NORTHROP

CIVIL

Engineering Report

for

559 Anambah Road Residential Subdivision

for Thirdi Anambah Pty Ltd

NL222055 / 28 May 2025 / Revision D

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1. Introduction

1.1 Project Overview

Northrop Consulting Engineers have been engaged by Thirdi Anambah Pty Ltd (The Proponent) to prepare a concept civil engineering design for the proposed Residential Development located at 559 Anambah Road, Gosforth NSW 2320, being Lot 55 DP 8741070 and part of Lot 177 DP 874171 (the site). This parcel, forming part of the broader Anambah Urban Release Area (AURA) is currently zoned R1 residential.

The Proponent is seeking approval for a concept development application (DA) consisting of up to 900 low and medium density residential lots and associated roads and open space, and Stage 1 subdivision DA approval for 220 lots.

This report provides an overview of the pertinent civil engineering facets of the proposed development and seeks to provide a concise summary to aide Council's assessment. It is noted that the information contained in this report is not intended to provide detailed design solutions, but rather provide solutions proportionate with a conceptual design suitable for Development Application assessment. This report shall be read in conjunction with associated project documentation.

1.2 Site Description

The subject site is located within the Maitland City Council (MCC) local government area (LGA) and has a total area of approximately 66 hectares, with extents illustrated in Figure 1.

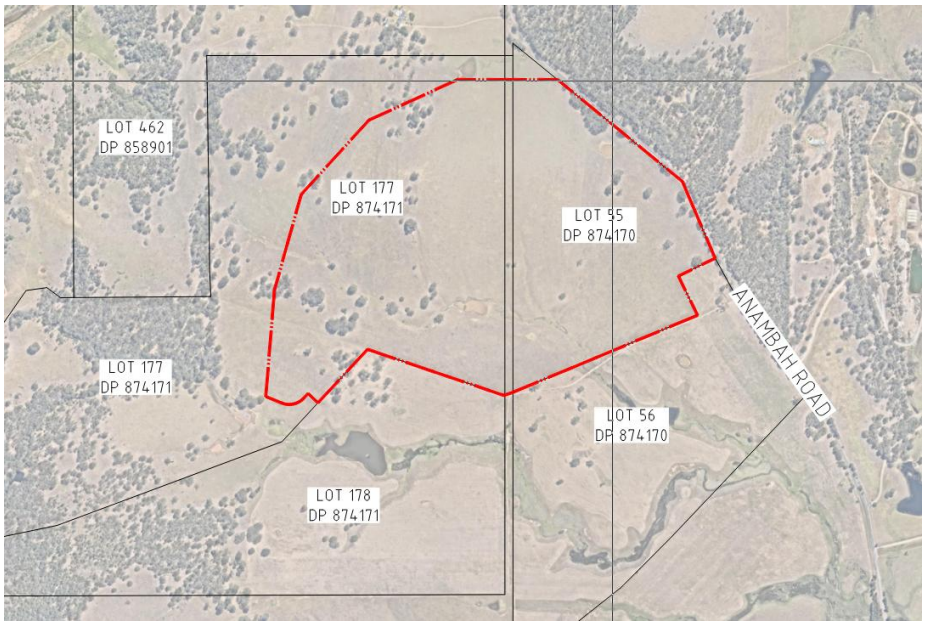


Figure 1 – Subject Site

The development site is within the Anambah Urban Release Area. The current land use zoning of the development site is R1 General Residential, with areas to the west of the proposed development consisting of RU2 Rural Landscape, and areas to the north of the development consisting of RU1 Primary Production (Maitland LEP 2011). The existing River Road reserve exists centrally within the site, extending from south to north. Existing land uses are primarily pasture land, comprises with some scattered areas of remnant vegetation.

The site has a defined ridge centrally within the site from east to west. The northern section of the site generally falls to the north at approximately 4-8% to an existing farming dam. This dam then discharges to a piped culvert crossing of Anambah Road. The southern section of the site generally falls at

approximately 4-8% to an existing first order watercourse which runs to the south-east within the site. A small area in the south-west corner of the site falls to the south to an existing third order watercourse which also runs to the south-east. Both watercourses eventually converge further south before crossing Anambah Road via a piped culvert crossing.

