roundabout

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Station Road - South															
Lane 1[d]	995	4.0	995	4.0	1233	0.807	100	7.5	LOS C	13.0	94.1	Full	165	0.0	0.0
Approach	995	4.0	995	4.0		0.807		7.5	LOS C	13.0	94.1				
North: Station Road - North															
Lane 1[d]	1182	4.0	1182	4.0	1392	0.849	100	5.9	LOS C	17.6	127.7	Full	170	-3.2[N3]	0.0
Approach	1182	4.0	1182	4.0		0.849		5.9	LOS C	17.6	127.7				
West: Ross Watt Road - West															
Lane 1[d]	182	4.0	182	4.0	506	0.360	100	14.6	LOS A	3.1	22.6	Full	500	-1.5[N3]	0.0
Approach	182	4.0	182	4.0		0.360		14.6	LOS A	3.1	22.6				
Intersection	2359	4.0	2359	4.0		0.849		7.3	LOS C	17.6	127.7				

Site Level of Service (LOS) Method: Degree of Saturation (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Roundabout LOS Method: Same as Signalised Intersections.
Lane LOS values are based on degree of saturation per lane.
Intersection and Approach LOS values are based on worst degree of saturation for any lane.
Roundabout Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

d Dominant lane on roundabout approach
N3 Capacity Adjustment due to downstream lane blockage determined by the program.

Approach Lane Flows (veh/h)

Mov. From S To Exit:	L2 W	T1 N	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
South: Station Road - South									
Lane 1	127	867	995	4.0	1233	0.807	100	NA	NA
Approach	127	867	995	4.0		0.807			
North: Station Road - North									
Mov. From N To Exit:	T1 S	R2 W	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	999	183	1182	4.0	1392	0.849	100	NA	NA
Approach	999	183	1182	4.0		0.849			
West: Ross Watt Road - West									
Mov. From W To Exit:	L2 N	R2 S	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	111	72	182	4.0	506	0.360	100	NA	NA

Approach	111	72	182	4.0	0.360
	Total	%HV	Deg.Satn (v/c)		
Intersection	2359	4.0	0.849		

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

Merge Analysis

	Exit Lane Number	Short Lane Length m	Percent Opng in Lane %	Opposing Flow Rate veh/h	Opposing Flow Rate pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
South Exit: Station Road - South Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
North Exit: Station Road - North Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
West Exit: Ross Watt Road - West Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										

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LANE SUMMARY

Site: 101v [StatCherPMExFu - Signals (Site Folder: PM - Post Dev - 10yr Growth)]

Network: N101 [Signals - Cherry (Network Folder: Post Dev - 10yr Growth - PM Peak)]

Station Road / Cherry Lane
PM Peak, Existing Geometry, Future Volumes
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 120 seconds (Site User-Given Cycle Time)

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Station Road - South															
Lane 1	235	2.0	235	2.0	1251	0.188	100	12.8	LOS A	4.9	34.7	Short	50	0.0	NA
Lane 2	936	4.0	936	4.0	1111[1]	0.842	100	13.7	LOS C	34.2	247.5	Full	500	0.0	0.0
Approach	1171	3.6	1171	3.6		0.842		13.5	LOS C	34.2	247.5				
North: Station Road - North															
Lane 1	946	4.0	946	4.0	1419[1]	0.667	100	5.5	LOS B	22.5	162.8	Full	165	0.0	3.8
Lane 2	60	2.0	60	2.0	251	0.239	100	18.0	LOS A	1.5	10.7	Short	30	0.0	NA
Approach	1006	3.9	1006	3.9		0.667		6.2	LOS B	22.5	162.8				
West: Cherry Lane - West															
Lane 1	184	2.0	184	2.0	214	0.862	100	71.3	LOS C	12.0	85.3	Full	500	0.0	0.0
Approach	184	2.0	184	2.0		0.862		71.3	LOS C	12.0	85.3				
Intersection	2361	3.6	2361	3.6		0.862		14.9	LOS C	34.2	247.5				

Site Level of Service (LOS) Method: Degree of Saturation (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Lane LOS values are based on degree of saturation per lane.
Intersection and Approach LOS values are based on worst degree of saturation for any lane.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

1 Reduced capacity due to a short lane effect. Short lane queues may extend into the full-length lanes. Some upstream delays at entry to short lanes are not included.

Approach Lane Flows (veh/h)

South: Station Road - South

Mov. From S To Exit:	L2 W	T1 N	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	235	-	235	2.0	1251	0.188	100	0.0	2
Lane 2	-	936	936	4.0	1111[1]	0.842	100	NA	NA
Approach	235	936	1171	3.6		0.842			

North: Station Road - North

Mov. From N To Exit:	T1 S	R2 W	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	946	-	946	4.0	1419[1]	0.667	100	NA	NA
Lane 2	-	60	60	2.0	251	0.239	100	0.0	1
Approach	946	60	1006	3.9		0.667			

West: Cherry Lane - West

Mov.	L2	R2	Total	%HV		Deg.	Lane	Prob.	Ov.

From W To Exit:	N	S			Cap. veh/h	Satn v/c	Util. %	SL Ov. %	Lane No.
Lane 1	62	122	184	2.0	214	0.862	100	NA	NA
Approach	62	122	184	2.0		0.862			
	Total	%HV	Deg.Satn (v/c)						
Intersection	2361	3.6		0.862					

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

1 Reduced capacity due to a short lane effect. Short lane queues may extend into the full-length lanes. Some upstream delays at entry to short lanes are not included.

Merge Analysis

	Exit Lane Number	Short Lane Length m	Percent Opng in Lane %	Opposing Flow Rate veh/h	Opposing Flow Rate pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
South Exit: Station Road - South Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
North Exit: Station Road - North Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
West Exit: Cherry Lane - West Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										

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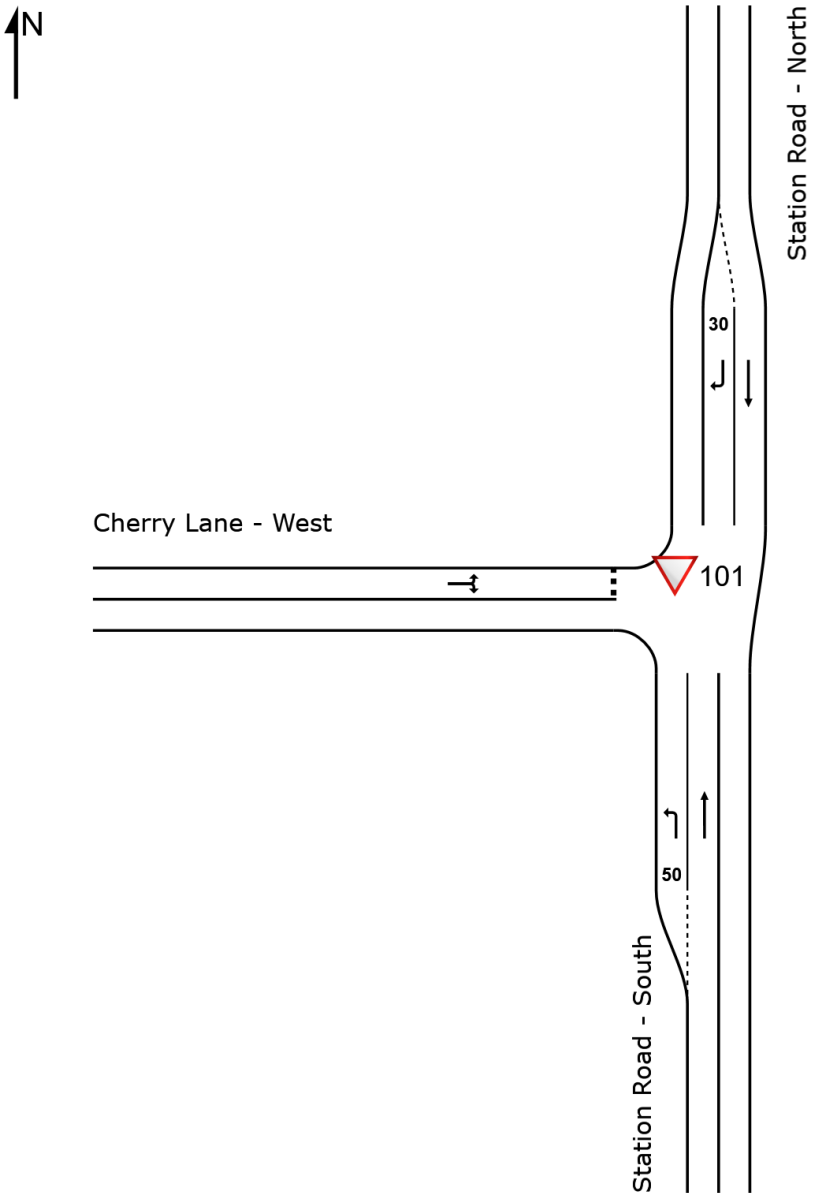
SITE LAYOUT

Site: 101 [StatCherAMExFu (Site Folder: Sensitivity - 40 lots)]

Station Road / Cherry Lane
AM Peak, Existing Geometry, Future Volumes
Site Category: (None)
Give-Way (Two-Way)

Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.



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MOVEMENT SUMMARY

Site: 101 [StatCherAMExFu (Site Folder: Sensitivity - 40 lots)]

Station Road / Cherry Lane
AM Peak, Existing Geometry, Future Volumes
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Station Road - South														
1	L2	29	2.0	31	2.0	0.017	5.6	LOS A	0.0	0.0	0.00	0.58	0.00	53.5
2	T1	672	4.0	707	4.0	0.372	0.1	LOS A	0.0	0.0	0.00	0.00	0.00	59.8
Approach		701	3.9	738	3.9	0.372	0.4	LOS A	0.0	0.0	0.00	0.02	0.00	59.3
North: Station Road - North														
8	T1	840	4.0	884	4.0	0.469	0.1	LOS A	0.0	0.0	0.00	0.00	0.00	59.6
9	R2	21	2.0	22	2.0	0.039	10.4	LOS A	0.1	1.0	0.62	0.80	0.62	45.6
Approach		861	4.0	906	4.0	0.469	0.3	LOS A	0.1	1.0	0.02	0.02	0.02	59.2
West: Cherry Lane - West														
10	L2	39	2.0	41	2.0	0.765	57.6	LOS C	3.3	23.8	0.95	1.21	1.81	18.4
12	R2	32	2.0	34	2.0	0.765	130.9	LOS C	3.3	23.8	0.95	1.21	1.81	23.8
Approach		71	2.0	75	2.0	0.765	90.6	LOS C	3.3	23.8	0.95	1.21	1.81	21.0
All Vehicles		1633	3.9	1719	3.9	0.765	4.3	LOS C	3.3	23.8	0.05	0.07	0.09	54.1

Site Level of Service (LOS) Method: Degree of Saturation (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on degree of saturation per movement.
Minor Road Approach LOS values are based on worst degree of saturation for any vehicle movement.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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MOVEMENT SUMMARY

Site: 101 [StatCherPMExFu (Site Folder: Sensitivity - 40 lots)]

Station Road / Cherry Lane
PM Peak, Existing Geometry, Future Volumes
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Station Road - South														
1	L2	48	2.0	51	2.0	0.028	5.6	LOS A	0.0	0.0	0.00	0.58	0.00	53.5
2	T1	777	4.0	818	4.0	0.430	0.2	LOS A	0.0	0.0	0.00	0.00	0.00	59.7
Approach		825	3.9	868	3.9	0.430	0.5	LOS A	0.0	0.0	0.00	0.03	0.00	59.1
North: Station Road - North														
8	T1	771	4.0	812	4.0	0.429	0.1	LOS A	0.0	0.0	0.00	0.00	0.00	59.7
9	R2	34	2.0	36	2.0	0.080	12.4	LOS A	0.3	1.9	0.70	0.88	0.70	43.9
Approach		805	3.9	847	3.9	0.429	0.6	LOS A	0.3	1.9	0.03	0.04	0.03	58.8
West: Cherry Lane - West														
10	L2	33	2.0	35	2.0	0.696	49.4	LOS B	2.7	19.0	0.96	1.14	1.57	19.5
12	R2	27	2.0	28	2.0	0.696	124.3	LOS B	2.7	19.0	0.96	1.14	1.57	25.0
Approach		60	2.0	63	2.0	0.696	83.1	LOS B	2.7	19.0	0.96	1.14	1.57	22.2
All Vehicles		1690	3.8	1779	3.8	0.696	3.5	LOS B	2.7	19.0	0.05	0.07	0.07	55.1

Site Level of Service (LOS) Method: Degree of Saturation (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on degree of saturation per movement.
Minor Road Approach LOS values are based on worst degree of saturation for any vehicle movement.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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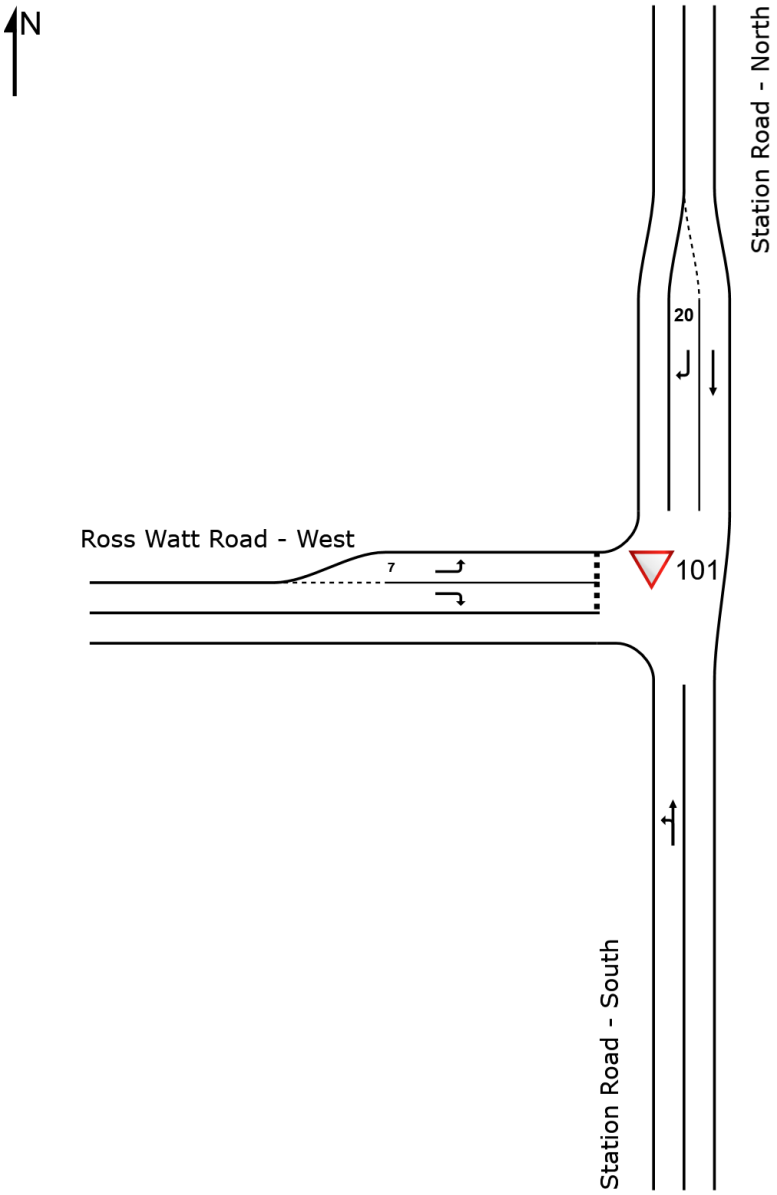
SITE LAYOUT

Site: 101 [StatRossAMExFu (Site Folder: Sensitivity - 280 lots)]

Station Road / Ross Watt Road
AM Peak, Existing Geometry, Future Volumes
Site Category: (None)
Give-Way (Two-Way)

Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.



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MOVEMENT SUMMARY

Site: 101 [StatRossAMExFu (Site Folder: Sensitivity - 280 lots)]

Station Road / Ross Watt Road
AM Peak, Existing Geometry, Future Volumes
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Station Road - South														
1	L2	68	2.0	72	2.0	0.415	5.6	LOS A	0.0	0.0	0.00	0.05	0.00	56.5
2	T1	678	4.0	714	4.0	0.415	0.1	LOS A	0.0	0.0	0.00	0.05	0.00	58.3
Approach		746	3.8	785	3.8	0.415	0.6	LOS A	0.0	0.0	0.00	0.05	0.00	58.0
North: Station Road - North														
8	T1	863	4.0	908	4.0	0.482	0.1	LOS A	0.0	0.0	0.00	0.00	0.00	59.6
9	R2	46	2.0	48	2.0	0.071	9.9	LOS A	0.3	1.9	0.63	0.82	0.63	46.4
Approach		909	3.9	957	3.9	0.482	0.6	LOS A	0.3	1.9	0.03	0.04	0.03	58.0
West: Ross Watt Road - West														
10	L2	90	2.0	95	2.0	0.132	9.4	LOS A	0.5	3.4	0.59	0.83	0.59	47.1
12	R2	46	2.0	48	2.0	0.797	136.7	LOS C	3.0	21.5	0.99	1.15	1.65	13.5
Approach		136	2.0	143	2.0	0.797	52.5	LOS C	3.0	21.5	0.73	0.93	0.95	25.7
All Vehicles		1791	3.7	1885	3.7	0.797	4.5	LOS C	3.0	21.5	0.07	0.11	0.09	49.8

Site Level of Service (LOS) Method: Degree of Saturation (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on degree of saturation per movement.
Minor Road Approach LOS values are based on worst degree of saturation for any vehicle movement.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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MOVEMENT SUMMARY

Site: 101 [StatRossPMExFu (Site Folder: Sensitivity - 280 lots)]

Station Road / Ross Watt Road
PM Peak, Existing Geometry, Future Volumes
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Station Road - South														
1	L2	91	2.0	96	2.0	0.457	5.6	LOS A	0.0	0.0	0.00	0.07	0.00	56.4
2	T1	731	4.0	769	4.0	0.457	0.1	LOS A	0.0	0.0	0.00	0.07	0.00	57.9
Approach		822	3.8	865	3.8	0.457	0.7	LOS A	0.0	0.0	0.00	0.07	0.00	57.6
North: Station Road - North														
8	T1	847	4.0	892	4.0	0.472	0.1	LOS A	0.0	0.0	0.00	0.00	0.00	59.6
9	R2	69	2.0	73	2.0	0.123	11.1	LOS A	0.5	3.3	0.70	0.87	0.70	45.4
Approach		916	3.8	964	3.8	0.472	0.9	LOS A	0.5	3.3	0.05	0.07	0.05	57.2
West: Ross Watt Road - West														
10	L2	43	2.0	45	2.0	0.069	9.8	LOS A	0.2	1.7	0.61	0.82	0.61	46.7
12	R2	34	2.0	36	2.0	0.672	125.4	LOS B	2.2	15.8	0.98	1.08	1.36	14.4
Approach		77	2.0	81	2.0	0.672	60.8	LOS B	2.2	15.8	0.78	0.93	0.94	23.6
All Vehicles		1815	3.7	1911	3.7	0.672	3.3	LOS B	2.2	15.8	0.06	0.10	0.07	51.9

Site Level of Service (LOS) Method: Degree of Saturation (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on degree of saturation per movement.
Minor Road Approach LOS values are based on worst degree of saturation for any vehicle movement.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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SITE LAYOUT

Site: 101 [RossSiteAMFuFu (Site Folder: Other Intersection)]

Ross Watt Road / Site Access
AM Peak, Proposed Geometry, Future Volumes
Site Category: (None)
Give-Way (Two-Way)

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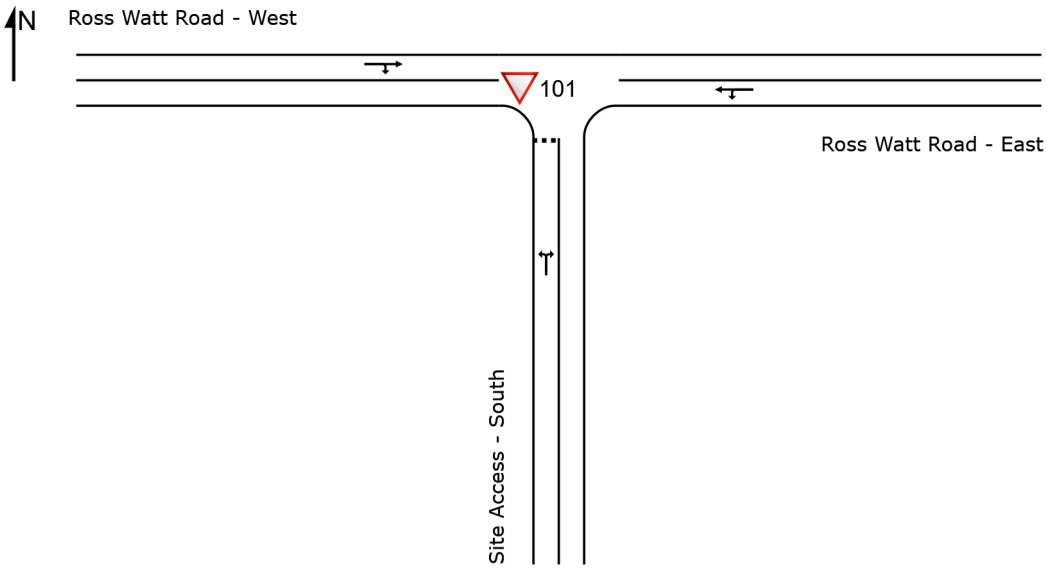

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MOVEMENT SUMMARY

Site: 101 [RossSiteAMFuFu (Site Folder: Other Intersection)]

Ross Watt Road / Site Access
AM Peak, Proposed Geometry, Future Volumes
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Site Access - South														
1	L2	24	2.0	25	2.0	0.234	5.9	LOS A	0.9	6.4	0.29	0.61	0.29	52.8
3	R2	221	2.0	233	2.0	0.234	6.4	LOS A	0.9	6.4	0.29	0.61	0.29	52.2
Approach		245	2.0	258	2.0	0.234	6.3	LOS A	0.9	6.4	0.29	0.61	0.29	52.3
East: Ross Watt Road - East														
4	L2	88	2.0	93	2.0	0.099	5.6	LOS A	0.0	0.0	0.00	0.29	0.00	55.8
5	T1	89	2.0	94	2.0	0.099	0.0	LOS A	0.0	0.0	0.00	0.29	0.00	57.4
Approach		177	2.0	186	2.0	0.099	2.8	LOS A	0.0	0.0	0.00	0.29	0.00	56.6
West: Ross Watt Road - West														
11	T1	45	2.0	47	2.0	0.033	0.2	LOS A	0.1	0.5	0.13	0.12	0.13	58.4
12	R2	11	2.0	12	2.0	0.033	6.0	LOS A	0.1	0.5	0.13	0.12	0.13	56.2
Approach		56	2.0	59	2.0	0.033	1.3	LOS A	0.1	0.5	0.13	0.12	0.13	58.0
All Vehicles		478	2.0	503	2.0	0.234	4.4	LOS A	0.9	6.4	0.16	0.44	0.16	54.4

Site Level of Service (LOS) Method: Degree of Saturation (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on degree of saturation per movement.
Minor Road Approach LOS values are based on worst degree of saturation for any vehicle movement.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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MOVEMENT SUMMARY

Site: 101 [RossSitePMFuFu (Site Folder: Other Intersection)]

Ross Watt Road / Site Access
PM Peak, Proposed Geometry, Future Volumes
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Site Access - South														
1	L2	14	2.0	15	2.0	0.150	6.0	LOS A	0.5	3.8	0.35	0.65	0.35	52.5
3	R2	126	2.0	133	2.0	0.150	6.9	LOS A	0.5	3.8	0.35	0.65	0.35	52.0
Approach		140	2.0	147	2.0	0.150	6.8	LOS A	0.5	3.8	0.35	0.65	0.35	52.1
East: Ross Watt Road - East														
4	L2	176	2.0	185	2.0	0.175	5.6	LOS A	0.0	0.0	0.00	0.33	0.00	55.4
5	T1	135	2.0	142	2.0	0.175	0.0	LOS A	0.0	0.0	0.00	0.33	0.00	57.0
Approach		311	2.0	327	2.0	0.175	3.2	LOS A	0.0	0.0	0.00	0.33	0.00	56.1
West: Ross Watt Road - West														
11	T1	62	2.0	65	2.0	0.051	0.5	LOS A	0.2	1.1	0.22	0.15	0.22	57.8
12	R2	20	2.0	21	2.0	0.051	6.6	LOS A	0.2	1.1	0.22	0.15	0.22	55.6
Approach		82	2.0	86	2.0	0.051	2.0	LOS A	0.2	1.1	0.22	0.15	0.22	57.3
All Vehicles		533	2.0	561	2.0	0.175	4.0	LOS A	0.5	3.8	0.13	0.39	0.13	55.2

Site Level of Service (LOS) Method: Degree of Saturation (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on degree of saturation per movement.
Minor Road Approach LOS values are based on worst degree of saturation for any vehicle movement.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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SITE LAYOUT

Site: 101 [RossSwinAMExFu (Site Folder: Other Intersection)]

Ross Watt Road / Swinburne Street
AM Peak, Existing Geometry, Future Volumes
Site Category: (None)
Give-Way (Two-Way)

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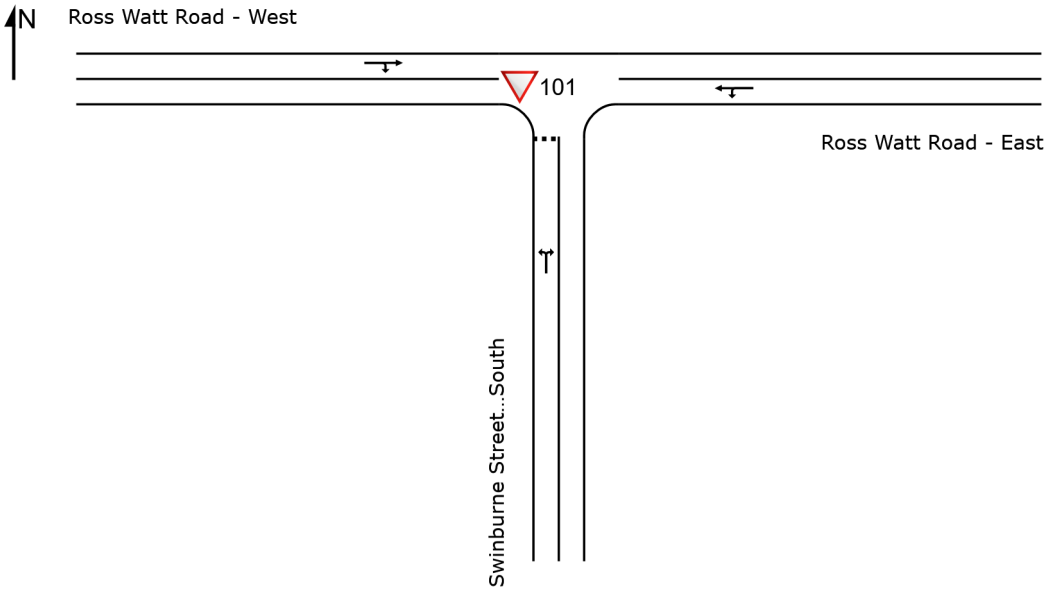

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MOVEMENT SUMMARY

Site: 101 [RossSwinAMExFu (Site Folder: Other Intersection)]

Ross Watt Road / Swinburne Street
AM Peak, Existing Geometry, Future Volumes
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Swinburne Street - South														
1	L2	12	2.0	13	2.0	0.066	6.1	LOS A	0.2	1.6	0.36	0.65	0.36	52.3
3	R2	45	2.0	47	2.0	0.066	7.4	LOS A	0.2	1.6	0.36	0.65	0.36	51.8
Approach		57	2.0	60	2.0	0.066	7.2	LOS A	0.2	1.6	0.36	0.65	0.36	51.9
East: Ross Watt Road - East														
4	L2	13	2.0	14	2.0	0.096	5.6	LOS A	0.0	0.0	0.00	0.04	0.00	57.8
5	T1	162	2.0	171	2.0	0.096	0.0	LOS A	0.0	0.0	0.00	0.04	0.00	59.6
Approach		175	2.0	184	2.0	0.096	0.4	LOS A	0.0	0.0	0.00	0.04	0.00	59.4
West: Ross Watt Road - West														
11	T1	251	2.0	264	2.0	0.144	0.0	LOS A	0.1	0.5	0.03	0.02	0.03	59.7
12	R2	9	2.0	9	2.0	0.144	6.1	LOS A	0.1	0.5	0.03	0.02	0.03	57.3
Approach		260	2.0	274	2.0	0.144	0.2	LOS A	0.1	0.5	0.03	0.02	0.03	59.6
All Vehicles		492	2.0	518	2.0	0.144	1.1	LOS A	0.2	1.6	0.06	0.10	0.06	58.5

Site Level of Service (LOS) Method: Degree of Saturation (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on degree of saturation per movement.
Minor Road Approach LOS values are based on worst degree of saturation for any vehicle movement.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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MOVEMENT SUMMARY

Site: 101 [RossSwinPMExFu (Site Folder: Other Intersection)]

Ross Watt Road / Swinburne Street
PM Peak, Existing Geometry, Future Volumes
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Swinburne Street - South														
1	L2	7	2.0	7	2.0	0.038	6.6	LOS A	0.1	0.9	0.42	0.67	0.42	52.0
3	R2	23	2.0	24	2.0	0.038	7.8	LOS A	0.1	0.9	0.42	0.67	0.42	51.5
Approach		30	2.0	32	2.0	0.038	7.5	LOS A	0.1	0.9	0.42	0.67	0.42	51.6
East: Ross Watt Road - East														
4	L2	19	2.0	20	2.0	0.177	5.6	LOS A	0.0	0.0	0.00	0.04	0.00	57.9
5	T1	303	2.0	319	2.0	0.177	0.0	LOS A	0.0	0.0	0.00	0.04	0.00	59.6
Approach		322	2.0	339	2.0	0.177	0.4	LOS A	0.0	0.0	0.00	0.04	0.00	59.5
West: Ross Watt Road - West														
11	T1	176	2.0	185	2.0	0.105	0.1	LOS A	0.1	0.7	0.06	0.03	0.06	59.5
12	R2	10	2.0	11	2.0	0.105	6.8	LOS A	0.1	0.7	0.06	0.03	0.06	57.1
Approach		186	2.0	196	2.0	0.105	0.5	LOS A	0.1	0.7	0.06	0.03	0.06	59.3
All Vehicles		538	2.0	566	2.0	0.177	0.8	LOS A	0.1	0.9	0.04	0.07	0.04	58.9

Site Level of Service (LOS) Method: Degree of Saturation (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on degree of saturation per movement.
Minor Road Approach LOS values are based on worst degree of saturation for any vehicle movement.
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Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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alluvium

SURFACE/STORMWATER MANAGEMENT STRATEGY (OVERVIEW)

89 Ross Watt Road, Gisborne

ID_Land

April 2022

Document history

Revision:

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Author/s	Kieran Port Jonathon McLean
Approved	Jonathon McLean

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1 Introduction

Alluvium Consulting Australia Pty Ltd (Alluvium) has been engaged by ID_Land to prepare a Surface/Storm Water Management Strategy (SWMS), in support of its permit application for the land parcel at 89 Ross Watt Road, Gisborne.

The purpose of this SWMS is to propose management strategies for:

- Stormwater quantity
- Stormwater quality
- Existing and constructed waterways

Through meeting these objectives, this SWMS acts as a critical component of the development servicing strategy and ensures stormwater is managed in accordance with Melbourne Water's and Council's requirements. The strategy will directly inform the local drainage design for the site and will include appropriate mitigation measures to protect the local environment values.

2 Site Overview

The 89 Ross Watt Road site covers an area of approximately 88 ha, of which about 67ha is developable land. The site is generally bound by Jacksons Creek to the west and south, Ross Watt Road to the north and Swinburne Avenue to the east (refer to Figure 1).

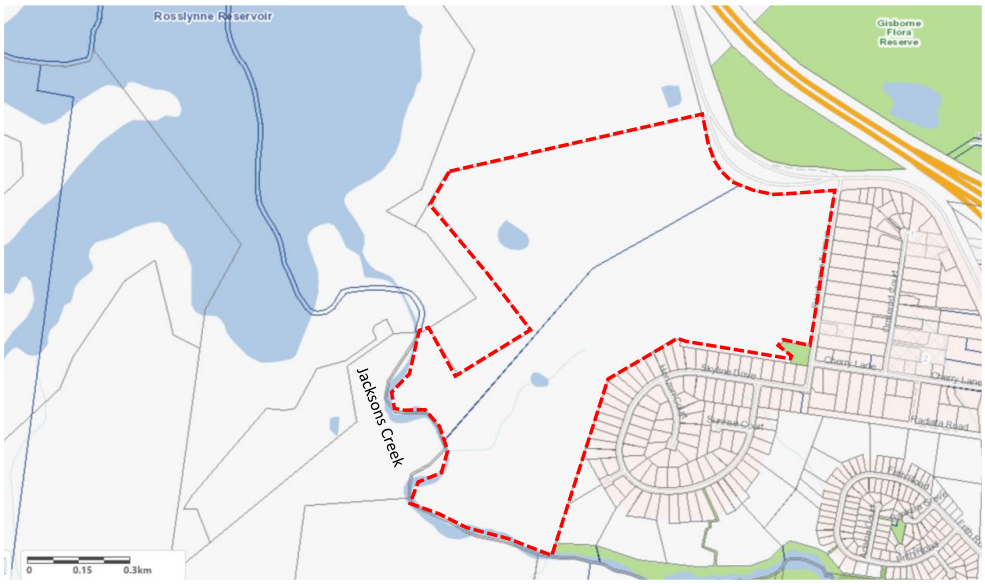


Figure 1. *Site location (subject site shown in red dash line)*

The subject site is within the Jacksons Creek catchment. Rosslynne Reservoir is located to the north of the proposed site, however all of the proposed development naturally drains to the south and enters Jacksons Creek downstream of the reservoir. The topography of the subject site varies with grades on the plateau typically ranging from 0.5 to 2%, whilst the grades on the escarpment to Jacksons Creek are extremely steep.

Jacksons Creek is located immediately to the south of the subject site and is one of the more significant waterways within the metropolitan Melbourne system. The Healthy Waterways Strategy (2018) provides a framework for addressing community expectations and the responsibilities for waterway management. For each of the five major catchments within the Port Phillip and Westernport region (Werribee, Maribyrnong, Yarra, Dandenong and Westernport), the Strategy outlines catchment-specific visions, goals, long-term targets (10 to 50 years) for key values and waterway conditions, and short-term performance objectives (10-years). Effort and investment at catchment and sub-catchment scale are prioritised and aligned to ensure they contribute to broader, regional goals and outcomes. The 89 Ross Watt Road site is located within the Maribyrnong catchment.

The subject site is not located within a Precinct Structure Plan area. Apart from a very small area in the north west corner of the site, the proposed development is not located in a Melbourne Water Development Services Scheme (DSS). The small area that is within the New Gisborne DSS does not have any proposed scheme infrastructure to service the development of this land. Under existing conditions runoff from this small catchment does not actually outfall to the Racecourse Marshlands Reserve (ie the Gisborne Conservation Area) as the flow path is contained by Ross Watt Road and as a result all flows continue to outfall in a south-easterly direction.

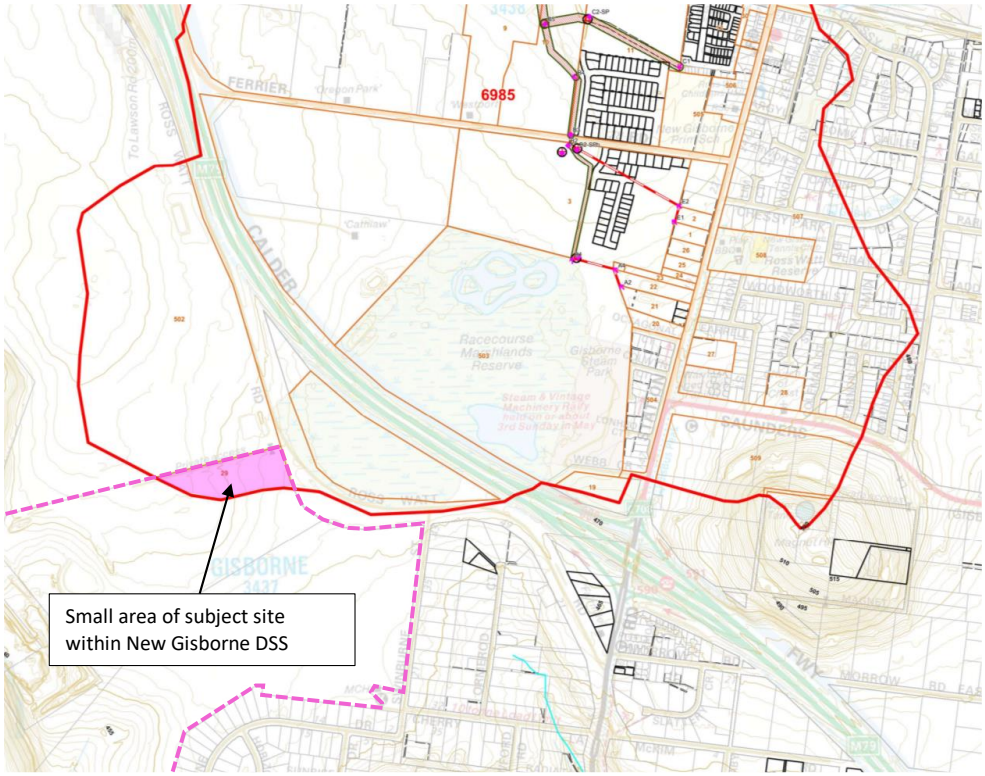


Figure 2 *New Gisborne DSS (subject site shown by pink dash line)*

3 Existing Conditions: Tributaries and Geomorphology

3.1 Waterway/tributary assessment

A detailed field assessment of the existing drainage lines in the study areas was undertaken by a geomorphologist (Alex Sims) and an urban drainage engineer (Jonathon McLean) from Alluvium. The field assessments included a walkover survey of all the drainage lines that discharge to Jackson Creek and drainage pathways to existing road infrastructure. A range of indicators in the field were assessed, including the relationship between the floodplains and drainage lines; the channel planform, gradient and any areas of active or incipient erosion or sedimentation. The field assessment focussed on the physical geomorphic features and processes sensitive to, or likely to be affected by, future altered hydrology.

The field observations were synthesised and combined with the literature review outputs to provide an assessment of the condition and trajectory of waterways and drainage lines within the proposed development sites. Summary results of the baseline geomorphic assessment are provided below.

The main subject of this report is the 350 metre long waterway, located at the southern margin of the proposed Ross Watt Road development area. The study reach is a small drainage line that flow across the steep escarpment edge and into Jacksons Creek (Figure 3). Two additional sites (sites A and B in Figure 3) located along an unnamed waterway to the east of the proposed development were also inspected. The unnamed waterway is expected to receive a portion of the stormwater generated by the proposed development and sites A and B are expected to receive additional stormwater from the surrounding urban area.

The geomorphic processes within the study waterway and at sites A and B were assesses using two methods:

- A desktop assessment of that used high-resolution aerial imagery, Geological and soil mapping and the proposed development layout
- A site assessment that included GPS photos, field notes and the use of a small UAV (drone). The site assessment was used to break the study waterway into reaches, with the boundary between reaches marking the points of change in waterway shape, slope and behaviour. Within each reach, the following was noted:
    - The condition of the bed and banks of the waterway
    - Existing instabilities in the channel that pose a risk to the public (given that the waterway will be included as publicly accessed open space following development

The desktop and field assessments were used to understand the existing condition of the waterways, geomorphic processes operating in the waterways, and the likely response of the waterways to increased flows form stormwater following further development of the catchment.

3.2 Study waterway

Overall, three distinct but relatively short reaches were defined for the study waterway (Figure 4). The reaches are:

- Reach 1: the length of the defined waterway between the current farm dam and the edge of the basalt escarpment.
- Reach 2: the portion of the waterway over the steep escarpment.
- Reach 3: the short section of waterway between the top of the escarpment and Jacksons Creek.

Figure 3. *The study waterway and sites A and B – which were assessed for their suitability to accommodate additional flows*

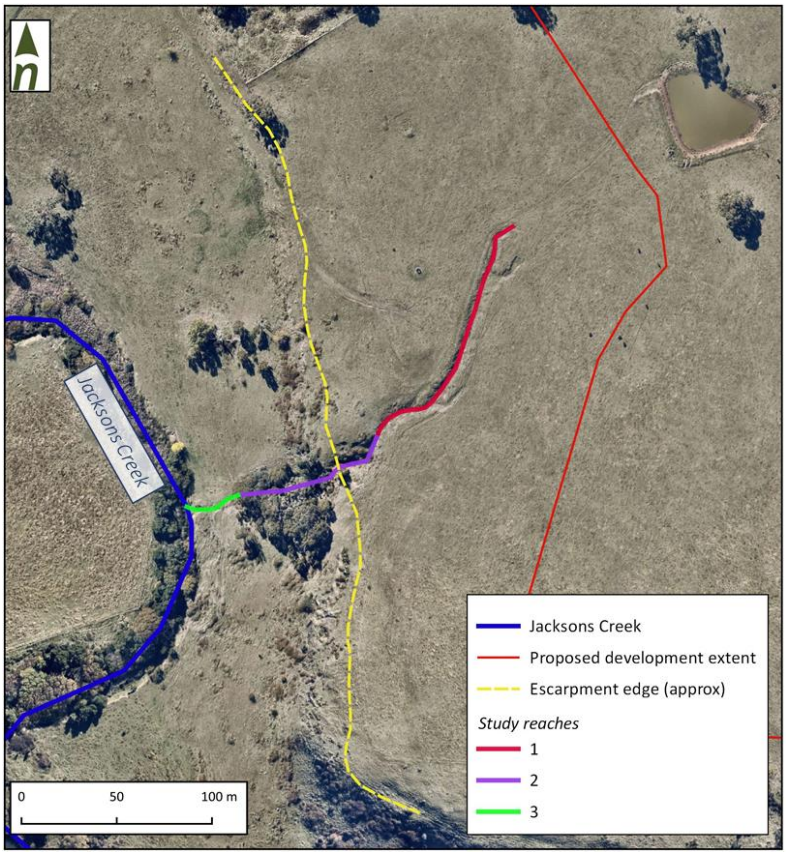


Figure 4. *Reaches of the study waterway*

The condition of each reach and the geomorphic processes shaping the waterway are considered below.

Reach 1
Reach 1 is in the upper part of the site and follows a gentle slope towards the sharp break in slope (the escarpment edge), that defined the valley of Jacksons Creek. Stock have ongoing access to this reach. The head of this reach is defined by a vertical head-cut that appears to be migrating upstream, towards the farm dam. The migrating head cut is fed by runoff from the dam (which has a small spill channel) and from the surrounding paddock. The absence of rilling or other smaller channel features suggests that this head-cut is starved of water in all but very heavy rainfall events. The head cut is the result of stock trampling grass, which exposes soils to erosion during heavy rainfall, but the presence of underlying bedrock and the farm dam limit the opportunities for head cut migration.

The bed of the waterway is comprised of relatively shallow soils derived from the underlying basalt, and occasional outcrops of basalt bedrock, which become more common in a downstream direction. The banks of the reach show numerous signs of erosion, most of which is small, shallow slumping which has been exacerbated by movement of stock. The reach is relatively straight.

Reach 2
Reach two is the steep section of the waterway that flows across the escarpment edge. The channel is roughly v-shaped and does not have well defined banks (rather the valley walls are the banks). The bed of the channel is exposed basalt bedrock with accumulations of shallow soil (which has been transported to the reach from erosion in reach 1). The bed profile is stepped, with the steps in bed profile following natural undulations in

the bedrock or clusters of large basalt boulders, which have been dislodged form the adjacent slope as the channel cut downwards. The large boulders are colluvial (slope) deposits, and likely move downslope by toppling (rather than transport by water). The toppling of the boulders is very rare, and the catchment is unlikely to generate sufficient flow to transport these rocks.

Thick vegetation (gum trees and dense blackberry) covers the downstream part of this reach and these trees are not currently being undermined by erosion.

Reach 3

Reach three is a short section that flows over an alluvial fan – a cone shaped deposit of sediment at the base of a steep, confined waterway - that has formed between the base of the escarpment and the top of the left bank of Jackson Creek (Figure 6)

The alluvial fan is comprised of coarse gravels (likely colluvium eroded form the bedrock in reach 2) and finer sediment (a combination of fine sediment from the upper part of the waterways catchment and sediment deposited by floodwaters of Jacksons Creek).

The channel currently flows along the eastern edge of this small fan and has incised a deep gully at the junction with Jacksons Creek. Incision of the alluvial fan was likely cause by the increased runoff from the catchment following conversion to agriculture, combined with the abrupt drop between the floodplain and the bed of Jacksons Creek. Sediment eroded from the small gully appears to have been deposited in the bed of Jacksons Creek, immediately downstream, where macrophytes have colonised the streambed. The position of the head cut coincides with an informal track, and basalt boulders placed at the head of this small gully appear to have been manually placed in an attempt to limit gully extension.

A natural depression (possibly a former channel) lies on the western side of the alluvial fan (**Figure 5**). Were the apex of the fan (the narrow point at the base of the escarpment where the stream emerges) to become blocked (for example by toppling of boulders from reach 2) then an avulsion (a sudden change in channel position) could occur. The channel avulsion would occur during higher flows and the most likely pathway of the 'new' channel is the depression on the western side of the fan. Channel avulsion would likely erode a second gully on the western side of the fan, similar to the gully already present on the eastern side of the fan. The avulsion and subsequent scour of the new channel may occur rapidly during high flows and would pose a threat to public safety and the visual amenity of the Jackson Creek floodplain.

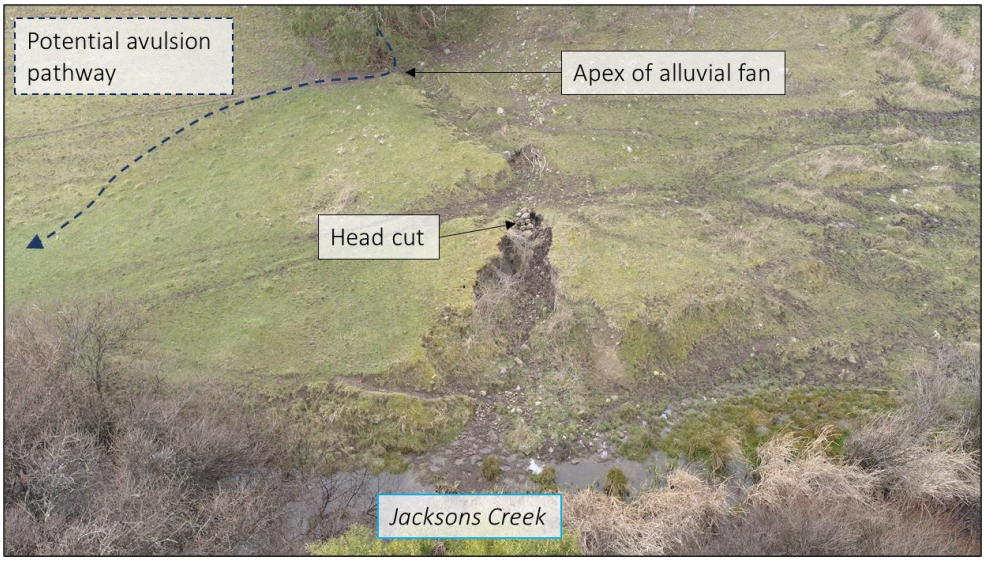


Figure 5.*The alluvial fan (looking upstream) at the base of the study waterway, with the potential avulsion pathway (new river course) on the western side (image left) of the fan*

Figure 6. *Overview of geomorphology of the study waterway*

3.3 Site A

Site A is located on a small waterway (ie Honeysuckle Creek) to the east of the proposed development, at the Cherry Lane culvert. Flows discharge from a buried pipe and into the unnamed waterway. The waterway at site A is narrow and well-vegetated. The bed is comprised of sediment ranging in size from silt to gravel. Deposition within the bed of this waterway, which already receives stormwater form the urban sued catchment, suggests that stream power is relatively low. The likelihood of bed incision due to a relatively small increase in stormwater delivery from the proposed development is low.

3.4 Site B

Site B is at the base of the exposed section of Honeysuckle Creek, where flow is directed into a sealed pipe at the culvert beneath Frith Road. This section of the waterway is covered in dense vegetation and basalt boulders can be seen on some sections of the channel bed. This section of waterway is unlikely to be impacted by the increased delivery of stormwater from the proposed development

3.5 Recommendations and findings

The change from an agricultural to urban/recreation land use in and adjacent to the study waterway will remove the main pressures driving erosion of the channel bed and banks: stock. At the same time, the delivery of stormwater to the reach will alter the flow regime of the waterway by increasing the total flow energy available to erode the bed and banks.

The natural valley line has not been mapped by Melbourne Water as a waterway or headwater stream (see Figure 7). Given this status and the low geomorphic value as identified via the field assessment it appears likely that there will not be a requirement to provide a waterway corridor through the site. Therefore, the risk of erosion along reach 1 for developed conditions will not be an issue as a road reserve will be used to convey flows along the valley floor.

Figure 7. *Melbourne Water mapped waterways*

This erosion will be most severe in the upstream section where the soil is deeper, and less severe at the downstream end of the reach (adjacent the escarpment edge) where exposed bedrock will prevent channel incision. The following mitigation measures are recommended to:

- prevent widespread erosion that decreases waterway amenity (and in many cases the mitigation measures will enhance waterway amenity relative to existing conditions)
- Prevent erosion that poses a threat to public safety
- Prevent delivery additional fine sediment to Jacksons Creek.

The recommended mitigation measures are:

1. Reach 2 comprises bedrock and will therefore be very resilient to changes in the hydrology due to urbanisation. Flow mitigation of future urban flows is therefore not necessary for this reach for both low and high flow events. Very little remediation is required apart from minor areas of weed removal and re-vegetation on the outer margins of the corridor.
2. Earthworks at the alluvial fan at the downstream end of the water way to ensure that the current channel alignment (to the east of the small fan) is maintained and that the head cut in incise channel does not migrate upstream, towards the base of the escarpment. A small bund or shaping of the channel to ensure that blockages at the fan apex do not trigger an avulsion to the west of the fan should maintain the current alignment.
3. Re-profiling of the downstream end of the channel in reach 3 at the toe of the alluvial fan to remove the incised gully and install a stable rock structure. The aim of these works is to:
    - Control the slope of the channel where it enters Jacksons Creek
    - Prevent a new head cut from forming and then migrating up the fan towards the escarpment.
    - Maintain a safe and high-amenity section of waterway that connects with Jacksons Creek

From a channel stability perspective, additional stormwater delivery to either site A (the head of a small waterway) or Site B (the small culvert at the downstream end of that waterway) will have little to no impact on those waterways. Dense vegetation and large basalt boulders prevents any small increase in total flow energy from eroding the channel bed or banks.

4 Existing conditions: Hydrology

4.1 Major Catchments

There are two main catchments associated with the 89 Ross Watt Road site, an eastern catchment and a western catchment (see Figure 8). A small area (2.3ha) north of the subject site and south of Ross Watt Road flows into the subject area. Although outside the subject site boundary, this area has been included in the hydrological analysis as an "external catchment".

East Catchment

- Total catchment area is 33.4ha
- Outlet/discharge point is at the corner of Swinburne Ave/Cherry Lane
- A small area to the north of the 89 Ross Watt Road site is shown as part of Melbourne Water's New Gisborne DSS. However, there is no infrastructure within the scheme to drain future development from this area. Under existing conditions runoff from this area naturally drains outside the subject site temporarily before flowing back into the subject site further to the east (refer to section 4.2).
- Outfall pipe required to be constructed along Cherry Lane
- Will need to retard back to equivalent pre-development peak flow rate for flows up to the 1% AEP event
- Stormwater quality to meet Best Practice pollutant removal targets at the outlet

West Catchment

- Total catchment area is 41ha
- Outlet/discharge point is directly to Jacksons Creek via the existing tributary on the site
- The north-west portion (8.5ha) of the site naturally outfalls to the low point along the western boundary of the site (refer to section 4.3). An overland flow path required at this low point. Post development discharge to be restricted to no more than pre-development conditions. This will require piping of drainage flows (up to say the 5% AEP) to the subject site's outfall to the south.
- The tributary is sufficiently resilient (ie. bedrock) to convey urban flows from the catchment without attenuation of the hydrology. Therefore, retardation on this catchment for stability and erosion protection is not required.
- Jacksons Creek is an incised valley and has no capacity issues to contain the 1% AEP flood levels. The no requirement for retardation precedent was set by Melbourne Water for the Sunbury Growth area where their investigations determined the above principal.
- Stormwater quality to meet Best Practice pollutant removal targets at the outlet
- Remediation works required on the alluvial fan along the lower reach of the tributary prior to connection to Jacksons Creek

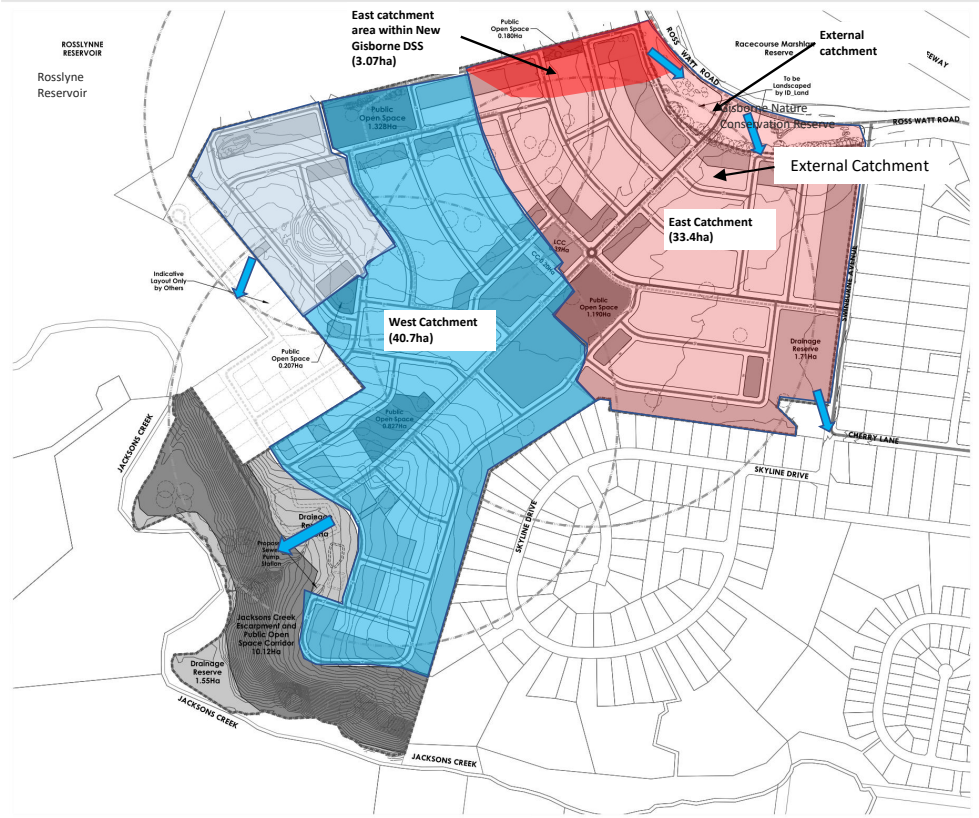


Figure 8 – Major catchment plan

4.2 Eastern flows near Gisborne Nature Conservation Reserve

The northern catchment area of the subject site within the New Gisborne DSS flows in an easterly direction towards Ross Watt Road. Based on levels from the site survey there is a small depression that runs between the subject site and an unnamed access track for Ross Watt Road, and another more formal swale running in-between Ross Watt Road and the unnamed track (see Figure 9 and Figure 10). Together these depressions/swales convey flows parallel to Ross Watt Road and are discharged back within the subject site. As such, all flows within the subject site remain south of Ross Watt Road and do not enter Gisborne Nature Conservation Reserve (located north of Ross Watt Road).

Development within the subject site will result in flows being conveyed within the road reserves and contained within the subject site. As such no flows will enter the Gisborne Nature Conservation Reserve and there will be no change to the hydrological regime (ie quantity or quality) within the conservation reserve as a result of the development of the 89 Ross Watt Road site.

Figure 9 Depression parallel to Ross Watt Road (looking south)

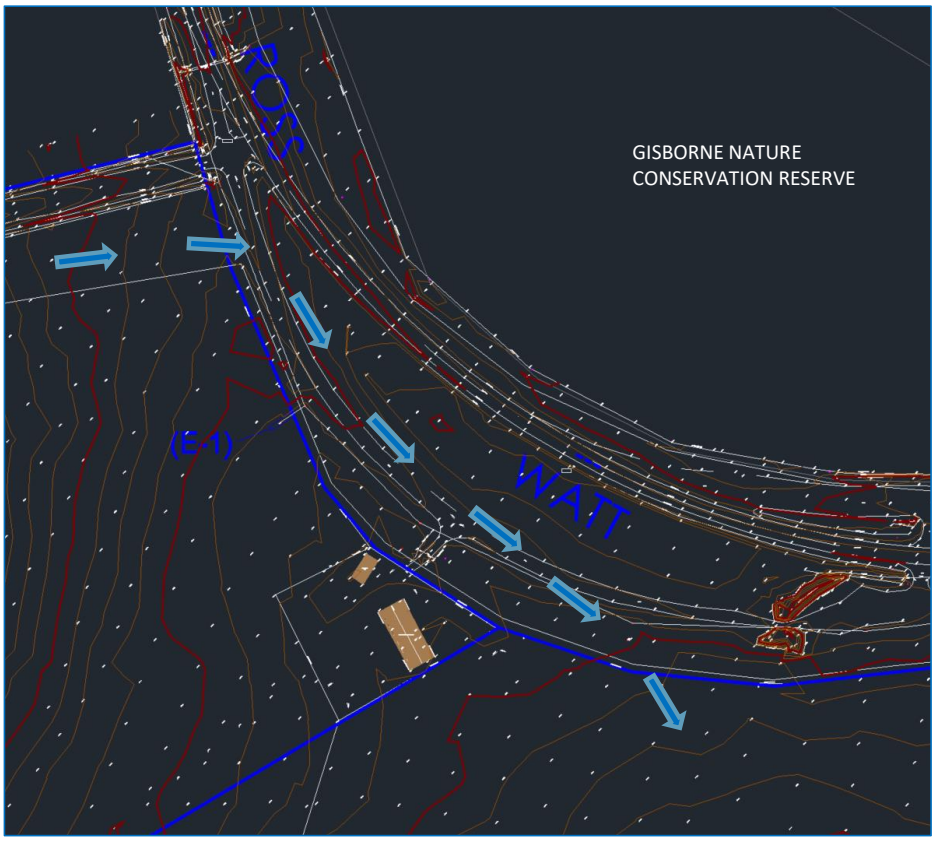


Figure 10 Field survey showing small depression parallel to Ross Watt Road

4.3 Western flows near Rosslynne Reservoir

No stormwater runoff from the proposed development site is able to enter the Rosslynne Reservoir. An existing ridge line along the northern boundary of the subject site continues through to the reservoir wall/spillway and as a result it is impossible for stormwater runoff to flow into the Rosslynne Reservoir (see Figure 11). A small subcatchment (ie 7.6 hectares) in the north west corner of the development site falls away from the northern boundary ridge line and into a drainage line (ie location 4) to the south that traverses the escarpment before outfalling to Jacksons Creek about 200 metres downstream (ie location 0) of the Rosslynne Reservoir wall/spillway.

