

SERVICING STRATEGY REPORT

# 241 Waterfall Way, Armidale

Job No. 25002 | 14<sup>th</sup> of May 2026

## DOCUMENT CONTROL

### Document Identification

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|----------------|--------------------------------|
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| Document Title | Servicing Strategy Report      |
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| Client         | Knox Corp & Transcend Property |
| Client Contact | Jim Knox & Alistair Palmer     |

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|              |            |              |
|              |            |              |

### Document Approval

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# CONTENTS

|                                                         |           |
|---------------------------------------------------------|-----------|
| <b>DOCUMENT CONTROL</b>                                 | <b>2</b>  |
| <b>1 INTRODUCTION</b>                                   | <b>5</b>  |
| 1.1 Background                                          | 5         |
| 1.2 Report Limitations                                  | 5         |
| <b>2 SITE CHARACTERISTICS</b>                           | <b>6</b>  |
| 2.1 Location                                            | 6         |
| 2.2 Existing Services                                   | 6         |
| 2.2.1 Stormwater                                        | 6         |
| 2.2.2 Water                                             | 7         |
| 2.2.3 Sewer                                             | 7         |
| 2.2.4 Power/Telecommunications                          | 7         |
| 2.3 Development Scope                                   | 7         |
| <b>3 ROADS AND TRANSPORT INFRASTRUCTURE</b>             | <b>9</b>  |
| 3.1 Internal Road Network                               | 9         |
| 3.2 External Connections & Intersection Upgrades        | 9         |
| 3.3 Traffic Impact Assessment                           | 9         |
| 3.4 Pedestrian & Cycling Facilities                     | 10        |
| 3.5 Driveway & Property Access Standards                | 10        |
| <b>4 EARTHWORKS &amp; SITE PREPARATION</b>              | <b>11</b> |
| 4.1 Earthworks Strategy                                 | 11        |
| 4.2 Grading and Fill Requirements                       | 11        |
| 4.3 Retaining Walls                                     | 11        |
| 4.4 Erosion and Sediment Control                        | 11        |
| <b>5 STORMWATER MANAGEMENT STRATEGY</b>                 | <b>12</b> |
| 5.1 Lawful Point of Discharge                           | 12        |
| 5.2 Stormwater Drainage Infrastructure                  | 12        |
| 5.3 Stormwater Quality Treatment                        | 12        |
| 5.4 Overland Flow Paths                                 | 12        |
| 5.5 Compliance with Regulatory Requirements             | 12        |
| <b>6 WATER SUPPLY STRATEGY</b>                          | <b>14</b> |
| 6.1 Connection Points                                   | 14        |
| 6.2 System Configuration                                | 14        |
| 6.3 Supply Capacity & Pressure Considerations           | 14        |
| 6.4 Internal Network Layout                             | 14        |
| 6.5 Fire Flow Considerations                            | 14        |
| 6.6 Compliance with Regulatory Requirements             | 14        |
| <b>7 SEWERAGE STRATEGY</b>                              | <b>15</b> |
| 7.1 Connection Points                                   | 15        |
| 7.2 System Type                                         | 15        |
| 7.3 Internal Sewer Network                              | 15        |
| 7.4 Easements & Setbacks                                | 15        |
| 7.5 Capacity & Future Network Considerations            | 15        |
| 7.6 Compliance with Regulatory Requirements             | 15        |
| <b>APPENDIX A: SERVICING STRATEGY DRAWINGS</b>          | <b>16</b> |
| <b>APPENDIX B: EXTERNAL INTERSECTION CONCEPT DESIGN</b> | <b>17</b> |

**APPENDIX C: TRAFFIC IMPACT ASSESSMENT****18****TABLES**

|                             |   |
|-----------------------------|---|
| Table 2.1: Site description | 6 |
|-----------------------------|---|

**FIGURES**

|                                         |   |
|-----------------------------------------|---|
| Figure 2.1: Project locality            | 6 |
| Figure 2.2: Proposed development layout | 8 |



# 1 INTRODUCTION

## 1.1 Background

Dykman Consulting (DC) has been engaged by Transcend Property (TP) C/- Knox Corp to undertake the civil engineering servicing strategy for the proposed development at 241 Waterfall Way, Armidale.

The proposed development will create lots between approximately 500 m<sup>2</sup> and 1.2 Ha to comply with the zoning requirements of R1 General Residential and R2 Low Density Residential of Armidale Regional Council's (ARC) Local Environmental Plan (LEP), 2012 and Development Control Plan (DCP), 2024.

This report has been prepared to accompany the proposed Development Application and to provide background information to be used in the detailed design phase once the Development Application has been approved.

## 1.2 Report Limitations

This report has been prepared for the exclusive use of the client for the purpose of providing an engineering services strategy for the proposed development at 241 Waterfall Way, Armidale. The information presented is based on preliminary site investigations, available data at the time of preparation, and discussions with relevant authorities.

Key limitations include:

- **Preliminary Nature:** The recommendations and strategies provided are conceptual and subject to refinement during detailed design phases.
- **Data Reliance:** Information from third parties, including utility providers and council records, has been assumed to be accurate and has not been independently verified.
- **Scope of Assessment:** No detailed capacity checks, geotechnical investigations, or environmental studies have been undertaken unless specifically noted.
- **Regulatory Changes:** Future amendments to council policies or standards may affect the recommendations herein.
- **Use of Report:** This document should not be used for construction purposes. It is intended for planning and feasibility assessment only.

DC accepts no liability for the use of this report by any third parties or for purposes beyond its stated intent without prior written approval.

## 2 SITE CHARACTERISTICS

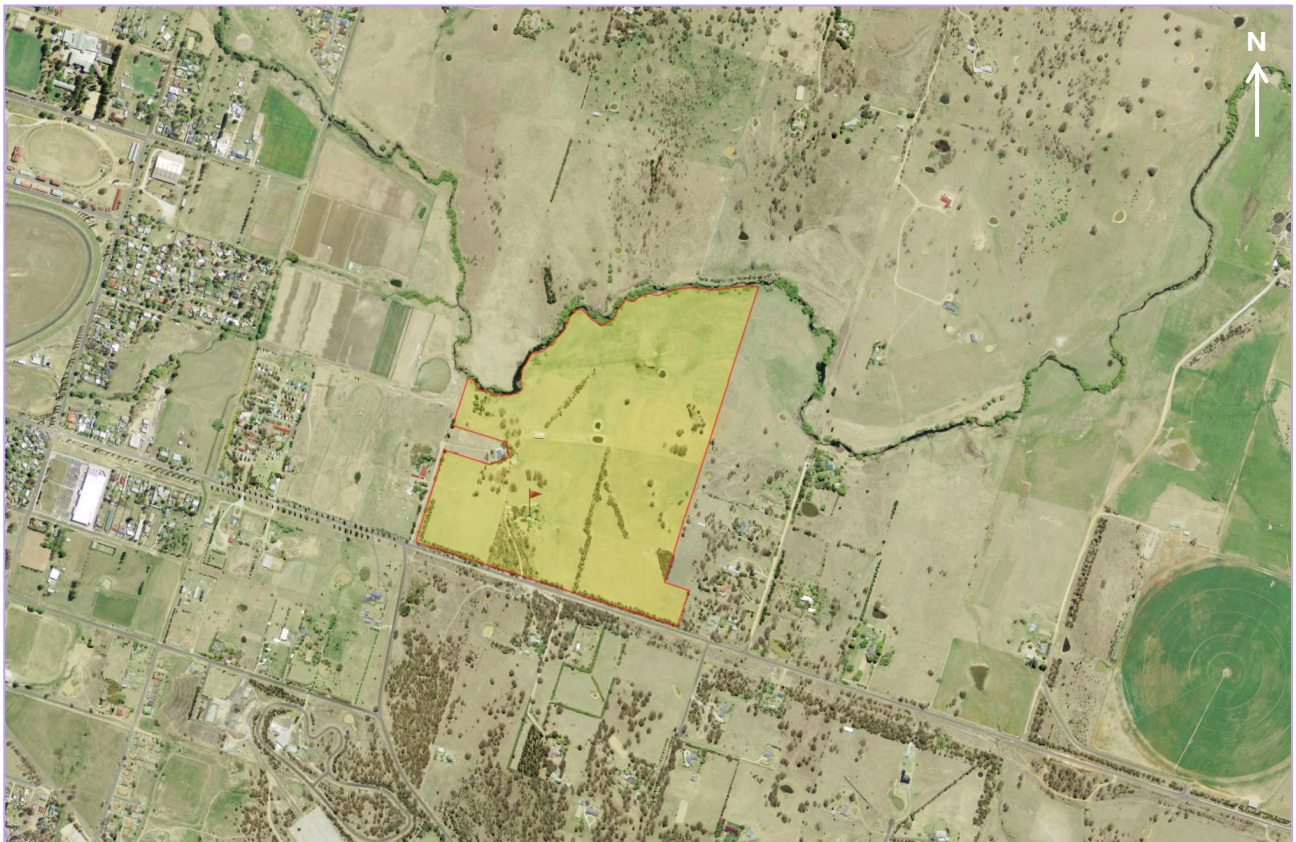
The land contained within the site is described in Table 2.1.

*Table 2.1: Site description*

| Information    | Details                                                     |
|----------------|-------------------------------------------------------------|
| Title details  | Lot 1 DP 1209469, Lot 8 DP 240862 and Lot 69 & 70 DP 755808 |
| Street address | 241 Waterfall Way, Armidale                                 |
| Area           | Approx 44 ha                                                |
| Zoning         | C2, C3, R1, R2, and RE1                                     |

### 2.1 Location

The subject site, as seen in Figure 2.1 is located on the eastern outskirts of the township Armidale and is characterised by predominantly northerly sloping land draining to Dumaesq Creek, which is the northern boundary of the subject site.



*Figure 2.1: Project locality*

### 2.2 Existing Services

Detailed survey by New England Surveying and Engineering (NESE), 'Dial Before You Dig' (DBYD) data covering the existing infrastructure services for the site and surrounding area has been obtained to determine if any infrastructure is required for the development.

#### 2.2.1 Stormwater

There is no existing formal stormwater infrastructure within the site. Surface runoff currently follows the natural topography, draining towards Dumaesq Creek, which is located along the northern boundary. During rainfall events, stormwater disperses across the site in two directions (east and west) split by a large ridgeline that runs north south located on the western third of the development. It is conveyed through overland flow paths, discharging to the northwest corner and centrally making its way to the

creek. The absence of any constructed drainage systems means that stormwater management currently relies on natural infiltration and sheet flow processes.

### 2.2.2 Water

The site has access to existing reticulated water mains, with one main running along Tombs Road and additional infrastructure present on the southern side of Waterfall Way. These mains form part of the broader water supply network managed by Armidale Regional Council, providing potential connection points for future development. At this stage, no hydraulic assessments have been undertaken to determine the available capacity, pressure, or flow rates within these mains. Further investigations and consultation with Council will be required in subsequent project phases to confirm their suitability for servicing the development.

### 2.2.3 Sewer

There are multiple trunk sewer mains located along the northern boundary of the site, forming part of the broader regional wastewater network. It is believed that some of these mains are now redundant, though this has yet to be confirmed. DC will coordinate with ARC to identify the active sewer main that will be utilised for the site's connection.

At this stage, no capacity analysis has been undertaken to assess the system's ability to accommodate additional flows from the proposed development. Further hydraulic assessments and consultations with Council will be necessary in future project phases to determine the adequacy of the network and identify any potential upgrade requirements.

### 2.2.4 Power/Telecommunications

Overhead powerlines are present along Waterfall Way and Toombs Road, forming part of the existing electrical distribution network that services the area. These powerlines provide an essential electricity supply to surrounding properties and infrastructure.

The site is also serviced by fixed-line telecommunications and NBN infrastructure, ensuring access to broadband internet and telecommunication services, and facilitating reliable communication and digital access within the development area.

## 2.3 Development Scope

The proposed development consists of 275 residential lots, as illustrated in Figure 2.2. The various colours shown on the development layout indicate the staging of the development, as outlined below:

- Stage 1 – 36 lots
- Stage 2 – 22 lots
- Stage 3 – 25 lots
- Stage 4 – 13 lots
- Stage 5 – 15 lots
- Stage 6 – 25 lots
- Stage 7 – 23 lots
- Stage 8 – 29 lots
- Stage 9 – 21 lots
- Stage 10 – 15 lots
- Stage 11 – 22 lots
- Stage 12 – 29 lots



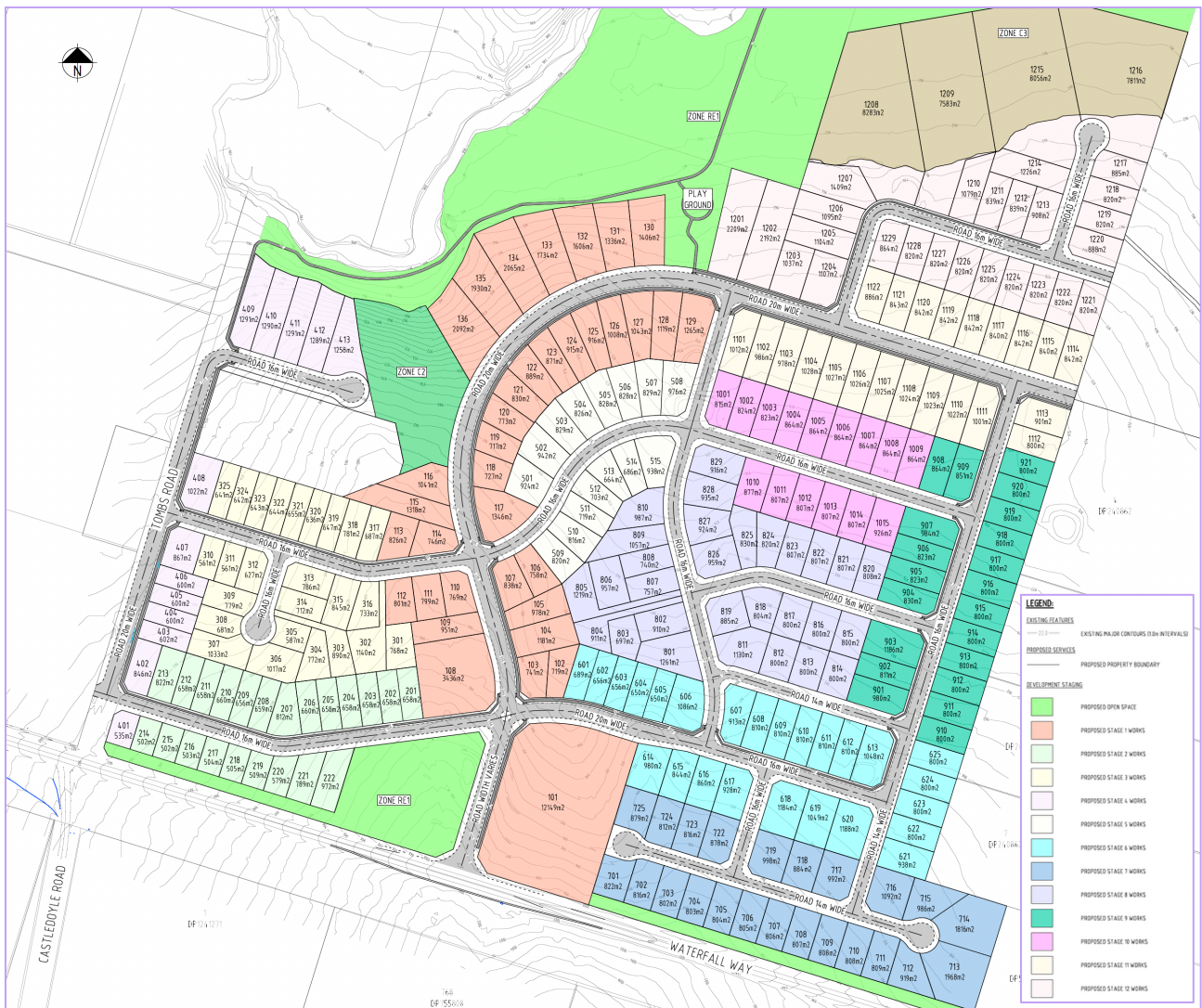


Figure 2.2: Proposed development layout

Refer to **Appendix A** for the Servicing Strategy Drawings.



## 3 ROADS AND TRANSPORT INFRASTRUCTURE

### 3.1 Internal Road Network

The internal road network will be designed in accordance with Armidale Regional Council's Engineering Design Code - Geometric Road Design (D1). The road hierarchy will follow Council's standards to provide safe and efficient access while ensuring connectivity with existing transport infrastructure. The design will:

- Comply with Austroads geometric road design guidelines to ensure appropriate sight distances, lane widths, and intersection spacing.
- Integrate with the existing road network, providing direct and safe access to all lots.
- Accommodate emergency and service vehicles, ensuring appropriate manoeuvrability at intersections and cul-de-sacs.
- Include appropriate turning areas and cul-de-sac designs, meeting the minimum radius requirements outlined in D1 Road Design Code.
- Ensure compliance with road reserve width standards, incorporating required allowances for utilities, drainage, and pedestrian pathways.

Roads will be crowned in the centre with a 3% crossfall for effective drainage, and pavement construction will meet Council's minimum structural design standards.

### 3.2 External Connections & Intersection Upgrades

The development will gain access from Waterfall Way, a key regional road. DC has prepared a concept design incorporating a Channelised Right-Turn (CHRs) and Basic Left-Turn (BAL) treatment to facilitate safe vehicle entry and exit into the site. These treatments will ensure:

- Improved traffic flow and reduced delays, minimising disruptions to through traffic on Waterfall Way.
- Enhanced safety, with dedicated turn lanes reducing conflicts between entering and through traffic.
- Compliance with Austroads and Council's D1.09 - Design Speed requirements for intersection layout and sight distances.
- Integration with existing and future road infrastructure, allowing for potential network expansion or future upgrades.

Consultation with Transport for NSW will be undertaken to ensure the intersection treatments meet state road authority requirements and align with the regional transport strategy. Refer to **Appendix B** for the Concept Design of the external intersection.

### 3.3 Traffic Impact Assessment

The development is expected to generate approximately 2,475 daily vehicle trips, with peak hour traffic volumes of 234 trips during both the AM and PM periods. During the AM peak, approximately 20% of trips are inbound and 80% outbound, while the PM peak experiences an 80% inbound and 20% outbound distribution. The majority of traffic movements (95%) are anticipated to travel to and from Armidale via the western section of Waterfall Way, with only 5% accessing the site from the east.

Assessment of the surrounding road network and key intersections indicates that operations will continue to perform within acceptable limits under future year 2038 conditions, with acceptable levels of delay and queueing maintained following development traffic growth. SIDRA modelling of the proposed access intersection identified the 2038 AM peak as the worst-case scenario, with the right-turn movement exiting the site operating at LOS D with an average delay of approximately 30 seconds and queue lengths of up to 29.4 metres.

Safety analysis identified only two recorded crashes within the vicinity of the site over the previous five years. Access design assessments confirmed that the proposed intersection achieves the required sight distance standards, ensuring safe vehicular access can be maintained.

The TIA concludes that the proposed development can be appropriately accommodated within the surrounding road network, subject to implementation of the recommended access and operational measures.

Refer to **Appendix C** for the Traffic Impact Assessment.

### 3.4 Pedestrian & Cycling Facilities

The development will integrate pedestrian and cycle-friendly design elements, adhering to Armidale Regional Council's Cycleway and Pathway Design Code (D9):

- Shared pathways and footpaths will be provided where feasible, meeting the minimum widths specified in D9 Table D9.1.
- Footpaths, kerb ramps and pedestrian refuge islands will be incorporated at key points to enhance safety.
- Cycling provisions will follow Austroads Guide to Road Design Part 6A recommendations, including appropriate signage and pavement markings.

### 3.5 Driveway & Property Access Standards

Driveways will be designed in accordance with Armidale Regional Council's Driveway Access Handbook (D1.37 & D1.38). Key requirements include:

- Minimum sight distance compliance, ensuring safe entry and exit to properties.
- Driveway width and grade limits, preventing excessive steepness that may affect vehicle access.
- Integration with footpaths and kerb alignments, ensuring smooth transitions and accessibility.

All road and transport infrastructure will be designed for long-term durability, ensuring compliance with Council's Engineering Standards and Austroads best practices. Future upgrades will be assessed based on traffic growth and Council recommendations.

## 4 EARTHWORKS & SITE PREPARATION

### 4.1 Earthworks Strategy

The earthworks strategy for the site aims to achieve a balanced cut-and-fill approach while minimising the need for material importation. Given the high costs of importing material in rural areas, the design prioritises on-site material reuse to reduce external sourcing. Where necessary, controlled importation of engineered fill will be considered to meet site grading and compaction requirements.

All site regrading and earthworks will be undertaken in compliance with Armidale Regional Council's Engineering Design Code - Site Regrading (D6), ensuring appropriate ground preparation, stability, and drainage integration.

### 4.2 Grading and Fill Requirements

Lot grading will ensure a desired surface grading of 1.5% (1% minimum) in the direction of the stormwater drainage system. Fill material must be free from organic matter, large rocks, and debris and meet compaction requirements. All fill placed on site will be compacted in 150mm layers to a minimum of 95% Standard Maximum Dry Density (SMDD) per AS 3798 - Guidelines on Earthworks for Residential Developments. Areas where fill exceeds 400mm depth will require Level 1 geotechnical supervision and testing. The earthworks design will optimise cut and fill to balance the site, reducing haulage impacts on the surrounding road network. Slopes greater than 15% will require specific geotechnical assessment to determine stability and suitability for development.

### 4.3 Retaining Walls

Retaining walls will be constructed between lots and at the rear of selected lots to ensure compliance with lot grading requirements and Armidale Regional Council's D6 Site Regrading specifications. These walls will provide structural stability, prevent erosion, and integrate with overland flow paths. Their height and material selection will comply with Council's geotechnical and structural requirements to ensure long-term durability and site stability.

### 4.4 Erosion and Sediment Control

All earthworks and site preparation will integrate erosion and sediment control measures as per Armidale Regional Council's Engineering Design Code - Erosion Control and Sedimentation Management (D7):

- Temporary Diversion Drains will be installed to direct stormwater away from construction areas, minimizing runoff impacts.
- Silt Fencing and Sediment Basins will be implemented to capture disturbed soil and prevent sedimentation into Dumaresq Creek.
- Stockpile Management:
  - All topsoil will be retained on-site and stockpiled for re-use in landscaping.
  - Stockpiles will be protected with silt fences and temporary revegetation where left exposed for extended periods.
- Progressive Stabilisation: As construction progresses, exposed areas will be revegetated using local native grasses to minimize soil loss and maintain long-term stability.

This integrated earthwork approach ensures compliance with Armidale Regional Council's design codes, providing a stable and environmentally sustainable foundation for development.



## 5 STORMWATER MANAGEMENT STRATEGY

### 5.1 Lawful Point of Discharge

Following discussions with the client and Armidale Regional Council, the lawful point of discharge for the site will be direct discharge into Dumaresq Creek, located at the northern boundary of the development. This approach eliminates the need for an on-site retention/detention basin, while ensuring compliance with council requirements for stormwater management and environmental protection. The stormwater discharge will be carefully managed to minimise downstream impacts, including erosion and potential flooding.

### 5.2 Stormwater Drainage Infrastructure

Stormwater from the development will be collected via a pit and pipe network designed to efficiently capture runoff from roads, driveways, and residential lots. The network will safely convey collected stormwater to the designated discharge point into Dumaresq Creek. The design will ensure:

- Compliance with Armidale Regional Council's Drainage Design Standards (D5).
- Adequate hydraulic capacity to manage minor storm events (up to a 5-year ARI for urban areas).
- Safe conveyance of flows to prevent localized flooding or erosion.
- Integration with online stormwater quality treatment infrastructure to address runoff quality before discharge.

### 5.3 Stormwater Quality Treatment

To manage the quality of stormwater runoff, online treatment measures will be implemented within the drainage network prior to discharge into Dumaresq Creek. In accordance with Armidale Regional Council's Stormwater Drainage Design Code (D5) and Water Sensitive Urban Design (WSUD) principles, the following treatment options will be considered:

#### Gross Pollutant Traps (GPTs)

- Installed at key locations within the drainage network to capture litter, debris, and coarse sediments.
- Regular maintenance schedules will be established to ensure effective operation.

#### Inline Stormwater Quality Improvement Devices

- Modular devices capable of removing fine sediments, nutrients (nitrogen and phosphorus), and hydrocarbons.
- Devices may include cartridge filters or hydrodynamic separators, selected based on hydraulic performance and pollutant removal efficiency.

#### Vegetated Swales or Biofilters (where feasible):

- Positioned along road reserves or easements to promote infiltration and pollutant removal.
- Designed in accordance with Council's minimum width and gradient requirements.

These measures will collectively ensure that stormwater quality meets council's requirements without the need for an on-site basin.

### 5.4 Overland Flow Paths

In addition to the pit and pipe network, designated overland flow paths will be incorporated into the development layout to manage exceedance flows during significant rainfall events. These flow paths will:

- Provide secondary conveyance during major storm events exceeding the capacity of the underground system.
- Be graded to direct excess flows safely towards Dumaresq Creek, preventing uncontrolled sheet flows across properties and roadways.
- Include erosion control measures, such as rock armouring or turf reinforcement, to stabilise flow paths and mitigate scouring risks.

### 5.5 Compliance with Regulatory Requirements

The stormwater management system, including the pit and pipe network, retention/detention basin, and overland flow paths, will comply with:

- Armidale Regional Council Development Control Plan 2024
- Armidale Regional Council Stormwater Drainage Design Code (D5)
- Water Sensitive Urban Design (WSUD) best practices, ensuring environmentally sustainable stormwater management

This integrated stormwater strategy will ensure effective flood mitigation, stormwater quality improvement, and regulatory compliance, protecting both the development and downstream ecosystems.



## 6 WATER SUPPLY STRATEGY

### 6.1 Connection Points

The site benefits from existing water infrastructure in the surrounding area, with a water main along Toombs Road and additional water infrastructure on the southern side of Waterfall Way. These provide potential connection points for the development. The final connection point will be determined during the detailed design phase, subject to further consultation with Armidale Regional Council.

### 6.2 System Configuration

The proposed development will be connected to the existing water reticulation network in accordance with Armidale Regional Council's Water Supply Design and Construction Code (D11). The system configuration will ensure:

- A looped network design where feasible, improving reliability and reducing pressure fluctuations.
- Hydraulic efficiency, minimising head loss across the site.
- Consistent pressure and supply, ensuring compliance with the council's service pressure requirements.

### 6.3 Supply Capacity & Pressure Considerations

At this stage, capacity checks will not be undertaken. However, the system will be designed to accommodate residential peak hour and peak day demands, as per D11 - Water Supply Code:

- Peak Day Demand (PDD) =  $2.2 \times \text{Average Day Demand}$  (per D11 Table 2.3.4.2)
- Peak Hour Demand (PHD) =  $2 \times \text{Average Hour Demand}$  (on peak day)

Minimum and maximum service pressure requirements will align with Table 2.3 of D11:

- Minimum Service Pressure: 200 kPa (20m head) for residential lots
- Maximum Allowable Service Pressure: 800 kPa (80m head)
- Desirable Minimum Static Pressure: 300 kPa (30m head)

### 6.4 Internal Network Layout

The internal water reticulation network will be designed to:

- Provide sufficient flow rates and pressures across all lots.
- Ensure adequate spacing of hydrants to meet fire flow requirements, in compliance with AS2419.1-2005 and NSW Water Directorate Fire Flow Guidelines.
- Minimise dead-end lines, utilising looped connections where practical.

Hydrants will be spaced according to D11 Table 8.8.8:

- Residential areas: 70m

### 6.5 Fire Flow Considerations

The water supply system will meet fire flow requirements as per D11 Table 3.1.5:

- Residential Developments: 10 L/s at 150 kPa

### 6.6 Compliance with Regulatory Requirements

The water supply network will be designed and constructed in accordance with:

- Armidale Regional Council's Engineering Design Code - Water Supply (D11)
- Water Supply Code of Australia (WSA 03-2011)
- Fire safety requirements under AS2419.1-2005

This approach ensures a reliable, efficient, and compliant water supply system for the development, while allowing for future capacity assessments as the project progresses.

## 7 SEWERAGE STRATEGY

### 7.1 Connection Points

The site benefits from existing sewer infrastructure, with sewer mains and potentially a trunk sewer located along the northern boundary. These provide viable connection points for the development. The final connection point will be determined in consultation with Armidale Regional Council, ensuring compliance with D12 - Sewerage Design and Construction standards.

### 7.2 System Type

A gravity-fed sewer system is the preferred method for servicing the site, in alignment with Armidale Regional Council's Sewerage Code (D12). Council has a clear preference for gravity-based systems over sewer pumping stations.

### 7.3 Internal Sewer Network

The internal sewer network will be designed to provide efficient collection and conveyance of wastewater. Key design considerations include:

- Minimum Pipe Size: Per D12 - Sewerage Design Code, all reticulation sewers will be a minimum of DN150 PVC-U pipes.
- Grade Requirements: Gravity sewers will comply with Council's minimum gradient standards to maintain self-cleansing velocities and prevent blockages.
- Property Connection Points: Each lot will have an individual property sewer connection (IO interface method) to allow for future maintenance and expansion.
- Maintenance Structures: Manholes and maintenance shafts will be installed at required intervals, complying with spacing and access standards in D12 Table 7.1.

### 7.4 Easements & Setbacks

Where sewer mains are located within private property, easements will be required over the full alignment of the sewer pipes. Easements will be centred over the pipe, with minimum widths determined by:

- 3m width for gravity sewers up to 300mm diameter and 3m depth.
- 6m width for sewers larger than 300mm diameter or greater than 3m deep.
- 10m width for sewers deeper than 5m or larger than 600mm diameter.

### 7.5 Capacity & Future Network Considerations

At this stage, no capacity checks or hydraulic modelling will be conducted. Future assessments will be required to confirm the adequacy of downstream infrastructure to accommodate increased flows. Should capacity constraints be identified, network augmentations or onsite pre-treatment solutions may be required in consultation with Armidale Regional Council.

### 7.6 Compliance with Regulatory Requirements

All sewer infrastructure will be designed and constructed in accordance with:

- Armidale Regional Council's Sewerage Design & Construction Code (D12).
- Sewerage Code of Australia (WSA 02-2014).
- Australian Standards (AS/NZS 3500.2 - Plumbing and Drainage: Sanitary Plumbing and Drainage).