1.3 Major Components

The proposed development will incorporate the following major civil and stormwater engineering components:

- External intersection with Anambah Road, which will form the primary access to the site.
- Internal road network – DCP compliant road geometries have been provided to facilitate access for design vehicles, including garbage collection truck and buses as well as efficient links for pedestrians and cyclists.
- River Road access road – An access road will be formed along the existing River Road corridor, providing a secondary vehicular link between the subdivision and New England Highway via the Wyndella Estate. The road will also function as a means to construct and access lead-in services to development prior to further development within the broader AURA.
- Primary drainage corridor – As part of the wider stormwater and flood mitigation strategy for the site, it is proposed to utilise the existing watercourse traversing the site for stormwater conveyance and detention. The culvert crossings will be designed to attenuate peak flows in accordance with Council's Engineering Manual and mitigate downstream flood impacts from the development. The drainage corridor will be revegetated in accordance with an approved vegetation management plan.
- Site regrading – Bulk earthworks are proposed across the site to provide benched lots with compliant access to the proposed internal road network. The developer's general intent for lot benching is to provide surface fall across lots ranging from 1.5-2.5% front to rear, with zero fall side to side. Level differences between lot pads will be achieved via retaining walls constructed as part of the subdivision works, up to 1.5m high, or where walls are not required, a localised batter.
- Stormwater management – Stormwater to be managed in 3 distinct catchment areas. The majority of the site will be managed within the primary drainage corridor, which includes offline bioretention basins to manage water quality. The northern and south-western portions of the site will each discharge to separate detention basins, which will incorporate a bioretention component for tertiary treatment. In all cases, proprietary gross pollutant traps are proposed to provide primary pollutant reduction prior to discharge. Internal stormwater piped drainage networks and overland flow paths are to be designed in accordance with Council's Manual of Engineering Standards.

1.4 Relevant Guidelines

This report and associated drawings have been prepared in accordance with the following standards and guidelines:

- Maitland Development Control Plan (DCP) 2011
- Maitland City Council Manual of Engineering Standards – 6. Stormwater Drainage (MOES)
- NSW Floodplain Development Manual 2005
- NSW MUSIC Modelling Guidelines 2015
- Soils and Construction Volume 1 2004 ('Blue Book')
- Australian Rainfall and Runoff 2019

2. Stormwater Management System

2.1 Stormwater Management Objectives

The objective of the proposed stormwater management strategy is twofold:

1. Provide stormwater quantity management measures to limit stormwater discharge from the site, ensuring minimisation of downstream impacts.
2. Provide stormwater quality management measures to ensure post-developed stormwater flows meet MCC's water quality objectives.

2.2 Stormwater Conveyance

Conceptual stormwater drainage networks have been included in the concept civil design drawings for both the masterplan and Stage 1. Generally, the internal stormwater network will be designed in accordance with Council's Manual of Engineering Standards, namely a minor system designed for the 10% AEP event and major system drainage including overland flow paths for the 1% AEP event. Detailed modelling and design of the internal minor and major stormwater network will be undertaken at SWC stage.

2.2.1 Road Creek Crossings

Within the subdivision there are a total of 4 online drainage structures crossing the creek corridor, comprising two proposed road creek crossings and two earth embankments. Drainage culverts traverse each embankment for conveyance and control of stormwater flows. Batter slopes at each crossing and along the sides of the watercourse have been graded at a maximum slope of 1V:4H generally. Batters will be mass planted and managed under a vegetation management plan upon completion of earthworks.

The River Road access road traverses several watercourses and will require 5 culvert crossings.

Detailed 2-dimensional flood modelling has been undertake to confirm road culvert crossings have been sized to provide flood-free pedestrian and vehicular access during the 1% AEP event. Details of this modelling, including preliminary sizing of hydraulic structures are contained within the Flood Impact Risk Assessment (FIRA) prepared by Northrop Engineers (reference NL222055, revision B).