Development within the subject site will result in flows being conveyed by underground pipes and the road reserve and outfalling to Jacksons Creek. The peak 1% AEP flow rate discharging to the existing low point/drainage line at location 4 will be kept to the equivalent pre-development peak flow rate.

Therefore based on the above the proposed development will have no stormwater flows entering Rosslynne Reservoir.

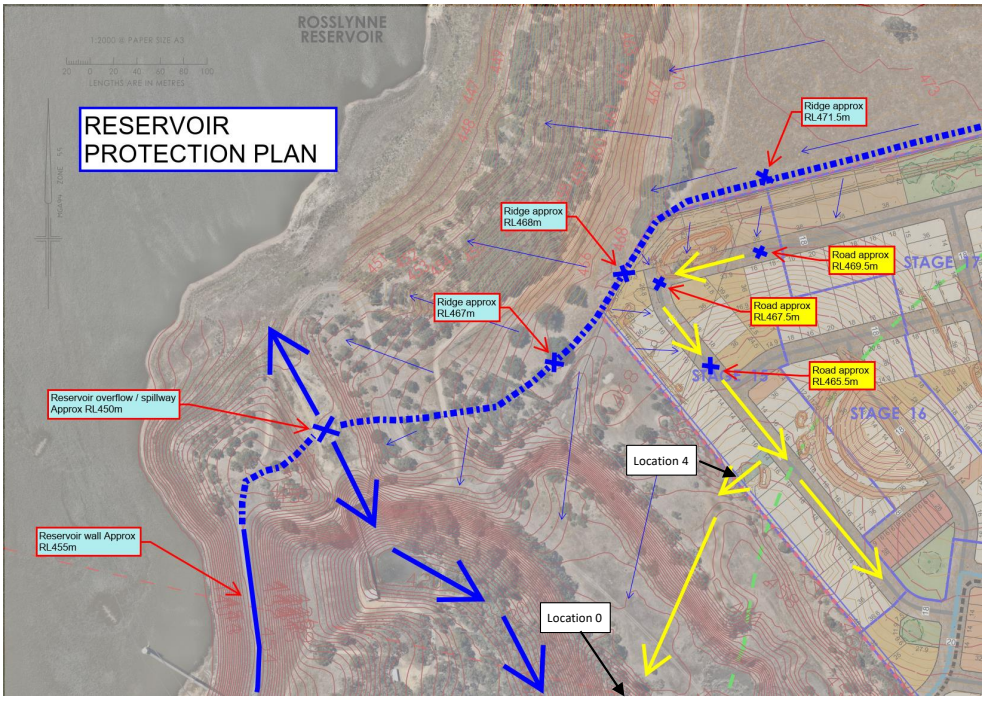


Figure 11 Flow paths near Rosslynne Reservoir (ridgeline shown in blue) (Breese Pitt Dixon, 2022)

4.4 Sub catchment delineation

Catchment delineation was conducted based on available survey data and the proposed road network. Under existing conditions flow paths are determined by the existing topography of the subject site. When the area is developed, flow paths will be influenced by the road network. To accurately compare the two scenarios, catchment delineation for both the existing and developed conditions were conducted based on the proposed road network (see Figure 12).

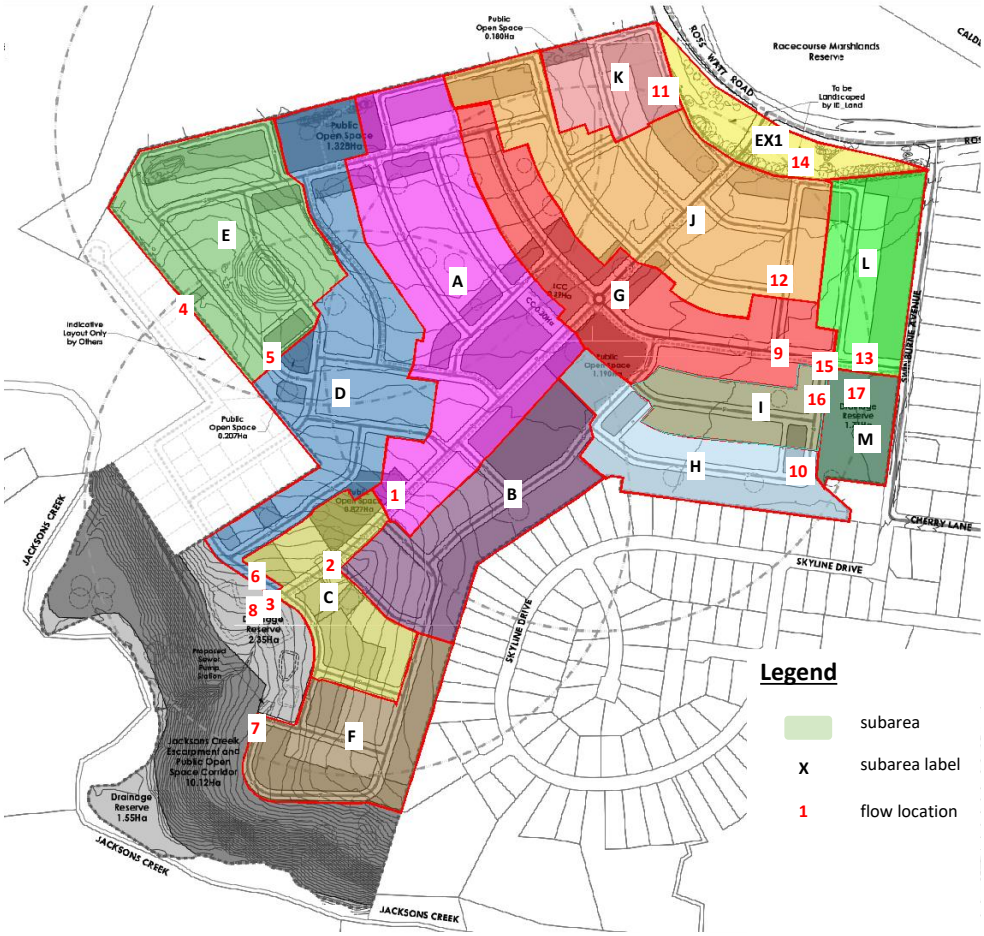


Figure 12 Sub-catchment area plan

Table 1 Descriptions of sub-catchments

Sub-catchment Label	Area (ha)	Comment
A	11.03	Catchment A outfalls through catchment C
B	5.49	Catchment B outfalls through catchment C
C	3.75	Catchment C outfalls over escarpment into Jacksons Creek
D	8.47	Catchment D outfalls through catchment C
E	7.67	Catchment E outfalls over escarpment into Jacksons Creek
F	4.31	Catchment F outfalls over escarpment into Jacksons Creek
G	7.07	Catchment G outfalls through catchment M
H	4.14	Catchment H outfalls through catchment I
I	2.47	Catchment E outfalls into Swinburne Ave
J	9.56	Catchment J outfalls through catchment G
K	2.45	Catchment K outfalls through catchment I
L	3.69	Catchment L outfalls through catchment M
M	1.70	Catchment M outfalls into Swinburne Ave/Cherry Lane
EX1	2.27	Catchment EX1 outfalls through catchment J

4.5 Existing stormwater quantity

The hydrological conditions of the subject were established using the RORB software package and rational method. These tools were used to estimate the peak design flows from the subject area under existing (i.e. pre-development) conditions discharging into Jacksons Creek and Swinburne Ave/Cherry Lane.

The following design rainfall parameters were adopted for the subject site based upon the Bureau of Meteorology's (BOM) "Intensity Frequency Duration (IFD) Tool – AR&R 2019) (refer to Figure 13).

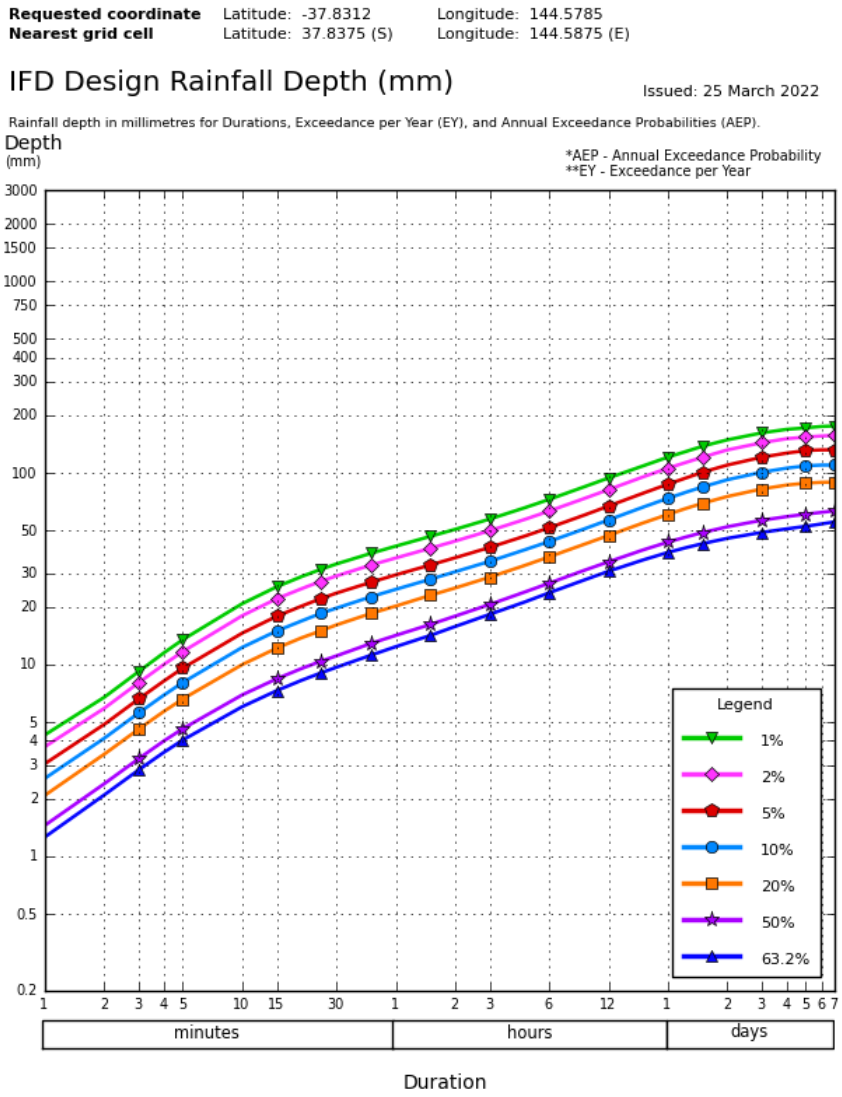


Figure 13 Design rainfall intensities for subject site

Existing Peak flowrates
Under existing conditions, the subject site largely consists of a greenfield used for farming purposes with a couple of farm dams. Flowrates for the West catchment (Flow locations 4, 7 and 8) were estimated using the rational method.

For the East catchments, critical flowrates were estimated using a combination of the rational method and RORB hydrological modelling. In accordance with best practice modelling procedures, at least 4 subareas exist upstream from the point of interest. The hydrologic modelling considered a range of design storms, from 10 minutes duration through to 72 hours, for a range of ten ensemble temporal patterns, in order to determine the critical duration event with respect to storage (i.e. the 60th percentile peak flow for a given duration).

The RORB model parameters were "derived" using Melbourne Water's regional equation for the Yarra and Maribynong catchments. Table 2 summarises the RORB input variables and parameters.

Table 2 RORB Pre-developed input variables

RORB input variable (Pre-developed)	Value	Method of derivation
m	0.8	Standard value
kc	0.65	Adopted based on Melbourne Water standard equation for Yarra and Maribynong catchments
IL	27	Sourced from ARR datahub
CL	3.1	Sourced from ARR datahub

The pre-developed flow rates are summarised below.

Flow location 4:

- 20% AEP: 0.30 m^3/s
- 1% AEP: 0.73 m^3/s

Flow location 7:

- 20% AEP: 0.16 m^3/s
- 1% AEP: 0.38 m^3/s

Flow location 8 (main outfall of West catchment):

- 20% AEP: 0.91 m^3/s
- 1% AEP: 2.23 m^3/s

Flow location 14 (main outfall of East catchment):

- 20% AEP: 0.55 m^3/s
- 1% AEP: 2.03 m^3/s

5 Stormwater Management Objectives

While traditionally stormwater management strategies are typically concerned with meeting 1% AEP flood management and stormwater quality objectives, the unique landscape associated with the Jacksons Creek catchment also requires some additional considerations.

The table below summarises the parameters and stormwater management for the subject site.

Table 3 Objectives

Key issue	Objective	Commentary
Tributary/waterway stability	Ensure the tributary has the stability and resilience to receive runoff from the urbanised catchment	Informed by previous Alluvium's geomorphic field investigations for the site.
Protection of Rosslynne Reservoir	Ensure no runoff from urban development flows into Rosslynne Reservoir	All developed flows from the 89 Ross Watt Road site will flow into Jacksons Creek downstream of the reservoir
Stormwater quality	Best practice environmental management targets (BPEM) in terms of percentage reduction TSS: 80%, TP: 45%, TN: 45%	
Stormwater quantity	No specific objective to provide flood management for Jacksons Creek . Minor drainage system of 20% AEP for residential Major drainage system to safely convey flows through developed areas.	No requirement to provide retardation to control peak flow events (eg 1% AEP) back to predevelopment peak flow rates prior to entering Jacksons Creek. Local requirement to provide retardation to control peak flow events (eg 1% AEP) back to predevelopment peak flow rates prior at the Cherry Lane outfall.

6 Stormwater Quantity – Proposed Strategy

The proposed internal drainage system should be designed and constructed in accordance with the minor / major drainage system philosophy. For drainage assets within a catchment area of 60 hectares, Council design standards are expected to apply. For drainage assets greater than 60 hectares, Melbourne Water design standards are expected to apply.

The sub-catchments and the location of flows at key points of interest are shown in

Figure 12.

6.1 Minor Drainage

The minor drainage system would consist essentially of an underground piped network and should be designed to accommodate a 20% annual exceedance probability (AEP) rainfall event. The calculations adopted a 20% AEP runoff coefficient of 0.57 for residential areas, based on a combined fraction impervious for the site of 0.60. Table 4 summarises the minor drainage flows for the subject site, derived using the rational method.

Table 4 Minor drainage for subject site

Location	Contributing catchment	Area (ha)	tc (min)	I (20% AEP-mm/h)	Minor flows (20% AEP) (m^3/s)	Indicative pipe size (mm)
1	A	11.03	11.84	61.81	1.06	750
2	B	5.49	10.70	64.15	0.59	600
3	A, B, C	20.27	12.48	60.50	1.94	900
4	*					
5	E	7.67	10.66	64.23	0.78	825**
6	D, E	16.14	12.24	60.98	1.55	750
7	F	4.31	8.49	71.35	0.44	450
8	A, B, C, D, E, F	40.72	12.48	60.50	3.90	1050
9	G	7.07	11.30	62.93	0.70	675
10	H	4.14	8.5	71.35	0.47	525
11	0.5K	1.17	6.5	77.0	0.14	375
12	K, J, EX1	14.28	11.80	61.90	1.40	825
13	L	3.69	8.50	71.35	0.42	450
14	EX1	2.27	10.0	65.60	0.12	375
15	K,J,EX1,G	21.35	12.2	60.98	2.06	900
16	H,I	6.61	9.0	69.40	0.73	675
17	G, H, I, J, K, L, I, EX1	33.35	14.98	55.33	2.92	1050

* Minor flows are diverted from Flow location 4 towards Flow location 5.
** Pipe sizing in Catchment E increased to convey up to the 5% AEP event (discussed further in Section 6.2)

Based on the catchment areas, the entire pipe networks within the subject site is expected to become the responsibility of Council.

Stormwater quantity criteria:

- ✓ Convey minor flows (20% AEP) through residential catchments in a piped network
  - ✓ Maximum pipe size of 1050 mm
  - ✓ All pipes are Council assets

6.2 Major Drainage

The major drainage system will convey the 1% AEP flows through the study area. This consists of the road reserves throughout the development. Generally, the flows required to be conveyed in road reserves will be the gap flow, 1% AEP flow minus the pipe flow (ie 20% AEP) which will be contained within the minor piped drainage system. The calculations adopted a 1% AEP runoff coefficient of 0.70 for residential areas, based on a fraction impervious of 0.60. Table 5 summarises the major drainage flows for the subject site, derived using the rational method.

Table 5 Major drainage flowrates for subject site

Location	Contributing catchment	Area (ha)	tc (min)	I	Major flows	Gap Flow
1	A	11.03	13.50	113.80	2.44	1.38
2	B	5.49	11.90	120.20	1.28	0.69
3,8**	A, B, C	20.27	15.40	106.20	4.19	2.25
4	E	7.67	11.0	123.90	1.85	0.73^
6	D	8.47	15.00	107.90	1.78	1.07
7	F	4.31	9.00	135.00	1.13	0.69
9	G	7.07	12.6	117.60	1.62	0.92
10	H	4.14	10.30	126.70	1.02	0.55
11	(0.5*K)	1.17	8.00	142.50	0.32	0.18
12	K, J, EX1	14.28	13.10	115.50	3.21	1.81
13	L	3.69	9.00	135.00	0.97	0.55
14	EX1	2.27	10.00	128.00	0.34	0.12
15	K,J,EX1,G	21.35	13.60	113.50	4.49	2.43
16	H,I	6.61	11.00	123.90	1.58	0.85

* * Flows at location 3 and 8 are the same as overland flows from catchment D outfall to the drainage reserve
^ Pipe upsized to convey the 5% AEP design flow

The north-west portion of the West catchment (Sub-catchment E) requires the minor drainage to be sized to ensure the resulting 1% AEP gap flow is less than existing conditions at Flow location 4. This has been achieved by increasing the size of the pipe network within Sub-catchment E to be able to convey flows up to the 5% AEP event (see Table 6).

Table 6 Flow location 4 - 1% AEP flows

Location	Existing 1% AEP flows (m^3/s)	Design 1% AEP flows (m^3/s)	Design Gap flow (m^3/s)
4	0.730	1.85	0.73

Based on the road width and slope, and the maximum allowable nature strip cross-fall of 1 in 15, the capacity that can be contained within the main road reserves is shown in Table 7. This capacity has been determined using HEC-RAS based on the DELWP 2019 document "Guidelines for Development in Flood Affected Areas" and Council's requirement that 1% AEP design flows must be contained within the road reserve and must not enter any part of private allotments.

Table 7 Road reserve flow capacities

Road width	Slope	Road capacity (m^3/s)
16 m	2.5 %	2.6
16 m	1.0 %	2.5
16 m	0.5 %	2.3
20 m	0.5 %	2.8
20 m	1.5 %	3.1
20 m	2.5 %	3.2

Based on the above information all overland flows can be safely contained within the proposed road reserves. Figure 14 shows the overland flow paths through the subject site.

Figure 14 Overland flow paths

Stormwater quantity criteria:

- ✓ Convey internal major flows through road reserves and pipe system
  - Maximum gap flow = 2.43 m^3/s

6.3 Retardation and Outfall overview

Western Catchment

The outfall from the western catchment is via the existing tributary that flows through the site and outfalls directly to Jacksons Creek.

As outlined in Section 3 and Section 5, the geomorphology assessment has determined that the existing drainage line is bedrock and therefore of sufficient stability to accept the hydrologic flow regime for the post development conditions. As a result, retardation on this catchment is not required from a waterway stability perspective.

Jacksons Creek is an incised valley and has no capacity issues to contain the 1% AEP flood levels. The no requirement for retardation precedent was set by Melbourne Water for the Sunbury Growth area where their investigations determined the above principal.

Eastern Catchment

The eastern catchment naturally outfalls to Swinburne Avenue and Cherry Lane. The existing outfall is a swale/table drain along Cherry Lane where it discharges to the open channel known as Honeysuckle Creek (refer to Figure 15). The southern portion of the Swinburne Avenue/Cherry Lane intersection is raised, which results in overland flows in large events (eg. 1% AEP) flowing east along the Cherry Lane road reserve.

The proposed development will need to provide retardation to attenuate post development peak flow rates to the equivalent pre-development peak flow rate for events up to the 1% AEP. The retardation storage will be integrated with the wetland asset (WLRB) within the proposed drainage reserve (1.70ha) in the south east corner of the site (refer to Figure 16).

The invert level of the subdivisional drainage system and the outlet from the wetland/retarding basin will be significantly lower than existing table drain depth in Swinburne Avenue/Cheery Lane. As a result an underground drainage outfall will need to be constructed along Cherry Lane from the proposed drainage reserve to the outlet at Honeysuckle Creek. The upstream portion of the pipe will control flows up to the 1% AEP before progressively surcharging along Cherry Lane to revert to a 20% AEP capacity pipe (refer to Figure 15).

The minor flows within the east catchment will be conveyed by the pipe network to outfall into the sediment basin associated with the WLRB.

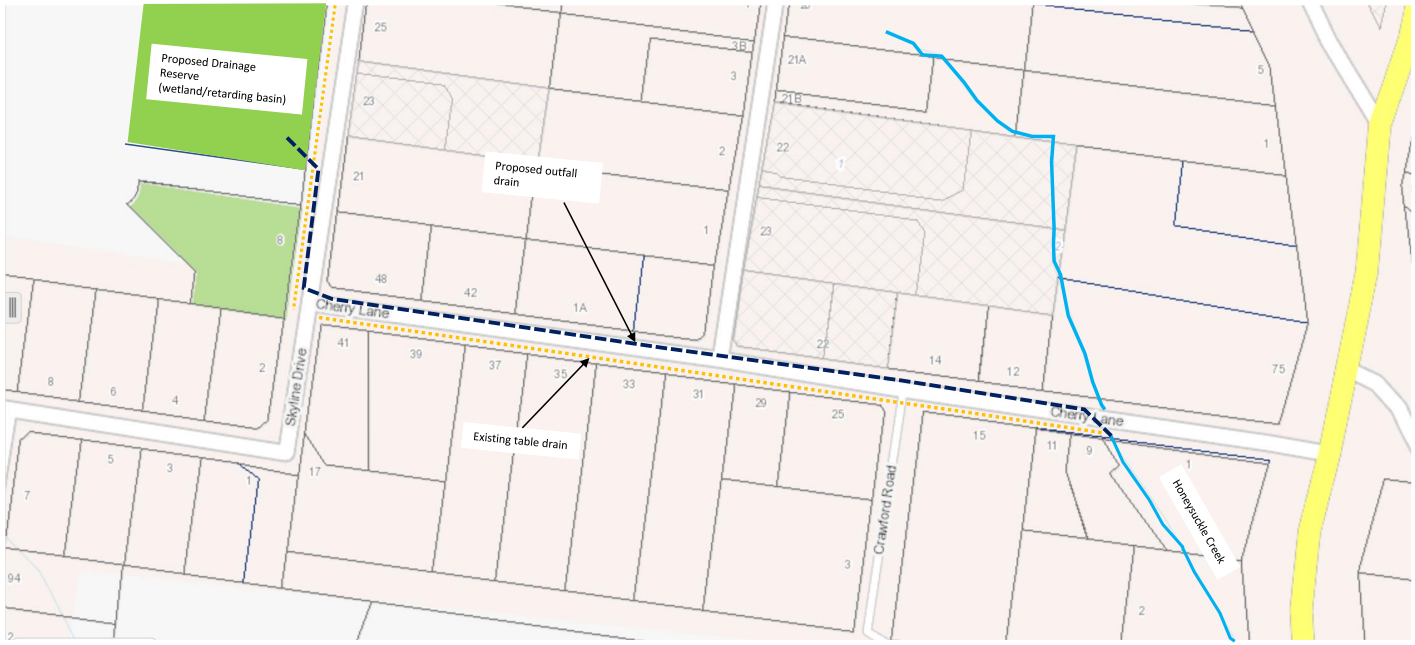


Figure 15 Outfall arrangements along Swinburne Avenue / Cherry Lane

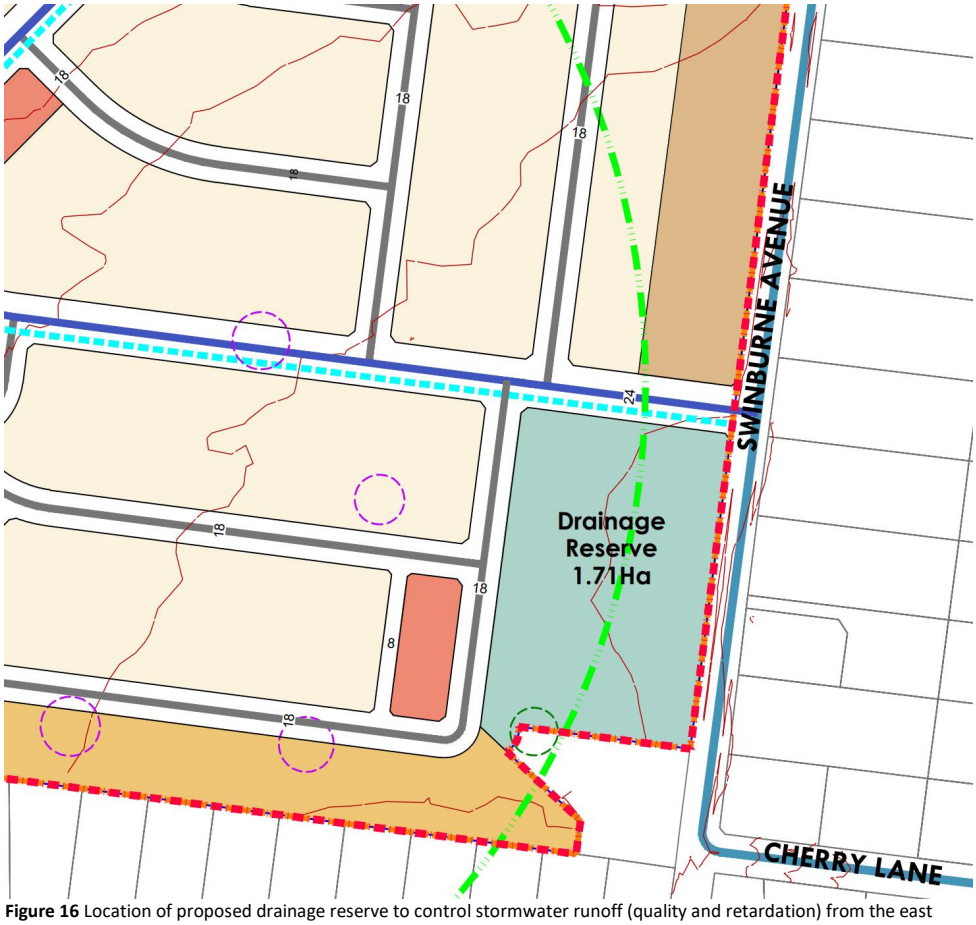


Figure 16 Location of proposed drainage reserve to control stormwater runoff (quality and retardation) from the east catchment

6.4 Retarding basin (east catchment)

In the development scenario of the subject site, retardation storage is required to attenuate flows back to the peak flow rates for the east catchment as identified in Section 4. Specifically, this requires peak flow rate from the east catchment to be attenuated back to 2.03 cumecs for the 1% AEP event. Flows will be discharged into an underground pipe along Cherry Lane, sized to convey the 1% AEP flowrates from the subject site.

Hydrologic Modelling

Similar to deriving the peak flows under pre-developed conditions in the East catchment, the RORB software package was used to produce a hydrological model and determine the retardation storage requirements for the site under developed conditions. Table 8 summarises the RORB input variables used for the developed conditions.

Table 8 Developed RORB inputs variables

RORB input variable (Developed)	Value	Method of derivation
m	0.8	Standard value
kc	0.65	Adopted based on Melbourne Water standard equation for Yarra and Maribynong catchments
IL	15.1	Taken as 60% of ARR datahub value (minus medium pre-burst value)
CL	3.1	Sourced from ARR datahub

The RORB hydrological model was iteratively run to determine the minimum storage size for the WLRB while still meeting the 1% AEP flowrate requirements. In accordance with the recommendations in ARR2019, the hydrologic modelling considered a range of design storms, from 10 minutes duration through to 72 hours, using an ensemble of ten temporal patterns in order to determine the critical duration event with respect to storage.

A summary of the detention modelling results for the 1% AEP event is provided below:

- Critical storm – 2 hours
- Peak flow catchment outfall – 1.81 cumecs (compared to existing peak flow of 2.03 cumecs)
- Peak storage – 7,820 m^3
- Outlet pipe diameter – 1350mm

The storage volume, peak storage and outlet pipe diameter reported are preliminary estimates for the purpose of sizing the drainage reserve and land budget requirements. Storage parameters and pipe characteristics will be refined in the future functional design phase.

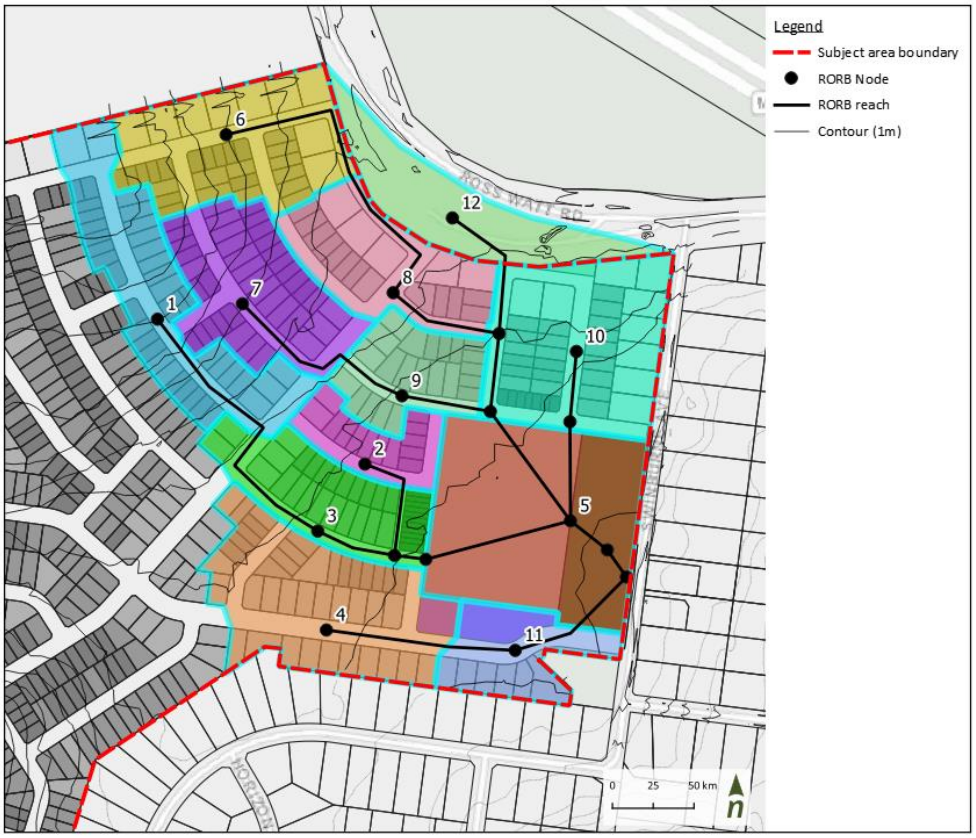


Figure 17 RORB catchment plan

7 Stormwater Quality

Alluvium understands that a key principle for the development of the site is that all stormwater is to be treated to best practice (ie Best Practice Environmental Management Guidelines (BPEM)) before being discharged into a waterway. The following BPEM targets have been adopted:

- 70% removal of the total Gross Pollutant load
- 80% removal of total Suspended Solids (TSS)
- 45% removal of total Nitrogen (TN)
- 45% removal of total Phosphorus (TP)

The catchments and stormwater treatment train have been modelled via MUSIC using parameters defined in Table 9. The analysis has been based on the latest Melbourne Water MUSIC modelling guidelines. This includes:

- The ten year rainfall template for the Kooweerup station between the years 1971 – 1980
- Soil store parameters with a soil store capacity of 120mm and a field capacity of 50mm.
- Fraction impervious value of 0.60 for residential area

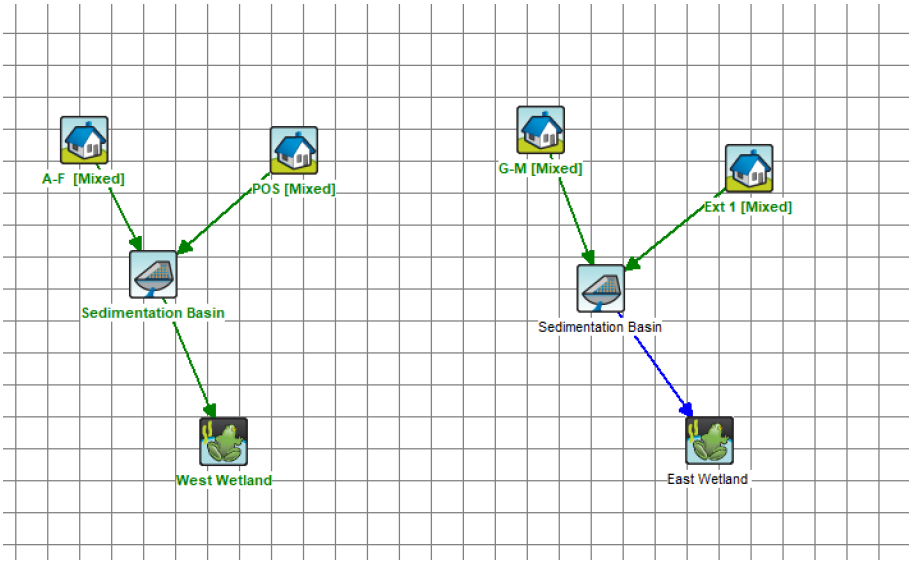


Figure 18. *MUSIC model for the west and east catchments*

The configuration of the treatment train is provided in Table 9. It consists of a sediment basin and wetland located in each of the two main catchments (ie west catchment and east catchment). Wetland performance is given in Table 10, demonstrating the design meets the BPEM pollutant reduction targets.

Table 9. Treatment asset parameters

Description	*West Catchment*		*East Catchment*	
	Sediment Basin	*Wetland*	*Sediment Basin*	*Wetland*
NWL area, m^2	950	6800	700	5800
Average depth, m	1.0	0.40	1.0	0.40
Extended detention, m	0.35	0.35	0.35	0.35
Residence time, h	-	72		72

Table 10. Overall treatment performance of the system

Parameter	West Catchment	East Catchment
Total Suspended Solids (TSS) removed	83.6%	83.3%
Total Phosphorus (TP) removed	70.0	70.1%
Total Nitrogen (TN) removed	45.0%	45.0%

The sediment pond has been sized in accordance with Melbourne Waters sediment pond design guidelines using the Fair and Geyer equation, design calculations are provided in Table 11.

Table 11. Sediment basin design parameters and checks (west catchment)

	Parameter	Proposed design
Conditions	Contributing Catchment (ha)	41
	Area of Basin (m^2)	950
Capture Efficiency	Settling Velocity of Target Sediment (mm/s) [Particle size 125 µm]	11
	Hydraulic Efficiency (λ)	0.19
	Permanent Pool Depth, dp (m)	1.5 (empty); 0.5 (full)
	Extended detention depth, de	0.35
	Number of CTSR's, n	1.23
	Depth below permanent pool that is sufficient to retain sediment, d* (m)	0.5
	Design Discharge (m^3/s) [4EY]	0.78
	Capture Efficiency	95.1%
	Check (>95%)	OK
Sediment Storage	Sediment Loading rate, Lo (m^3/ha/yr)	2.0
	Desired clean-out frequency, Fr	5
	Storage volume required, St	405
	Available sediment storage volume	500
	Check (Available storage > required storage)	OK
Sediment dewatering	Depth for dewatering area (m)	0.5
	Area required for dewatering (m^2)	810

Table 12. Sediment basin design parameters and checks (east catchment)

	Parameter	Proposed design
Conditions	Contributing Catchment (ha)	33.4
	Area of Basin (m^2)	700
Capture Efficiency	Settling Velocity of Target Sediment (mm/s) [Particle size 125 µm]	11
	Hydraulic Efficiency (λ)	0.19
	Permanent Pool Depth, dp (m)	1.5 (empty); 0.5 (full)
	Extended detention depth, de	0.35
	Number of CTSR's, n	1.23
	Depth below permanent pool that is sufficient to retain sediment, d* (m)	0.5
	Design Discharge (m^3/s) [4EY]	0.58
	Capture Efficiency	95.2%
	Check (>95%)	OK
Sediment Storage	Sediment Loading rate, Lo (m^3/ha/yr)	2.0
	Desired clean-out frequency, Fr	5
	Storage volume required, St	322
	Available sediment storage volume	360
	Check (Available storage > required storage)	OK
Sediment dewatering	Depth for dewatering area (m)	0.5
	Area required for dewatering (m^2)	644

The location of the proposed wetlands within the drainage reserve is shown in Figure 19.

A conceptual layout has been prepared for each asset which includes provision for a 4-metre maintenance access/path around the periphery of the treatment area (ie 50%), sediment dewatering area and batters. The topography within the vicinity of the western wetland is relatively steep, therefore the wetland has been aligned to run parallel to the contours (refer to Figure 20). For the western wetland batters will vary from 1 in 4 (planted) and 1 in 6 (grassed) due to the topography.

Figure 19. *Proposed wetland locations*

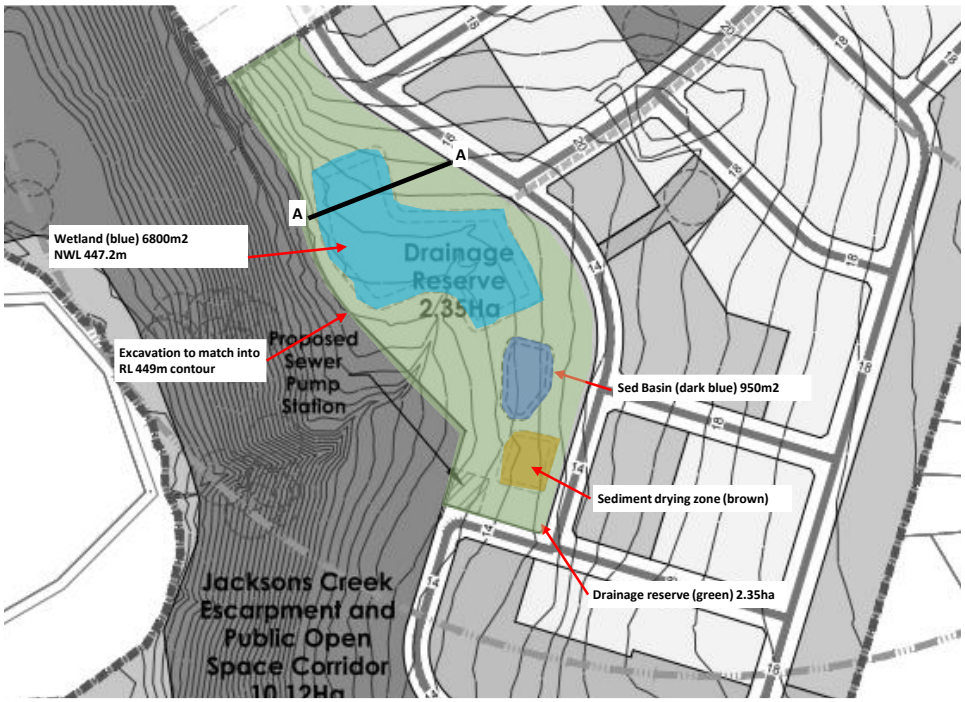


Figure 20. *Proposed west wetland layout*

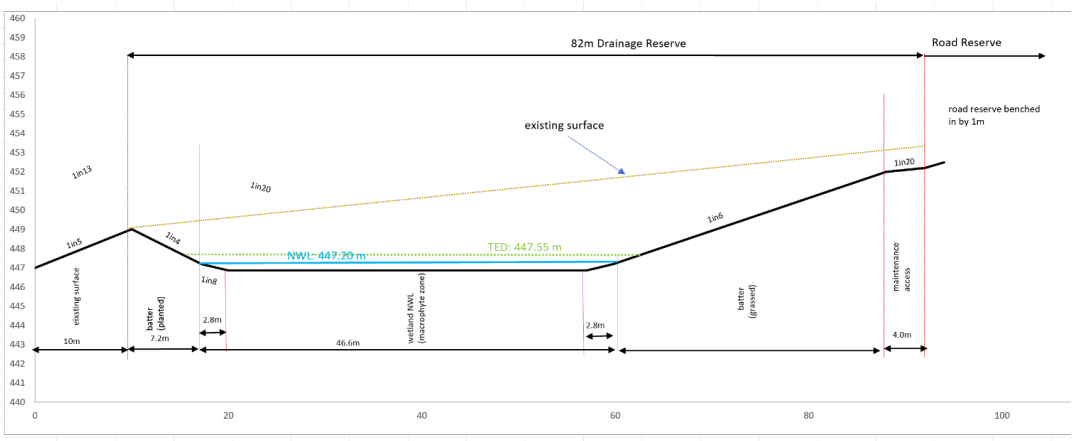


Figure 21. *Proposed west wetland cross-section (A-A)*

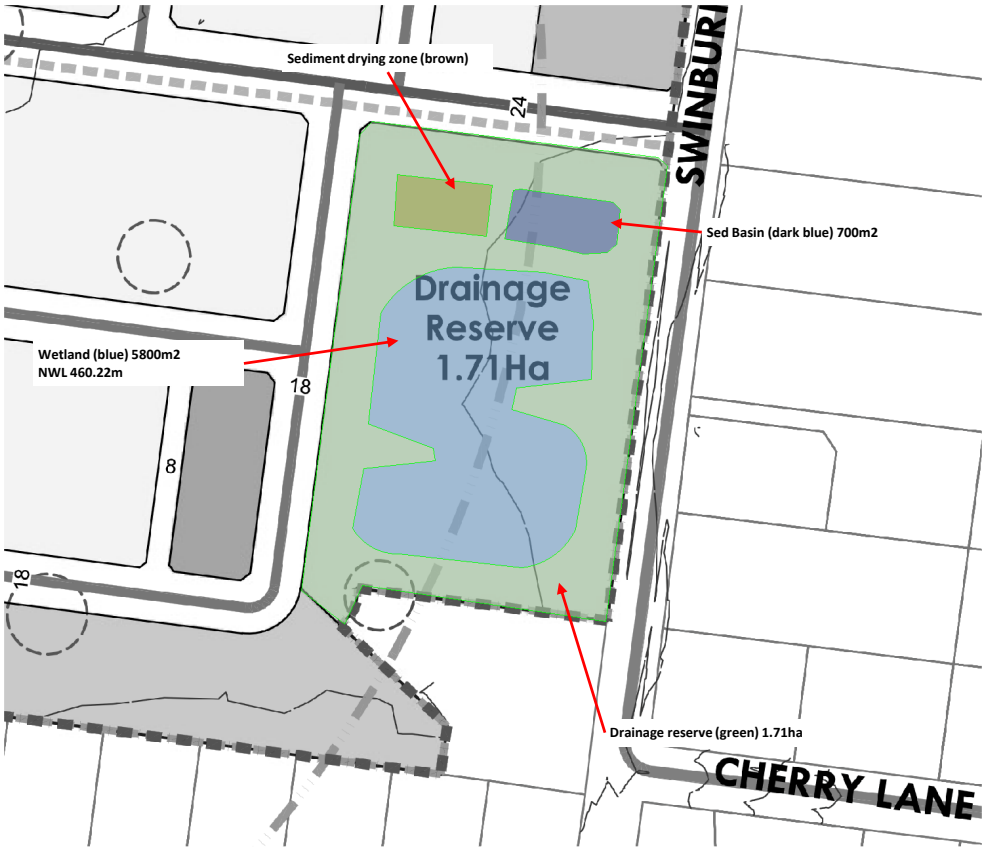


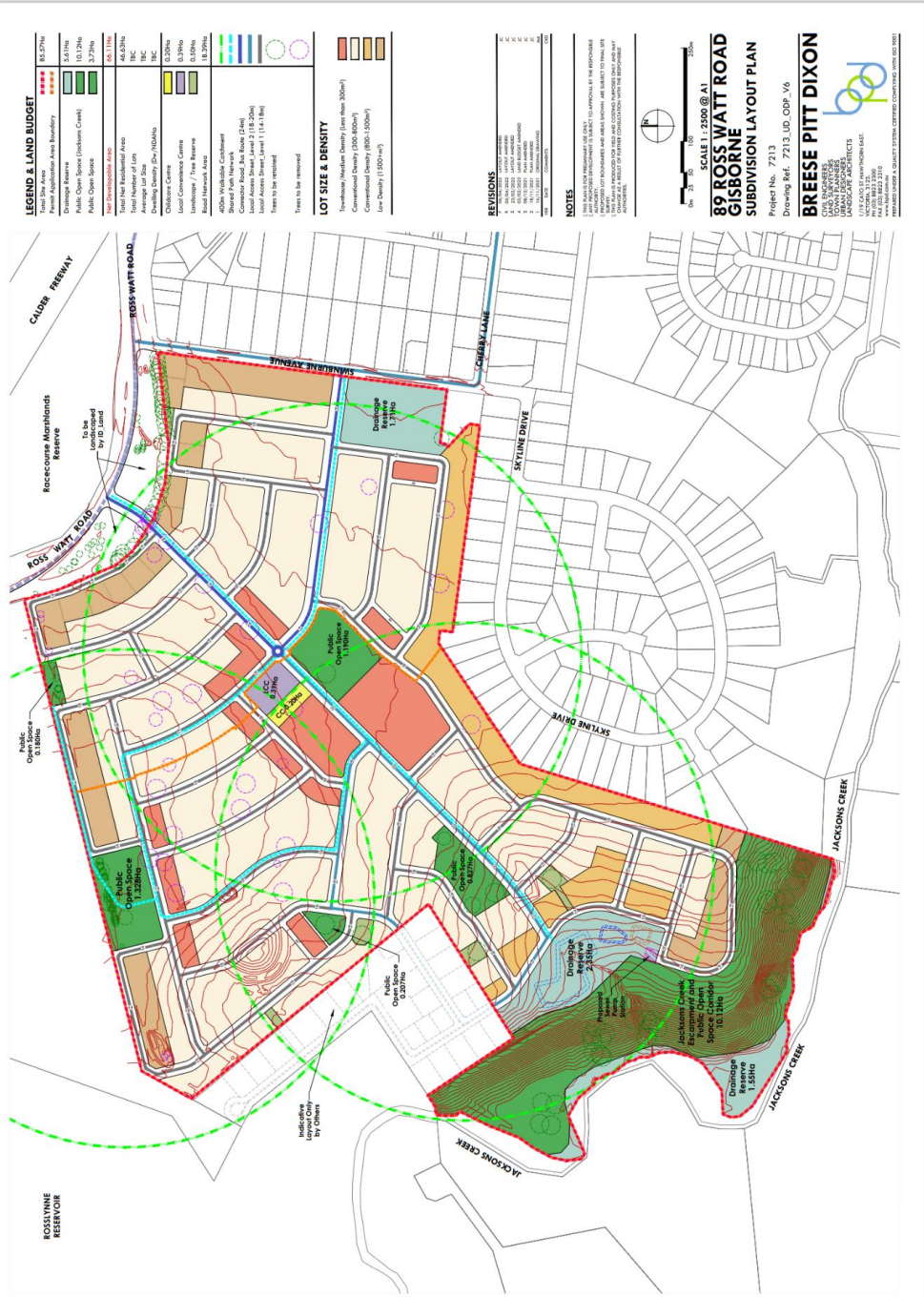
Figure 22. *Proposed east wetland layout*

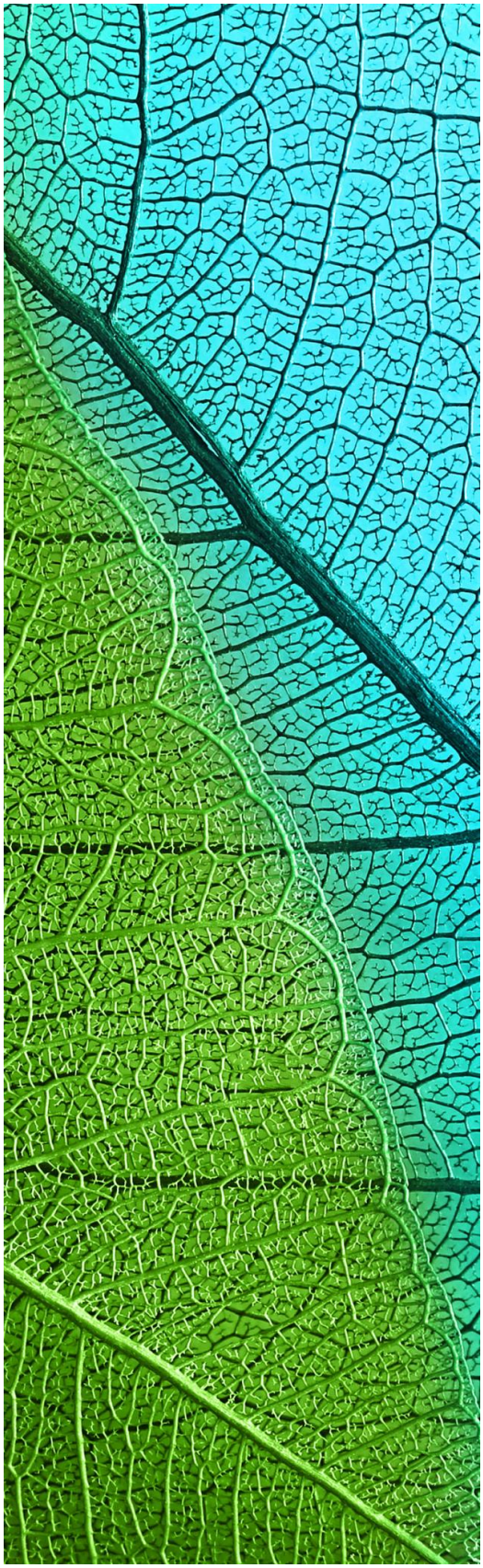
8 Conclusion

This Storm Water Management Strategy (SWMS) report has proposed a management strategy for stormwater quantity and quality for the 89 Ross Watt Road development site. Hydrological assessment has been conducted for the site and stormwater infrastructure and assets have been preliminarily designed to meet stormwater quantity and quality objectives. Through meeting these objectives, this SWMS acts as a critical component of the development servicing strategy and ensures stormwater is managed in accordance with Melbourne Water's and Council's requirements.

APPENDIX A

DEVELOPMENT CONCEPT LAYOUT


LEGEND & LAND BUDGET
Total Site Area 85.27Ha
Permit Application Area Boundary
Drainage Reserve 5.61Ha
Public Open Space (Jacksons Creek) 10.12Ha
Public Open Space 3.73Ha
Net Developable Area 66.11Ha
Total Net Residential Area 46.63Ha
Total Number of Lots TBC
Average Lot Size TBC
Dwelling Density (No./NDAHa) TBC
Childcare Centre 0.20Ha
Local Convenience Centre 0.39Ha
Landscape / Tree Reserve 0.59Ha
Road Network Area 18.39Ha
>40m Wide Public Conservation Sound Path Network
Connector Road_Bus Route (24m)
Local Access Street_Level 2 (18-20m)
Local Access Street_Level 1 (14-16m)
Trees to be retained
Trees to be removed
LOT SIZE & DENSITY
Townhouse/Medium Density (zero from 300m²)
Compact Lot Density (300-400m²)
Conventional Density (400-500m²)
Low Density (>500m²)
REVISIONS
NOTES
SCALE 1 : 2500 @ A1
89 ROSS WATT ROAD
GISBORNE
SUBDIVISION LAYOUT PLAN
Project No. 7213
Drawing Ref. 7213_UD_ODP_V6
BREESE PITT DIXON
CALDER FREEWAY
ROSS WATT ROAD
Racecourse Marshlands Reserve
To be Landscaped by ID Land
SUNBURNE AVENUE
CREEKY LANE
SKYLINE DRIVE
Drainage Reserve 1.17Ha
Public Open Space 1.19Ha
CCC 0.39Ha
CCC 0.20Ha
Public Open Space 0.180Ha
Public Open Space 1.32Ha
Public Open Space 0.427Ha
Public Open Space 0.237Ha
Drainage Reserve 2.35Ha
Proposed Sediment Ponds Subject to Detailed Design
Jacksons Creek Escarpment and Riparian Drainage Space Corridor 10.12Ha
Drainage Reserve 1.55Ha
JACKSONS CREEK
Indicative Layout Only by Others
ROSSLYNNE RESERVOIR



89 Ross Watt Road, Gisborne

Flora and Fauna Assessment

Prepared for ID Ross Watt Road Pty Ltd

May 2022
Report No. 21137 (3.2)

Nature Advisory
(Formerly Brett Lane & Associates Pty Ltd)
5/61-63 Camberwell Road
Hawthorn East, VIC 3123
PO Box 337, Camberwell VIC 3124
(03) 9815 2111
www.natureadvisory.com.au

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1. Executive summary

Nature Advisory Pty Ltd undertook a flora and fauna assessment in August 2021 of an 87.83 hectare area of land in at 89 Ross Watt Road, Gisborne, a property proposed for residential subdivision and development.

The majority of vegetation within the study area consists of paddocks containing a mixture of introduced and native grass species. Large remnant Swamp Gum trees are scattered throughout. Overall, introduced grass species are more abundant than native grass species. Brown-top Bent is the most common species present. Small patches of ephemeral wetland vegetation predominantly comprised of Rush are most numerous in the eastern paddock adjacent to Swinburne Avenue. Riparian vegetation occurs along the banks of Jacksons Creek and a small patch of woodland is present in the south-eastern corner of the study area upslope of the riparian vegetation.

Fauna habitat comprised native treed vegetation, grassland and aquatic areas. Most Swamp Gum trees are hollow-bearing and provide important nesting and roosting habitat for birds, mammals and bats. Grassland areas may provide suitable habitat for Golden Sun Moth. Areas of aquatic habitat are likely to provide important linkages between Jacksons Creek and Gisborne Nature Conservation Reserve to facilitate the movement of frogs and waterbirds.

The following native vegetation was recorded in the study area:

- 40 patches of native vegetation, totalling 13.297 hectares (including 31 large trees in patches); and
- 42 large scattered trees.

The proponent proposed to remove the following vegetation:

- 3.424 hectares of native vegetation in patches; and
- 29 large scattered trees.

These patches were examples of *Higher Rainfall* Plains Grassy Woodland (EVC 55_63), Herb-rich Foothill Forest (EVC 23), Riparian Woodland (EVC 641) and Plains Grassy Wetland (EVC 125).

The DEWLP assessment pathway is determined by the location of the site and extent of native vegetation. The application site lies within Location category 2 and supports more than 0.5 ha of native vegetation. As such, the proposal will be assessed under the **Detailed** assessment pathway. This **would** trigger a referral to DELWP.

Offsets required to compensate for the proposed removal of native vegetation from the study area are provided below.

- 1.228 general habitat units and must include the following offset attribute requirements:
  - Minimum strategic biodiversity value (SBV) of 0.303;
  - Occur within the Port Phillip and Westernport CMA boundary or the Macedon Ranges municipal district; and
  - Include protection of at 29 large trees.

Under the Guidelines all offsets must be secured prior to the removal of native vegetation. The offset target for the current proposal will be achieved via a third-party offset. An online search of the *Native Vegetation Credit Register* (NVCR) has shown that the required offset is currently

available for purchase from a native vegetation credit owner (Appendix 8, DELWP 2020e). The required offset would be secured following approval of the application to remove native vegetation.

The *Native Vegetation Removal* (NVR) report for the proposed removal of native vegetation from within the study area is provided in Appendix 7. The tables below summarise the compliance of the information in this report with the relevant application requirements of the Guidelines (DELWP 2017a).

	Application requirement	Response
1.	Information about the native vegetation to be removed.	Section 4.2 & 4.3.2; Appendix 7
2.	Topographic and land information relating to the native vegetation to be removed.	Section 4.1
3.	Recent, dated photographs of the native vegetation to be removed.	Appendix 5
4.	Details of any other native vegetation approved to be removed, or that was removed without the required approvals, on the same property or on contiguous land in the same ownership as the applicant, in the five-year period before the application for a permit is lodged.	N/A
5.	An avoid and minimise statement.	Section 4.3.1
6.	A copy of any Property Vegetation Plan contained within an agreement made pursuant to section 69 of the *Conservation, Forests and Lands Act 1987* that applies to the native vegetation to be removed.	N/A
7.	Where the removal of native vegetation is to create defendable space, a written statement explaining why the removal of native vegetation is necessary. This statement is not required when the creation of defendable space is in conjunction with an application under the Bushfire Management Overlay.	N/A
8.	If the application is under Clause 52.16, a statement that explains how the proposal responds to the Native Vegetation Precinct Plan considerations (at decision guideline 8).	N/A
9.	An offset statement providing evidence that an offset that meets the offset requirements for the native vegetation to be removed has been identified and can be secured in accordance with the Guidelines.	Section 4.3.6 & Appendix 8

Additional requirements for applications in the Detailed assessment pathway		
Application requirement		Response
10.	A site assessment report of the native vegetation to be removed, including: ▪ A habitat hectare assessment of any patches of native vegetation, including the condition, extent (in hectares), Ecological Vegetation Class and bioregional conservation status. ▪ The location, number, circumference (in centimetres measured at 1.3 metres above ground level) and species of any large trees within patches. ▪ The location, number, circumference (in centimetres measured at 1.3 metres above ground level) and species of any scattered trees, and whether each tree is small or large.	Section 4.2; Appendices 2 & 3
11.	Information about impacts on rare or threatened species habitat, including: The relevant section of the Habitat importance map for each rare or threatened species requiring a species offset. For each rare or threatened species that the native vegetation to be removed is habitat for, according to the Habitat importance maps: ▪ The species' conservation status ▪ The proportional impact of the removal of native vegetation on the total habitat for that species ▪ Whether their habitats are highly localised habitats, dispersed habitats, or important areas of habitat within a dispersed species habitat.	Section 4.3.3 & Appendix 7

The following listed flora species have potential to occur within the study area:

- Matted Flax-lily (EPBC Act: Endangered; FFG Act: Listed)
- Swamp Everlasting (EPBC Act: Vulnerable; FFG Act: Listed)

The following listed fauna species have potential to occur within the study area and may be impacted by the development if present:

- Growling Grass Frog
- Golden Sun Moth
- Striped Legless Lizard

No listed ecological communities occur within the study area.