# Appendix A: Servicing Strategy Drawings

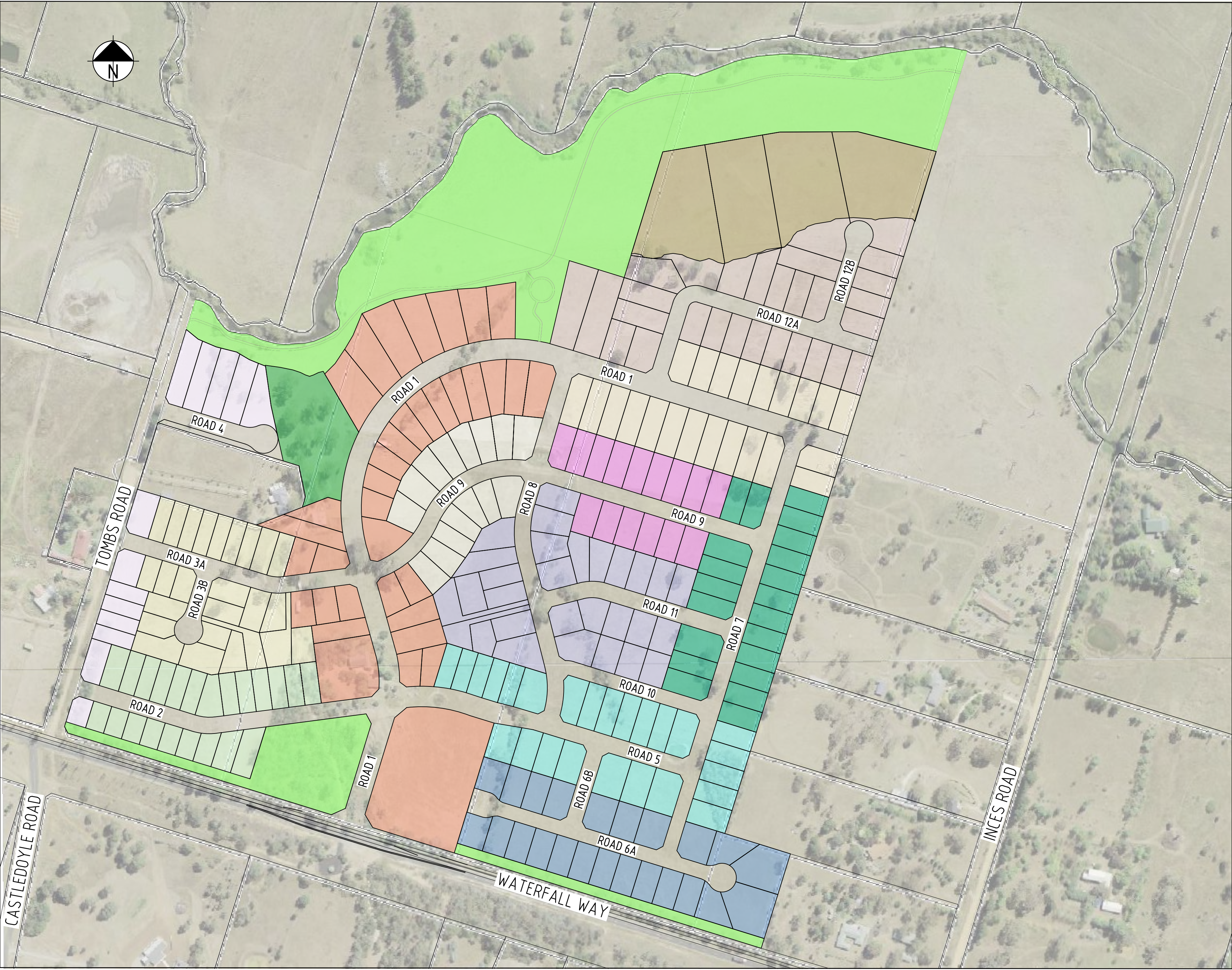
# A



# 241 WATERFALL WAY, ARMIDALE

## 275 LOT - RESIDENTIAL SUBDIVISION

### SERVICE STRATEGY



LOCALITY PLAN  
SCALE 1:2500

DRAWING LIST

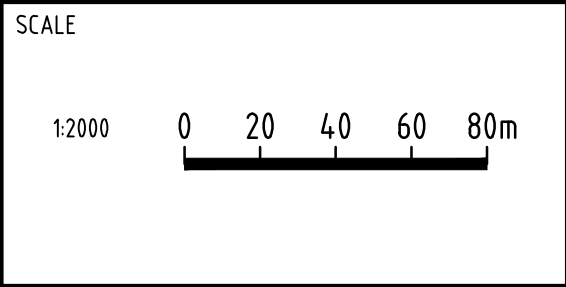
| DRAWING No.   | DRAWING TITLE                                             |
|---------------|-----------------------------------------------------------|
| 25002-CO-1000 | SERVICE STRATEGY COVER SHEET, LOCALITY PLAN DRAWING INDEX |
| 25002-CO-1001 | SERVICE STRATEGY GENERAL NOTES                            |
| 25002-CO-1002 | SERVICE STRATEGY GENERAL SITE PLAN ALL STAGES             |
| 25002-CO-1003 | SERVICE STRATEGY PLAN PROPOSED SEWER                      |
| 25002-CO-1004 | SERVICE STRATEGY PLAN PROPOSED STORMWATER                 |
| 25002-CO-1005 | SERVICE STRATEGY PLAN PROPOSED WATER                      |
| 25002-CO-1006 | SERVICE STRATEGY EXTERNAL INTERSECTION LAYOUT PLAN        |
| 25002-CO-1007 | SERVICE STRATEGY EXTERNAL INTERSECTION SECTIONS           |

**FOR APPROVAL**  
14 May 2026

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| REV | REVISION DETAILS    | DATE     | APPR |
|-----|---------------------|----------|------|
| B   | ISSUED FOR APPROVAL | 13.05.26 |      |
| A   | ISSUED FOR APPROVAL | 27.02.25 |      |

XREFS :- X\_CD\_CIVIL.dwg ; X\_25002-Master.dwg ; X\_D\_CONTS\_FINISHED.dwg ; X\_LOTS.dwg ; X\_D\_CONTROL\_LINE.dwg ; X\_D\_DESIGN\_STRINGS.dwg ; X\_DROA\_INT.dwg ; X\_SURVEY.dwg ; X\_AERIAL\_IMAGE.dwg ; X\_STRATEGY.dwg ; X\_D\_WATERFALLWAY ENDANGERED TREE SURVEY.dwg



**KNOXCORP**



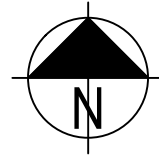
| APPROVAL       |          |         |
|----------------|----------|---------|
| RPEQ SIGNATURE |          | RPEQ No |
| DRAWN          | DESIGNED | CHECKED |
| T.A.           | M.G.     | S.G.    |

**PROPOSED SUBDIVISION**  
**241 WATERFALL WAY ARMIDALE NSW**  
**SERVICE STRATEGY**

SERVICE STRATEGY  
COVER SHEET, LOCALITY PLAN  
DRAWING INDEX

|                     |               |
|---------------------|---------------|
| ISSUE: FOR APPROVAL |               |
| PROJECT No:         | 25002         |
| DRAWING No:         | 25002-CO-1000 |
| REV:                | B             |





LEGEND:

EXISTING FEATURES

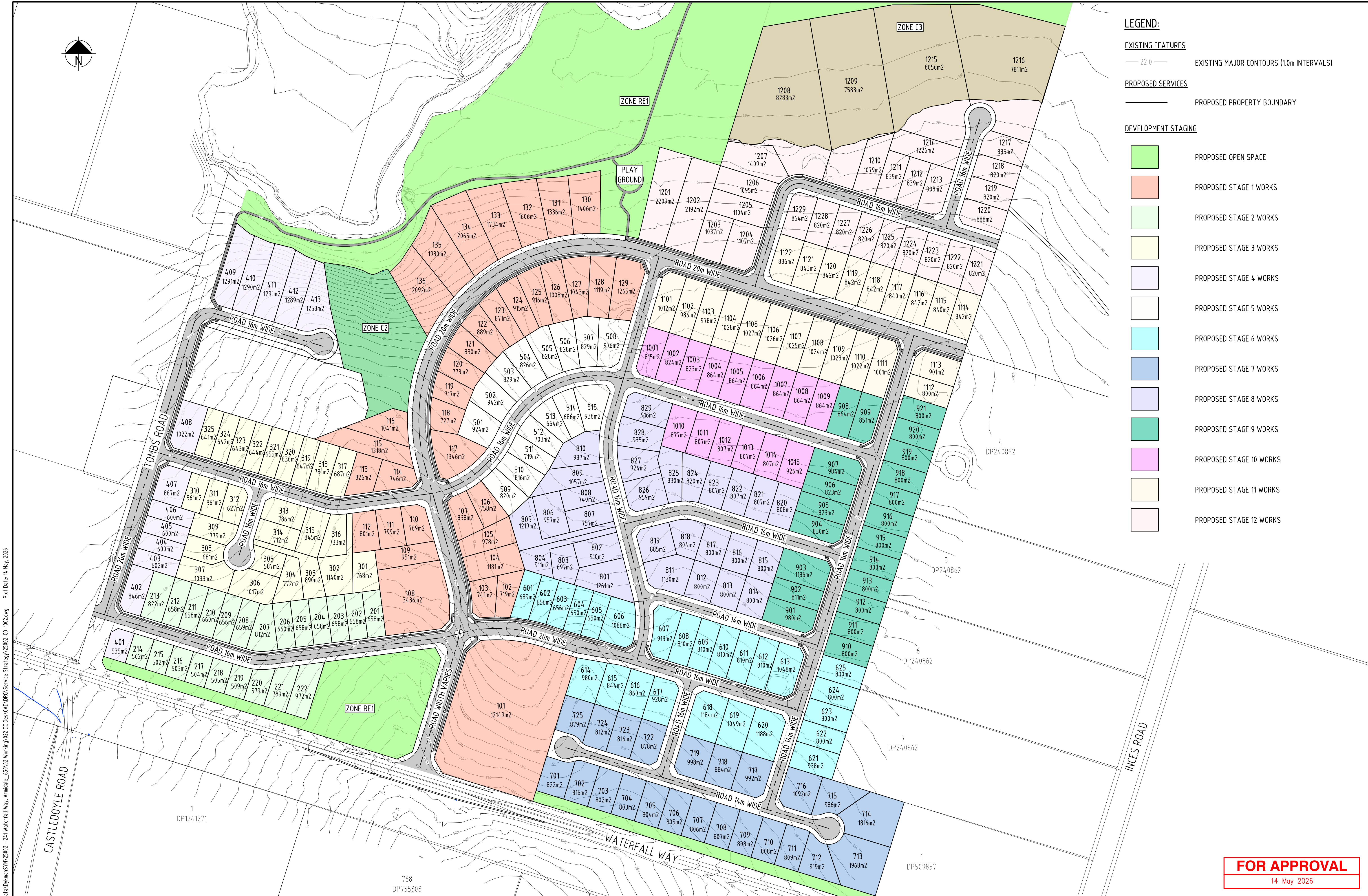
22.0 EXISTING MAJOR CONTOURS (1.0m INTERVALS)

PROPOSED SERVICES

PROPOSED PROPERTY BOUNDARY

DEVELOPMENT STAGING

- PROPOSED OPEN SPACE
- PROPOSED STAGE 1 WORKS
- PROPOSED STAGE 2 WORKS
- PROPOSED STAGE 3 WORKS
- PROPOSED STAGE 4 WORKS
- PROPOSED STAGE 5 WORKS
- PROPOSED STAGE 6 WORKS
- PROPOSED STAGE 7 WORKS
- PROPOSED STAGE 8 WORKS
- PROPOSED STAGE 9 WORKS
- PROPOSED STAGE 10 WORKS
- PROPOSED STAGE 11 WORKS
- PROPOSED STAGE 12 WORKS



FOR APPROVAL

14 May 2026

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|     |                     |          |      |
|-----|---------------------|----------|------|
| F   | ISSUED FOR APPROVAL | 15.04.26 |      |
| E   | LOT LAYOUT UPDATED  | 15.04.26 |      |
| D   | LOT LAYOUT UPDATED  | 14.04.26 |      |
| C   | LOT LAYOUT UPDATED  | 13.04.26 |      |
| B   | LOT LAYOUT UPDATED  | 09.04.26 |      |
| REV | REVISION DETAILS    | DATE     | APPR |

|       |                |
|-------|----------------|
| SCALE |                |
| 1:500 | 0 15 30 45 60m |

KNOXCORP



|                |               |
|----------------|---------------|
| APPROVAL       | RPEQ No       |
| RPEQ SIGNATURE | DATE          |
| DRAWN T.N.     | DESIGNED M.G. |
| CHECKED S.G.   |               |

PROPOSED SUBDIVISION  
241 WATERFALL WAY ARMIDALE NSW  
SERVICE STRATEGY

SERVICE STRATEGY  
GENERAL SITE PLAN  
ALL STAGES

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| DRAWING No: | 25002-CO-1002 |
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**LEGEND:**

**EXISTING FEATURES**

22.0 EXISTING MAJOR CONTOURS (1.0m INTERVALS)

**PROPOSED SERVICES**

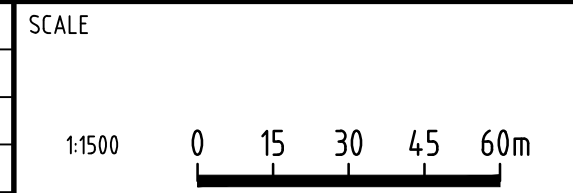
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SEWER

SEWER MANHOLE

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| A   | ISSUED FOR APPROVAL | 27.02.25 |      |  |
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| T.A.           | M.G.     | S.G.    |         |

**PROPOSED SUBDIVISION**  
**241 WATERFALL WAY ARMIDALE NSW**  
**SERVICE STRATEGY**

SERVICE STRATEGY PLAN  
PROPOSED SEWER

**FOR APPROVAL**  
14 May 2026

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**LEGEND:**

**EXISTING FEATURES**

22.0 EXISTING MAJOR CONTOURS (1.0m INTERVALS)

**PROPOSED SERVICES**

PROPOSED PROPERTY BOUNDARY

SW STORM WATER

DENOTES SURFACE FLOW PATHS

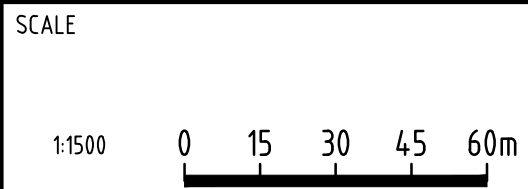
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Q100 FLOOD EXTENT

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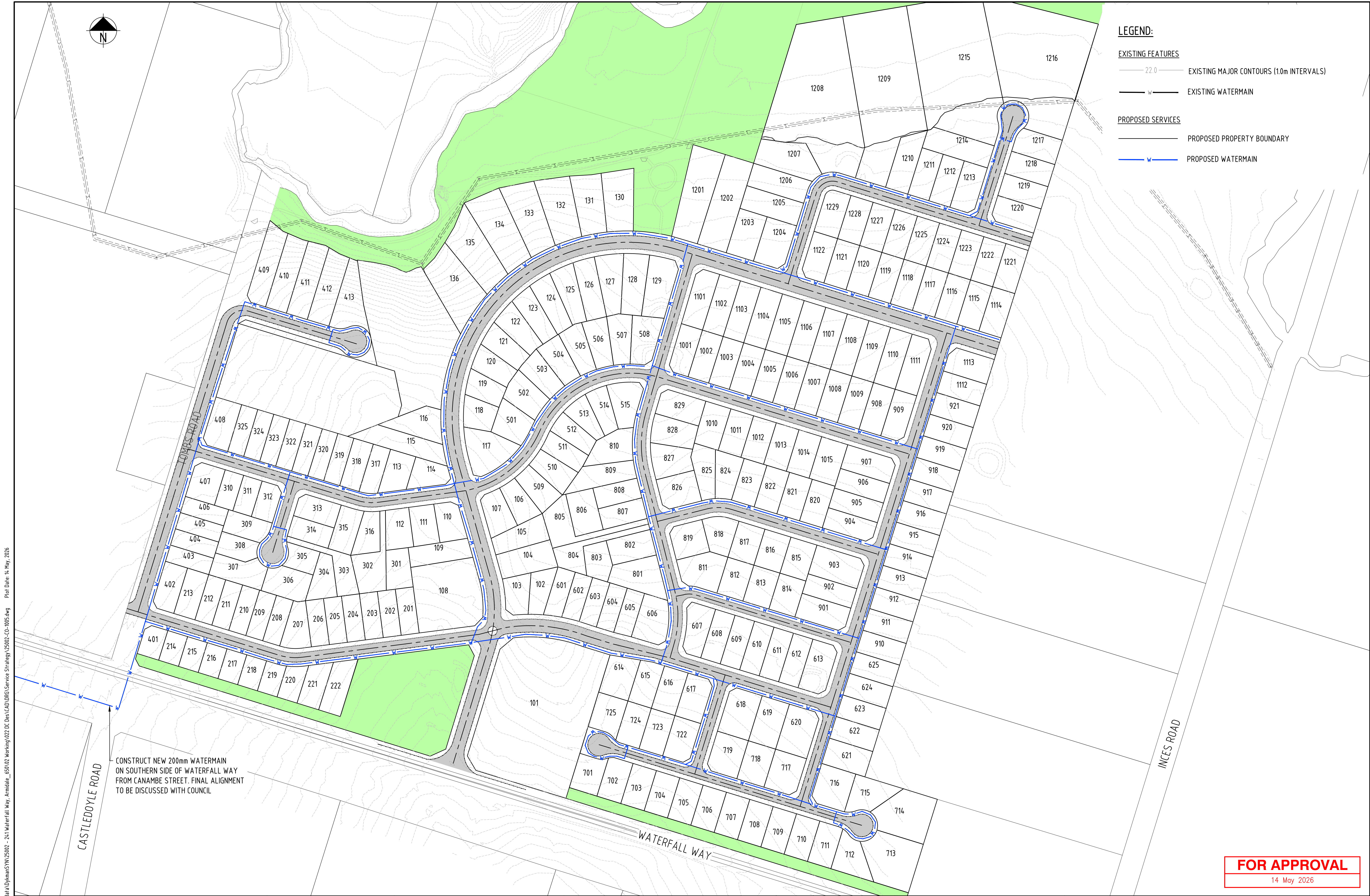
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**SERVICE STRATEGY**

SERVICE STRATEGY PLAN  
PROPOSED STORMWATER

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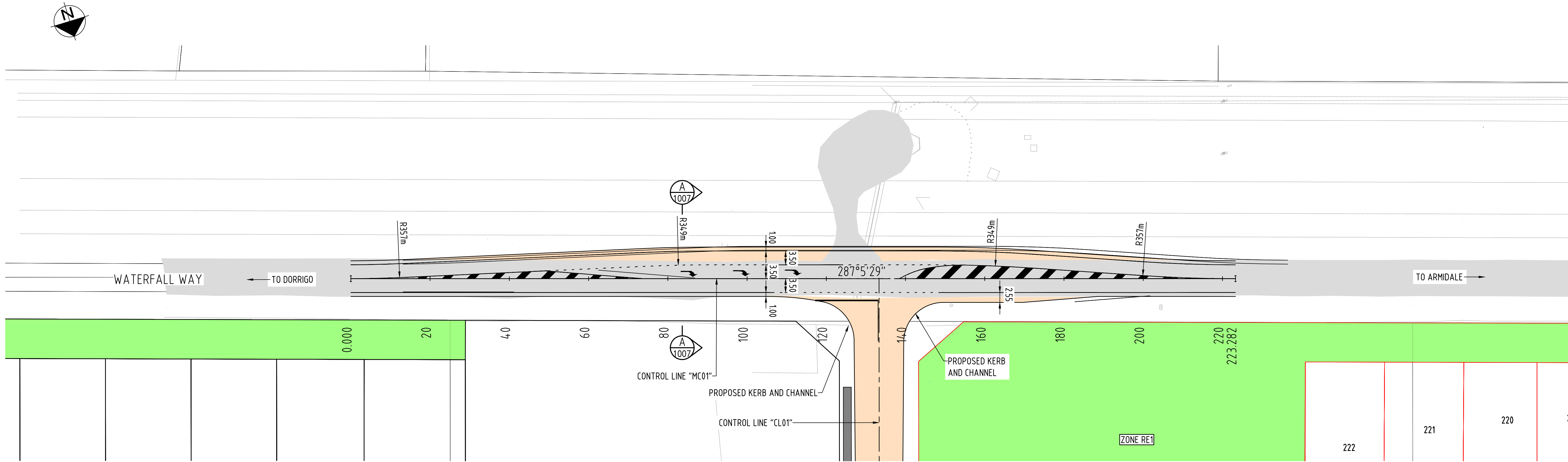




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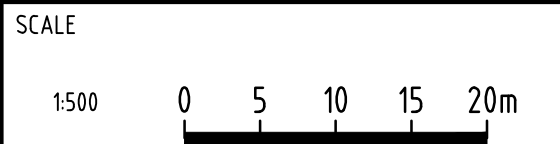
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LAYOUT PLAN  
SCALE 1:500

LEGEND:

- EXISTING PAVEMENT
- FORMATION WIDENING

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**PROPOSED SUBDIVISION**  
**241 WATERFALL WAY ARMIDALE NSW**  
**SERVICE STRATEGY**

SERVICE STRATEGY PLAN  
EXTERNAL INTERSECTION  
LAYOUT PLAN

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|                             |          |          |          |          |          |          |          |         |         |         |         |         |
|-----------------------------|----------|----------|----------|----------|----------|----------|----------|---------|---------|---------|---------|---------|
| DEPTH TO<br>NATURAL SURFACE | -0.000   |          | -0.011   | -0.024   | -0.052   | -0.014   | -0.003   | -0.199  | -0.174  | -0.001  | -0.001  | -0.008  |
| DESIGN HEIGHT               | 1001.152 | 1001.094 | 1001.036 | 1000.978 | 1000.929 | 1000.914 | 1000.512 | 999.579 | 998.117 | 998.051 | 996.370 | 994.743 |
| NATURAL SURFACE             | 1001.152 | 1001.105 | 1001.012 | 1000.927 | 1000.915 | 1000.917 | 1000.711 | 999.753 | 998.119 | 998.052 | 996.378 |         |
| CHAINAGE                    | 0        | 25       | 50       | 75       | 96.22    | 100      | 125      | 150     | 175     | 175.957 | 200     | 223.282 |

**SCALE**

1:100      0      1      2      3      4m

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**PROPOSED SUBDIVISION  
241 WATERFALL WAY ARMIDALE NSW  
SERVICE STRATEGY**

## SERVICE STRATEGY PLAN EXTERNAL INTERSECTION SECTIONS

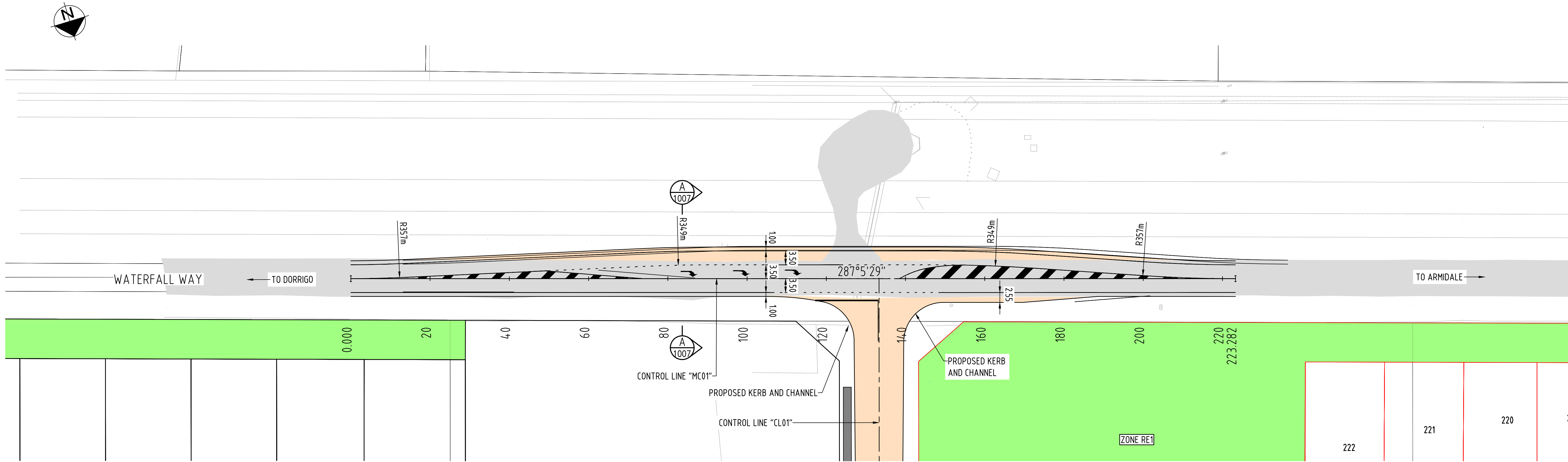
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# Appendix B: External Intersection Concept Design



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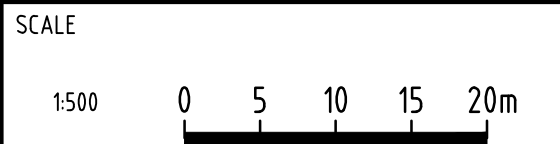
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SCALE 1:500

LEGEND:

- EXISTING PAVEMENT
- FORMATION WIDENING

**FOR APPROVAL**  
14 May 2026

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**PROPOSED SUBDIVISION**  
**241 WATERFALL WAY ARMIDALE NSW**  
**SERVICE STRATEGY**

SERVICE STRATEGY PLAN  
EXTERNAL INTERSECTION  
LAYOUT PLAN

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| DRAWING No:         | 25002-CO-1006 |
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# Appendix C: Traffic Impact Assessment



TRAFFIC IMPACT ASSESSMENT

# 241 Waterfall Way, Armidale

Job No. 25002 | 11<sup>th</sup> May 2026



## DOCUMENT CONTROL

### Document Identification

| Description    | Details                        |
|----------------|--------------------------------|
| Project Name   | 241 Waterfall Way, Armidale    |
| Project Number | 25002                          |
| Document Title | Traffic Impact Assessment      |
| Document ID    | 25002-REP-TIA-1                |
| Author         | Herman Joubert (RPEQ 25899)    |
| Client         | Knox Corp & Transcend Property |
| Client Contact | Jim Knox & Alistair Palmer     |

### Revision Details

| Revision No. | Date                           | Comments                            |
|--------------|--------------------------------|-------------------------------------|
| 0            | 28 <sup>th</sup> February 2025 | First Issue                         |
| 1            | 20 <sup>th</sup> of April 2026 | First Revision                      |
| 2            | 11 <sup>th</sup> May 2026      | Second Revision (Updated Lot Yield) |
|              |                                |                                     |
|              |                                |                                     |

### Document Approval

Reviewed By

Approved By

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Principal Traffic Engineer (RPEQ 25899)  
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# CONTENTS

|                                                           |           |
|-----------------------------------------------------------|-----------|
| <b>1 INTRODUCTION</b>                                     | <b>5</b>  |
| 1.1 Project Overview                                      | 5         |
| 1.2 Proposed Application                                  | 5         |
| 1.3 Scope and Context of Report                           | 6         |
| 1.4 Reference Guides                                      | 6         |
| 1.5 Data Sources                                          | 6         |
| <b>2 SIDRA MODELLING METHODOLOGY</b>                      | <b>7</b>  |
| 2.1 Delay Based Intersection Analysis                     | 7         |
| 2.2 Practical Degree of Saturation                        | 7         |
| 2.3 Queueing Ratio Analysis Criteria                      | 7         |
| <b>3 EXISTING CONDITIONS</b>                              | <b>9</b>  |
| 3.1 On-Site Uses                                          | 9         |
| 3.2 Site Surrounding Road Network                         | 9         |
| 3.3 Public Transport                                      | 9         |
| 3.3.1 Public Transport, Pedestrian and Bicycle Facilities | 9         |
| 3.4 Existing Intersection Performance                     | 12        |
| <b>4 DEVELOPMENT DETAILS</b>                              | <b>16</b> |
| 4.1 Development Layout                                    | 16        |
| 4.2 Vehicle Access                                        | 16        |
| 4.2.1 Design Speed                                        | 16        |
| 4.2.2 Access Spacing                                      | 16        |
| 4.2.3 Sight Distance                                      | 17        |
| 4.2.4 Access Capacity                                     | 18        |
| 4.2.5 Safety                                              | 18        |
| <b>5 TRAFFIC GENERATION</b>                               | <b>20</b> |
| <b>6 TRAFFIC IMPACT ASSESSMENT</b>                        | <b>21</b> |
| 6.1 External Intersection Impact Assessment               | 21        |
| 6.2 Intersection Impact Analysis Results                  | 22        |
| 6.3 Access Intersection Capacity Modelling Results        | 22        |
| <b>7 LAYOUT DESIGN REVIEW</b>                             | <b>24</b> |
| 7.1 Road Layout Design Conformance                        | 24        |
| 7.2 Lot Access                                            | 24        |
| 7.3 Servicing Requirements                                | 25        |
| <b>8 TRAFFIC ENGINEERING CONCLUSIONS</b>                  | <b>26</b> |
| 8.1 Conclusion                                            | 26        |
| 8.2 Recommendation                                        | 27        |
| <b>APPENDIX A: LAYOUT PLAN</b>                            | <b>28</b> |
| <b>APPENDIX B: TURN VOLUMES</b>                           | <b>29</b> |
| <b>APPENDIX C: SIDRA RESULTS</b>                          | <b>30</b> |



## TABLES

|                                                                                  |    |
|----------------------------------------------------------------------------------|----|
| Table 1.1: Proposed Development Extents                                          | 5  |
| Table 1.2: Legislative Summary                                                   | 6  |
| Table 2.1: LoS Definitions Based on Delay                                        | 7  |
| Table 2.2: Degree of Saturation                                                  | 7  |
| Table 2.3: Queue Storage Ratio                                                   | 8  |
| Table 3.1: Surrounding Road Network                                              | 9  |
| Table 3.2: Existing Conditions Year 2025 PM Peak Results                         | 13 |
| Table 3.3: Existing Conditions Year 2025 PM Peak Results                         | 14 |
| Table 4.1: SISD Results                                                          | 17 |
| Table 4.2: MGSD Analysis Results                                                 | 18 |
| Table 4.3: Crash Information                                                     | 19 |
| Table 5.1: Trip Generation, Distribution and Assignment                          | 20 |
| Table 6.1: Castledoyle Road / Waterfall Way Intersection Impact Analysis Results | 22 |
| Table 6.2: Access Intersection Capacity Analysis Results                         | 23 |
| Table 7.1: Internal Road Cross Section                                           | 24 |

## FIGURES

|                                                                |    |
|----------------------------------------------------------------|----|
| Figure 1.1: Project Locality                                   | 5  |
| Figure 3.1: Bus Stop Locations                                 | 10 |
| Figure 3.2: Existing Bus Route Map                             | 11 |
| Figure 3.3: Waterfall Way / Castledoyle Road Existing Geometry | 12 |
| Figure 4.1: Left Turn Overlap Avoidance Spacing                | 16 |
| Figure 4.2: MGSD Requirements                                  | 18 |
| Figure 4.3 Crash Analysis                                      | 19 |
| Figure 6.1: Proposed Access Intersection Configuration         | 22 |
| Figure 7.1 Standard Driveways 030-070A / 030-071               | 25 |



# 1 INTRODUCTION

## 1.1 Project Overview

Dykman Consulting was appointed in order to conduct a Traffic Impact Assessment (TIA) for a proposed 275 lot subdivision situated on Lot 1 DP1209469, Lot 8 DP240862 & Lots 69 & 70 DP755808. The proposed site is located on the R1 General Residential and R2 Low Density Residential zones of the Armidale Regional Council's (ARC) Development Control Plan (DCP), 2024. The site locality is provided in Figure 1.1.