2.3 Stormwater Detention and Flood Impact and Risk Assessment (FIRA)

Stormwater detention is proposed to be provided within the development to manage the impact the proposed development has on flooding behaviour within the site, within adjacent properties and downstream of the development.

In accordance with Maitland's Manual of Engineering Standards, detention storages and outlets have generally been sized to ensure no significant increase in runoff from the 1EY to the 1% AEP. Further, 2-dimensional flood modelling has been undertaken to review downstream impacts of site outflows within neighbouring land and at Anambah Road.

Stormwater detention is proposed to be achieved as follows:

- Online storage within the watercourse traversing the site, utilising the 4 culvert crossings as flow controls. To achieve the required storage volume the watercourse will be modified by realigning the existing flow channel and widening the creek bed.
- Two offline basins, one located at the northern end of the site and one to the south-west. These basins will also integrate bioretention basins. These basins will be free-draining, with the exception of a shallow extended detention depth associated with the bioretention storage zone.

2-dimensional modelling of the proposed detention measures, including sizing of hydraulic structures and assessment of downstream impacts is contained within the Flood Impact Risk Assessment (FIRA) prepared by Northrop Engineers (reference NL222055, revision B).

No allowance has been made in the 2-dimensional modelling for rainwater storage or similar retention measures on each lot. Ultimately, these measures will act to further attenuate peak flows from the development largely in more frequent storm events.

2.4 Stormwater Quality

2.4.1 Overview

MCC's engineering design requirements for stormwater drainage requires the provision of stormwater quality controls to manage the environmental impact of runoff on receiving waters and provide reduction targets which must be met. These targets have been reproduced in Table 1 below:

Table 1: Adopted Pollutant Reduction Targets.

Pollutant	Treatment Target (when compared to the unmitigated developed scenario)
Total Suspended Solids (TSS)	80% yearly reduction
Total Phosphorus (TP)	45% yearly reduction
Total Nitrogen (TN)	45% yearly reduction
Gross Pollutants (GP)	70% yearly reduction

2.4.2 Proposed Treatment Train

The following stormwater treatment measures have been proposed:

Gross Pollutant Traps

Gross pollutant traps (GPTs) have been proposed to provide primary treatment prior to discharge to secondary and tertiary treatment measures for each catchment. The devices are designed to remove litter, debris and course sediment from runoff to protect downstream treatment measures. Stormwater runoff greater than the median 4 EY (3-month ARI) storm event was modelled to bypass the GPTs and downstream treatment measures, reflecting a typical high flow bypass weir or splitter pit arrangement. Humegard GPTs have been proposed, subject to further review at SWC stage.

Bioretention Basins

End of line bioretention basins have been proposed to provide tertiary stormwater treatment immediately downstream of the GPTs. Bioretention systems are shallow, vegetated water bodies that utilise fine filtration and biological uptake processes to remove pollutants from stormwater.

For this concept design, the following basin parameters have been adopted:

- Extended detention depth = 0.30 m
- Filter depth = 0.40 m
- Saturated hydraulic conductivity = 100 mm/hr
- Basin planted with effective nutrient reducing vegetation.
- Lined base with underdrain.

High flows from each the basin will discharge via a piped stormwater outlet directly to the receiving watercourse. An emergency spillway will also be provided for controlled discharge of flows in the event

the pit or pipe outlet become blockage. A typical bioretention system section is illustrated in Figure 2. Basin locations are illustrated in Figure 2.

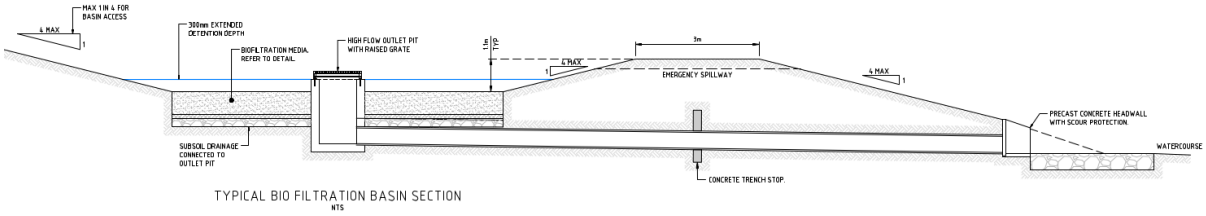


Figure 2 – Typical bioretention basin.