Targeted surveys are recommended to determine the status of these values in the study area and to assess any potential impacts on these values, should their habitat proposed to be impacted.

Surveys for Striped legless Lizard have been started by setting up tile grids in August 2021.

A Referral under the EPBC Act will be required for the above-listed species, should any be found during targeted surveys and be potentially significantly impacted upon.

2. Introduction

ID Ross Watt Road Pty Ltd engaged Nature Advisory Pty Ltd to conduct a flora and fauna assessment of an 87.83 hectare area of land at 89 Ross Watt Road, Gisborne, a property proposed for residential subdivision and development. This was undertaken in August 2021.

The specific area investigated, referred to herein as the 'study area', comprises grassy paddocks bordered by Ross Watt Road and pastoral land to the north, Swinburne Avenue and residential housing to the east, and Jacksons Creek to the south and west.

This investigation was commissioned to provide information on the extent and condition of native vegetation in the study area according to Victoria's *Guidelines for the removal, destruction or lopping of native vegetation* (DELWP 2017a), herein referred to as 'the Guidelines', as well as any potential impacts on flora and fauna matters listed under the state *Flora and Fauna Guarantee Act 1988* (FFG Act) and the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). This report outlines any implications under relevant national, state and local legislation and policy frameworks.

Specifically, the scope of the investigation included:

- A review of existing information on the flora and native vegetation of the study area and surrounds including:
  - The *Victorian Biodiversity Atlas* administered by the Department of Environment, Land, Water and Planning (DELWP);
  - The *Commonwealth Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) *Protected Matters Search Tool*;
  - DELWP's *Native Vegetation Information Management system* (NVIM); and
  - DELWP's *Naturekit*.
- A site survey involving:
  - Characterisation and mapping of native vegetation on the site, as defined in Victoria's *Guidelines for the removal, destruction or lopping of native vegetation* (the 'Guidelines');
  - Assessment of native vegetation in accordance with the Guidelines, including habitat hectare assessment and/or scattered tree assessment;
  - Compilation of a flora species list for the site;
  - Assessment of the nature and quality of any native fauna habitat present; and
  - Assessment of the likelihood of occurrence of EPBC Act- and *Flora and Fauna Guarantee Act 1988* (FFG Act)-listed flora, fauna and communities on the site.

This report is divided into the following sections:

Section 3 provides the legislative background including details of all relevant Commonwealth, State and local legislation and policies.

Section 4 describes the sources of information, including the methods used for the field survey.

Section 5 presents the assessment results, including details of the native vegetation, flora and fauna of the study area.

Section 6 discusses the proposed impacts of the project.

Section 7 details the implications of the findings under the relevant legislation and policy.

This investigation was undertaken by a team from Nature Advisory comprising Emily Baldwin (Botanist), Peter Lansley (Zoologist), Emma Loboda (GIS Analyst), Kate Callister (Project Manager) and Inga Kulik (Senior Ecologist and Project Manager).

3. Planning and legislative considerations

This investigation and report address the application on the site of relevant legislation and planning policies that protect biodiversity. Local, state and Commonwealth controls are summarised below.

3.1. Local planning provisions

The study area is located within the Macedon Ranges local government area and is currently zoned General Residential Zone – Schedule 1 (GRZ1) in the Macedon Ranges Planning Scheme.

The study area is located within a Bushfire-prone Area.

Local planning provisions apply under the *Victorian Planning and Environment Act 1987*.

3.2. Overlays

The study area is subject to the following three overlays in the Macedon Ranges Planning Scheme:

- *Development Contributions Plan Overlay – Schedule 2* (DCPO2)
- *Development Plan Overlay – Schedule 4* (DPO4)
- *Land Subject to Inundation Overlay* (LSIO)

These overlays are not considered to be relevant to this ecological investigation.

3.3. State planning provisions

State planning provisions are established under the *Victorian Planning and Environment Act 1987*.

Clause 52.17 of all Victorian Planning Schemes states that:

A permit is required to remove, destroy or lop native vegetation, including dead native vegetation.

A permit is not required if:

- An exemption in Table 52.17-7 specifically states that a permit is not required.
- A native vegetation precinct plan corresponding to the land is incorporated into the planning scheme and listed in the schedule to Clause 52.16.
- The native vegetation is specified in a schedule to Clause 52.17.

3.3.1. Exemptions

Exemptions listed in Table 52.17-7 relevant to the study area include:

- *Dead native vegetation:* Native vegetation that is dead is exempt and does not require a planning permit. This does not apply to a standing dead tree with a trunk diameter of 40 centimetres or more at a height of 1.3 metres above ground level. As such, any dead trees with a trunk diameter of 40 centimetres or more at a height of 1.3 metres above ground level have been included in the tree data collected for this investigation.

3.3.2. Application requirements

Any application to remove, destroy or lop native vegetation must comply with the application requirements specified in the Guidelines (DELWP 2017a).

When assessing an application, Responsible Authorities are also obligated to refer to Clause 12.01-2 (Native vegetation management) in the Planning Scheme which in addition to the Guidelines, refers to the following:

- *Assessor's handbook – applications to remove, destroy or lop native vegetation* (Version 1.1) (DELWP 2018a).
- Statewide biodiversity information maintained by DELWP.

The application of the Guidelines (DELWP 2017a) are explained further in Appendix 1.

3.3.3. Referral to DELWP

Clause 66.02-2 of the planning scheme determines the role of DELWP in the assessment of native vegetation removal permit applications. If an application is referred, DELWP may make certain recommendations to the responsible authority in relation to the permit application.

Any application to remove, destroy or lop native vegetation must be referred to DELWP if:

- The impacts to native vegetation are in the Detailed Assessment Pathway;
- A property vegetation plan applies to the site; or
- The native vegetation is on Crown land which is occupied or managed by the responsible authority.

3.4. EPBC Act

The *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) protects a number of threatened species and ecological communities that are considered to be of national conservation significance. Any significant impacts on these species require the approval of the Australian Minister for the Environment.

If there is a possibility of a significant impact on nationally threatened species or communities or listed migratory species, a Referral under the EPBC Act should be considered. The Minister will decide after 20 business days whether the project will be a 'controlled action' under the EPBC Act, in which case it cannot be undertaken without the approval of the Minister. This approval depends on a further assessment and approval process (lasting between three and nine months, depending on the level of assessment).

Implications under the EPBC Act for the current proposal are discussed in Section 7.3.

3.5. FFG Act

The Victorian *Flora and Fauna Guarantee Act 1988* (FFG Act) lists threatened and protected species and ecological communities (DELWP 2018b, DELWP 2017b). Any removal of protected flora, which includes threatened flora species and the plants that make up threatened communities, listed under the FFG Act from public land requires a Protected Flora Licence or Permit under the Act, obtained from DELWP.

The FFG Act only applies to private land where a license is required to remove grass trees, tree ferns and sphagnum moss for sale, or where an Interim Conservation Order has been made to protect critical habitat for a threatened species or community. As no such habitat has ever been declared, this mechanism under the FFG Act has never been implemented.

Implications under the FFG Act for the current proposal are discussed in Section 7.4.

3.6. EE Act

One or a combination of a number of criteria may trigger a requirement for a Referral to the Victorian Minister for Planning who will determine if an Environmental Effects Statement (EES) is required

according to the *Ministerial Guidelines for Assessment of Environmental Effects under the* Environment Effects Act 1978 (DSE 2006).

The criteria related to flora, fauna and native vegetation which trigger a Referral are outlined below.

One or more of the following would trigger a Referral:

- Potential clearing of 10 hectares or more of native vegetation from an area that:
  - Is of an Ecological Vegetation Class identified as endangered by the Department of Sustainability and Environment (in accordance with Appendix 2 of Victoria's Native Vegetation Management Framework); or
  - Is, or is likely to be, of very high conservation significance (as defined in accordance with Appendix 3 of Victoria's Native Vegetation Management Framework); and
  - Is not authorised under an approved Forest Management Plan or Fire Protection Plan
- Potential long-term loss of a significant proportion (e.g. 1 to 5 percent depending on the conservation status of the species) of known remaining habitat or population of a threatened species within Victoria
- Potential long-term change to the ecological character of a wetland listed under the Ramsar Convention or in 'A Directory of Important Wetlands in Australia'
- Potential extensive or major effects on the health or biodiversity of aquatic, estuarine or marine ecosystems, over the long term

Two or more of the following would also trigger a Referral:

- Potential clearing of 10 hectares or more of native vegetation, unless authorised under an approved Forest Management Plan or Fire Protection Plan
- Matters listed under the Flora and Fauna Guarantee Act 1988:
  - Potential loss of a significant area of a listed ecological community; or
  - Potential loss of a genetically important population of an endangered or threatened species (listed or nominated for listing), including as a result of loss or fragmentation of habitats; or
  - Potential loss of critical habitat; or

Potential significant effects on habitat values of a wetland supporting migratory bird species.

Implications under the *Environment Effects Act 1978* (EE Act) for the current proposal are discussed in Section 7.5.

3.7. CaLP Act

The *Catchment and Land Protection Act 1994* (CaLP Act) requires that landowners (or a third party to whom responsibilities have been legally transferred) must eradicate regionally prohibited weeds and prevent the growth and spread of regionally controlled weeds.

Weed species listed on the CaLP Act that have been recorded in the study area are discussed in Section 7.6.

4. Existing information and methods

4.1. Existing information

Existing information used for this investigation is described below.

4.1.1. Existing reporting and documentation

The existing documentation below, relating to the study area was reviewed.

- Macedon Ranges Planning Scheme

4.1.2. Native vegetation

Pre-1750 (pre-European settlement) vegetation mapping administered by DELWP was reviewed to determine the type of native vegetation likely to occur in the study area and surrounds. Information on Ecological Vegetation Classes (EVCs) was obtained from published EVC benchmarks. These sources included:

- Relevant EVC benchmarks for the Victorian Volcanic Plain and Central Victorian Uplands bioregion[1] (DSE 2004a);
- *NatureKit* (DELWP 2020a).

4.1.3. Listed matters

Existing flora and fauna species records and information about the potential occurrence of listed matters was obtained from an area termed the 'search region', defined here as an area with a radius of ten kilometres from the approximate centre point of the study area (coordinates: latitude 37° 28' 26" S and longitude 144° 34' 47" E).

A list of the flora and fauna species recorded in the search region was obtained from the *Victorian Biodiversity Atlas* (VBA), a database administered by DELWP.

The online EPBC Act *Protected Matters Search Tool* (DAWE 2020a) was consulted to determine whether nationally listed species or communities potentially occurred in the search region based on habitat modelling.

4.2. Field methods

The field assessments were conducted on the 17th June 2021 (overview assessment), 4th August and 11th August 2021. During this assessment, the majority of the study area was surveyed on foot. Land designated as the Jacksons Creek Escarpment in the proposed development plan and roadside vegetation along Ross Watt Road was in addition surveyed for native vegetation on 6th May 2022.

Sites in the study area found to support native vegetation were mapped through a combination of aerial photograph interpretation and ground-truthing using a hand-held GPS (accurate to approximately five metres). Species and ecological communities listed as threatened under the EPBC Act were also mapped using the same method.

[1] A bioregion is defined as "a geographic region that captures the patterns of ecological characteristics in the landscape, providing a natural framework for recognising and responding to biodiversity values". In general bioregions reflect underlying environmental features of the landscape (DNRE 1997).

4.2.1. Native vegetation

Native vegetation is currently defined in Clause 73.01 of all Victorian planning schemes as 'plants that are indigenous to Victoria, including trees, shrubs, herbs and grasses'. The Guidelines (DELWP 2017a) further classify native vegetation as belonging to two categories:

- Patch; or
- Scattered tree.

The definitions of these categories are provided below, along with the prescribed DELWP methods to assess them. Further details on definitions of patches and scattered trees are provided in Appendix 1.

Patch

A patch of native vegetation is either:

- An area of vegetation where at least 25 per cent of the total perennial understorey plant cover is native; or
- Any area with three or more native canopy trees[2] where the drip line[3] of each tree touches the drip line of at least one other tree, forming a continuous canopy; or
- Any mapped wetland included in the *Current wetlands map*, available at *MapShareVic* (DELWP 2020b).

Patch condition is assessed using the habitat hectare method (Parkes *et al.* 2003; DSE 2004b) whereby components of the patch (e.g. tree canopy, understorey and ground cover) are assessed against an EVC benchmark. The score effectively measures the percentage resemblance of the vegetation to its original condition.

The *Native Vegetation Information Management* (NVIM) system (DELWP 2020c) provides modelled condition scores for native vegetation to be used in certain circumstances.

Scattered tree

A scattered tree is:

- A native canopy tree[2] that does not form part of a patch.

Scattered trees are counted and mapped, the species identified and their circumference at 1.3 m above the ground is recorded.

4.2.2. Flora species and habitats

Records of flora species were made in conjunction with sampling methods used to undertake habitat hectare assessments of native vegetation described above. Specimens requiring identification using laboratory techniques were collected.

Species protected under the FFG Act were determined by crosschecking against the FFG Act *Protected Flora List* (DELWP 2017b).

[2] A native canopy tree is a mature tree (i.e. it is able to flower) that is greater than 3 metres in height and is normally found in the upper layer of the relevant vegetation type.
[3] The drip line is the outermost boundary of a tree canopy (leaves and/or branches) where the water drips on to the ground.

The potential for habitats to support listed flora species was assessed based on the criteria outlined below:

- The presence of suitable habitat for flora species such as soil type, floristic associations and landscape context; and
- The level of disturbance of suitable habitats by anthropogenic disturbances and invasions by pest plants and animals.

Wherever appropriate, a precautionary approach was adopted in determining the likelihood of occurrence or flora listed under the EPBC Act and/or FFG Act. That is, where insufficient evidence was available on the potential occurrence of a listed species, it is assumed that it could be in an area of suitable habitat.

4.2.3. Fauna species and habitats

During the site assessment, the presence of fauna habitat was noted. Fauna habitats are described using habitat components that include old-growth trees, fallen timber, leaf litter and surface rocks.

The study area's habitat connectivity (i.e. degree of isolation/fragmentation), including linkages to other habitats in the region, was determined using field observations, recent aerial photography and *NatureKit* (DELWP 2020a).

Wherever appropriate, a precautionary approach was adopted in determining the likelihood of occurrence of fauna listed under the EPBC Act and FFG Act. That is, where insufficient evidence was available on the potential occurrence of a listed species, it was assumed that it could be present in an area of suitable habitat.

4.2.4. Threatened ecological communities

The study area was assessed against published descriptions of relevant listed ecological communities modelled to potentially occur in the study area.

Reviewed ecological community descriptions comprised identification criteria and condition thresholds from listing advice for EPBC Act communities as well as FFG Act-listed community descriptions (SAC 2015).

4.3. Limitations of field assessment

Whilst this assessment was not designed to provide an exhaustive inventory of flora species in the study area, all efforts were made to schedule the site assessment at a time of year when the majority of native vegetation life forms are likely to be present. The timing of the survey was considered suitable to ascertain the extent and condition of native vegetation within the study area. The accuracy of some species identification may be reduced due to the fact that most grasses did not have inflorescences present. The timing of the survey and condition of vegetation was otherwise considered suitable to ascertain the extent and condition of native vegetation and fauna habitats.

5. Assessment results

5.1. Site description

The study area for this investigation (Figure 1) is 87.38 hectares of private land located at Gisborne, approximately 50 kilometres from Melbourne's CBD. The study area is bordered by Ross Watt Road and pastoral land to the north, Swinburne Avenue and residential housing to the east, and Jacksons Creek to the south and west.

The study area supports heavy soils on an undulating landscape sloping down towards Jacksons Creek. Several dams occur within the study area. The study area and surrounding land to the north and south are currently used for livestock grazing.

The majority of vegetation within the study area consists of paddocks containing a mixture of introduced and native grass species. Large remnant Swamp Gum trees are scattered throughout. Overall, introduced grass species are more abundant than native grass species. Brown-top Bent is the most common species present. Small patches of ephemeral wetland vegetation predominantly comprised of Rush are most numerous in the eastern paddock adjacent to Swinburne Avenue. Riparian vegetation occurs along the banks of Jacksons Creek and a small patch of woodland is present in the south-eastern corner of the study area upslope of the riparian vegetation.

Fauna habitat within the study area consists of native treed vegetation, grassland and aquatic areas. Large scattered remnant trees are numerous and hollow-bearing, however most are isolated from patches of treed vegetation adjacent to Jacksons Creek.

The following key fauna habitat areas occurred within the region:

- Gisborne Nature Conservation Reserve to the northeast. This reserve was separated from the study area by Ross Watt Road.
- Jacksons Creek along the southern and western boundaries of the study area.
- Rosslynne Reservoir approximately 200 metres to the northwest. A narrow strip of grassland and treed vegetation separated the reservoir from the study area.
- Lerderderg State Park approximately 4 kilometres to the southwest. A mixture of pastoral land and remnant bush separated the study area from the State Park.

The study area provides an important link between Gisborne Nature Conservation Reserve and Jacksons Creek and Rosslynne Reservoir.

The study area lies within the Victorian Volcanic Plain and Central Victorian Uplands bioregions and falls within the Port Phillip and Westernport catchment management area.

5.2. Native vegetation

5.2.1. Patches of native vegetation

Pre–European EVC mapping (DELWP 2020a) indicated that the study area and surrounds would have supported Higher Rainfall Plains Grassy Woodland (EVC 55_63), Plains Grassy Woodland (EVC 55), Herb-rich Foothill Forest (EVC 23) and Riparian Woodland (EVC 641) prior to European settlement based on modelling of factors including rainfall, aspect, soils and remaining vegetation.

Evidence on site, including floristic composition and soil characteristics, suggested suggests that Higher Rainfall Plains Grassy Woodland (EVC 55_63), Plains Grassy Woodland (EVC 55), Plains

Sedgy Wetland (EVC 647) and Tall Marsh (EVC 821) are present within the study area (Figure 1). A description of these EVCs is provided within the EVC benchmarks in Appendix 6.

40 patches (referred to herein as habitat zones) comprising the abovementioned EVCs, were identified in the study area (Table 1). This totalled an area of 13.297 hectares of native vegetation in patches and included 31 large trees.

Table 1: Description of habitat zones in the study area

Habitat Zone	EVC	Description
A	Plains Grassy Woodland (EVC 55)	Mature Black Wattle (60% cover) over a ground layer of Wallaby Grass (10% cover) and introduced weeds including Cape Weed and Couch (80% cover).
B	Plains Grassy Woodland (EVC 55)	Wallaby Grass (40% cover) formed the majority of native vegetation within this habitat zone. Scattered Rush was also present (1% cover). Weed cover was moderate (55%) and predominantly comprised Brown-top Bent, Couch and Ribwort.
C	*Higher Rainfall* Plains Grassy Woodland (EVC 55_63)	Characterised by Wallaby Grass (30% cover) and a moderate cover of bryophytes (10%) and weeds (40%). Brown-top Bent and Onion Grass were common.
D	*Higher Rainfall* Plains Grassy Woodland (EVC 55_63)	A canopy of Gum Tree (15% cover) over an understorey of immature canopy specimens, Black Wattle and Blackwood (55% cover combined). Cherry Ballart was also present in the understorey. The groundstorey consisted of Wallaby Grass and Spear Grass (7% cover combined) with scattered Wood Sorrel and isolated Crane's Bill and Groundsel. A moderate cover of weeds (50%) was present. Blackberry, Drooping Cassinia and Canary Grass were the most common weed species observed.
E & F	*Higher Rainfall* Plains Grassy Woodland (EVC 55_63)	This habitat zone comprised a ground layer of Wallaby Grass (30% cover). Weed cover was moderate (55%) and Brown-top Bent, Cape Weed and Cat's Ear were numerous.
G, H, I, J, K, L, M, N, P, Q & R	Plains Sedgy Wetland (EVC 647)	Rush (25% cover) was moderately abundant and weed cover high (60%). Brown-top Bent was widespread.
O	Plains Sedgy Wetland (EVC 647)	A moderate cover of Rush (40%) with Spike Sedge (10%) occurring in deeper water. Bulrush was also present (1% cover). Brown-top Bent was the main weed species observed (15% total weed cover).
S	*Higher Rainfall* Plains Grassy Woodland (EVC 55_63)	Blackwood (60% cover) shaded a groundstorey of Kangaroo Grass and Wallaby Grass (50% cover combined). Weed cover was moderate (50%) and Brown-top Bent and Canary Grass common.

Habitat Zone	EVC	Description
T	*Higher Rainfall* Plains Grassy Woodland (EVC 55_63)	Native vegetation comprised Black Wattle (55% cover), Blackwood (10% cover) and Wallaby Grass (20% cover). No mature canopy specimens of Blackwood were present. A moderate cover of weeds (45%) predominantly comprised Brown-top Bent and Canary Grass. Bryophyte cover was high (25%).
U	*Higher Rainfall* Plains Grassy Woodland (EVC 55_63)	Blackwood (50% cover) and Black Wattle (25% cover) constituted the highest stratum of vegetation as no canopy was present within this habitat zone. Ground layer vegetation consisted of Wallaby Grass (20% cover) and weeds such as Brown-top Bent and Canary Grass (65% cover combined).
V	*Higher Rainfall* Plains Grassy Woodland (EVC 55_63)	Black Wattle (80% cover) was the sole indigenous species present. In the ground layer, bryophytes were abundant (40% cover) but weed cover was high (70%). Common weed species included Brown-top Bent and Canary Grass.
W	*Higher Rainfall* Plains Grassy Woodland (EVC 55_63)	Black Wattle (80% cover) shaded a ground layer of Wallaby Grass (10% cover), bryophytes (25% cover) and a moderate cover of weeds (30%). Brown-top Bent and Canary Grass were common.
X	*Higher Rainfall* Plains Grassy Woodland (EVC 55_63)	Native vegetation comprised a canopy of Swamp Gum (7% cover) over an understorey of immature canopy specimens (10% cover), Blackwood and Black Wattle (8% cover combined). Wallaby Grass (40% cover) and bryophytes (30% cover) were abundant in the groundlayer and were interspersed with Brown-top Bent and Canary Grass (30% total weed cover).
Y	*Higher Rainfall* Plains Grassy Woodland (EVC 55_63)	Native vegetation comprised a Black Wattle and Blackwood (30% cover) canopy over a diverse but sparse understory (10% total cover) including Creeping Bossiaea, Sheep's Burr, Wallaby Grasses, Kangaroo Grass and Small-leaved Clematis. Bryophytes were largely absent. Weed cover was very high (70%) and comprised a canopy of Radiata Pine and a dense understory of Hawthorn, Blackberry, Sweet Briar and various exotic pasture grasses.
Z, AA, AB	*Higher Rainfall* Plains Grassy Woodland (EVC 55_63)	Native vegetation consisted largely of dense clusters of Blackwood (50%) over a very sparse understory layer (<1-5%) of Hairy Willow-herb, Bristly Wallaby-grass, Sheep's Burr and Rush. Bryophytes were absent. Understory weed cover was extremely high (80%) and consisted largely of Toowoomba Canary Grass.
AC	*Higher Rainfall* Plains Grassy Woodland (EVC 55_63)	Native vegetation consisted solely of an understory of Red-leg Grass, Bog Sedge and Scarlet Sundew (30%) with intermittent bryophytes (15%). Weed cover was high (30%) and consisted of Rat's-tail Fescue and Paspalum.

Habitat Zone	EVC	Description
AD	*Higher Rainfall* Plains Grassy Woodland (EVC 55_63)	Native vegetation consisted of a dense cluster of Black Wattle (45%) with scattered Windmill Grass and Crane's Bill (<1%). Bryopyhtes were present at low cover (1%). Weed cover in the ground layer was very high (80%) and largely consisted of Toowoomba Canary-grass with Blackberry, Morning Glory, Prunus, Hemlock and Scotch Broom.
AE	Herb-rich Foothill Forest (EVC 23)	Native vegetation consisted of several clusters of Manna Gum and Swamp Gum (3%), including 24 large trees, over a ground layer of dense Wallaby Grasses, Spear Grasses, Kangaroo Grass and Weeping Grass (60%). Native herbs such as Bluebells, Sweet Hound's-tongue, Tall Raspwort, Groundsel and Slender Dock were also present (5%). Weed cover was moderate (20%), and largely consisted of scattered patches of Blackberry, Sweet Vernal-grass and Spear Thistle.
AF-AM	Tall Marsh (EVC 821)	Creekline vegetation dominated by Narrow-leaf Cumbungi, Broad-leaf Cumbungi and Common Reed (40-60%), including a diversity of herbs and graminoids such as Club Sedge, Swamp Crassula, Common Water-ribbons, Common Spike-sedge, Slender Knotweed, Red Pondweed and Streaked Arrowgrass (10-25%). Bryophytes were present at low cover (3%). Pussy Willow was the dominant weed which separated these habitat zones, and had variable cover across them, from 50% in HZ AI to 10% in HZ AF.
AN	Riparian Woodland (EVC 641)	Native vegetation consisted of Manna Gum and Swamp Gum (20%), including 3 large trees, over a sparse ground layer of Wallaby Grasses, Spear Grasses, Kangaroo Grass and Weeping Grass (10%). Native herbs such as Crane's Bill, Tall Raspwort and Spreading Crassula were also present (<1%). Weed cover was very high (60%), and largely consisted of scattered patches of Blackberry and Sweet Vernal-grass.

The habitat hectare assessment results for these habitat zones are provided in Appendix 1. More detailed habitat scoring results are presented in Appendix 2. Details of large trees in patches are provided in Appendix 3. The DBHs of large trees within the Jackson Creek Reserve (mostly Manna Gums and Swamp Gums) have been estimated.

Table 2: Summary of habitat hectare assessment results

Habitat Zone	EVC	Area (ha)	Condition Score (out of 100)	Large Trees recorded
A	Plains Grassy Woodland (EVC 55)	0.031	21	0
B	Plains Grassy Woodland (EVC 55)	0.626	16	0
C	Higher Rainfall Plains Grassy Woodland (EVC 55_63)	0.397	21	0
D	Higher Rainfall Plains Grassy Woodland (EVC 55_63)	1.032	40	0

Habitat Zone	EVC	Area (ha)	Condition Score (out of 100)	Large Trees recorded
E	Higher Rainfall Plains Grassy Woodland (EVC 55_63)	3.569	20	1
F	Higher Rainfall Plains Grassy Woodland (EVC 55_63)	0.309	19	0
G	Plains Sedgy Wetland (EVC 647)	0.064	24	0
H	Plains Sedgy Wetland (EVC 647)	0.010	22	0
I	Plains Sedgy Wetland (EVC 647)	0.052	22	0
J	Plains Sedgy Wetland (EVC 647)	0.033	22	0
K	Plains Sedgy Wetland (EVC 647)	0.014	22	0
L	Plains Sedgy Wetland (EVC 647)	0.028	22	0
M	Plains Sedgy Wetland (EVC 647)	0.033	22	0
N	Plains Sedgy Wetland (EVC 647)	0.023	22	0
O	Plains Sedgy Wetland (EVC 647)	0.034	46	0
P	Plains Sedgy Wetland (EVC 647)	0.035	24	0
Q	Plains Sedgy Wetland (EVC 647)	0.081	24	0
R	Plains Sedgy Wetland (EVC 647)	0.002	22	0
S	Higher Rainfall Plains Grassy Woodland (EVC 55_63)	0.005	17	0
T	Higher Rainfall Plains Grassy Woodland (EVC 55_63)	0.039	17	0
U	Higher Rainfall Plains Grassy Woodland (EVC 55_63)	0.017	18	0
V	Higher Rainfall Plains Grassy Woodland (EVC 55_63)	0.001	13	0
W	Higher Rainfall Plains Grassy Woodland (EVC 55_63)	0.003	22	0
X	Higher Rainfall Plains Grassy Woodland (EVC 55_63)	0.739	32	2
Y	Higher Rainfall Plains Grassy Woodland (EVC 55_63)	0.390	36	0
Z	Higher Rainfall Plains Grassy Woodland (EVC 55_63)	0.009	16	0
AA	Higher Rainfall Plains Grassy Woodland (EVC 55_63)	0.008	16	0
AB	Higher Rainfall Plains Grassy Woodland (EVC 55_63)	0.110	19	0
AC	Higher Rainfall Plains Grassy Woodland (EVC 55_63)	0.006	18	0
AD	Higher Rainfall Plains Grassy Woodland (EVC 55_63)	0.070	11	0
AE	Herb-rich Foothill Forest (EVC 23)	4.500	46	24
AF	Tall Marsh (EVC 821)	0.320	46	0
AG	Tall Marsh (EVC 821)	0.011	39	0
AH	Tall Marsh (EVC 821)	0.017	24	0
AI	Tall Marsh (EVC 821)	0.005	36	0
AJ	Tall Marsh (EVC 821)	0.010	45	0
AK	Tall Marsh (EVC 821)	0.390	56	0
AL	Tall Marsh (EVC 821)	0.078	49	0
AM	Tall Marsh (EVC 821)	0.079	46	0
AN	Riparian Woodland (EVC 641)	0.120	45	3
Total		13.297		31

Figure 1: Study area and native vegetation

5.2.2. Scattered trees

Scattered trees recorded in the study area would have once comprised the canopy component of *Higher Rainfall* Plains Grassy Woodland (EVC 55_63).

42 large scattered trees (≥ 70-centimetre DBH) occurred in the study area (Figure 1).

Details of all scattered trees recorded are listed in Appendix 3.

5.3. Flora species

5.3.1. Species recorded

During the field assessments 30 plant species were recorded. Of these, 18 (60%) were indigenous and 12 (40%) were introduced or non-indigenous native in origin (Appendix 4).

5.3.2. Listed species

VBA records (DELWP 2020d) and the EPBC Protected Matters Search Tool (DAWE 2020a) indicated that within the search region there were records of, or there occurred potential suitable habitat for, 12 flora species listed under the Commonwealth EPBC Act and 11 listed under the state FFG Act, including 8 listed under both Acts. No flora species listed under the EPBC Act were recorded during the field survey.

Species considered 'likely to occur' are those that have a very high chance of being in the study area based on numerous records in the search region and suitable habitat in the study area. Species considered to have the 'potential to occur' are those for which suitable habitat exists, but recent records are scarce.

Targeted surveys are recommended to determine the status of these values in the study area.

The likelihood of occurrence in the study area of species listed under the EPBC Act and FFG Act is addressed in Table 3. Species considered 'likely to occur' are those that have a very high chance of being in the study area based on numerous records in the search region and suitable habitat in the study area. Species considered to have the 'potential to occur' are those for which suitable habitat exists, but recent records are scarce.

This analysis indicates that the following two listed flora species have the potential to occur:

- Matted Flax-lily (EPBC Act: Endangered; FFG Act: Listed, flowering Dec–Feb)
- Swamp Everlasting (EPBC Act: Vulnerable; FFG Act: Listed, flowering Nov–March)

Table 3: Listed flora species and the likelihood of their occurrence in the study area

Common name	Scientific name	Conservation status		Habitat	Likelihood of occurrence
		EPBC	FFG		
Bacchus Marsh Wattle	*Acacia rostriformis*		L	Confined to the Bacchus Marsh area (Lerderderg Gorge, Long Forest, Coimadai, Balliang and Werribee) where it occurs in low hilly areas in Eucalyptus woodland. (vicflora.rbg.vic.gov.au)	No specimens observed within the study area - **unlikely to occur**.
River Swamp Wallaby-grass	*Amphibromus fluitans*	VU		River Swamp Wallaby-grass grows mostly in permanent swamps and also lagoons, billabongs, dams and roadside ditches. The species requires moderately fertile soils with some bare ground; conditions that are caused by seasonally-fluctuating water levels (DAWE 2020).	No records nearby, habitat highly disturbed - **unlikely to occur.**
Ornate Pink-fingers	*Caladenia ornata*	VU	L	Heathy forest and among shrubs on seasonally moist sandy loams (Jones 2006).	No suitable habitat present and no records nearby - **unlikely to occur**.
Candy Spider-orchid	*Caladenia versicolor*	VU	L	The candy spider-orchid is found on plains, sedgy woodland and shallow sands woodland dominated by Eucalyptus leucoxylon (yellow gum) (DAWE 2020).	Vegetation within the study area is highly modified and no records nearby - **unlikely to occur**.
Matted Flax-lily	*Dianella amoena*	EN	L	Lowland grassland and grassy woodlands on well-drained to seasonally waterlogged fertile sandy loams to heavy cracking soils derived from sedimentary or volcanic Geology. It is widely distributed from eastern to south-western Victoria (DAWE 2020).	No specimens observed within the study area but numerous records nearby - **potential to occur** along the northern boundary of the study area.
Sunshine Diuris	*Diuris fragrantissima*	EN	L	Native grasslands dominated by Kangaroo Grass, on heavy basalt soils, often with embedded basalt boulders. The sole remaining natural population at Sunshine occurs in a small (0.1 ha) remnant of Western (Basalt) Plains Grassland (DAWE 2020).	Habitat present is highly modified and no records nearby - **unlikely to occur.**

Common name	Scientific name	Conservation status		Habitat	Likelihood of occurrence
		EPBC	FFG		
Purple Diuris	*Diuris punctata*		L	Principally in lowland native grasslands, grassy woodlands, heathy woodlands and open heathlands, usually on fertile, loamy soils and including periodically inundated areas (Earl & Barlow 2004).	All nearby records relate to known population in Riddles Creek, approximately 10km east of the study area. Habitat on site highly degraded - **unlikely to occur.**
Trailing Hop-bush	*Dodonaea procumbens*	VU		Grows in low lying, often winter wet areas in woodland, low open-forest heathland and grasslands on sands and clays. Largely confined to SW of Victoria (DAWE 2020).	Habitat present is highly modified and no records nearby - **unlikely to occur**.
Black Gum	*Eucalyptus aggregata*	VU	L	Very restricted in Vic. to the Gisborne- Woodend region (Brooker & Slee 1996).	No specimens of this conspicuous species observed within the study area - **unlikely to occur**.
Large-flower Crane's-bill	*Geranium sp. 1*		L	Volcanic plains in Grassy Woodland, Plains Grassland and Plains Grassy Wetland (Bull 2014).	Known only from four population groups, the nearest being Riddlels Creek. Habitat highly degraded - **unlikely to occur.**
Clover Glycine	*Glycine latrobeana*	VU	L	Found across south-eastern Australia in native grasslands, dry sclerophyll forests, woodlands and low open woodlands with a grassy ground layer. In Victoria, populations occur in lowland grasslands, grassy woodlands and sometimes in grassy heath (DAWE 2020).	Habitat present is highly modified and no records in the locality - **unlikely to occur.**
Adamson's Blown-grass	*Lachnagrostis adamsonii subsp. adamsonii*	VU		Confined to slow moving creeks, swamps, flats, depressions or drainage lines that are seasonally inundated or waterlogged and usually moderately to highly saline. Appear to favour sites that have some shelter from the wind (DAWE 2020).	Habitat present is highly modified and no records in the locality - **unlikely to occur.**

Common name	Scientific name	Conservation status		Habitat	Likelihood of occurrence
		EPBC	FFG		
Basalt Peppercress	*Lepidium hyssopifolium s.s.*	EN	L	Known to establish on open, bare ground with limited competition from other plants. Previously recorded from Eucalypt woodland with a grassy ground cover, low open Casuarina woodland with a grassy ground cover and tussock grassland. Now generally found amongst exotic pasture grasses and beneath exotic trees (DAWE 2020).	Suitable habitat present but no records in the locality - **unlikely to occur.**
Spiny Rice-flower	*Pimelea spinescens subsp. spinescens*	CR	L	Occurs in grassland or open shrubland on basalt derived soils, usually comprising black or grey clays. Plants from more northerly populations occur on red clay complexes, while plants from southern populations occur on heavy grey-black clay loams. Topography is generally flat but populations may occur on slight rises or in slightly wettish depressions.	Habitat present is highly modified and no records nearby - **unlikely to occur**.
Maroon Leek-orchid	*Prasophyllum frenchii*	EN	L	Grows mainly in open sedge swampland or in wet grassland and wet heathland generally bordering swampy regions. Sites are generally low altitude, flat and moist. Soils are generally moderately rich damp sandy or black clay loams. Climate is mild, with an annual rainfall of 600–1100 mm, occurring predominantly in winter and spring (DAWE 2020).	Habitat present is highly modified and no records nearby - **unlikely to occur**.
Green-striped Greenhood	*Pterostylis chlorogramma*	VU	L	Occurs in mixed Box-Stringybark forest with a shrubby understorey, often with Pteridium esculentum as a major component on sandy or clay loam soils (Duncan et al. 2009).	No suitable habitat present - **unlikely to occur**.
Button Wrinklewort	*Rutidosis leptorhynchoides*	EN	L	In Victoria restricted to open stands of plains grassland and grassy woodlands, on fertile clays to clay loams, usually in areas where the grass cover is more open, either as a result of recurrent fires or grazing by native macropods or stock. It also occurs on low rises with shallow, stony soils at less than 100 m above sea level.	Habitat present is highly modified and no records nearby - **unlikely to occur**.

Common name	Scientific name	Conservation status		Habitat	Likelihood of occurrence
		EPBC	FFG		
Large-headed Fireweed	*Senecio macrocarpus*	VU	L	In Victoria, Large-fruit Fireweed occurs most commonly in grasslands on red-brown earth soils. It may also occur in grassy woodlands and open woodlands predominantly in the Western (Basalt) Plains grassland on red brown earth soils found on recent Quaternary (basalt) deposits (DAWE 2020).	No suitable habitat present and no records nearby - **unlikely to occur**.
Swamp Fireweed	*Senecio psilocarpus*	VU		Herb-rich winter-wet swamps on volcanic clays or peaty soils (Walsh 1999). Known from approximately 10 sites between Wallan, about 45 km north of Melbourne, and Honans Scrub in south-eastern South Australia (TSSC 2008).	Recorded in wetlands of the Gisborne Nature Conservation Reserve just north of the study area, but no habitat present on site - **unlikely to occur.**
Hairy-leaf Triggerplant	*Stylidium armeria subsp. pilosifolium*		L	Is thought to be confined to dry heathy vegetation on skeletal shaly soils in the southern foothills of the Macedon Range near Riddells Creek and the Pyrete Range (Best et al. 2009).	No suitable habitat present - **unlikely to occur**.
Swamp Everlasting	*Xerochrysum palustre*	VU	L	Grows in wetlands including sedge-swamps and shallow freshwater marshes, often on heavy black clay soils. Commonly associated genera include *Amphibromus, Baumea, Carex, Chorizandra, Craspedia, Eleocharis, Isolepis, Lachnagrostis, Lepidosperma, Myriophyllum, Phragmites australis, Themea triandra* and *Villarsia* (DAWE 2020).	Recorded in wetlands of the Gisborne Nature Conservation Reserve just north of the study area. Habitat on site highly degraded but **potential to occur**, especially in the north/northwest of the study area.

Notes: EPBC = threatened species status under EPBC Act (EX = presumed extinct in the wild; CR = critically endangered; EN = endangered; VU = vulnerable); **FFG** = threatened species status under the FFG Act = listed as threatened (L) under the FFG Act.

5.4. Fauna habitats

The study area supported the following three fauna habitat types.

- Native treed vegetation;
- Grassland; and
- Aquatic habitat.

Native Treed Vegetation: Native treed vegetation predominantly consisted of large scattered remnant Swamp Gum. A small area of woodland occurred in the south-eastern corner of the study area. Most Swamp Gum were very old and contained at least one hollow. Many had multiple hollows (see picture below). Hollows provide important nesting and roosting habitat for birds, mammals and bats. Swamp Gum also provide food resources either directly (flowers) or indirectly (insects) for fauna.

Grassland: Grassland covered the majority of the study area and comprised native and introduced species (see picture below). Patches of Wallaby Grass present may be suitable Golden Sun Moth habitat.

Aquatic habitat: Small patches of Plains Grassy Wetland and several dams were scattered throughout the study area. Most patches of wetland were ephemeral but contained water at the time of the survey (see pictures above and below). These patches provide habitat for frogs and waterbirds, and are likely to provide important links between Jacksons Creek and Gisborne Nature Conservation Reserve. Both frogs and waterbirds were observed to be utilising aquatic habitat present.

5.5. Fauna species

5.5.1. Listed species

The review of existing information (including VBA records (DELWP 2020d) and the results of the EPBC Protected Matters Search Tool (DAWE 2020a)) indicated that within the search region there were records of, or there occurred potential suitable habitat for 17 fauna species listed under the Commonwealth EPBC Act and the state FFG Act. The likelihood of occurrence of these species in the study area was assessed and the results are presented in Table 4.

This analysis of potential occurrence of listed fauna species excludes:

- Marine fauna given that the study area is inland; and
- Migratory oceanic bird species (such as albatrosses and petrels) and migratory shorebirds given that the study area is inland.

Species considered 'likely to occur' are those that have a very high chance of being in the study area given the existence of numerous records in the search region and suitable habitat in the study area. Using the precautionary approach, species considered to have the 'potential to occur' are those for which suitable habitat exists, but recent records are scarce. This analysis indicates that 17 listed fauna species are likely to occur or have the potential to occur. These species are:

- Black Falcon (FFG Act listed)
- Eastern Great Egret (EPBC Act, migratory, FFG Act Listed)
- Latham's Snipe (EPBC Act, migratory)
- Little Eagle (FFG Act listed)
- Powerful Owl (FFG Act listed)
- Rufous Fantail (EPBC Act, migratory)
- Satin Flycatcher (EPBC Act, migratory)
- Swift Parrot (EPBC and FFG Act listed)
- White-throated Needletail (EPBC Act listed)
- Grey-headed Flying Fox (EPBC and FFG Act listed)
- Platypus (FFG Act listed)
- Southern Greater Glider (EPBC and FFG Act listed)
- Striped Legless Lizard (EPBC and FFG Act listed)
- Dwarf Galaxias (EPBC and FFG Act listed)
- Amethyst Hairstreak Butterfly (FFG Act listed)
- Golden Sun Moth (EPBC and FFG Act listed)
- Growling Grass Frog (EPBC and FFG Act listed)

The susceptibility of these species to impacts from development is discussed in Section 5.5.2.

Table 4: Listed fauna species and the likelihood of their occurrence in the study area

Common Name	Scientific Name	Conservation Status			Habitat	Number of Records	Date of Last Record	Likelihood of Occurrence
		EPBC-T	EPBC-M	FFG				
Birds								
Australasian Bittern	*Botaurus poiciloptilus*	EN		cr	Terrestrial wetlands, including a range of wetland types but prefers permanent water bodies with tall dense vegetation, particularly those dominated by sedges, rush, reeds or cutting grass (Marchant & Higgins 1990).	4	3/03/2017	Lack of habitat. Unlikely to occur.
Australian Painted-snipe	*Rostratula australis*	EN		cr	Generally inhabits shallow terrestrial freshwater wetlands, including temporary and permanent lakes, swamps and claypans. They also use inundated or waterlogged grassland or saltmarsh, dams, rice crops, sewage farms and bore drains. Typical sites include those with rank emergent tussocks of grass, sedges, rushes or reeds, or samphire; often with scattered clumps of *lignum muehlenbeckia* or canegrass or sometimes tea-tree (Melaleuca). Sometimes utilises areas that are lined with trees, or that have some scattered fallen or washed-up timber (DAWE 2020).	None	N/A	Lack of habitat. Unlikely to occur.
Black Falcon	*Falco subniger*			cr	Woodlands, open country and terrestrial wetlands; in arid and semi-arid zones; mainly over open plains and undulating land with large tracts of low vegetation. It is more commonly found in north-western Victoria and is only occasionally found in southern Victoria. It is a highly mobile species, moving in response to food availability and seasonal conditions (Marchant & Higgins 1993).	4	9/02/2018	Habitat exists. Potential to occur.
Common Greenshank	*Tringa nebularia*		M (Bonn A2H, ROKAMBA, JAMBA, CAMBA)	en	Inhabits wide range of coastal or inland wetlands with varying levels of salinity; mainly muddy margins or rocky shores of wetlands (Higgins & Davies 1996).	None	N/A	Lack of habitat. Unlikely to occur.
Common Sandpiper	*Actitis hypoleucos*		M (Bonn A2H, ROKAMBA, JAMBA, CAMBA)	vu	Inhabits a wide range of coastal or inland wetlands with varying levels of salinity; mainly muddy margins or rocky shores of wetlands. In Victoria, mostly found Westernport and Port Phillip Bay (Higgins & Davies 1996).	None	N/A	Lack of habitat. Unlikely to occur.
Curlew Sandpiper	*Calidris ferruginea*	CR	M (Bonn A2H, ROKAMBA, JAMBA, CAMBA)	cr	Inhabits wide range of coastal or inland wetlands with varying levels of salinity; mainly muddy margins or rocky shores of wetlands (Higgins & Davies 1996).	None	N/A	Lack of habitat. Unlikely to occur.
Diamond Dove	*Geopelia cuneata*			vu	Mostly arid and semi-arid grassland savannah, often of spinifex and in low open woodlands with grassy understorey. Also often found in open riparian woodlands (Higgins & Davies 1996).	3	5/01/2017	Site is beyond normal range. Unlikely to occur,
Eastern Curlew	*Numenius madagascariensis*	CR	M (Bonn A1, ROKAMBA, JAMBA, CAMBA)	cr	Inhabits sheltered coasts, especially estuaries, embayment, harbours, inlets and coastal lagoons with large intertidal mudflats or sandflats, often with beds of sea grass (Higgins & Davies 1996).	None	N/A	Lack of habitat. Unlikely to occur.
Eastern Great Egret	*Ardea alba*		M (Bonn A1, ROKAMBA, JAMBA, CAMBA)	vu	Occurs in a variety of wetlands including: permanent water bodies on flood plains; shallows of deep permanent lakes, either open or vegetated with shrubs or trees; semi-permanent swamps with tall emergent vegetation (e.g. bulrush) and herb dominated seasonal swamps with abundant aquatic flora (Marchant & Higgins 1990).	8	12/09/2018	Habitat exists (farm dams) and high quality habitat available nearby. Likely to occur.

Common Name	Scientific Name	Conservation Status			Habitat	Number of Records	Date of Last Record	Likelihood of Occurrence
		EPBC-T	EPBC-M	FFG				
Grey Falcon	*Falco hypoleucos*	VU		vu	Inhabits arid and semi-arid zones; mainly on sandy and stony plains of inland drainage systems, lightly timbered with acacia. Hunt far into open areas, over spinifex, tussock grasslands and low shrublands. In Victoria, few records mostly in north and northwestern regions (Marchant & Higgins 1993).	None	N/A	Lack of habitat. Unlikely to occur.
Latham's Snipe	*Gallinago hardwickii*		M (Bonn A2H, ROKAMBA, JAMBA, CAMBA)		Occurs in wide variety of permanent and ephemeral wetlands; it prefers open freshwater wetlands with dense cover nearby, such as the edges of rivers and creeks, bogs, swamps, waterholes. The species is wide spread in southeast Australia and most of its population occurs in Victoria, except in the northwest of the state (Naarding 1983; Higgins & Davies 1996).	4	1/08/2016	Habitat exists (farm dams and wet pasture with soft substrate) and high quality habitat available nearby. Likely to occur.
Lewin's Rail	*Lewinia pectoralis*			vu	Occurs in a variety of densely vegetated wetland habitats, fresh or saline, and usually with areas of standing water. Requires shallow water areas for foraging (Marchant & Higgins 1993).	10	12/09/2018	Lack of habitat. Unlikely to occur.
Little Eagle	*Hieraaetus morphnoides*			vu	Open forests and woodlands, open country and grasslands, including floodplains and shrublands in semi-arid zone (Marchant & Higgins 1993).	5	17/12/1977	Habitat exists. Likely to occur.
Osprey	*Pandion cristatus*		M (Bonn A2S)		Rare vagrant to Victoria (Marchant & Higgins 1993). Littoral and coastal habitats and terrestrial wetlands. They are mostly found in coastal areas but occasionally travel inland along major rivers (Johnstone & Storr 1998; Marchant & Higgins 1993; Olsen 1995). They require extensive areas of open fresh, brackish or saline water for foraging (Marchant & Higgins 1993).	None	N/A	Lack of habitat. Unlikely to occur.
Painted Honeyeater	*Grantiella picta*	VU		en	Inhabits box-ironbark forests and woodlands and mainly feeds on the fruits of mistletoe. Strongly associated with mistletoe around the margins of open forests and woodlands. Can also be found in farmland containing remnant treed vegetation. Occurs at few localities. Uncommon breeding migrant from further north, arriving in October and leaving in February (Higgins et al. 2001; Tzaros 2005).	None	N/A	Lack of habitat. Unlikely to occur.
Pectoral Sandpiper	*Calidris melanotos*		M (Bonn A2H, ROKAMBA, JAMBA)		Inhabit shallow fresh to saline wetlands, usually coastal to near-coastal, but occasionally farther inland. Wetlands often have open fringing mudflats and low emergent or fringing vegetation (Higgins & Davies 1996).	None	N/A	Lack of habitat. Unlikely to occur.
Powerful Owl	*Ninox strenua*			vu	Found in open and tall wet sclerophyll forests with sheltered gullies and old growth forest with dense understorey. They are also found in dry forests with box and ironbark eucalypts and River Red Gum. Large old trees with hollows are required by this species for nesting. In Victoria, the Powerful Owl is widespread, having been recorded from most of the state. However, throughout its range it is uncommon and occurs in low densities (Higgins 1999). Also occurs in highly urbanised areas, such as metropolitan Melbourne, where they are heavily reliant upon various forms of movement corridors (riparian strips, roadside vegetation and recreational reserves) to both hunt within and navigate throughout the landscape (Carter et al. 2019).	25	26/06/2019	Some riparian habitat. Potential to occur.
Rufous Fantail	*Rhipidura rufifrons*		M (Bonn A2H)		In east and south-east Australia, mainly inhabits tall wet sclerophyll forests, often in gullies. When on passage in warmer months, they are sometimes recorded in drier sclerophyll forests and woodlands, as well as parks and gardens (Higgins et al. 2006). Virtually absent from south-eastern Australia during winter (Higgins et al. 2006).	28	3/06/2017	Some riparian habitat. Potential to occur.

Common Name	Scientific Name	Conservation Status			Habitat	Number of Records	Date of Last Record	Likelihood of Occurrence
		EPBC-T	EPBC-M	FFG				
Satin Flycatcher	*Myiagra cyanoleuca*		M (Bonn A2H)		Mostly found in eucalypt forest, particularly tall wet forests and woodland within gullies (Higgins et al. 2006). Also inhabits eucalypt woodland comprising an open understorey and a grassy ground layer (Higgins et al. 2006). Generally absent from rainforest (Higgins et al. 2006).	26	12/09/2009	Some riparian habitat. Potential to occur.
Sharp-tailed Sandpiper	*Calidris acuminata*		M (Bonn A2H, ROKAMBA, JAMBA, CAMBA)		Inhabit shallow fresh to saline wetlands, usually coastal to near-coastal, but occasionally farther inland. Wetlands often have open fringing mudflats and low emergent or fringing vegetation (Higgins & Davies 1996).	None	N/A	Lack of habitat. Unlikely to occur.
Swift Parrot	*Lathamus discolor*	CR		cr	Prefers a select range of eucalypts in Victoria, including Yellow Gum, Grey Box, White Box, Red Ironbark and Yellow Box, as well as River Red-gum when this species supports abundant 'lerp' (Saunders & Tzaros 2011). The species is also known to forage within planted stands of Spotted Gum and Sugar Gum (Nature Advisory; unpublished data). Breeds in Tasmania and migrates to the mainland of Australia for the autumn, winter and early spring months. It lives mostly north of the Great Dividing Range, passing through two areas of Victoria on migration: the Port Phillip district and Gippsland (Emison et al. 1987; Higgins 1999; Kennedy & Tzaros 2005). Though it is also not uncommonly sighted in urban areas (Nature Advisory; unpublished data). Occurrence of this species on the mainland can substantially change from year to year depending on food availability, giving potential for this species to occur almost anywhere throughout its range (Emison et al. 1987).	None	N/A	Some habitat (Swamp Gum). Potential to occur.
White-bellied Sea-Eagle	*Haliaeetus leucogaster*			en	Maritime habitats, terrestrial large wetlands and coastal lands of tropical and temperate Australia and offshore islands, ranging far inland only over large rivers and wetlands. The eagles usually breed on coast and offshore islands and inland beside large lakes or rivers, usually in tall trees in or near water, also in cliffs, rock pinnacles and escarpments (Marchant & Higgins 1993).	1	23/05/2010	Lack of habitat. Unlikely to occur.
White-throated Needletail	*Hirundapus caudacutus*	VU	M (CAMBA, ROKAMBA, JAMBA)	vu	Aerial, over all habitats, but probably more over wooded areas, including open forest and rainforest. Often over heathland and less often above treeless areas such as grassland and swamps or farmland (Higgins 1999).	13	5/01/2017	Habitat exists. Potential to occur.
Yellow Wagtail	*Motacilla flava*		M (CAMBA, JAMBA, ROKAMBA)		Regular non-breeding visitor in northern Australia mainly spring-summer, vagrant to the south. Occupies a wide range of habitats, usually open areas with low vegetation such as crop, grassland and even parkland. Often recorded near water (Higgins, Peter & Cowling 1999)	None	N/A	Lack of habitat. Unlikely to occur.
Mammals								
Brush-tailed Phascogale	*Phascogale tapoatafa*			vu	Dry forest and woodland in association with box, ironbark and stringybark eucalypts (Menkhorst 1995). Closely associated with remnant vegetation, this species occupies large home ranges of woodland habitat (M=100Ha; F=20-70Ha) (Menkhorst 1995).	13	13/05/2016	Lack of habitat. Unlikely to occur.
Grey-headed Flying-fox	*Pteropus poliocephalus*	VU		vu	Brisbane, Newcastle, Sydney and Melbourne are occupied continuously. Elsewhere, during spring, they are uncommon south of Nowra and widespread in other areas of their range. Roosts in aggregations of various sizes on exposed branches. Roost sites are typically located near water, such as lakes, rivers or the coast. Roost vegetation includes rainforest patches, stands of *Melaleuca*, mangroves and riparian vegetation, but colonies also use highly modified vegetation in urban and suburban areas (DAWE 2020).	None	N/A	Mobile and wide-ranging species for which habitat exists. Potential to occur.

Common Name	Scientific Name	Conservation Status			Habitat	Number of Records	Date of Last Record	Likelihood of Occurrence
		EPBC-T	EPBC-M	FFG				
Long-nosed Potoroo	*Potorous tridactylus trisulcatus*	VU		vu	In Victoria, the species occupies a wide variety of wet forest and wet scrub, usually occuring on sandy loam soils where rainfall exceeds 750mm annually (Menkhorst 1995); In Tasmania, moist forest with dense shrub layer; in the north edge of rainforest (Menkhorst 1995). Dense understorey vegetation is an essential component for the species persistence, which can consist of grass trees, sedges, ferns, heath, tea-tree or melaleucas (Menkhorst 1995).	None	N/A	Lack of habitat. Unlikely to occur.
Platypus	*Ornithorhynchus anatinus*			vu	Inhabits freshwater streams, ranging from alpine creeks to tropical lowland rivers; also lakes, shallow reservoirs and farm dams (Menkhorst and knight 2001).	7	15/11/2017	Some habitat in creek forming site boundary. Potential to occur.
Southern Greater Glider	*Petauroides volans*	VU		vu	In Victoria, this species inhabits forest habitats dominated by peppermint, stringybark, ash and gum eucalypts (Menkhorst 1995). Restricted to the central highlands and eastern Victoria, and common in areas of high rainfall. Rare in dry stringybark-box and Snow Gum forest, and does not occur in the box-ironbark or River Red-gum dominated riverina regions (Menkhorst 1995).	13	29/11/1993	Some riparian habitat. Potential to occur.
Spot-tailed Quoll	*Dasyurus maculatus maculatus*	EN		en	Rainforest, wet and dry forest, coastal heath and scrub and River Red-gum woodlands along inland rivers (Menkhorst 1995).	3	1/01/1992	Habitat exists, although with such a low population in Victoria, unlikely to occur.
Reptiles								
Striped Legless Lizard	*Delma impar*	VU		en	Grassland specialist. Known to occur in some areas dominated by introduced species such as Harding Grass Phalaris aquatica, Serrated Tussock Nasella trichotoma and Flatweed Hypocharis radicata and at sites with a history of grazing and pasture improvement. shelter in grass tussocks, thick ground cover, soil cracks, under rocks, spider burrows, and under ground debris such as timber. The majority of sites in Victoria and NSW occur on cracking clay soils with some surface rock which provide shelter for the species (DAWE 2020).	None	N/A	Habitat exists. Potential to occur.
Pink-tailed Worm-Lizard	*Aprasia parapulchella*	VU		en	Sites where the species is found generally include rocky outcrops or scattered partly buried rocks. This species is diurnal and largely fossorial, sheltering under rocks and vegetation, and in the burrow passages of small ants and termites within grassland and woodland habitats of south-eastern Australia (Robertson & Coventry 2019). It feeds primarily on the larvae and eggs of ants. In Victoria, the species is largely restricted to box-ironbark woodland in the greater Bendigo region, though it may also persist elsewhere in the state (Robertson & Coventry 2019).	None	N/A	Lack of habitat. Unlikely to occur.
Fish								
Dwarf Galaxias	*Galaxiella pusilla*	VU		en	Ranges from the Melbourne region to the Mitchell River basin in central Gippsland. Western populations (from Barwon River catchment west) recently [2015] split as Little Galaxias *G. toourtkoourt.* Vegetated margins of still water, ditches, swamps and backwaters of creeks, both ephemeral and permanent (Allen et al. 2002). Some wetlands where it occurs may partially or completely dry up during summer, with such wetlands reliant on seasonal flooding plus linkages to other sites where the species occurs, for habitat and population replenishment (Saddlier, Jackson & Hammer 2010). Dwarf Galaxias is also often found in association with burrowing freshwater crayfish (Engaeus spp.), with the crayfish burrows reportedly providing refuge from predators and dry conditions for the species (Saddlier, Jackson & Hammer 2010).	None	N/A	Habitat may exist (riparian zone). Potential to occur.
Flat-headed Galaxias	*Galaxias rostratus*	CR		vu	Still or gently flowing water on the margins of lakes, billabongs and streams. Usually swims in midwater over rock or sand bottoms, also in the vicinity of aquatic plants such as ribbon weed (Allen et al. 2002).	None	N/A	Lack of habitat. Unlikely to occur.