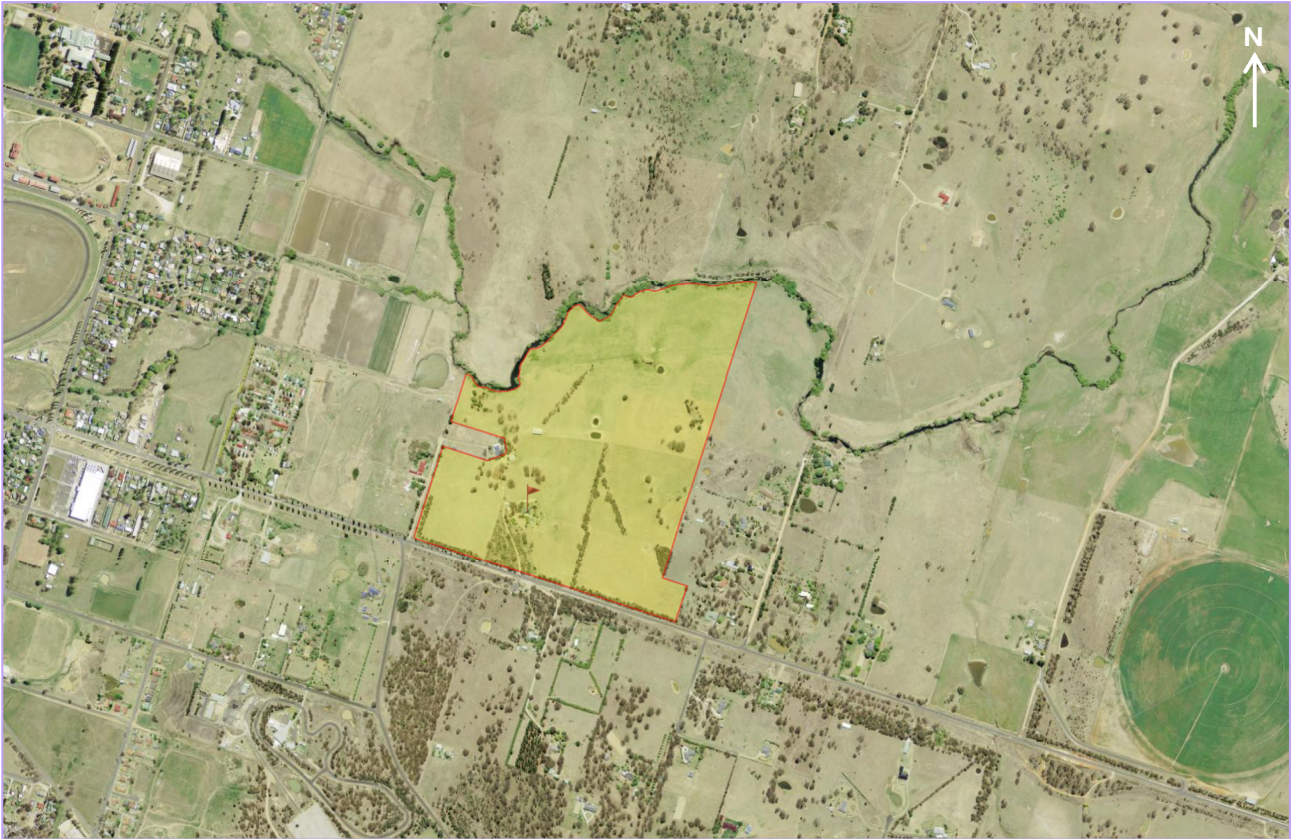


Figure 1.1: Project Locality

Access to the site is proposed to be obtained from a news access intersection from Waterfall Way with a formalised internal road network. Subsequent sections will discuss the access configuration in more detail.

## 1.2 Proposed Application

The proposed application is for a material change of use consisting of:

Table 1.1: Proposed Development Extents

| Parameter              | Extent                                                                              |
|------------------------|-------------------------------------------------------------------------------------|
| Lots:                  | 275                                                                                 |
| Internal Road Network: | 20m wide Local Collector<br>16m wide Local Access Streets<br>14m wide Access Places |

The following legislative summary items applicable to the proposed reconfiguration and TIA are indicated in Table 1.2.



Table 1.2: Legislative Summary

| Legislative Summary        |                                                          |
|----------------------------|----------------------------------------------------------|
| Local Government Authority | Armidale Regional Council                                |
| Planning Scheme Zone/s     | C2, C3, R1, R2, and RE1                                  |
| Applicable Planning Scheme | Armidale Regional Council Development Control Plan, 2024 |

### 1.3 Scope and Context of Report

This report investigates the transport aspects associated with the proposed development. The scope of the transport aspects investigated includes:

- Broadly identify the existing transport infrastructure which is of relevance to the Project.
- Broadly define the proposed road upgrade works to address infrastructure requirements.
- Assess the current, background operation of the surrounding transport infrastructure.
- Estimate traffic generation associated with the Project and the distribution of this development traffic on the identified road network.
- Assess the potential traffic impact on the surrounding transport infrastructure.
- Identify potential mitigation and management strategies to be implemented to offset the traffic impact of the proposed Project (if required).

The adopted methodology centres on establishing a background, or “without Project” traffic scenario for the identified transport routes and comparing this with a scenario including the Project-generated traffic, i.e. the “with Project” or post development scenario. This process allows for the assessment of the traffic impacts of the Project in terms of road safety, access requirements, intersection operations, road link capacity and other transport infrastructure. Following this, potential mitigation and/or management measures will be formulated, if required, to address the potential traffic impacts caused by the proposed development.

### 1.4 Reference Guides

The following documents have been evaluated in order to formulate the traffic advice within this assessment:

- AS/NZS 2890.1 – 2004 Parking facilities Part 1: Off-street car parking
- AS/NZS 2890.2 – 2018: Off-street commercial vehicle facilities
- RMS Guide to Traffic Impact Assessment Manual, 2024
- Plans of the proposed development provided in **Appendix A** to this report
- Armidale Regional Council Development Control Plan, 2024

### 1.5 Data Sources

The following sources of data have been used for the purpose of this assessment:

- Traffic Count Data as obtained from 360 Surveys – refer **Appendix B**. An industry standard 3% traffic growth rate was adopted to project future year volumes from baseline volumes.
- Intersection turning movement counts, undertaken on 30 May 2024 for the following intersection:
  - Waterfall Way / Tombs Road.
- The raw traffic data from this intersection count is included for reference as **Appendix B**.
- RMS Crash Map Viewer (<https://www.transport.nsw.gov.au/roadsafety/statistics/interactive-crash-statistics/lga-view-crashes-map>) - crash data in vicinity of the site.



## 2 SIDRA MODELLING METHODOLOGY

### 2.1 Delay Based Intersection Analysis

An increase in vehicles through an intersection as a result of the development or future growth will likely increase traffic delays. Increases in delays have an economic and social impact on the community through increased travel times, driver impatience (leading to possible crashes) and the associated economic cost of these delays to private and commercial / heavy vehicle trips. The following input types are required as a basis to evaluate existing intersection performance:

- Existing intersection geometry and lane configuration data
- Vehicle movement data
- Peak hour traffic volume data

The delay-based analyses criteria adopted for the purposes of this study are provided in Table 2.1. The table indicates the LoS per intersection control type associated with a respective delay per vehicle measured in seconds.

*Table 2.1: LoS Definitions Based on Delay*

| Level of Service | Control delay per Vehicle in Seconds (d) |                |                |
|------------------|------------------------------------------|----------------|----------------|
|                  | Signals                                  | Roundabout     | Sign Control   |
| A                | $d \leq 10$                              | $d \leq 10$    | $d \leq 10$    |
| B                | $10 d \leq 20$                           | $10 d \leq 20$ | $10 d \leq 15$ |
| C                | $20 d \leq 35$                           | $20 d \leq 35$ | $15 d \leq 25$ |
| D                | $35 d \leq 55$                           | $35 d \leq 50$ | $25 d \leq 35$ |
| E                | $55 d \leq 80$                           | $50 d \leq 70$ | $35 d \leq 50$ |
| F                | $d < 80$                                 | $d < 70$       | $d < 50$       |

Source: RMS Modelling Guidelines 2013

Intersection Level of Service (LoS) was assessed using the NSW LoS criteria as provided in Table 2.1 above. For the purpose of this assessment a maximum threshold of LoS D for the whole intersection was adopted. Therefore, an intersection option found to operate at LoS E or F is deemed unacceptable from a traffic performance perspective, as defined in the Austroads Guide to Traffic Management: Part 3 Traffic Studies and Analysis (2017).

### 2.2 Practical Degree of Saturation

The Degree of Saturation (DoS) is defined as the ratio of demand (arrival) flow to capacity, which is equivalent to volume / capacity ratio, or V/C ratio. A DoS above 1.0 represents oversaturated conditions where the demand flows exceeds available capacity. The DoS criteria adopted for this assessment is provided in Any intersection operating at higher than the maximum DoS is considered unacceptable for operational performance.

*Table 2.2: Degree of Saturation*

| Intersection type | Maximum Practical degree of saturation |
|-------------------|----------------------------------------|
| Signals           | 0.900                                  |
| Roundabouts       | 0.850                                  |
| Sign-controlled   | 0.800                                  |
| Continuous lanes  | 0.980                                  |

Source: RMS Modelling Guidelines 2013

### 2.3 Queueing Ratio Analysis Criteria

Vehicle queueing analysis results were evaluated in parallel to vehicle delay (LoS). Queueing analyses results depict the queue storage ratio (percentile of vehicles queueing in relation to the lane storage capacity in meters). Queueing analysis outputs contribute to safety impacts, where extensive queueing

beyond allowable storage capacity contributes to a higher probability for the occurrence of an accident. The queue storage ratio analyses criteria are indicated in Table 2.3.

*Table 2.3: Queue Storage Ratio*

| Control delay per Vehicle in Seconds (d) |                                        |            |           |
|------------------------------------------|----------------------------------------|------------|-----------|
| Level of Service                         | Queue Storage Ratio – Percentile (Rq%) | Colour     | Rating    |
| A                                        | $Rq\% \leq 6$                          | Green      | Excellent |
| B                                        | $0.6 < Rq\% \leq 0.7$                  | Light Blue | Very Good |
| C                                        | $0.7 < Rq\% \leq 0.8$                  | Dark Blue  | Good      |
| D                                        | $0.8 < Rq\% \leq 0.9$                  | Magenta    | Fair      |
| E                                        | $0.9 < Rq\% \leq 0.1$                  | Orange     | Poor      |
| F                                        | $1.0 < Rq\%$                           | Red        | Very Poor |

Source: SIDRA Intersection 8 User Guide



## 3 EXISTING CONDITIONS

### 3.1 On-Site Uses

The site currently consists of a vacant site which will be developed as part of this application.

### 3.2 Site Surrounding Road Network

Descriptive details regarding the road network surrounding the proposed site are provided in Table 3.1. The table provides information regarding existing geometrical conditions of the road network and associated road links.

*Table 3.1: Surrounding Road Network*

| Road Name       | Road Class        | Number of Lanes per Direction | Carriageway Single / Dual | Lane Width (m) | Posted Speed (km/h) |
|-----------------|-------------------|-------------------------------|---------------------------|----------------|---------------------|
| Waterfall Way   | Major Distributor | 1                             | S                         | 3.5            | 80                  |
| Tombs Road      | Local Collector   | 1                             | S                         | Unformed       | 50                  |
| Castledoye Road | Minor Distributor | 1                             | S                         | 3              | 80                  |

There are no classified stock routes in close proximity of the site or proposed access location which would have an impact on the proposed development.

#### Tombs Road

Tombs Road is currently an unformed gravel road with a classification of a Local Collector Road. The formation of the road allows for an assumed speed of 50km/h. The northern Tombs Road access onto Waterfall Way is proposed to be closed off as part of this application, with existing traffic heading to and from the north of Tombs Road to divert via the new internal road network and distribute externally via the new access intersection. The road is a council road and falls under the ownership of Armidale Regional Council.

#### Castledoye Road

The road can be classified as a Minor Distributor with a posted speed of 80km/h. The road has a paved width of approximately 6m without any formal roadside shoulders. Castledoye Road intersects with Waterfall Way as a priority-controlled intersection with formal signage and line marking. The road is a council road and falls under the ownership of Armidale Regional Council.

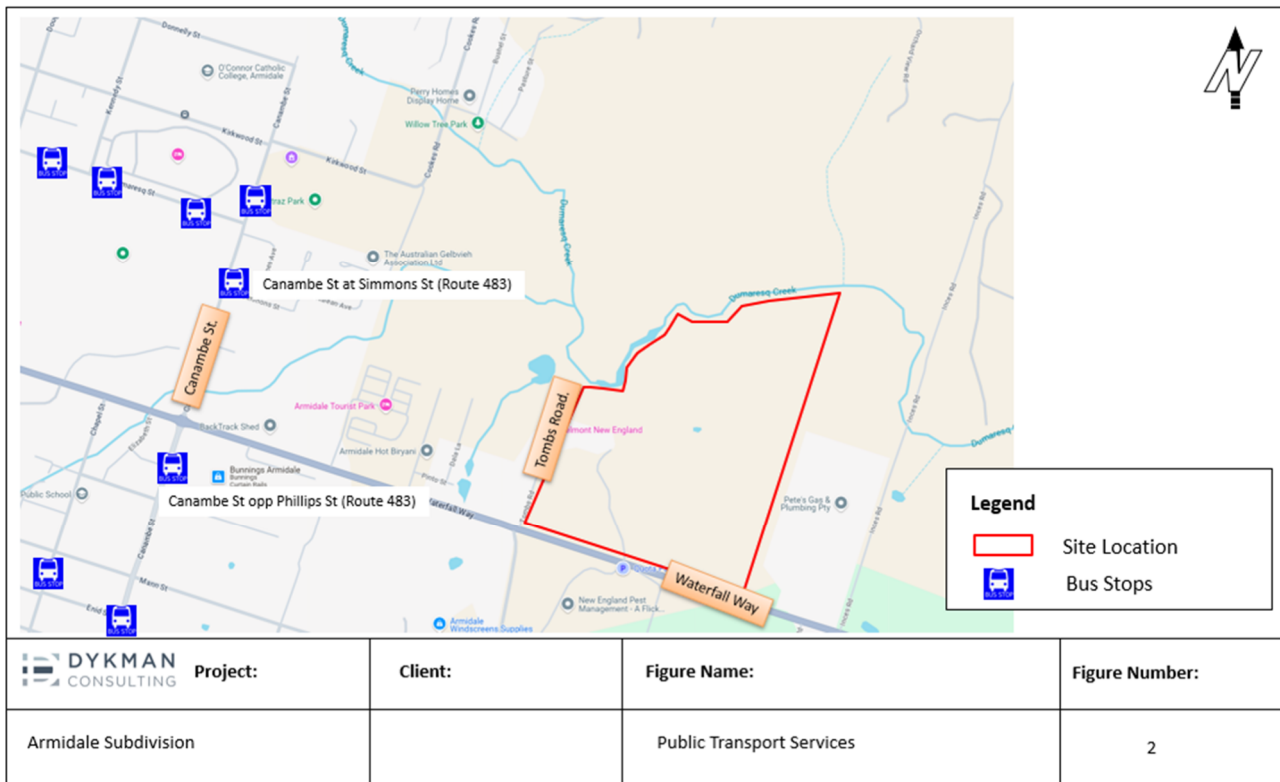
#### Waterfall Way

This is considered to be a Major Distributor with a posted speed of 80km/h and a paved road width of approximately 9m. Roadside shoulders of about 1m width occurs along both sides of the carriageway. The road is classified as a state road and falls under the ownership of RMS.

### 3.3 Public Transport

#### 3.3.1 Public Transport, Pedestrian and Bicycle Facilities

The closest bus stop to the proposed site is located approximately 1.4km from the site which services bus route 483. The closest bus stop locations are illustrated in Figure 3.1.



*Figure 3.1: Bus Stop Locations*

Given the dispersed extent of available bus stops and significant walking distance to these stops, allowance is made for in the proposed layout to accommodate a bus stop. This would enhance accessibility and connectivity to these bus routes servicing the CBD and surrounding neighbourhoods. The existing bus routes which should be allowed for in the layout design would include Route 483 as illustrated on the existing route map in Figure 3.2.



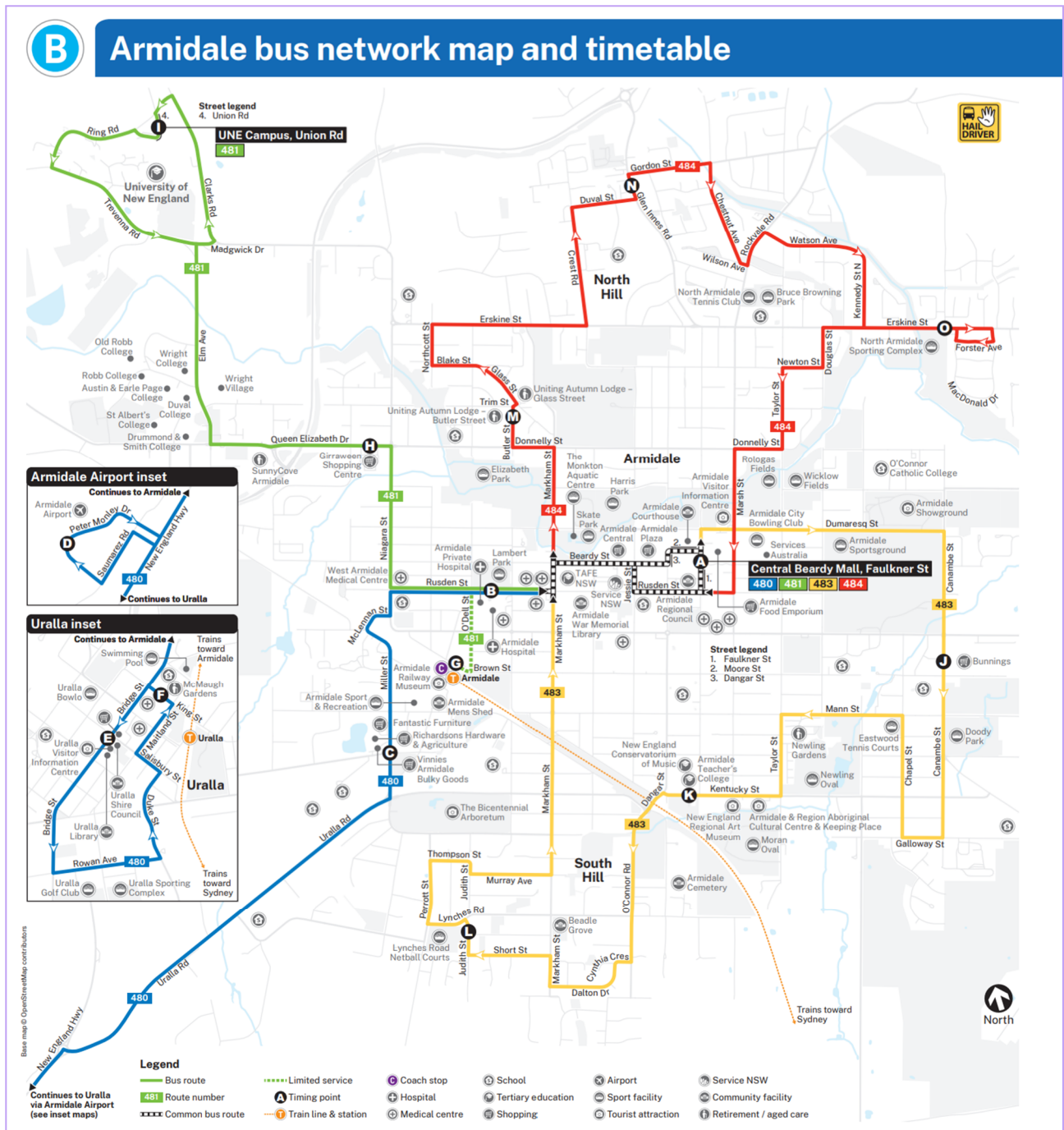


Figure 3.2: Existing Bus Route Map

### 3.4 Existing Intersection Performance

The key intersection expected to be impacted as a result of the development was considered to be the Waterfall Way / Castledoye Road intersection. Given the central areas of employment, education, shopping and medical necessities occurring within Armidale, the majority of development trips would traverse through this intersection before cascading through the network. The existing condition modelling evaluated the AM and PM peak hour traffic volumes traversing through the intersection based on the existing geometry and control. The existing geometry and control measures of the intersection are illustrated in Figure 3.3.

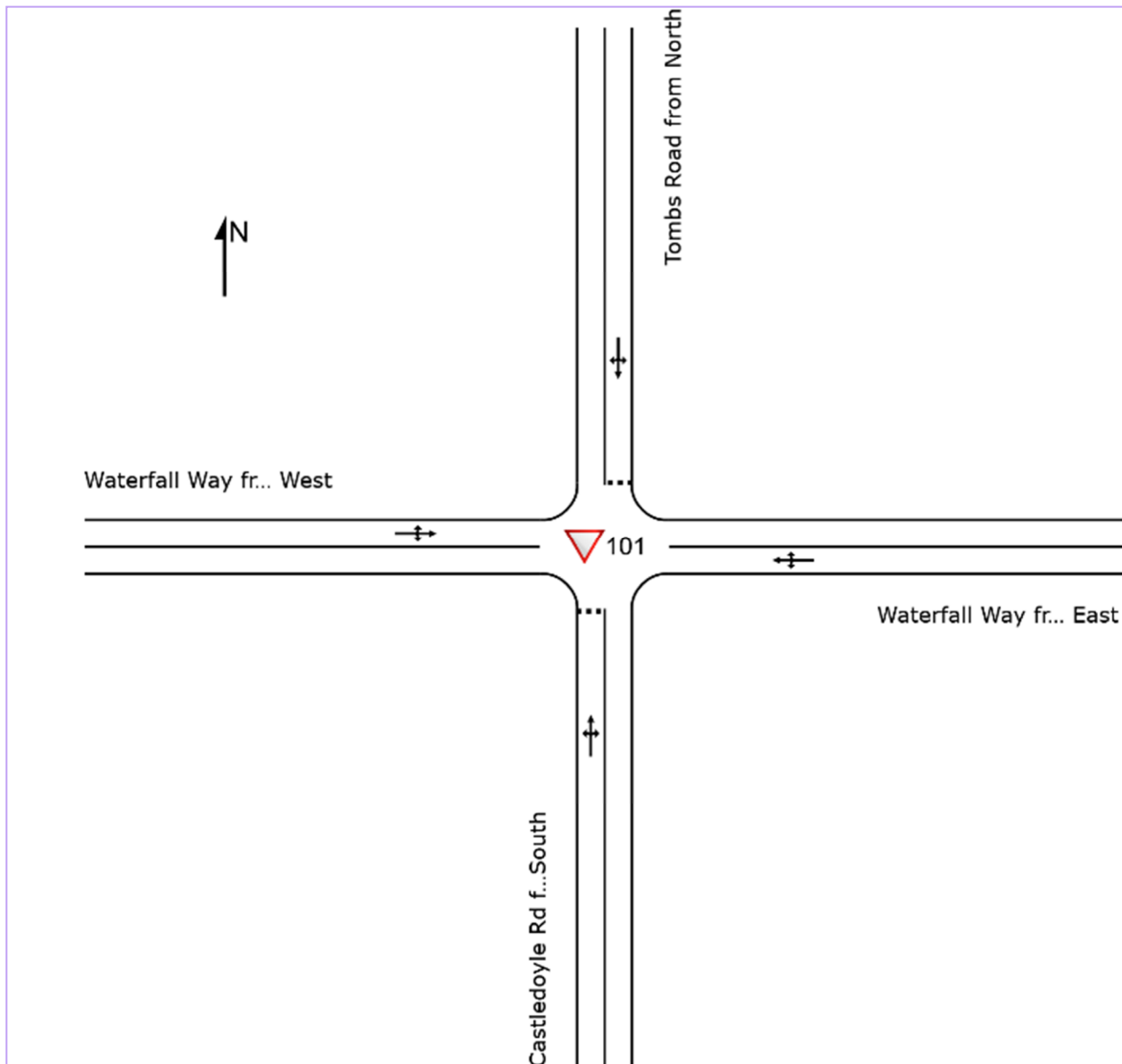


Figure 3.3: Waterfall Way / Castledoye Road Existing Geometry

The analysis results of the existing operating conditions of the intersection are provided in Table 3.2 and Table 3.3 for both peak hours.



Table 3.2: Existing Conditions Year 2025 PM Peak Results

| Vehicle Movement Performance Year 2025 AM Peak                                                                                  |      |           |              |      |               |      |           |             |                  |                   |       |           |                |                     |             |
|---------------------------------------------------------------------------------------------------------------------------------|------|-----------|--------------|------|---------------|------|-----------|-------------|------------------|-------------------|-------|-----------|----------------|---------------------|-------------|
| Mov ID                                                                                                                          | Turn | Mov Class | Demand Flows |      | Arrival Flows |      | Deg. Satn | Aver. Delay | Level of Service | 95% Back Of Queue |       | Prop. Que | Eff. Stop Rate | Aver. No. of Cycles | Aver. Speed |
|                                                                                                                                 |      |           | [Total]      | HV]  | [Total]       | HV]  |           |             |                  | [Veh.             | Dist] |           |                |                     |             |
|                                                                                                                                 |      |           | veh/h        | %    | veh/h         | %    | v/c       | sec         |                  | veh               | m     |           |                |                     | km/h        |
| South: Castledoye Rd from South                                                                                                 |      |           |              |      |               |      |           |             |                  |                   |       |           |                |                     |             |
| 1                                                                                                                               | L2   | All MCs   | 82           | 42.3 | 82            | 42.3 | 0.093     | 7.3         | LOS A            | 0.4               | 3.4   | 0.38      | 0.61           | 0.38                | 50.1        |
| 2                                                                                                                               | T1   | All MCs   | 1            | 0.0  | 1             | 0.0  | 0.093     | 6.7         | LOS A            | 0.4               | 3.4   | 0.38      | 0.61           | 0.38                | 52.2        |
| 3                                                                                                                               | R2   | All MCs   | 5            | 40.0 | 5             | 40.0 | 0.093     | 11.1        | LOS B            | 0.4               | 3.4   | 0.38      | 0.61           | 0.38                | 49.8        |
| Approach                                                                                                                        |      |           | 88           | 41.7 | 88            | 41.7 | 0.093     | 7.5         | LOS A            | 0.4               | 3.4   | 0.38      | 0.61           | 0.38                | 50.1        |
| East: Waterfall Way from East                                                                                                   |      |           |              |      |               |      |           |             |                  |                   |       |           |                |                     |             |
| 4                                                                                                                               | L2   | All MCs   | 8            | 50.0 | 8             | 50.0 | 0.138     | 6.1         | LOS A            | 0.0               | 0.1   | 0.00      | 0.03           | 0.00                | 54.9        |
| 5                                                                                                                               | T1   | All MCs   | 202          | 41.1 | 202           | 41.1 | 0.138     | 0.0         | LOS A            | 0.0               | 0.1   | 0.00      | 0.03           | 0.00                | 59.8        |
| 6                                                                                                                               | R2   | All MCs   | 1            | 0.0  | 1             | 0.0  | 0.138     | 5.7         | LOS A            | 0.0               | 0.1   | 0.00      | 0.03           | 0.00                | 56.9        |
| Approach                                                                                                                        |      |           | 212          | 41.3 | 212           | 41.3 | 0.138     | 0.3         | NA               | 0.0               | 0.1   | 0.00      | 0.03           | 0.00                | 59.5        |
| North: Tombs Road from North                                                                                                    |      |           |              |      |               |      |           |             |                  |                   |       |           |                |                     |             |
| 7                                                                                                                               | L2   | All MCs   | 1            | 0.0  | 1             | 0.0  | 0.017     | 6.1         | LOS A            | 0.1               | 0.5   | 0.53      | 0.68           | 0.53                | 49.2        |
| 8                                                                                                                               | T1   | All MCs   | 1            | 0.0  | 1             | 0.0  | 0.017     | 6.4         | LOS A            | 0.1               | 0.5   | 0.53      | 0.68           | 0.53                | 49.6        |
| 9                                                                                                                               | R2   | All MCs   | 5            | 60.0 | 5             | 60.0 | 0.017     | 13.4        | LOS B            | 0.1               | 0.5   | 0.53      | 0.68           | 0.53                | 46.7        |
| Approach                                                                                                                        |      |           | 7            | 42.9 | 7             | 42.9 | 0.017     | 11.3        | LOS B            | 0.1               | 0.5   | 0.53      | 0.68           | 0.53                | 47.5        |
| West: Waterfall Way from West                                                                                                   |      |           |              |      |               |      |           |             |                  |                   |       |           |                |                     |             |
| 10                                                                                                                              | L2   | All MCs   | 5            | 80.0 | 5             | 80.0 | 0.158     | 6.5         | LOS A            | 0.5               | 5.3   | 0.22      | 0.28           | 0.22                | 51.9        |
| 11                                                                                                                              | T1   | All MCs   | 146          | 66.2 | 146           | 66.2 | 0.158     | 0.0         | LOS A            | 0.5               | 5.3   | 0.22      | 0.28           | 0.22                | 57.7        |
| 12                                                                                                                              | R2   | All MCs   | 44           | 64.3 | 44            | 64.3 | 0.158     | 10.2        | LOS B            | 0.5               | 5.3   | 0.22      | 0.28           | 0.22                | 52.1        |
| Approach                                                                                                                        |      |           | 196          | 66.1 | 196           | 66.1 | 0.158     | 2.5         | NA               | 0.5               | 5.3   | 0.22      | 0.28           | 0.22                | 56.2        |
| All Vehicles                                                                                                                    |      |           | 503          | 51.0 | 503           | 51.0 | 0.158     | 2.6         | NA               | 0.5               | 5.3   | 0.16      | 0.24           | 0.16                | 56.2        |
| Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options tab). |      |           |              |      |               |      |           |             |                  |                   |       |           |                |                     |             |

Table 3.3: Existing Conditions Year 2025 PM Peak Results

| Vehicle Movement Performance Year 2025 PM Peak                                                                                  |      |           |              |       |               |       |           |  |             |                  |                   |       |           |                |                     |             |
|---------------------------------------------------------------------------------------------------------------------------------|------|-----------|--------------|-------|---------------|-------|-----------|--|-------------|------------------|-------------------|-------|-----------|----------------|---------------------|-------------|
| Mov ID                                                                                                                          | Turn | Mov Class | Demand Flows |       | Arrival Flows |       | Deg. Satn |  | Aver. Delay | Level of Service | 95% Back Of Queue |       | Prop. Que | Eff. Stop Rate | Aver. No. of Cycles | Aver. Speed |
|                                                                                                                                 |      |           | [Total]      | HV]   | [Total]       | HV]   |           |  |             |                  | [Veh.             | Dist] |           |                |                     |             |
|                                                                                                                                 |      |           | veh/h        | %     | veh/h         | %     | v/c       |  | sec         |                  | veh               | m     |           |                |                     | km/h        |
| South: Castledoyle Rd from South                                                                                                |      |           |              |       |               |       |           |  |             |                  |                   |       |           |                |                     |             |
| 1                                                                                                                               | L2   | All MCs   | 2            | 50.0  | 2             | 50.0  | 0.003     |  | 6.2         | LOS A            | 0.0               | 0.1   | 0.11      | 0.53           | 0.11                | 50.9        |
| 2                                                                                                                               | T1   | All MCs   | 1            | 0.0   | 1             | 0.0   | 0.003     |  | 4.3         | LOS A            | 0.0               | 0.1   | 0.11      | 0.53           | 0.11                | 53.4        |
| 3                                                                                                                               | R2   | All MCs   | 1            | 0.0   | 1             | 0.0   | 0.003     |  | 5.7         | LOS A            | 0.0               | 0.1   | 0.11      | 0.53           | 0.11                | 52.7        |
| Approach                                                                                                                        |      |           | 4            | 25.0  | 4             | 25.0  | 0.003     |  | 5.6         | LOS A            | 0.0               | 0.1   | 0.11      | 0.53           | 0.11                | 51.9        |
| East: Waterfall Way from East                                                                                                   |      |           |              |       |               |       |           |  |             |                  |                   |       |           |                |                     |             |
| 4                                                                                                                               | L2   | All MCs   | 1            | 0.0   | 1             | 0.0   | 0.016     |  | 5.5         | LOS A            | 0.0               | 0.1   | 0.02      | 0.05           | 0.02                | 56.7        |
| 5                                                                                                                               | T1   | All MCs   | 22           | 38.1  | 22            | 38.1  | 0.016     |  | 0.0         | LOS A            | 0.0               | 0.1   | 0.02      | 0.05           | 0.02                | 59.1        |
| 6                                                                                                                               | R2   | All MCs   | 1            | 100.0 | 1             | 100.0 | 0.016     |  | 6.8         | LOS A            | 0.0               | 0.1   | 0.02      | 0.05           | 0.02                | 51.6        |
| Approach                                                                                                                        |      |           | 24           | 39.1  | 24            | 39.1  | 0.016     |  | 0.5         | NA               | 0.0               | 0.1   | 0.02      | 0.05           | 0.02                | 58.6        |
| North: Tombs Road from North                                                                                                    |      |           |              |       |               |       |           |  |             |                  |                   |       |           |                |                     |             |
| 7                                                                                                                               | L2   | All MCs   | 1            | 0.0   | 1             | 0.0   | 0.002     |  | 5.6         | LOS A            | 0.0               | 0.1   | 0.11      | 0.53           | 0.11                | 52.9        |
| 8                                                                                                                               | T1   | All MCs   | 1            | 0.0   | 1             | 0.0   | 0.002     |  | 4.3         | LOS A            | 0.0               | 0.1   | 0.11      | 0.53           | 0.11                | 53.4        |
| 9                                                                                                                               | R2   | All MCs   | 1            | 0.0   | 1             | 0.0   | 0.002     |  | 5.7         | LOS A            | 0.0               | 0.1   | 0.11      | 0.53           | 0.11                | 52.7        |
| Approach                                                                                                                        |      |           | 3            | 0.0   | 3             | 0.0   | 0.002     |  | 5.2         | LOS A            | 0.0               | 0.1   | 0.11      | 0.53           | 0.11                | 53.0        |
| West: Waterfall Way from West                                                                                                   |      |           |              |       |               |       |           |  |             |                  |                   |       |           |                |                     |             |
| 10                                                                                                                              | L2   | All MCs   | 1            | 100.0 | 1             | 100.0 | 0.019     |  | 6.7         | LOS A            | 0.0               | 0.3   | 0.03      | 0.11           | 0.03                | 51.8        |
| 11                                                                                                                              | T1   | All MCs   | 23           | 40.9  | 23            | 40.9  | 0.019     |  | 0.0         | LOS A            | 0.0               | 0.3   | 0.03      | 0.11           | 0.03                | 58.6        |
| 12                                                                                                                              | R2   | All MCs   | 4            | 25.0  | 4             | 25.0  | 0.019     |  | 5.8         | LOS A            | 0.0               | 0.3   | 0.03      | 0.11           | 0.03                | 54.6        |
| Approach                                                                                                                        |      |           | 28           | 40.7  | 28            | 40.7  | 0.019     |  | 1.1         | NA               | 0.0               | 0.3   | 0.03      | 0.11           | 0.03                | 57.7        |
| All Vehicles                                                                                                                    |      |           | 60           | 36.8  | 60            | 36.8  | 0.019     |  | 1.4         | NA               | 0.0               | 0.3   | 0.04      | 0.14           | 0.04                | 57.3        |
| Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options tab). |      |           |              |       |               |       |           |  |             |                  |                   |       |           |                |                     |             |



The analysis results indicate that minimal turn movements occur at the intersection. The existing operational performance constitutes LOS A during the PM peak and worst movement LOS B during the AM peak.