Sediment basin

A temporary sediment basin is proposed to provide temporary secondary treatment for a portion of Stage 1 draining to the north. The sediment basin will be constructed by modifying an existing farm dam located immediately north of the Stage 1 limit of works. It is envisioned that this basin will initially be modified to function as a sediment capture basin during construction phase activities. Following completion of works, the basin will be further formalised and function to intercept and settle coarse and fine sediment, as well as limit erosion from temporary stormwater outflows in the short to medium term, until developed occurs to the north and Basin 1 is completed.

Developed case catchment areas and water quality management device locations are illustrated in Appendix B Exhibit A, with a summary of respective treatment measures provided in Table 2.

Table 2 – Proposed Treatment Measures.

Catchment	Total Area (ha)	% Impervious	Treatment Measures	Proposed Bioretention Filter Area (m^2)
C1, C2	19.79	65	GPT, Bioretention	1000
C3	18.15	65	GPT, Bioretention	1000
C4	10.06	65	GPT, Bioretention	690
C5	3.01	65	GPT	n/a (GPT only)
C6	1.38	65	GPT	n/a (GPT only)
C7	3.67	65	GPT, Bioretention	550
C8	3.72	65	GPT	n/a (GPT only)
C9	2.71	65	GPT, Bioretention	200
C1 (Stage 1 Only)	1.80	65	Sediment Basin	n/a, approximate total basin storage volume 660 m^3

2.4.3 MUSIC Model Setup

Treatment train performance was assessed using the MUSIC software package version 6. MUSIC serves as a planning and decision support system used to estimate the efficiency of Stormwater Quality Improvement Devices (SQIDs) at capturing common pollutants from stormwater runoff, namely total suspended solids (TSS), total nitrogen (TN), total phosphorous (TP) and gross pollutants (GP). Modelling involves the use of historical or synthesized long-term rainfall data and algorithms to

accurately simulate the performance of treatment measures. Where applicable, model parameters have been adopted from the NSW MUSIC Modelling Guidelines (2015).

MUSIC model schematics for the ultimate case and Stage are provided in Figure 3 and Figure 4 respectively.