Common Name	Scientific Name	Conservation Status			Habitat	Number of Records	Date of Last Record	Likelihood of Occurrence
		EPBC-T	EPBC-M	FFG				
Invertebrates								
Amethyst Hairstreak Butterfly	*Jalmenus icilius*			en	Grassy open-woodland and Acacia shrubland in lower rainfall areas, particularly the arid zone, where the food plants (primarily *Acacia spp.*) grow as shrubs (Braby 2016).	25	22/01/2021	Occurs is Acacia shrubland including Blackwood *A.melanoxylon*. Potential to occur.
Caddisfly	*Archaeophylax canarus*			dd	Poorly known. Mostly in eastern ranges of Victoria, but also recorded Otway Range, Wombat Forest area and Whittlesea (EOL 2021). Caddisflies are usually found in waterways - streams, ponds, lakes, usually in still water; larvae occur in damp, rotting vegetation.	2	25/11/1998	Poorly known. Potential to occur along riparian zone.
Golden Sun Moth	*Synemon plana*	CE		vu	Areas that are, or have been native grasslands or grassy woodlands. It is known to inhabit degraded grasslands with introduced grasses being dominant, with a preference for the native wallaby grass being present (DEWHA 2009).	None	N/A	Small patches of suitable habitat (Spear-grass Austrostipa spp., Wallabygrass, Chilean Needle-grass) may occur. Potential to occur.
Amphibians								
Brown Toadlet	*Pseudophryne bibronii*			en	Wet and dry forest, grassy areas besides small creeks, alpine grasslands and mossy bogs (Cogger 2000). In Victoria, the Brown Toadlet is distributed from the north-east through to central and western Victoria with scattered records in Gippsland (SWIFFT 2020).	1	3/08/1980	No recent records and paucity of habitat. Unlikely to occur.
Growling Grass Frog	*Litoria raniformis*	VU		vu	Permanent, still or slow flowing water with fringing and emergent vegetation in streams, swamps, lagoons and artificial wetlands such as farm dams and abandoned quarries (Clemann & Gillespie 2004).	6	17/09/1988	Habitat exists. Potential to occur.

Notes: EPBC-T = threatened species status under EPBC Act (EX = presumed extinct in the wild; CR = critically endangered; EN = endangered; VU = vulnerable); **EPBC-M**: migratory status under the EPBC Act (M = listed migratory taxa; Bonn Convention (A2H) - Convention on the Conservation of Migratory Species of Wild Animals – listed as a member of a family; Bonn Convention (A2S) - Convention on the Conservation of Migratory Species of Wild Animals - species listed explicitly; CAMBA - China-Australia Migratory Birds Agreement; JAMBA - Japan-Australia Migratory Birds Agreement; ROKAMBA - Republic of Korea Australia Migratory Birds Agreement); **FFG =** listed as threatened (L) under the FFG Act.

5.5.2. Susceptibility of listed fauna to impacts

The following analysis identifies the susceptibility to development of listed fauna species which may utilise the study area. This analysis includes consideration of the factors below.

- The mobility of the species
- The availability and extent of other suitable habitat in the region and the degree to which each species may rely on habitat in the study area

Targeted surveys will be required to determine the presence or absence of any listed fauna species considered to be susceptible to impacts from development.

Birds (non-migratory)

Three listed non-migratory bird species are considered to have the potential to occur in the study area. The susceptibility of these species to possible impacts from any development in the study area is discussed below.

- **Eastern Great Egret** (EPBC Act: Migratory; FFG Act: Vulnerable)

This species may occur in the study area during times following heavy rain events resulting in more extensive inundation of low-lying areas adjacent to the existing wetlands and dams. There are more extensive suitable areas nearby, e.g. Gisborne Nature Conservation Reserve, which has a high quality wetland that would provide suitable habitat for Eastern Great Egret. There is unlikely to be any significant impact on Eastern Great Egret arising from development of the study area.

- **Powerful Owl** (FFG Act: Vulnerable)

This species may occur in the study area in the forest remnant in the south-east corner and along the riparian area of Jacksons Creek where treed habitat is close to continuous. Extensive habitat lies not far to the west in the catchment of Rosslyne Reservoir. It may be expected therefore that the Powerful Owl would reach the study area at least occasionally during its foraging, given its large home range (Higgins 1999; Soderquist and Gibbons 2007) and existence of potentially suitable Herb-rich Foothill Forest (EVC 23). No significant impact is expected as no breeding trees are present on site.

- **Swift Parrot** (EPBC Act: Critically Endangered; FFG Act: Critically Endangered)

This species may occur in the study area in some years when on site Swamp Gums (*Eucalyptus ovata*) are flowering extensively and other more traditional habitat such as the Box Ironbark forests of northern and central Victoria (Kennedy and Tzaros 2005) fail to produce sufficient forage for the species. This would be an infrequent event but may be important intermittently such as during drought conditions. It is likely however that this species is able to find alternative foraging areas, as demonstrated by recent records of over 100 birds from planted Spotted Gums (*Corymbia maculata*) in the Melbourne area and ranging as far as Port Macquarie, NSW in numbers in winter 2021, with additional small numbers in south-east Queensland (eBird species maps, 2021). For this reason, no significant impacts are expected from the development for this species.

- **Black Falcon and Little Eagle** (FFG Act: critically endangered and vulnerable)

Both species may occasionally occur in the woodland areas of the study area and adjacent to it. Black Falcon and Little Eagle are highly mobile species, moving in response to food availability and seasonal conditions and would not be impacted significant by the removal of trees within the study area.

Migratory Birds

Six listed migratory bird species (excluding oceanic species and shorebirds) have the potential to occur in the study area. The susceptibility of these species to possible impacts from any development in the study area is discussed below.

- **Eastern Great Egret** – discussed under non-migratory species, above.
- **Latham's Snipe (EPBC Act: Migratory)**

This species may occur in the study area seasonally (late August to March) following rain events resulting in more extensive inundation of low-lying areas adjacent to the existing wetlands and dams, particularly where soft substrates (e.g. mud) results in suitable feeding habitat. More extensive suitable areas nearby (i.e. Gisborne Nature Conservation Reserve) have a high quality wetland that likely provides habitat for Latham's snipe in spring and summer and some birds may visit the study area intermittently. Given the extent of habitat however, the study area is unlikely to support more than a few birds and therefore the risk to the species populations arising from development of the site is low.

- **White-throated Needletail** (EPBC Act: Migratory; FFG Act: Vulnerable)

This species is a trans-equatorial migrant breeding in north-east Asia and spending its non-breeding season in Australia from September to April (Higgins 1999). It is likely to occur regularly in summer and early autumn on a few days per year when conditions are suitable, such as warm days with unsettled conditions such as low-pressure weather events approaching (e.g. thunderstorms and fronts). It forages aerial insects and is rarely if ever seen perching in Australia. Given its aerial habits and occasional occurrence, it is unlikely White-throated Needletail would be directly impacted by the development. Indirect impacts would amount to a very small loss of insect prey and represent a negligible loss to the species overall.

- **Rufous Fantail** (EPBC Act: Migratory)

This species breeds in densely forested habitats along the coast and Great Dividing Range of eastern Australia. It migrates north as far as southern New Guinea to spend winter (Higgins et al. 2006). This species may occur in the study area in the forest remnant in the south-east corner and along the riparian area of Jacksons Creek where treed habitat is close to continuous. Extensive habitat lies not far to the west in the catchment of Rosslyne Reservoir. Since the areas of potential habitat are not extensive and suboptimal for breeding, it is likely any impacts from development upon the species' regional population would be minimal. Indirect impacts would amount to a very small loss of insect prey and represent a negligible loss to the species overall.

- **Satin Flycatcher** (EPBC Act: Migratory)

This species breeds in densely forested habitats along the coast and Great Dividing Range of south eastern Australia, including Tasmania. It migrates north to New Guinea to spend winter (Higgins et al. 2006). This species may occur in the study area in the forest remnant in the south-east corner and along the riparian area of Jacksons Creek where treed habitat is close to continuous. Extensive potential habitat lies not far to the west in the catchment of Rosslyne Reservoir. Since the areas of potential habitat are not extensive in the study area and probably suboptimal for breeding, it is likely any impacts from

development upon the species' regional population would be minimal. Indirect impacts would amount to a very small loss of insect prey and represent a negligible loss to the species overall.

Mammals

Two listed mammal species are considered to have the potential to occur in the study area. The susceptibility of these species to possible impacts from any development in the study area is discussed below.

- **Platypus** (FFG Act: Vulnerable)

This species could occur in the channel of the Jackson's Creek running along the southern boundary of the study area. There are seven records from the search region, so the species could occur given habitat connectivity along Jackson's Creek to Rosslyne Reservoir. As no impacts are proposed on the creekline habitat, this species is unlikely to be impacted by the proposed development.

- **Southern Greater Glider** (EPBC Act: Vulnerable; FFG Act: Vulnerable)

This species may occur in the study area in the forest remnant in the south-east corner and along the riparian area of Jacksons Creek where treed habitat is close to continuous. Extensive habitat lies close (<0.5 km) to the west in the catchment of Rosslyne Reservoir. Although there have been no records from the search region since 1993, Southern Greater Glider may still occur in the study area given the connectivity with more extensive potential habitat around the Rosslyne Reservoir, and large proportion of large trees with hollows on site and along the riparian strip of Jacksons Creek. Pre-clearance surveys and salvage will be required if any large trees with hollows are proposed to be removed.

- **Grey-headed Flying Fox** (EPBC Act: Vulnerable; FFG Act: Vulnerable)

Roost sites are typically located near water, such as lakes, rivers or the coast. This species may occasionally visit the site and feed on flowering eucalypts. No significant impacts are expected from the proposed development as a wide range of food sources is available adjacent to the study area.

Reptiles

One listed reptile species is considered to have the potential to occur in the study area. The susceptibility of this species to possible impacts from any development in the study area is discussed below.

- **Striped Legless Lizard** (EPBC Act: Vulnerable; FFG Act: Vulnerable)

The species could plausibly be present in remnant grassland fragments of the study area. Although much of the area is dominated by the introduced pasture grass Brown-top Bent (not considered suitable to support SLL populations), other grassland fragments in the study area should be surveyed at the appropriate season (September to November) to inform risk to the species. If present, this species could be impacted by development.

Frogs

One listed frog species is considered to have the potential to occur in the study area. The susceptibility of this species to possible impacts from any development in the study area is discussed below.

- **Growling Grass Frog** (EPBC Act: Vulnerable; FFG Act: Vulnerable)

This species may occur in the study area given its proximity to an extensive suitable area nearby (i.e. Gisborne Nature Conservation Reserve and its high-quality wetland bisecting the Calder Freeway) and potential habitat on site. Growling Grass Frog may move into the study area from time to time to use farm dams or small wetland remnants. If present, it could be impacted by development.

Fish

One listed fish species is considered to have the potential to occur in the study area. The susceptibility of this species to possible impacts from any development in the study area is discussed below.

- **Dwarf Galaxias** (EPBC Act: Vulnerable; FFG Act: Endangered)

This species could occur in the channel of the Jackson's Creek running along the boundary of the study area, and any ephemeral drainage line connecting with Jackson's Creek. Although there are no records from the search region, this may be due to lack of sampling for small native fish in the area. As no impacts are proposed on the creekline habitat, this species is unlikely to be impacted by the proposed development.

Invertebrates

Two listed invertebrate species are considered to have the potential to occur in the study area. The susceptibility of these species to possible impacts from any development in the study area is discussed below.

- **Amethyst Hairstreak** (FFG Act: Endangered)

This butterfly species may occur in the study area given the presence of potential habitat in the form of grassy woodland remnants likely to include some *Acacia* spp. shrubs. There are 25 records from the search region including one dated 2021. If present, it could be impacted by development, so a precautionary survey at the appropriate season (e.g. December), would be advisable.

- **Golden Sun Moth** (EPBC Act: Critically Endangered; FFG Act: Vulnerable)

The species could plausibly be present in remnant grassland fragments of the study area. Although much of the area is dominated by the introduced pasture grass Brown-top Bent (not considered suitable to support GSM populations), the site should be surveyed at the appropriate season (November to January) to inform risk to the species, if any. If present, it could be impacted by development.

5.6. Listed ecological communities

The EPBC Protected Matters Search Tool (DAWE 2020a) indicated that five ecological communities listed under the EPBC Act had the potential to occur in the search region (Table 5). Their occurrence in the study area was determined based on an assessment of the native vegetation present against published descriptions and condition thresholds for these communities. None of these communities were found to be present.

Table 5: EPBC Act listed ecological communities and likelihood of occurrence in the study area

Ecological Community	EPBC Status	Occurrence in the study area
Grassy Eucalypt Woodland of the Victorian Volcanic Plain	CR	Patches of native vegetation present are too degraded to meet condition thresholds for this community.
Grey Box (*Eucalyptus microcarpa*) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia	EN	Not present
Natural Temperate Grassland of the Victorian Volcanic Plain	CR	Not present

Ecological Community	EPBC Status	Occurrence in the study area
Seasonal Herbaceous Wetlands (Freshwater) of the Temperate Lowland Plains	CR	Patches of native vegetation present are too degraded to meet condition thresholds for this community.
White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland	CR	Not present

Notes: EPBC = status under the EPBC Act (CR = Critically Endangered; EN = Endangered).

6. Assessment of impacts

6.1. Proposed development

To determine impacts to native vegetation, the proposed development plan was overlaid with the native vegetation mapped as part of this investigation. Native vegetation occurring in the following locations was considered to be removed based on the proposed development plan:

- Direct removal:
  - Native vegetation within all proposed building envelopes
  - Native vegetation within all proposed driveways
- Consequential removal:
  - Native vegetation within 10 metres of all proposed building envelopes
  - Native vegetation two metres either side of all proposed lot boundaries (to address the future fence exemption of Clause 52.17)

Impacts to trees

In accordance with the *Assessor's Handbook* (DELWP 2018a), a tree is deemed lost when earthworks encroach on more than 10% of its Tree Protection Zone (TPZ). A TPZ is defined as an area around the trunk of the tree which has a radius of 12 × the DBH (to a maximum of 15 metres but no less than 2 metres). Dead trees are treated in the same manner.

6.2. Impacts of proposed development

Various design measures have been undertaken for this proposal to avoid and minimise impacts to native vegetation. These are detailed in Section 7.2.1.

6.2.1. Native vegetation

The current development footprint will result in the loss of a total extent of 5.513 hectares of native vegetation as represented in Appendix 2 and documented in the *Native Vegetation Removal* (NVR) report provided by DELWP (Appendix 7).

This comprised:

- 2.424 hectares of native vegetation in patches (including no large trees in patches); and
- 29 large scattered trees, equating to an area loss of 2.082 hectares.

The native vegetation to be removed is in an area mapped as an endangered Ecological Vegetation Class.

It is understood that no native vegetation has been approved for removal on the property within the last five years.

Photographs of native vegetation proposed for removal are provided in Appendix 5.

6.2.2. Modelled species important habitat

The current proposal footprint will not have a significant impact on any habitat of any rare or threatened species as determined in Appendix 7.

6.2.3. Listed flora species

The analysis of the likelihood of occurrence of listed flora species presented in Section 5.3.2 identified that the following species could be impacted by any development in the study area:

- Matted Flax-lily (EPBC Act: Endangered; FFG Act: Listed, flowers Dec–Feb) close to northern boundary
- Swamp Everlasting (EPBC Act: Vulnerable; FFG Act: Listed, flowers Nov–March) within wetland areas

Targeted surveys are recommended for these species within suitable habitat in December 2021.

6.2.4. Fauna habitat

Twenty-nine large remnant Swamp Gum trees are proposed to be removed as well as small patches of native grassland, wetland and woodland.

6.2.5. Listed fauna species

The analysis of susceptibility of listed fauna species to impacts presented in Section 5.5.2 identified that the following species could be impacted by any development in the study area, if found to be present:

- Golden Sun Moth (EPBC Act: critically endangered)
- Growling Grass Frog (EPBC Act: vulnerable)
- Striped Legless Lizard (EPBC Act: vulnerable)

Targeted surveys are recommended to verify whether these species are present on site. Surveys for Striped legless Lizard have already started by setting up tile grids in August 2021.

6.2.6. Threatened ecological communities

No listed communities are found to be present on site.

Figure 2: Residual impacts of proposed development

7. Implications under legislation and policy

7.1. Summary of planning implications

A planning permit under Clause 52.17 of the Macedon Ranges Planning Scheme is required for the removal of native vegetation from within the study area.

7.2. Implications under the Guidelines

7.2.1. Avoid and minimise statement

In accordance with the Guidelines, all applications to remove native vegetation must provide an avoid and minimise statement which details any efforts undertaken to avoid the removal of, and minimise the impacts on biodiversity and other values of native vegetation, and how these efforts focussed on areas of native vegetation that have the most value. Efforts to avoid and minimise impacts to native vegetation in the current application are presented as follows:

- *Strategic level planning* – N/A
- *Site level planning*
  - The proponent has retained eleven large remnant trees within the study area. In addition, a portion of habitat zones E, W, U, T, X, Y, AA, AB, AC and AD have been retained including two large trees in habitat zone X.
  - The native vegetation mapped within the Creek Reserve will not be impacted except for a small area for an alluvial outfall. An additional 31 large trees will be retained in this section (see Figure 2).
  - No further retention of large old trees within the property was considered feasible due to design considerations.

7.2.2. Assessment pathway

The assessment pathway is determined by the location category and the extent of native vegetation as detailed for the study area as follows:

- **Location Category:** Location 2
- **Extent of native vegetation:** A total of 5.513 hectares of native vegetation (including 29 large trees and 3.424 ha native vegetation in patches).

Based on these details, the Guidelines stipulate that the proposal is to be assessed under the **Detailed** assessment pathway.

This proposal **would** trigger a referral to DELWP based on the criteria specified in Section 3.3.3.

7.2.3. Offset requirements

Offsets required to compensate for the proposed removal of native vegetation from the study area are provided below.

- 1.228 general habitat units and must include the following offset attribute requirements:
  - Minimum strategic biodiversity value (SBV) of 0.303
  - Occur within the Port Phillip and Westernport CMA boundary or the Macedon Ranges municipal district.
  - Include protection of 29 large trees.

Under the Guidelines all offsets must be secured prior to the removal of native vegetation.

7.2.4. Offset statement

The offset target for the current proposal will be achieved via a third-party offset. An online search of the *Native Vegetation Credit Register* (NVCR) has shown that the required offset is currently available for purchase from a native vegetation credit owner (DELWP 2020e). Evidence that the required offset is available is provided in Appendix 8. The required offset would be secured following approval of the application to remove native vegetation.

7.3. EPBC Act

The EPBC Act protects a number of threatened species and ecological communities that are considered to be of national conservation significance. Any significant impacts on these species require the approval of the Australian Minister for the Environment.

Based on the relevant guidelines, development of the study area may result in a significant impact on the EPBC Act-listed values presented below.

Flora

- Matted Flax-lily (EPBC Act: Endangered; FFG Act: Listed)
- Swamp Everlasting (EPBC Act: Vulnerable; FFG Act: Listed)

Fauna

- Golden Sun Moth (EPBC Act: critically endangered)
- Growling Grass Frog (EPBC Act: vulnerable)
- Striped Legless Lizard (EPBC Act: vulnerable)

Targeted surveys are therefore recommended to determine the status of these values in the study area and to assess any potential impacts on these values, should their habitat proposed to be impacted.

A Referral under the EPBC Act will be required for the above-listed species, should any be found during targeted surveys and be potentially significantly impacted upon.

7.4. FFG Act

The Victorian FFG Act lists threatened and protected species and ecological communities (DELWP 2018b, DELWP 2017b). Any removal of threatened flora species or communities (or protected flora) listed under the FFG Act from public land requires a Protected Flora Permit under the Act, obtained from DELWP.

The FFG Act only applies to private land in relation to the commercial collection of grasstrees, tree-ferns and sphagnum moss.

The land addressed in this assessment is private land; therefore, a Protected Flora Licence or Permit under the FFG Act would not be required for the current proposal.

7.5. EE Act

The *Ministerial Guidelines for Assessment of Environmental Effects under the* Environment Effects Act 1978 (DSE 2006), identifies criteria which trigger a Referral to the State Minister for Planning.

Based on the relevant criteria, a Referral to the State Minister for Planning may be required under the EE Act for the aspects covered by the current investigation.

7.6. CaLP Act

The *Catchment and Land Protection Act 1994* (CaLP Act) requires that landowners (or a third party to whom responsibilities have been legally transferred) must eradicate regionally prohibited weeds and prevent the growth and spread of regionally controlled weeds.

Property owners who do not eradicate Regionally prohibited weeds or prevent the growth and spread of Regionally controlled weeds for which they are responsible, may be issued with a Land Management Notice or Directions Notice that requires specific control work to be undertaken.

In accordance with the *Catchment and Land Protection Act 1994*, the noxious weed species listed below, which were recorded in the study area, must be controlled.

- Blackberry;
- Spear Thistle; and
- Sweet Briar.

Precision control methods that minimise off-target kills (e.g. spot spraying) should be used in environmentally sensitive areas (e.g. within or near native vegetation, waterways, etc.).

7.7. Construction mitigation recommendations

Recommendations to avoid and minimise impacts to native vegetation are provided in this report in Section 7.2.1.

Additional recommendations to mitigate impacts to vegetation during construction are provided below:

- Establish appropriate vegetation protection zones around areas of native vegetation to be retained prior to works.
- Establish appropriate tree protection zones around scattered native trees to be retained prior to works.
- Ensure all construction personnel are appropriately briefed prior to works, and that no construction personnel, machinery or equipment are placed inside vegetation/tree protection zones.
- A suitably qualified zoologist should undertake a pre-clearance survey of planted trees to be removed in the week prior to removal to identify the presence of any nests or hollows.
- If considered necessary based on the results of the pre-clearance survey, a suitably qualified zoologist should be on site during any tree removal works to capture and relocate any misplaced fauna that may be present.

8. References

DAWE 2020a, *EPBC Act Protected Matters Search Tool*, Department of the Environment and Energy, Canberra, viewed 21st June 2021, https://www.environment.gov.au/epbc/pmst/index.html.

DAWE 2020b, *Species Profile and Threats Database*, Department of Agriculture, Water and the Environment, Canberra, https://www.environment.gov.au/cgi-bin/sprat/public/sprat.pl.

DELWP 2017a, *Guidelines for the removal, destruction or lopping of native vegetation* (dated December 2017), Department of Environment, Land, Water and Planning, East Melbourne.

DELWP 2017b, *Flora and Fauna Guarantee Act 1988 - Protected Flora List, June 2017*, Department of Environment, Land, Water and Planning, East Melbourne.

DELWP 2018a, *Assessor's Handbook – Applications to remove, destroy or lop native vegetation* (Version 1.1, dated October 2018), Department of Environment, Land, Water and Planning, East Melbourne.

DELWP 2018b, *Flora and Fauna Guarantee Act 1988 – Threatened List, April 2018*, Department of Environment, Land, Water and Planning, East Melbourne.

DELWP 2020a, *NatureKit*, Department of Environment, Land, Water and Planning, East Melbourne, Victoria, viewed 16th June 2021, https://www.environment.vic.gov.au/biodiversity/naturekit.

DELWP 2020b, *MapShareVic*, Department of Environment, Land, Water and Planning, East Melbourne, Victoria, viewed 16th June 2021, https://www2.delwp.vic.gov.au/maps/maps-and-services/interactive-maps.

DELWP 2020c, *Native Vegetation Information Management system*, Department of Environment, Land, Water and Planning, East Melbourne, Victoria, viewed 16th June 2021, https://nvim.delwp.vic.gov.au/.

DELWP 2020d, *Victorian Biodiversity Atlas 3.2.5*, Department of Environment, Land, Water and Planning, East Melbourne, Victoria, viewed 16th June 2021, https://vba.dse.vic.gov.au.

Department of Natural Resources and Environment (DNRE) 1997, *Victoria's Biodiversity – Directions in Management*, Department of Environment, Land, Water and Planning, East Melbourne.

Department of Sustainability and Environment (DSE) 2004a, *Ecological Vegetation Class (EVC) Benchmarks by Bioregion*, Department of Environment, Land, Water and Planning, East Melbourne.

Department of Sustainability and Environment (DSE) 2004b, *Native Vegetation: sustaining a living landscape, Vegetation Quality Assessment Manual – guidelines for applying the Habitat Hectare scoring method (Version 1.3)*, Department of Environment, Land, Water and Planning, East Melbourne.

Department of Sustainability and Environment (DSE) 2006, *Ministerial Guidelines for Assessment of Environmental Effects under the* Environmental Effects Act 1978, Department of Environment, Land, Water and Planning, East Melbourne.

eBird Species Maps 2021, www.ebird.org, viewed 9 June 2021, Cornell Lab of Ornithology, Cornell University, New York State, USA.

Appendix 1: Details of the assessment process in accordance with the Guidelines for the removal, destruction or lopping of native vegetation (DELWP 2017a)

Purpose and objective

Policies and strategies relating to the protection and management of native vegetation in Victoria are defined in the State Planning Policy Framework (SPPF). The objective identified in Clause 12.01 of all Victorian Planning Schemes is 'To ensure that there is no net loss to biodiversity as a result of the removal, destruction or lopping of native vegetation'.

This is to be achieved through the following three-step approach, as detailed in the Guidelines:

1. Avoid the removal, destruction or lopping of native vegetation.
2. Minimise impacts from the removal, destruction or lopping of native vegetation that cannot be avoided.
3. Provide an offset to compensate for the biodiversity impact from the removal, destruction or lopping of native vegetation.

Note: While a planning permit may still be required, if native vegetation does not meet the definition of either a patch or a scattered tree, an offset under the Guidelines is not required.

Assessment pathways

The first step in determining the type of assessment required for any site in Victoria is to determine the assessment pathway for the proposed native vegetation removal. The three possible assessment pathways for applications to remove native vegetation in Victoria are:

- Basic;
- Intermediate; or
- Detailed.

This assessment pathway is determined by two factors:

- **Location Category**, as determined using the states' Location Map. The location category indicates the potential risk to biodiversity from removing a small amount of native vegetation. The three location categories are defined as:
  - Location 1 – shown in light blue-green on the Location Map; occurring over most of Victoria.
  - Location 2 – shown in dark blue-green on the Location Map; includes areas mapped as endangered EVCs and/or sensitive wetlands and coastal areas.
  - Location 3 – shown in brown on the Location Map; includes areas where the removal of less than 0.5 hectares of native vegetation could have a significant impact on habitat for rare and threatened species.
- **Extent of native vegetation** – The extent of any patches and scattered trees proposed to be removed (as well as the extent of any past native vegetation removal), with consideration as to whether the proposed removal includes any large trees. Extent of native vegetation is determined as follows:
  - **Patch** – the area of the patch in hectares.
  - **Scattered Tree** – the extent of a scattered tree is dependent on whether the scattered tree is small or large. A tree is considered to be a large tree if it is greater or equal to the large tree benchmark diameter at breast height (DBH) for the relevant bioregional EVC. Any scattered

tree that is not a large tree is a small scattered tree. The extent of large and small scattered trees is determined as follows:

- **Large scattered tree** – the area of a circle with a 15-metre radius, with the trunk of the tree at the centre.
- **Small scattered tree** – the area of a circle with a ten-metre radius, with the trunk of the tree at the centre.

The assessment pathway for assessing an application to remove native vegetation is then determined as detailed in the following matrix table:

Extent of native vegetation	Location Category		
	Location 1	Location 2	Location 3
< 0.5 hectares and not including any large trees	Basic	Intermediate	Detailed
< 0.5 hectares and including one or more large trees	Intermediate	Intermediate	Detailed
≥ 0.5 hectares	Detailed	Detailed	Detailed

Note: If the native vegetation to be removed includes more than one location category, the higher location category is used to determine the assessment pathway.

Landscape scale information – strategic biodiversity value

The strategic biodiversity value (SBV) is a measure of a location's importance to Victoria's biodiversity, relative to other locations across the state. It is represented as a score between 0 and 1 and determined from the Strategic biodiversity value map, available from *NVIM* (DELWP 2020c).

Landscape scale information – habitat for rare or threatened species

Habitat importance for rare or threatened species is a measure of the importance of a location in the landscape as habitat for a particular rare or threatened species, in relation to other habitat available for that species. It is represented as a score between 0 and 1 and is determined from the Habitat importance maps, administered by DELWP.

This includes two groups of habitat:

- **Highly localised habitats** – Limited in area and considered to be equally important, therefore having the same habitat importance score.
- **Dispersed habitats** – Less limited in are and based on habitat distribution models.

Habitat for rare or threatened species is used to determine the type of offset required in the detailed assessment pathway.

Biodiversity value

A combination of site-based and landscape scale information is used to calculate the biodiversity value of native vegetation to be removed. Biodiversity value is represented by a general or species habitat score, detailed as follows.

Firstly, the extent and condition of native vegetation to be removed are combined to determine the habitat hectares as follows:

Habitat hectares = extent of native vegetation x condition score

Secondly, the habitat hectare score is combined with a landscape factor to obtain an overall measure of biodiversity value. Two landscape factors exist as follows:

- **General landscape factor** – determined using an adjusted strategic biodiversity score, and relevant when no habitat importance scores are applicable;
- **Species landscape factor** – determined using an adjusted habitat importance score for each rare or threatened species habitat mapped at a site in the Habitat importance map.

These factors are then used as follows to determine the biodiversity value of a site:

General habitat score = habitat hectares x general landscape factor

Species habitat score = habitat hectares x species landscape factor

Offset requirements

A native vegetation offset is required for the approved removal of native vegetation. Offsets conform to one of two types and each type incorporates a multiplier to address the risk of offset:

- A **general offset** is required when the removal of native vegetation does not have a significant impact on any habitat for rare or threatened species (i.e. the proportional impact is below the species offset threshold). In this case a multiplier of 1.5 applies to determine the general offset amount.

General offset (amount of general habitat units) = general habitat score x 1.5

- A **species offset** is required when the removal of native vegetation has a significant impact on habitat for a rare or threatened species (i.e. the proportional impact is above the species offset threshold). In this case a multiplier of 2 applies to determine the species offset amount.

Species offset (amount of species habitat units) = Species habitat score x 2

Note: if native vegetation does not meet the definition of either a patch or scattered tree an offset is not required.

Offset attributes

Offsets must meet the following attribute requirements, as relevant:

- General offsets
  - **Offset amount** – general offset = general habitat score x 1.5

- **Strategic biodiversity value (SBV)** – the offset has at least 80% of the SBV of the native vegetation removed
- **Vicinity** – the offset is in the same CMA boundary or municipal district as the native vegetation removed
- Habitat for rare and threatened species – N/A
- **Large trees** – the offset include the protection of at least one large tree for every large tree to be removed

- Species offsets
  - **Offset amount** – species offset = species habitat score x 2
  - Strategic biodiversity value (SBV): N/A
  - Vicinity: N/A
  - **Habitat for rare and threatened species** – the offset comprises mapped habitat according to the Habitat importance map for the relevant species
  - **Large trees** – the offset include the protection of at least one large tree for every large tree to be removed

Appendix 2: Detailed habitat hectare assessment results

Habitat Zone			A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
Bioregion			CVU	CVU	VVP	VVP	VVP	VVP	VVP	VVP	VVP	VVP	VVP	VVP	VVP	VVP	VVP
EVC Number			55	55	55_63	55_63	55_63	55_63	647	647	647	647	647	647	647	647	647
Total area of Habitat Zone (ha)			0.031	0.626	0.397	1.032	3.569	0.309	0.064	0.010	0.052	0.033	0.014	0.028	0.033	0.023	0.034
Site Condition	Large Old Trees	/10	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0
	Tree Canopy Cover	/5	0	0	0	4	3	3	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	Lack of Weeds	/15	4	2	7	4	2	2	2	2	2	2	2	2	9	2	2
	Understorey	/25	5	5	5	15	5	5	5	5	5	5	5	5	15	5	5
	Recruitment	/10	0	0	0	0	0	0	3	3	3	3	3	3	3	3	3
	Organic Matter	/5	2	4	4	5	4	4	4	4	4	4	4	4	3	4	4
	Logs	/5	5	0	0	4	0	0	0	0	0	0	0	0	0	0	0
	Site condition standardising multiplier*		1.00	1.00	1.00	1.00	1.00	1.00	1.36	1.36	1.36	1.36	1.36	1.36	1.36	1.36	1.36
	Site Condition subtotal		*16*	*11*	*16*	*35*	*14*	*14*	*19*	*19*	*19*	*19*	*19*	*19*	*19*	*41*	*19*
Landscape Context	Patch Size	/10	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1
	Neighbourhood	/10	1	1	1	3	1	1	1	1	1	1	1	1	1	1	1
	Distance to Core	/5	3	3	3	1	3	3	3	1	1	1	1	1	3	1	1
Total Condition Score		**/100**	**21**	**16**	**21**	**40**	**20**	**19**	**24**	**22**	**22**	**22**	**22**	**22**	**22**	**46**	**22**

* Modified approach to habitat scoring - refer to Table 14 of DELWP's Vegetation Quality Assessment Manual (DSE, 2004).

Habitat Zone			P	Q	R	S	T	U	V	W	X
Bioregion			VVP	VVP	VVP	VVP	VVP	VVP	VVP	VVP	VVP
EVC Number			647	647	647	55_63	55_63	55_63	55_63	55_63	55_63
Total area of Habitat Zone (ha)			0.035	0.081	0.002	0.005	0.039	0.017	0.001	0.003	0.739
Site Condition	Large Old Trees	/10	0	0	0	0	0	0	0	0	2
	Tree Canopy Cover	/5	N/A	N/A	N/A	0	0	0	0	0	2
	Lack of Weeds	/15	2	2	2	6	6	0	2	6	6
	Understorey	/25	5	5	5	5	5	5	5	5	10
	Recruitment	/10	3	3	3	0	0	5	0	5	3
	Organic Matter	/5	4	4	4	4	4	2	4	4	5
	Logs	/5	0	0	0	0	0	4	0	0	0
	Site condition standardising multiplier*		1.36	1.36	1.36	1.00	1.00	1.00	1.00	1.00	1.00
	Site Condition subtotal		*19*	*19*	*19*	*15*	*15*	*16*	*11*	*20*	*28*
Landscape Context	Patch Size	/10	1	1	1	1	1	1	1	1	1
	Neighbourhood	/10	1	1	1	0	0	0	0	0	0
	Distance to Core	/5	3	3	1	1	1	1	1	1	3
Total Condition Score		**/100**	**24**	**24**	**22**	**17**	**17**	**18**	**13**	**22**	**32**

* Modified approach to habitat scoring - refer to Table 14 of DELWP's Vegetation Quality Assessment Manual (DSE, 2004)

Habitat Zone			Y	Z	AA	AB	AC	AD	AE	AF	AG	AH	AI	AJ	AK	AL	AM	AN
Bioregion			VVP	VVP	VVP	VVP	VVP	VVP	VVP	VVP	VVP	VVP	VVP	VVP	VVP	VVP	VVP	CVU
EVC Number			55_63	55_63	55_63	55_63	55_63	55_63	23	821	821	821	821	821	821	821	821	641
Total area of Habitat Zone (ha)			0.39	0.009	0.008	0.11	0.006	0.07	4.50	0.32	0.011	0.017	0.005	0.01	0.39	0.078	0.079	0.120
Site Condition	Large Old Trees	/10	0	0	0	0	0	0	4	NA	NA	NA	NA	NA	NA	NA	NA	10
		No. large trees in habitat zone	0	0	0	0	0	0	23	0	0	0	0	0	0	0	0	3
	Tree Canopy Cover	/5	5	0	0	3	0	0	0	NA	NA	NA	NA	NA	NA	NA	NA	5
	Lack of Weeds	/15	0	0	0	0	4	0	7	7	4	0	0	4	7	7	4	4
	Understorey	/25	15	5	5	5	5	5	15	15	15	15	15	15	20	15	15	10
	Recruitment	/10	6	5	5	5	0	0	5	6	3	3	3	6	6	6	6	3
	Organic Matter	/5	2	2	2	2	5	2	5	3	3	3	5	5	5	5	5	5
	Logs	/5	4	0	0	0	0	0	2	NA	NA	NA	NA	NA	NA	NA	NA	0
		Site condition standardising multiplier *	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.36	1.36	1.36	1.36	1.36	1.36	1.36	1.36	1.00
	Site Condition subtotal		*32*	*12*	*12*	*15*	*14*	*7*	*38*	*42*	*34*	*29*	*31*	*41*	*52*	*45*	*41*	*37*
Landscape Context	Patch Size	/10	1	1	1	1	1	1	4	1	1	1	1	1	1	1	1	4
	Neighbourhood	/10	0	0	0	0	0	0	1	0	1	1	1	0	0	0	1	1
	Distance to Core	/5	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Total Condition Score		**/100**	**36**	**16**	**16**	**19**	**18**	**11**	**46**	**46**	**39**	**34**	**36**	**45**	**56**	**49**	**46**	**45**

Appendix 3: Large trees in patches and scattered trees recorded in the study area

Tree no.	Common Name	Scientific Name	DBH (cm)	Habitat Category	Radius of TPZ (m)	Remove/ Retain	Notes
1	Swamp Gum	*Eucalyptus ovata*	131	Large Scattered Tree	15	Retain	
2	Swamp Gum	*Eucalyptus ovata*	224	Large Scattered Tree	15	Remove	
3	Swamp Gum	*Eucalyptus ovata*	142	Large Scattered Tree	15	Remove	
4	Swamp Gum	*Eucalyptus ovata*	117	Large Scattered Tree	14.04	Remove	
5	Swamp Gum	*Eucalyptus ovata*	150	Large Scattered Tree	15	Remove	
6	Swamp Gum	*Eucalyptus ovata*	136	Large Scattered Tree	15	Remove	
7	Swamp Gum	*Eucalyptus ovata*	111	Large Scattered Tree	13.32	Remove	Dead
8	Swamp Gum	*Eucalyptus ovata*	102	Large Scattered Tree	12.24	Retain	
9	Swamp Gum	*Eucalyptus ovata*	130	Large Scattered Tree	15	Remove	
10	Swamp Gum	*Eucalyptus ovata*	114	Large Scattered Tree	13.68	Remove	
11	Swamp Gum	*Eucalyptus ovata*	123	Large Scattered Tree	14.76	Remove	
12	Swamp Gum	*Eucalyptus ovata*	162	Large Scattered Tree	15	Remove	
13	Swamp Gum	*Eucalyptus ovata*	153	Large Scattered Tree	15	Remove	
14	Swamp Gum	*Eucalyptus ovata*	159	Large Scattered Tree	15	Remove	
15	Swamp Gum	*Eucalyptus ovata*	135	Large Scattered Tree	15	Remove	
16	Swamp Gum	*Eucalyptus ovata*	164	Large Scattered Tree	15	Remove	
17	Swamp Gum	*Eucalyptus ovata*	169	Large Scattered Tree	15	Remove	
18	Swamp Gum	*Eucalyptus ovata*	133	Large Scattered Tree	15	Remove	
19	Gum Tree	*Eucalyptus* sp.	163	Large Scattered Tree	15	Remove	
20	Gum Tree	*Eucalyptus* sp.	115	Large Scattered Tree	13.8	Remove	Dead
21	Swamp Gum	*Eucalyptus ovata*	124	Large Scattered Tree	14.88	Remove	
22	Gum Tree	*Eucalyptus* sp.	103	Large Scattered Tree	12.36	Remove	Dead
23	Swamp Gum	*Eucalyptus ovata*	128	Large Scattered Tree	15	Remove	
24	Swamp Gum	*Eucalyptus ovata*	136	Large Tree in HZ X	15	Retain	
25	Swamp Gum	*Eucalyptus ovata*	159	Large Tree in HZ X	15	Retain	
26	Swamp Gum	*Eucalyptus ovata*	126	Large Scattered Tree	15	Retain	
27	Swamp Gum	*Eucalyptus ovata*	139	Large Scattered Tree	15	Retain	
28	Swamp Gum	*Eucalyptus ovata*	142	Large Scattered Tree	15	Retain	
29	Swamp Gum	*Eucalyptus ovata*	110	Large Scattered Tree	13.2	Retain	
30	Swamp Gum	*Eucalyptus ovata*	159	Large Scattered Tree	15	Retain	
31	Swamp Gum	*Eucalyptus ovata*	150	Large Scattered Tree	15	Remove	
32	Gum Tree	*Eucalyptus* sp.	110	Large Scattered Tree	13.2	Retain	Dead
33	Swamp Gum	*Eucalyptus ovata*	147	Large Scattered Tree	15	Remove	
34	Swamp Gum	*Eucalyptus ovata*	124	Large Scattered Tree	14.88	Remove	
35	Swamp Gum	*Eucalyptus ovata*	124	Large Scattered Tree	14.88	Remove	
36	Gum Tree	*Eucalyptus* sp.	87	Large Scattered Tree	10.44	Retain	Dead
37	Swamp Gum	*Eucalyptus ovata*	105	Large Scattered Tree	12.6	Remove	
38	Swamp Gum	*Eucalyptus ovata*	116	Large Scattered Tree	13.92	Remove	

Tree no.	Common Name	Scientific Name	DBH (cm)	Habitat Category	Radius of TPZ (m)	Remove/ Retain	Notes
39	River Red Gum	*Eucalyptus camaldulensis*	145	Large Scattered Tree	15	Remove	
40	Swamp Gum	*Eucalyptus ovata*	126	Large Scattered Tree	15	Remove	
41	Swamp Gum	*Eucalyptus ovata*	130	Large Tree in HZ E	15	Retain	
42	Manna Gum	*Eucalyptus viminalis*	103	Large Scattered Tree	12	Retain	
43	Manna Gum	*Eucalyptus viminalis*	125	Large Scattered Tree	15	Retain	
44	Manna Gum	*Eucalyptus viminalis*	130	Large Scattered Tree	15	Retain	
45	Swamp Gum	*Eucalyptus ovata*	123	Large Scattered Tree	15	Retain	
46	Manna Gum	*Eucalyptus sp.*	130	Large Tree in HZ AE	15	Retain	dead
47	Manna Gum	*Eucalyptus viminalis*	130	Large Tree in HZ AE	15	Retain	
48	Swamp Gum	*Eucalyptus ovata*	130	Large Tree in HZ AE	15	Retain	
49	Manna Gum	*Eucalyptus viminalis*	90	Large Tree in HZ AE	10.8	Retain	
50	Swamp Gum	*Eucalyptus ovata*	110	Large Tree in HZ AE	13.2	Retain	
51	Manna Gum	*Eucalyptus viminalis*	120	Large Tree in HZ AE	14	Retain	
52	Manna Gum	*Eucalyptus viminalis*	100	Large Tree in HZ AE	12	Retain	
53	Manna Gum	*Eucalyptus viminalis*	130	Large Tree in HZ AE	15	Retain	
54	Manna Gum	*Eucalyptus viminalis*	130	Large Tree in HZ AE	15	Retain	
55	Manna Gum	*Eucalyptus viminalis*	110	Large Tree in HZ AE	13.2	Retain	
56	Manna Gum	*Eucalyptus viminalis*	100	Large Tree in HZ AE	12	Retain	
57	Manna Gum	*Eucalyptus viminalis*	110	Large Tree in HZ AE	13.2	Retain	
58	Manna Gum	*Eucalyptus viminalis*	90	Large Tree in HZ AE	10.8	Retain	
59	Manna Gum	*Eucalpytus viminalis*	100	Large Tree in HZ AE	12	Retain	
60	Manna Gum	*Eucalyptus viminalis*	110	Large Tree in HZ AE	13.2	Retain	
61	Manna Gum	*Eucalyptus viminalis*	120	Large Tree in HZ AE	14	Retain	
62	Manna Gum	*Eucalyptus viminalis*	120	Large Tree in HZ AE	14	Retain	
63	Manna Gum	*Eucalyptus viminalis*	100	Large Tree in HZ AE	12	Retain	
64	Manna Gum	*Eucalyptus viminalis*	130	Large Tree in HZ AE	15	Retain	
65	Manna Gum	*Eucalyptus viminalis*	130	Large Tree in HZ AE	15	Retain	
66	Manna Gum	*Eucalyptus viminalis*	100	Large Tree in HZ AE	15	Retain	
67	Manna Gum	*Eucalyptus viminalis*	130	Large Tree in HZ AE	15	Retain	
68	Manna Gum	*Eucalyptus viminalis*	120	Large Tree in HZ AN	14	Retain	
69	Manna Gum	*Eucalyptus viminalis*	100	Large Tree in HZ AN	12	Retain	
70	Manna Gum	*Eucalyptus viminalis*	100	Large Tree in HZ AN	12	Retain	
71	Manna Gum	*Eucalyptus viminalis*	130	Large Tree in HZ AE	15	Retain	

Notes: DBH = Diameter at breast height (130 cm from the ground); **TPZ =** Tree Protection Zone.

Appendix 4: Flora species recorded in the study area

Origin	Common name	Scientific name	EPBC	FFG-T	FFG-P	CaLP Act
	Black Wattle	*Acacia mearnsii*			P	
*	Blackberry	*Rubus fruticosus* spp. agg.				C
	Blackwood	*Acacia melanoxylon*				
*	Brown-top Bent	*Agrostis capillaris*				
	Bulrush	*Typha* spp.				
*	Canary Grass	*Phalaris* spp.				
*	Cape weed	*Arctotheca calendula*				
*	Cat's Ear	*Hypochaeris* spp.				
	Cherry Ballart	*Exocarpos cupressiformis*				
*	Clover	*Trifolium* spp.				
	Couch	*Cynodon dactylon*				
	Crane's Bill	*Geranium* spp.				
	Crassula	*Crassula* spp.				
*	Drooping Cassinia	*Cassinia sifton*				
	Eucalypt	*Eucalyptus* spp.				
	Groundsel	*Senecio* spp.			P	
	Kangaroo Grass	*Themeda triandra*				
	Mistletoe	*Amyema* spp.				
*	Onion Grass	*Romulea rosea*				
*	Ribwort	*Plantago lanceolata*				
	Rush	*Juncus* spp.				
*	Sheep Sorrel	*Acetosella vulgaris*				
	Spear Grass	*Austrostipa* spp.				
*	Spear Thistle	*Cirsium vulgare*				C
	Spike Sedge	*Eleocharis* spp.				
	Swamp Gum	*Eucalyptus ovata*				
*	Sweet Briar	*Rosa rubiginosa*				C
	Wallaby Grass	*Rytidosperma* spp.				
	Wood Sorrel	*Oxalis* spp.				
	Woodruff	*Asperula* spp.				

Notes: EPBC = threatened species status under the EPBC Act (EX = presumed extinct in the wild; CR = critically endangered; EN = endangered; VU = vulnerable); **FFG-T** = listed as threatened (L) under the FFG Act; **FFG-P**: listed as protected (P) under the FFG Act; **CaLP Act**: declared noxious weeds under the CaLP Act (S = State Prohibited Weeds [any infestations are to be reported to DELWP. DELWP is responsible for control of State Prohibited Weeds]; P = Regionally Prohibited Weeds [Land owners must take all reasonable steps to eradicate regionally prohibited weeds on their land]; C = Regionally Controlled Weeds [Land owners have the responsibility to take all reasonable steps to prevent the growth and spread of Regionally controlled weeds on their land]; R = Restricted Weeds [Trade in these weeds and their propagules, either as plants, seeds or contaminants in other materials is prohibited].

* = introduced to Victoria

= Victorian native taxa occurring outside their natural range

Appendix 5: Photographs of native vegetation proposed for removal

Large scattered Swamp Gum tree

Hollows in large scattered Swamp Gum

Habitat zone A – Plains Grassy Woodland (EVC 55)

Habitat zone B –Plains Grassy Woodland (EVC 55)

Habitat zone C – *Higher Rainfall* Plains Grassy Woodland (EVC 55_63)

Habitat zone L – Plains Sedgy Wetland (EVC 647)

Habitat zone P – Plains Sedgy Wetland (EVC 647)

Habitat zone T – *Higher Rainfall* Plains Grassy Woodland (EVC 55_63)

Habitat zone X – *Higher Rainfall* Plains Grassy Woodland (EVC 55_63)

Large scattered Swamp Gum tree

Appendix 6: EVC benchmarks

Higher Rainfall Plains Grassy Woodland (EVC 55_63) – Victorian Volcanic Plain

Plains Sedgy Wetland (EVC 647) – Victorian Volcanic Plain

Plains Grassy Woodland (EVC 55) – Central Victorian Uplands

Appendix 7: Native Vegetation Removal (NVR) report

Appendix 8: Evidence that native vegetation offset requirement is available

Above: Row 1.
Below: Tree 1A.

Above: Group 2.
Below: Group 3.

Above: Tree 4.
Below: Group 5- eastern half.

Above: Group 5- western half.
Below: Group 6.

Above: Tree 10.
Below: Tree 11.

Above: Tree 12.
Below: Group 13- southern row.

Above: Group 13- northern row.
Below: Tree 14.

Above: Tree 15.
Below: Group 16.

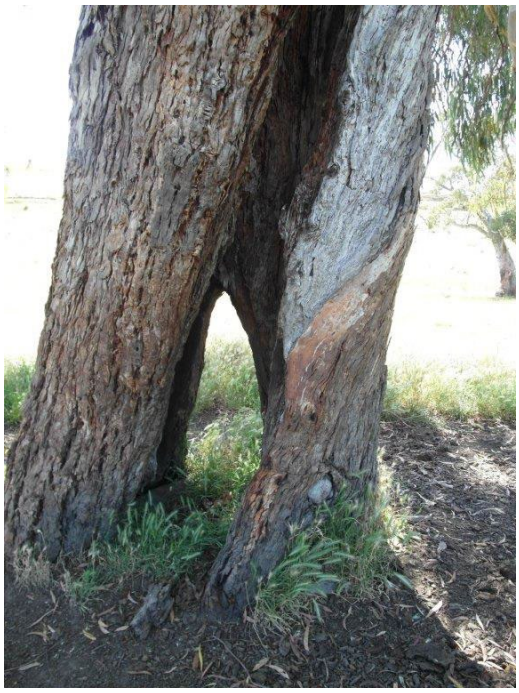
Above: Tree 17.
Below: Tree 17A.

Above: Base of tree 17A.
Below: Tree 17B.

Above: Tree 17C.
Below: Tree 21A.

Above: Tree 21B.
Below: Tree 21C.

Above: Tree 21D.
Below: Base of tree 21D.



Above: Tree 22.
Below: Tree 23.

Above: Tree 24.
Below: Tree 25.

Above: Tree 26.
Below: Tree 27.

Above: Tree 28.
Below: Tree 29.

Above: Tree 30.
Below: Tree 32.

Above: Base of tree 32.
Below: Group 33A.

Above: Tree 33B.
Below: Group 33C.

Above: Tree 33D.
Below: Tree 33F (on left) and tree 33E (on right).

Above: Tree 33G.
Below: Tree 34.

Above: Tree 35.
Below: Tree 36B (left) and southern half of group 36.

Above: Northern half of group 36.
Below: Tree 36B.

Above: Tree 36C.
Below: Group 37.

Above: Tree 37A.
Below: Tree 38.

Above: Tree 39.
Below: Tree 40.

Above: Tree 41.
Below: Tree 42.

Above: Tree 43.
Below: Tree 44.

Above: Tree 45.
Below: Tree 46.

Above: Tree 47.
Below: Tree 48.

Above: Tree 49.
Below: Tree 50.

Above: Tree 51.
Below: Tree 52.

Above: Tree 53.
Below: Tree 54.

Tree Consultants & Contractors
Tel (03) 9888 5214

3 Feb 2022

ID Land
Attention: Alex While
Development Manager

Dear Sir,

Re: 89 Ross Watt Rd, Gisborne

Introduction
I am informed that the above property has recently been purchased by ID Land. It consists principally of paddocks with scattered self-sown trees native to the local area. The property also includes a few garden tree plantings, and tree presence of highly variable density on the slopes and flats next to Jacksons Creek. Galbraith and Associates has been requested by ID Land to inspect the site, to discuss the overall treed nature of the properties and to report on the individual trees.

Individual trees and tree groups (if relatively homogeneous) are located and numbered on the accompanying copy of the feature survey and described in the accompanying excel spreadsheet table of data in terms of species, whether 'native' as per the planning scheme, estimation of worthiness of retention ranking from 1-10 (based on assumption that the subdivision is for a housing development) and tree protection zones as per the relevant Australian Standard 4970:2009 'Protection of trees on development sites'.

The Trees
The trees assessed include approximately 84 live trees located on the site, consisting of four local species of eucalypts and a couple of species of wattles. All of the eucalypts are self-sown and all of the wattles are likely self-sown.

Swamp Gum (Eucalyptus ovata) is numerically dominant, accounting for some 70% of all the site trees. A linear group (group 36) consisting of about 25 young and young mature individuals situated along the edge of the quarry track on the northern edge of the property is in generally good condition and has a long safe useful life expectancy. In strong contrast, the balance of Swamp Gums are overmature paddock trees which typically have suffered massive trunk failures associated with decay caused by

termites and are at risk of further large collapses. Two overmature Swamp Gums have a moderate worth for retention, namely trees 23 and 26.

There are two to four individuals of each of the other three eucalypt species, namely Manna Gum (Eucalyptus viminalis subsp. viminalis), Candlebark (Eucalyptus rubida) and Snow Gum (Eucalyptus pauciflora). The Candlebarks and Snow Gums are overmature, affected by failures and decay. and have a low worth for retention in any re-development. The condition of the four Manna Gums is variable. Tree 17C has a high worth for retention, and trees 17 and 17B have a moderate worth for retention. Trees rated moderate, whether Manna Gums or Swamp Gums, will generally require tree surgery works if they are to be retained. Such hazard reduction works will include selective weight reduction and deadwood removal.

All of the wattles present are of low worth, due to their poor condition or small size and can be easily replaced by new plantings. The species present are Late Black Wattle (Acacia mearnsii) and (Blackwood) Acacia melanoxylon.

Non-natives on the site consist primarily of a row of over mature pines and a few plantings around the existing residence of Chinese Elm, Desert Ash and a cypress. Close inspection of these trees was not possible, but they appear to be in reasonable condition. Willows which are present along Jacksons Creek are a serious weed species.

Permit Requirements

As per Clause 52.17 of the planning scheme, a permit is required to remove, destroy or lop any native tree which is over 10 years old and self-sown. This requirement will apply to all the trees denoted ISS under the ‘Origin’ column in the table of data, as these are naturally self-sown native Victorian and indigenous trees, and classified ‘native’ under the planning scheme.

Notes on Terminology
In order to understand the column headings of the tables of data, I have provided the following explanations:

DBH diameter of trunk over bark at breast height In a number of cases where the tree has forked into multiple trunks below breast height (1.3-1.5m) the diameter is measured below the fork and an estimate is made for the single trunk equivalent at breast height, or else figures for each of the individual stems can be given.

HxS This is the estimated height (H) of the tree and its average crown spread (S).

SULE Safe useful life expectancy in years. Taken in the context that the area is to be developed for residential use, and that sensible distances are maintained between the buildings and the trees, this is the estimate of time that the tree will continue to provide useful amenity without imposing an onerous financial burden in order to maintain relative safety, and avoid excessive nuisance.

Worthiness of Retention (WOR):
The worth for retention of a tree is based on the assumption that the site is to be re-developed, and that there is the opportunity for new tree planting. It is based on a number of factors. These factors are:

1. structure, health, form and safe useful life expectancy,
2. size, prominence in the landscape,
3. species rarity,
4. whether indigenous,
5. whether an environmental weed.
6. importance for habitat of native wildlife
7. whether of historical or cultural interest

Any tree with a WOR rating of 3 or less should be seriously considered for removal before development begins because it is dead, nearly dead or dangerous, a weed, is causing or is likely to cause a severe nuisance in the near future, or just of very little significance and readily replaceable with new plantings. Trees rated 4-6 are of some significance. Some of these trees may respond to treatments such as formative pruning, removal of dead wood, weight reduction pruning etc. Trees rated 7 or higher are of high significance (the higher the ranking the more so), primarily because of their good health, structure, form, prominence in the landscape and SULE, although all they still may need substantial works done on them as already detailed, if they are to be retained.

Tree Protection Zone (TPZ) According to the Australian Standard AS 4970-2009 'Protection of Trees on Building Sites', the TPZ is the principal means of protecting trees on development sites. It is a combination of the root area and crown area requiring protection. It is an area isolated from construction disturbance, so that the tree remains viable.' The radius of the TPZ is calculated by multiplying the DBH by 12. The radius is measured from the centre of the stem at ground level. An area of 10% of the TPZ is deemed acceptable to violate if 10% of the *area* of the TPZ is made up in other directions. *Thus if encroachment is from one side only, encroachment to as close as approximately 8.3 times the DBH (slightly over 2/3 the listed TPZ radius) is permissible according to the Standard.*

Where the tree has more than one trunk, the TPZ is deduced by taking the square root of the sum of the squares of each of the DBHs, and multiplying this figure by 12

The TPZs as determined by the AS 4970-2009 approach should be construed as a rough guide. Many factors such as the type of encroachment on the TPZ, species tolerance, age, tree height, presence of spiral grain, soil type, soil depth, tree lean, the existence of onsite structures or root directional impediments, level of wind exposure, irrigation and ongoing tree care and maintenance are each highly influential on the size and success of the TPZ estimation.