## 4 DEVELOPMENT DETAILS

### 4.1 Development Layout

The proposed site layout plan is attached as **Appendix A**. This includes a proposed subdivision for 275 Lots.

### 4.2 Vehicle Access

It is proposed that vehicle access be obtained from a new formal intersection off Waterfall Way. An assessment has been carried out to determine the viability of the proposed access position from a traffic engineering perspective. From an engineering perspective the location of an access should be spaced at sufficient distances to allow for safe and effective driver reaction times and deceleration distances, whilst not impacting on operational performance / capacity of a road. Analysis was carried out to location viability of the proposed access intersection, whilst not compromising the safety of road network. Intersection and access requirements were determined based on the factors as indicated in the Austroads Guide to Road Design Part 4A.

- Access spacing
- Intersection sight distance
- Ingress and egress capacity
- Safety and risk assessment

#### 4.2.1 Design Speed

The existing posted speed along Waterfall Way is 80km/h. The posted speed along the frontage of the site will be reduced to 50km/h and as such a design speed of 60km/h (posted + 10km/h) was assumed.

#### 4.2.2 Access Spacing

##### Left Turn Collision Avoidance

An overlap occurs when the through driver must monitor more than one access at a time. Providing at least the stopping sight distance between access points will allow a through vehicle to avoid a collision with an entering vehicle. However, this is too conservative as the entering vehicle will be accelerating away.

Austroads uses deceleration rates from 2.5 m/sec<sup>2</sup> (comfortable) to 3.5 m/sec<sup>2</sup> (maximum) and implied acceleration rates for developing acceleration lanes from about 1.0 m/sec<sup>2</sup> to 1.4 m/sec<sup>2</sup> (Section 5 of AGRD Part 4A). By applying the standard equations of motion and assuming constant acceleration and deceleration rates, the values for 'd' and 'a' can be calculated, the value of 'd' being the minimum spacing to avoid the collision. The required spacing for left turn overlap avoidance is indicated in Figure 4.1.

| Speed<br>(km/h) | $d + a$ (m)                              |                                          | $a$ (m)                                  |                                          | Spacing<br>(desirable)<br>$A - C$<br>(m) | Spacing<br>(minimum)<br>$B - D$<br>(m) | SSD<br>(m) |
|-----------------|------------------------------------------|------------------------------------------|------------------------------------------|------------------------------------------|------------------------------------------|----------------------------------------|------------|
|                 | A<br>Decel. rate<br>2.5 m/s <sup>2</sup> | B<br>Decel. rate<br>3.5 m/s <sup>2</sup> | C<br>Accel. rate<br>1.0 m/s <sup>2</sup> | D<br>Accel. rate<br>1.5 m/s <sup>2</sup> |                                          |                                        |            |
| 50              | 31                                       | 26                                       | 5                                        | 7                                        | 30 (26)                                  | 20 (19)                                | 45         |
| 60              | 45                                       | 38                                       | 7                                        | 10                                       | 40 (38)                                  | 30 (28)                                | 65         |
| 70              | 61                                       | 51                                       | 9                                        | 14                                       | 55 (52)                                  | 40 (37)                                | 85         |
| 80              | 79                                       | 67                                       | 12                                       | 18                                       | 70 (67)                                  | 50 (49)                                | 105        |
| 90              | 100                                      | 85                                       | 15                                       | 23                                       | 85 (85)                                  | 65 (62)                                | 130        |
| 100             | 124                                      | 105                                      | 19                                       | 29                                       | 105 (105)                                | 80 (76)                                | 170        |

Figure 4.1: Left Turn Overlap Avoidance Spacing



Based on the road design speed fronting the site of 60 km/h, a spacing distance of 40m as desirable is required for access on the same side. The nearest intersection on the same side (Inces Road) is located approximately 618m from the proposed access intersection. The spacing is thus fully compliant to allow for safe left turn overlaps.

### 4.2.3 Sight Distance

An access sight distance evaluation was undertaken for the proposed site accesses egress in order to evaluate whether safe sight distances would be achieved, given the proposed location. The sight distance assessment was conducted for:

- Safe Intersection Sight Distance (SISD)
- Minimum Gap Sight Distance (MGSD)

#### Safe Intersection Sight Distance (SISD)

SISD is derived from two components:

1. the distance travelled during the total reaction time
2. the distance travelled during the braking time from the design speed to a stop and their relationship is shown below.

The access required SSD was determined based on the following equation:

$$SISD = \frac{RT \times V}{3.6} + \frac{V^2}{254 (d + 0.01 \times a)}$$

Where:

SSD = stopping sight distance (m)

RT = reaction time (sec) – refer to AGRD Part 3 (Austroads 2016b) for a guide to values

V = operating (85th percentile) speed (km/h)

d = coefficient of deceleration – refer to Table 3.3 and AGRD Part 3 for a guide to values

a = longitudinal grade in % (in direction of travel: positive for uphill grade, negative for downhill grade)

It was found that the proposed site access is located along a gently undulating gradient on Gwydir Highway with straight horizontal alignment for both directions of travel. Table 4.1 provides the assessment results.

*Table 4.1: SISD Results*

| Parameter            | Direction of Travel |            |
|----------------------|---------------------|------------|
|                      | To West             | To East    |
| Ot                   | 3                   | 3          |
| Rt                   | 1.5                 | 1.5        |
| Dt                   | 4.5                 | 4.5        |
| V                    | 60                  | 60         |
| d                    | 0.46                | 0.46       |
| a                    | 4.5                 | 2          |
| <b>SISD Required</b> | <b>103</b>          | <b>105</b> |

The minimum required SISD would need to be 103m to the west and 105m to the east. It was found that the available sight distance would be sufficient to meet the minimum required SISD requirements. The available sight distance would be >215m for both directions of travel. This is considered sufficient.

## Minimum Gap Sight Distance

The MGSD was calculated based on the observation angle to approaching traffic and critical gap acceptance values adopted by drivers undertaking typical manoeuvres at the intersections. The MGSD is defined by the Guide to Road Design – Part 4A: Unsignalised and Signalised Intersections (Austroads, 2010) as the minimum distance in meters required for the driver of a vehicle entering the major flow to see a vehicle in the conflicting streams, in order to safely commence the desired manoeuvre. The MGSD varies depending on vehicle approach speeds and critical gap acceptance times, as shown in Figure 4.2.

| Critical gap acceptance time (ta) (secs) | 85th percentile speed of approaching vehicle (km/h) |    |    |     |     |     |     |     |     |     |     |
|------------------------------------------|-----------------------------------------------------|----|----|-----|-----|-----|-----|-----|-----|-----|-----|
|                                          | 10                                                  | 20 | 30 | 40  | 50  | 60  | 70  | 80  | 90  | 100 | 110 |
| 4                                        | 11                                                  | 22 | 33 | 44  | 55  | 67  | 78  | 89  | 100 | 111 | 122 |
| 5                                        | 14                                                  | 28 | 42 | 55  | 69  | 83  | 97  | 111 | 125 | 139 | 153 |
| 6                                        | 17                                                  | 33 | 50 | 67  | 83  | 100 | 117 | 133 | 150 | 167 | 183 |
| 7                                        | 19                                                  | 39 | 58 | 78  | 97  | 117 | 136 | 155 | 175 | 194 | 214 |
| 8                                        | 22                                                  | 44 | 67 | 89  | 111 | 133 | 155 | 178 | 200 | 222 | 244 |
| 9                                        | 25                                                  | 50 | 75 | 100 | 125 | 150 | 175 | 200 | 225 | 250 | 275 |
| 10                                       | 28                                                  | 56 | 83 | 111 | 139 | 167 | 194 | 222 | 250 | 278 | 305 |

Figure 4.2: MGSD Requirements

Based on the evaluation the following MGSD is required for the access:

- Left and right turn movement from minor road (Access) = 83m
- Right turn from major road = 67m

The MGSD analysis results are provided in Table 4.2.

Table 4.2: MGSD Analysis Results

| Movement                                              | MGSD Required | Sight Distance Achieved (Y/N) |
|-------------------------------------------------------|---------------|-------------------------------|
| Left and right turn movement from minor road (Access) | 83m           | Y                             |
| Right turn from major road (Waterfall Way)            | 67m           | Y                             |

It was found that sufficient MGSD is available to meet the minimum requirements. The sight distance analysis indicating a 215m sight line from the access in line of travel path is available. Sight distances are considered acceptable.

### 4.2.4 Access Capacity

It is proposed that the access allow for dedicated right and left turning lanes as per the access intersection design. This would allow for safe vehicle storage and allow for unopposed vehicle passing of the through lane movements to enhance operational efficiency. A SIDRA modelling exercise was carried out to determine the operational performance of the access at future year 2038. The analysis results are detailed in Section 4 of this report. However, it was found that based on the access geometry proposed, sufficient capacity would prevail.

### 4.2.5 Safety

Readily available crash data was obtained from the TfNSW Crash Map data portal. The data indicates that only two crashes occurred in close proximity to the site in the last 5 years.





Figure 4.3 Crash Analysis

Table 4.3: Crash Information

| Year | Degree of Crash      | RUM Code | Description      | Number Injured |
|------|----------------------|----------|------------------|----------------|
| 2019 | Moderate Injury      | 71       | Off road on left | 2              |
| 2022 | No injury (tow away) | 67       | Struck animal    | 0              |

The crash analysis indicate that minimal crashes have occurred in the last 5 years in close proximity the site. The development and associated access is thus not expected to have an impact on such existing crash trends.

In summary it was found that the proposed access intersection and development as proposed would not adversely affect the safety, efficiency and ongoing operation of the road and that the proposed intersection geometry as proposed would be functional.

## 5 TRAFFIC GENERATION

The traffic generation of the proposed development has been forecast with reference to the Roads & Maritime Service (RMS) Guide to Traffic Generating Developments (GTGD) October 2002 and August 2013 Technical Direction. For low density residential dwellings, the GTGD October 2002 provides one set of generation rates, whereas the August 2013 Technical Direction categorises the generation rates into two sets namely Sydney (CBD) and regional areas. With consideration of the location of the proposed development, it has been considered reasonable to adopt the generation rates outlined in the GTGD October 2002, which seem to represent an approximate middle range between the Sydney (CBD) and regional rates in the August 2013 edition. These are industry standard trip generation rates applicable for this proposed development.

*Table 5.1: Trip Generation, Distribution and Assignment*

| Development Traffic Calculations             |   |       |                                              |   |       |
|----------------------------------------------|---|-------|----------------------------------------------|---|-------|
| Proposed No. Lots                            | = | 275   |                                              |   |       |
| Traffic Generation                           |   |       |                                              |   |       |
| AM Peak Generation Rate                      | = | 0.85  | trips per lot                                |   |       |
| AM Peak Dev Traffic Volume                   | = | 234   | -                                            |   |       |
| PM Peak Generation Rate                      | = | 0.85  | trips per lot                                |   |       |
| PM Peak Dev Traffic Volume                   | = | 234   | -                                            |   |       |
| Daily Generation Rate                        | = | 9     | trips per lot                                |   |       |
| Daily Dev Traffic Volume                     | = | 2475  | -                                            |   |       |
| Traffic Distribution                         |   |       |                                              |   |       |
| AM PEAK                                      |   |       | PM PEAK                                      |   |       |
| % New Trips                                  | = | 100 % | % New Trips                                  | = | 100 % |
| New Trips Volume                             | = | 234   | New Trips Volume                             | = | 234   |
| Inbound %                                    | = | 20%   | Inbound %                                    | = | 80%   |
| Inbound Volume                               | = | 47    | Inbound Volume                               | = | 187   |
| Inbound from East via Waterfall Way          | = | 5%    | Inbound from East via Waterfall Way          | = | 5%    |
| Inbound from East via Waterfall Way (volume) | = | 3     | Inbound from East via Waterfall Way (volume) | = | 10    |
| Inbound from West via Waterfall Way          | = | 95%   | Inbound from West via Waterfall Way          | = | 95%   |
| Inbound from West via Waterfall Way (volume) | = | 45    | Inbound from West via Waterfall Way (volume) | = | 178   |
| Outbound %                                   | = | 80%   | Outbound %                                   | = | 20%   |
| Outbound Volume                              | = | 187   | Outbound Volume                              | = | 47    |
| Outbound to East via Waterfall Way           | = | 5%    | Outbound to East via Waterfall Way           | = | 5%    |
| Outbound to East via Waterfall Way (volume)  | = | 10    | Outbound to East via Waterfall Way (volume)  | = | 3     |
| Outbound to West via Waterfall Way           | = | 95%   | Outbound to West via Waterfall Way           | = | 95%   |
| Outbound to West via Waterfall Way (volume)  | = | 178   | Outbound to West via Waterfall Way (volume)  | = | 45    |

The development is expected to generate approximately 234 vehicles per hour during both AM and PM peaks. Of these trips, 95% is assumed to travel to and from Armidale. The trip distribution and assignment is based on the overall development which takes the total development quantum into consideration to determine overall impacts.



## 6 TRAFFIC IMPACT ASSESSMENT

### 6.1 External Intersection Impact Assessment

This subsection provides the impact analysis findings of the expected intersections of impact. Traffic modelling has been conducted using SIDRA v9 for the following scenarios for both the AM and PM peak hours for each of the expected intersection of impact:

#### “Without Development” Scenarios

- **Scenario 1:** Opening Year 2028 AM Peak Hour Analysis Results with existing geometry and control (without Development) – This scenario evaluated the operational conditions of the intersection based on existing geometry and control without the additional development generated traffic at year 2028. This was done for the AM peak hour for the future year 2028 in order to determine the operational performance metrics (vehicle queueing, vehicle delay and LoS) of the intersection.
- **Scenario 2:** Opening Year 2028 PM Peak Hour Analysis Results with existing geometry and control (without Development) – This scenario evaluated the operational conditions of the intersection based on existing geometry and control without the additional development generated traffic at year 2028. This was done for the PM peak hour for the future year 2028 in order to determine operational performance metrics (vehicle queueing, vehicle delay and LoS) of the intersection
- **Scenario 3:** Future Year 2038 (opening + 10 years) AM Peak Hour Analysis Results with existing geometry and control (without Development) – This scenario evaluated the operational conditions of the intersection based on existing geometry and control without the additional development generated traffic at year 2038. This was done for the AM peak hour for the future year 2038 in order to determine operational performance metrics (vehicle queueing, vehicle delay and LoS) of the intersection.
- **Scenario 4:** Future Year 2038 (opening + 10 years) PM Peak Hour Analysis Results with existing geometry and control (without Development) – This scenario evaluated the operational conditions of the intersection based on existing geometry and control without the additional development generated traffic at year 2038. This was done for the PM peak hour for the future year 2038 in order to determine operational performance metrics (vehicle queueing, vehicle delay and LoS) of the intersection.

#### “With Development” Scenarios

- **Scenario 5:** Opening Year 2028 AM Peak Hour Analysis Results with existing geometry and control (with Development) – This scenario evaluated the operational conditions of the intersection based on existing geometry and control with the additional development generated traffic at year 2028. This was done for the AM peak hour for the future year 2028 in order to determine the impact on operational performance metrics (vehicle queueing, vehicle delay and LoS) of the intersection.
- **Scenario 6:** Opening Year 2028 PM Peak Hour Analysis Results with existing geometry and control (with Development) – This scenario evaluated the operational conditions of the intersection based on existing geometry and control with the additional development generated traffic at year 2028. This was done for the PM peak hour for the future year 2028 in order to determine the impact on operational performance metrics (vehicle queueing, vehicle delay and LoS) of the intersection
- **Scenario 7:** Future Year 2038 (opening + 10 years) AM Peak Hour Analysis Results with existing geometry and control (with Development) – This scenario evaluated the operational conditions of the intersection based on existing geometry and control with the additional development generated traffic at year 2038. This was done for the AM peak hour for the future year 2038 in order to determine the impact on operational performance metrics (vehicle queueing, vehicle delay and LoS) of the intersection.
- **Scenario 8:** Future Year 2038 (opening + 10 years) PM Peak Hour Analysis Results with existing geometry and control (with Development) – This scenario evaluated the operational conditions of the intersection based on existing geometry and control with the additional development generated traffic at year 2038. This was done for the PM peak hour for the future year 2038 in order to determine the impact on operational performance metrics (vehicle queueing, vehicle delay and LoS) of the intersection.

## 6.2 Intersection Impact Analysis Results

The impact analysis results of the Castledoyle Road / Waterfall Way intersection is provided in Table 6.1

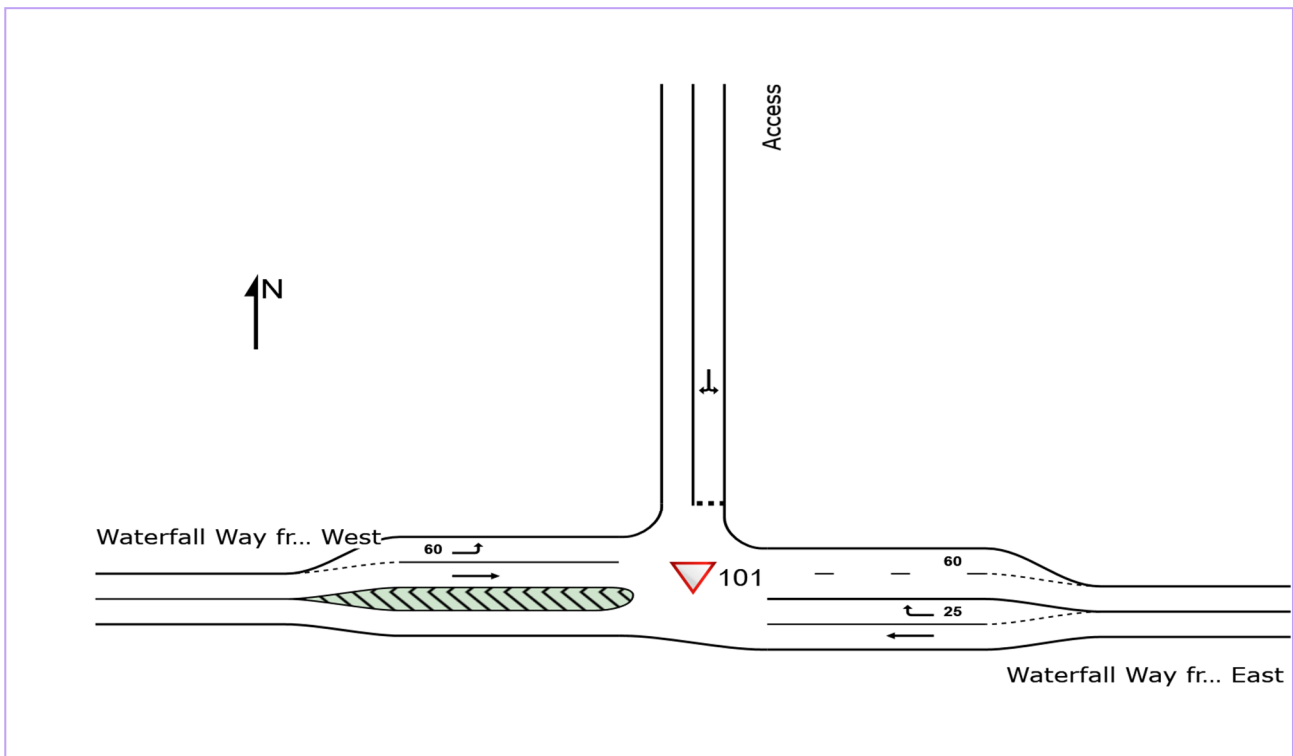
*Table 6.1: Castledoyle Road / Waterfall Way Intersection Impact Analysis Results*

| Analysis Scenario | Intersection Degree of Saturation | Worst Movement Level of Service | Intersection Average Delay (sec) | Maximum 95% Back of Queue Length (m) |
|-------------------|-----------------------------------|---------------------------------|----------------------------------|--------------------------------------|
| Scenario 1        | 0.17                              | B                               | 2.6                              | 6                                    |
| Scenario 2        | 0.02                              | A                               | 1.3                              | 0.3                                  |
| Scenario 3        | 0.24                              | C                               | 3.1                              | 9.5                                  |
| Scenario 4        | 0.02                              | A                               | 1.2                              | 0.3                                  |
| Scenario 5        | 0.24                              | C                               | 2.5                              | 7.9                                  |
| Scenario 6        | 0.11                              | A                               | 0.3                              | 0.3                                  |
| Scenario 7        | 0.30                              | D                               | 3.4                              | 12.9                                 |
| Scenario 8        | 0.12                              | A                               | 0.3                              | 0.3                                  |

The analysis results indicate that the intersection will operate at acceptable LOS thresholds and adequate levels of delay and queueing even at future year 2038 post development. The development is not considered to have a significant impact on the performance of the intersection. Detailed SIDRA outputs are provided in **Appendix B**.

## 6.3 Access Intersection Capacity Modelling Results

The capacity assessment for the proposed access intersection was carried out for future year 2038 with the development traffic volumes during both AM and PM peak hours. The analysis results are based on the layout as illustrated in Figure 6.1.



*Figure 6.1: Proposed Access Intersection Configuration*



*Table 6.2: Access Intersection Capacity Analysis Results*

| Analysis Scenario | Intersection Degree of Saturation | Worst Movement Level of Service | Intersection Average Delay (sec) | Maximum 95% Back of Queue Length (m) |
|-------------------|-----------------------------------|---------------------------------|----------------------------------|--------------------------------------|
| Year 2038 AM Peak | 0.69                              | D                               | 6.1                              | 29.4                                 |
| Year 2038 PM Peak | 0.11                              | A                               | 2.8                              | 2.0                                  |

The results indicate that the AM peak is considered to be the worst-case scenario. Although even at year 2038 the proposed intersection and associated geometry and control configuration would allow for acceptable level of service and delay metrics to prevail. The worst performing turn movement is considered to be the right turn movement out of site which would experience a LoS D with 30.2 second delay and 29.4m queue length. Detailed SIDRA outputs are provided in **Appendix B**.

## 7 LAYOUT DESIGN REVIEW

### 7.1 Road Layout Design Conformance

The new internal road will serve as a local collector with internal local access streets providing direct lot access which will be designed as per the Armidale Development Control Plan 2024 requirements. Table 7.1 outlines the adopted street cross section, and associated daily traffic volumes, for the internal road network.

*Table 7.1: Internal Road Cross Section*

| Road Hierarchy                      | Road Reserve | Carriageway Width                            | Compliance | Maximum Traffic Catchment | Daily Traffic Volume (vpd) |
|-------------------------------------|--------------|----------------------------------------------|------------|---------------------------|----------------------------|
| New Road 1: Local Collector         | 22m          | 11.6m with 4.25m verge (walkway on one side) | Yes        | 333 Lots                  | Up to 2000                 |
| New Road 2-13: Local Access Streets | 16m          | 8m with 4.25m verge (walkway on one side)    | Yes        | 222 Lots                  | Up to 3000                 |

The proposed road hierarchy and associated cross sectional elements are considered appropriate and compliant with the Armidale Development Control Plan 2024. The required target speeds of these internal roads are to be 50km/h for the Local Collector and 40km/h for the Access Streets. It is recommended that local Area Traffic Management (LATM) measures be included in the design in order to achieve these target speeds given the block lengths and horizontal curve radii within the layout. These measures are to be refined and included in relevant Operational Works Design Drawings.

### 7.2 Lot Access

Direct lot access is proposed to be obtained from the internal Local Access Streets. These will be facilitated by means of standard vehicle driveways as per Armidale Regional Council Standard Roadworks Drawings 030-070A and 030-071 as indicated in Figure 7.1



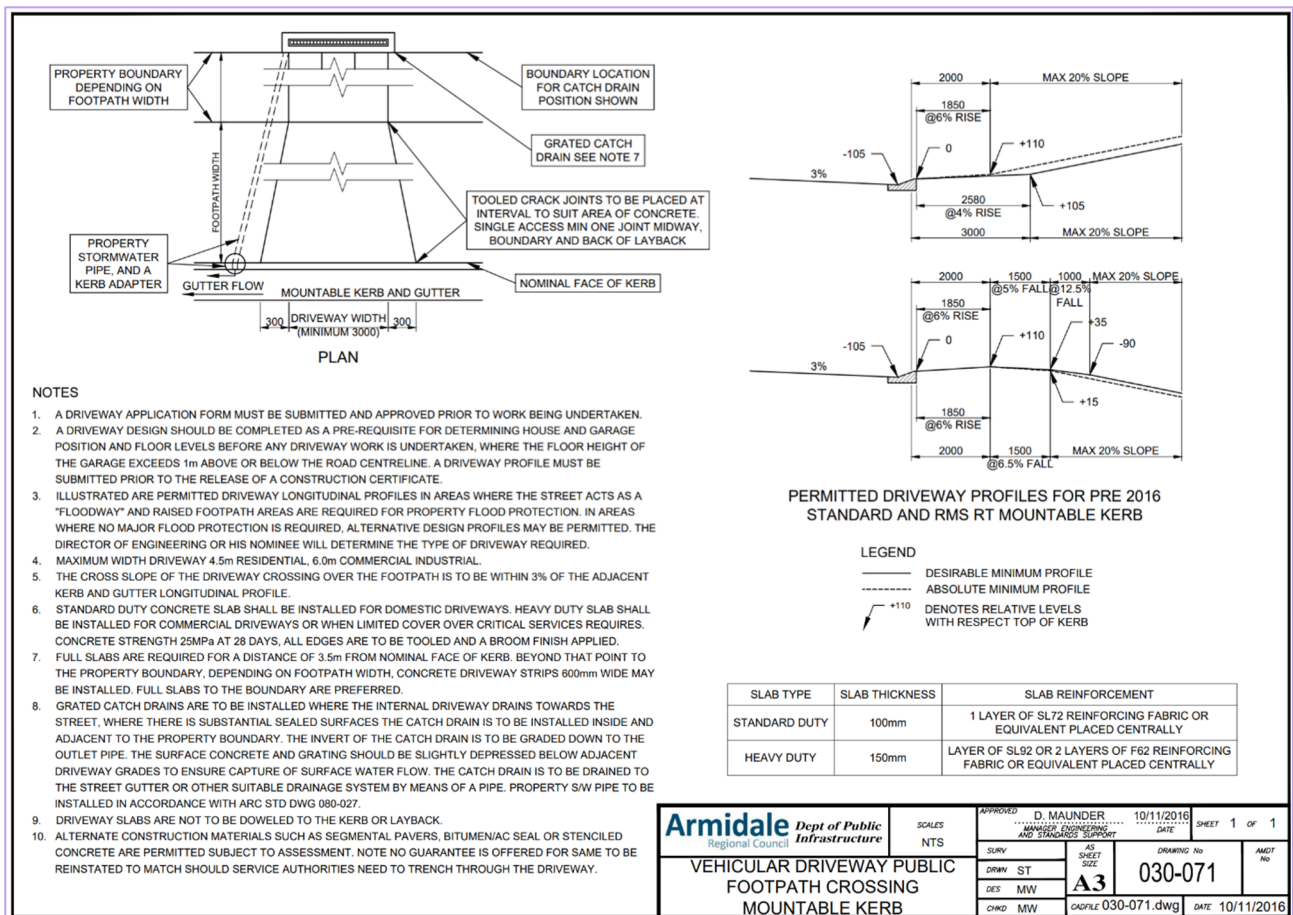


Figure 7.1 Standard Driveways 030-070A / 030-071

## 7.3 Servicing Requirements

### Waste

Allowance has been made for allowing a 12.5m AS2890.2:2018 HRV side loading waste truck to access and exit the site in a forward gear. The waste truck would be able to circulate the internal layout while maintaining sufficient clearances.