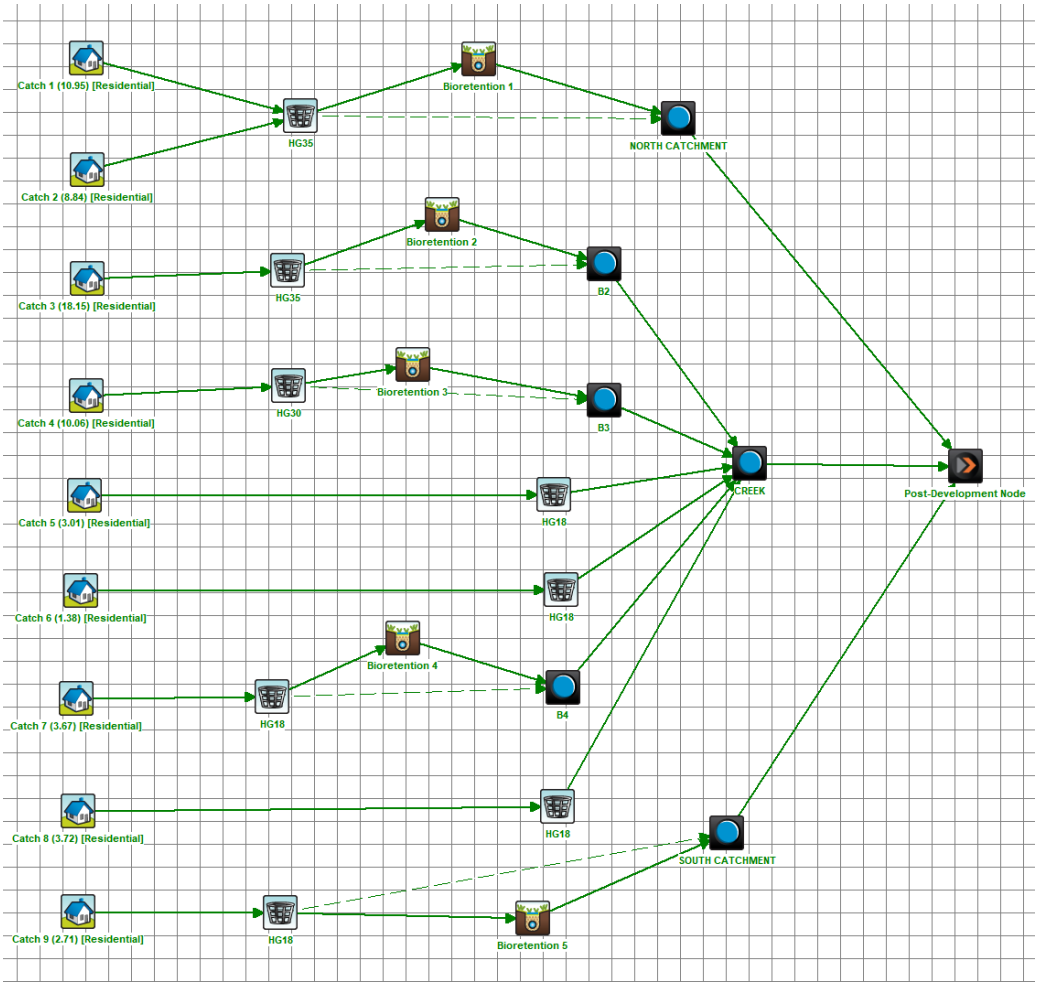


Figure 3 – MUSIC Model Schematic – Ultimate Case.

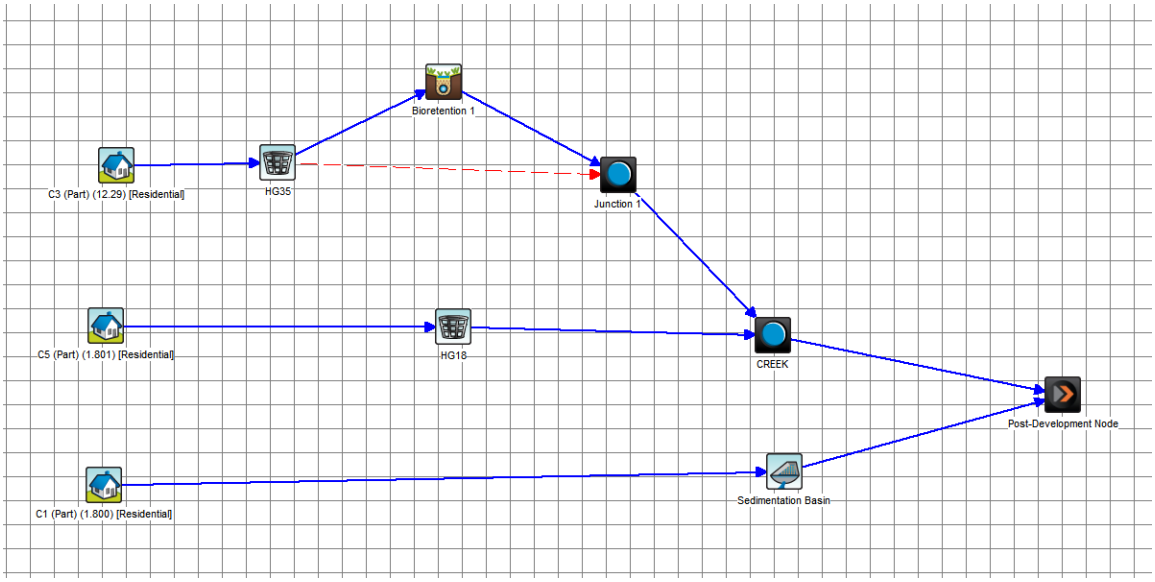


Figure 4 – MUSIC Model Schematic – Stage 1.

2.4.4 Results

MUSIC modelling results for the ultimate development and Stage 1 respectively are provided in Table 3 and Table 4 respectively.