Tree Origin Categories

Each tree has been classified as to whether it is indigenous (**I**), native to Victoria (**V**), native to Australia (**A**), exotic (**E**) or an environmental weed (**W**).

An indigenous species (**I**) is one that is known to grow naturally in the local area, even if the individual tree has been planted and is from a seed source or provenance foreign to the area.

A tree denoted as **ISS** is one which is both indigenous and has naturally self-sown.

A species classified **V** is one which has a part or all, even if very small, of its natural range within Victoria, although it may occur outside the state as well. It does not however occur naturally in the local area.

A species classified **A** is native elsewhere in Australia than Victoria. It does not occur naturally in the local area.

A species classified **E** has its natural range occurring outside Australia.

A species classified **W** is a seriously invasive environmental weed.

GALBRAITH & ASSOCIATES

Knud Hansen
B.A. (Melb.)
Dip. Hort. (Arboriculture)
Assoc.Dip.App.Sci. (Amenity Horticulture)

Above: Row 1.
Below: Tree 1A.

Above: Group 2.
Below: Group 3.

Above: Tree 4.
Below: Group 5- eastern half.

Above: Group 5- western half.
Below: Group 6.

Above: Tree 10.
Below: Tree 11.

Above: Tree 12.
Below: Group 13- southern row.

Above: Group 13- northern row.
Below: Tree 14.

Above: Tree 15.
Below: Group 16.

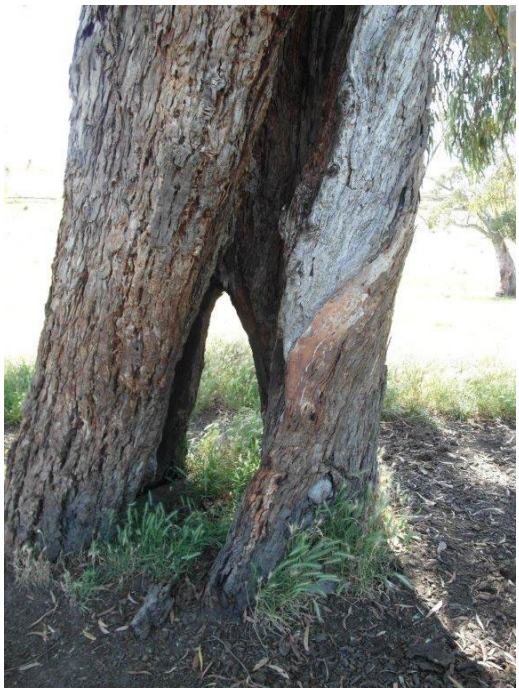
Above: Tree 17.
Below: Tree 17A.

Above: Base of tree 17A.
Below: Tree 17B.

Above: Tree 17C.
Below: Tree 21A.

Above: Tree 21B.
Below: Tree 21C.

Above: Tree 21D.
Below: Base of tree 21D.



Above: Tree 22.
Below: Tree 23.

Above: Tree 24.
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Above: Tree 28.
Below: Tree 29.

Above: Tree 30.
Below: Tree 32.

Above: Base of tree 32.
Below: Group 33A.

Above: Tree 33B.
Below: Group 33C.

Above: Tree 33D.
Below: Tree 33F (on left) and tree 33E (on right).

Above: Tree 33G.
Below: Tree 34.

Above: Tree 35.
Below: Tree 36B (left) and southern half of group 36.

Above: Northern half of group 36.
Below: Tree 36B.

Above: Tree 36C.
Below: Group 37.

Above: Tree 37A.
Below: Tree 38.

Above: Tree 39.
Below: Tree 40.

Above: Tree 41.
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Below: Tree 52.

Above: Tree 53.
Below: Tree 54.

LEGEND

- Subject Site
- Waterway/Drainage Reserve
- 600mm Water (By Others)
- 225 mm Sewer
- 150mm Rising Main Sewer

REVISIONS

VER	DATE	COMMENTS	CKD
4	16/11/2021	DRAINAGE RESERVE	MA
3	29/10/2021	WATER ALIGNMENT	DS
2	28/10/2021	PLAN UPDATED	MA
1	25/10/2021	ORIGINAL DRAWING	MA

NOTES

- THIS PLAN IS FOR PRELIMINARY USE ONLY
- ANY PROPOSED DEVELOPMENT IS SUBJECT TO APPROVAL BY THE RESPONSIBLE AUTHORITY.
- PROPOSED LOT BOUNDARIES AND AREAS SHOWN ARE SUBJECT TO FINAL SITE SURVEY.
- THIS PLAN IS PRODUCED FOR YIELD AND COSTING PURPOSES ONLY AND MAY CHANGE AS A RESULT OF FURTHER CONSULTATION WITH THE RESPONSIBLE AUTHORITIES.
- SUBDIVISION LAYOUT IS BASED ON SLP04 VERSION 2

N

0m 25 50 100 250m

SCALE 1 : 5000 @ A3

89 ROSS WATT ROAD GISBORNE

INFRASTRUCTURE PROVISION PLAN

Project No. 7213

Drawing Ref. 7213_UD_DP04_V04
INFRASTRUCTURE PROVISION PLAN

BREESE PITT DIXON

CIVIL ENGINEERS
LAND SURVEYORS
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1/19 CATO ST HAWTHORN EAST.
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89 Ross Watt Road Gisborne

Social Infrastructure Assessment

Final Report

May 2022

Prepared for ID Land Pty Ltd
by ASR Research Pty Ltd
Suite 7 / 321 Chapel Street, Prahran
Author: Robert Panozzo, Director
For all enquiries in relation to the contents of this report call (03) 9510 4440 or email rpanozzo@asrresearch.com.au

89 Ross Watt Road, Gisborne Social Infrastructure Assessment

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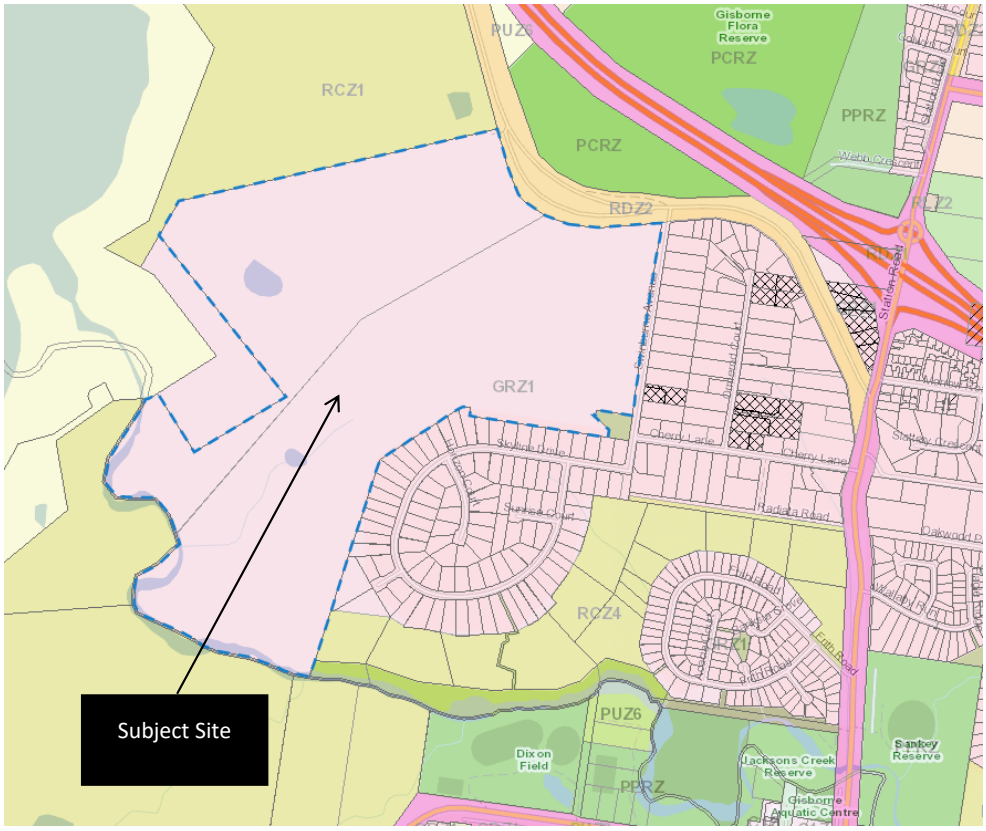
1 Introduction

1.1 Assessment Objectives

ASR Research was engaged by ID land ("the client") to prepare the social infrastructure assessment as part of the proposed development of 89 Ross Watt Road, Gisborne (the "subject site"), shown below in Figure 1. The subject site is covered by a Development Plan Overlay which requires ID Land to submit a Development Plan prior to the lodgment of a planning permit application.

Figure 1 - Location of Subject Site



1.2 Scope of Assessment

The assessment includes an audit of the existing and planned supply of social infrastructure within the subject site and the surrounding area (i.e. the Gisborne District) and indicative estimates of demand and / or supply

requirements for each form of social infrastructure. It is envisaged that the development plan will have the greatest impact on what is considered neighbourhood or local level social infrastructure forms that are typically managed by local government.

The assessment will focus on the following main community infrastructure categories:

1. Open space;
2. Early years services;
3. Community meeting spaces, libraries and learning centres;
4. Recreation facilities;
5. Education facilities;
6. Aged and disability services including residential aged care;
7. Health facilities; and
8. Police and emergency services.

It is important to note that categories 1 to 4 are typically (but not exclusively) Local Government responsibilities.

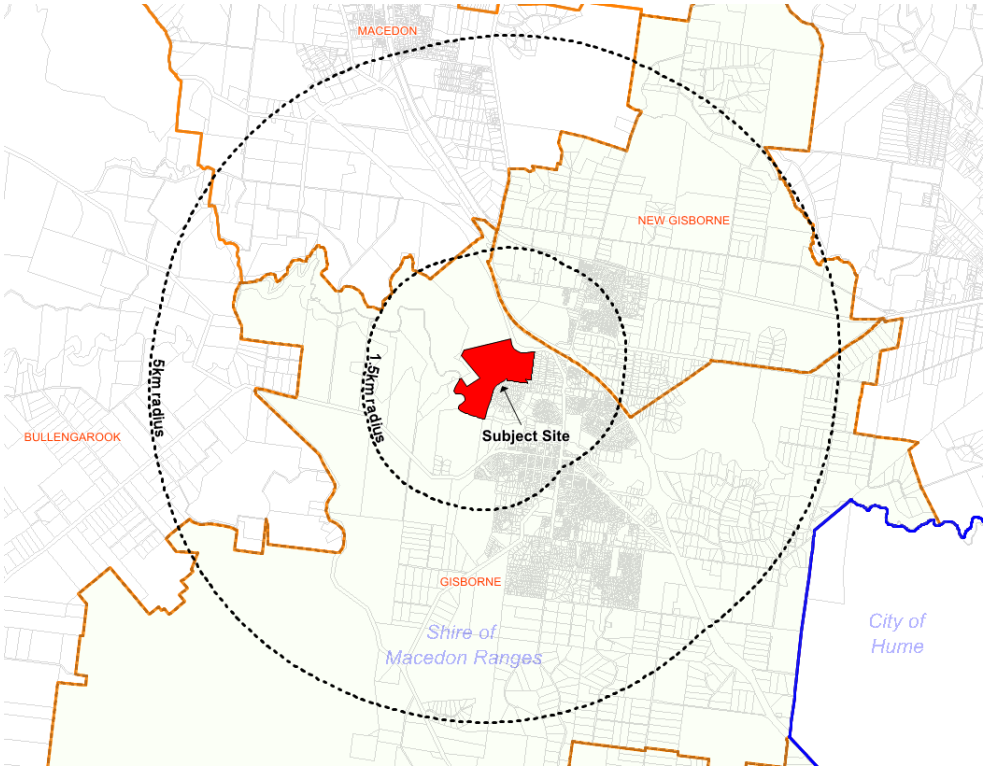
Table 1 – Scope of Community Infrastructure Items Assessed

Population Catchment Hierarchy	Items
Level 1 • Neighbourhood Level • *Provision ratios up to 10,000 people*	• Open space (passive and active) • Local playgrounds • Local bicycle / pedestrian pathways (on and off-road) • Early Years (Kindergartens, Long Day Child Care, Playgroups) • Government primary schools • Neighbourhood house (Inc. Community education services) • Community meeting spaces (Council and Non-Council) • Senior citizens groups • Public art installations • Social housing
Level 2 • Precincts (2-3 Neighbourhoods) • *Provision ratios between 10,000 and 30,000 people*	• Occasional Child Care • Government secondary Schools • Catholic primary Schools • Maternal and Child Health Services • Indoor recreation centres • Residential aged care
Level 3 • Cluster of Precincts (District) • *Provision ratios between 30,000 people and 60,000 people*	• Libraries • Council aquatic / leisure centres • Community arts centres • Other non-government secondary schools • Community health centres
Level 4 • Municipal Level *Provision for the total municipality*	• Principal Bicycle Network (on and off-road) • Civic centres
Level 5 • Regional Level • Provision for 2 or more municipalities	• Highest Order Performance Arts Facility • Universities/TAFEs • Public and private hospitals

1.3 Study Area

In order to determine the need for, and the optimal location of proposed social infrastructure within the subject site, this assessment reviewed requirements across a larger study area constructed using the Shire of Macedon Ranges small area population forecasts, prepared on behalf of Council by .id consulting (source: https://forecast.id.com.au/macedon-ranges). Figure 2 below shows the Gisborne District area which was used to define the study area for this assessment and which consists of the Gisborne, New Gisborne and Gisborne South communities.

Figure 2 - Assessment Study Area: Gisborne District



1.4 The Development Proposal

A draft subdivision plan for the subject site has been prepared on behalf of the client and is shown in Figure 3 on the following page. The proposed development aims to deliver approximately 700 to 800 new dwellings consisting of:

- Low density lots (1500m2 and greater);
- Low to conventional density lots (1500m2 to 800m2);
- Conventional density lots (500m2 to 800m2);
- Medium density lots (300m2 to 500m2); and
- Townhouse lots (less than 300 m2).

For the purposes of preparing this assessment, including calculating community infrastructure demands, a dwelling yield of 750 has been assumed.

This new residential community will be supported with a number of amenities and services including the establishment of a central community hub consisting of a local convenience centre, public open space and a proposed long day child care centre site[1].

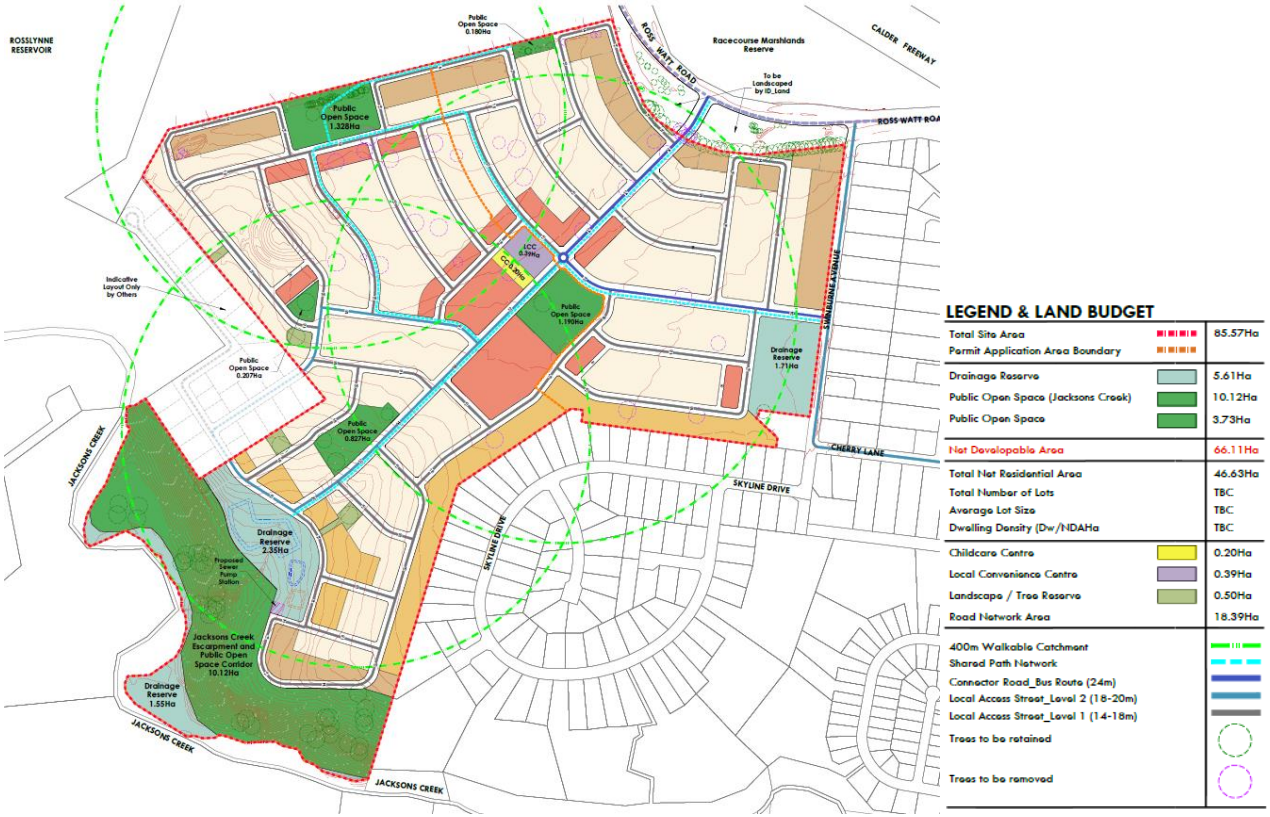
The total site area of the development is 88.57 hectares, of which 66.11 hectares is classified as the Net Developable Area (NDA). Of relevance to this assessment are the following on site social infrastructure and open space proposals:

- Four local unencumbered public open spaces (3.73ha in total);
- A network of diverse public open spaces performing a range of functions consisting of:
  - Jacksons Creek Escarpment and Public Open Space Corridor (10.12ha);
  - Three drainage reserves (5.61ha in total); and
  - Landscape / tree reserves (0.5 ha).
- A local convenience centre (0.39 ha);
- One long day child care centre site (0.2ha); and
- An extensive shared pathway and footpath network.

[1] Note: This is proposed to be a new privately operated long day child care centre and is to be interpreted as in addition to the Swinburne Avenue Children's Centre, an existing Council owned two-room kindergarten facility abutting the south east corner of the subject site.

89 Ross Watt Road, Gisborne Social Infrastructure Assessment

Figure 3 – Draft Subdivision Plan for Ross Watt Road, Gisborne



Source: Breese Pitt Dixon (06/04/2022)

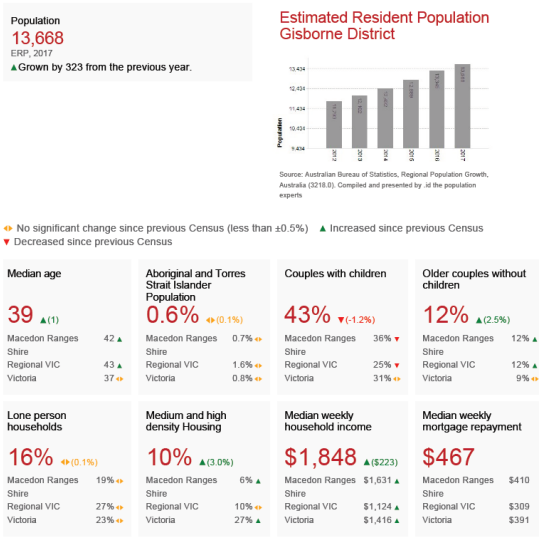
2 An Overview of Gisborne District

2.1 Population Characteristics

Figure 4 below reveals some of the main demographic characteristics of the Gisborne District and compares these to the Shire of Macedon Ranges, Regional Victoria and Victoria. The Gisborne District, with a population of approximately 14,000 residents, has:

- A younger median age (39) than Macedon Ranges and Regional Victoria, but older than Victoria;
- A lower proportion of Aboriginal and Torres Strait Islander people;
- A much higher percentage of couples with children than Macedon Ranges, Regional Victoria and Victoria;
- A similar percentage of older couples without children than Macedon Ranges, Regional Victoria, but higher than Victoria;
- A higher proportion of medium and high density housing than Macedon Ranges, the same as Regional Victoria and much lower than Victoria;
- A higher median weekly household income than Macedon Ranges, Regional Victoria and Victoria; and
- A higher median weekly mortgage repayment than Macedon Ranges, the same as Regional Victoria and much lower than Victoria.

Figure 4 - Population Highlights



Source: Australian Bureau of Statistics, Regional Population Growth, Australia (3218.0). Compiled and presented by .id the population experts

2.2 Population Forecasts Development Assumptions

According to Council's population forecasts, shown below in Table 2 below, the Gisborne District currently (2021) has a population of approximately 14,700. By 2036 the population of the Gisborne District is projected to increase to approximately 20,500 (a 39% increase over 15 years) and accommodate an additional 5,700 residents.

Table 2 - Gisborne District Population Forecasts

	Year				Change from 2021 to 2036 No.	Change from 2021 to 2036 %
	2021	2026	2031	2036		
Average household size	2.79	2.77	2.76	2.76	-0.03	-1%
Dwellings	5,468	6,101	6,750	7,754	2,286	42%
Total Population	14,716	16,297	17,850	20,454	5,738	39%

Source: Macedon Ranges Population and household forecasts, 2016 to 2036, prepared by .id (informed decisions), November 2017.

Council's current development assumptions for the Gisborne District includes the subject site. However, these forecasts, prepared in 2017, are now relatively old and pre-date the latest Census (2021).

2.3 Current & Planned Social Infrastructure within Gisborne

Appendix 2 of this report provides a series of maps showing the current locations of all major social infrastructure forms located within the Gisborne District. Both existing and planned social infrastructure for the Gisborne District has been taken into consideration in preparing this assessment.

3 Policy Context & Review of Strategic Documents

This section reviews:

- Relevant sections of the Macedon Ranges Planning Scheme, and
- Other Council strategic documents.

The review allows for existing statutory requirements and broader strategic objectives to be identified and assessed for its potential relevance and application to the subject site.

3.1 Macedon Planning Scheme

3.1.1 Clause 21.01 Municipal Profile

The municipal profile includes a section on community development and infrastructure where it states:

> *The Shire has high quality community infrastructure and provides a range of community health and wellbeing services and facilities, many of which are focused in Kyneton, Gisborne, Woodend and the larger towns. Existing community infrastructure and services have capacity to accommodate some residential growth.*
>
> *There is a high level of interconnection between towns for community services. Residents commonly travel to other towns to access services not available in their own community. Malmsbury, Kyneton, Tylden, Woodend, Macedon, Gisborne, Riddells Creek, Romsey and Lancefield all have reticulated wastewater systems.*

3.1.2 Clause 21.02-8 Community Development and Infrastructure

Clause 21.02-8 has a specific focus on community development and infrastructure influences which includes:

- *By 2026 it is expected that the number of people over 64 in the Shire's population will more than double. Growth is particularly strong in the 70 years and over age group with many of these currently living in rural parts of the Shire.*
- *The provision of reticulated town water, gas and sewerage will provide increased opportunities for urban development.*
- *Population growth increases demand for infrastructure and services that require funding. The provision of services for new development should be assisted by Development Contributions.*
- *In the rural areas, early settlement and farming practices represent significant cultural associations and relationships for the community.*
- *Open space, recreation, leisure facilities, provision of aged care and youth services and a broad variety of housing are important to improving the health and wellbeing of the community.*

3.1.3 Clause 21.03-3 Strategic framework plans

The Macedon Ranges strategic framework plan interprets the land use vision and identifies the vision's key elements influencing land use planning up to 2036. Figure 5 on the following page defines settlement types in the Shire.

Figure 5 - Settlement Types and Hierarchy Definitions

Settlement type	Settlement hierarchy definitions
Regional centre	A centre with a large, diverse population (10,000 plus), employment and housing base. All essential services are connected and higher order goods and services are provided. All levels of education are offered and access to large hospitals and numerous medical facilities is generally provided. Regional centres have strong relationships with surrounding settlements of all types.
Large district town	A town with a substantial and diverse population base (6,000 to 10,000) and a dominant business district with a moderate employment base. All essential services are provided. Access to services such as police stations, medical/hospital facilities and a range of education facilities is generally high. A variety of accommodation types and sizes are available.
District town	A town with a moderate population (2,000 to 6,000) with connections to all essential services. District towns tend to have a dominant town centre with a variety of retail services, post office, schools, police station and some basic medical facilities. Employment is generally in higher order centres.
Small town	Town population levels vary with general service provision (500-2,000) and there are strong employment relationships with larger towns. All are connected to reticulated water, and electricity, and in most cases have sewer connection available.
Village	A settlement with a low population (less than 500).
Hamlet/locality	A cluster of houses on smaller than average rural sized allotments in a non-urban zone (population less than 100). Reticulated water and/or sewer are generally not available.

This Clause is relevant in so far as it identifies a Town the size of Gisborne as a Large District Town moving towards, if not already performing the role of a Reginal Centre.

3.1.4 Clause 21.04 Settlement

One of the key settlement strategies in Macedon Ranges is to encourage the development of Gisborne as a regional centre by facilitating the provision of a large, diverse, employment and housing base and the provision of higher order goods and services.

3.1.5 Clause 21.12-1 Community Development

Objective 1

To improve the physical health of the community by providing safe, attractive, useable, well maintained public spaces that encourage active lifestyles for people of all ages and abilities.

Strategies

- *Strategy 1.1 Ensure new areas of public open space and new public buildings are safe and attractive for users of all ages and abilities, through providing appropriate areas of shade, seating, lighting and physical infrastructure such as drinking fountains and toilets.*

- *Strategy 1.2 Promote passive surveillance of public spaces through design including having regard for orientation issues; boundary treatments and use of physical and symbolic barriers.*
- *Strategy 1.3 Encourage developments to incorporate appropriate walking trails, bicycle paths, playgrounds and social infrastructure.*
- *Strategy 1.4 Enhance the walkability and safety of existing residential areas with improvements to footpaths and recreational areas to ensure consistency with disability discrimination act requirements.*
- *Strategy 1.5 Require development contributions to fund the provision of community services and facilities.*
- *Strategy 1.6 Facilitate the inclusion and identification of community facilities in structure plans.*

3.1.6 Clause 21.12-2 Development infrastructure

Objective 1

To provide infrastructure, services and community facilities to new and established urban areas in an equitable manner.

Strategies

- Strategy 1.1 Encourage the delivery of necessary infrastructure to occur concurrent with or prior to development
- Strategy 1.2 Consider the sequencing of development relative to the provision of services and facilities.
- Strategy 1.3 Promote development within existing urban areas according to the Settlement Hierarchy outlined in Clause 21.04.
- Strategy 1.4 Require development contributions to fund the provision of services and facilities.

3.1.7 Clause 21.13-1 Gisborne and New Gisborne

Key objectives and strategies for this Clause relevant to this assessment are outlined below.

Natural environment and open space objectives

Objective 1

To protect and improve areas of remnant vegetation, fauna habitat, natural drainage corridors, Gisborne Racecourse Marshlands Reserve and the landscape and open space corridor along Jacksons Creek as essential elements of Gisborne and New Gisborne's natural setting.

Objective 2

To create an attractive urban environment with a strong sense of place that contributes to Gisborne and New Gisborne's natural setting through provision of a range of open space areas.

Objective 3

To ensure open space areas meet the active and passive needs of the community, in conjunction with required drainage infrastructure, areas of flora and fauna, and linkages to key destinations.

Natural environment and open space strategies

1.1 Provide buffer areas between new residential development and vegetated public and recreation land areas, such as Gisborne Racecourse Marshlands Reserve and Golf Course.

1.2 Require new development to front public open space areas with roads or lots with open-style fencing to encourage use and safety through passive surveillance and active frontages, where relevant.

1.3 Ensure open space and buffer areas provided along waterways and drainage corridors are wide enough to accommodate drainage functions, riparian buffers and shared pedestrian / cycling paths.

Infrastructure objectives

Objective 1

To provide a sustainable transport network that reduces dependence on car use and encourages public transport, walking and cycling within and between neighbourhoods.

Objective 2

To create sustainable and liveable residential areas that provide a healthy environment and enable opportunities for social interaction and access to services and facilities for all residents.

Objective 3

To optimise the use of existing infrastructure, particularly the New Gisborne railway station.

Objective 4

To ensure residential development occurs in a sequential manner allowing for the efficient and timely provision of social and physical infrastructure, and integration with existing development.

Infrastructure strategies

1.1 Develop safe, attractive and efficient bicycle and pedestrian networks using public open spaces, linear links and road networks through all urban areas.

1.2 Give priority to connecting new residential areas to the town centre, local neighbourhood centres, community facilities, open space, public transport and the railway station when planning and designing pedestrian and bicycle paths.

1.3 Encourage the continued improvement of public transport services within and between Gisborne and New Gisborne.

1.4 Ensure new development is designed to accommodate future bus routes, including suitable road widths and intersection treatments to enable the safe and efficient operation of bus movements.

1.5 Retain and protect Station Road as the key north-south road between Gisborne and New Gisborne.

1.6 Develop a new north-south collector road within the New Gisborne growth area to alleviate traffic pressure on Station Road.

1.7 Develop the road hierarchy in Gisborne / New Gisborne and undertake the upgrades identified in the Gisborne Movement Network Study 2007.

1.8 Ensure new residential development addresses issues relating to the sequence of development and timely provision of physical and social infrastructure, including connecting roads, open space and walking / cycling paths.

1.9 Discourage residential development that requires 'leapfrogging' of services or cannot be fully serviced or interface with existing development at the time of development.

3.1.8 Schedule 4 to Clause 43.04 Development Plan Overlay (DPO4) – Gisborne Residential Areas

DPO4 affects land zoned for residential purposes in Gisborne. This schedule aims to ensure the co-ordinated and sequential development of the land to provide for the immediate and longer term residential requirements of Gisborne. The adopted Gisborne / New Gisborne Outline Development Plan Revised Final Report, September 2009 (ODP) provides the basis for this schedule.

Requirements for a development plan in the Gisborne area include:

The proposed public open space network which:-

- *Provides links to existing or proposed open space areas.*
- *Is fronted by roads or lots, to enhance passive surveillance of the area.*
- *Integrates with areas and corridors of habitat significance where possible.*
- *Incorporates passive and active recreation opportunities, including shared pedestrian/bicycle paths, urban art and playgrounds.*
- *Is not encumbered by any constraints, such as drainage reserves or land slope. Any encumbered open space areas must be provided in addition to an unencumbered public open space contribution of at least 5% of the development plan area.*
- *The provision and timing of physical and social infrastructure including retail, community, open space and recreational facilities (where required); clearly demonstrating the ability to provide any reticulated service or infrastructure item required by the proposed development.*

Area specific requirements are identified for the subject site as "West Gisborne". The following requirements must be incorporated into a development plan for the West Gisborne area identified as Development Area 1 in the Planning Scheme of this schedule, unless agreed in writing by the responsible authority to vary such requirements where necessary.

- *A conceptual urban design for the development of the Local Neighbourhood Activity Centre (approximate floor space of 500sqm) that includes:*
  - *Integration with proposed active and passive open space areas, and the existing childcare facility on Swinburne Avenue.*
  - *A high quality urban design and pedestrian focused development outcome.*
- *An active open space area of appropriate size and dimensions to accommodate formal recreation activities. This open space area must be integrated with the Local Neighbourhood*

Activity Centre. Linear open space linkages from this area through the development and connecting to the Jacksons Creek escarpment open space area must also be provided.

- *A low density interface to the Calder Freeway, Ross Watt Road opposite Gisborne Racecourse Marshlands Reserve, Jacksons Creek escarpment and adjoining rural land, and protection of the Jacksons Creek escarpment via an open space designation.*
- *Consideration of drainage and other development impacts on the Gisborne Racecourse Marshlands Reserve to the north to ensure that the existing biodiversity and hydrological values of the marshlands area are protected and enhanced.*
- *Building siting, design (including materials and colours) and height controls for future development in order to address the landscape sensitivity of the site resulting from significant view lines from the Calder Freeway and Jacksons Creek.*
- *Measures to protect, enhance and manage identified environmental values of Gisborne Racecourse Marshlands Reserve from impacts of the proposed development during pre-construction, construction and post-development, as identified in the Environmental and Drainage Assessment for Gisborne Racecourse Marshlands Reserve and Conservation Management Plans for Growling Grass Frog and migratory water birds.*

3.1.9 Schedule 2 to Clause 45.06 Development Contributions Plan Overlay (DCP02)

DCPO2 applies to all land in Gisborne and New Gisborne covered by the DCPO2 Area which also includes the subject site. As shown in Figure 6 on the following page, the subject site is located within charge area 4[2]. Charge area 4 requires residential development to pay $2,164.09 per residential lot[3].

- Bicycle and pedestrian links along Ross Watt Way;
- Jacksons Creek pedestrian and bicycle link;
- Upgrade Gardiner Reserve oval surface;
- Additional Netball complex inclusive of lighting; and
- Land for additions to active sportsfields.

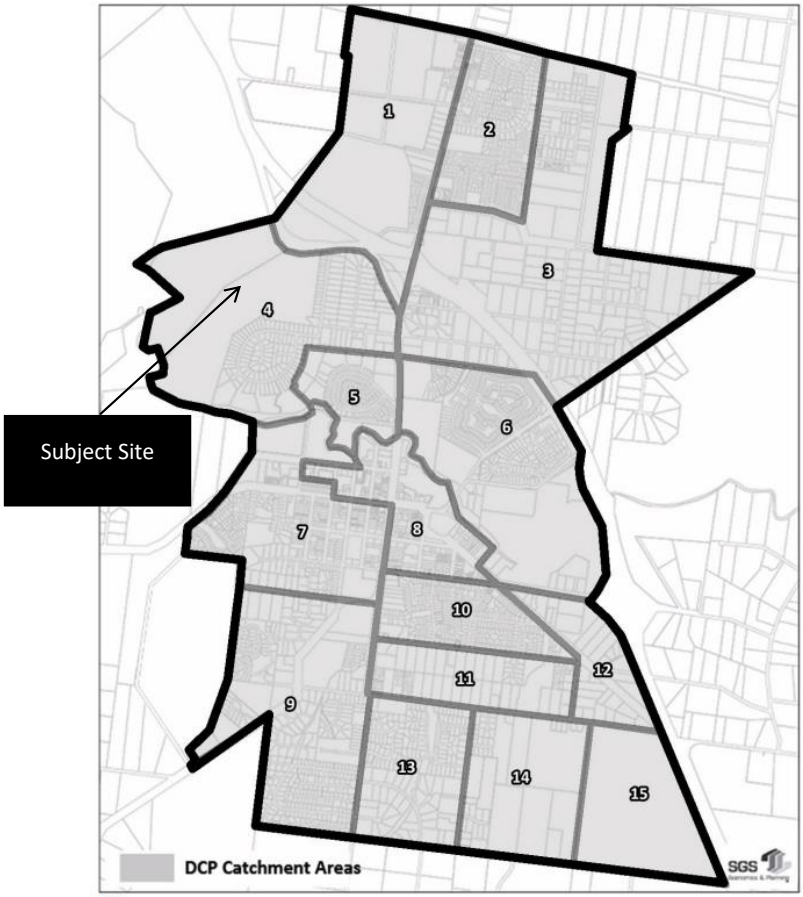
It should be noted that all the above items are classified as Development Infrastructure Levy (DIL) items. Section 46J of the Act requires that infrastructure in a DCP be classified in one of two categories: Development Infrastructure Levy (DIL) or Community Infrastructure Levy (CIL). In accordance with the relevant Victorian State

[2] In a DCP, contribution rates are set for areas known as 'charging areas'. A charging area is a small land area for which a discrete development contribution rate is calculated. All development within a particular charging area will be required to pay the same contribution amount.

[3] This is a July 1, 2013 figure which is adjusted annually. Capital works items are adjusted annually by applying the Building Price Index, June Quarter, Melbourne, in Rawlinsons Australian Construction Handbook. Land acquisition costs (open space land) are adjusted annually based on either the rise or fall of the relevant value as determined by the average of two registered valuations of the land involved, one of which is to be provided by the Victorian Valuer General.

Government DCP Guidelines and Ministerial Direction, there are no selected DCP projects that are classified as Community Infrastructure in this DCP.

Figure 6 – Subject Site in Relation to Gisborne Township Development Contributions Plan Charge Areas



Notes:
The DCP charge areas were estbalished during the DCP preparation process having regard to infrastructure project catchment characteritics and other planning information.

3.1.10 Clause 56.03-3 of the Macedon Ranges Planning Scheme (Planning for Community Facilities Objective)

The objective of this Clause is:

To provide appropriately located sites for community facilities including schools, libraries, preschools and childcare, health services, police and fire stations, recreation and sports facilities.

Standard C4

A subdivision should:

- Implement any relevant regional and local community facility strategy, plan or policy for the area set out in this scheme.
- Locate community facilities on sites that are in or near activity centres and public transport. School sites should:
  - Be integrated with the neighbourhood and located near activity centres.
  - Be located on walking and cycling networks.
  - Have a bus stop located along the school site boundary.
  - Have student drop-off zones, bus parking and on-street parking in addition to other street functions in abutting streets.
  - Adjoin the public open space network and community sporting and other recreation facilities.
  - Be integrated with community facilities.
  - Be located on land that is not affected by physical, environmental or other constraints.

Schools should be accessible by the Principal Public Transport Network in Metropolitan Melbourne and on the regional public transport network outside Metropolitan Melbourne.

Primary schools should be located on connector streets and not on arterial roads. New State Government school sites must meet the requirements of the Department of Education and Training and abut at least two streets with sufficient widths to provide student drop-off zones, bus parking and on-street parking in addition to other street functions.

3.1.11 Clause 56.05-2 of the Macedon Ranges Planning Scheme (Public Open Space Provision Objectives)

The objectives of this Clause are:

- To provide a network of quality, well-distributed, multi-functional and cost-effective public open space that includes local parks, active open space, linear parks and trails, and links to regional open space.
- To provide a network of public open space that caters for a broad range of users.
- To encourage healthy and active communities.
- To provide adequate unencumbered land for public open space and integrate any encumbered land with the open space network.
- To ensure land provided for public open space can be managed in an environmentally sustainable way and contributes to the development of sustainable neighbourhoods.

Standard C13

The provision of public open space should:

- Implement any relevant objective, policy, strategy or plan (including any growth area precinct structure plan) for open space set out in this scheme.
- Provide a network of well-distributed neighbourhood public open space that includes:
  - Local parks within 400 metres safe walking distance of at least 95 percent of all dwellings. Where not designed to include active open space, local parks should be generally 1 hectare in area and suitably dimensioned and designed to provide for their intended use and to allow easy adaptation in response to changing community preferences.
  - Additional small local parks or public squares in activity centres and higher density residential areas.
  - Active open space of a least 8 hectares in area within 1 kilometre of 95 percent of all dwellings that is:
    - Suitably dimensioned and designed to provide for the intended use, buffer areas around sporting fields and passive open space
    - Sufficient to incorporate two football/cricket ovals
    - Appropriate for the intended use in terms of quality and orientation
    - Located on flat land (which can be cost effectively graded)
    - Located with access to, or making provision for, a recycled or sustainable water supply
    - Adjoin schools and other community facilities where practical
    - Designed to achieve sharing of space between sports.
- Linear parks and trails along waterways, vegetation corridors and road reserves within 1 kilometre of 95 percent of all dwellings.

Public open space should:

- Be provided along foreshores, streams and permanent water bodies.
- Be linked to existing or proposed future public open spaces where appropriate.
- Be integrated with floodways and encumbered land that is accessible for public recreation.
- Be suitable for the intended use.

3.2 Gisborne Town Structure Plan

An Outline Development Plan (ODP), now known as a Town Structure Plan, has been developed for Gisborne/New Gisborne to ensure future development in the town is managed in an orderly, coordinated and sustainable way. Planning Scheme Amendment C67 (Parts 1 & 2) have introduced the recommendations of the Gisborne/New Gisborne Outline Development Plan Final Report (September 2009) into the Macedon Ranges Planning Scheme. The Gisborne / New Gisborne Framework Plan is shown on the following page in Figure 7 (along with the location of the subject site) and the notes and legend accompanying the Framework Plan are shown in Figure 8 following Figure 7.

Figure 7 - Gisborne / New Gisborne Framework Plan

Source: Macedon Ranges Planning Scheme, Clause 21.13-1 Gisborne and New Gisborne

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Figure 8 - Gisborne / New Gisborne Framework Plan Notes and Legend

NOTES (refer to numbers on plan):

1. Provide the opportunity for a new education facility or an increase in size of the existing Holy Cross School, and ensure the recreation reserve is retained for future active sports facilities.
2. Facilitate limited expansion of New Gisborne to the west to create a critical mass that provides an opportunity for the area to support a localised neighbourhood activity and community precinct within walking distance of most dwellings in New Gisborne.
3. Proposed drainage retarding basin required in this growth area subject to Melbourne Water approval.
4. Further investigate whether this area should be developed for industrial purposes or whether new industrial development should be confined to the area immediately south of the railway line.
5. Provision of a collector road linking the northern and southern ends of the proposed growth area to assist in alleviating traffic pressure on Station Road and protecting the character of Station Road, subject to a detailed traffic assessment.
6. Proposed f-uture expansion of the New Gisborne Industrial Estate to Saunders Road and to the east, to provide for more local employment opportunities. Ensure a high quality built and landscaped interface with Saunders Road.
7. Protect the interface with the Racecourse Marshlands Reserve.
8. Acquire additional land to provide space for an accessible public walkway link from the Skyline Drive estate to the Jacksons Creek linear parkland.
9. Protect the interface and viewlines along the Calder Freeway with lower densities.
10. Ensure that the Jacksons Creek valley and escarpments continue to be protected from development to maintain the natural setting of Gisborne.
11. Provide for a neighbourhood convenience store and community facility (ie. community centre/kindergarten) to service local needs. Subject to review, this community centre could be either additional to the Grant Avenue centre, or a site for it's relocation if required in the future.
12. Maximise connectivity of roads and open spaces to provide opportunities for pedestrian and bicycle networks.
13. Protect the interface of Gisborne and view lines along the Calder Freeway with lower densities (lots greater than 1,500sqm in area) and landscape screening.
14. Protect the interface with the Rosslynne Reservoir and Jacksons Creek by providing low density buffers along boundaries and protecting the Jacksons Creek escarpment with the PCRZ.

LEGEND

- Existing and proposed Residential 1 Zoned land
- Existing Low Density Residential Zoned land
- Existing Rural Living Zone
- Existing Rural Conservation Zone
- Existing and proposed Industrial Zoned land
- Existing Business Zoned land
- Community Facilities and Public Use
- Existing Public Open Space and Reserves
- Gisborne Golf Course
- Waterways
- Existing Child Care and Kindergartens
- Existing and indicative road structure
- Railway corridor and Station
- Proposed open space areas
- Proposed significant reserve areas (EVC - area identified with flora and flora values)
- Jacksons Creek Escarpment and Open Space Corridor
- Proposed community facility
- Proposed local neighbourhood retail (ie. local shop)
- Potential future mixed use precinct (ie. general store and community uses/medical centre) in New Gisborne
- Preferred area for medium density housing (Gisborne)
- Low Density Interface
- Preferred location for any new education facility site in New Gisborne
- Indicative bicycle and pedestrian networks
- Visually sensitive area
- Sensitive interface/design response required
- Protect Prominent Viewlines
- Mt. Gisborne - protect ridgelines and viewlines of and from Mt. Gisborne
- **Township Boundary** Restrict urban expansion to within the township boundary to the year 2031, in line with population projections.
- Indication of areas for investigation for township expansion opportunities post 2031, or once existing land supply within the township boundaries is limited.

Source: Macedon Ranges Planning Scheme, Clause 21.13-1 Gisborne and New Gisborne

3.3 Other Relevant Strategic Documents

A number of other Macedon Ranges Shire Council and non-Council agency strategies, plans and polices were identified and reviewed for potential relevance to the preparation of the assessment. These are listed in Table 3 below. Relevant details from these documents have been considered as part of the more detailed assessment in Section 4 of this report.

Table 3 – Existing Strategic Directions & Actions Potentially Relevant to the Assessment

Strategy
Corporate Strategies & Policies
Macedon Ranges Council Plan 2021-2031 The Council Plan sets out the strategic direction for the future of the Macedon Ranges Shire. It outlines Council's key priorities for the next four years, covering the term of the current elected Council, and supports the achievement of the Community Vision through planned objectives and strategies. The Local Government Act 2020 introduced strategic planning principles for Victorian councils, which include an integrated approach to planning, monitoring and performance reporting. The Council Plan forms part of the core legislated elements of the Integrated Strategic Planning and Reporting Framework. The four key strategic objectives identified by the Plan are: 1. Connecting communities 2. Healthy environment, healthy people 3. Business and tourism 4. Deliver strong and reliable government Key actions identified by the Plan of relevance to the assessment are: • Continue to improve continuous accessible paths of travel to key destinations, such as recreation and community facilities, through the funding of the Footpath Construction Program • Progress the Gisborne Structure Plan incorporating the Neighbourhood Character Study and Town Centre Urban Design Framework Plan to Council for decision and consider implementation into the Macedon Ranges Planning Scheme • Progress the review of Council's Developer Contributions Plans (Gisborne and Romsey) and consider any future changes to the Macedon Ranges Planning Scheme recommended by its findings • Progress the development of a new Open Space Strategy and consider implementation into the Macedon Ranges Planning Scheme • Commence construction on stage 1 of the Macedon Ranges Regional Sports Precinct project and continue advocacy for funding towards future stage delivery • Commence implementation of recommended master plan actions at the Gisborne, Kyneton and Malmsbury Botanic Gardens, including the delivery of an entry garden (western entrance) at the Gisborne Botanic Gardens • Optimise accessibility and usage of open space and facilities through a program of development and renewals for open space, playgrounds and sporting infrastructure • Work with the Department of Education to support current education reforms, such as the rollout of three-year-old kindergarten in the Macedon Ranges Shire and School Readiness Funding. • Provide and support access to quality kindergarten programs across the shire • Improve social connection for children and families with barriers to social engagement • Deliver the first-year actions for Council's Early Years Plan – CREATE • Strengthen municipal planning of early years' services
Recreation
Sport and Active Recreation Strategy 2018-2028 The role of the Sport and Active Recreation Strategy is to set out a framework for enhancing the health and wellbeing of residents through a range of services and facilities aimed at supporting and encouraging participation in physical activity, active recreation and sport and therefore community life. The strategy is an important planning tool that will be used by Council, Council officers and the community as a key reference document to help guide Councils future resource priorities and major projects and initiatives to support participation in community sport and active recreation. Key actions identified by the Strategy for the Gisborne District are:

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Strategy
• Support staged development of two multi-use ovals and associated infrastructure in New Gisborne over the short-medium term. In consultation with the New Gisborne Tennis Club, consider options to remain at Ross Watt Reserve or explore opportunities to relocate/replace the existing four tennis courts at Ross Watt Reserve to the proposed new Sports Precinct (ovals) in New Gisborne in the long-term (i.e. consider as part of the Master Plan design for this site), including shared use of proposed pavilion facilities. • Investigate and support upgrade / improvement requirements at Gardiner Reserve to reinforce the venue as one of the Shire's three premier AFL/ cricket sporting reserves – particularly cricket net facilities (address safety issues with balls entering the adjacent netball courts, and change room improvements including catering for female participants). • Dixon Field should be progressively developed as a regional standard facility for soccer in the Shire, including possible establishment of a synthetic pitch with match standard lighting in the very long-term (i.e. 10+ years) to cater for possible additional usage loads. • Support court upgrade at Gisborne Tennis Club (Dixon Field) as required. Also support lighting provision to final 2 courts (i.e. all 8 courts to be lit). • Support improvements to South Gisborne Tennis facilities subject to condition audit outcomes. • In consultation with all existing equestrian user groups undertake a Master Plan for I.R. Robertson Reserve (Gisborne) to explore requirements and options for staged upgrade of facilities, including opportunities for shared use. • Support installation of outdoor fitness equipment at suitable locations along Jacksons Creek. • Continue staged implementation of township specific recommendations from Council's Walking & Cycling Strategy and Open Space Strategy. • Continue to consider an expansion of the Gisborne Aquatic Centre and co-location of the Gisborne Fitness Centre should funding opportunities present.
Macedon Ranges Aquatic Strategy (2011) The primary purpose of the strategy is to develop an integrated strategic approach to planning and provision of affordable aquatic facilities across the Shire. The overall vision of the Council is to provide a range of quality and affordable indoor and outdoor aquatic facilities across the Shire. This vision sees a network of aquatic facilities coordinated with each other in location, use, management, marketing and fitting into an overall regional context. In particular the vision sees: *Indoor aquatic facilities being located in the major population centres of Gisborne, Kyneton and Romsey at a time when it is economical to do so. Modern user friendly and exciting outdoor aquatic facilities being managed and maintained for long term sustainability in Woodend and Lancefield serving those communities and, at times, the larger catchment areas.* The Strategy included a recommendation that Council prepare and submit an application to Sport and Recreation Victoria's Better Pools program for 2012/13 for an expansion of the Gisborne Aquatic Centre and, if successful, allocate Council's share of the funding over the next two financial years.
Macedon Ranges Open Space Strategy (2013) The purpose of the Macedon Ranges Open Space Strategy is to provide direction to Council for the planning and provision of open space within the Shire in an ongoing manner over the next ten or more years. Priority projects identified for Gisborne were: • G1 - Complete a study to identify open space that can provide for sports fields functions to cater for growth into the future. • G2 - Prepare a master plan for Gisborne Racecourse Reserve / Magnet Hill. Other aspirational priorities identified for Gisborne by the Strategy were: • G3 - Consolidate existing play equipment in Jacksons Creek Reserve and improve as a district social / family recreation open space. • G4 - Prepare a master plan for UL Daly Nature Reserve. • G5 - Redesign Ross Watt Reserve as a local social / family recreation open space, and sporting reserve. • G6 - Seek provision of a new local social / family recreation open space as part of new residential development south of Willowbank Road. • G7 - Seek provision of a new local social / family recreation open space as part of new residential development between Fersfield and Willowbank Roads. • G8 - Further develop the Jacksons Creek corridor. • G9 - Seek environment funding to contribute towards management of the Gisborne Racecourse Reserve, Jacksons Creek, and further embellishment of the Gisborne Botanic Gardens. • G10 - Investigate the provision of continuous off-road trails in southern Gisborne. • G11 - Provide an off-road trail circuit around New Gisborne. • G12 - Protect existing street trees throughout Gisborne. • G13 - Undertake improvements to the Gisborne Botanic Gardens and vicinity, in accordance with the existing master plan. • G14 - In line with the Management Plan, provide directional signage and consideration of parking at the base of Mt Gisborne.

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Strategy
• G15 - Consider providing parking at the base of Mt Aitken, and develop a walking trail to the summit. • G16 – Continue to preserve the drainage way in southern Gisborne as an open space corridor, and develop a trail along it towards Mt Gisborne. • G17 - In conjunction with Council's Domestic Animal Management Plan 2012-2016 identify an off-leash area to exercise and socialise dogs, to serve New Gisborne, and both the northern and southern areas of Gisborne. • G18 - Should the pine plantation between Gisborne Cemetery and Gisborne Secondary College be harvested and the cemetery expanded: seek a portion of the site to be retained as open space and revegetated with appropriate native species. • G19 - Work closely with user groups of Gilligan Reserve and IR Robertson Reserve in South Gisborne to continue to improve landscaping, environmental management. • G20 - Retain Pleasant View Court Reserve as open space for its restorative values. Allow for people to enjoy views through providing additional shade trees and seating. In terms of relevance to the assessment actions G1, G6 and G10 are considered to be the highest priorities.
Early years and youth services

CREATE Macedon Ranges Shire Early Years Plan: 2021-2025
 	
CREATE is a five year plan that responds to the needs, priorities and aspirations of children, as identified by the community. The plan now replaces the previous Early Years Plan 2016-2020.
 	
CREATE is informed by community and sector consultation undertaken in late 2019 and early 2021, and includes children's voices. It includes priority areas for action and responsibilities across Council departments and, in some instances, shared with the community.
 	
The Plan highlights the key achievements of the previous Plan including:
 	
• Upgrade of Swinburne Avenue, Romsey and Woodend kindergarten outdoor areas.
• Review of Occasional Care program across the shire and cessation of program due to poor utilisation.
• Advocacy to State and Federal Government for a long term commitment to fund 15 hours of kindergarten for eligible four year olds.
 	
The vision statement of the new Plan is as follows: "The Macedon Ranges is a place where childhood is valued and where every child can thrive, reach their potential and actively participate in the community, now and into the future."
 	
The new Plan identifies the following priorities:
 	
• Children are socially connected and active
• Children thrive in their community
• Children's needs are recognised in infrastructure and the built environment
• Children are respected and valued in their community
 	
Although the Plan contains no specific references to proposed initiatives in Gisborne, general actions relevant to the social infrastructure assessment include:
 	
• 1.2.1 In conjunction with community consultation, Early Years and Maternal and Child Health are engaged as knowledge experts for projects in the community impacting children and families, to gain a better understanding of children's and families' needs, including footpath improvements and better connectivity to meet community expectations, child/family needs and address safety concerns.
• 1.3.1 In conjunction with community consultation, Early Years and Maternal and Child Health are engaged as knowledge experts for projects in the community impacting children and families, to gain a better understanding of children's and families' needs, including more interconnected bike paths that benefit the whole community.
• 1.10.1 Explore partnerships with local schools around children's use of school grounds outside of school hours and during school holidays
• 2.1.2 Advocate for increased funding and resource investment by the State Government to co-locate new facilities with relevant early childhood services, eg schools and Maternal and Child Health
• 2.1.3 Explore new partnership opportunities with not-for-profit and private sector agencies
• 2.1.4 Explore feasibility of bush kinder programs being run across the shire
• 2.2.1 Implement funded three year old kindergarten in Council managed kindergartens from 2022
• 3.1.1 In conjunction with community consultation, Early Years and Maternal and Child Health are engaged as knowledge experts for projects in the community impacting children and families, to gain a better understanding of children's and families' needs, including:
  ➢ all ability access to Council outdoor and community open spaces including seating, shade, BBQ facilities and toilets with baby change facilities and breast feeding amenities
  ➢ improvements to parks and public spaces to make them more child and family friendly
  ➢ fencing of playgrounds as appropriate to increase safety of children

Strategy
• 3.3.2 Work with stakeholders on a process that considers early years expertise in the provision of public play spaces and early years infrastructure in the shire, and broader infrastructure and development projects including new planning applications
ELEVATE Macedon Ranges Shire Council Youth Strategy 2018-2028 The Youth Strategy 2018–2028 is a ten year strategic plan that will provide overall direction for Council's Youth Development unit and guide the programs, initiatives, advocacy and support work for young people and their families. The eight key priorities of the Youth Strategy are to: • Priority Area 1: Young people feel healthy and well • Priority Area 2: Young people feel safe • Priority Area 3: Young people feel connected to each other, and those around them • Priority Area 4: Young people feel proud • Priority Area 5: Young people feel embraced and heard • Priority Area 6: Young people feel supported • Priority Area 7: Young people feel inspired • Priority Area 8: Young people feel informed Although no Gisborne specific recommendations are identified by the Strategy a number of general actions are potentially relevant to the assessment including: • Advocate to all levels of government for more appropriate emergency and affordable housing for young people within the Macedon Ranges • Consider young people's needs and include young people's views in the design of community spaces, services and infrastructure • Support the Macedon Ranges libraries to become tech learning hubs for young people • Explore feasibility of converting existing facilities such as halls and/or mechanics institutes to be multi-purpose youth centres
Arts & Culture
Macedon Ranges Shire Council Arts and Culture Strategy 2018-2028 This 10 year strategy aims to enhance the social, cultural and economic development of the Macedon Ranges by building on what its doing well; exploring new opportunities for arts and culture; and making the most of the uniqueness of the shire, particularly its local talent and beautiful natural setting. The strategy's background document presents the significant amount of research and consultation undertaken during development. Council's Public Art and Memorial policies sit under this strategy. Actions relating to Gisborne are: • Based on existing infrastructure limitations and projected population growth, future planning for upgrades or renewal of the Macedon Ranges library facilities should prioritise Gisborne followed by Kyneton. • Council undertakes further investigation to determine the physical and programming capacity of the proposed sports hub in New Gisborne to accommodate arts and cultural activity. • Council supports GREAT to progress the Gisborne Amphitheatre project.

4 Future Social Infrastructure Demand & Supply Estimates

4.1 Development & Population Assumptions

This section provides indicative quantitative community infrastructure demand and supply estimates for the subject site and the Gisborne District using Macedon Ranges Shire Council's population forecasts prepared by .id consulting (http://forecast.id.com.au/macedon-ranges/home). For the purposes of this assessment ASR

Research has assumed an indicative dwelling yield of 750 for the subject site, generating a potential population of approximately 2,100 people[4].

Table 4 on the following page shows the likely age cohort populations generated by the subject site and the wider Gisborne District by 2036. It also indicates that the subject site will account for approximately 9% of all dwellings located within the Gisborne District by 2036.

[4] Based on average household size of 2.76 for the Gisborne District by 2036.

Table 4 - Revised Dwelling & Population Forecasts for Subject Site & Gisborne District by 2036

Age Cohort	Community infrastructure types the age cohort is relevant to	Subject Site by Build Out	Gisborne District by 2036	Adjusted Gisborne District by 2036
0-3	MCH, Playgroups	125	1,222	1,237
4	4 Year Old Kindergarten	35	339	343
0-4	Long Day Child Care & Occasional Child Care	160	1,561	1,581
5-11	Primary School enrolments, out of school hours care	244	2,375	2,405
12-17	Secondary School enrolments	500	4,874	4,935
0-14	Participation in organised children's sport	1,600	15,578	15,774
15+	Participation in organised youth & adult sport	243	2,364	2,394
15-24	Participation in higher education (youth & young adult)	1,357	13,214	13,380
25+	Participation in higher education (older adults)	183	1,785	1,807
70+	Residential & home based aged care services	283	2,757	2,792
0 to 69 years	NDIS services (younger clients)	1,817	17,695	17,917
Total Population		***2,100***	***20,452***	***21,172***
Dwellings		***750***	***7,754***	***8,011***

4.2 Social Infrastructure Provision Measures and Standards

Appendix 1 of this report provides indicative estimates for various forms of social infrastructure that lend themselves to some form of quantifiable demand and / or supply measure. ***It should be emphasised that the numbers indicated should not be interpreted as final provision recommendations for the structure plan areas.*** Community infrastructure assessments also require existing strategic priorities be taken into consideration, as well as the capacity of existing services and facility to meet current and future needs.