## 8 TRAFFIC ENGINEERING CONCLUSIONS

### 8.1 Conclusion

The traffic and transportation aspects of the proposed development are considered acceptable and in line with council, RMS and Australian Standard requirements. The following summary of findings are provided:

- Dykman Consulting was appointed in order to conduct a Traffic Impact Assessment (TIA) for a proposed 275 LOT subdivision situated on LOT 1 DP1209469, LOT 8 DP240862 & LOTS 69 & 70 DP755808.
- The key intersection expected to be impacted as a result of the development was considered to be the Waterfall Way / Castledoyle Road intersection. Given the central areas of employment, education, shopping and medical necessities occurring within Armidale, the majority of development trips would traverse through this intersection before cascading through the network. The existing condition modelling evaluated the AM and PM peak hour traffic volumes traversing through the intersection based on the existing geometry and control. The analysis results indicate that minimal turn movements occur at the intersection. The existing operational performance constitutes LOS A during the PM peak and worst movement LOS B during the AM peak. The impact analysis results indicate that the intersection will operate at acceptable LOS thresholds and adequate levels of delay and queueing even at future year 2038 post development. The development is not considered to have a significant impact on the performance of the intersection. Detailed SIDRA outputs are provided in Appendix B.
- It is proposed that vehicle access be obtained from a new formal intersection off Waterfall Way. An assessment has been carried out to determine the viability of the proposed access position from a traffic engineering perspective. From an engineering perspective the location of an access should be spaced at sufficient distances to allow for safe and effective driver reaction times and deceleration distances, whilst not impacting on operational performance / capacity of a road. Analysis was carried out to location viability of the proposed access intersection, whilst not compromising the safety of road network. Intersection and access requirements were determined based on the factors as indicated in the Austroads Guide to Road Design Part 4A. It was found that the proposed access intersection and development as proposed would not adversely affect the safety, efficiency and ongoing operation of the road and that the proposed intersection geometry as proposed would be functional. Refer to Section 4 for specific assessment details.
- The development is expected to generate approximately 234 vehicles per hour during both AM and PM peaks. Of these trips, 95% is assumed to travel to and from Armidale. The trip distribution and assignment is based on the overall development which takes the total development quantum into consideration to determine overall impacts.
- The access SIDRA analyses results indicate that the AM peak is considered to be the worst-case scenario. Although even at year 2038 the proposed intersection and associated geometry and control configuration would allow for acceptable level of service and delay metrics to prevail. The worst performing turn movement is considered to be the right turn movement out of site which would experience a LoS D with 30.2 second delay and 29.4m queue length. Detailed SIDRA outputs are provided in Appendix B.
- The proposed road hierarchy and associated cross sectional elements are considered appropriate and compliant with the Armidale Development Control Plan 2024. The required target speeds of these internal roads are to be 50km/h for the Local Collector and 40km/h for the Access Streets. It is recommended that local Area Traffic Management (LATM) measures be included in the design in order to achieve these target speeds given the block lengths and horizontal curve radii within the layout. These measures are to be refined and included in relevant Operational Works Design Drawings.
- Given the dispersed extent of available bus stops and significant walking distance to these stops, allowance is made for in the proposed layout to accommodate a bus stop. This would enhance accessibility and connectivity to these bus routes servicing the CBD and surrounding neighbourhoods. The existing bus routes which should be allowed for in the layout design would include Route 483.



- Allowance has been made for allowing a 12.5m AS2890.2:2018 HRV side loading waste truck to access and exit the site in a forward gear. The waste truck would be able to circulate the internal layout while maintaining sufficient clearances.

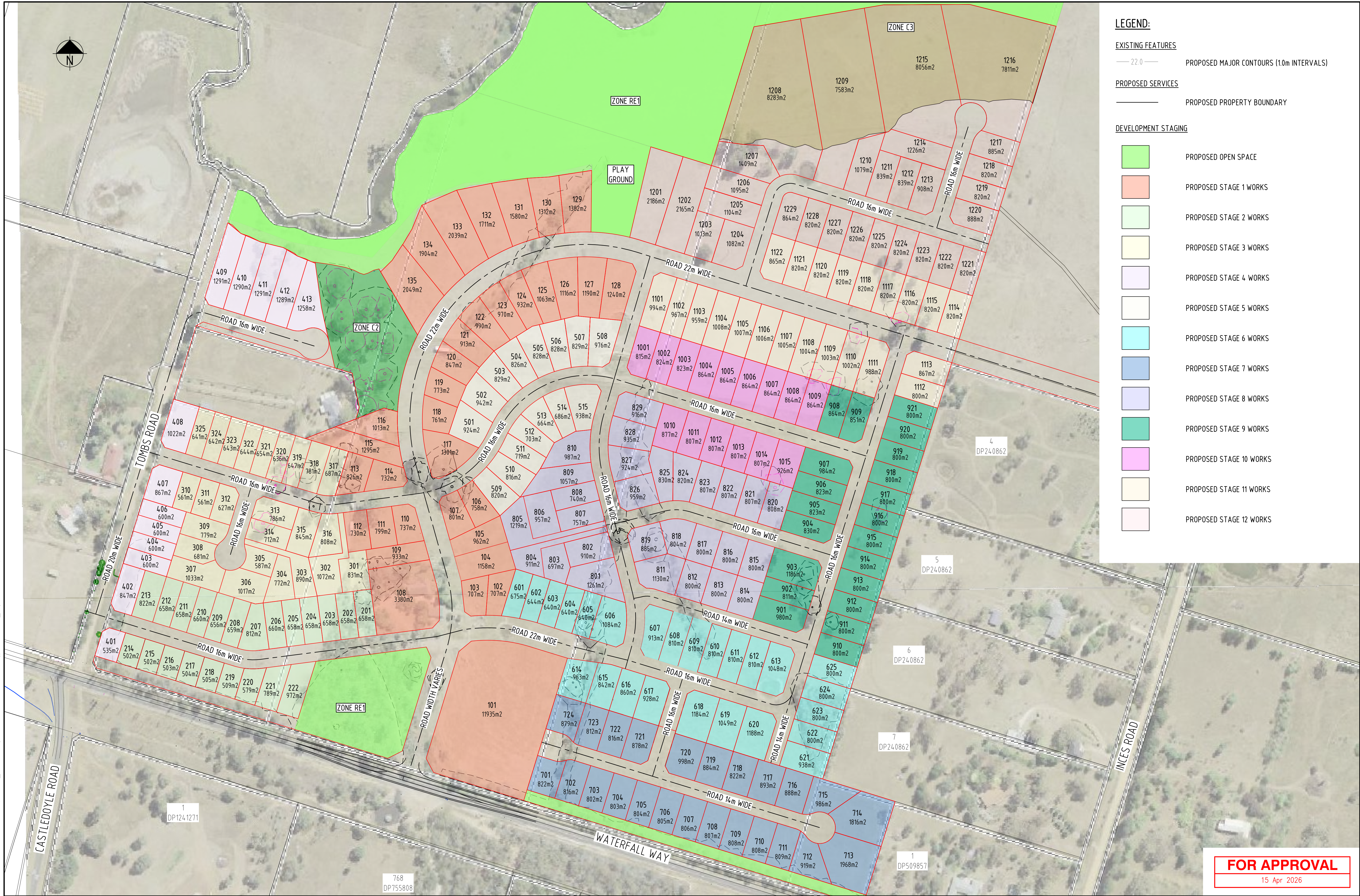
## 8.2 Recommendation

It is recommended that the proposed development be approved from a Traffic Engineering perspective, subject to recommendations made within this Traffic Impact Assessment.

# Appendix A: Layout Plan



CAD FILENAME: C:\265\knox\dykman\SYN\25002 - 241 Waterfall Way Armidale - 650102 Working\022 DC Des\CAD\DRG\Service Strategy\25002-CO-1002.dwg Plot Date: 15 Apr. 2026



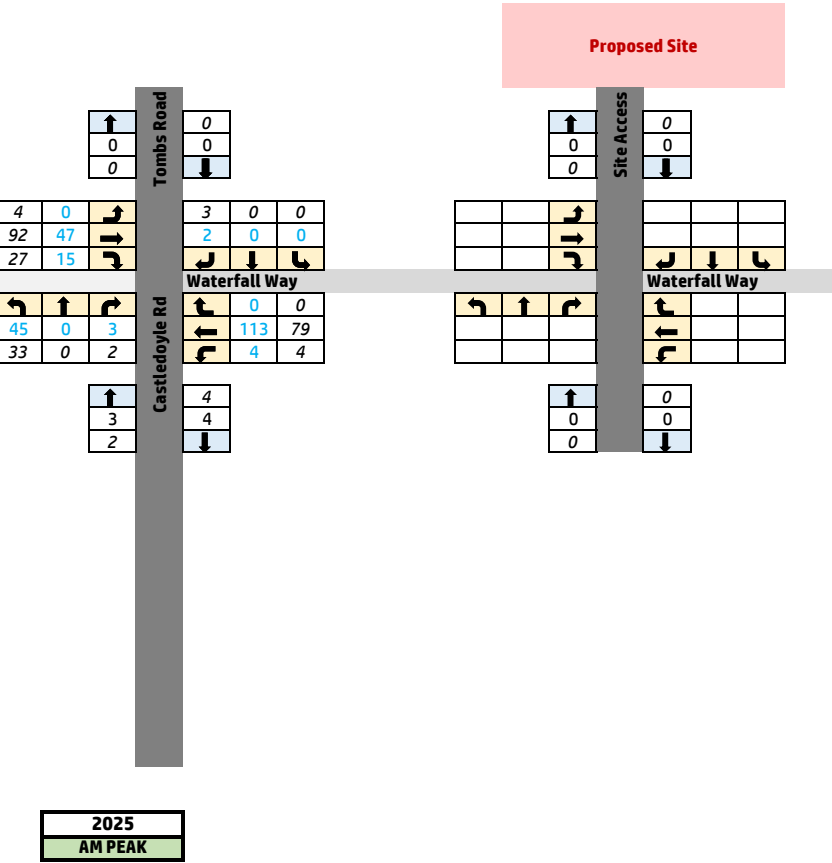
|                                                                                                                                                                                                                                                                                                                                             |  |          |                                                                                         |                              |                |  |      |                                                                                                       |                                                                                |                           |  |  |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|----------|-----------------------------------------------------------------------------------------|------------------------------|----------------|--|------|-------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------|---------------------------|--|--|
| E LOT LAYOUT UPDATED                                                                                                                                                                                                                                                                                                                        |  | 15.04.26 | <div>SCALE</div> <div>1:1500</div> <div><div>015304560m</div></div> <div>KNOXCORP</div> | <div>Dykman Consulting</div> | APPROVAL       |  |      | <div>PROPOSED SUBDIVISION</div> <div>241 WATERFALL WAY ARMIDALE NSW</div> <div>SERVICE STRATEGY</div> | <div>SERVICE STRATEGY</div> <div>GENERAL SITE PLAN</div> <div>ALL STAGES</div> | ISSUE: FOR APPROVAL       |  |  |
| D LOT LAYOUT UPDATED                                                                                                                                                                                                                                                                                                                        |  | 14.04.26 |                                                                                         |                              | RPEQ No.       |  |      |                                                                                                       |                                                                                | PROJECT No: 25002         |  |  |
| C LOT LAYOUT UPDATED                                                                                                                                                                                                                                                                                                                        |  | 13.04.26 |                                                                                         |                              | DATE           |  |      |                                                                                                       |                                                                                | DRAWING No: 25002-CO-1002 |  |  |
| B LOT LAYOUT UPDATED                                                                                                                                                                                                                                                                                                                        |  | 09.04.26 |                                                                                         |                              | RPEQ SIGNATURE |  |      |                                                                                                       |                                                                                | REV: E                    |  |  |
| A ISSUED FOR APPROVAL                                                                                                                                                                                                                                                                                                                       |  | 27.02.25 |                                                                                         |                              | DRAWN          |  |      |                                                                                                       |                                                                                |                           |  |  |
| REV REVISION DETAILS                                                                                                                                                                                                                                                                                                                        |  | DATE     | APPR                                                                                    | T.N.                         |                |  | M.G. |                                                                                                       |                                                                                | S.G.                      |  |  |
| XREFS - X_CD_CIVIL.dwg; X_LOTS.dwg; X_25002-Master.dwg; x_stormwater drainage.dwg; X_D_CONTS_FINISHED.dwg; X_D_CONTS_EXISTING.dwg; X_D_CONTROL_LINE.dwg; X_D_DESIGN_STRINGS.dwg; X_D_CUT_FILL_HATCH.dwg; X_DROA_INT.dwg; X_SURVEY.dwg; X_AERIAL_IMAGE.dwg; X_STRATEGY.dwg; X_D_WATERFALLWAY ENDANGERED TREE SURVEY.dwg; X_LOTS OPTION F.dwg |  |          |                                                                                         |                              |                |  |      |                                                                                                       |                                                                                |                           |  |  |



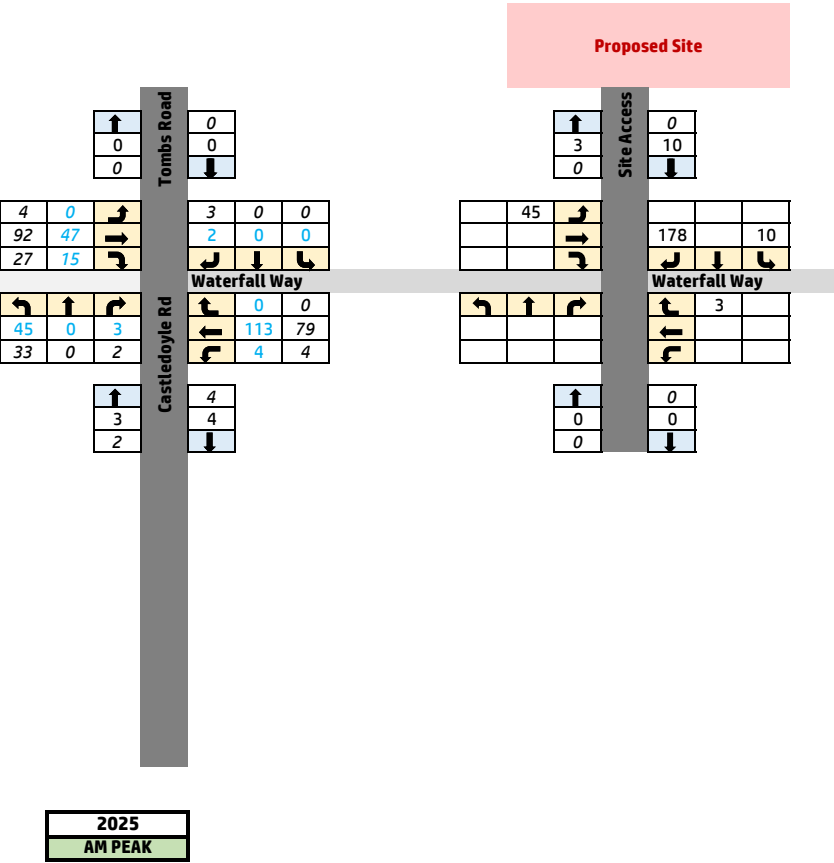
# Appendix B: Turn Volumes



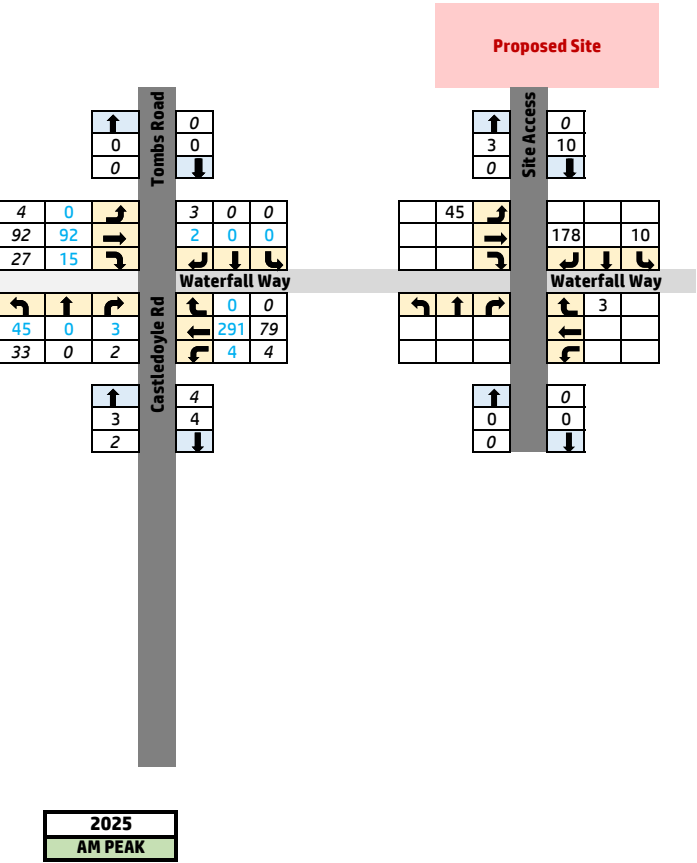
Armidale ROL  
 Background Traffic Volumes



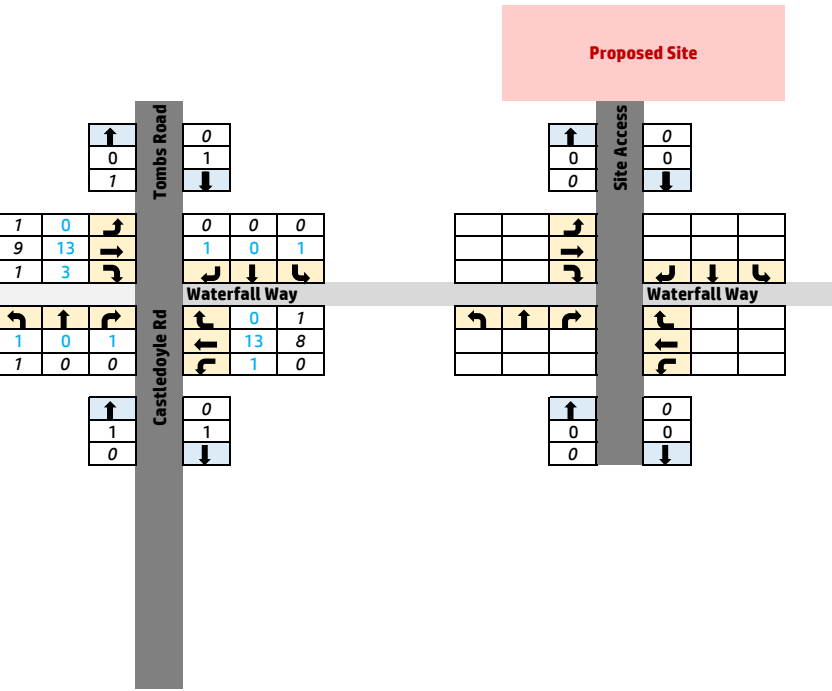
Armidale ROL  
 Development Generated Traffic Volumes



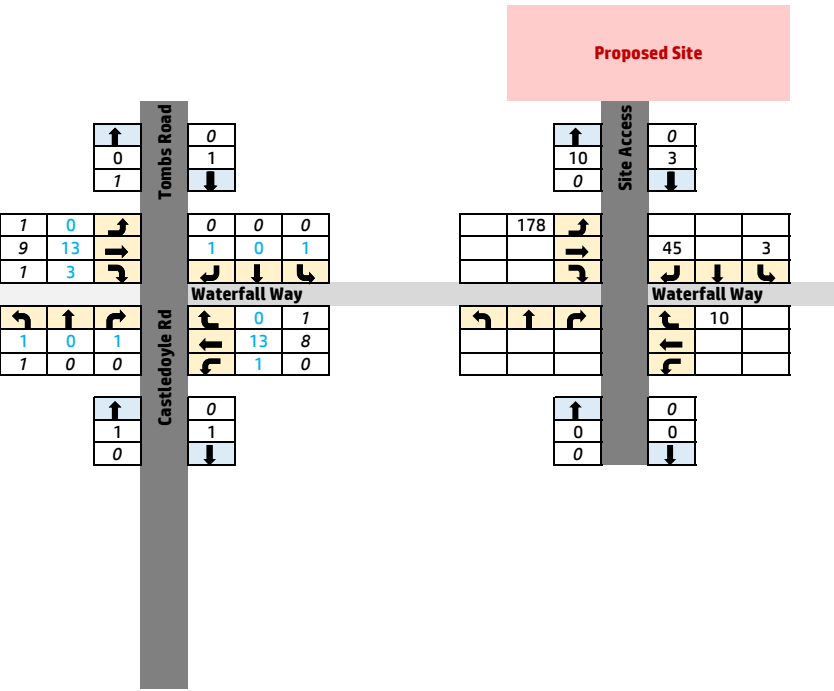
Armidale ROL  
 Development Generated Traffic Volumes + Background Traffic



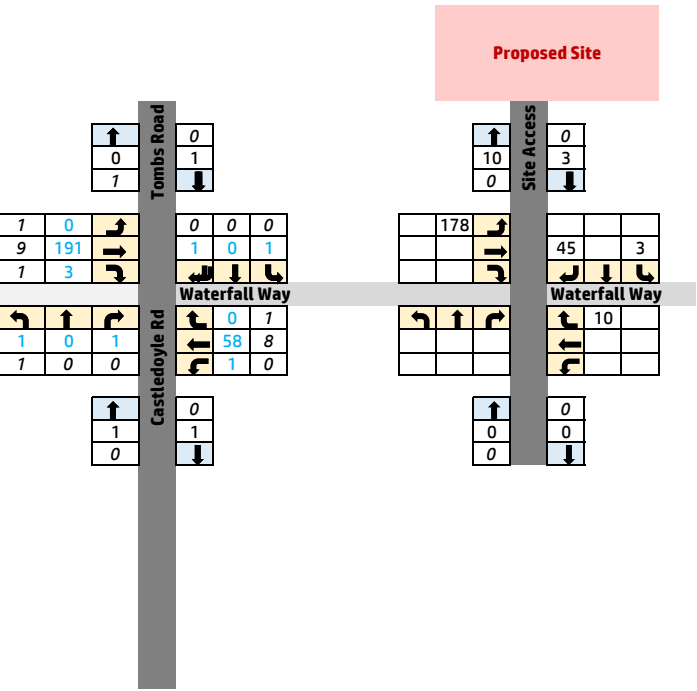
Armidale ROL  
 Background Traffic Volumes



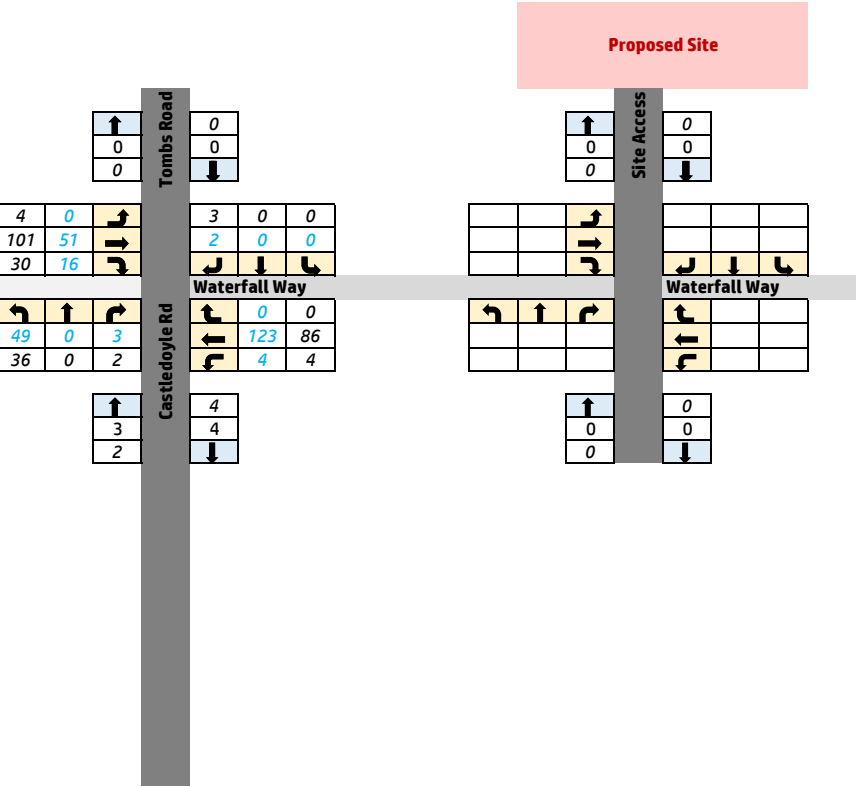
Armidale ROL  
 Development Generated Traffic Volumes



Armidale ROL  
 Development Generated Traffic Volumes + Background Traffic

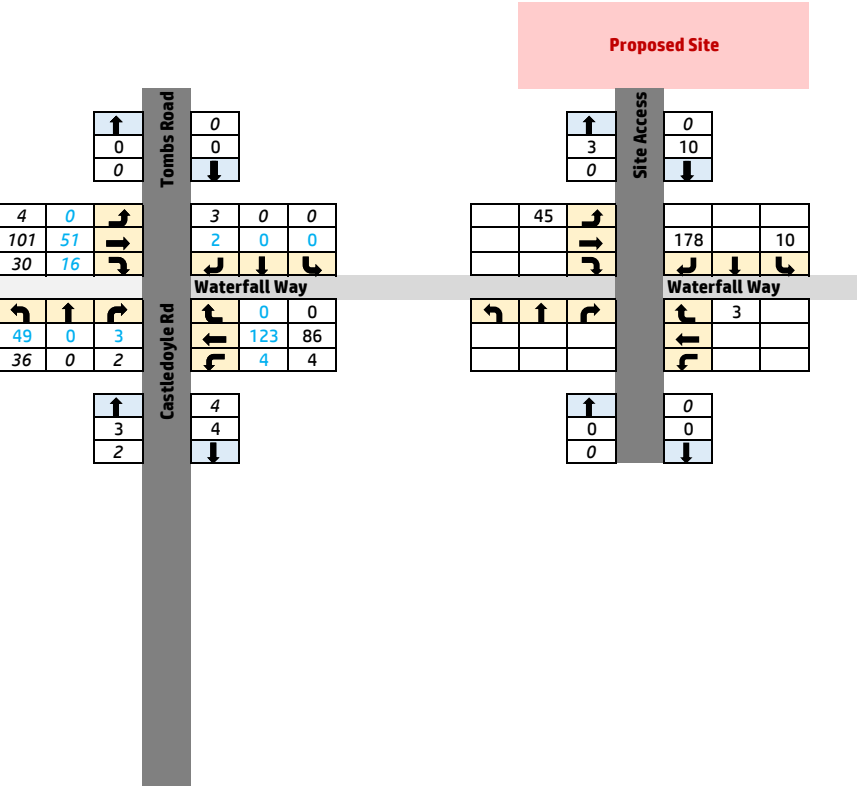


Armidale ROL  
Background Traffic Volumes



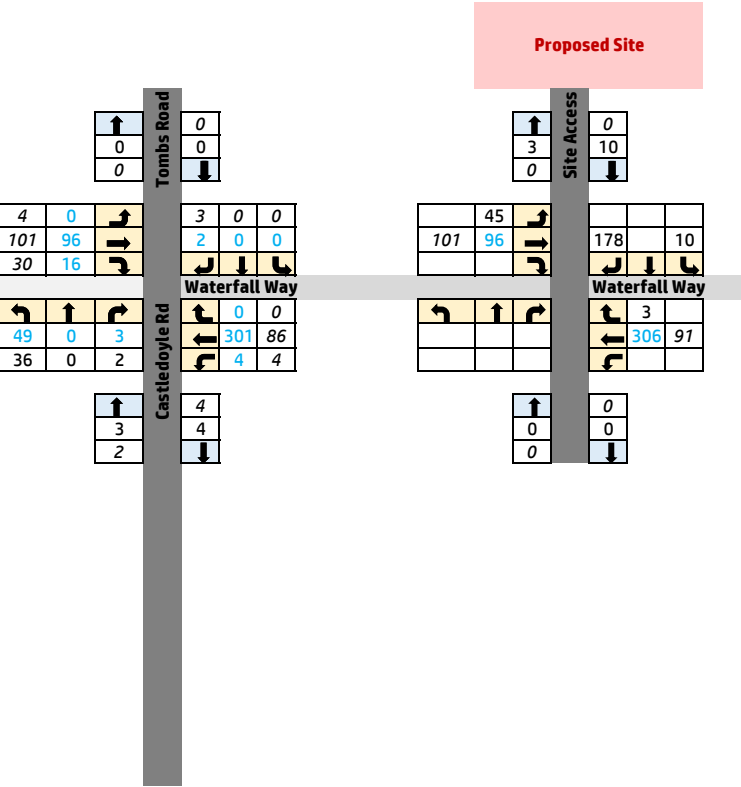
2028  
AM PEAK

Armidale ROL  
Development Generated Traffic Volumes



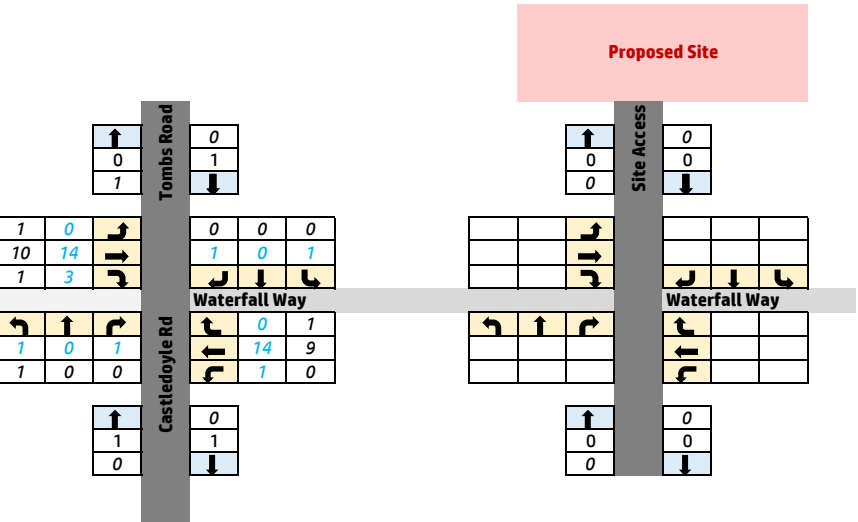
2028  
AM PEAK

Armidale ROL  
Development Generated Traffic Volumes + Background Traffic

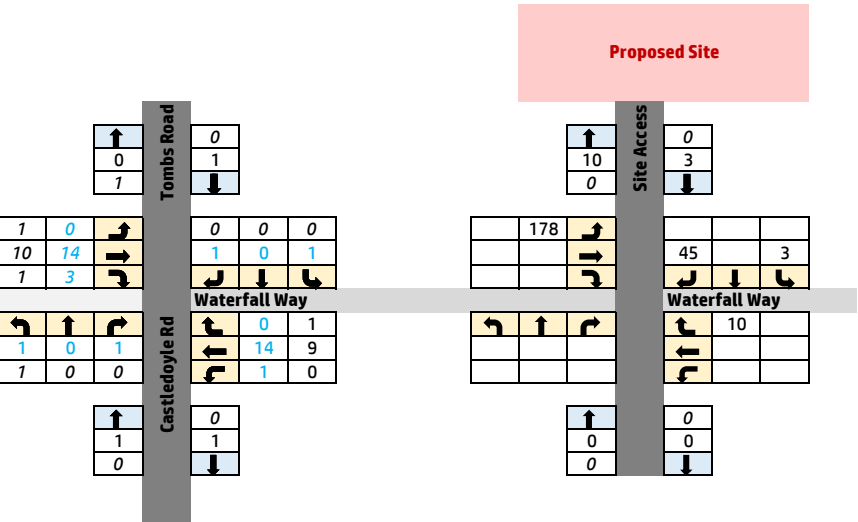


2028  
AM PEAK

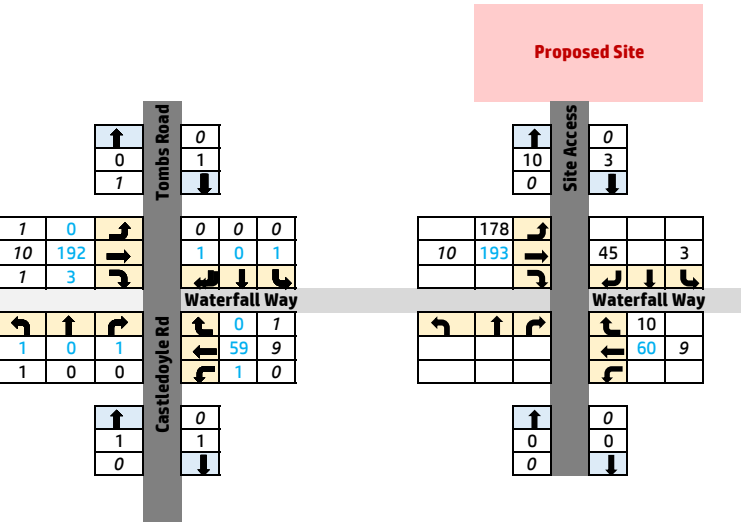
Armidale ROL  
Background Traffic Volumes



Armidale ROL  
Development Generated Traffic Volumes

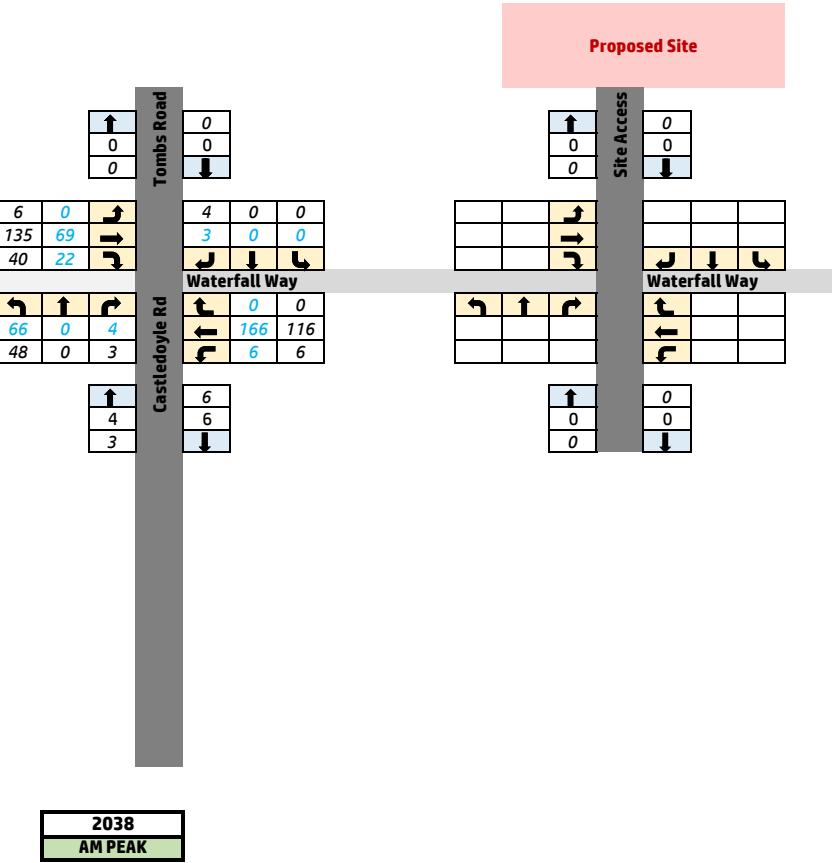


Armidale ROL  
Development Generated Traffic Volumes + Background Traffic

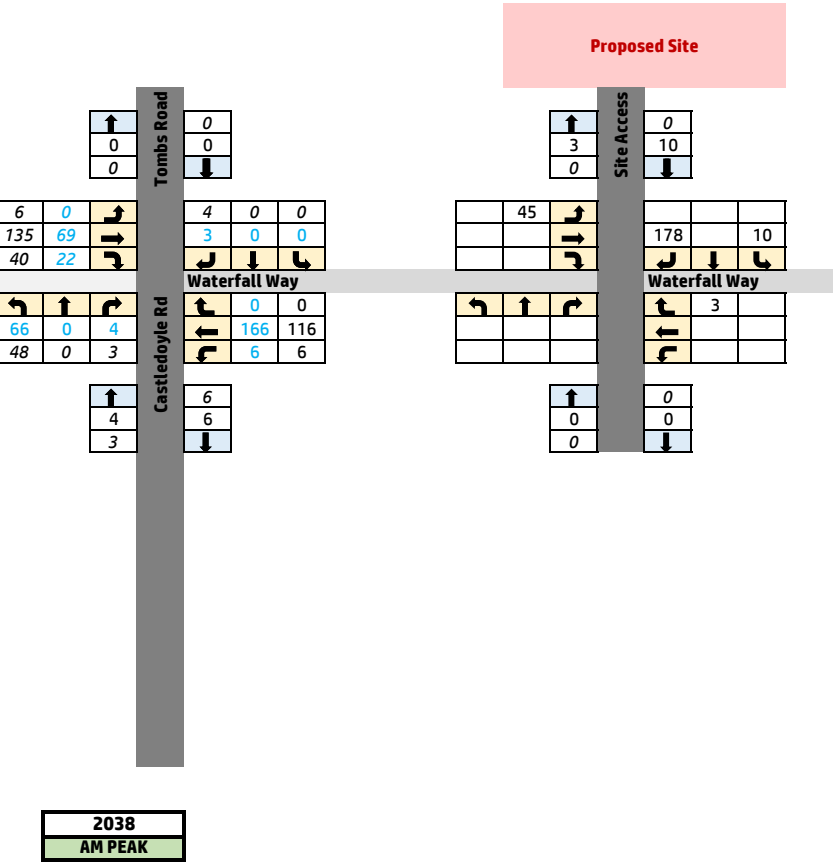




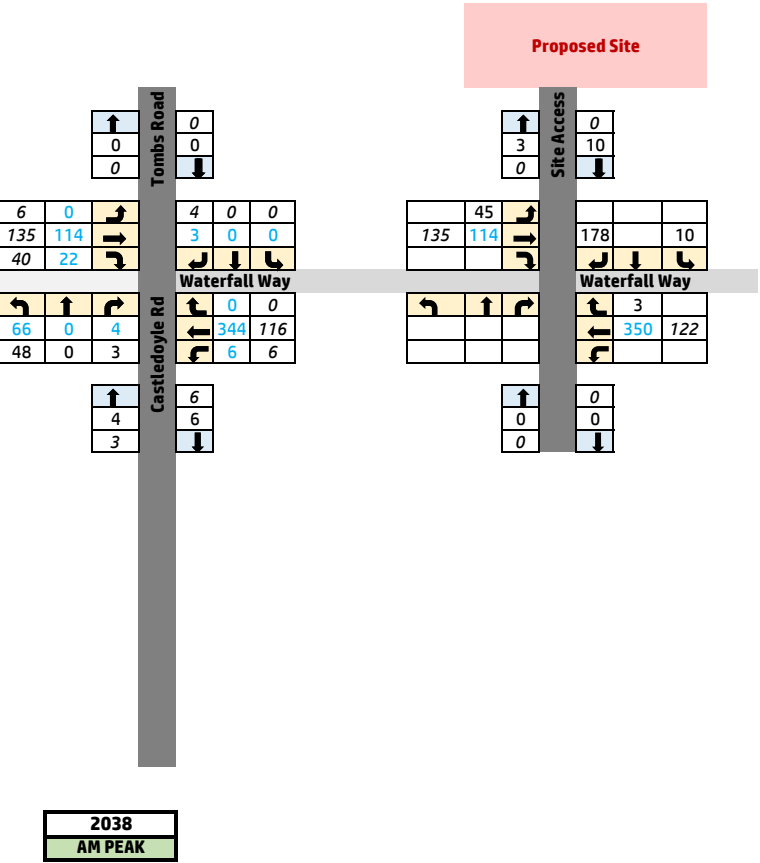
Armidale ROL  
Background Traffic Volumes



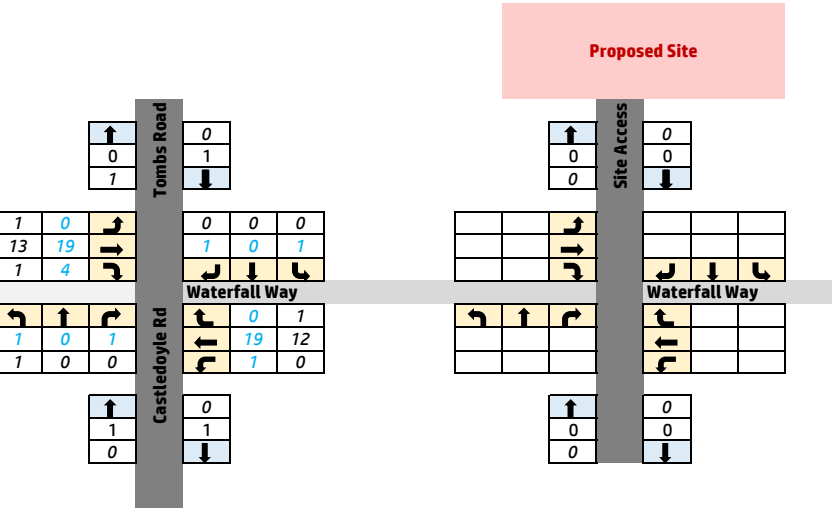
Armidale ROL  
Development Generated Traffic Volumes



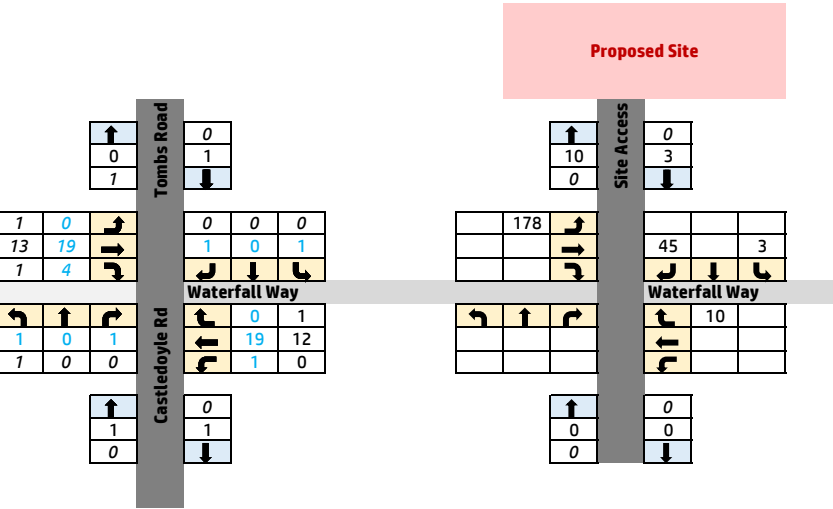
Armidale ROL  
Development Generated Traffic Volumes + Background Traffic



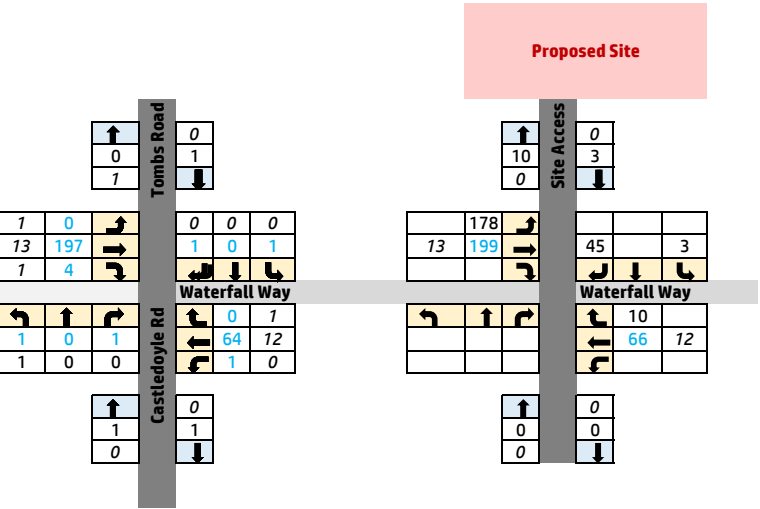
Armidale ROL  
Background Traffic Volumes



Armidale ROL  
Development Generated Traffic Volumes



Armidale ROL  
Development Generated Traffic Volumes + Background Traffic



# Appendix C: SIDRA Results

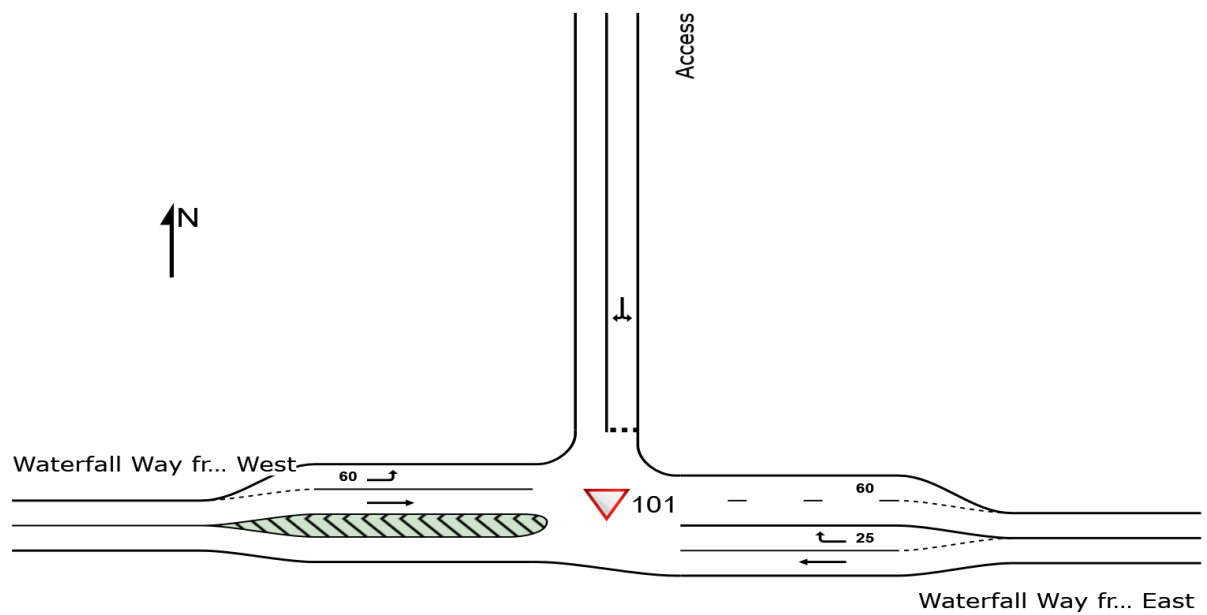


# SITE LAYOUT

▽ Site: 101 [Access / Waterfall Way AM Peak Hour Opening  
Year 2028 AM Peak (Site Folder: Access Analysis)]

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

Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.



# MOVEMENT SUMMARY

Site: 101 [Tombs Road / Waterfall Way PM Peak Hour Year 2038 With Development (Site Folder: Intersection Impact)]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

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

| Vehicle Movement Performance     |      |           |                                         |       |                                          |       |                      |                        |                  |                                             |     |           |                |                     |                         |
|----------------------------------|------|-----------|-----------------------------------------|-------|------------------------------------------|-------|----------------------|------------------------|------------------|---------------------------------------------|-----|-----------|----------------|---------------------|-------------------------|
| Mov ID                           | Turn | Mov Class | Demand Flows<br>[ Total HV ]<br>veh/h % |       | Arrival Flows<br>[ Total HV ]<br>veh/h % |       | Deg. Satn<br><br>v/c | Aver. Delay<br><br>sec | Level of Service | 95% Back Of Queue<br>[ Veh. Dist ]<br>veh m |     | Prop. Que | Eff. Stop Rate | Aver. No. of Cycles | Aver. Speed<br><br>km/h |
| South: Castledoyle Rd from South |      |           |                                         |       |                                          |       |                      |                        |                  |                                             |     |           |                |                     |                         |
| 1                                | L2   | All MCs   | 2                                       | 50.0  | 2                                        | 50.0  | 0.004                | 6.5                    | LOS A            | 0.0                                         | 0.1 | 0.25      | 0.52           | 0.25                | 50.5                    |
| 2                                | T1   | All MCs   | 1                                       | 0.0   | 1                                        | 0.0   | 0.004                | 5.4                    | LOS A            | 0.0                                         | 0.1 | 0.25      | 0.52           | 0.25                | 53.0                    |
| 3                                | R2   | All MCs   | 1                                       | 0.0   | 1                                        | 0.0   | 0.004                | 7.0                    | LOS A            | 0.0                                         | 0.1 | 0.25      | 0.52           | 0.25                | 52.3                    |
| Approach                         |      |           | 4                                       | 25.0  | 4                                        | 25.0  | 0.004                | 6.3                    | LOS A            | 0.0                                         | 0.1 | 0.25      | 0.52           | 0.25                | 51.6                    |
| East: Waterfall Way from East    |      |           |                                         |       |                                          |       |                      |                        |                  |                                             |     |           |                |                     |                         |
| 4                                | L2   | All MCs   | 1                                       | 0.0   | 1                                        | 0.0   | 0.047                | 6.3                    | LOS A            | 0.0                                         | 0.2 | 0.02      | 0.03           | 0.02                | 57.2                    |
| 5                                | T1   | All MCs   | 80                                      | 15.8  | 80                                       | 15.8  | 0.047                | 0.0                    | LOS A            | 0.0                                         | 0.2 | 0.02      | 0.03           | 0.02                | 59.7                    |
| 6                                | R2   | All MCs   | 1                                       | 100.0 | 1                                        | 100.0 | 0.047                | 7.7                    | LOS A            | 0.0                                         | 0.2 | 0.02      | 0.03           | 0.02                | 52.1                    |
| Approach                         |      |           | 82                                      | 16.7  | 82                                       | 16.7  | 0.047                | 0.2                    | NA               | 0.0                                         | 0.2 | 0.02      | 0.03           | 0.02                | 59.6                    |
| North: Tombs Road from North     |      |           |                                         |       |                                          |       |                      |                        |                  |                                             |     |           |                |                     |                         |
| 7                                | L2   | All MCs   | 1                                       | 0.0   | 1                                        | 0.0   | 0.003                | 6.2                    | LOS A            | 0.0                                         | 0.1 | 0.34      | 0.54           | 0.34                | 52.3                    |
| 8                                | T1   | All MCs   | 1                                       | 0.0   | 1                                        | 0.0   | 0.003                | 5.4                    | LOS A            | 0.0                                         | 0.1 | 0.34      | 0.54           | 0.34                | 52.7                    |
| 9                                | R2   | All MCs   | 1                                       | 0.0   | 1                                        | 0.0   | 0.003                | 7.0                    | LOS A            | 0.0                                         | 0.1 | 0.34      | 0.54           | 0.34                | 52.0                    |
| Approach                         |      |           | 3                                       | 0.0   | 3                                        | 0.0   | 0.003                | 6.2                    | LOS A            | 0.0                                         | 0.1 | 0.34      | 0.54           | 0.34                | 52.3                    |
| West: Waterfall Way from West    |      |           |                                         |       |                                          |       |                      |                        |                  |                                             |     |           |                |                     |                         |
| 10                               | L2   | All MCs   | 1                                       | 100.0 | 1                                        | 100.0 | 0.122                | 6.7                    | LOS A            | 0.0                                         | 0.3 | 0.01      | 0.01           | 0.01                | 52.8                    |
| 11                               | T1   | All MCs   | 221                                     | 6.2   | 221                                      | 6.2   | 0.122                | 0.0                    | LOS A            | 0.0                                         | 0.3 | 0.01      | 0.01           | 0.01                | 59.8                    |
| 12                               | R2   | All MCs   | 4                                       | 25.0  | 4                                        | 25.0  | 0.122                | 5.8                    | LOS A            | 0.0                                         | 0.3 | 0.01      | 0.01           | 0.01                | 55.7                    |
| Approach                         |      |           | 226                                     | 7.0   | 226                                      | 7.0   | 0.122                | 0.1                    | NA               | 0.0                                         | 0.3 | 0.01      | 0.01           | 0.01                | 59.7                    |
| All Vehicles                     |      |           | 316                                     | 9.7   | 316                                      | 9.7   | 0.122                | 0.3                    | NA               | 0.0                                         | 0.3 | 0.02      | 0.03           | 0.02                | 59.5                    |

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options 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 (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).  
Two-Way Sign Control Capacity Model: SIDRA Standard.  
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).  
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.  
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).  
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.  
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.



# MOVEMENT SUMMARY

Site: 101 [Access / Waterfall Way AM Peak Hour Opening  
Year 2028 AM Peak (Site Folder: Access Analysis)]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

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

| Vehicle Movement Performance  |      |           |                                         |      |                                          |      |                      |                        |                  |                                             |      |           |                |                     |                         |
|-------------------------------|------|-----------|-----------------------------------------|------|------------------------------------------|------|----------------------|------------------------|------------------|---------------------------------------------|------|-----------|----------------|---------------------|-------------------------|
| Mov ID                        | Turn | Mov Class | Demand Flows<br>[ Total HV ]<br>veh/h % |      | Arrival Flows<br>[ Total HV ]<br>veh/h % |      | Deg. Satn<br><br>v/c | Aver. Delay<br><br>sec | Level of Service | 95% Back Of Queue<br>[ Veh. Dist ]<br>veh m |      | Prop. Que | Eff. Stop Rate | Aver. No. of Cycles | Aver. Speed<br><br>km/h |
| East: Waterfall Way from East |      |           |                                         |      |                                          |      |                      |                        |                  |                                             |      |           |                |                     |                         |
| 5                             | T1   | All MCs   | 418                                     | 22.9 | 418                                      | 22.9 | 0.246                | 0.1                    | LOS A            | 0.0                                         | 0.0  | 0.00      | 0.00           | 0.00                | 59.8                    |
| 6                             | R2   | All MCs   | 3                                       | 0.0  | 3                                        | 0.0  | 0.003                | 6.7                    | LOS A            | 0.0                                         | 0.1  | 0.37      | 0.55           | 0.37                | 47.4                    |
| Approach                      |      |           | 421                                     | 22.8 | 421                                      | 22.8 | 0.246                | 0.1                    | NA               | 0.0                                         | 0.1  | 0.00      | 0.00           | 0.00                | 59.8                    |
| North: Access                 |      |           |                                         |      |                                          |      |                      |                        |                  |                                             |      |           |                |                     |                         |
| 7                             | L2   | All MCs   | 11                                      | 0.0  | 11                                       | 0.0  | 0.514                | 10.0                   | LOS B            | 2.8                                         | 19.7 | 0.78      | 1.04           | 1.22                | 38.0                    |
| 9                             | R2   | All MCs   | 187                                     | 0.0  | 187                                      | 0.0  | 0.514                | 19.1                   | LOS C            | 2.8                                         | 19.7 | 0.78      | 1.04           | 1.22                | 38.0                    |
| Approach                      |      |           | 198                                     | 0.0  | 198                                      | 0.0  | 0.514                | 18.6                   | LOS C            | 2.8                                         | 19.7 | 0.78      | 1.04           | 1.22                | 38.0                    |
| West: Waterfall Way from West |      |           |                                         |      |                                          |      |                      |                        |                  |                                             |      |           |                |                     |                         |
| 10                            | L2   | All MCs   | 47                                      | 0.0  | 47                                       | 0.0  | 0.026                | 5.5                    | LOS A            | 0.0                                         | 0.0  | 0.00      | 0.58           | 0.00                | 49.0                    |
| 11                            | T1   | All MCs   | 207                                     | 51.3 | 207                                      | 51.3 | 0.142                | 0.0                    | LOS A            | 0.0                                         | 0.0  | 0.00      | 0.00           | 0.00                | 59.9                    |
| Approach                      |      |           | 255                                     | 41.7 | 255                                      | 41.7 | 0.142                | 1.1                    | NA               | 0.0                                         | 0.0  | 0.00      | 0.11           | 0.00                | 58.3                    |
| All Vehicles                  |      |           | 874                                     | 23.1 | 874                                      | 23.1 | 0.514                | 4.6                    | NA               | 2.8                                         | 19.7 | 0.18      | 0.27           | 0.28                | 54.5                    |

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options 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 (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).  
Two-Way Sign Control Capacity Model: SIDRA Standard.  
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).  
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.  
Gap-Acceptance Capacity Formula: SIDRA Standard (Akcelik M3D).  
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.  
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

# MOVEMENT SUMMARY

Site: 101 [Access / Waterfall Way AM Peak Hour Opening  
Year 2028 PM Peak (Site Folder: Access Analysis)]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

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

| Vehicle Movement Performance  |      |           |                                         |      |                                          |      |                      |                        |                  |                                             |     |           |                |                     |                         |
|-------------------------------|------|-----------|-----------------------------------------|------|------------------------------------------|------|----------------------|------------------------|------------------|---------------------------------------------|-----|-----------|----------------|---------------------|-------------------------|
| Mov ID                        | Turn | Mov Class | Demand Flows<br>[ Total HV ]<br>veh/h % |      | Arrival Flows<br>[ Total HV ]<br>veh/h % |      | Deg. Satn<br><br>v/c | Aver. Delay<br><br>sec | Level of Service | 95% Back Of Queue<br>[ Veh. Dist ]<br>veh m |     | Prop. Que | Eff. Stop Rate | Aver. No. of Cycles | Aver. Speed<br><br>km/h |
| East: Waterfall Way from East |      |           |                                         |      |                                          |      |                      |                        |                  |                                             |     |           |                |                     |                         |
| 5                             | T1   | All MCs   | 73                                      | 13.0 | 73                                       | 13.0 | 0.040                | 0.0                    | LOS A            | 0.0                                         | 0.0 | 0.00      | 0.00           | 0.00                | 60.0                    |
| 6                             | R2   | All MCs   | 9                                       | 0.0  | 9                                        | 0.0  | 0.010                | 7.2                    | LOS A            | 0.0                                         | 0.3 | 0.43      | 0.60           | 0.43                | 47.1                    |
| Approach                      |      |           | 82                                      | 11.5 | 82                                       | 11.5 | 0.040                | 0.8                    | NA               | 0.0                                         | 0.3 | 0.05      | 0.07           | 0.05                | 58.8                    |
| North: Access                 |      |           |                                         |      |                                          |      |                      |                        |                  |                                             |     |           |                |                     |                         |
| 7                             | L2   | All MCs   | 3                                       | 0.0  | 3                                        | 0.0  | 0.075                | 6.4                    | LOS A            | 0.3                                         | 2.0 | 0.48      | 0.68           | 0.48                | 46.0                    |
| 9                             | R2   | All MCs   | 47                                      | 0.0  | 47                                       | 0.0  | 0.075                | 8.6                    | LOS A            | 0.3                                         | 2.0 | 0.48      | 0.68           | 0.48                | 46.0                    |
| Approach                      |      |           | 51                                      | 0.0  | 51                                       | 0.0  | 0.075                | 8.5                    | LOS A            | 0.3                                         | 2.0 | 0.48      | 0.68           | 0.48                | 46.0                    |
| West: Waterfall Way from West |      |           |                                         |      |                                          |      |                      |                        |                  |                                             |     |           |                |                     |                         |
| 10                            | L2   | All MCs   | 187                                     | 0.0  | 187                                      | 0.0  | 0.101                | 5.6                    | LOS A            | 0.0                                         | 0.0 | 0.00      | 0.58           | 0.00                | 49.0                    |
| 11                            | T1   | All MCs   | 214                                     | 4.9  | 214                                      | 4.9  | 0.113                | 0.0                    | LOS A            | 0.0                                         | 0.0 | 0.00      | 0.00           | 0.00                | 59.9                    |
| Approach                      |      |           | 401                                     | 2.6  | 401                                      | 2.6  | 0.113                | 2.6                    | NA               | 0.0                                         | 0.0 | 0.00      | 0.27           | 0.00                | 55.7                    |
| All Vehicles                  |      |           | 534                                     | 3.7  | 534                                      | 3.7  | 0.113                | 2.9                    | NA               | 0.3                                         | 2.0 | 0.05      | 0.28           | 0.05                | 55.4                    |

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options 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 (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).  
Two-Way Sign Control Capacity Model: SIDRA Standard.  
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).  
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.  
Gap-Acceptance Capacity Formula: SIDRA Standard (Akcelik M3D).  
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.  
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.