To assess future need, the service and / or facility provision ratios (or measures) were applied to population projections for the full development scenarios of both structure plan locations. A description of these measures, the assumptions that underpin them, and their source is also outlined in Appendix 1.

It should be emphasised that townships such as Gisborne also service population catchments beyond their urban core area, particularly rural and smaller township populations not large enough to sufficiently justify a diverse range of social infrastructure.

4.3 The Limitations of Social Infrastructure Standards

While providing a useful ***guide*** of demand and supply requirements generated by a given development scenario, social infrastructure standards and "demand estimators" do have limitations. For example, the estimates of organised sporting participation are based on survey data from the ABS and generalised for the Victorian population as a whole.

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Tables 5 on the following pages discusses the implications of the demand and supply estimates provided in Appendix 1 in the context of existing supply characteristics, and other more qualitative considerations.

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Table 5 – 89 Ross Watt Road Gisborne Social Infrastructure Assessment

Service / Community infrastructure type	Need generated by subject site	Likely requirements within the subject site / or off-site contributions
Public open space	DPO4 outlines public open space requirements as follows: • Provides links to existing or proposed open space areas. • Is fronted by roads or lots, to enhance passive surveillance of the area. • Integrates with areas and corridors of habitat significance where possible. • Incorporates passive and active recreation opportunities, including shared pedestrian/bicycle paths, urban art and playgrounds. • Is not encumbered by any constraints, such as drainage reserves or land slope. Any encumbered open space areas must be provided in addition to an unencumbered public open space contribution of at least 5% of the development plan area. • The provision and timing of physical and social infrastructure including retail, community, open space and recreational facilities (where required); clearly demonstrating the ability to provide any reticulated service or infrastructure item required by the proposed development. In relation to the subject site the DPO4 specifies: • Integration with proposed active and passive open space areas, and the existing childcare facility on Swinburne Avenue. • A high quality urban design and pedestrian focused development outcome. • An active open space area of appropriate size and dimensions to accommodate formal recreation activities. This open space area must be integrated with the Local Neighbourhood Activity Centre. Linear open space linkages from this area through the development and connecting to the Jacksons Creek escarpment open space area must also be provided.	Based on a Net Developable Area (NDA) of 66.11 hectares the theoretical minimum unencumbered public open space requirement is 3.3 hectares (5% of NDA). The draft concept plan proposes to establish four new unencumbered public open spaces supplying a total of 3.73 hectares of unencumbered public open space (5.6% of NDA). On this basis, the concept plan satisfies and exceeds the unencumbered public open space obligations stipulated by DPO4 of the Macedon Ranges Planning Scheme. In addition to this unencumbered public open space reserve, the draft concept plan identifies a number of other significant encumbered public open spaces consisting of: • Jacksons Creek Escarpment and Public Open Space Corridor (10.12ha); • Three drainage reserves (5.61ha in total); and • Landscape / tree reserves (0.5 ha). Although encumbered, drainage reserve land can potentially play an important informal recreational role for local residents (e.g. by accommodating a shared pedestrian and bicycle pathway which provides linkages to existing residential areas to the east and south). The client has advised that it intends to prepare a landscape concept plan which will detail the function and embellishments proposed for both the active open space and other encumbered public open spaces.

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Service / Community infrastructure type	Need generated by subject site	Likely requirements within the subject site / or off-site contributions
	The distribution of local passive parks should typically be accessible within 400 metres of most households. Active open space reserves should typically be available within 1 kilometre of most residents in an urbanised area.	
Active Open Space & Informal Outdoor Recreation	The nearest active open space reserves to subject site include: 1) Dixon Field (cricket, soccer, tennis, athletics and croquet); 2) Ross watt Recreation Reserve (tennis and BMX); 3) Sankey Reserve (cricket and Australian rules football) and 4) Gardiner Reserve (Australian rules football, cricket, netball and lawn bowls). The Gisborne District remains the focus for sports infrastructure development for the Shire including the 8 outdoor court Macedon Ranges Regional Netball Complex (opened in 2016), the proposed Regional Sports Hub (envisioned as a four-to-six court indoor stadium adjacent to the Regional Netball Complex) and the proposed New Gisborne Sports Fields project (located adjacent to the Regional Sports Hub and Netball Complex) which will deliver two ovals (catering for Australian rules football and cricket), 8 tennis courts and 2 outdoor multi-purpose courts. In relation to major outdoor participation sports the subject site is likely to generate the following demand by full development: • Australian football – 120 participants; • Tennis – 90 participants; • Soccer – 90 participants; • Netball – 70 participants (note: could also play indoor competitions); and • Cricket – 70 participants. It is worth noting that the majority of recreation activities undertaken are of an informal unstructured nature (i.e.	Given the subject site generates an unencumbered public open space requirement of 3.3 hectares, there remains little capacity to allocate sufficient land for a formal active open space reserve without compromising on the supply of smaller passive open space reserves. On this basis this assessment does recommend the inclusion of a formal active open space reserve as part of the proposed development.

Service / Community infrastructure type	Need generated by subject site	Likely requirements within the subject site / or off-site contributions
	where participation in the activity is not via an organisation such as a sporting club). In Victoria, the main informal recreation activities are walking, fitness / gym activities, running / jogging, swimming and cycling.	
Council Indoor Recreation Courts & Aquatic Leisure Centres	Council aquatic leisure centres • 0.1 facilities for the subject site • 0.8 aquatic leisure centres for the Gisborne District Indoor multipurpose courts • 0.2 courts for the subject site • 2 courts for the Gisborne District	Gisborne contains the Gisborne Aquatic Centre, Gisborne Fitness Centre and the recently developed Gisborne Stadium, a 2-court indoor stadium located within the Gisborne Secondary College. In 2018, Macedon Ranges Council endorsed the integration of two projects in Gisborne - the New Gisborne Sports Fields project and the Macedon Ranges Regional Sports Hub project—embracing a vision for the Macedon Ranges Regional Sports Precinct. The precinct has the potential to be constructed as one project or as a multi-stage development that will feature a mix of state-of-the-art sports facilities. The Regional Sports Hub concept is envisioned as a four-to-six court indoor stadium and community activity hub in New Gisborne which will service the growing needs of participants across the shire. The facilities will be spread across two interconnected sites in New Gisborne at the corner of Barringo Rd and Hamilton Road (located 9 kilometres west of the PSP, or 7 minutes driving time) and support a wide range of local sporting and community organisations and clubs; and also attract regional, state and other elite level competitions. Construction of the Hub is anticipated to commence in 2021. Given the existing facilities and proposed new facilities, and the moderate demand generated by the subject site, no additional indoor recreation facility provision within the subject site is likely to be sought by Council.
Early Years Services	The subject site generates the equivalent of:	
Long Day Child Care	• *40 long day child care places (one third of a large long day child care centre operating with 120 places)*	The future demand for long day child care in the Gisborne District will continue to increase over the coming decades, inclusive of the growth generated by the subject site. This assessment recommends that the subject site makes provision for a Long Day Child Care Centre that includes an integrated Kindergarten program for the community.

Service / Community infrastructure type	Need generated by subject site	Likely requirements within the subject site / or off-site contributions
4-year-old sessional Kindergartens	• *1 Kindergarten room for 4-year-old and 3-year-old sessional kindergarten programs (60 three and four year old enrolments)*	The proposed inclusion of a new long day child care facility would satisfy the demand for kindergarten services by providing an integrated Kindergarten program.
Maternal & Child Health (MCH)	• *0.1 MCH consulting suites*	Due to insufficient demand generated by the subject site and sufficient existing supply levels within the Gisborne District, no additional MCH service is recommended for the subject site.
Playgroups	• *1 playgroup session per week*	Due to the relatively small demand generated by the subject site future playgroup needs are best accommodated within existing services in the Gisborne and New Gisborne Townships.
Community Centres / Community Meeting Space)	The subject site generates the equivalent of: • 0.2 to 0.3 community centres (50 sqm of community meeting space)	The subject site does not have a sufficient number of dwellings to justify a multipurpose community centre.
Libraries & Neighbourhood House Facilities	The subject site generates the equivalent of: • 0.2 Libraries (18,300 loans per annum and 14,000 library visits per annum). • 0.3 Neighbourhood Houses (approximately 60 users per week).	The Gisborne District is serviced by the existing Gisborne Library and one Neighbourhood House (Macedon Ranges Further Education Centre). Given these existing facilities and the moderate demand generated by the subject site, no additional library or neighbourhood house provision within the Gisborne District is likely to be sought by Council.
Health Facilities	The subject site generates the equivalent of: • 8 public / private hospital beds; • 60 community health clients; and • 1 general practice	Although the provision of a variety of private and public health services is likely to expand within the Gisborne District over the coming decades, the subject site does not have locational attributes that make it a desirable location for future health services.
Aged Care Places	The subject site generates the equivalent of: • 35 aged care places (including residential aged care).	The Gisborne District contains 3 existing residential aged care providers supplying 131 beds. Approximately 220 beds will be required by 2036 to meet the future needs of the Gisborne District. This indicates that the subject site potentially offers an attractive location to establish a new residential aged care facility. This assessment encourages the proponent of the subject site to explore market interest in establishing an additional residential aged care facility. However, Council should not interpret the inclusion of a residential aged care facility within the subject site as a mandatory requirement.
Education Facilities	In relation to the Government education provision the subject site generates the equivalent of:	There are two existing Government Primary Schools and one Government Secondary College (Gisborne Secondary College) within the Gisborne District. A third Government Primary School – Willowbank Primary School - is currently being constructed and will open in 2022.

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Service / Community infrastructure type	Need generated by subject site	Likely requirements within the subject site / or off-site contributions
	• 0.3 Government Primary Schools (approximately 150 Government Primary School enrolments); and • 0.0 Government Secondary Schools (approximately 70 Government Secondary School enrolments). In relation to the non-government education provision the subject site generates the equivalent of: • approximately 60 Catholic primary school enrolments; • approximately 20 other non-government primary school enrolments; • approximately 60 Catholic secondary school enrolments; and • approximately 30 other non-government secondary school enrolments. In relation to higher education provision the subject site generates the equivalent of: • approximately 30 TAFE student enrolments; and • approximately 60 university student enrolments	Based on current population forecasts the Gisborne District will require 3 Government Primary Schools by 2036 and 1 Government Secondary College. Given the existing Government education facilities and soon to open Willowbank Primary School, and the moderate demand generated by the subject site, no additional Government Primary School or Government Secondary School is likely to be required within the Gisborne District. Non-government education provision within the Gisborne District consists of two Catholic Primary Schools (Holy Cross and St Brigid's School) and the Gisborne Montessori School (also a primary school). The Gisborne District does not currently contain a non-government secondary school. Provision strategies for non-government schools will need to be confirmed with existing local schools and / or their respective planning agencies (e.g. Catholic Education Melbourne). Any potential future interest from such providers may not be limited to the subject site.

5 Conclusion and Summary of Social Infrastructure Requirements

5.1 Suitability of the Subject Site for Social Infrastructure

On social infrastructure grounds, the subject site has a number of attributes which support early commencement. These can be described as follows:

- Based on the indicative dwelling yield assumed for this assessment (750 dwellings and a population of 2,100), the location attributes of the subject site, the proposed development triggers the need for some additional local level community infrastructure to be included. However, as described below, the early demands of the subject site can be met by a diverse range of existing services and facilities located more centrally within Gisborne and within the township of New Gisborne.
- The growth projected to occur within the Gisborne District, is made somewhat easier by the presence of many existing and planned higher order community infrastructure forms within Gisborne such as an aquatic leisure centre and library.

5.2 Subject Site Social Infrastructure Requirements

A summary of the key social infrastructure requirements for the subject site are presented below.

5.2.1 Public Open Space

1. Based on a Net Developable Area (NDA) of 66.11 hectares the theoretical minimum unencumbered public open space requirement is 3.3 hectares (5% of NDA). The draft concept plan proposes to establish four new unencumbered public open spaces supplying a total of 3.73 hectares of unencumbered public open space (5.6% of NDA). On this basis, the concept plan satisfies and exceeds the unencumbered public open space obligations stipulated by DPO4 of the Macedon Ranges Planning Scheme.
2. In addition to this unencumbered public open space reserve, the draft concept plan identifies a number of other significant encumbered public open spaces consisting of:
3. In addition to this unencumbered public open space reserve, the draft concept plan identifies a number of other significant encumbered public open spaces consisting of:
    - Jacksons Creek Escarpment and Public Open Space Corridor (10.12ha);
    - Three drainage reserves (5.61ha in total); and
    - Landscape / tree reserves (0.5 ha).

4. Although encumbered, drainage reserve land can potentially play an important informal recreational role for local residents (e.g. by accommodating a shared pedestrian and bicycle pathway which provides linkages to existing residential areas to the east and south).
5. The client has advised that it intends to prepare a landscape concept plan which will detail the function and embellishments proposed for both the active open space and other encumbered public open spaces.

5.2.2 Active Open Space and Indoor Recreation

Active Open Space

5 Given the subject site generates an unencumbered public open space requirement of 3.3 hectares, there remains little capacity to allocate sufficient land for a formal active open space reserve without compromising on the supply of smaller passive open space reserves. On this basis this assessment does not recommend the inclusion of a formal active open space reserve as part of the proposed development.

6 It is also worth noting that the proposed development will include an extensive network of shared pathways which will facilitate informal recreation activities such as cycling and running.

Indoor Recreation

7 Gisborne contains the Gisborne Aquatic Centre, Gisborne Fitness Centre and the recently developed Gisborne Stadium, a 2-court indoor stadium located within the Gisborne Secondary College.

8 In 2018, Macedon Ranges Council endorsed the integration of two projects in Gisborne - the New Gisborne Sports Fields project and the Macedon Ranges Regional Sports Hub project—embracing a vision for the Macedon Ranges Regional Sports Precinct. The precinct has the potential to be constructed as one project or as a multi-stage development that will feature a mix of state-of-the-art sports facilities.

9 The Regional Sports Hub concept is envisioned as a four-to-six court indoor stadium and community activity hub in New Gisborne which will service the growing needs of participants across the shire.

10 The facilities will be spread across two interconnected sites in New Gisborne at the corner of Barringo Rd and Hamilton Road (located 9 kilometres west of the PSP, or 7 minutes driving time) and support a wide range of local sporting and community organisations and clubs; and also attract regional, state and other elite level competitions. Construction of the Hub is anticipated to commence in 2021.

11 Given the existing facilities and proposed new facilities, and the moderate demand generated by the subject site, no additional indoor recreation facility provision within the subject site is likely to be sought by Council.

5.2.3 Early Years Services

12 Long day Child Care. The future demand for long day child care in the Gisborne District will continue to increase over the coming decades, inclusive of the growth generated by the subject site. This assessment recommends that the subject site makes provision for a Long Day Child Care Centre that includes an integrated Kindergarten program for the community.

13 Kindergarten. The proposed inclusion of a new long day child care facility would satisfy the demand for kindergarten services by providing an integrated Kindergarten program.

14 Maternal & Child Health. Due to insufficient demand generated by the subject site and sufficient existing supply levels within the Gisborne District, no additional MCH service is recommended for the subject site.

15 Playgroups. Due to the relatively small demand generated by the subject site future playgroup needs are best accommodated within existing services in the Gisborne and New Gisborne Townships.

5.2.4 Community Centres

16 The subject site does not have a sufficient number of dwellings to justify a multipurpose community centre.

5.2.5 Libraries & Neighbourhood Houses

17 The Gisborne District is serviced by the existing Gisborne Library and one Neighbourhood House (Macedon Ranges Further Education Centre). Given these existing facilities and the moderate demand generated by the subject site, no additional library or neighbourhood house provision within the Gisborne District is likely to be sought by Council.

5.2.6 Health Services

18 Although the provision of a variety of private and public health services is likely to expand within the Gisborne District over the coming decades, the subject site does not have locational attributes that make it a desirable location for future health services.

5.2.7 Residential Aged Care

19 The Gisborne District contains 3 existing residential aged care providers supplying 131 beds. Approximately 220 beds will be required by 2036 to meet the future needs of the Gisborne District. This indicates that the subject site potentially offers an attractive location to establish a new residential aged care facility. This assessment encourages the proponent of the subject site to explore market interest in establishing an additional residential aged care facility. However, Council should not interpret the inclusion of a residential aged care facility within the subject site as a mandatory requirement.

5.2.8 Education

20 There are two existing Government Primary Schools and one Government Secondary College (Gisborne Secondary College) within the Gisborne District. A third Government Primary School – Willowbank Primary School - is currently being constructed and will open in 2022. Based on current population forecasts the Gisborne District will require 3 Government Primary Schools by 2036 and 1 Government Secondary College.

21 Given the existing Government education facilities and soon to open Willowbank Primary School, and the moderate demand generated by the subject site, no additional Government Primary School or Government Secondary School is likely to be required within the Gisborne District.

22 Non-government education provision within the Gisborne District consists of two Catholic Primary Schools (Holy Cross and St Brigid's School) and the Gisborne Montessori School (also a primary school). The Gisborne District does not currently contain a non-government secondary school.

23 Provision strategies for non-government schools will need to be confirmed with existing local schools and / or their respective planning agencies (e.g. Catholic Education Melbourne). Any potential future interest from such providers may not be limited to the subject site.

5.3 Development Contributions Plan Obligations

Beyond the conclusions and recommendations outlined above all future residential development within the subject site will also be required to pay a development contribution to Council. Schedule 2 to Clause 45.06 Development Contributions Plan Overlay (DCP02) applies to all land in Gisborne and New Gisborne covered by the DCPO2 Area which also includes the subject site. The subject site is located within charge area 4 which requires residential development to pay $2,164.09 per residential lot (July 1, 2013 figure). The actual figure will be higher than this as the levy is indexed annually. The DCP levy paid by the proposed development will fund a range of projects including the following community infrastructure and open space projects:

- Bicycle and pedestrian links along Ross Watt Way;
- Jacksons Creek pedestrian and bicycle link;
- Upgrade Gardiner Reserve oval surface;
- Additional Netball complex inclusive of lighting; and
- Land for additions to active sportsfields.

Appendices

Appendix 1 – Social Infrastructure Demand & Supply Estimates for Ross Watt Road, Gisborne & Gisborne District

Community Infrastructure Category	Provision ratio / participation Rate	Description of measure	Source of measure	Ross Watt Road Development	Gisborne District by 2036	Adjusted Gisborne District by 2036
Public Open Space						
Unencumbered Public open space	5%	Public open space contribution	Schedule to Clause 53.01 Macedon Ranges Planning Scheme	**3.35**	**Not available**	**Not available**
Organised Sport Facility & Participation Estimates						
Indoor and outdoor recreation facilities						
Indoor recreation centres / courts	10,000	Total population per court	Typical standard used by some Melbourne Growth Area Councils (note: individual LGAs vary on their views about the "desired" benchmark and some have no documented working benchmark).	**0.2**	**2.0**	**2.1**
Council aquatic / leisure centre memberships	3.4%	% of Population who are members of a Council aquatic / leisure centre	Based on 2010 CERM PI® Operational Management Benchmarks for Australian Public Sports & Aquatic Centres	**71.4**	**695**	**720**
Council aquatic / leisure centres	25,000	Approximate total population per facility in Macedon Ranges (2019)	ASR Research calculation based on Macedon Ranges having 2 Council indoor aquatic leisure centre (2019).	**0.1**	**0.8**	**0.8**
Participation in organisation/venue based activity: Adults (people aged 15 and over)						
Fitness/Gym	30.2%	% of people aged 15 years and over participating in organised physical activity or sport at least once per year	Australian Sports Commission, AusPlay Survey (AusPlay): January 2018 to December 2018 Victoria Data (Table 11)	**483**	**4705**	**4,764**
Swimming	9.1%	As above	As above	**146**	**1418**	**1,435**
Golf	4.1%	As above	As above	**66**	**639**	**647**
Pilates	4.0%	As above	As above	**64**	**619**	**627**
Basketball	3.9%	As above	As above	**62**	**608**	**615**
Tennis	3.4%	As above	As above	**54**	**528**	**534**
Football/soccer	2.5%	As above	As above	**40**	**389**	**394**

89 Ross Watt Road, Gisborne Social Infrastructure Assessment

Community Infrastructure Category	Provision ratio / participation Rate	Description of measure	Source of measure	Ross Watt Road Development	Gisborne District by 2036	Adjusted Gisborne District by 2036
Yoga	4.1%	As above	As above	**66**	**639**	**647**
Netball	2.4%	As above	As above	**38**	**374**	**379**
Australian football	3.6%	As above	As above	**58**	**561**	**568**
Athletics, track and field (includes jogging and running)	3.1%	As above	As above	**50**	**483**	**489**
Cricket	2.6%	As above	As above	**42**	**405**	**410**
Organised participation by activity - top 10 activities (children aged 0 to 14)						
Swimming	39.4%	% of children aged 0-14 participating in organised physical activity or sport at least once per year	Australian Sports Commission, AusPlay Survey (AusPlay): January 2018 to December 2018 Victoria Data (Table 10)	**197**	**1920**	**1,944**
Australian football	13.1%	As above	As above	**66**	**638**	**647**
Basketball	11.4%	As above	As above	**57**	**556**	**563**
Cricket	5.7%	As above	As above	**29**	**278**	**281**
Dancing (recreational)	10.6%	As above	As above	**53**	**517**	**523**
Netball	7.1%	As above	As above	**36**	**346**	**350**
Football/soccer	10.4%	As above	As above	**52**	**507**	**513**
Tennis	7.3%	As above	As above	**37**	**356**	**360**
Gymnastics	11.0%	As above	As above	**55**	**536**	**543**
Athletics, track and field (includes jogging and running)	4.0%	As above	As above	**20**	**195**	**197**
Early Years Services						
Kindergartens						
Number of 4 year olds participating in 4 year old Kindergarten	100%	% of all eligible children participating in 4 Year Old Subsidised Kindergarten	Based on 100% participation rate	**35**	**339**	**343**

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Community Infrastructure Category	Provision ratio / participation Rate	Description of measure	Source of measure	Ross Watt Road Development	Gisborne District by 2036	Adjusted Gisborne District by 2036
Total number of enrolments in 4 year old sessional Kindergarten	85%	% of participating children (see above) enrolled at a Sessional Kindergarten service	Victorian Child and Adolescent Monitoring System (VCAMS), Department of Education & Training Based on indicator 31.4 Number of four year old kindergarten enrolments in a long day care or integrated children's services setting for Macedon Ranges: 15% (2015 data).	**30**	**288**	**292**
Number of Kindergarten rooms required	66	Number of sessional Kindergarten rooms required if 1 Kindergarten room accommodates 66 enrolments per week	ASR Research constructed measure assuming one kindergarten room is licensed for 33 places	**0.4**	**4.4**	**4.4**
Number of 3 year olds participating in 3 year old Kindergarten	90%	% of children participating in 3 Year old Kindergarten	ASR assumption based on proposed introduction of subsidised 3 year old Kindergarten program	**30**	**294**	**298**
Number of Kindergarten rooms when proposed policy changes are implemented	66	Number of sessional Kindergarten rooms required if 1 Kindergarten room accommodates 66 enrolments per week	ASR Research constructed measure assuming one kindergarten room is licensed for 33 places	**0.5**	**4.5**	**4.5**
Maternal & Child Health						
Number of MCH Full-Time Nurses	130	1 FT nurse per 130 children 0 years	ASR Research estimate	**0.2**	**2.2**	**2.2**
Number of MCH consulting units	1	Number of MCH consulting units required per FT nurse	Based on above	**0.2**	**2.2**	**2.2**
Playgroup						
Number of 2 hr playgroup sessions per week	134	Total number of children aged 0-3 years required to generate demand for a 2 hour playgroup session per week	ASR Research constructed measure using Playgroup Victoria	**0.9**	**9.1**	**9**
Occasional Child Care						
Number of occasional child care places	10	Total number people aged 0 to 4 years per licensed place	Macedon Ranges Provision Rate 2019 (2 centre and 33 places)	**1.6**	**15.6**	**16**

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Community Infrastructure Category	Provision ratio / participation Rate	Description of measure	Source of measure	Ross Watt Road Development	Gisborne District by 2036	Adjusted Gisborne District by 2036
Number of occasional child care centres	30	Total number of facilities required based on number of licensed places generated (see above)	ASR Research constructed measure based on a typical sized occasional child care facility.	**0.1**	**0.5**	**0.5**
Long Day Child Care Centres						
Number of Long Day Child Care places	252	Total number of licensed places per 1,000 children aged 0 to 4 years	Victorian Planning Authority, Melbourne Metropolitan Community Infrastructure Assessment: Local and Subregional Rates of Provision (MMCIA). A provision rate of long day child care places equal to that documented by the MMCIA report (2015) for Interface Councils.	**40**	**393**	**398**
Number of Long Day Child Care centres	120	Total number of facilities required based on number of licensed places generated (see above)	ASR Research constructed measure based on a typical large sized long day child care facility.	**0.4**	**4.1**	**4.2**
Community Centres, Meeting spaces, Neighbourhood Houses & Libraries						
multipurpose community meeting space	3000	200m2 per local community centre (1 community centre per 3,000 dwellings)	Based on Victorian Planning Authority, Review of Benchmark Infrastructure Costings Report (2018)	**50**	**517**	**534**
Neighbourhood Houses						
Number of Neighbourhood Houses	8300	Approximate total population per facility in Macedon Ranges Shire (2019)	Macedon Ranges Shire provision rate in 2019 (6 Neighbourhood Houses)	**0.3**	**2.5**	**2.6**
Number of Neighbourhood House users per week	3%	Percentage of population using a Neighbourhood House in a given week	Neighbourhood Houses Victoria, Neighbourhood Houses Survey 2017	**63**	**614**	**635**
Libraries						
Total number of loans of physical items	8.7	Total loans per person, per annum	Public Libraries Victoria Network, 2016-17 PLVN Annual Statistical Survey (2016), Goldfields Libraries data	**18,270**	**177,932**	**184,193**

89 Ross Watt Road, Gisborne Social Infrastructure Assessment

Community Infrastructure Category	Provision ratio / participation Rate	Description of measure	Source of measure	Ross Watt Road Development	Gisborne District by 2036	Adjusted Gisborne District by 2036
Number of library visits per annum	6.7	Total visits per person, per annum	Public Libraries Victoria Network, 2016-17 PLVN Annual Statistical Survey (2016), Goldfields Libraries data	**14,070**	**137,028**	**141,850**
Number of library facilities	8.0	Library facilities per 100,000 people	Macedon Ranges Shire provision rate (2019)	**0.2**	**1.6**	**1.7**
Education Enrolment & Facility Estimates						
Primary Schools						
Govt Primary Enrolment	63%	% of 5-11 year old population	Australian Bureau of Statistics, 2016 Census of Population and Housing, based on data for Macedon Ranges Shire Local Government Area	**154**	**1496**	**1,515**
Catholic Primary Enrolment	23%	% of 5-11 year old population	As above	**56**	**546**	**553**
Non Govt Primary Enrolment	7%	% of 5-11 year old population	As above	**17**	**166**	**168**
Total Primary Enrolment	93%	% of 5-11 year old population	As above	**227**	**2209**	**2,237**
Govt Primary School	3000	Total number of dwellings per facility	Department of Education & Training	**0.3**	**2.6**	**2.7**
Secondary Schools						
Govt Secondary Enrolment	39%	% of 12-17 year old population	Australian Bureau of Statistics, 2016 Census of Population and Housing, based on data for Macedon Ranges Shire Local Government Area	**71**	**696**	**705**
Catholic Secondary Enrolment	31%	% of 12-17 year old population	As above	**57**	**553**	**560**
Non Gov Secondary Enrolment	18%	% of 12-17 year old population	As above	**33**	**321**	**325**
Total Secondary Enrolment	88%	% of 12-17 year old population	As above	**161**	**1571**	**1,591**
Govt Secondary School	10000	Total number of dwellings per facility	Department of Education & Training	**0.0**	**0.1**	**0.1**
TAFE						

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Community Infrastructure Category	Provision ratio / participation Rate	Description of measure	Source of measure	Ross Watt Road Development	Gisborne District by 2036	Adjusted Gisborne District by 2036
TAFE Full-Time Enrolment (15 to 24)	2.0%	% of 15-24 year old population	Australian Bureau of Statistics, 2016 Census of Population and Housing, based on data for Macedon Ranges Shire Local Government Area	**5**	**47**	**48**
TAFE Full-Time Enrolment (25+)	0.1%	% 25 + year old population	As above	**1**	**13**	**13**
TAFE Part-Time Enrolment (15 to 24)	4.4%	% of 15-24 year old population	As above	**11**	**104**	**105**
TAFE Part-Time Enrolment (25+)	0.7%	% 25 + year old population	As above	**9**	**92**	**94**
Total TAFE students			As above	**26**	**257**	**260**
Universities						
University Full-Time Enrolment (15 to 24)	13.2%	% of 15-24 year old population	As above	**32**	**312**	**316**
University Full-Time Enrolment (25+)	0.6%	% 25 + year old population	As above	**8**	**79**	**80**
University Part-Time Enrolment (25 to 24)	1.6%	% of 15-24 year old population	As above	**4**	**38**	**38**
University Part-Time Enrolment (25+)	1.3%	% 25 + year old population	As above	**18**	**172**	**174**
Total University students		% 25 + year old population	As above	**62**	**601**	**608**
Primary & Acute Health Services						
Number of public and private hospital beds	3.9	Number of public and private beds per 1,000 people	Australian Institute of Health & Welfare, Australian hospital statistics 2015–16	**8**	**79**	**82**
Number of public hospital beds	2.4	Number of public beds per 1,000 people	Australian Institute of Health & Welfare, Australian hospital statistics 2015–16	**5**	**49**	**51**
Community health clients	3%	Proportion of population that is a registered community health client	Victorian Auditor-General's report, *Community Health Program* (June 2018)	**60**	**587**	**608**
Allied health service sites	0.90	Number of allied health service sites per 1,000 people (Macedon Ranges Shire)	Department of Health and Human Services, Macedon Ranges Shire Health Profile 2015 (https://www2.health.vic.gov.au/about/reporting-planning-data/gis-and-planning-products/geographical-profiles)	**0.7**	**7.0**	**7.2**

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Community Infrastructure Category	Provision ratio / participation Rate	Description of measure	Source of measure	Ross Watt Road Development	Gisborne District by 2036	Adjusted Gisborne District by 2036
General practice clinics	0.40	Number of general practice clinics per 1,000 people (Macedon Ranges Shire)	Department of Health and Human Services, Macedon Ranges Health Profile 2015 (https://www2.health.vic.gov.au/about/reporting-planning-data/gis-and-planning-products/geographical-profiles)	**0.8**	**8.2**	**8**
Dental service sites	0.20	Number of dental service sites per 1,000 people (Macedon Ranges Shire)	Department of Health and Human Services, Macedon Ranges Health Profile 2015 (https://www2.health.vic.gov.au/about/reporting-planning-data/gis-and-planning-products/geographical-profiles)	**0.4**	**4.1**	**4**
Pharmacies	0.20	Number of pharmacies per 1,000 people (Macedon Ranges Shire)	Department of Health and Human Services, Macedon Ranges Health Profile 2015 (https://www2.health.vic.gov.au/about/reporting-planning-data/gis-and-planning-products/geographical-profiles)	**0.4**	**4.1**	**4**
Projected hospital admissions	387.3	Hospital inpatient separations per 1,000 people (Macedon Ranges Shire). Note: projected to increase by 2.7% per annum until 2026/27.	Department of Health and Human Services, Macedon Ranges Health Profile 2015 (https://www2.health.vic.gov.au/about/reporting-planning-data/gis-and-planning-products/geographical-profiles)	**813**	**7921**	**8,200**
Emergency presentations	150.6	Emergency department presentations per 1,000 people (Macedon Ranges Shire). Note: projected to increase by 3.0% per annum until 2026/27	Department of Health and Human Services, Macedon Ranges Health Profile 2015 (https://www2.health.vic.gov.au/about/reporting-planning-data/gis-and-planning-products/geographical-profiles)	**316**	**3080**	**3,188**
Drug & alcohol clients	3.2	Number of registered Alcohol & Drug Treatment clients per 1,000 people (Macedon Ranges Shire)	Department of Health and Human Services, Macedon Ranges Health Profile 2015 (https://www2.health.vic.gov.au/about/reporting-planning-data/gis-and-planning-products/geographical-profiles)	**6.7**	**65**	**68**
Mental health clients	9.2	Number of registered mental health clients per 1,000 people (Macedon Ranges Shire)	Department of Health and Human Services, Macedon Ranges Health Profile 2015 (https://www2.health.vic.gov.au/about/reporting-	**19**	**188**	**195**

89 Ross Watt Road, Gisborne Social Infrastructure Assessment

Community Infrastructure Category	Provision ratio / participation Rate	Description of measure	Source of measure	Ross Watt Road Development	Gisborne District by 2036	Adjusted Gisborne District by 2036
			planning-data/gis-and-planning-products/geographical-profiles)			
Aged Care & HACC						
Aged Care						
Number of aged care places (residential and home care)	123	Number of beds per 1000 people aged 70 years +	Australian Government Planning Ratio 2019	**35**	**339**	**343**
Short Term Restorative Care Programme	2	Number of Community Aged Care Packages per 1000 people aged 70 years +	Australian Government Planning Ratio by 2019	**0.6**	**6**	**6**

Appendix 2 – Social Infrastructure Audit Maps

89 Ross Watt Road, Gisborne Social Infrastructure Assessment

Figure 9 – Existing Early Years Services

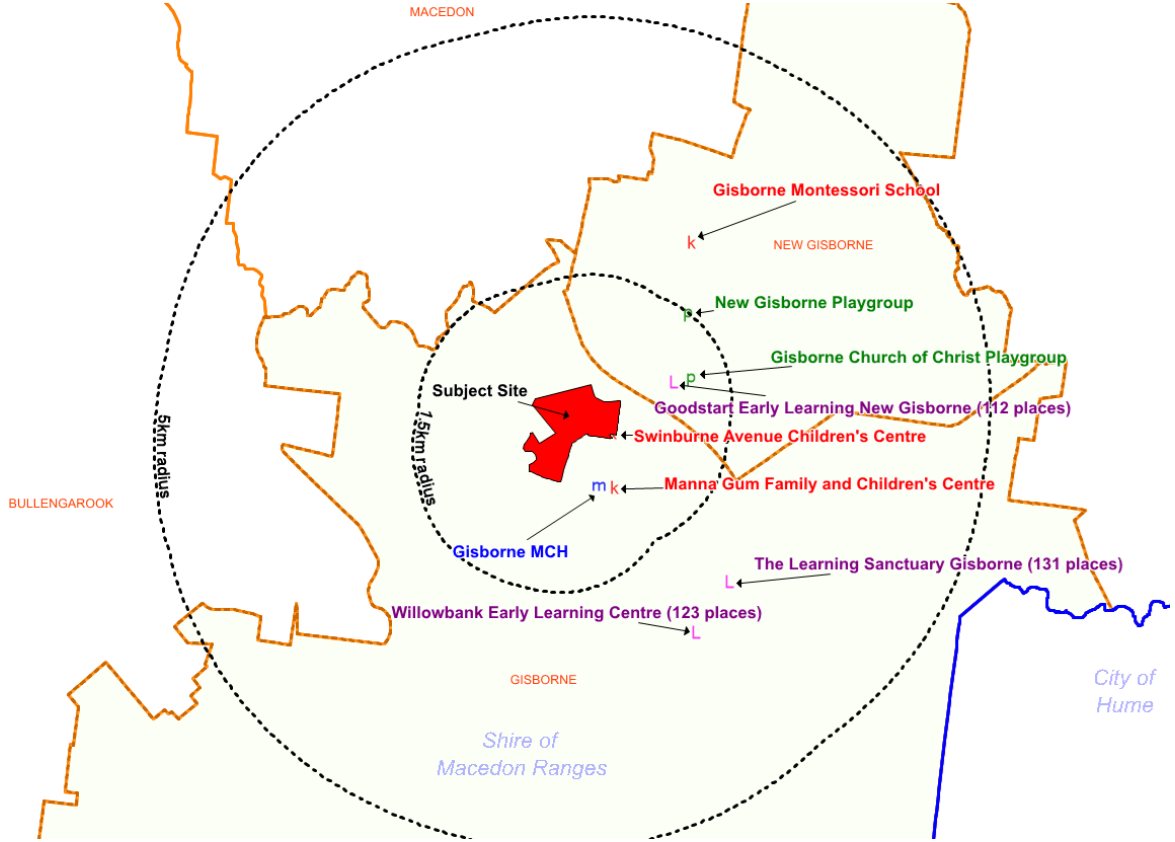

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Figure 10 - Library, Neighbourhood Houses & Community Meeting Spaces

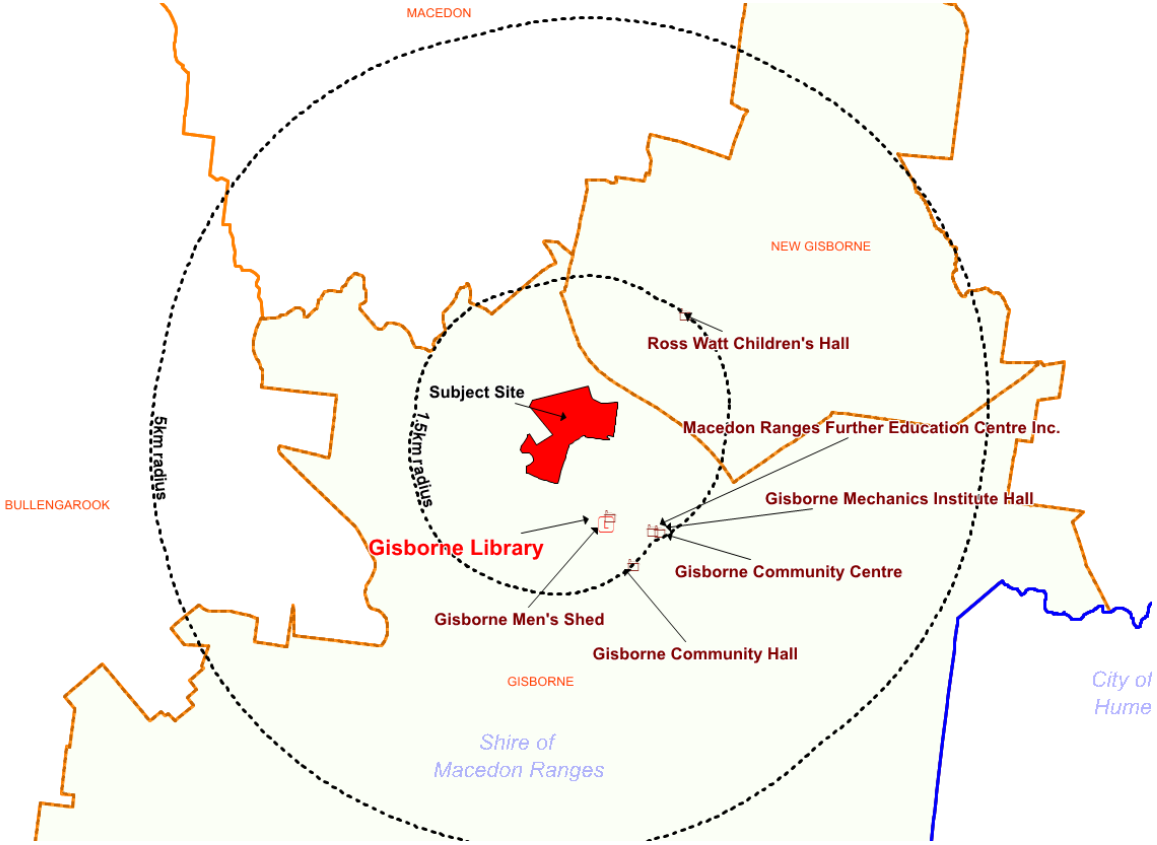

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Figure 11 - Education Facilities

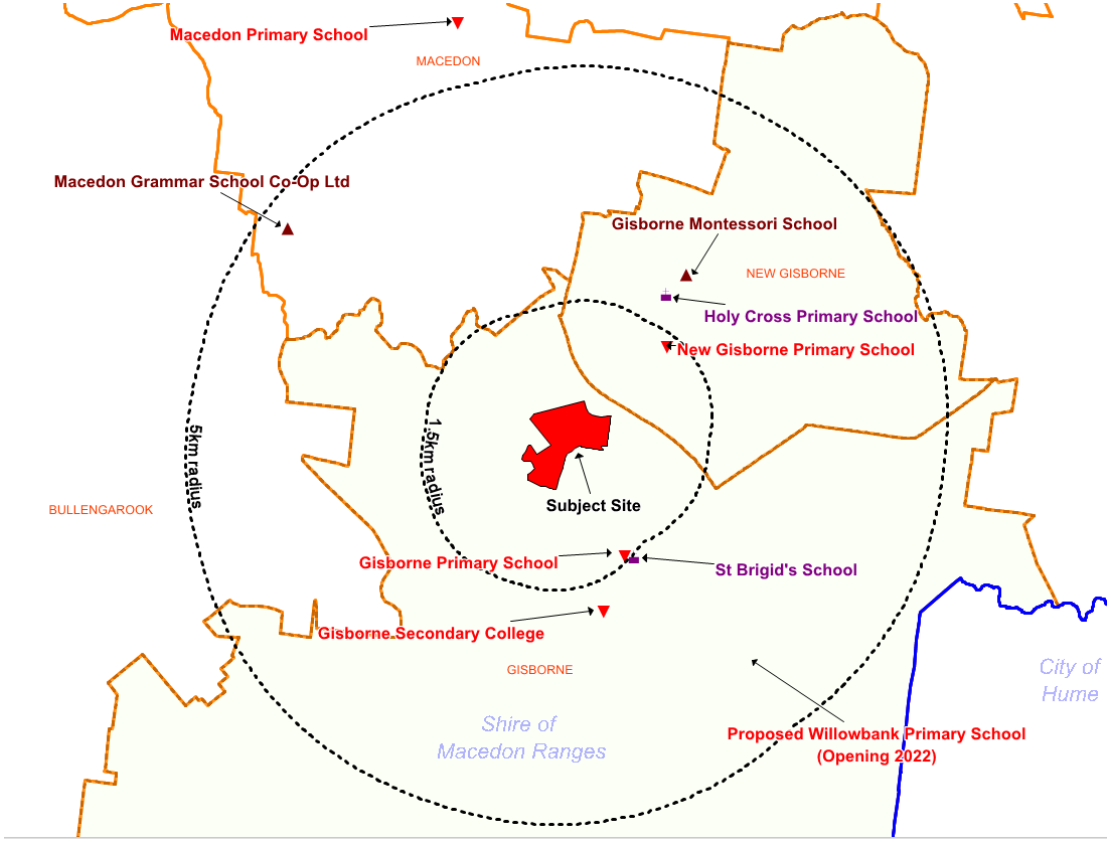

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Figure 12 - Indoor & Outdoor Recreation & Aquatic Facilities

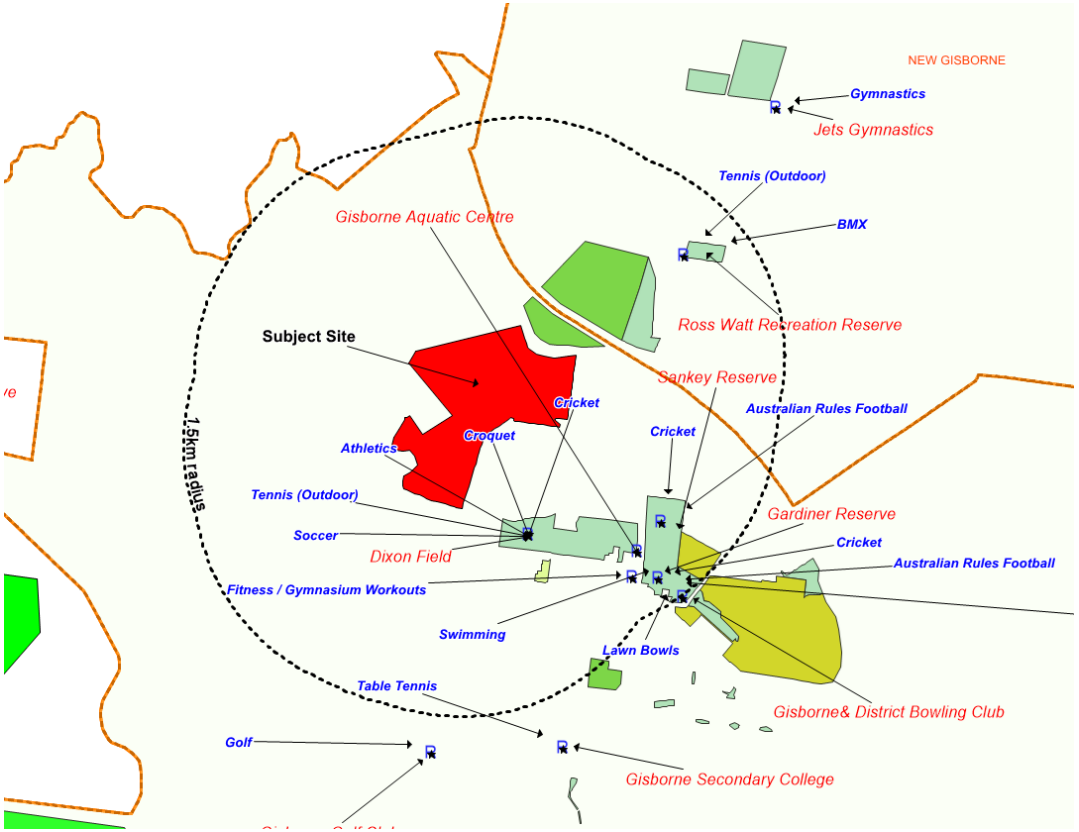

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Figure 13 – Open Space

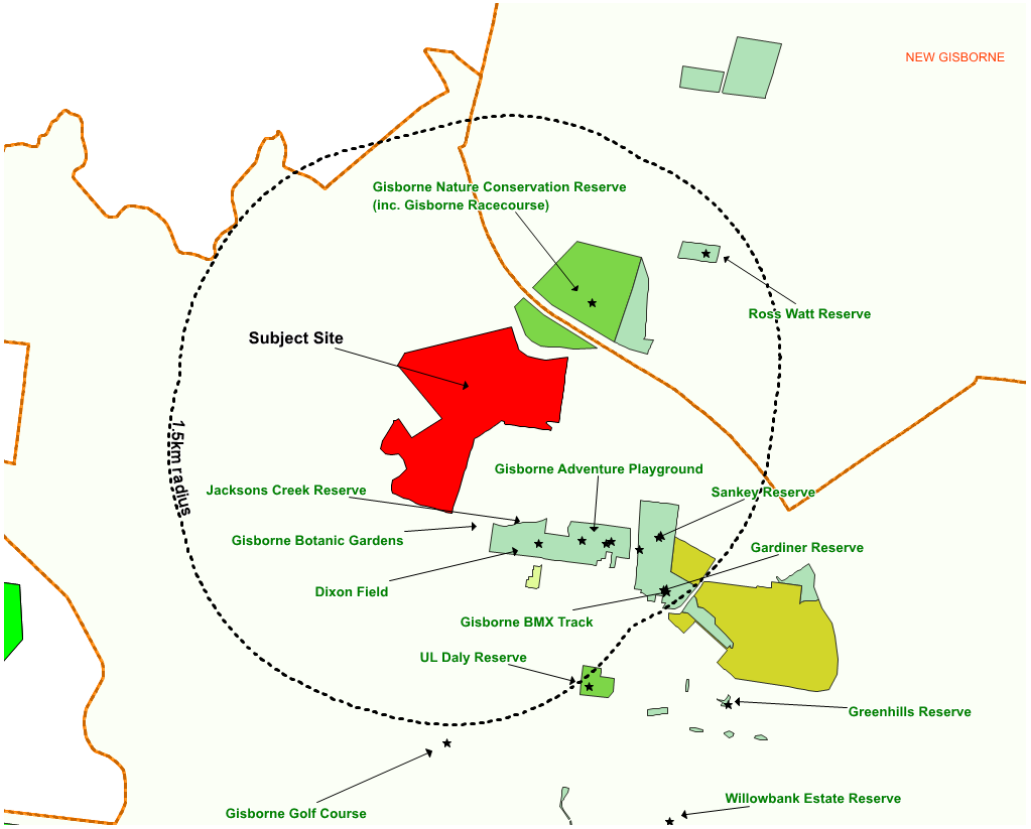

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Figure 14 - Residential Aged Care

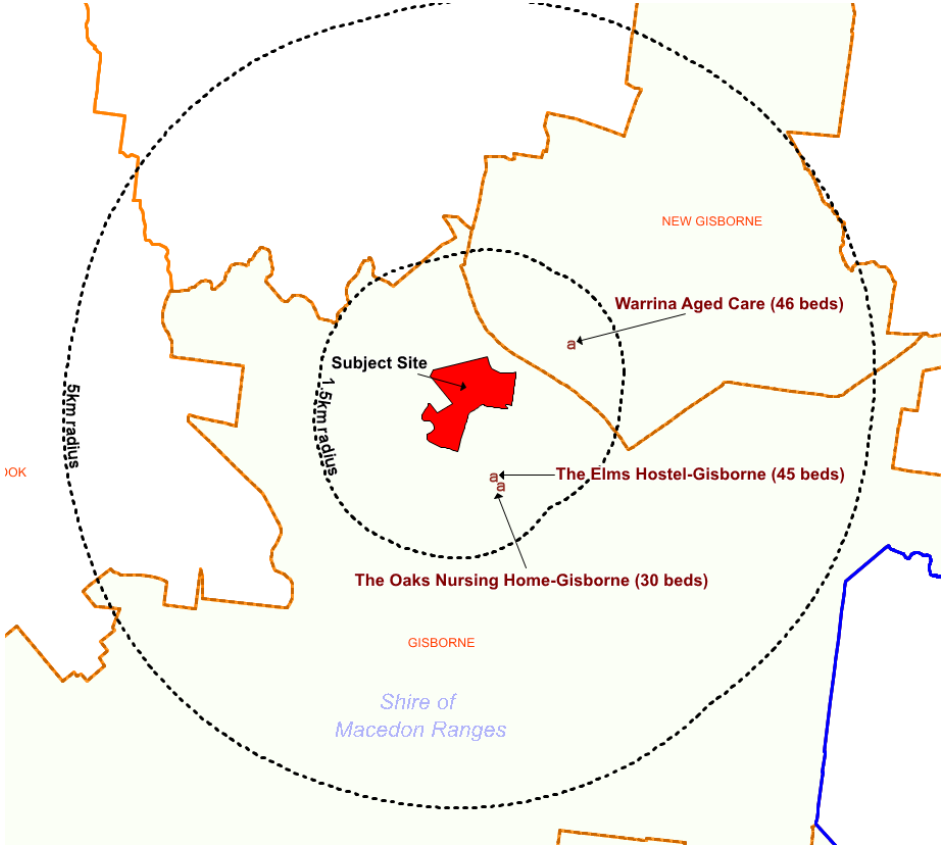

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Figure 15 - Primary & Acute Health Services

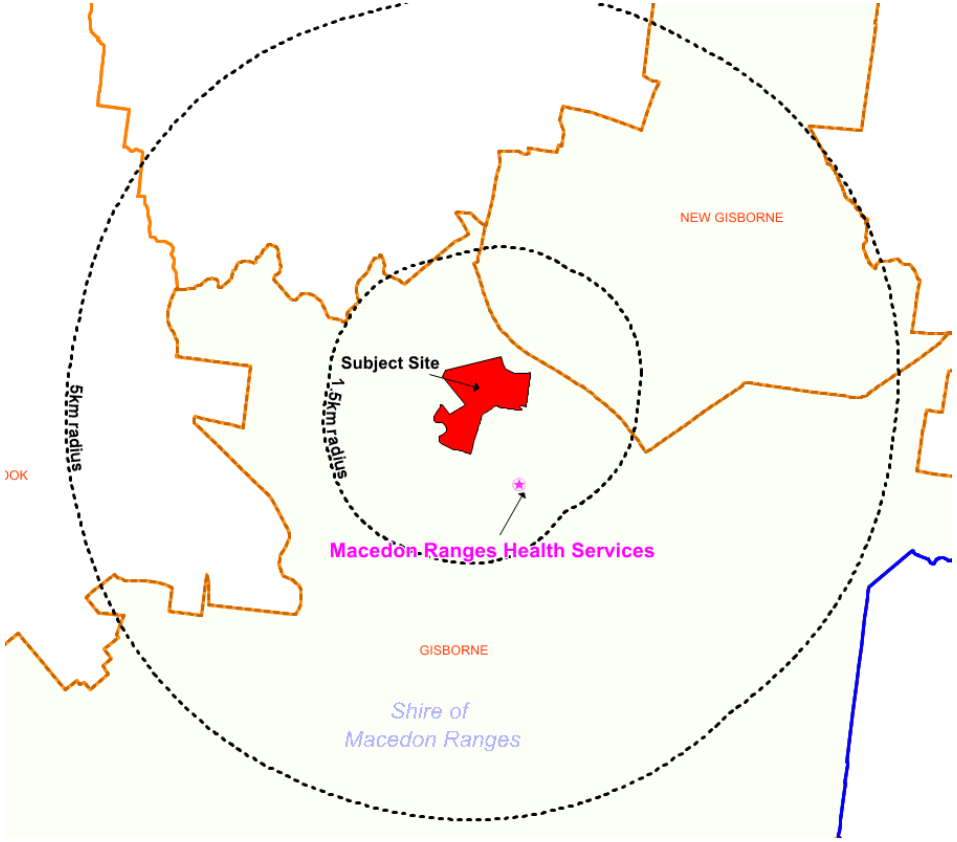

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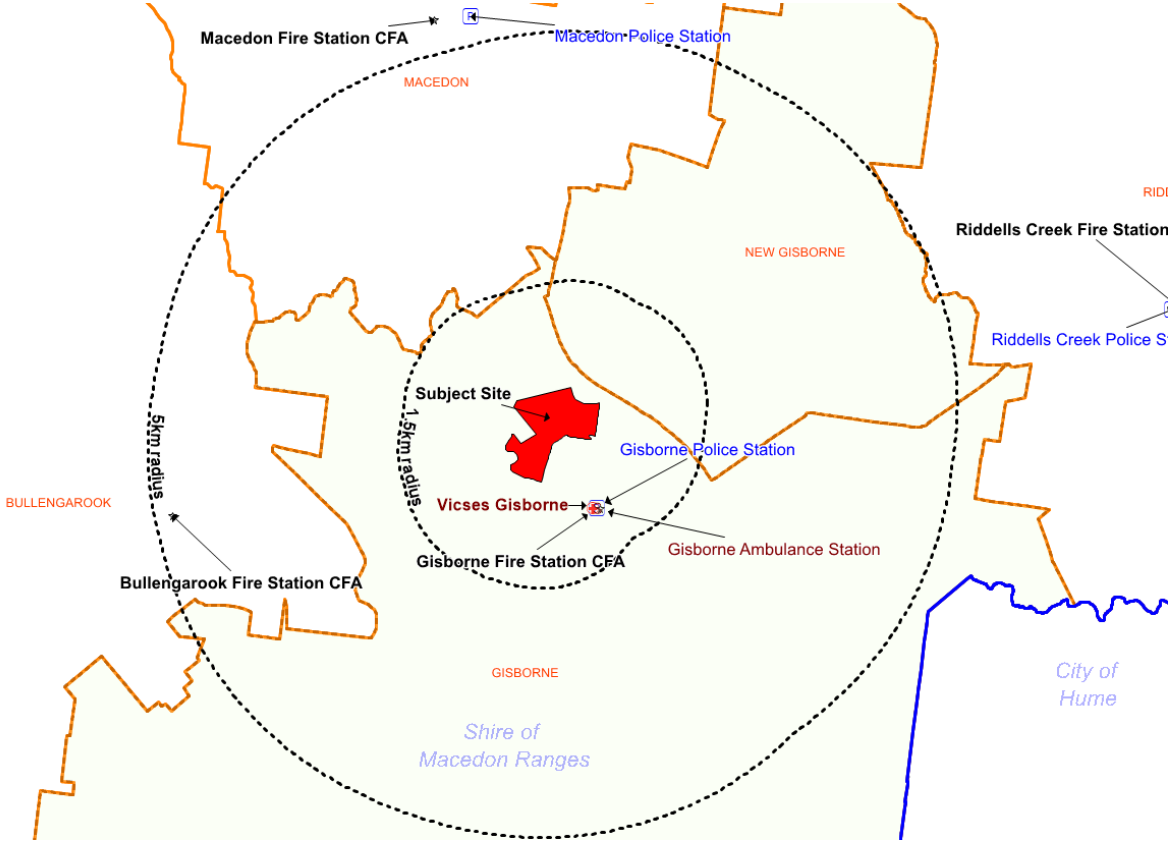
Figure 16 - Police & Emergency Services



TOWN PLANNERS | URBAN DESIGNERS | LANDSCAPE ARCHITECTS

collie

23 December 2021

Macedon Ranges Shire Council
Town Planning Department
Attention: Ms Leanne Kahn
PO Box 151
KYNETON VICTORIA 3444

Email: mrsc@mrsc.vic.gov.au

PLANNING PERMIT APPLICATION
GISBORNE AREA 1 - Subdivision
89 Ross Watt Road, Gisborne

Dear Ms Kahn,

On behalf of ID_Ross Watt Road Pty Ltd, please find enclosed a planning permit application for the subdivision of land under the Gisborne Area 1 Development Plan (GA1DP) at part 89 Ross Watt Road, Gisborne. The proposed subdivision has been designed to be generally in accordance with GA1DP and thus is exempt from notice, decision and review requirements of the Planning and Environment act 1987.

In order to assist you in the consideration of this application, please find enclosed the following information.