# MOVEMENT SUMMARY

Site: 101 [Access / Waterfall Way AM Peak Hour Future Year  
2038 AM Peak (Site Folder: Access Analysis)]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

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

| Vehicle Movement Performance  |      |           |                                         |      |                                          |      |                      |                        |                  |                                                                       |      |           |                |                     |                         |
|-------------------------------|------|-----------|-----------------------------------------|------|------------------------------------------|------|----------------------|------------------------|------------------|-----------------------------------------------------------------------|------|-----------|----------------|---------------------|-------------------------|
| Mov ID                        | Turn | Mov Class | Demand Flows<br>[ Total HV ]<br>veh/h % |      | Arrival Flows<br>[ Total HV ]<br>veh/h % |      | Deg. Satn<br><br>v/c | Aver. Delay<br><br>sec | Level of Service | 95% Back Of Queue<br>[ Veh. veh      Dist ]<br>veh                  m |      | Prop. Que | Eff. Stop Rate | Aver. No. of Cycles | Aver. Speed<br><br>km/h |
| East: Waterfall Way from East |      |           |                                         |      |                                          |      |                      |                        |                  |                                                                       |      |           |                |                     |                         |
| 5                             | T1   | All MCs   | 497                                     | 25.8 | 497                                      | 25.8 | 0.298                | 0.1                    | LOS A            | 0.0                                                                   | 0.0  | 0.00      | 0.00           | 0.00                | 59.8                    |
| 6                             | R2   | All MCs   | 3                                       | 0.0  | 3                                        | 0.0  | 0.003                | 7.0                    | LOS A            | 0.0                                                                   | 0.1  | 0.42      | 0.57           | 0.42                | 47.2                    |
| Approach                      |      |           | 500                                     | 25.7 | 500                                      | 25.7 | 0.298                | 0.1                    | NA               | 0.0                                                                   | 0.1  | 0.00      | 0.00           | 0.00                | 59.7                    |
| North: Access                 |      |           |                                         |      |                                          |      |                      |                        |                  |                                                                       |      |           |                |                     |                         |
| 7                             | L2   | All MCs   | 11                                      | 0.0  | 11                                       | 0.0  | 0.695                | 16.6                   | LOS C            | 4.2                                                                   | 29.4 | 0.90      | 1.20           | 1.77                | 32.0                    |
| 9                             | R2   | All MCs   | 187                                     | 0.0  | 187                                      | 0.0  | 0.695                | 30.2                   | LOS D            | 4.2                                                                   | 29.4 | 0.90      | 1.20           | 1.77                | 32.0                    |
| Approach                      |      |           | 198                                     | 0.0  | 198                                      | 0.0  | 0.695                | 29.5                   | LOS D            | 4.2                                                                   | 29.4 | 0.90      | 1.20           | 1.77                | 32.0                    |
| West: Waterfall Way from West |      |           |                                         |      |                                          |      |                      |                        |                  |                                                                       |      |           |                |                     |                         |
| 10                            | L2   | All MCs   | 47                                      | 0.0  | 47                                       | 0.0  | 0.026                | 5.5                    | LOS A            | 0.0                                                                   | 0.0  | 0.00      | 0.58           | 0.00                | 49.0                    |
| 11                            | T1   | All MCs   | 262                                     | 54.2 | 262                                      | 54.2 | 0.182                | 0.1                    | LOS A            | 0.0                                                                   | 0.0  | 0.00      | 0.00           | 0.00                | 59.9                    |
| Approach                      |      |           | 309                                     | 45.9 | 309                                      | 45.9 | 0.182                | 0.9                    | NA               | 0.0                                                                   | 0.0  | 0.00      | 0.09           | 0.00                | 58.6                    |
| All Vehicles                  |      |           | 1007                                    | 26.9 | 1007                                     | 26.9 | 0.695                | 6.1                    | NA               | 4.2                                                                   | 29.4 | 0.18      | 0.26           | 0.35                | 53.3                    |

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options 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 (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).  
Two-Way Sign Control Capacity Model: SIDRA Standard.  
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).  
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.  
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).  
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.  
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

# MOVEMENT SUMMARY

Site: 101 [Access / Waterfall Way AM Peak Hour Future Year  
2038 PM Peak (Site Folder: Access Analysis)]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

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

| Vehicle Movement Performance  |      |           |                                         |      |                                          |      |                      |                        |                  |                                             |     |           |                |                     |                         |
|-------------------------------|------|-----------|-----------------------------------------|------|------------------------------------------|------|----------------------|------------------------|------------------|---------------------------------------------|-----|-----------|----------------|---------------------|-------------------------|
| Mov ID                        | Turn | Mov Class | Demand Flows<br>[ Total HV ]<br>veh/h % |      | Arrival Flows<br>[ Total HV ]<br>veh/h % |      | Deg. Satn<br><br>v/c | Aver. Delay<br><br>sec | Level of Service | 95% Back Of Queue<br>[ Veh. Dist ]<br>veh m |     | Prop. Que | Eff. Stop Rate | Aver. No. of Cycles | Aver. Speed<br><br>km/h |
| East: Waterfall Way from East |      |           |                                         |      |                                          |      |                      |                        |                  |                                             |     |           |                |                     |                         |
| 5                             | T1   | All MCs   | 82                                      | 15.4 | 82                                       | 15.4 | 0.046                | 0.0                    | LOS A            | 0.0                                         | 0.0 | 0.00      | 0.00           | 0.00                | 60.0                    |
| 6                             | R2   | All MCs   | 11                                      | 0.0  | 11                                       | 0.0  | 0.011                | 7.2                    | LOS A            | 0.0                                         | 0.3 | 0.44      | 0.60           | 0.44                | 47.1                    |
| Approach                      |      |           | 93                                      | 13.6 | 93                                       | 13.6 | 0.046                | 0.8                    | NA               | 0.0                                         | 0.3 | 0.05      | 0.07           | 0.05                | 58.8                    |
| North: Access                 |      |           |                                         |      |                                          |      |                      |                        |                  |                                             |     |           |                |                     |                         |
| 7                             | L2   | All MCs   | 3                                       | 0.0  | 3                                        | 0.0  | 0.078                | 6.5                    | LOS A            | 0.3                                         | 2.0 | 0.49      | 0.69           | 0.49                | 45.8                    |
| 9                             | R2   | All MCs   | 47                                      | 0.0  | 47                                       | 0.0  | 0.078                | 8.9                    | LOS A            | 0.3                                         | 2.0 | 0.49      | 0.69           | 0.49                | 45.8                    |
| Approach                      |      |           | 51                                      | 0.0  | 51                                       | 0.0  | 0.078                | 8.7                    | LOS A            | 0.3                                         | 2.0 | 0.49      | 0.69           | 0.49                | 45.8                    |
| West: Waterfall Way from West |      |           |                                         |      |                                          |      |                      |                        |                  |                                             |     |           |                |                     |                         |
| 10                            | L2   | All MCs   | 187                                     | 0.0  | 187                                      | 0.0  | 0.101                | 5.6                    | LOS A            | 0.0                                         | 0.0 | 0.00      | 0.58           | 0.00                | 49.0                    |
| 11                            | T1   | All MCs   | 223                                     | 6.1  | 223                                      | 6.1  | 0.119                | 0.0                    | LOS A            | 0.0                                         | 0.0 | 0.00      | 0.00           | 0.00                | 59.9                    |
| Approach                      |      |           | 411                                     | 3.3  | 411                                      | 3.3  | 0.119                | 2.6                    | NA               | 0.0                                         | 0.0 | 0.00      | 0.26           | 0.00                | 55.8                    |
| All Vehicles                  |      |           | 554                                     | 4.8  | 554                                      | 4.8  | 0.119                | 2.8                    | NA               | 0.3                                         | 2.0 | 0.05      | 0.27           | 0.05                | 55.5                    |

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options 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 (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).  
Two-Way Sign Control Capacity Model: SIDRA Standard.  
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).  
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.  
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).  
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.  
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

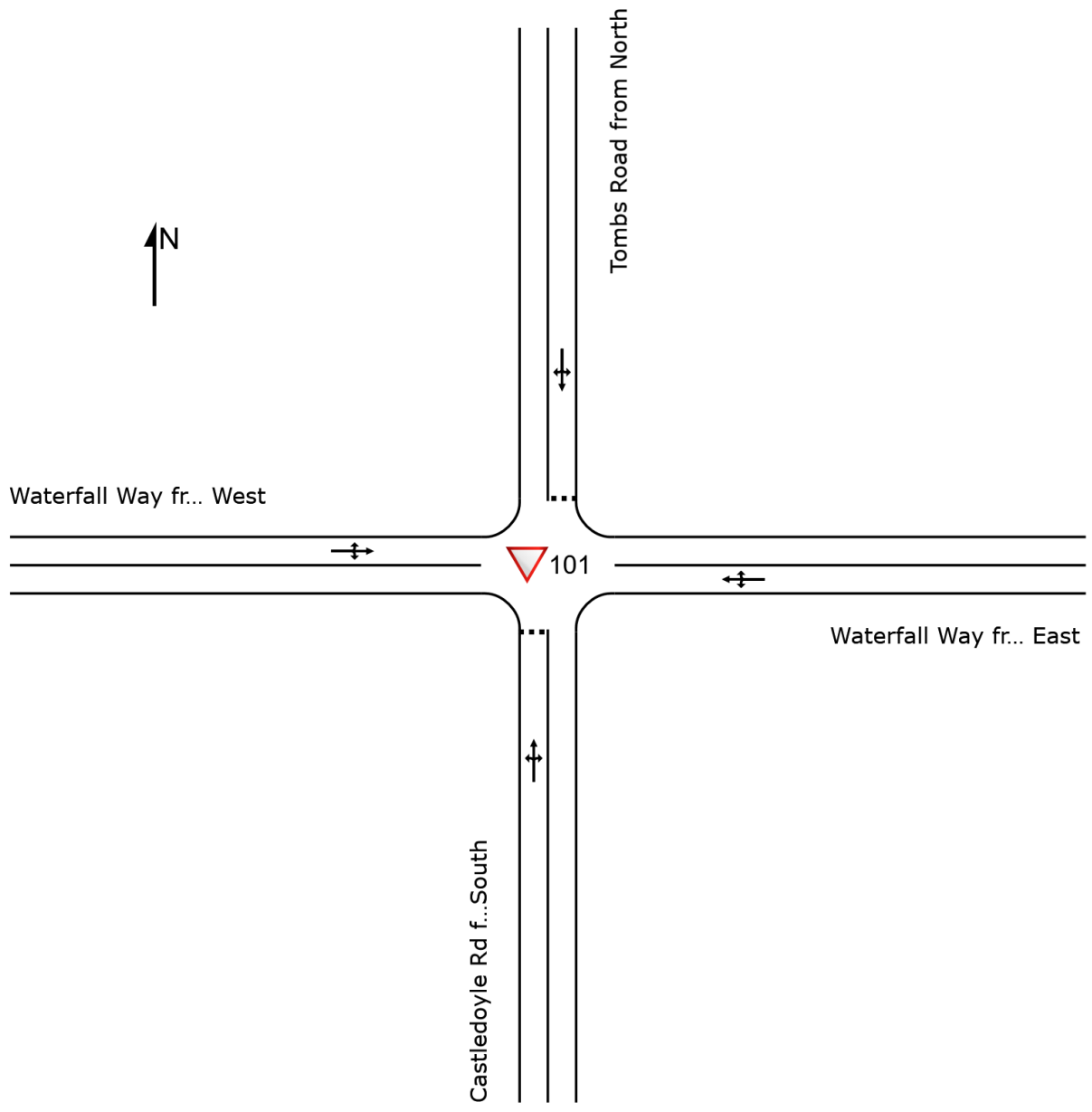


# SITE LAYOUT

▽ Site: 101 [Tombs Road / Waterfall Way AM Peak Hour Year  
2025 Without Development (Site Folder: Intersection Impact)]

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

Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.



# MOVEMENT SUMMARY

Site: 101 [Tombs Road / Waterfall Way AM Peak Hour Year 2025 Without Development (Site Folder: Intersection Impact)]

Output produced by SIDRA INTERSECTION Version: 9.1.1.200

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

| Vehicle Movement Performance     |      |           |                                         |      |                                          |      |                      |                        |                  |                                                           |     |           |                |                     |                         |
|----------------------------------|------|-----------|-----------------------------------------|------|------------------------------------------|------|----------------------|------------------------|------------------|-----------------------------------------------------------|-----|-----------|----------------|---------------------|-------------------------|
| Mov ID                           | Turn | Mov Class | Demand Flows<br>[ Total HV ]<br>veh/h % |      | Arrival Flows<br>[ Total HV ]<br>veh/h % |      | Deg. Satn<br><br>v/c | Aver. Delay<br><br>sec | Level of Service | 95% Back Of Queue<br>[ Veh. veh      Dist ]<br>veh      m |     | Prop. Que | Eff. Stop Rate | Aver. No. of Cycles | Aver. Speed<br><br>km/h |
| South: Castledoyle Rd from South |      |           |                                         |      |                                          |      |                      |                        |                  |                                                           |     |           |                |                     |                         |
| 1                                | L2   | All MCs   | 82                                      | 42.3 | 82                                       | 42.3 | 0.093                | 7.3                    | LOS A            | 0.4                                                       | 3.4 | 0.38      | 0.61           | 0.38                | 50.1                    |
| 2                                | T1   | All MCs   | 1                                       | 0.0  | 1                                        | 0.0  | 0.093                | 6.7                    | LOS A            | 0.4                                                       | 3.4 | 0.38      | 0.61           | 0.38                | 52.2                    |
| 3                                | R2   | All MCs   | 5                                       | 40.0 | 5                                        | 40.0 | 0.093                | 11.1                   | LOS B            | 0.4                                                       | 3.4 | 0.38      | 0.61           | 0.38                | 49.8                    |
| Approach                         |      |           | 88                                      | 41.7 | 88                                       | 41.7 | 0.093                | 7.5                    | LOS A            | 0.4                                                       | 3.4 | 0.38      | 0.61           | 0.38                | 50.1                    |
| East: Waterfall Way from East    |      |           |                                         |      |                                          |      |                      |                        |                  |                                                           |     |           |                |                     |                         |
| 4                                | L2   | All MCs   | 8                                       | 50.0 | 8                                        | 50.0 | 0.138                | 6.1                    | LOS A            | 0.0                                                       | 0.1 | 0.00      | 0.03           | 0.00                | 54.9                    |
| 5                                | T1   | All MCs   | 202                                     | 41.1 | 202                                      | 41.1 | 0.138                | 0.0                    | LOS A            | 0.0                                                       | 0.1 | 0.00      | 0.03           | 0.00                | 59.8                    |
| 6                                | R2   | All MCs   | 1                                       | 0.0  | 1                                        | 0.0  | 0.138                | 5.7                    | LOS A            | 0.0                                                       | 0.1 | 0.00      | 0.03           | 0.00                | 56.9                    |
| Approach                         |      |           | 212                                     | 41.3 | 212                                      | 41.3 | 0.138                | 0.3                    | NA               | 0.0                                                       | 0.1 | 0.00      | 0.03           | 0.00                | 59.5                    |
| North: Tombs Road from North     |      |           |                                         |      |                                          |      |                      |                        |                  |                                                           |     |           |                |                     |                         |
| 7                                | L2   | All MCs   | 1                                       | 0.0  | 1                                        | 0.0  | 0.017                | 6.1                    | LOS A            | 0.1                                                       | 0.5 | 0.53      | 0.68           | 0.53                | 49.2                    |
| 8                                | T1   | All MCs   | 1                                       | 0.0  | 1                                        | 0.0  | 0.017                | 6.4                    | LOS A            | 0.1                                                       | 0.5 | 0.53      | 0.68           | 0.53                | 49.6                    |
| 9                                | R2   | All MCs   | 5                                       | 60.0 | 5                                        | 60.0 | 0.017                | 13.4                   | LOS B            | 0.1                                                       | 0.5 | 0.53      | 0.68           | 0.53                | 46.7                    |
| Approach                         |      |           | 7                                       | 42.9 | 7                                        | 42.9 | 0.017                | 11.3                   | LOS B            | 0.1                                                       | 0.5 | 0.53      | 0.68           | 0.53                | 47.5                    |
| West: Waterfall Way from West    |      |           |                                         |      |                                          |      |                      |                        |                  |                                                           |     |           |                |                     |                         |
| 10                               | L2   | All MCs   | 5                                       | 80.0 | 5                                        | 80.0 | 0.158                | 6.5                    | LOS A            | 0.5                                                       | 5.3 | 0.22      | 0.28           | 0.22                | 51.9                    |
| 11                               | T1   | All MCs   | 146                                     | 66.2 | 146                                      | 66.2 | 0.158                | 0.0                    | LOS A            | 0.5                                                       | 5.3 | 0.22      | 0.28           | 0.22                | 57.7                    |
| 12                               | R2   | All MCs   | 44                                      | 64.3 | 44                                       | 64.3 | 0.158                | 10.2                   | LOS B            | 0.5                                                       | 5.3 | 0.22      | 0.28           | 0.22                | 52.1                    |
| Approach                         |      |           | 196                                     | 66.1 | 196                                      | 66.1 | 0.158                | 2.5                    | NA               | 0.5                                                       | 5.3 | 0.22      | 0.28           | 0.22                | 56.2                    |
| All Vehicles                     |      |           | 503                                     | 51.0 | 503                                      | 51.0 | 0.158                | 2.6                    | NA               | 0.5                                                       | 5.3 | 0.16      | 0.24           | 0.16                | 56.2                    |

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options 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 (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).  
Two-Way Sign Control Capacity Model: SIDRA Standard.  
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).  
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.  
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).  
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.  
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.



# MOVEMENT SUMMARY

Site: 101 [Tombs Road / Waterfall Way PM Peak Hour Year 2025 Without Development (Site Folder: Intersection Impact)]

Output produced by SIDRA INTERSECTION Version: 9.1.1.200

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

| Vehicle Movement Performance     |      |           |                                         |       |                                          |       |                      |                        |                  |                                             |     |           |                |                     |                         |
|----------------------------------|------|-----------|-----------------------------------------|-------|------------------------------------------|-------|----------------------|------------------------|------------------|---------------------------------------------|-----|-----------|----------------|---------------------|-------------------------|
| Mov ID                           | Turn | Mov Class | Demand Flows<br>[ Total HV ]<br>veh/h % |       | Arrival Flows<br>[ Total HV ]<br>veh/h % |       | Deg. Satn<br><br>v/c | Aver. Delay<br><br>sec | Level of Service | 95% Back Of Queue<br>[ Veh. Dist ]<br>veh m |     | Prop. Que | Eff. Stop Rate | Aver. No. of Cycles | Aver. Speed<br><br>km/h |
| South: Castledoyle Rd from South |      |           |                                         |       |                                          |       |                      |                        |                  |                                             |     |           |                |                     |                         |
| 1                                | L2   | All MCs   | 2                                       | 50.0  | 2                                        | 50.0  | 0.003                | 6.2                    | LOS A            | 0.0                                         | 0.1 | 0.11      | 0.53           | 0.11                | 50.9                    |
| 2                                | T1   | All MCs   | 1                                       | 0.0   | 1                                        | 0.0   | 0.003                | 4.3                    | LOS A            | 0.0                                         | 0.1 | 0.11      | 0.53           | 0.11                | 53.4                    |
| 3                                | R2   | All MCs   | 1                                       | 0.0   | 1                                        | 0.0   | 0.003                | 5.7                    | LOS A            | 0.0                                         | 0.1 | 0.11      | 0.53           | 0.11                | 52.7                    |
| Approach                         |      |           | 4                                       | 25.0  | 4                                        | 25.0  | 0.003                | 5.6                    | LOS A            | 0.0                                         | 0.1 | 0.11      | 0.53           | 0.11                | 51.9                    |
| East: Waterfall Way from East    |      |           |                                         |       |                                          |       |                      |                        |                  |                                             |     |           |                |                     |                         |
| 4                                | L2   | All MCs   | 1                                       | 0.0   | 1                                        | 0.0   | 0.016                | 5.5                    | LOS A            | 0.0                                         | 0.1 | 0.02      | 0.05           | 0.02                | 56.7                    |
| 5                                | T1   | All MCs   | 22                                      | 38.1  | 22                                       | 38.1  | 0.016                | 0.0                    | LOS A            | 0.0                                         | 0.1 | 0.02      | 0.05           | 0.02                | 59.1                    |
| 6                                | R2   | All MCs   | 1                                       | 100.0 | 1                                        | 100.0 | 0.016                | 6.8                    | LOS A            | 0.0                                         | 0.1 | 0.02      | 0.05           | 0.02                | 51.6                    |
| Approach                         |      |           | 24                                      | 39.1  | 24                                       | 39.1  | 0.016                | 0.5                    | NA               | 0.0                                         | 0.1 | 0.02      | 0.05           | 0.02                | 58.6                    |
| North: Tombs Road from North     |      |           |                                         |       |                                          |       |                      |                        |                  |                                             |     |           |                |                     |                         |
| 7                                | L2   | All MCs   | 1                                       | 0.0   | 1                                        | 0.0   | 0.002                | 5.6                    | LOS A            | 0.0                                         | 0.1 | 0.11      | 0.53           | 0.11                | 52.9                    |
| 8                                | T1   | All MCs   | 1                                       | 0.0   | 1                                        | 0.0   | 0.002                | 4.3                    | LOS A            | 0.0                                         | 0.1 | 0.11      | 0.53           | 0.11                | 53.4                    |
| 9                                | R2   | All MCs   | 1                                       | 0.0   | 1                                        | 0.0   | 0.002                | 5.7                    | LOS A            | 0.0                                         | 0.1 | 0.11      | 0.53           | 0.11                | 52.7                    |
| Approach                         |      |           | 3                                       | 0.0   | 3                                        | 0.0   | 0.002                | 5.2                    | LOS A            | 0.0                                         | 0.1 | 0.11      | 0.53           | 0.11                | 53.0                    |
| West: Waterfall Way from West    |      |           |                                         |       |                                          |       |                      |                        |                  |                                             |     |           |                |                     |                         |
| 10                               | L2   | All MCs   | 1                                       | 100.0 | 1                                        | 100.0 | 0.019                | 6.7                    | LOS A            | 0.0                                         | 0.3 | 0.03      | 0.11           | 0.03                | 51.8                    |
| 11                               | T1   | All MCs   | 23                                      | 40.9  | 23                                       | 40.9  | 0.019                | 0.0                    | LOS A            | 0.0                                         | 0.3 | 0.03      | 0.11           | 0.03                | 58.6                    |
| 12                               | R2   | All MCs   | 4                                       | 25.0  | 4                                        | 25.0  | 0.019                | 5.8                    | LOS A            | 0.0                                         | 0.3 | 0.03      | 0.11           | 0.03                | 54.6                    |
| Approach                         |      |           | 28                                      | 40.7  | 28                                       | 40.7  | 0.019                | 1.1                    | NA               | 0.0                                         | 0.3 | 0.03      | 0.11           | 0.03                | 57.7                    |
| All Vehicles                     |      |           | 60                                      | 36.8  | 60                                       | 36.8  | 0.019                | 1.4                    | NA               | 0.0                                         | 0.3 | 0.04      | 0.14           | 0.04                | 57.3                    |

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options 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 (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).  
Two-Way Sign Control Capacity Model: SIDRA Standard.  
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).  
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.  
Gap-Acceptance Capacity Formula: SIDRA Standard (Akcelik M3D).  
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.  
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

# MOVEMENT SUMMARY

Site: 101 [Tombs Road / Waterfall Way AM Peak Hour Year 2028 Without Development (Site Folder: Intersection Impact)]

Output produced by SIDRA INTERSECTION Version: 9.1.1.200

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

| Vehicle Movement Performance     |      |           |                                         |      |                                          |      |                      |                        |                  |                                                  |     |           |                |                     |                         |
|----------------------------------|------|-----------|-----------------------------------------|------|------------------------------------------|------|----------------------|------------------------|------------------|--------------------------------------------------|-----|-----------|----------------|---------------------|-------------------------|
| Mov ID                           | Turn | Mov Class | Demand Flows<br>[ Total HV ]<br>veh/h % |      | Arrival Flows<br>[ Total HV ]<br>veh/h % |      | Deg. Satn<br><br>v/c | Aver. Delay<br><br>sec | Level of Service | 95% Back Of Queue<br>[ Veh. veh      Dist ]<br>m |     | Prop. Que | Eff. Stop Rate | Aver. No. of Cycles | Aver. Speed<br><br>km/h |
| South: Castledoyle Rd from South |      |           |                                         |      |                                          |      |                      |                        |                  |                                                  |     |           |                |                     |                         |
| 1                                | L2   | All MCs   | 89                                      | 42.4 | 89                                       | 42.4 | 0.103                | 7.5                    | LOS A            | 0.4                                              | 3.8 | 0.40      | 0.62           | 0.40                | 50.0                    |
| 2                                | T1   | All MCs   | 1                                       | 0.0  | 1                                        | 0.0  | 0.103                | 7.0                    | LOS A            | 0.4                                              | 3.8 | 0.40      | 0.62           | 0.40                | 52.0                    |
| 3                                | R2   | All MCs   | 5                                       | 40.0 | 5                                        | 40.0 | 0.103                | 12.0                   | LOS B            | 0.4                                              | 3.8 | 0.40      | 0.62           | 0.40                | 49.7                    |
| Approach                         |      |           | 96                                      | 41.8 | 96                                       | 41.8 | 0.103                | 7.7                    | LOS A            | 0.4                                              | 3.8 | 0.40      | 0.62           | 0.40                | 50.0                    |
| East: Waterfall Way from East    |      |           |                                         |      |                                          |      |                      |                        |                  |                                                  |     |           |                |                     |                         |
| 4                                | L2   | All MCs   | 8                                       | 50.0 | 8                                        | 50.0 | 0.150                | 6.1                    | LOS A            | 0.0                                              | 0.1 | 0.00      | 0.02           | 0.00                | 54.9                    |
| 5                                | T1   | All MCs   | 220                                     | 41.1 | 220                                      | 41.1 | 0.150                | 0.0                    | LOS A            | 0.0                                              | 0.1 | 0.00      | 0.02           | 0.00                | 59.8                    |
| 6                                | R2   | All MCs   | 1                                       | 0.0  | 1                                        | 0.0  | 0.150                | 5.7                    | LOS A            | 0.0                                              | 0.1 | 0.00      | 0.02           | 0.00                | 57.0                    |
| Approach                         |      |           | 229                                     | 41.3 | 229                                      | 41.3 | 0.150                | 0.3                    | NA               | 0.0                                              | 0.1 | 0.00      | 0.02           | 0.00                | 59.6                    |
| North: Tombs Road from North     |      |           |                                         |      |                                          |      |                      |                        |                  |                                                  |     |           |                |                     |                         |
| 7                                | L2   | All MCs   | 1                                       | 0.0  | 1                                        | 0.0  | 0.019                | 6.2                    | LOS A            | 0.1                                              | 0.5 | 0.55      | 0.70           | 0.55                | 48.6                    |
| 8                                | T1   | All MCs   | 1                                       | 0.0  | 1                                        | 0.0  | 0.019                | 6.7                    | LOS A            | 0.1                                              | 0.5 | 0.55      | 0.70           | 0.55                | 49.0                    |
| 9                                | R2   | All MCs   | 5                                       | 60.0 | 5                                        | 60.0 | 0.019                | 14.5                   | LOS B            | 0.1                                              | 0.5 | 0.55      | 0.70           | 0.55                | 46.2                    |
| Approach                         |      |           | 7                                       | 42.9 | 7                                        | 42.9 | 0.019                | 12.2                   | LOS B            | 0.1                                              | 0.5 | 0.55      | 0.70           | 0.55                | 46.9                    |
| West: Waterfall Way from West    |      |           |                                         |      |                                          |      |                      |                        |                  |                                                  |     |           |                |                     |                         |
| 10                               | L2   | All MCs   | 5                                       | 80.0 | 5                                        | 80.0 | 0.175                | 6.5                    | LOS A            | 0.5                                              | 6.0 | 0.24      | 0.29           | 0.24                | 51.9                    |
| 11                               | T1   | All MCs   | 160                                     | 66.4 | 160                                      | 66.4 | 0.175                | 0.0                    | LOS A            | 0.5                                              | 6.0 | 0.24      | 0.29           | 0.24                | 57.7                    |
| 12                               | R2   | All MCs   | 48                                      | 65.2 | 48                                       | 65.2 | 0.175                | 10.8                   | LOS B            | 0.5                                              | 6.0 | 0.24      | 0.29           | 0.24                | 52.0                    |
| Approach                         |      |           | 214                                     | 66.5 | 214                                      | 66.5 | 0.175                | 2.6                    | NA               | 0.5                                              | 6.0 | 0.24      | 0.29           | 0.24                | 56.2                    |
| All Vehicles                     |      |           | 546                                     | 51.3 | 546                                      | 51.3 | 0.175                | 2.6                    | NA               | 0.5                                              | 6.0 | 0.17      | 0.24           | 0.17                | 56.1                    |

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options 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 (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).  
Two-Way Sign Control Capacity Model: SIDRA Standard.  
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).  
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.  
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).  
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.  
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.