- A completed Application for a Planning Permit form.
- A recent (less than three months old) copy of the relevant title information.
- A completed credit card payment form in payment of the relevant application fee.
- A copy of the planning report in support of the proposal with the following as appendices:
  - GA1DP;
  - a subdivision plan for endorsement (version 4, Breese Pitt Dixon, 8 December 2021);
  - a letter prepared by Archaeology at Tardis confirming a voluntary Cultural Heritage Management Plan for the subdivision area will be undertaken
  - GA1DP Scheme response table;

Please note, background reports have not been provided as part of this application as all background reports remain current as provided very recently to Macedon Ranges Shire Council as part of the GA1DP submission.

It should also be noted that this application is being made with the consent of the owner.

We trust that the enclosed information is to your satisfaction and look forward to your consideration of this application. Please contact Michael Collie of this office should you have any queries.

Yours sincerely,

Collie Pty Ltd

Copy *Mr Alex While, ID Gisborne Pty Ltd*
Enclosure *As listed above.*

Collie Pty Ltd ABN 11 076 755 069
designers and facilitators

Level 16, 356 Collins Street
Melbourne Victoria 3000
Australia

+61 3 8698 9300

consult@colliepl.com.au
www.colliepl.com

https://collieptyltd.sharepoint.com/sites/Collie/Shared Documents/projects/21-8774 89 ross watt rd gisborne/00500 ppa/003 word/finalised/33056L.docx

Macedon Ranges Shire Council

Office Use Only

Application No.: Date Lodged: / /

Application for a **Planning Permit**

Planning Enquiries
Phone: (03) 5421 9670
Web: www.mrsc.vic.gov.au

If you need help to complete this form, read MORE INFORMATION at the end of this form.

Any material submitted with this application, including plans and personal information, will be made available for public viewing, including electronically, and copies may be made for interested parties for the purpose of enabling consideration and review as part of a planning process under the *Planning and Environment Act 1987*. If you have any questions, please contact Council's planning department.

Questions marked with an asterisk (*) must be completed.

If the space provided on the form is insufficient, attach a separate sheet.

Click for further information.

[redacted]

The Land

Address of the land. Complete the Street Address and one of the Formal Land Descriptions.

Street Address *

Unit No.: | St. No.: 89 | St. Name: Ross Watt Road

Suburb/Locality: Gisborne | Postcode: 3437

Formal Land Description *
Complete either A or B.

This information can be found on the certificate of title.

If this application relates to more than one address, attach a separate sheet setting out any additional property details.

A Lot No.: 1 ◯ Lodged Plan ⊗ Title Plan ◯ Plan of Subdivision No.: 844764W

OR

B Crown Allotment No.: | Section No.:

Parish/Township Name: Gisborne

The Proposal

You must give full details of your proposal and attach the information required to assess the application. Insufficient or unclear information will delay your application.

For what use, development or other matter do you require a permit? *

Subdivision in stages, construction of single dwellings on lots less than 300 square metres, removal of native vegetation and associated buildings and works

Provide additional information about the proposal, including: plans and elevations; any information required by the planning scheme, requested by Council or outlined in a Council planning permit checklist; and if required, a description of the likely effect of the proposal.

Estimated cost of any development for which the permit is required *

Cost $ Less than $100,000

You may be required to verify this estimate. Insert '0' if no development is proposed.

Existing Conditions

Describe how the land is used and developed now *

For example, vacant, three dwellings, medical centre with two practitioners, licensed restaurant with 80 seats, grazing.

Farming (grazing)

☑ Provide a plan of the existing conditions. Photos are also helpful.

Title Information

Encumbrances on title *

Does the proposal breach, in any way, an encumbrance on title such as a restrictrive covenant, section 173 agreement or other obligation such as an easement or building envelope?

- ○ Yes (If 'yes' contact Council for advice on how to proceed before continuing with this application.)
- ○ No
- (X) Not applicable (no such encumbrance applies).

☑ Provide a full, current copy of the title for each individual parcel of land forming the subject site.
The title includes: the covering 'register search statement', the title diagram and the associated title documents, known as 'instruments', for example, restrictive covenants.

Applicant and Owner Details

Provide details of the applicant and the owner of the land.

Applicant *

The person who wants the permit.

Name:
Title: | First Name: | Surname:
Organisation (if applicable): ID_Ross Watt Road Pty Ltd
Postal Address: | If it is a P.O. Box, enter the details here:
Unit No.: | St. No.: | St. Name:
Suburb/Locality: | State: | Postcode:

Please provide at least one contact phone number *

Contact information for applicant OR contact person below
Business phone: 86989300 | Email: mjsc@colliepl.com.au
Mobile phone: | Fax:

Where the preferred contact person for the application is different from the applicant, provide the details of that person.

Contact person's details*
Same as applicant ☐
Name:
Title: Mr | First Name: Michael | Surname: Collie
Organisation (if applicable): Collie Pty Ltd
Postal Address: | If it is a P.O. Box, enter the details here:
Unit No.: | St. No.: Level 16, 356 | St. Name: Collins Street
Suburb/Locality: Melbourne | State: VIC | Postcode: 3000

Owner *

The person or organisation who owns the land

Where the owner is different from the applicant, provide the details of that person or organisation.

Same as applicant ☐
Name:
Title: | First Name: | Surname:
Organisation (if applicable): Barro Group Pty Ltd
Postal Address: | If it is a P.O. Box, enter the details here:
Unit No.: | St. No.: 191 | St. Name: Drummond Street
Suburb/Locality: Carlton | State: VIC | Postcode: 3053
Owner's Signature (Optional): | Date: day / month / year

Declaration

This form must be signed by the applicant *

Remember it is against the law to provide false or misleading information, which could result in a heavy fine and cancellation of the permit.

I declare that I am the applicant; and that all the information in this application is true and correct; and the owner (if not myself) has been notified of the permit application.

Signature:

Date: **23/12/2021**
day / month / year

Need help with the Application?

General information about the planning process is available at planning.vic.gov.au

Contact Council's planning department to discuss the specific requirements for this application and obtain a planning permit checklist. Insufficient or unclear information may delay your application.

Has there been a pre-application meeting with a council planning officer?

(X) No ( ) Yes

If 'Yes', with whom?:

Date: day / month / year

Checklist

Have you:

Filled in the form completely?

[X] Paid or included the application fee?

Most applications require a fee to be paid. Contact Council to determine the appropriate fee.

[X] Provided all necessary supporting information and documents?

- [X] A full, current copy of title information for each individual parcel of land forming the subject site.
- [X] A plan of existing conditions.
- [X] Plans showing the layout and details of the proposal.
- [X] Any information required by the planning scheme, requested by council or outlined in a council planning permit checklist.
- [X] If required, a description of the likely effect of the proposal (for example, traffic, noise, environmental impacts).

[X] Completed the relevant council planning permit checklist?

[X] Signed the declaration above?

Lodgement

Lodge the completed and signed form, the fee and all documents with:

Macedon Ranges Shire Council
PO Box 151
Kyneton VIC 3444

Contact information:

Phone: (03) 5421 9670
Email: mrsc@mrsc.vic.gov.au

Deliver application in person, by post or by electronic lodgement.

MORE INFORMATION

The Land

Planning permits relate to the use and development of the land. It is important that accurate, clear and concise details of the land are provided with the application.

How is land identified?

Land is commonly identified by a street address, but sometimes this alone does not provide an accurate identification of the relevant parcel of land relating to an application. Make sure you also provide the formal land description – the lot and plan number or the crown, section and parish/township details (as applicable) for the subject site. This information is shown on the title.

See **Example 1.**

The Proposal

Why is it important to describe the proposal correctly?

The application requires a description of what you want to do with the land. You must describe how the land will be used or developed as a result of the proposal. It is important that you understand the reasons why you need a permit in order to suitably describe the proposal. By providing an accurate description of the proposal, you will avoid unnecessary delays associated with amending the description at a later date.

⚠ Planning schemes use specific definitions for different types of use and development. Contact the Council planning office at an early stage in preparing your application to ensure that you use the appropriate terminology and provide the required details.

How do planning schemes affect proposals?

A planning scheme sets out policies and requirements for the use, development and protection of land. There is a planning scheme for every municipality in Victoria. Development of land includes the construction of a building, carrying out works, subdividing land or buildings and displaying signs.

Proposals must comply with the planning scheme provisions in accordance with Clause 61.05 of the planning scheme. Provisions may relate to the State Planning Policy Framework, the Local Planning Policy Framework, zones, overlays, particular and general provisions. You can access the planning scheme by either contacting Council's planning department or by visiting the Planning Schemes Online section of the department's website http://planning-schemes.delwp.vic.gov.au

⚠ You can obtain a planning certificate to establish planning scheme details about your property. A planning certificate identifies the zones and overlays that apply to the land, but it does not identify all of
the provisions of the planning scheme that may be relevant to your application. Planning certificates for land in metropolitan areas and most rural areas can be obtained by visiting www.landata.vic.gov.au Contact your local Council to obtain a planning certificate in Central Goldfields, Corangamite, Macedon Ranges and Greater Geelong. You can also use the free Planning Property Report to obtain the same information.

See **Example 2.**

Estimated cost of development

In most instances an application fee will be required. This fee must be paid when you lodge the application. The fee is set down by government regulations.

To help Council calculate the application fee, you must provide an accurate cost estimate of the proposed development. This cost does not include the costs of development that you could undertake without a permit or that are separate from the permit process. Development costs should be calculated at a normal industry rate for the type of construction you propose.

Council may ask you to justify your cost estimates. Costs are required solely to allow Council to calculate the permit application fee. Fees are exempt from GST.

⚠ Costs for different types of development can be obtained from specialist publications such as Cordell Housing: Building Cost Guide or Rawlinsons: Australian Construction Handbook.

⚠ Contact the Council to determine the appropriate fee. Go to planning.vic.gov.au to view a summary of fees in the Planning and Environment (Fees) Regulations.

Existing Conditions

How should land be described?

You need to describe, in general terms, the way the land is used now, including the activities, buildings, structures and works that exist (e.g. single dwelling, 24 dwellings in a three-storey building, medical centre with three practitioners and 8 car parking spaces, vacant building, vacant land, grazing land, bush block).

Please attach to your application a plan of the existing conditions of the land. Check with the local Council for the quantity, scale and level of detail required. It is also helpful to include photographs of the existing conditions.

See **Example 3.**

Title Information

What is an encumbrance?

An 'encumbrance' is a formal obligation on the land, with the most common type being a 'mortgage'. Other common examples of encumbrances include:

- **Restrictive Covenants**: A 'restrictive covenant' is a written agreement between owners of land restricting the use or development of the land for the benefit of others, (eg. a limit of one dwelling or limits on types of building materials to be used).
- **Section 173 Agreements**: A 'section 173 agreement' is a contract between an owner of the land and the Council which sets out limitations on the use or development of the land.
- **Easements:** An 'easement' gives rights to other parties to use the land or provide for services or access on, under or above the surface of the land.
- **Building Envelopes:** A 'building envelope' defines the development boundaries for the land.

Aside from mortgages, the above encumbrances can potentially limit or even prevent certain types of proposals.

What documents should I check to find encumbrances?

Encumbrances are identified on the title (register search statement) under the header 'encumbrances, caveats and notices'. The actual details of an encumbrance are usually provided in a separate document (instrument) associated with the title. Sometimes encumbrances are also marked on the title diagram or plan, such as easements or building envelopes.

What about caveats and notices?

A 'caveat' is a record of a claim from a party to an interest in the land. Caveats are not normally relevant to planning applications as they typically relate to a purchaser, mortgagee or chargee claim, but can sometimes include claims to a covenant or easement on the land. These types of caveats may affect your proposal.

Other less common types of obligations may also be specified on title in the form of 'notices'. These may have an effect on your proposal, such as a notice that the building on the land is listed on the Heritage Register.

What happens if the proposal contravenes an encumbrance on title?

Encumbrances may affect or limit your proposal or prevent it from proceeding. Section 61(4) of the *Planning and Environment Act 1987* for example, prevents a Council from granting a permit if it would result in a breach of a registered restrictive covenant. If the proposal contravenes any encumbrance, contact the Council for advice on how to proceed.

You may be able to modify your proposal to respond to the issue. If not, separate procedures exist to change or remove the various types of encumbrances from the title. The procedures are generally quite involved and if the encumbrance relates to more than the subject property, the process will include notice to the affected party.

⚠ You should seek advice from an appropriately qualified person, such as a solicitor, if you need to interpret the effect of an encumbrance or if you seek to amend or remove an encumbrance.

Why is title information required?

Title information confirms the location and dimensions of the land specified in the planning application and any obligations affecting what can be done on or with the land.

As well as describing the land, a full copy of the title will include a diagram or plan of the land and will identify any encumbrances, caveats and notices.

What is a 'full' copy of the title?

The title information accompanying your application must include a 'register search statement' and the title diagram, which together make up the title.

In addition, any relevant associated title documents, known as 'instruments', must also be provided to make up a full copy of the title.

Check the title to see if any of the types of encumbrances, such as a restrictive covenant, section 173 agreement, easement or building envelope, are listed. If so, you must submit a copy of the document (instrument) describing that encumbrance. Mortgages do not need to be provided with planning applications.

⚠ Some titles have not yet been converted by Land Registry into an electronic register search statement format. In these earlier types of titles, the diagram and encumbrances are often detailed on the actual title, rather than in separate plans or instruments.

Why is 'current' title information required?

It is important that you attach a current copy of the title for each individual parcel of land forming the subject site. 'Current' title information accurately provides all relevant and up-to-date information.

Some Councils require that title information must have been searched within a specified time frame. Contact the Council for advice on their requirements.

⚠ Copies of title documents can be obtained from Land Registry: Level 10, 570 Bourke Street, Melbourne; 03 8636 2010; www.landata.vic.gov.au – go direct to "titles & property certificates".

Applicant and Owner Details

This section provides information about the permit applicant, the owner of the land and the person who should be contacted about any matters concerning the permit application.

The applicant is the person or organisation that wants the permit. The applicant can, but need not, be the contact person.

In order to avoid any confusion, the Council will communicate only with the person who is also responsible for providing further details. The contact may be a professional adviser (e.g. architect or planner) engaged to prepare or manage the application. To ensure prompt communications, contact details should be given.

Check with council how they prefer to communicate with you about the application. If an email address is provided this may be the preferred method of communication between Council and the applicant/contact.

The owner of the land is the person or organisation who owns the land at the time the application is made. Where a parcel of land has been sold and an application made prior to settlement, the owner's details should be identified as those of the vendor. The owner can, but need not, be the contact or the applicant.

See **Example 4.**

Declaration

The declaration should be signed by the person who takes responsibility for the accuracy of all the information that is provided. This declaration is a signed statement that the information included with the application is true and correct at the time of lodgement.

The declaration can be signed by the applicant or owner. If the owner is not the applicant, the owner must either sign the application form or must be notified of the application which is acknowledged in the declaration.

⚠ Obtaining or attempting to obtain a permit by wilfully making or causing any false representation or declaration, either orally or in writing, is an offence under the *Planning and Environment Act 1987* and could result in a fine and/or cancellation of the permit.

Need help with the Application?

If you have attended a pre-application meeting with a Council planner, fill in the name of the planner and the date, so that the person can be consulted about the application once it has been lodged.

Checklist

What additional information should you provide to support the proposal?

You should provide sufficient supporting material with the application to describe the proposal in enough detail for the Council to make a decision. It is important that copies of all plans and information submitted with the application are legible.

There may be specific application requirements set out in the planning scheme for the use or development you propose. The application should demonstrate how these have been addressed or met.

The checklist is to help ensure that you have:

- provided all the required information on the form
- included payment of the application fee
- attached all necessary supporting information and documents
- completed the relevant Council planning permit checklist
- signed the declaration on the last page of the application form

⚠ The more complete the information you provide with your permit application, the sooner Council will be able to make a decision.

Lodgement

The application must be lodged with the Council responsible for the planning scheme in which the land affected by the application is located. In some cases the Minister for Planning or another body is the responsible authority instead of Council. Ask the Council if in doubt.

Check with Council how they prefer to have the application lodged. For example, they may have an online lodgement system, prefer email or want an electronic and hard copy. Check also how many copies of plans and the size of plans that may be required.

Contact details are listed in the lodgement section on the last page of the form.

⚠ Approval from other authorities: In addition to obtaining a planning permit, approvals or exemptions may be required from other authorities or Council departments. Depending on the nature of your proposal, these may include food or health registrations, building permits or approvals from water and other service authorities.

EXAMPLES

Example 1

The Land

Address of the land. Complete the Street Address and one of the Formal Land Descriptions.

Street Address *

Unit No.: 4 | St. No.: 26 | St. Name: Planmore Avenue

Suburb/Locality: HAWTHORN | Postcode: 3122

Formal Land Description *
Complete either A or B.

This information can be found on the certificate of title.

If this application relates to more than one address, attach a separate sheet setting out any additional property details.

A Lot No.: 2 ○ Lodged Plan ○ Title Plan ● Plan of Subdivision No.: LP93562

OR

B Crown Allotment No.: | Section No.:

Parish/Township Name:

Example 2

For what use, development or other matter do you require a permit? *

Construction of two, double-storey dwellings and construction of two new crossovers.

Provide additional information about the proposal, including: plans and elevations; any information required by the planning scheme, requested by Council or outlined in a Council planning permit checklist; and if required, a description of the likely effect of the proposal.

Example 3

Existing Conditions

Describe how the land is used and developed now *

For example, vacant, three dwellings, medical centre with two practitioners, licensed restaurant with 80 seats, grazing.

Single dwelling.

a plan of the existing conditions. Photos are also helpful.

Example 4

Applicant and Owner Details

Provide details of the applicant and the owner of the land.

Applicant *

The person who wants the permit.

Name:

Title: Mr | First Name: Len | Surname: Browning

Organisation (if applicable): Responsible Developers P/L

Postal Address: | If it is a P.O. Box, enter the details here:

Unit No.: 4 | St. No.: 12 | St. Name: Ardour Lane

Suburb/Locality: Wycheproof | State: Vic | Postcode: 3527

Please provide at least one contact phone number *

Contact information for applicant OR contact person below

Business phone: 9123 4567 | Email: tcpl@bigpond.net.au

Mobile phone: 0412 345 678 | Fax: 9123 4567

Where the preferred contact person for the application is different from the applicant, provide the details of that person.

Contact person's details*

Same as applicant ☐

Name:

Title: Mr | First Name: Andrew | Surname: Hodge

Organisation (if applicable): Town Planning Consultants

Postal Address: | If it is a P.O. Box, enter the details here:

Unit No.: | St. No.: | St. Name: PO Box 111

Suburb/Locality: Parkdale | State: Vic | Postcode: 3194

Owner *

The person or organisation who owns the land

Where the owner is different from the applicant, provide the details of that person or organisation.

Same as applicant ☐

Name:

Title: | First Name: | Surname:

Organisation (if applicable):

Postal Address: | If it is a P.O. Box, enter the details here:

Unit No.: | St. No.: | St. Name:

Suburb/Locality: | State: | Postcode:

Owner's Signature (Optional): | Date: day / month / year

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The Victorian Government acknowledges the Traditional Owners of Victoria and pays respects to their ongoing connection to their Country, History and Culture. The Victorian Government extends this respect to their Elders, past, present and emerging.

REGISTER SEARCH STATEMENT (Title Search) Transfer of Land Act 1958

VOLUME 09633 FOLIO 633

Security no : 124094575956C
Produced 22/12/2021 10:54 AM

LAND DESCRIPTION

Lot 1 on Title Plan 844764W (formerly known as part of Lot 14 on Plan of Subdivision 005226).
PARENT TITLE Volume 07602 Folio 147
Created by instrument L624210X 19/04/1985

REGISTERED PROPRIETOR

Estate Fee Simple
Sole Proprietor
BARRO GROUP PTY LTD of 191 DRUMMOND STREET CARLTON 3053
U851542D 02/07/1997

ENCUMBRANCES, CAVEATS AND NOTICES

CAVEAT AU632623R 29/07/2021
Caveator
ID ROSS WATT ROAD PTY LTD ACN: 651707149
Grounds of Claim
PURCHASERS' CONTRACT WITH THE FOLLOWING PARTIES AND DATE.
Parties
THE REGISTERED PROPRIETOR(S)
Date
23/07/2021
Estate or Interest
FREEHOLD ESTATE
Prohibition
ABSOLUTELY
Lodged by
MADDOCKS
Notices to
NICK HOLUIGUE of "COLLINS SQUARE" LEVEL 25 727 COLLINS STREET MELBOURNE VIC 3008

Any encumbrances created by Section 98 Transfer of Land Act 1958 or Section 24 Subdivision Act 1988 and any other encumbrances shown or entered on the plan set out under DIAGRAM LOCATION below.

DIAGRAM LOCATION

SEE TP844764W FOR FURTHER DETAILS AND BOUNDARIES

ACTIVITY IN THE LAST 125 DAYS

NIL

DOCUMENT END

Imaged Document Cover Sheet

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Document Type	**Plan**
Document Identification	**TP844764W**
Number of Pages (excluding this cover sheet)	**1**
Document Assembled	**22/12/2021 10:58**

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TITLE PLAN

EDITION 1

TP844764W

LOCATION OF LAND

Parish: GISBORNE
Township: -
Section: 34A
Crown Allotment: 1(PT)
Crown Section: 35(PT)

Last Plan Reference: LP 5226
Derived From: VOL.9633 FOL.633
Depth Limitation: NIL

Notations

ANY REFERENCE TO MAP IN THE TEXT MEANS THE DIAGRAM SHOWN ON THIS TITLE PLAN

Description of Land/Easement Information

ENCUMBRANCES
AS TO THE LAND MARKED E-1
AN EASEMENT FOR THE TRANSMISSION OF ELECTRICITY HAS BEEN ACQUIRED BY S.E.C. VIDE NOTIFICATION N704201L

THIS PLAN HAS BEEN PREPARED BY LAND REGISTRY, LAND VICTORIA FOR TITLE DIAGRAM PURPOSES

COMPILED: Date: 27/12/2006
VERIFIED: A. DALLAS
Assistant Registar of Titles

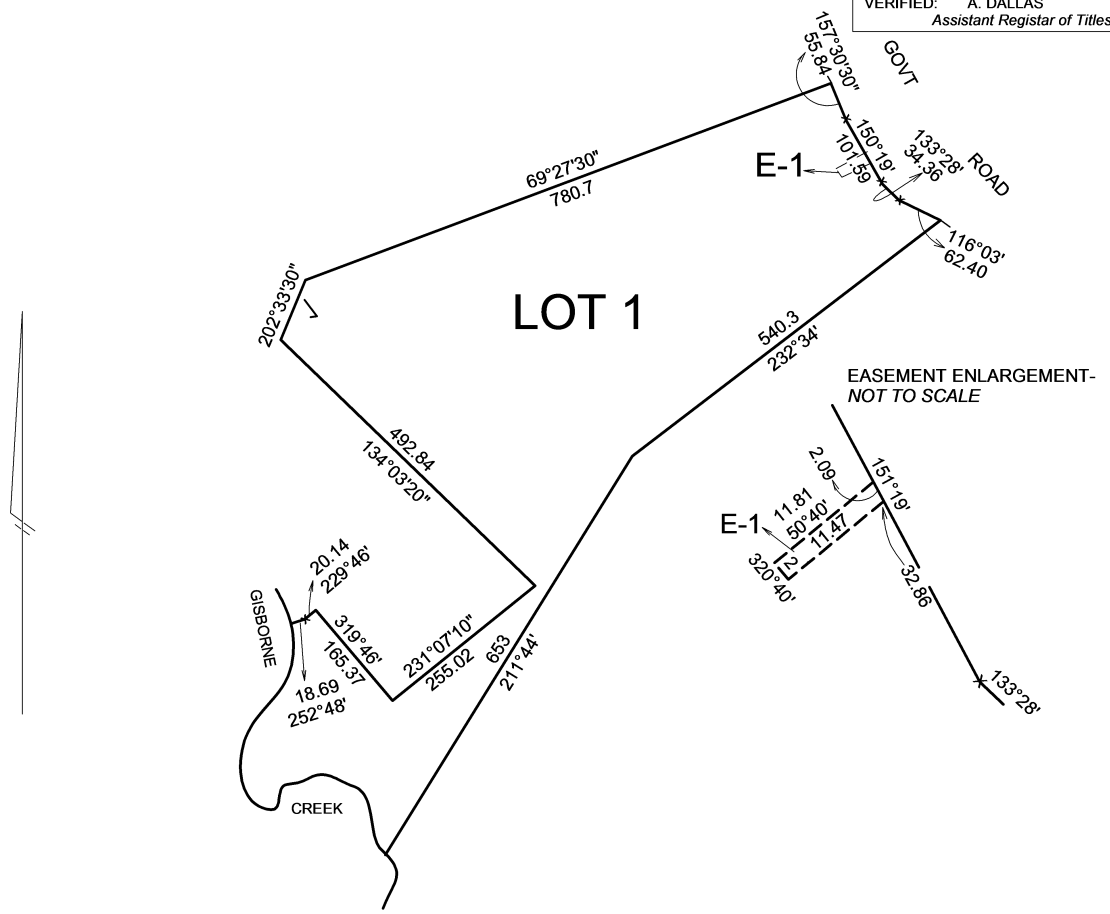

TABLE OF PARCEL IDENTIFIERS
WARNING: Where multiple parcels are referred to or shown on this Title Plan this does not imply separately disposable parcels under Section 8A of the Sale of Land Act 1962
LOT 1 = LOT 14(PT) ON LP 5226

LENGTHS ARE IN METRES	Metres = 0.3048 Feet Metres = 0.201168 x Links	Sheet 1 of 1 sheets

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PLAN OF SUBDIVISION	STAGE No.	LTO USE ONLY EDITION 2	PLAN NUMBER PS 318022 T

LOCATION OF LAND

PARISH: GISBORNE

TOWNSHIP: –

SECTION: 34A & 35 (PART)

CROWN ALLOTMENT: 2,3,6 & 1(PT)

CROWN PORTION: –

LTO BASE RECORD: TYLDEN 2500/22·08 MACEDON 25000/7823-3-3

TITLE REFERENCES: V.9816 F.617, V.9633 F.634

LAST PLAN REFERENCE/S: LOT 13 ON LP.5226

POSTAL ADDRESS: (At time of subdivision) 440 CALDER HIGHWAY GISBORNE

AMG Co-ordinates (of approx centre of land in plan) E 285893 N 849480 ZONE: 55

COUNCIL CERTIFICATION AND ENDORSEMENT

COUNCIL NAME: SHIRE OF GISBORNE REF: S-916

1. This plan is certified under Section 6 of the Subdivision Act 1988.
2. This plan is certified under Section 11(7) of the Subdivision Act 1988. Date of original certification under Section 6. / /.
3. This is a statement of compliance issued under Section 21 of the Subdivision Act 1988.

OPEN SPACE

(i) A requirement for public open space under Section 18 of the Subdivision Act 1988 has/has not been made.

(ii) The requirement has been satisfied.

(iii) The requirement is to be satisfied in Stage .....

Council Delegate
Council Seal
Date 13 / 7 / 92

Re-certified under Section 11(7) of the Subdivision Act 1988.
Council Delegate
Council Seal
Date / /

VESTING OF ROADS AND/OR RESERVES

IDENTIFIER	COUNCIL/BODY/PERSON
RESERVE NO.1	SHIRE OF GISBORNE

NOTATIONS

STAGING This is/is not a staged subdivision. Planning permit No.

DEPTH LIMITATION 15.24 METRES BELOW THE SURFACE

SURVEY THIS PLAN IS/IS NOT BASED ON SURVEY

THIS SURVEY HAS BEEN CONNECTED TO PERMANENT MARKS No.(s) IN PROCLAIMED SURVEY AREA No.

EASEMENT INFORMATION

LEGEND A - Appurtenant Easement E - Encumbering Easement R - Encumbering Easement (Road)

Easement Reference	Purpose	Width (Metres)	Origin	Land Benefited/In Favour Of
E-1	DRAINAGE & SEWERAGE	3	THIS PLAN	LAND IN THIS PLAN
E-2	WATER SUPPLY & SEWERAGE	3	THIS PLAN	LAND IN THIS PLAN

LTO USE ONLY

STATEMENT OF COMPLIANCE/ EXEMPTION STATEMENT

RECEIVED ☐

DATE / /

LTO USE ONLY

PLAN REGISTERED

TIME 9.40

DATE 2 / 2 / 93

Assistant Registrar of Titles

SHEET 1 OF 2 SHEETS

KLM DEVELOPMENT CONSULTANTS
4/50 THOMAS ST.
DANDENONG. 3175
PH.(03) 794 9438

LICENSED SURVEYOR (PRINT) James A.Dea

SIGNATURE ..... DATE / /

REF 78183 A VERSION 2

DATE / /

COUNCIL DELEGATE SIGNATURE

ORIGINAL SHEET SIZE A3

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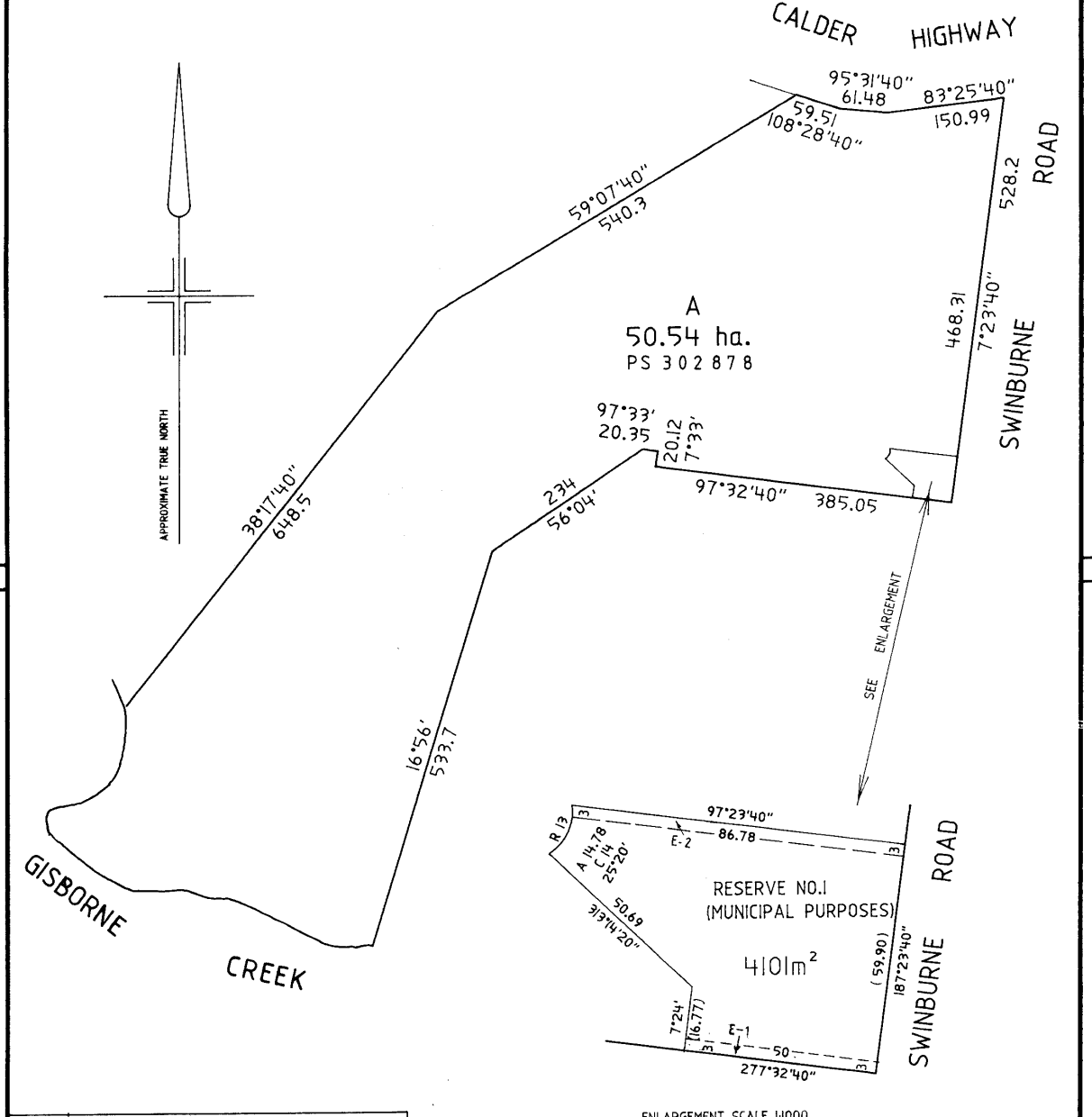
PLAN OF SUBDIVISION

STAGE No.

PLAN NUMBER **PS** 318022 T



ENLARGEMENT SCALE 1:1000

KLM DEVELOPMENT CONSULTANTS
4/50 THOMAS STREET
DANDENONG 3175
PH.(03) 794 9438

50 0 50 100 150 200 250
LENGTHS ARE IN METRES

ORIGINAL

SCALE	SHEET SIZE
1:5000	A3

LICENSED SURVEYOR (PRINT) James Andrew Dea

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SHEET 2 OF 2 SHEETS

DATE / /

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0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150mm

Crefields PS03

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MODIFICATION TABLE
RECORD OF ALL ADDITIONS OR CHANGES TO THE PLAN

PLAN NUMBER
PS318022T

LAND	MODIFICATION	DEALING REFERENCE	DATE AND TIME ENTERED		NEW EDITION NUMBER	SIGNATURE OF ASSISTANT REGISTRAR OF TITLES
			DATE	TIME		
LOT A	SUBDIVISION	PS 302878			2	

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VICTORIAN LAND TITLES OFFICE

U851542D
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Transfer of Land

Section 45 Transfer of Land Act 1958

OFFICE OF TITLES B.J. VICTORIA

MADE AVAILABLE / CHANGE CONTROL
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Name: L. F. SARTORI
Phone: 482 3811
Ref: 3399V Customer Code 3399V

The Transferor at the direction of the directing party (if any) transfers to the transferee the estate and interest specified in the land described for the consideration expressed and subject to the encumbrances affecting the land including any created by dealings lodged for registration before the lodging of this transfer.

Land *(Title)*
Volume 9633 Folio 633 and Volume 10099 Folio 540

Estate and Interest *(e.g. "all my estate in fee simple")*
all its estate in fee simple

Consideration
being entitled in equity

Transferor *(Full name)*
PARTELL PTY. LTD. (ACN 054 630 554)

Transferee *(Full name and address for future notices including postcode)*
BARRO GROUP PTY. LTD. (ACN 005 105 724) of 191 Drummond Street, Carlton, 3053

Directing Party *(Full name)*

Dated: 30 / 5 / 1995

Execution and Attestation

THE COMMON SEAL of PARTELL PTY. LTD. (ACN 054 630 554) was hereunto afixed in accordance with its Articles of Association in the presence of:

Director: Rhonda Barro Secretary: Ian P. Alexander

PARTELL PTY. LTD. THE COMMON SEAL OF A.C.N. 054 630 554

THE COMMON SEAL of BARRO GROUP PTY. LTD. (ACN 005 105 724) was hereunto affixed in accordance with its Articles of Association in the presence of:

Director: D Barro Secretary: Ian P. Alexander

Common Seal BARRO GROUP PTY. LTD. A.C.N. 005 105 724

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T1

OFFICE OF TITLES VICTORIA

Licence No. 2926L

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STATE REVENUE OFFICE VICTORIA

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ORDER TO REGISTER

To the Registrar of Titles

Please register this dealing and upon completion issue the documents as follows :-

Signed.....

Firm's Name.....

Customer code.....

L 70 *Available from:* Harston Partridge & Co. Pty. Ltd. (03) 428 1541

Department of Environment, Land, Water & Planning

Electronic Instrument Statement

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Status	Registered	Dealing Number	AU632623R
Date and Time Lodged	29/07/2021 01:56:20 PM		

Lodger Details

Lodger Code	17223H
Name	MADDOCKS
Address	
Lodger Box	
Phone	
Email	
Reference	8620663 - 2

CAVEAT

Jurisdiction VICTORIA

Privacy Collection Statement
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Land Title Reference
9633/633
10099/540

Caveator

Name	ID ROSS WATT ROAD PTY LTD
ACN	651707149

Grounds of claim
Purchasers' contract with the following Parties and Date.

Parties
The Registered Proprietor(s)

Date
23/07/2021

Estate or Interest claimed
Freehold Estate

Prohibition
Absolutely

Department of Environment, Land, Water & Planning

Electronic Instrument Statement

Name and Address for Service of Notice
Nick Holuigue
Address

Property Name	COLLINS SQUARE
Floor Type	LEVEL
Floor Number	25
Street Number	727
Street Name	COLLINS
Street Type	STREET
Locality	MELBOURNE
State	VIC
Postcode	3008

The caveator claims the estate or interest specified in the land described on the grounds set out. This caveat forbids the registration of any instrument affecting the estate or interest to the extent specified.

Execution

1. The Certifier has taken reasonable steps to ensure that this Registry Instrument or Document is correct and compliant with relevant legislation and any Prescribed Requirement.
2. The Certifier has retained the evidence supporting this Registry Instrument or Document.
3. The Certifier has taken reasonable steps to verify the identity of the caveator or his, her or its administrator or attorney.

Executed on behalf of	ID ROSS WATT ROAD PTY LTD
Signer Name	JOHN VAROS
Signer Organisation	MADDOCKS
Signer Role	AUSTRALIAN LEGAL PRACTITIONER
Execution Date	29 JULY 2021

File Notes:
NIL

This is a representation of the digitally signed Electronic Instrument or Document certified by Land Use Victoria.

Statement End.

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FINAL SEARCH STATEMENT **Land Use Victoria**

Security No : 124094576159F Volume 9633 Folio 633
Produced 22/12/2021 10:58 AM

ACTIVITY IN THE LAST 125 DAYS

NIL

ADMINISTRATIVE NOTICES

NIL

STATEMENT END

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REGISTER SEARCH STATEMENT (Title Search) Transfer of Land Act 1958

VOLUME 10099 FOLIO 540

Security no : 124094575957A
Produced 22/12/2021 10:54 AM

LAND DESCRIPTION

Lot A on Plan of Subdivision 318022T.
PARENT TITLES :
Volume 09633 Folio 634 Volume 09816 Folio 617
Created by instrument S284878J 02/02/1993

REGISTERED PROPRIETOR

Estate Fee Simple
Sole Proprietor
BARRO GROUP PTY LTD of 191 DRUMMOND ST CARLTON 3053
U851542D 02/07/1997

ENCUMBRANCES, CAVEATS AND NOTICES

CAVEAT AU632623R 29/07/2021
Caveator
ID ROSS WATT ROAD PTY LTD ACN: 651707149
Grounds of Claim
PURCHASERS' CONTRACT WITH THE FOLLOWING PARTIES AND DATE.
Parties
THE REGISTERED PROPRIETOR(S)
Date
23/07/2021
Estate or Interest
FREEHOLD ESTATE
Prohibition
ABSOLUTELY
Lodged by
MADDOCKS
Notices to
NICK HOLUIGUE of "COLLINS SQUARE" LEVEL 25 727 COLLINS STREET MELBOURNE VIC 3008

Any encumbrances created by Section 98 Transfer of Land Act 1958 or Section 24 Subdivision Act 1988 and any other encumbrances shown or entered on the plan set out under DIAGRAM LOCATION below.

DIAGRAM LOCATION

SEE PS318022T FOR FURTHER DETAILS AND BOUNDARIES

ACTIVITY IN THE LAST 125 DAYS

NIL

DOCUMENT END

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FINAL SEARCH STATEMENT **Land Use Victoria**

Security No : 124094576162B Volume 10099 Folio 540
Produced 22/12/2021 10:58 AM

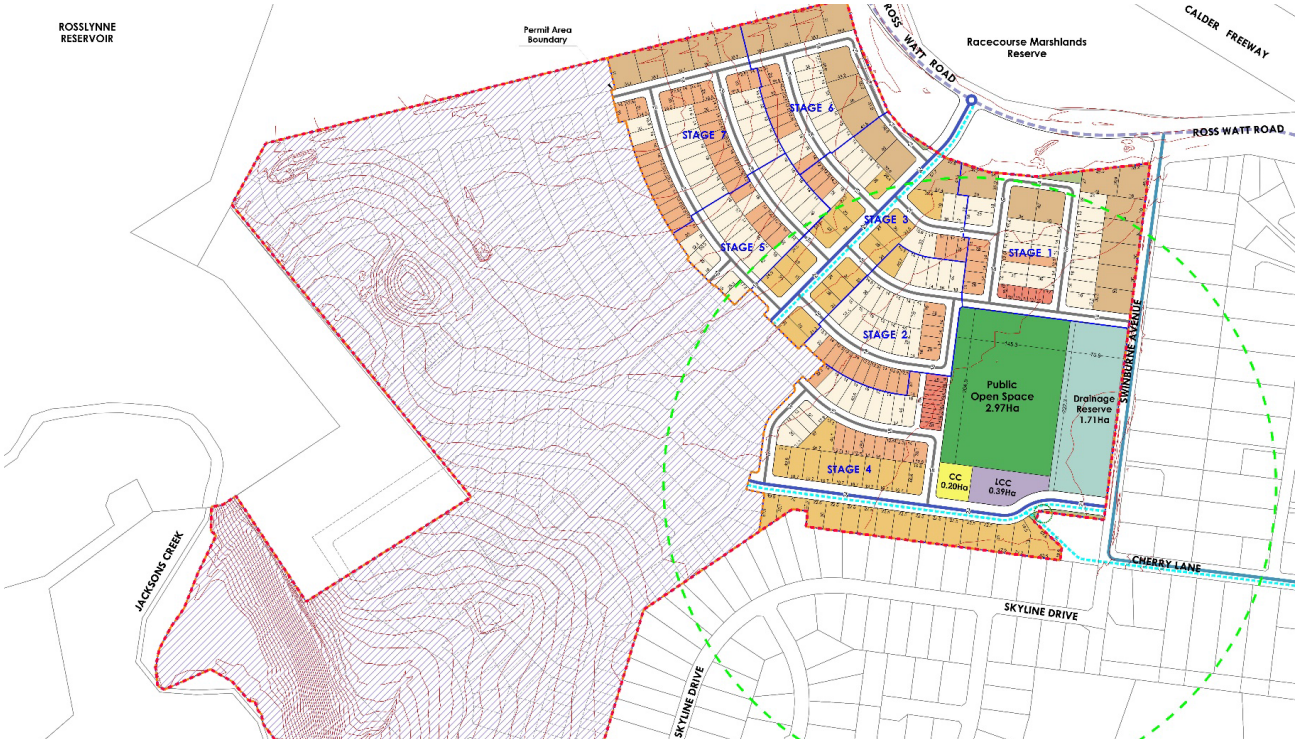
ACTIVITY IN THE LAST 125 DAYS

NIL

ADMINISTRATIVE NOTICES

NIL

STATEMENT END



TOWN PLANNING Report

23 December 2021

APPLICANT

ID_Ross Watt Road Pty Ltd

APPLICATION

Subdivision in stages, construction of single dwellings on lots less than 300 square metres, removal of native vegetation and associated buildings and works

ADDRESS

89 Ross Watt Road, Gisborne

collie

collie

TOWN PLANNERS | URBAN DESIGNERS | LANDSCAPE ARCHITECTS

Collie Pty Ltd
ABN 11 076 755 069
Level 16, 356 Collins Street
Melbourne Victoria 3000
Australia
+61 3 8698 9300
consult@colliepl.com.au
www.colliepl.com

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APPENDICES

Appendix A	GA1DP
Appendix B	Subdivision Plan
Appendix C	CHMP Letter
Appendix D	GA1DP Scheme Response Table

1 INTRODUCTION

This report has been prepared by Collie Pty Ltd (Collie) on behalf of ID_Ross Watt Road Pty Ltd (the applicant) in support of a planning permit application for subdivision at 89 Ross Watt Road, Gisborne (the subject land).

Specifically, this application seeks a planning permit for:

- subdivision in stages:
- construction of single dwellings on lots less than 300 square metres;
- removal of native vegetation;
- associated buildings and works.

This report provides a detailed description of the proposed subdivision, an assessment of the proposal against the relevant provisions of the Macedon Ranges Planning Scheme (the Scheme) and the Gisborne Area 1 Development Plan (GA1DP) (refer appendix A).

1.1 THE SUBJECT LAND AND SURROUNDS

The Gisborne Area 1 Development Plan (GA1DP) associated with the land covers land in the Gisborne town boundary in its northwest and is characterised by:

- an area of approximately 88.41 hectares of undulating land with road frontages to Ross Watt Road and Swinburne Avenue of 530.97 and 462.62 metres respectively;
- extensive existing residential development along its eastern and part southern flank;
- Jacksons Creek Escarpment Open Space Corridor to the west;
- Rosslynne Reservoir to the west;
- a mixture of native and exotic pasture grasses, with a number of exotic and native trees, with varying degrees of value;
- an existing dwelling and outbuildings (associated with the former farming use of the property) on Ross Watt Road;
- two farm dams;
- easy access to facilities and services of the Gisborne town centre (about 1.5 kilometres southeast) and the Calder Freeway.

As stated in more detail later in this report, this application seeks to subdivide only part of the GA1DP land, being a 30.51 hectares parcel (the subject land) in the northeast of GA1DP. For the exact details on the area of the subject land proposed to be subdivided by this application, refer to the subdivision plan prepared by Breese Pitt Dixon and included in appendix B (and provided separately).

The subject land is bounded to the north by Ross Watt Road, with marshland associated with the Gisborne Racecourse Marshlands Reserve on the north side of Ross Watt Road, on both sides of the Calder Freeway. As a result of Ross Watt Road as well as the Marshland, the subject land is well removed from the Calder Freeway, which is further to the north. The Calder Freeway also acts as the divider between Gisborne to the south of the Freeway and New Gisborne to the north.

The east boundary of the subject land is Swinburne Avenue, with residential development on the opposite side of the Avenue, which forms part of the urban area of Gisborne. Similarly, south (part) of the subject land is residential development while the remainder of the south / southwest boundary abuts future residential subdivision in GA1DP. outside the GA1DP area.

The northwest boundary is existing farming land.

1.2 BACKGROUND

The subject land is covered by Schedule 4 (DPO4) to the Development Plan Overlay (DPO) in the Scheme. Under the DPO / DPO4, a permit must not be granted to use or subdivide land, construct a building or construct or carry out works until a development plan has been prepared to the satisfaction of the responsible authority.

It is noted that the applicant submitted on 19 November 2021 to Macedon Ranges Shire Council (MRSC), the GA1DP for approval under DPO4. Although the GA1DP has not yet received MRSC approval, this planning permit application for subdivision is generally in accordance with the GA1DP dated 19 November 2021.

It is noted that as part of the original GA1DP, a number of expert reports were submitted to MRSC, as background to the GA1DP. These included:

- a flora and fauna assessment (89 Ross Watt Road Gisborne Flora and Fauna Assessment, Nature Advisory, September 2021);
- an arborist assessment (89 Ross Watt *Road Gisborne, Galbraith and Associates, 25 June 2021*);
- a preliminary Cultural Heritage report (89 Ross Watt *Road, Gisborne, Archaeology At Tardis, 5 November 2021);*
- a preliminary surface / stormwater management investigation (89 Ross Watt *Road Gisborne, Alluvium, November 2021);*
- an environmental site assessment (*Environmental Site Assessment 89 Ross Watt Road Gisborne, Golder Associates, 29 October 2021);*
- a social infrastructure assessment (89 Ross Watt *Road, Gisborne Social Infrastructure Assessment, ASR Research, November 2021);*
- a servicing report (*Development Report, 89 Ross Watt Road Gisborne, Breese Pitt Dixon, 29 October 2021*);
- a traffic and movement assessment (89 Ross Watt *Road Gisborne Transport Impact Assessment, One Mile Grid, 18 November 2021);*
- a bushfire development report (*Bushfire Development Report for 89 Ross Watt Road, Gisborne, Terramatrix, November 2021*).

This background information is being assessed as part of GA1DP and as the subdivision proposed by this application has been prepared to be generally in accordance with the GA1DP and to be consistent with those background report findings and recommendations.

1.3 ABORIGINAL CULTURAL HERITAGE

As part of the GA1DP submission, a preliminary cultural heritage report prepared by Archaeology at Tardis dated 5 November 2021 was submitted to MRSC.

A standard assessment was carried out as part of the preliminary report which concluded that the preparation of a cultural heritage management plan (CHMP) is triggered by any planning permit application that proposes activity in the area of GA1DP that is within 200 metres of Jacksons Creek.

This planning permit application relates to the area of GA1DP outside the potential CHMP area, and as a result, a CHMP is not required.

Notwithstanding the above and as confirmed in a letter prepared by Archaeology at Tardis and included with this application (refer appendix C), a voluntary CHMP will be prepared for the subject land. This letter also confirms that whilst subdivision is considered a high impact activity, there are no areas of cultural heritage sensitivity within the subdivision area.

2 THE APPLICATION AND PROPOSAL

2.1 DESCRIPTION OF THE APPLICATION AND PROPOSAL

The following summary of the application and proposal should be read in conjunction with the subdivision plan prepared by Breese Pitt Dixon and included in appendix B (and provided separately).

The key features of the proposal include:

- subdivision of the subject land into 275 lots with 25 lots being over 1500 square metres, 151 lots being between 500 and 1500 square metres, 81 lots being between 300 and 500 square metres and 18 lots being under 300 square metres;
- a net developable area of 28.8 hectares;
- a net residential area of 25.83 hectares;
- proposed unencumbered public open space of 2.97 hectares;
- proposed encumbered public open space (drainage reserve) of 1.71 hectares - but designed to include passive recreation areas;
- a site for a possible local convenience centre of 0.39 hectares;
- a site for a possible child care centre of 0.20 hectares;
- a network of local access streets, which includes the provision of two 24 metres wide bus
- capable connector roads;
- the creation of easements to reflect the new subdivision layout and associated servicing with the exact location of these easements to be determined at the detailed design stage;
- lots with an east-west or north-south orientation, wherever possible;
- the removal of native vegetation;
- associated buildings and works;
- a population target of approximately 688 based on a long-term average occupancy rate of 2.5 persons per household.

The subdivision layout has been designed to provide street connections to the existing road network of Ross Watt Road (to the north) and Swinburne Avenue (to the east). For an assessment of the proposed road layout and consequences for existing surrounding roads and intersections, refer to the transport impact assessment prepared by One Mile Grid and included with the GA1DP submission. The assessment confirms the appropriateness of the proposed and existing road network, accessibility to public transport routes and pedestrian and cycling connectivity through the proposed development. No access to the Calder Freeway is proposed as part of this application.

In order to facilitate the development of this general residential zone land, a subdivision has been designed to avoid and minimise native vegetation removal. Nevertheless, a number of native trees and small native vegetation patches are proposed for removal. Further details regarding flora and fauna are included in the assessment prepared by Nature Advisory and previously provided as part of the GA1DP submission.

An environmental site assessment prepared by Golder Associates was submitted as part of the GA1DP application and concluded that the subject land is identified as 'low' in terms of potential contamination. It is acknowledged however, that further testing is required of the existing house site

2.2 GA1DP

As noted earlier, GA1DP covers the subject land and was submitted to meet the DPO / DPO4 requirements. At the time of lodging this planning permit application, GA1DP had not been approved.

The subdivision plan included with this application has been designed to be generally in accordance with the GA1DP.

3 MACEDON RANGES SHIRE PLANNING SCHEME.

The proposal / application has been assessed against the relevant provisions of the Scheme, including:

- the Planning Policy Framework;
- the Local Planning Policy Framework;
- zoning;
- overlays;
- particular provisions.

As a general comment, a response to the relevant provisions of the Scheme was provided in the GA1DP with each relevant Scheme provision summarised with a response (refer extract in appendix D. Section 3 of this report provides a more specific response to those clauses of the Scheme that relate to this planning permit application.

3.1 PLANNING POLICY FRAMEWORK

The provisions of the Planning Policy Framework (PPF) relevant to this proposal include 11.01-1S (Settlement), 12.01-2S (Native vegetation management), 13.02-1S (Bushfire planning), 15.01-3S (Subdivision design), 16 (Housing), 16.01-1S (Housing supply) and 19.02-6S (Open space). The following provides a response to these policies.

- The subdivision is located within the identified Gisborne town boundary, which is the primary urban area of the Municipality and one suitable for residential growth.
- Although native vegetation is proposed for removal, it is noted that areas of native vegetation (including a number of large scattered trees) will be retained across the subject land. Where removal is unavoidable, appropriate offsets will be made.
- The risk of bushfire to people, property and community infrastructure has been considered as part of the application. A bushfire risk assessment has been prepared by Terramatrix and was submitted as part of the GA1DP application. The report concludes that bushfire risk can be mitigated to an acceptable level and the proposal priorities appropriately the protection of human life.
- The proposal will contribute to creating a well-planned neighbourhood, which adds to perceptions of safety and potential community participation.
- The range of lot sizes proposed will allow for a diversity of housing types to be constructed to cater for the needs of a variety of home buyers.
- All proposed lots will be within 400 metres walking distance of areas of public open space ensuring a healthy and active neighbourhood will be facilitated.
- The subdivision has been designed to ensure that land is set aside for the development of recreational uses through public open space as well as pedestrian and bicycle links through the development and to surrounding land uses.

3.2 LOCAL PLANNING POLICY FRAMEWORK

The Municipal Strategic Statement (MSS) contained in clause 21 of the Scheme, outlines the objectives for future land use planning and development within the Municipality.

The key provisions of the MSS relevant to this proposal are clause 21.01 (Municipal profile), 21.02 (Key issues and influences), 21.03 (Vision), 21.04 (Settlement), 21.05 (Environment and landscape values), 21.08 (Built environment and heritage), 21.09 (Housing), 21.12 (Community development and infrastructure) and 21.13 (Local areas and small settlements). The following provides a response to the relevant provisions of these clauses.

- The proposal provides a subdivision in the established Gisborne Township, which has existing community infrastructure to accommodate the proposed population growth.
- The proposal includes the provision for a range of lot sizes, which will make possible a variety of house types and sizes to be developed.
- Gisborne is identified as the only regional centre in the Municipality and the proposal implements the Municipal vision by proposing fully serviced housing within the Gisborne Township and on land already zoned for residential development.

- Native vegetation is proposed for removal where there is no opportunity for its retention. A number of large scattered trees and vegetation patches are identified for retention as part of the proposal.
- The proposed subdivision directs new population and development into an identified urban settlement that is not in a scenic landscape that will be jeopardised.
- The design of the subdivision also ensures appropriate connections to existing surrounding development.
- As discussed further below in Section 3.5.2, the subdivision provides greater than the required public open space, which will improve the physical health of the community by providing safe, attractive, useable and well maintained public spaces.
- The proposed subdivision directs new urban development and economic stimulus into the existing identified urban area of Gisborne while at the same time assisting in reducing pressure for urban residential growth into semi-rural and rural areas. It will be accompanied by full urban services, new public open space facilities and a possible local convenience centre and child care centre.
- The subdivision proposes a range of lot sizes being low, conventional and medium density. Whilst clause 21.13 seeks an average lot size of 800 square metres for conventional lots, it also allows for greater provisions of medium density lots in locations in proximity to local activity centres and public open space and where the quality of the built form and the intensity and scale of the development is such that amenity impacts on adjoining residential properties is minimised. Given that all lots of the subdivision are within 400 metres walking distance of a local activity centre and / or an area of public open space, 39 per cent of the total lots are between 500 and 800 square metres in size with a further 25 per cent of the lots being above 800 square metres, the proposed subdivision is appropriate as it achieves the housing strategy of clause 21.13 which seeks for medium density housing in walking distance of local activity centre and / or public open space.
- In relation to the above point, it is noted also that there are several competing provisions in the Scheme in relation to an appropriate lot density. Whilst clause 21.13 seeks an average lot size of 800 square metres for conventional density development, it also allows for medium density lots in certain locations. The Scheme also promotes residential development in the established Gisborne Township with new development to provide for a range of lot sizes and densities to meet the diverse needs of the community. As a result, the proposed lot mix provides a balancing of the relevant provisions of the Scheme, is appropriate, especially when considering the medium density development sought in locations in proximity to public open space and provides a net community benefit.

3.3 SCHEDULE 1 TO THE GENERAL RESIDENTIAL ZONE

The Scheme includes the subject land within Schedule 1 to the General Residential Zone (GRZ1). The purpose of the General Residential Zone (GRZ) includes to "*encourage a diversity of housing types and housing growth particularly in locations offering good access to services and transport*".

Under the GRZ, a planning permit is required to subdivide land and a dwelling is a section 1 (permit not required) use. An application to subdivide land into 60 or more lots for residential development must meet all (except clause 56.03 5) of the objectives of clause 56. An assessment of the proposal against the relevant objectives of clause 56 is provided in section 4.

Clause 32.08-3 states that for "*an application to subdivide land that would create a vacant lot less than 400 square metres capable of development for a dwelling or residential building, must ensure that each vacant lot created less than 400 square metres contains at least 25 percent as garden area*". This does not apply to a lot created in accordance with an approved development plan.

As the GA1DP has been submitted for approval and the subdivision is generally in accordance with it, the garden area requirements of clause 32.08-3 do not apply.

Clause 32.08-5 states that a "*permit is required to construct a dwelling on a lot less than 300 square metres*". A permit is required therefore, for the construction of dwellings on lots less than 300 square metres and this application responds to that provision.

As it is intended to apply approved building envelopes to those lots less than 300 square metres, a planning permit must include an 'approved building envelope' condition.

It is requested therefore, that a condition be included on the planning permit with the wording as follows.

"Before a statement of compliance for any stage is issued, an approved building envelope for that stage must be submitted to and approved by the responsible authority. The approved building envelope must show a building envelope for each relevant lot to the satisfaction of the responsible authority. The building envelopes, created as a result of this permit, are approved building envelopes for the purposes of applying parts 4 and 5 of the building regulations. The plan of subdivision certified under the Subdivision Act 1988 by Macedon Ranges Shire Council must include a restriction that buildings conform to the building envelopes. The restriction must provide for:

- *buildings to be constructed only in conformity with the approved building envelope;*
- *an approved building envelope to be amended to the satisfaction of Macedon Ranges Shire Council and any criteria or matters that must be considered by Macedon Ranges Shire Council in deciding on an amendment to a building envelope;*
- *an approved building envelope to cease to have effect on the lot containing the envelope ten years after an occupancy permit has been issued for the dwelling on the lot ".*

3.4 OVERLAYS

3.4.1 Schedule 2 to the Development Contributions Plan Overlay

The subject land is affected by Schedule 2 to the Development Contributions Plan Overlay (DCPO2).

The purpose of the DCPO is to identify areas which require the preparation of a development contributions plan for contributions for the provision of works, services and facilities before development can commence.

Under the DCPO2, payment of the relevant levies will be made in accordance with an appropriately worded condition on the planning permit.

It is noted that the relevant levies appliable are those applies to charge area 4.

3.4.2 Schedule 4 to the Development Plan Overlay

The subject land is affected by Schedule 4 to the Development Plan Overlay (DPO4).

The purpose generally of the Development Plan Overlay (DPO) is to identify areas which require the form and conditions of future development and use to be shown on a development plan before a permit can be granted to develop or use the land; and providing exemption from notice and review when planning permit applications for development and use are generally in accordance with a development plan (clause 43.04).

Under the DPO, unless a schedule to the overlay states otherwise specifically, a "permit must not be granted to use or subdivide land, construct a building or construct or carry out works until a development plan has been prepared to the satisfaction of the responsible authority" (clause 43.04-1).

As stated above, the GA1DP was submitted to the responsible authority for approval in November 2021, with the GA1DP addressing all of the requirements of the DPO4. The proposed subdivision has been designed to be generally in accordance with the GA1DP.

Under the DPO, an application under any provision of the Scheme which is generally in accordance with the development plan is exempt from the notice requirements of Section 52(1)(a), (b) and (d), the decision requirements of Section 64(1), (2) and (3) and the review rights of Section 82 (1) of the Planning and Environment Act 1987 (clause 43.04-2).

As the proposed subdivision has been designed to be generally in accordance with the GA1DP, it is exempt from notice, decision and review requirements of the Planning and Environment Act 1987.

3.5 PARTICULAR PROVISIONS

3.5.1 Clause 52.17 – Native Vegetation

The purpose of clause 52.17 includes to "*minimise impacts from the removal, destruction or lopping of native vegetation that cannot be avoided*". Under clause 52.17, a planning permit is required to remove, destroy or lop native vegetation, including dead native vegetation.

As detailed in the flora and fauna assessment included with this application, it is proposed to remove a number of native trees and native vegetation patches to facilitate the proposed development.

The flora and fauna assessment provides a response to the 'Guidelines for the removal, destruction or lopping of native vegetation 2017' prepared by the Department of Environment, Land, Water and Planning with the assessment including an 'avoid and minimise' statement.

It should be noted that in accordance with the 'avoid and minimise' statement in the flora and fauna assessment, it is proposed to retain eleven large remnant trees as well as a number of habitat zones within the GA1DP area. Many of the trees proposed for retention have significant ecological value.

For further details on native vegetation, refer to the flora and fauna assessment included with the GA1DP submission.

3.5.2 Clause 53.01 – Public Open Space Contribution and Subdivision

Clause 53.01 requires in relation to the subdivision of land the provision of public open space, a cash contribution in lieu of land or a combination of both. The schedule to clause 53.01 requires a public open space contribution of 5 per cent for subdivision applications in the area including the subject land.

It is proposed to provide 2.97 hectares of passive open space (approximately 10.31 per cent of the net developable area; 11.5 per cent of the net residential area) as a land contribution in accordance with clause 53.01. A further 1.71 hectares of encumbered public open space (5.94 per cent of the net developable area; 6.62 per cent of the net residential area) is provided.

As the proposed provision of passive open space exceeds the area required to be provided under clause 53.01, a cash contribution is not required to be made. It should be noted that the public open space provision has been determined for the whole GA1DP area and thus the excess noted above is somewhat misleading as it allows for some public open space provision for the future area 2 subdivision in GAS1DP.

4 CLAUSE 56 ASSESSMENT

4.1 CLAUSE 56 – RESIDENTIAL SUBDIVISION

Clause 56 of the Scheme relates to residential subdivision. The purpose generally of clause 56 is to ensure appropriately designed subdivision that responds to the site and context and creates liveable and sustainable neighbourhoods. The following sections respond to specific relevant provisions of clause 56.

4.1.1 Clause 56.01 – Subdivision Site and Context Description and Design Response

Refer to section 1.1, the subdivision plan and the GA1DP.

4.1.2 Clause 56.02 – Policy Implementation

Refer to section 3, appendix d and the GA1DP.

4.1.3 Clause 56.03 – Livable and Sustainable Communities

The proposed subdivision is consistent with the relevant objectives and standards of clause 56.03 in the following ways.

- The proposal will create a compact and walkable neighbourhood that allows and encourages easy pedestrian movement within the subdivision. In addition, all lots will be within convenient walking distance of areas of public open space (clause 56.03-1).
- The subdivision is provided with good access to the existing bus stop at the intersection of Cherry Lane and Station Road that provides a connection to the Gisborne Town Centre and Train Station. The subdivision also allows for the extension of the bus network through the provision of bus capable relevant internal streets (clause 56.03-1).
- The subdivision design provides ease of movement through the street network and beyond via various methods of transport, including walking and cycling (clause 56.03-1).

4.1.4 Clause 56.04 – Lot Design

The proposed subdivision is consistent with the relevant objectives and standard of clause 56.04 as outlined below.

- Subdivision of the subject land into 275 lots with 25 lots being over 1500 square metres, 151 lots being between 500 and 1500 square metres, 81 lots being between 300 and 500 square metres and 18 lots being under 300 square metres (clause 56.04-1).
- All lots will be within 400 metres walking distance of existing and potential bus routes (clause 56.04-1).
- All lots between 300 and 500 square metres are capable of containing a building envelope measuring 10 metres by 15 metres (clause 56.04-2).
- Solar access is maximised with appropriate solar orientation of lots which are either on a north-south or east-west axis (clause 56.04-3).
- The encouragement of informal surveillance with lots having either frontages to streets, public open space or both (clause 56.04-4).
- The provision of streets along the boundaries of public open space (clause 56.04-4).
- No areas common to all lots are proposed (clause 56.04-5).

4.1.5 Clause 56.05 – Urban Landscape

A landscape development plan was prepared by CDA Design Group Pty Ltd and was submitted as part of the GA1DP application. It demonstrates that an attractive and continuous landscaping will be provided. It is intended to prepare and submit more detailed landscape plans to the satisfaction of the responsible authority in accordance with an appropriately worded condition on the planning permit (clause 56.05-1 and 56.05-2).

4.1.6 Clause 56.06 – Access and Mobility Management

The transport impact assessment included with the GA1DP submission addresses the relevant access network objectives and standard as listed in clause 56.06. In summary, the proposed subdivision will provide an appropriate

internal access network hierarchy of streets providing access to the proposed lots and links with the surrounding street network. Furthermore, the proposal will provide bicycle and pedestrian links that will connect with existing development.

4.1.7 Clause 56.07 – Integrated Water Management

The servicing report prepared by Breese Pitt Dixon and provided as part of the GA1DP submission provides a summary of servicing proposals for the subdivision. In addition, a preliminary surface / stormwater management investigation was prepared by Alluvium and also submitted as part of the GA1DP application. In response to clause 56.07, the services report and preliminary surface / stormwater management investigation outlines the following.

- Existing water mains within Ross Watt Road and Swinburne Avenue will be extended into the GA1DP area.
- The GA1DP area is well served by existing sewers along Cherry Lane, with a pump station being required for the southern outfall of the subject land to connect this area to the gravity outfall for the Cherry Lane sewer.
- The subject land is included within the east catchment which outlet / discharge point is at the corner of the Swinburne Avenue and Cherry Lane with an outfall pipe required to be constructed along Cherry Lane.

4.1.8 Clause 56.08 – Site Management

The subject land will be managed before and during construction period to the satisfaction of the responsible authority (clause 56.08-1). It is expected that a condition will be included on the planning permit that will require a site management plan to be prepared to satisfaction of the responsible authority before any works commence.

4.1.9 Clause 56.09 – Utilities

The servicing report prepared by Breese Pitt Dixon and provided previously as part of the GA1DP submission provides a summary of the utility connections available to the subject land.

In summary, all lots will be serviced with necessary public utilities including electricity and telecommunications in shared trenches where appropriate (clause 56.09-1 and 56.09-2).

The subject land will be provided with fire hydrants and public lighting in accordance with relevant requirements (clauses 56.09-3 and 56.09-4).

5 CONCLUSION

Based on the summary in this planning report, the proposed subdivision, associated buildings and works and removal of native vegetation accords generally with the GA1DP and the relevant provisions of the Scheme and should be supported, subject to conditions.

Appendix A

GA1DP

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LEGEND

- General Residential (and other permissible uses in the general residential zone)
- Larger Lots (Residential)
- Public Open Space (Encumbered)
- Public Open Space (Unencumbered)
- Landscape/ Tree Reserve
- Potential Childcare Centre
- Potential Local Convenience Centre
- Connector Road_Bus Route
- Local Access Street_Level 2
- Local Access Street_Level 1
- Shared Pathway (Pedestrian & Cycle)
- Existing Sub-Arterial Road

REVISIONS

VER	DATE	COMMENTS	CKD
3	18/11/2021	PLAN AMENDED	JC
2	28/10/2021	PLAN AMENDED	MA
1	21/10/2021	ORIGINAL DRAWING	MA

NOTES

- THIS PLAN IS FOR PRELIMINARY USE ONLY
- ANY PROPOSED DEVELOPMENT IS SUBJECT TO APPROVAL BY THE RESPONSIBLE AUTHORITY.
- PROPOSED LOT BOUNDARIES AND AREAS SHOWN ARE SUBJECT TO FINAL SITE SURVEY.
- THIS PLAN IS PRODUCED FOR YIELD AND COSTING PURPOSES ONLY AND MAY CHANGE AS A RESULT OF FURTHER CONSULTATION WITH THE RESPONSIBLE AUTHORITIES.
- SUBDIVISION LAYOUT IS BASED ON SLP04 VERSION 2

N

0m 25 50 100 250m

SCALE 1 : 5000 @ A3

89 ROSS WATT ROAD GISBORNE

DEVELOPMENT PLAN

Project No. 7213

Drawing Ref. 7213_UD_DP02_V03

BREESE PITT DIXON

CIVIL ENGINEERS
LAND SURVEYORS
TOWN PLANNERS
URBAN DESIGNERS
LANDSCAPE ARCHITECTS

1/19 CATO ST HAWTHORN EAST.
VICTORIA. 3123.
PH (03) 8823 2300
FAX (03) 8823 2310
www.bpd.com.au

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Appendix B

Subdivision Plan

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LEGEND & LAND BUDGET

Total Site Area	85.57Ha
Permit Application Area	30.51Ha
Future Application Area	55.06Ha
Drainage Reserve	1.71Ha
Public Open Space	2.97Ha
Net Developable Area	25.83Ha
Total Net Residential Area	17.31Ha
Total Number of Lots	275 Lots
Average Lot Size	629m²
Dwelling Density (Dw/NDAHa	10.6 Lots
Childcare Centre	0.20Ha
Local Convenience Centre	0.39Ha
Landscape / Tree Reserve	0.13Ha
Road Network Area	7.81Ha
400m Walkable Catchment	
Shared Path Network	
Connector Road_Bus Route (24m)	
Local Access Street_Level 2 (18-20m)	
Local Access Street_Level 1 (14-18m)	
Trees to be retained	

LOT SIZE & DENSITY

Townhouse (Less than 300m²)	18	6.5%
Medium Density (Less than 500m²)	81	29.5%
Conventional Density (500-800m²)	107	38.9%
Conventional Density (800-1500m²)	44	16.0%
Low Density (1500m²)	25	9.1%
Total	275	100.0%

REVISIONS

VER	DATE	COMMENTS	CKD
4	08/12/2021	PLAN UPDATED	MA
3	09/11/2021	PLAN UPDATED	MA
2	15/10/2021	LOT MIX AMENDED	JC
1	04/08/2021	ORIGINAL DRAWING	JC

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N

0m 25 50 100 250m

SCALE 1 : 2500 @ A1

89 ROSS WATT ROAD GISBORNE

SUBDIVISION LAYOUT PLAN PERMIT AREA 1

Project No. 7213

Drawing Ref. 7213_UD_SLP04_V4

BREESE PITT DIXON

CIVIL ENGINEERS
LAND SURVEYORS
TOWN PLANNERS
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1/19 CATO ST HAWTHORN EAST.
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PH (03) 8823 2300
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Appendix C

CHMP Letter

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Tardis Archaeology Pty Ltd
heritage advisors

ABN: 29 639 085 948

PO Box 776
Beaconsfield VIC 3807

Beaconsfield Office: 03 9769 7765
Port Melbourne Office: 03 9676 9009
enquiries@tardisenterprises.com.au
www.aatardis.com.au

Our Ref: 4536.300
89 Ross Watt Road, Gisborne

20 December 2021

To Whom it May Concern,

Please be advised the activity area of CHMP 18146, located at 89 Ross Watt Road has been reduced in size. This letter pertains to the northern portion of the activity area, now excluded from activity area of CHMP 18146.

A voluntary CHMP will be undertaken in this area. The CHMP is voluntary based on statutory obligations under the *Aboriginal Heritage Act 2006*, the *Aboriginal Heritage Regulations 2018*. The activity (a residential subdivision) is high impact, however there is no areas of cultural sensitivity within the activity area.

A NOI will be sent to your offices at the submission of the NOI to VAHR.

Yours sincerely,

Lauren Whiteford
Project Archaeologist

LEGEND & LAND BUDGET

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N

0m 25 50 100 250m

SCALE 1 : 2500 @ A1

89 ROSS WATT ROAD GISBORNE

SUBDIVISION LAYOUT PLAN PERMIT AREA 1

Project No. 7213

Drawing Ref. 7213_UD_SLP04_V4

BREESE PITT DIXON

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Appendix D

GA1DP Scheme Response Table

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https://collieptyltd.sharepoint.com/sites/collie/shared documents/projects/21-8774 89 ross watt rd gisborne/00500 ppa/003 word/finalised/33055r.docx

4 THE SCHEME PROVISIONS AND RESPONSE

As outlined in section 1.2, particular policies in the Scheme of relevance to the preparation and implementation of GA1DP and commentary on how each has been addressed, is provided below.

Item	Clause	Summary	Comments
1	11.01-1S	To promote and support sustainable growth and development and deliver choice in a network of settlements including the regional centre of Gisborne.	GA1DP covers an area identified within the Gisborne town boundary, which is the primary urban area of the Municipality. It is in an identified growth area and the proposal promotes sustainability and lot choices.
2	11.02-1S	Consider opportunities for the consolidation, redevelopment and intensification of existing urban areas.	Refer to comments in item 1.
3	12.01-2S	To avoid and minimise the removal, destruction or lopping of native vegetation and to provide offset compensation where native vegetation is to be removed.	Native vegetation (including a number of large scattered trees), will be retained across the GA1DP area, where removal is unavoidable. For the native vegetation proposed for removal, appropriate offsets will be made. Furthermore, an arborist assessment (*89 Ross Watt Road Gisborne, Galbraith and Associates, 25 June 2021*) was completed and forms part of the background reports. The trees proposed for retention have been identified in conjunction with the arborist assessment, which outlines those trees across the GA1DP area which are worthy of retention.
4	13.02-1S & 21.06-3	Identify bushfire hazard and complete risk assessments at the time of any relevant application for permit.	GA1DP is in a bushfire prone area and a bushfire risk assessment (*Bushfire Development Report for 89 Ross Watt Road, Gisborne, Terramatrix, November 2021*) has been completed for the GA1DP area and forms part of the background reports. This report concludes that bushfire risk can be mitigated to an acceptable level and the development of GA1DP can protect human life if dwellings are separated from hazardous vegetation to allow an appropriate BAL construction standard and the recommendations of the bushfire risk assessment are followed in relation to appropriate buffers and management strategies.
5	13.04-1S & 21.06-2	Identify potentially contaminated land and ensure it is suitable for its intended use.	A site assessment and report has been completed and has identified the GA1DP area as 'low' in terms of potential contamination.
6	13.05-1S	Assist the control of noise effects on sensitive land uses.	As the site is well removed from Calder Freeway, it has been determined that no noise attenuation measures are required for the development of the GA1DP area.
7	15, 16 & 21.12	Encourage development and land use that fosters healthy, active living and responds to its surroundings and existing or preferred character, is sustainable and reflects good urban design.	The GA1DP proposal will implement these provisions by encouraging pedestrian and cyclist activity, outdoor recreation and community uses. It is based on good urban design principles including maximising links into neighbouring development, solar orientation, appropriate road lengths and speed control, a range of lot sizes, locating all lots within 400 metres walking distance to an area of public open space, co-located community facilities and it responds to the local and intended residential neighbourhood character.

Item	Clause	Summary	Comments
8	15, 16, 21.01, 21.02-5 & 21.09	Provide a range of lot sizes to suit a variety of dwelling and household types to meet diverse needs, including affordability.	The GA1DP proposal implements these provisions with lot size variety including the provision of more affordable housing potential on medium density lots. The range of lot sizes proposed will allow for a diversity of housing types to be constructed to cater for the needs for a variety of home buyers.
9	16.01-1S	To increase the supply of cost-effective housing in existing urban areas by facilitating increased housing yield in appropriate locations, including under-utilised urban land and ensure integration with infrastructure and services, including in regional towns.	The GA1DP area is an identified candidate to assist in implementing this provision and the proposal is entirely consistent with the provision.
10	19.02 & 19.03	Provide for required community and development infrastructure.	The GA1DP area has been the subject of detailed background studies in the preparation of the GA1DP. These studies have identified the required community and development infrastructure, which has been incorporated into the proposal.
11	21.03	Promotes Gisborne / New Gisborne as a "regional centre" in the Municipality, characterized by "a large, diverse population (10,000 plus), employment and housing base. All essential services are connected and higher order goods and services are provided . . .".	GA1DP assists in implementing this vision by proposing fully serviced housing within the Gisborne regional centre and township boundary, on land already zoned for residential development.
12	21.04	Gisborne is a specified growth area in the Municipality and the GA1DP area is recognised as an area to accommodate a portion of this growth.	Refer to comments in items 1, 8 and 9.
13	21.04	Reinforce the key urban functions and role of Gisborne as the major urban centre.	Refer to comments in item 1.
14	21.08-2	Recognise and protect Aboriginal cultural heritage places and values.	Preparation of a CHMP is triggered by any planning permit application that proposed activity in the area of GA1DP that is within 200 metres of Jacksons Creek. Any recommendation in the CHMP, once prepared, would need to be met. As mentioned previously, if any artifacts are found to occur these are likely to be confined to the watercourse corridor. Notwithstanding this, the CHMP will ensure that any artefacts found to be located on the land are recorded and protected.
15	21.08-3	Ensure that development and built form occurs in a sustainable manner and direct population and development to settlements where scenic landscapes will not be jeopardised.	The GA1DP proposes development: ▪ with a subdivision that implements the sustainable development of limited urban land; ▪ that directs new population and development into an identified urban settlement that is not in a scenic landscape that will be jeopardised.
16	21.09	Provide for responsive and affordable housing and a diversity of lot sizes and styles	Refer to comments in items 1, 8 and 9.

Item	Clause	Summary	Comments
		to meet the requirements of all age groups, household types, lifestyles and preference.	
17	21.13	Objective 1 is to reinforce the key urban functions and role of Gisborne as a major urban centre.	GA1DP implements this objective by directing new urban development and economic stimulus into the existing identified urban area of Gisborne while at the same time assisting in reducing pressure in rural areas for urban residential growth. It will be accompanied by full urban services, new public open space facilities and a proposed local activity centre.
18	21.13	Consolidate and retain a compact urban form and contain urban development within the defined township boundary and major urban centre of Gisborne thus respecting the semi-rural character of the broader area.	Refer to comments In Item 1. The GA1DP proposal provides for urban development to be consolidated in the recognised urban area of Gisborne and its Township boundary, thus respecting the semi-rural character of land outside the urban area and lessening pressure for new development into those non-urban areas.
19	21.13	Consider medium density housing near public open space and a local neighbourhood activity centre.	GA1DP implements this provision.
20	21.13	Consider in other residential areas conventional residential densities with lot sizes ranging from 500 to 1500 square metres and averaging 800 square metres.	GA1DP proposes a range of lot sizes as low, conventional and medium density. The lots are between approximately 300 square metres and over 1,500 square metres, with average sizes as depicted on the Indicative Subdivision Layout in section 6.8 in this GA1DP. The GA1DP has been prepared seeking a balance with the competing policies in items 1, 2, 8, 9, 15, 16 and 17.
21	21.13	Protect and improve areas of remnant vegetation, fauna habitat and natural drainage corridors.	Background studies have been completed and as noted earlier, have concluded that the GA1DP proposal is consistent with this provision.
22	21.13	Gisborne / New Gisborne Framework Plan	The GA1DP area is noted on the Framework Plan as "Existing Residential – short-medium term growth opportunity". This provision has been in the Scheme for many years and was tested specifically at the Amendment C67 Panel hearing. In its report of September 2010, the Panel dealt with the GA1DP area (among others) and concluded that either the GA1DP area or the Gisborne Development Plan 4a and 4b should be open to development in "3 to 5 years" (that is, 2013 at the earliest or 2015 at the latest). As the Gisborne Development Plan 4a area is complete and development / lot sales are well advanced at the Gisborne Development Plan 4b area, the development of the GA1DP area is a logical step.
23	32.08	Encourage a diversity of housing types and housing growth particularly in locations offering good access to services and transport.	Refer to comments in items 1, 8 and 9. Reflected in its identification within the Gisborne town boundary, the GA1DP area is very well located in terms of access to services and transport.
24	32.08 & schedule	Provision to include in the GRZ1 schedule any neighbourhood character objectives to be achieved.	The GRZ1 schedule, which covers the GA1DP area, does not include any neighbourhood character objectives.

Item	Clause	Summary	Comments
25	32.08	A planning permit is required for subdivision, construction (but not use) of dwellings on lots less than 300 square metres, development and use of an education centre.	Relevant planning permits will be lodged in due course under this provision.
26	43.04	Objectives enabled in the DPO and set out in DPO4, which include the specified 'key principles' of: encouraging housing choice and the development of a variety of lot sizes and types within the context of a semi-rural township"; ▪ establishing open space networks for pedestrian and cycling links, passive and active recreation needs; ▪ limiting the visual intrusion of development around key township entrances, the Calder Freeway; ▪ protecting areas of remnant vegetation; ▪ encouraging current sustainable development principles and high quality urban design" among others.	Refer to comments in items 1, 7, 8, 9, 15 to 20 and 23. Refer to Site Analysis in section 3. Larger lots are proposed along the northern, western and southern boundaries to reflect the rural or semi-rural nature of abutting land and limit any visual intrusion of the development on Township entries, the adjoining Calder Freeway, Jacksons Creek Escarpment and Rosslynne Reservoir. An open space network is proposed that implements the key principles as set out in DOO4. Existing vegetation has been studied and identified where relevant for retention or removal.
27	DPO4	A development plan must include a detailed site analysis of the natural, cultural and strategic context of the site and a subdivision layout which shows: ▪ a variety of lot sizes across the development area; ▪ how development interfaces with environmentally significant and landscape sensitive areas; ▪ transition with nearby low-density residential lots; ▪ consideration of natural features; ▪ physical infrastructure; ▪ solar orientation; ▪ movement and open space networks; ▪ landscape concepts; ▪ major drainage and infrastructure features; ▪ staging and timing; ▪ a summary of the findings of specialist studies on flora and fauna, cultural heritage, stormwater management, traffic, environmental conditions	Refer to comments in items 8, 9, 15, 17, 18 and 23. The GA1DP area does not interface with identified environmentally significant or landscape sensitive areas, in the context of the Scheme. Neither the GA1DP area nor abutting land is affected by the Significant Landscape, Heritage or Environmental Significance Overlays. Nevertheless, part of the land includes the Jacksons Creek and its escarpment and GA1DP is proposing this area as a special open space for passive public open space (part) and drainage reserve (part below the 1 in 100 flood level). GA1DP proposes a combination of open space and larger low density lots along its northern, western and southern boundaries, which is the interface with rural conservation zone further to the west and south as well as to provide a buffer form the Calder Freeway to the north. The same approach is proposed along the part of the east border with its interface with existing lots to the east. The proposed subdivision layout has been designed to maximise solar energy capture, with lots being oriented predominantly east-west or north-south. Natural features have been identified and have informed the plan. Other aspects of the provision are addressed elsewhere in GA1DP.

Item	Clause	Summary	Comments
28	DPO4	Specific provisions relating to GA1DP area include: ▪ providing a conceptual urban design for the local neighbourhood activity Centre; ▪ an active open space area of appropriate size ▪ a low-density interface to the Calder Freeway, Ross Watt Road; Jacksons Creek escarpment and adjoining rural land; ▪ protection of Jacksons Creek escarpment via an open space designation; ▪ consideration of drainage / other impacts on Gisborne Racecourse Marshland Reserve;	Refer to comments provided in section 4.1 further below. As stated in section 2.2.1 above, Ross Watt Road provides a significant buffer between the GA1DP development area and the Gisborne Racecourse Marshlands Reserve further to the north. As confirmed in the preliminary stormwater management investigation, the GA1DP area drains to the east and south and not to the north into the Gisborne Racecourse Marshlands Reserve. As a result of these buffer distances and drainage directions, the development of GA1DP will not adversely impact the drainage or flora and fauna within the Gisborne Racecourse Marshlands Reserve.
29	44.04	To minimise the potential flood risk to life, health and safety associated with development	The Land Subject to Inundation Overlay (LSIO) under the Scheme covers Jacksons Creek but is confined largely to land south of the Creek. Only a very small part of the subject land is affected by the LSIO. This land is proposed in a drainage reserve, to ensure flood and stormwater risks are managed appropriately.
30	45.06 & schedule 2	Meet the requirements of DCPO2	The development of GA1DP will and must meet all the mandatory requirements of DCPO2.
31	52.17	A planning permit is required to remove, destroy or lop native vegetation including dead native vegetation	Relevant planning permits will be lodged in due course under this provision, if required.
32	53.01	A public open space contribution is required of 5 per cent of the land intended to be used for residential.	The GA1DP proposes public open space which exceeds this requirement.

PLANNING PROPERTY REPORT

Environment, Land, Water and Planning

From www.planning.vic.gov.au at 04 January 2022 04:22 PM

PROPERTY DETAILS

Address:	**89 ROSS WATT ROAD GISBORNE 3437**
Lot and Plan Number:	**More than one parcel - see link below**
Standard Parcel Identifier (SPI):	**More than one parcel - see link below**
Local Government Area (Council):	**MACEDON RANGES** www.mrsc.vic.gov.au
Council Property Number:	**1169430**
Planning Scheme:	**Macedon Ranges** Planning Scheme - Macedon Ranges
Directory Reference:	**Melway 658 A10**

This property has 2 parcels. For full parcel details get the free Property report at Property Reports

UTILITIES

Rural Water Corporation:	**Southern Rural Water**
Urban Water Corporation:	**Western Water**
Melbourne Water:	**Inside drainage boundary**
Power Distributor:	**POWERCOR**

View location in VicPlan

STATE ELECTORATES

Legislative Council:	**NORTHERN VICTORIA**
Legislative Assembly:	**MACEDON**

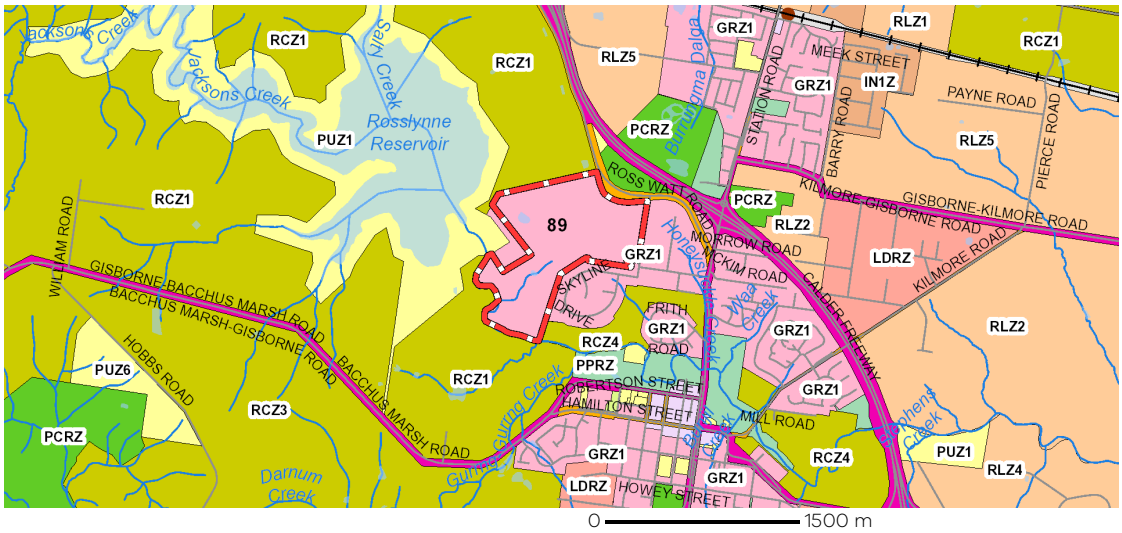
OTHER

Registered Aboriginal Party:	**Wurundjeri Woi Wurrung Cultural Heritage Aboriginal Corporation**

Planning Zones

GENERAL RESIDENTIAL ZONE (GRZ)

GENERAL RESIDENTIAL ZONE - SCHEDULE 1 (GRZ1)



C1Z - Commercial 1	GRZ - General Residential	IN1Z - Industrial 1
LDRZ - Low Density Residential	PCRZ - Public Conservation and Resource	PPRZ - Public Park and Recreation
PUZ1 - Public Use-Service and Utility	PUZ2 - Public Use-Education	PUZ3 - Public Use-Health & Community
PUZ4 - Public Use-Transport	PUZ6 - Public Use-Local Government	PUZ7 - Public Use-Other Public Use
RCZ - Rural Conservation	RDZ1 - Road-Category 1	RDZ2 - Road-Category 2
RLZ - Rural Living	SUZ - Special Use	Railway line
Railway station	Water area	Water course

Note: labels for zones may appear outside the actual zone - please compare the labels with the legend.

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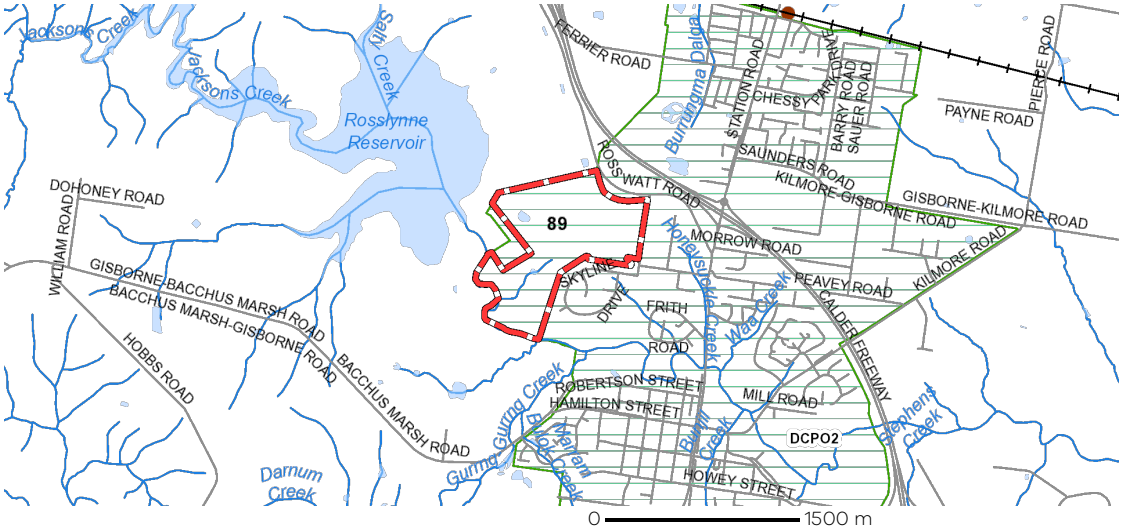
PLANNING PROPERTY REPORT

Environment, Land, Water and Planning

Planning Overlays

DEVELOPMENT CONTRIBUTIONS PLAN OVERLAY (DCPO)

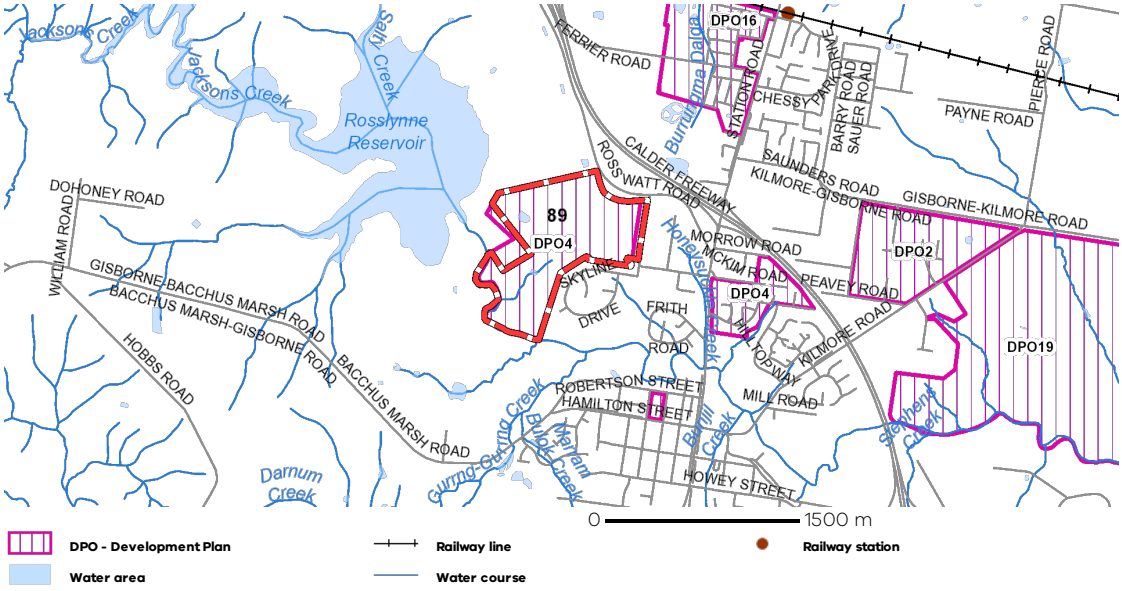
DEVELOPMENT CONTRIBUTIONS PLAN OVERLAY - SCHEDULE 2 (DCPO2)



Note: due to overlaps, some overlays may not be visible, and some colours may not match those in the legend

DEVELOPMENT PLAN OVERLAY (DPO)

DEVELOPMENT PLAN OVERLAY - SCHEDULE 4 (DPO4)



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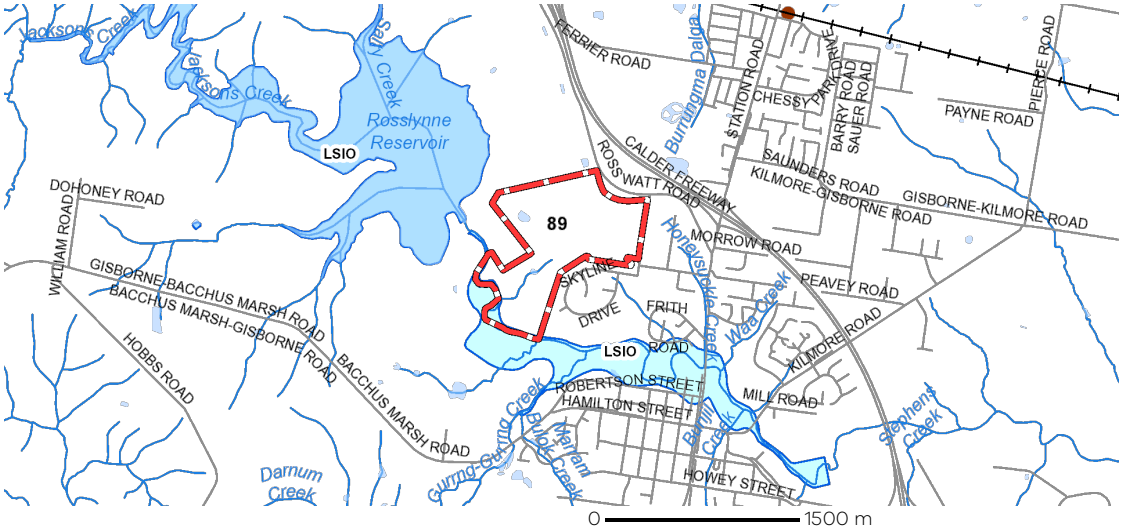
PLANNING PROPERTY REPORT

Environment, Land, Water and Planning

Planning Overlays

LAND SUBJECT TO INUNDATION OVERLAY (LSIO)
LAND SUBJECT TO INUNDATION OVERLAY SCHEDULE (LSIO)



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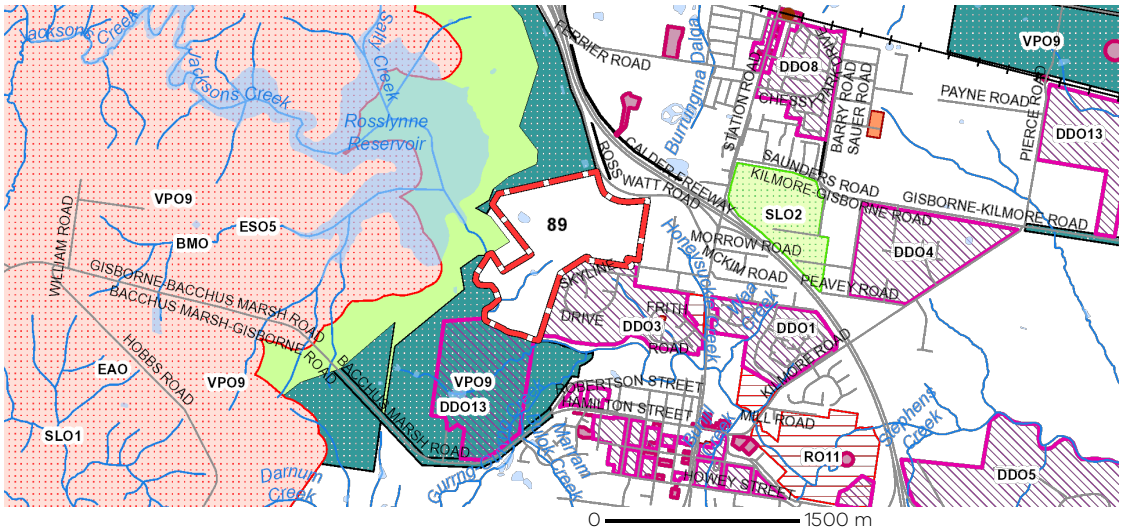
PLANNING PROPERTY REPORT

OTHER OVERLAYS

Other overlays in the vicinity not directly affecting this land

BUSHFIRE MANAGEMENT OVERLAY (BMO)
DESIGN AND DEVELOPMENT OVERLAY (DDO)
ENVIRONMENTAL AUDIT OVERLAY (EAO)
ENVIRONMENTAL SIGNIFICANCE OVERLAY (ESO)
HERITAGE OVERLAY (HO)
RESTRUCTURE OVERLAY (RO)
SIGNIFICANT LANDSCAPE OVERLAY (SLO)
VEGETATION PROTECTION OVERLAY (VPO)



BMO - Bushfire Management	DDO - Design and Development	EAO - Environmental Audit
ESO - Environmental Significance	HO - Heritage	RO - Restructure
SLO - Significant Landscape	VPO - Vegetation Protection	Railway line
Railway station	Water area	Water course

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PLANNING PROPERTY REPORT

Areas of Aboriginal Cultural Heritage Sensitivity

All or part of this property is an 'area of cultural heritage sensitivity'.

'Areas of cultural heritage sensitivity' are defined under the Aboriginal Heritage Regulations 2018, and include registered Aboriginal cultural heritage places and land form types that are generally regarded as more likely to contain Aboriginal cultural heritage.

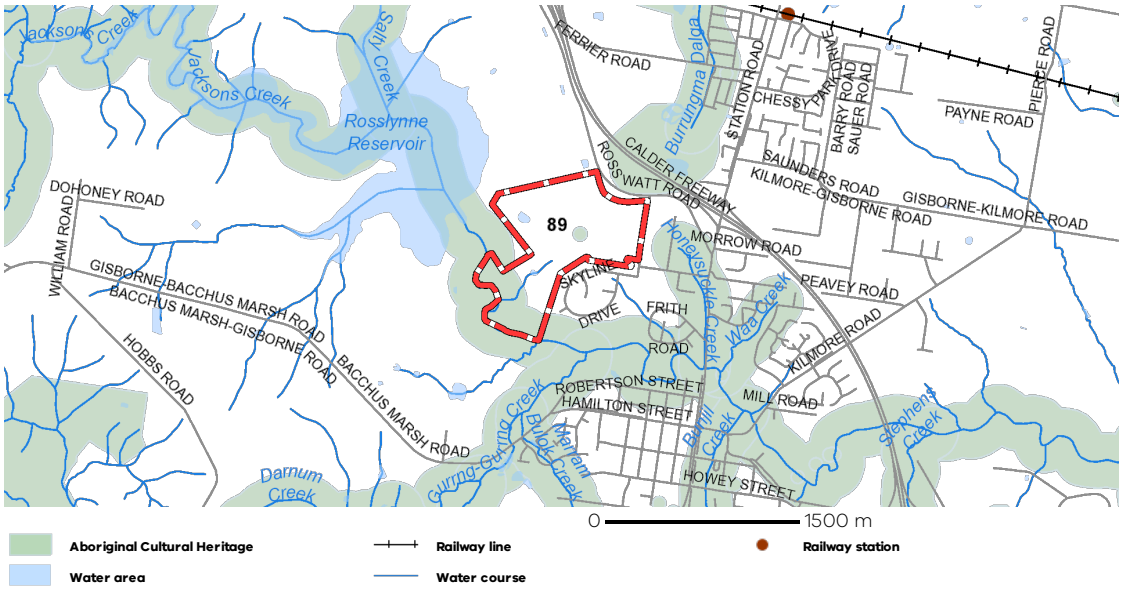
Under the Aboriginal Heritage Regulations 2018, 'areas of cultural heritage sensitivity' are one part of a two part trigger which require a 'cultural heritage management plan' be prepared where a listed 'high impact activity' is proposed.

If a significant land use change is proposed (for example, a subdivision into 3 or more lots), a cultural heritage management plan may be triggered. One or two dwellings, works ancillary to a dwelling, services to a dwelling, alteration of buildings and minor works are examples of works exempt from this requirement.

Under the Aboriginal Heritage Act 2006, where a cultural heritage management plan is required, planning permits, licences and work authorities cannot be issued unless the cultural heritage management plan has been approved for the activity.

For further information about whether a Cultural Heritage Management Plan is required go to http://www.aav.nrms.net.au/aavQuestion1.aspx

More information, including links to both the Aboriginal Heritage Act 2006 and the Aboriginal Heritage Regulations 2018, can also be found here - https://www.aboriginalvictoria.vic.gov.au/aboriginal-heritage-legislation



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PLANNING PROPERTY REPORT

Further Planning Information

Planning scheme data last updated on 23 December 2021.

A **planning scheme** sets out policies and requirements for the use, development and protection of land.
This report provides information about the zone and overlay provisions that apply to the selected land.
Information about the State and local policy, particular, general and operational provisions of the local planning scheme that may affect the use of this land can be obtained by contacting the local council
or by visiting https://www.planning.vic.gov.au

This report is NOT a **Planning Certificate** issued pursuant to Section 199 of the ***Planning and Environment Act 1987.***
It does not include information about exhibited planning scheme amendments, or zonings that may abut the land.
To obtain a Planning Certificate go to Titles and Property Certificates at Landata - https://www.landata.vic.gov.au

For details of surrounding properties, use this service to get the Reports for properties of interest.

To view planning zones, overlay and heritage information in an interactive format visit
https://mapshare.maps.vic.gov.au/vicplan

For other information about planning in Victoria visit https://www.planning.vic.gov.au

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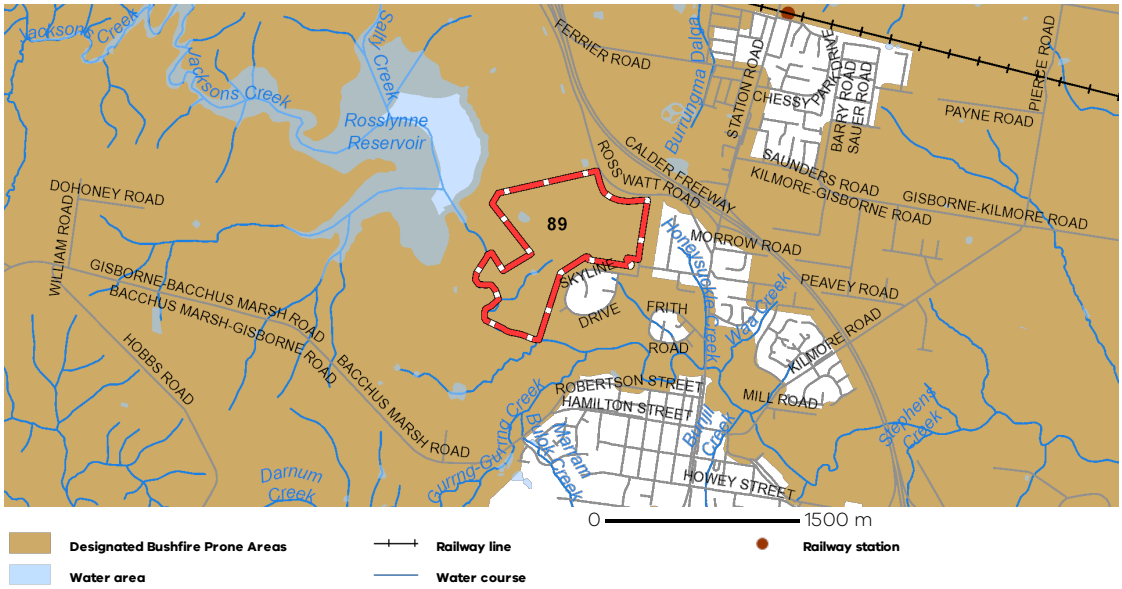
PLANNING PROPERTY REPORT

Designated Bushfire Prone Areas

This property is in a designated bushfire prone area.
Special bushfire construction requirements apply. Planning provisions may apply.



Designated bushfire prone areas as determined by the Minister for Planning are in effect from 8 September 2011 and amended from time to time.

The Building Regulations 2018 through application of the Building Code of Australia, apply bushfire protection standards for building works in designated bushfire prone areas.

Designated bushfire prone areas maps can be viewed on VicPlan at https://mapshare.maps.vic.gov.au/vicplan or at the relevant local council.

Note: prior to 8 September 2011, the whole of Victoria was designated as bushfire prone area for the purposes of the building control system.

Further information about the building control system and building in bushfire prone areas can be found on the Victorian Building Authority website https://www.vba.vic.gov.au

Copies of the Building Act and Building Regulations are available from http://www.legislation.vic.gov.au

For Planning Scheme Provisions in bushfire areas visit https://www.planning.vic.gov.au

Native Vegetation

Native plants that are indigenous to the region and important for biodiversity might be present on this property. This could include trees, shrubs, herbs, grasses or aquatic plants. There are a range of regulations that may apply including need to obtain a planning permit under Clause 52.17 of the local planning scheme. For more information see Native Vegetation (Clause 52.17) with local variations in Native Vegetation (Clause 52.17) Schedule

To help identify native vegetation on his property and the application of Clause 52.17 please visit the Native Vegetation Information Management system https://nvim.delwp.vic.gov.au/ and Native vegetation (environment.vic.gov.au) or please contact your relevant council.

You can find out more about the natural values on your property through NatureKit NatureKit (environment.vic.gov.au)

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Consistency of a proposal with the Statement of Planning Policy: DP/2021/1 – Ross Watt Road Development Plan.

Objective number	Objective in the SoPP (Direct quote)	Strategies to deliver the objective (Direct quote)	Meets	Does not meet	N/A	Planner's Comment
1	**To ensure the declared area's natural and cultural landscapes are conserved and enhanced.**					
		Manage land use, development and infrastructure to ensure that significant landscapes, views and vantage points are conserved and enhanced.		✓		There is concern with how the proposal will impact on the Jacksons Creek escarpment and views along the Calder Freeway.
		Encourage retention of native vegetation and revegetation that contributes to significant landscapes, particularly on escarpments and ridgelines and along riparian areas.		✓		Noting some vegetation has been retained on site, particularly within the Jacksons Creek escarpment, many paddock trees on the site are to be removed. This will irreparably change the native vegetation character of the site by removing these old trees.
		Manage development around significant landscapes of visual, scientific or education value, including along ridgelines and at vantage points.		✓		Concern with how the proposed development responds to and addresses the Jacksons Creek escarpment including providing little direction on built form outcomes. Views from the Calder Freeway are also important and there is minimal direction on how built form or landscaping will ensure a positive outcome.
		Manage development and infrastructure provision to ensure sequences of views from key road and rail corridors are maintained for current and future users.		✓		Key views from the Calder Freeway are available to the site. Some vegetation is present within this view. Outcomes from the development plan in terms of landscaping is at this stage high level and not clear what this will mean for the site.
2	**To ensure the significant biodiversity, ecological and environmental values of the declared area are conserved and enhanced**					
		Conserve and enhance high-value native vegetation and biodiversity and their ecological integrity by undertaking responsible environmental management, planning, procedures and practices.		✓		The proposal provides some retention of older, hollow bearing trees. However, a large number are still to be removed. Hollow trees are of habitat value which would be greatly reduced within the area.
		Utilise appropriate historical ecological knowledge and practices from Traditional custodians of the land in the management of biodiversity and ecological and environmental values.			*N/A*	

Objective number	Objective in the SoPP (Direct quote)	Strategies to deliver the objective (Direct quote)	Meets	Does not meet	N/A	Planner's Comment
		Encourage ecological restoration works in areas of identified state, regional and locally significant biodiversity value		✓		Melbourne Water and Council are both seeking what ecological work could be undertaken within Jacksons Creek. There is good potential to undertake restoration works on this site and this could be conditioned as part of future planning permits. Loss of hollow bearing trees is of concern for the remainder of the site.
		Establish and improve bio links to connect high-value ecological areas, including areas along waterways and areas within and between towns.		✓		The Jacksons Creek escarpment is being retained as an open space area. There has been no bio link area created between Gisborne Racecourse Marshland Reserve and Jackson Creek – two important ecological areas. There is a reliance of the paddock to the north providing a connection.
		Minimise the effects of weeds and pest animals on biodiversity values by establishing and implementing best practice land management plans.		✓		No guidance or land management plan has been included as part of the DP.
3.	**To prioritise the conservation and use of the declared area's water catchments to ensure a sustainable local, regional and state water supply, and healthy environment.**					
		Protect water quality and natural systems by discouraging development that contributes to the degradation of water quality and quantity.		✓		Melbourne Water, Southern Rural Water and Greater Western Water have all raised concern with the proposal and its impact on waterways. Demonstration within the DP to satisfy these authorities is required.
		Manage land use and development, including dams, in Declared Water Supply Catchments to retain and improve water quality and improve yield to support regional water needs and to increase system-wide capacity to Respond to demand.		✓		Melbourne Water, Southern Rural Water and Greater Western Water have all raised concern with the proposal and its impact on waterways. Demonstration within the DP to satisfy these authorities is required. No outline on how WSUD will be used within the development at this stage.
		Reinforce the role of waterways as biodiversity Linkages and as corridors for native plants and animals.	✓			Jacksons Creek will retain its function. Land would be vested to Council.

Objective number	Objective in the SoPP (Direct quote)	Strategies to deliver the objective (Direct quote)	Meets	Does not meet	N/A	Planner's Comment
		Ensure water supply and land use planning policies are integrated, to realise efficiencies in regional catchment management and best practice, water-sensitive urban design.		✓		No WSUD is outlined within DP. Relevant authorities have raised concern with the proposal.
		Address the expected impacts of climate change, including changes in the duration and frequency of rainfall events and changes in the intensity and frequency of bushfire events.		✓		No specific area within the DP addresses climate change directly.
		Review and improve regulation and monitoring of groundwater licences and surface water diversions.			*N/A*	
4.	**To recognise, protect, conserve and enhance the declared area's Aboriginal cultural and spiritual heritage values and work in partnership with Traditional Owners in caring for Country.**					
		With Traditional Owners, identify, protect, conserve and enhance sites, landscapes and views of Aboriginal cultural significance, consistent with the Aboriginal Heritage Act 2006 and Cultural Heritage Management Plans.	✓			Applicant is seeking to undertake a Voluntary Cultural Heritage Management Plan. Areas identified are to be retained and protected.
		With Traditional Owners, acknowledge, protect, promote and interpret tangible and intangible Aboriginal cultural values, heritage and knowledge when planning and managing land use and development, water and other environmental resources.		✓		No detail on how this will be met. However, a voluntary Cultural Heritage Management Plan is being prepared.
5.	**To recognise, conserve and enhance the declared area's significant post-contact cultural heritage values.**					
		Conserve and enhance the character of state and/or nationally significant post-contact cultural heritage values (including aesthetic, historic, scientific, social and spiritual values) in the declared area's heritage places, precincts and landscapes, including sequences of views along main road and rail routes.			*N/A*	No significant post-contact heritage has been identified.
		Acknowledge, promote and interpret significant post-contact cultural heritage values in the			*N/A*	

Objective number	Objective in the SoPP (Direct quote)	Strategies to deliver the objective (Direct quote)	Meets	Does not meet	N/A	Planner's Comment
		planning, design, development and management of land uses, including infrastructure.				
6.	**To support and encourage agricultural land uses that strengthen the declared area's economy and contribute to the rural landscape.**					
		Encourage the use of rural-zoned land for agricultural purposes and encourage the use of high-quality soils for soil-based agriculture.			***N/A***	
		Encourage and support innovations in agricultural practices (such as sustainable farming, water reuse, technologies to enable farming to adapt and respond to emerging and niche markets).			***N/A***	
		Support agricultural practices that improve soil health and respond to and encourage adaptation to climate change.			***N/A***	
		Encourage measures to ensure agricultural practices protect and enhance soil quality, water quality, biodiversity and native plants and animals.			***N/A***	
		Manage the effects of rural land use and development on important environmental and cultural values.			***N/A***	
		Restrict the supply of rural-living-zoned land to conserve and protect agricultural practices.			***N/A***	
		Protect strategic extractive resource areas and existing quarry operations from encroachment from inappropriate development.			***N/A***	
		Proposals to establish an extractive industry must adhere to best practice measures to avoid and minimise impacts on significant environments and landscapes.			***N/A***	
7.	**To provide for a diverse and sustainable visitor economy compatible with the natural and cultural values of the area.**					
		Support and facilitate sustainable and responsible tourism and recreation-related land uses and developments (such as agritourism) in keeping with the declared area's significant landscapes, environmental and cultural values.			***N/A***	

Objective number	Objective in the SoPP (Direct quote)	Strategies to deliver the objective (Direct quote)	Meets	Does not meet	N/A	Planner's Comment
		Facilitate tourism-related land use and development that encourages people to recognise and understand Aboriginal and post-contact cultural heritage.			*N/A*	
		Ensure the conservation and enhancement of Declared Water Supply Catchment Areas of regional or state significance in the planning of tourism and recreational land uses.			*N/A*	
		Protect the unique rural character of towns in the declared area.		✓		As nominated in the main report, the proposal has not adequately demonstrated how the proposal
8.	**To plan and manage growth of settlements in the declared area consistent with protection of the area's significant landscapes, protection of catchments, biodiversity, ecological and environmental values, and consistent with the unique character, role and function of each settlement.**					
		Direct urban development to a hierarchy of settlements identified for growth, through clearly defining long-term settlement boundaries.	✓			The DP directs development within the existing Gisborne township area.
		Direct rural residential development to rural-living-zoned land as provided for in the Macedon Ranges Council's rural living strategy, In the Rural Living Zone – Strategic Direction (2015).			*N/A*	
		Encourage infill development that respects the townships' character.			*N/A*	The DP area is for greenfield development.
		Limit the expansion of settlements in high risk locations, actively reducing the risks associated with natural hazards.	✓			It is considered the bushfire risk and flood risk can be managed for the DP area. Melbourne Water has raised concern with downstream risk which needs to be addressed.
		Encourage a range of housing types within settlement boundaries to support a diverse range of housing needs.	✓			The proposal nominates a range of housing types within the proposed DP area.
		Encourage provision of an adequate supply of well-serviced employment land within settlement boundaries to support local and regional jobs and services.			*N/A*	

Objective number	Objective in the SoPP (Direct quote)	Strategies to deliver the objective (Direct quote)	Meets	Does not meet	N/A	Planner's Comment
		Encourage the use of voluntary Cultural Heritage Management Plans.	✓			
9.	**To manage the provision of infrastructure consistent with protection of the area's significant landscapes and protection of environmental values to support the social and economic needs of communities and increase resilience to climate change effects.**					
		Provide timely infrastructure and services to meet community needs in sequence with development.	✓			
		Maintain and enhance transport connections that provide links between and within regional communities and to major cities.	✓			
		Reduce use of fossil fuels and reduce greenhouse gas emissions by prioritising active transport and public transport modes.	✓			Pedestrian and cycling linages have been provided within the DP.
		Maintain view lines of state-significant landscape features from the main road and rail transport corridors.	✓			
		Ensure the future operation and development of major transport linkages and rail corridors and upgrading and improved management of freight routes are considered when managing the growth of settlements.		✓		DOT is seeking further clarity regarding upgrades and the data behind these assumptions.
		Ensure equitable access to community infrastructure.	✓			
		Encourage the use of active and public transport by planning infrastructure and facilities in accessible locations, and improve walking and cycling routes.	✓			
10.	**Respond to the challenges and threats of climate change and natural hazards with careful planning and mitigation strategies.**					
		Support community and government planning for disaster preparedness and climate resilience.	✓			

Objective number	Objective in the SoPP (Direct quote)	Strategies to deliver the objective (Direct quote)	Meets	Does not meet	N/A	Planner's Comment
		Manage bushfire risks while also retaining valued biodiversity and landscape character.	✓			Limited biodiversity and landscape impact due to bushfire risk preparedness.
		Plan for more renewable energy generation and distribution.		✓		There is no inclusion of any standalone renewable energy generation within the proposal.
		Ensure proposals to establish renewable energy facilities adhere to best practice measures to avoid and minimise impacts on significant environments and landscapes.			*N/A*	
		Ensure planning for future use and development of land prone to flooding minimises the consequences of inundation.			*N/A*	