# MOVEMENT SUMMARY

Site: 101 [Tombs Road / Waterfall Way PM Peak Hour Year 2028 Without Development (Site Folder: Intersection Impact)]

Output produced by SIDRA INTERSECTION Version: 9.1.1.200

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

| Vehicle Movement Performance     |      |           |                                         |       |                                          |       |                      |                        |                  |                                             |     |           |                |                     |                         |
|----------------------------------|------|-----------|-----------------------------------------|-------|------------------------------------------|-------|----------------------|------------------------|------------------|---------------------------------------------|-----|-----------|----------------|---------------------|-------------------------|
| Mov ID                           | Turn | Mov Class | Demand Flows<br>[ Total HV ]<br>veh/h % |       | Arrival Flows<br>[ Total HV ]<br>veh/h % |       | Deg. Satn<br><br>v/c | Aver. Delay<br><br>sec | Level of Service | 95% Back Of Queue<br>[ Veh. Dist ]<br>veh m |     | Prop. Que | Eff. Stop Rate | Aver. No. of Cycles | Aver. Speed<br><br>km/h |
| South: Castledoyle Rd from South |      |           |                                         |       |                                          |       |                      |                        |                  |                                             |     |           |                |                     |                         |
| 1                                | L2   | All MCs   | 2                                       | 50.0  | 2                                        | 50.0  | 0.003                | 6.2                    | LOS A            | 0.0                                         | 0.1 | 0.12      | 0.53           | 0.12                | 50.9                    |
| 2                                | T1   | All MCs   | 1                                       | 0.0   | 1                                        | 0.0   | 0.003                | 4.4                    | LOS A            | 0.0                                         | 0.1 | 0.12      | 0.53           | 0.12                | 53.3                    |
| 3                                | R2   | All MCs   | 1                                       | 0.0   | 1                                        | 0.0   | 0.003                | 5.7                    | LOS A            | 0.0                                         | 0.1 | 0.12      | 0.53           | 0.12                | 52.6                    |
| Approach                         |      |           | 4                                       | 25.0  | 4                                        | 25.0  | 0.003                | 5.6                    | LOS A            | 0.0                                         | 0.1 | 0.12      | 0.53           | 0.12                | 51.9                    |
| East: Waterfall Way from East    |      |           |                                         |       |                                          |       |                      |                        |                  |                                             |     |           |                |                     |                         |
| 4                                | L2   | All MCs   | 1                                       | 0.0   | 1                                        | 0.0   | 0.017                | 5.5                    | LOS A            | 0.0                                         | 0.1 | 0.02      | 0.05           | 0.02                | 56.7                    |
| 5                                | T1   | All MCs   | 24                                      | 39.1  | 24                                       | 39.1  | 0.017                | 0.0                    | LOS A            | 0.0                                         | 0.1 | 0.02      | 0.05           | 0.02                | 59.2                    |
| 6                                | R2   | All MCs   | 1                                       | 100.0 | 1                                        | 100.0 | 0.017                | 6.8                    | LOS A            | 0.0                                         | 0.1 | 0.02      | 0.05           | 0.02                | 51.7                    |
| Approach                         |      |           | 26                                      | 40.0  | 26                                       | 40.0  | 0.017                | 0.5                    | NA               | 0.0                                         | 0.1 | 0.02      | 0.05           | 0.02                | 58.7                    |
| North: Tombs Road from North     |      |           |                                         |       |                                          |       |                      |                        |                  |                                             |     |           |                |                     |                         |
| 7                                | L2   | All MCs   | 1                                       | 0.0   | 1                                        | 0.0   | 0.002                | 5.6                    | LOS A            | 0.0                                         | 0.1 | 0.12      | 0.53           | 0.12                | 52.9                    |
| 8                                | T1   | All MCs   | 1                                       | 0.0   | 1                                        | 0.0   | 0.002                | 4.3                    | LOS A            | 0.0                                         | 0.1 | 0.12      | 0.53           | 0.12                | 53.3                    |
| 9                                | R2   | All MCs   | 1                                       | 0.0   | 1                                        | 0.0   | 0.002                | 5.7                    | LOS A            | 0.0                                         | 0.1 | 0.12      | 0.53           | 0.12                | 52.6                    |
| Approach                         |      |           | 3                                       | 0.0   | 3                                        | 0.0   | 0.002                | 5.2                    | LOS A            | 0.0                                         | 0.1 | 0.12      | 0.53           | 0.12                | 53.0                    |
| West: Waterfall Way from West    |      |           |                                         |       |                                          |       |                      |                        |                  |                                             |     |           |                |                     |                         |
| 10                               | L2   | All MCs   | 1                                       | 100.0 | 1                                        | 100.0 | 0.020                | 6.7                    | LOS A            | 0.0                                         | 0.3 | 0.03      | 0.10           | 0.03                | 51.8                    |
| 11                               | T1   | All MCs   | 25                                      | 41.7  | 25                                       | 41.7  | 0.020                | 0.0                    | LOS A            | 0.0                                         | 0.3 | 0.03      | 0.10           | 0.03                | 58.6                    |
| 12                               | R2   | All MCs   | 4                                       | 25.0  | 4                                        | 25.0  | 0.020                | 5.9                    | LOS A            | 0.0                                         | 0.3 | 0.03      | 0.10           | 0.03                | 54.7                    |
| Approach                         |      |           | 31                                      | 41.4  | 31                                       | 41.4  | 0.020                | 1.0                    | NA               | 0.0                                         | 0.3 | 0.03      | 0.10           | 0.03                | 57.8                    |
| All Vehicles                     |      |           | 64                                      | 37.7  | 64                                       | 37.7  | 0.020                | 1.3                    | NA               | 0.0                                         | 0.3 | 0.04      | 0.13           | 0.04                | 57.5                    |

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options 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 (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).  
Two-Way Sign Control Capacity Model: SIDRA Standard.  
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).  
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.  
Gap-Acceptance Capacity Formula: SIDRA Standard (Akcelik M3D).  
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.  
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

# MOVEMENT SUMMARY

Site: 101 [Tombs Road / Waterfall Way AM Peak Hour Year 2038 Without Development (Site Folder: Intersection Impact)]

Output produced by SIDRA INTERSECTION Version: 9.1.1.200

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

| Vehicle Movement Performance     |      |           |                                         |      |                                          |      |                      |                        |                  |                                             |     |           |                |                     |                         |
|----------------------------------|------|-----------|-----------------------------------------|------|------------------------------------------|------|----------------------|------------------------|------------------|---------------------------------------------|-----|-----------|----------------|---------------------|-------------------------|
| Mov ID                           | Turn | Mov Class | Demand Flows<br>[ Total HV ]<br>veh/h % |      | Arrival Flows<br>[ Total HV ]<br>veh/h % |      | Deg. Satn<br><br>v/c | Aver. Delay<br><br>sec | Level of Service | 95% Back Of Queue<br>[ Veh. Dist ]<br>veh m |     | Prop. Que | Eff. Stop Rate | Aver. No. of Cycles | Aver. Speed<br><br>km/h |
| South: Castledoyle Rd from South |      |           |                                         |      |                                          |      |                      |                        |                  |                                             |     |           |                |                     |                         |
| 1                                | L2   | All MCs   | 120                                     | 42.1 | 120                                      | 42.1 | 0.163                | 8.3                    | LOS A            | 0.6                                         | 6.0 | 0.49      | 0.69           | 0.49                | 49.3                    |
| 2                                | T1   | All MCs   | 1                                       | 0.0  | 1                                        | 0.0  | 0.163                | 8.9                    | LOS A            | 0.6                                         | 6.0 | 0.49      | 0.69           | 0.49                | 51.3                    |
| 3                                | R2   | All MCs   | 7                                       | 42.9 | 7                                        | 42.9 | 0.163                | 16.8                   | LOS C            | 0.6                                         | 6.0 | 0.49      | 0.69           | 0.49                | 48.9                    |
| Approach                         |      |           | 128                                     | 41.8 | 128                                      | 41.8 | 0.163                | 8.7                    | LOS A            | 0.6                                         | 6.0 | 0.49      | 0.69           | 0.49                | 49.3                    |
| East: Waterfall Way from East    |      |           |                                         |      |                                          |      |                      |                        |                  |                                             |     |           |                |                     |                         |
| 4                                | L2   | All MCs   | 13                                      | 50.0 | 13                                       | 50.0 | 0.203                | 6.1                    | LOS A            | 0.0                                         | 0.1 | 0.00      | 0.03           | 0.00                | 54.9                    |
| 5                                | T1   | All MCs   | 297                                     | 41.1 | 297                                      | 41.1 | 0.203                | 0.0                    | LOS A            | 0.0                                         | 0.1 | 0.00      | 0.03           | 0.00                | 59.8                    |
| 6                                | R2   | All MCs   | 1                                       | 0.0  | 1                                        | 0.0  | 0.203                | 5.9                    | LOS A            | 0.0                                         | 0.1 | 0.00      | 0.03           | 0.00                | 57.0                    |
| Approach                         |      |           | 311                                     | 41.4 | 311                                      | 41.4 | 0.203                | 0.3                    | NA               | 0.0                                         | 0.1 | 0.00      | 0.03           | 0.00                | 59.5                    |
| North: Tombs Road from North     |      |           |                                         |      |                                          |      |                      |                        |                  |                                             |     |           |                |                     |                         |
| 7                                | L2   | All MCs   | 1                                       | 0.0  | 1                                        | 0.0  | 0.038                | 6.4                    | LOS A            | 0.1                                         | 1.0 | 0.69      | 0.85           | 0.69                | 45.3                    |
| 8                                | T1   | All MCs   | 1                                       | 0.0  | 1                                        | 0.0  | 0.038                | 8.2                    | LOS A            | 0.1                                         | 1.0 | 0.69      | 0.85           | 0.69                | 45.6                    |
| 9                                | R2   | All MCs   | 7                                       | 57.1 | 7                                        | 57.1 | 0.038                | 20.6                   | LOS C            | 0.1                                         | 1.0 | 0.69      | 0.85           | 0.69                | 43.3                    |
| Approach                         |      |           | 9                                       | 44.4 | 9                                        | 44.4 | 0.038                | 17.7                   | LOS C            | 0.1                                         | 1.0 | 0.69      | 0.85           | 0.69                | 43.8                    |
| West: Waterfall Way from West    |      |           |                                         |      |                                          |      |                      |                        |                  |                                             |     |           |                |                     |                         |
| 10                               | L2   | All MCs   | 5                                       | 80.0 | 5                                        | 80.0 | 0.244                | 6.5                    | LOS A            | 0.9                                         | 9.5 | 0.29      | 0.35           | 0.29                | 51.5                    |
| 11                               | T1   | All MCs   | 215                                     | 66.2 | 215                                      | 66.2 | 0.244                | 0.0                    | LOS A            | 0.9                                         | 9.5 | 0.29      | 0.35           | 0.29                | 57.1                    |
| 12                               | R2   | All MCs   | 65                                      | 64.5 | 65                                       | 64.5 | 0.244                | 13.5                   | LOS B            | 0.9                                         | 9.5 | 0.29      | 0.35           | 0.29                | 51.6                    |
| Approach                         |      |           | 285                                     | 66.1 | 285                                      | 66.1 | 0.244                | 3.2                    | NA               | 0.9                                         | 9.5 | 0.29      | 0.35           | 0.29                | 55.7                    |
| All Vehicles                     |      |           | 734                                     | 51.1 | 734                                      | 51.1 | 0.244                | 3.1                    | NA               | 0.9                                         | 9.5 | 0.21      | 0.28           | 0.21                | 55.7                    |

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options 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 (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).  
Two-Way Sign Control Capacity Model: SIDRA Standard.  
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).  
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.  
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).  
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.  
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.



# MOVEMENT SUMMARY

Site: 101 [Tombs Road / Waterfall Way PM Peak Hour Year 2038 Without Development (Site Folder: Intersection Impact)]

Output produced by SIDRA INTERSECTION Version: 9.1.1.200

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

| Vehicle Movement Performance     |      |           |                                         |       |                                          |       |                      |                        |                  |                                             |     |           |                |                     |                         |
|----------------------------------|------|-----------|-----------------------------------------|-------|------------------------------------------|-------|----------------------|------------------------|------------------|---------------------------------------------|-----|-----------|----------------|---------------------|-------------------------|
| Mov ID                           | Turn | Mov Class | Demand Flows<br>[ Total HV ]<br>veh/h % |       | Arrival Flows<br>[ Total HV ]<br>veh/h % |       | Deg. Satn<br><br>v/c | Aver. Delay<br><br>sec | Level of Service | 95% Back Of Queue<br>[ Veh. Dist ]<br>veh m |     | Prop. Que | Eff. Stop Rate | Aver. No. of Cycles | Aver. Speed<br><br>km/h |
| South: Castledoyle Rd from South |      |           |                                         |       |                                          |       |                      |                        |                  |                                             |     |           |                |                     |                         |
| 1                                | L2   | All MCs   | 2                                       | 50.0  | 2                                        | 50.0  | 0.004                | 6.2                    | LOS A            | 0.0                                         | 0.1 | 0.12      | 0.53           | 0.12                | 50.9                    |
| 2                                | T1   | All MCs   | 1                                       | 0.0   | 1                                        | 0.0   | 0.004                | 4.4                    | LOS A            | 0.0                                         | 0.1 | 0.12      | 0.53           | 0.12                | 53.3                    |
| 3                                | R2   | All MCs   | 1                                       | 0.0   | 1                                        | 0.0   | 0.004                | 5.8                    | LOS A            | 0.0                                         | 0.1 | 0.12      | 0.53           | 0.12                | 52.6                    |
| Approach                         |      |           | 4                                       | 25.0  | 4                                        | 25.0  | 0.004                | 5.7                    | LOS A            | 0.0                                         | 0.1 | 0.12      | 0.53           | 0.12                | 51.9                    |
| East: Waterfall Way from East    |      |           |                                         |       |                                          |       |                      |                        |                  |                                             |     |           |                |                     |                         |
| 4                                | L2   | All MCs   | 1                                       | 0.0   | 1                                        | 0.0   | 0.017                | 5.5                    | LOS A            | 0.0                                         | 0.1 | 0.02      | 0.05           | 0.02                | 56.4                    |
| 5                                | T1   | All MCs   | 22                                      | 57.1  | 22                                       | 57.1  | 0.017                | 0.0                    | LOS A            | 0.0                                         | 0.1 | 0.02      | 0.05           | 0.02                | 58.8                    |
| 6                                | R2   | All MCs   | 1                                       | 100.0 | 1                                        | 100.0 | 0.017                | 6.9                    | LOS A            | 0.0                                         | 0.1 | 0.02      | 0.05           | 0.02                | 51.4                    |
| Approach                         |      |           | 24                                      | 56.5  | 24                                       | 56.5  | 0.017                | 0.5                    | NA               | 0.0                                         | 0.1 | 0.02      | 0.05           | 0.02                | 58.4                    |
| North: Tombs Road from North     |      |           |                                         |       |                                          |       |                      |                        |                  |                                             |     |           |                |                     |                         |
| 7                                | L2   | All MCs   | 1                                       | 0.0   | 1                                        | 0.0   | 0.003                | 5.6                    | LOS A            | 0.0                                         | 0.1 | 0.14      | 0.53           | 0.14                | 52.9                    |
| 8                                | T1   | All MCs   | 1                                       | 0.0   | 1                                        | 0.0   | 0.003                | 4.4                    | LOS A            | 0.0                                         | 0.1 | 0.14      | 0.53           | 0.14                | 53.3                    |
| 9                                | R2   | All MCs   | 1                                       | 0.0   | 1                                        | 0.0   | 0.003                | 5.8                    | LOS A            | 0.0                                         | 0.1 | 0.14      | 0.53           | 0.14                | 52.6                    |
| Approach                         |      |           | 3                                       | 0.0   | 3                                        | 0.0   | 0.003                | 5.3                    | LOS A            | 0.0                                         | 0.1 | 0.14      | 0.53           | 0.14                | 52.9                    |
| West: Waterfall Way from West    |      |           |                                         |       |                                          |       |                      |                        |                  |                                             |     |           |                |                     |                         |
| 10                               | L2   | All MCs   | 1                                       | 100.0 | 1                                        | 100.0 | 0.025                | 6.7                    | LOS A            | 0.0                                         | 0.3 | 0.03      | 0.08           | 0.03                | 52.1                    |
| 11                               | T1   | All MCs   | 34                                      | 40.6  | 34                                       | 40.6  | 0.025                | 0.0                    | LOS A            | 0.0                                         | 0.3 | 0.03      | 0.08           | 0.03                | 58.9                    |
| 12                               | R2   | All MCs   | 4                                       | 25.0  | 4                                        | 25.0  | 0.025                | 5.8                    | LOS A            | 0.0                                         | 0.3 | 0.03      | 0.08           | 0.03                | 54.9                    |
| Approach                         |      |           | 39                                      | 40.5  | 39                                       | 40.5  | 0.025                | 0.8                    | NA               | 0.0                                         | 0.3 | 0.03      | 0.08           | 0.03                | 58.3                    |
| All Vehicles                     |      |           | 71                                      | 43.3  | 71                                       | 43.3  | 0.025                | 1.2                    | NA               | 0.0                                         | 0.3 | 0.03      | 0.12           | 0.03                | 57.6                    |

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options 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 (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).  
Two-Way Sign Control Capacity Model: SIDRA Standard.  
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).  
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.  
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).  
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.  
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

# MOVEMENT SUMMARY

Site: 101 [Tombs Road / Waterfall Way AM Peak Hour Year 2028 With Development (Site Folder: Intersection Impact)]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

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

| Vehicle Movement Performance     |      |           |                                         |      |                                          |      |                      |                        |                  |                                                  |     |           |                |                     |                         |
|----------------------------------|------|-----------|-----------------------------------------|------|------------------------------------------|------|----------------------|------------------------|------------------|--------------------------------------------------|-----|-----------|----------------|---------------------|-------------------------|
| Mov ID                           | Turn | Mov Class | Demand Flows<br>[ Total HV ]<br>veh/h % |      | Arrival Flows<br>[ Total HV ]<br>veh/h % |      | Deg. Satn<br><br>v/c | Aver. Delay<br><br>sec | Level of Service | 95% Back Of Queue<br>[ Veh. veh      Dist ]<br>m |     | Prop. Que | Eff. Stop Rate | Aver. No. of Cycles | Aver. Speed<br><br>km/h |
| South: Castledoyle Rd from South |      |           |                                         |      |                                          |      |                      |                        |                  |                                                  |     |           |                |                     |                         |
| 1                                | L2   | All MCs   | 89                                      | 42.4 | 89                                       | 42.4 | 0.138                | 9.0                    | LOS A            | 0.5                                              | 4.8 | 0.53      | 0.74           | 0.53                | 48.8                    |
| 2                                | T1   | All MCs   | 1                                       | 0.0  | 1                                        | 0.0  | 0.138                | 9.3                    | LOS A            | 0.5                                              | 4.8 | 0.53      | 0.74           | 0.53                | 50.7                    |
| 3                                | R2   | All MCs   | 5                                       | 40.0 | 5                                        | 40.0 | 0.138                | 17.6                   | LOS C            | 0.5                                              | 4.8 | 0.53      | 0.74           | 0.53                | 48.5                    |
| Approach                         |      |           | 96                                      | 41.8 | 96                                       | 41.8 | 0.138                | 9.5                    | LOS A            | 0.5                                              | 4.8 | 0.53      | 0.74           | 0.53                | 48.8                    |
| East: Waterfall Way from East    |      |           |                                         |      |                                          |      |                      |                        |                  |                                                  |     |           |                |                     |                         |
| 4                                | L2   | All MCs   | 8                                       | 50.0 | 8                                        | 50.0 | 0.246                | 6.1                    | LOS A            | 0.0                                              | 0.1 | 0.00      | 0.01           | 0.00                | 55.0                    |
| 5                                | T1   | All MCs   | 407                                     | 22.2 | 407                                      | 22.2 | 0.246                | 0.0                    | LOS A            | 0.0                                              | 0.1 | 0.00      | 0.01           | 0.00                | 59.9                    |
| 6                                | R2   | All MCs   | 1                                       | 0.0  | 1                                        | 0.0  | 0.246                | 5.5                    | LOS A            | 0.0                                              | 0.1 | 0.00      | 0.01           | 0.00                | 57.1                    |
| Approach                         |      |           | 417                                     | 22.7 | 417                                      | 22.7 | 0.246                | 0.1                    | NA               | 0.0                                              | 0.1 | 0.00      | 0.01           | 0.00                | 59.8                    |
| North: Tombs Road from North     |      |           |                                         |      |                                          |      |                      |                        |                  |                                                  |     |           |                |                     |                         |
| 7                                | L2   | All MCs   | 1                                       | 0.0  | 1                                        | 0.0  | 0.030                | 6.3                    | LOS A            | 0.1                                              | 0.8 | 0.68      | 0.81           | 0.68                | 45.2                    |
| 8                                | T1   | All MCs   | 1                                       | 0.0  | 1                                        | 0.0  | 0.030                | 8.7                    | LOS A            | 0.1                                              | 0.8 | 0.68      | 0.81           | 0.68                | 45.6                    |
| 9                                | R2   | All MCs   | 5                                       | 60.0 | 5                                        | 60.0 | 0.030                | 21.9                   | LOS C            | 0.1                                              | 0.8 | 0.68      | 0.81           | 0.68                | 43.2                    |
| Approach                         |      |           | 7                                       | 42.9 | 7                                        | 42.9 | 0.030                | 17.8                   | LOS C            | 0.1                                              | 0.8 | 0.68      | 0.81           | 0.68                | 43.8                    |
| West: Waterfall Way from West    |      |           |                                         |      |                                          |      |                      |                        |                  |                                                  |     |           |                |                     |                         |
| 10                               | L2   | All MCs   | 5                                       | 80.0 | 5                                        | 80.0 | 0.219                | 10.4                   | LOS B            | 0.8                                              | 7.9 | 0.29      | 0.34           | 0.29                | 51.6                    |
| 11                               | T1   | All MCs   | 207                                     | 51.3 | 207                                      | 51.3 | 0.219                | 1.4                    | LOS A            | 0.8                                              | 7.9 | 0.29      | 0.34           | 0.29                | 57.3                    |
| 12                               | R2   | All MCs   | 48                                      | 65.2 | 48                                       | 65.2 | 0.219                | 10.3                   | LOS B            | 0.8                                              | 7.9 | 0.29      | 0.34           | 0.29                | 51.8                    |
| Approach                         |      |           | 261                                     | 54.4 | 261                                      | 54.4 | 0.219                | 3.3                    | NA               | 0.8                                              | 7.9 | 0.29      | 0.34           | 0.29                | 56.1                    |
| All Vehicles                     |      |           | 781                                     | 35.8 | 781                                      | 35.8 | 0.246                | 2.5                    | NA               | 0.8                                              | 7.9 | 0.17      | 0.22           | 0.17                | 56.8                    |

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options 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 (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).  
Two-Way Sign Control Capacity Model: SIDRA Standard.  
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).  
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.  
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).  
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.  
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.



# MOVEMENT SUMMARY

Site: 101 [Tombs Road / Waterfall Way PM Peak Hour Year 2028 With Development (Site Folder: Intersection Impact)]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

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

| Vehicle Movement Performance     |      |           |                                         |       |                                          |       |                      |                        |                  |                                             |     |           |                |                     |                         |
|----------------------------------|------|-----------|-----------------------------------------|-------|------------------------------------------|-------|----------------------|------------------------|------------------|---------------------------------------------|-----|-----------|----------------|---------------------|-------------------------|
| Mov ID                           | Turn | Mov Class | Demand Flows<br>[ Total HV ]<br>veh/h % |       | Arrival Flows<br>[ Total HV ]<br>veh/h % |       | Deg. Satn<br><br>v/c | Aver. Delay<br><br>sec | Level of Service | 95% Back Of Queue<br>[ Veh. Dist ]<br>veh m |     | Prop. Que | Eff. Stop Rate | Aver. No. of Cycles | Aver. Speed<br><br>km/h |
| South: Castledoyle Rd from South |      |           |                                         |       |                                          |       |                      |                        |                  |                                             |     |           |                |                     |                         |
| 1                                | L2   | All MCs   | 2                                       | 50.0  | 2                                        | 50.0  | 0.004                | 6.4                    | LOS A            | 0.0                                         | 0.1 | 0.24      | 0.52           | 0.24                | 50.6                    |
| 2                                | T1   | All MCs   | 1                                       | 0.0   | 1                                        | 0.0   | 0.004                | 5.3                    | LOS A            | 0.0                                         | 0.1 | 0.24      | 0.52           | 0.24                | 53.0                    |
| 3                                | R2   | All MCs   | 1                                       | 0.0   | 1                                        | 0.0   | 0.004                | 6.9                    | LOS A            | 0.0                                         | 0.1 | 0.24      | 0.52           | 0.24                | 52.3                    |
| Approach                         |      |           | 4                                       | 25.0  | 4                                        | 25.0  | 0.004                | 6.3                    | LOS A            | 0.0                                         | 0.1 | 0.24      | 0.52           | 0.24                | 51.6                    |
| East: Waterfall Way from East    |      |           |                                         |       |                                          |       |                      |                        |                  |                                             |     |           |                |                     |                         |
| 4                                | L2   | All MCs   | 1                                       | 0.0   | 1                                        | 0.0   | 0.042                | 6.3                    | LOS A            | 0.0                                         | 0.1 | 0.02      | 0.03           | 0.02                | 57.2                    |
| 5                                | T1   | All MCs   | 72                                      | 13.2  | 72                                       | 13.2  | 0.042                | 0.0                    | LOS A            | 0.0                                         | 0.1 | 0.02      | 0.03           | 0.02                | 59.7                    |
| 6                                | R2   | All MCs   | 1                                       | 100.0 | 1                                        | 100.0 | 0.042                | 7.7                    | LOS A            | 0.0                                         | 0.1 | 0.02      | 0.03           | 0.02                | 52.1                    |
| Approach                         |      |           | 74                                      | 14.3  | 74                                       | 14.3  | 0.042                | 0.2                    | NA               | 0.0                                         | 0.1 | 0.02      | 0.03           | 0.02                | 59.5                    |
| North: Tombs Road from North     |      |           |                                         |       |                                          |       |                      |                        |                  |                                             |     |           |                |                     |                         |
| 7                                | L2   | All MCs   | 1                                       | 0.0   | 1                                        | 0.0   | 0.003                | 6.2                    | LOS A            | 0.0                                         | 0.1 | 0.33      | 0.54           | 0.33                | 52.3                    |
| 8                                | T1   | All MCs   | 1                                       | 0.0   | 1                                        | 0.0   | 0.003                | 5.3                    | LOS A            | 0.0                                         | 0.1 | 0.33      | 0.54           | 0.33                | 52.7                    |
| 9                                | R2   | All MCs   | 1                                       | 0.0   | 1                                        | 0.0   | 0.003                | 6.9                    | LOS A            | 0.0                                         | 0.1 | 0.33      | 0.54           | 0.33                | 52.0                    |
| Approach                         |      |           | 3                                       | 0.0   | 3                                        | 0.0   | 0.003                | 6.1                    | LOS A            | 0.0                                         | 0.1 | 0.33      | 0.54           | 0.33                | 52.4                    |
| West: Waterfall Way from West    |      |           |                                         |       |                                          |       |                      |                        |                  |                                             |     |           |                |                     |                         |
| 10                               | L2   | All MCs   | 1                                       | 100.0 | 1                                        | 100.0 | 0.117                | 6.7                    | LOS A            | 0.0                                         | 0.3 | 0.01      | 0.02           | 0.01                | 52.8                    |
| 11                               | T1   | All MCs   | 213                                     | 5.0   | 213                                      | 5.0   | 0.117                | 0.0                    | LOS A            | 0.0                                         | 0.3 | 0.01      | 0.02           | 0.01                | 59.8                    |
| 12                               | R2   | All MCs   | 4                                       | 25.0  | 4                                        | 25.0  | 0.117                | 5.8                    | LOS A            | 0.0                                         | 0.3 | 0.01      | 0.02           | 0.01                | 55.7                    |
| Approach                         |      |           | 218                                     | 5.8   | 218                                      | 5.8   | 0.117                | 0.1                    | NA               | 0.0                                         | 0.3 | 0.01      | 0.02           | 0.01                | 59.7                    |
| All Vehicles                     |      |           | 299                                     | 8.1   | 299                                      | 8.1   | 0.117                | 0.3                    | NA               | 0.0                                         | 0.3 | 0.02      | 0.03           | 0.02                | 59.4                    |

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options 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 (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).  
Two-Way Sign Control Capacity Model: SIDRA Standard.  
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).  
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.  
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).  
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.  
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

# MOVEMENT SUMMARY

Site: 101 [Tombs Road / Waterfall Way AM Peak Hour Year 2038 With Development (Site Folder: Intersection Impact)]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

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

| Vehicle Movement Performance     |      |           |                                         |      |                                          |      |                      |                        |                  |                                                           |      |           |                |                     |                         |
|----------------------------------|------|-----------|-----------------------------------------|------|------------------------------------------|------|----------------------|------------------------|------------------|-----------------------------------------------------------|------|-----------|----------------|---------------------|-------------------------|
| Mov ID                           | Turn | Mov Class | Demand Flows<br>[ Total HV ]<br>veh/h % |      | Arrival Flows<br>[ Total HV ]<br>veh/h % |      | Deg. Satn<br><br>v/c | Aver. Delay<br><br>sec | Level of Service | 95% Back Of Queue<br>[ Veh. veh      Dist ]<br>veh      m |      | Prop. Que | Eff. Stop Rate | Aver. No. of Cycles | Aver. Speed<br><br>km/h |
| South: Castledoyle Rd from South |      |           |                                         |      |                                          |      |                      |                        |                  |                                                           |      |           |                |                     |                         |
| 1                                | L2   | All MCs   | 120                                     | 42.1 | 120                                      | 42.1 | 0.226                | 10.3                   | LOS B            | 0.8                                                       | 8.0  | 0.61      | 0.82           | 0.63                | 47.7                    |
| 2                                | T1   | All MCs   | 1                                       | 0.0  | 1                                        | 0.0  | 0.226                | 12.3                   | LOS B            | 0.8                                                       | 8.0  | 0.61      | 0.82           | 0.63                | 49.5                    |
| 3                                | R2   | All MCs   | 7                                       | 42.9 | 7                                        | 42.9 | 0.226                | 26.4                   | LOS D            | 0.8                                                       | 8.0  | 0.61      | 0.82           | 0.63                | 47.3                    |
| Approach                         |      |           | 128                                     | 41.8 | 128                                      | 41.8 | 0.226                | 11.3                   | LOS B            | 0.8                                                       | 8.0  | 0.61      | 0.82           | 0.63                | 47.7                    |
| East: Waterfall Way from East    |      |           |                                         |      |                                          |      |                      |                        |                  |                                                           |      |           |                |                     |                         |
| 4                                | L2   | All MCs   | 13                                      | 50.0 | 13                                       | 50.0 | 0.299                | 6.1                    | LOS A            | 0.0                                                       | 0.1  | 0.00      | 0.02           | 0.00                | 55.0                    |
| 5                                | T1   | All MCs   | 484                                     | 25.2 | 484                                      | 25.2 | 0.299                | 0.0                    | LOS A            | 0.0                                                       | 0.1  | 0.00      | 0.02           | 0.00                | 59.9                    |
| 6                                | R2   | All MCs   | 1                                       | 0.0  | 1                                        | 0.0  | 0.299                | 5.6                    | LOS A            | 0.0                                                       | 0.1  | 0.00      | 0.02           | 0.00                | 57.1                    |
| Approach                         |      |           | 498                                     | 25.8 | 498                                      | 25.8 | 0.299                | 0.2                    | NA               | 0.0                                                       | 0.1  | 0.00      | 0.02           | 0.00                | 59.7                    |
| North: Tombs Road from North     |      |           |                                         |      |                                          |      |                      |                        |                  |                                                           |      |           |                |                     |                         |
| 7                                | L2   | All MCs   | 1                                       | 0.0  | 1                                        | 0.0  | 0.064                | 6.6                    | LOS A            | 0.2                                                       | 1.6  | 0.81      | 0.92           | 0.81                | 40.3                    |
| 8                                | T1   | All MCs   | 1                                       | 0.0  | 1                                        | 0.0  | 0.064                | 11.1                   | LOS B            | 0.2                                                       | 1.6  | 0.81      | 0.92           | 0.81                | 40.5                    |
| 9                                | R2   | All MCs   | 7                                       | 57.1 | 7                                        | 57.1 | 0.064                | 33.0                   | LOS D            | 0.2                                                       | 1.6  | 0.81      | 0.92           | 0.81                | 38.7                    |
| Approach                         |      |           | 9                                       | 44.4 | 9                                        | 44.4 | 0.064                | 27.7                   | LOS D            | 0.2                                                       | 1.6  | 0.81      | 0.92           | 0.81                | 39.1                    |
| West: Waterfall Way from West    |      |           |                                         |      |                                          |      |                      |                        |                  |                                                           |      |           |                |                     |                         |
| 10                               | L2   | All MCs   | 5                                       | 80.0 | 5                                        | 80.0 | 0.301                | 12.1                   | LOS B            | 1.2                                                       | 12.9 | 0.34      | 0.42           | 0.34                | 50.8                    |
| 11                               | T1   | All MCs   | 262                                     | 54.2 | 262                                      | 54.2 | 0.301                | 2.3                    | LOS A            | 1.2                                                       | 12.9 | 0.34      | 0.42           | 0.34                | 56.3                    |
| 12                               | R2   | All MCs   | 65                                      | 64.5 | 65                                       | 64.5 | 0.301                | 12.0                   | LOS B            | 1.2                                                       | 12.9 | 0.34      | 0.42           | 0.34                | 51.0                    |
| Approach                         |      |           | 333                                     | 56.6 | 333                                      | 56.6 | 0.301                | 4.4                    | NA               | 1.2                                                       | 12.9 | 0.34      | 0.42           | 0.34                | 55.1                    |
| All Vehicles                     |      |           | 968                                     | 38.7 | 968                                      | 38.7 | 0.301                | 3.4                    | NA               | 1.2                                                       | 12.9 | 0.21      | 0.27           | 0.21                | 55.9                    |

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options 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 (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).  
Two-Way Sign Control Capacity Model: SIDRA Standard.  
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).  
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.  
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).  
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.  
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.





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**CREATING LASTING IMPACT**  
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