Table 3 – MUSIC Model Results for Ultimate Development.

Pollutant	Treatment Target	Source Loading (kg/year)	Residual Loading (kg/year)	Percentage Reduction
Total Suspended Solids (TSS)	80% total reduction	64700	12900	80.1%
Total Phosphorus (TP)	45% total reduction	107	41	61.6%
Total Nitrogen (TN)	45% total reduction	792	410	48.2%
Gross Pollutants (GP)	70% total reduction	11000	241	97.8%

Table 4 – MUSIC Model Results for Stage 1 of The Development

Pollutant	Treatment Target	Source Loading (kg/year)	Residual Loading (kg/year)	Percentage Reduction
Total Suspended Solids (TSS)	80% total reduction	16100	2760	82.8%
Total Phosphorus (TP)	45% total reduction	26.5	9.4	64.5%
Total Nitrogen (TN)	45% total reduction	198	96	51.8%
Gross Pollutants (GP)	70% total reduction	2760	45	98.4%

Based on the results presented above, the proposed treatment measures are considered to meet Council's water quality management objectives for both the overall development and Stage 1. Further management of individual sub-stages will be considered as required at SWC stage. A Music-Link report is provided in Appendix A.

Confirmation of individual device sizes, including identification of additional water quality and retention opportunities will be undertaken at detailed design stage. Inspection and maintenance requirements for the water quality treatment devices will be designed and documented further at SWC stage, in accordance with MCC requirements.

It is noted that the above investigation does not model the following additional measures, which will see further improvement of stormwater runoff quality:

- Development of an integrated system of water sensitive urban design built around naturalised conveyance of runoff, including measures to reduce and break up effective impervious areas, including street trees, vegetated medians, public gardens and permeable paving.
- Adoption of rainwater tank storage within the residential areas and business park. Wide scale adoption of rainwater storage will provide additional water quality benefits through retention of roof water runoff as well as additional filtration and settling of runoff e.g. through first flush devices.

2.5 Erosion and Sediment Control

To minimise sediment runoff from the development entering downstream waterways during the construction phase, several treatment devices will be implemented. These include but are not limited to:

- Minimising disturbance areas via temporary fencing and ‘No Go’ zones.
- Sediment Basins.
- Sediment Silt Fencing.
- Clean and Dirty water diversion drains.
- Rock check dams.
- A range of temporary sediment controls (i.e. sand bags, coir logs, mesh and gravel filters).
- Stabilised site entries.
- Progressive Rehabilitation.

A Soil and Water Management Plan has been included in the Civil Engineering Drawing Package prepared for this application. The intent of the plan is to demonstrate how the control of erosion and sediment can be managed to prevent the pollution of downstream waterways. It has been prepared in accordance with Council’s DCP and Managing Urban Stormwater: Soils and Construction (Landcom, 2004).

If required, the plan should be updated prior to construction commencing to ensure the plan suits the proposed construction methodology including any staging proposed by the civil contractor. The plan should then continually be reviewed and updated as required throughout the construction period.

3. Road Access

3.1 Internal Road Network

3.1.1 Design Standards

The internal road network has been designed generally in accordance with

- Austroads Guide to Road Design (AGRD).
- Maitland City Council Manual of Engineering Standards Part 4 – Road Design
- TfNSW NSW Bicycle Guidelines.
- TfNSW Delineation Guidelines.
- Austroads Design Vehicles and Turning Path Templates Guide.

Carriageway and lane widths have been adopted in accordance with Council's DCP on the basis on expected design traffic and intended bus routes. Reference should be made to the Traffic Assessment prepared by SCT Consulting for internal traffic generation and bus networks. Kerb return radii have generally been set at a minimum of 8 metres in accordance with Council's standards.

3.1.2 Proposed Roundabout

The proposed roundabout has been designed in accordance with Austroads Guide to Road Design Part 4B and Council's Manual of Engineering Standards Part 4.

The proposed roundabout configuration is as follows:

- 10m radius mountable outer annulus, with 8 m radius landscaped inner annulus;
- Circulating vehicle paths designed for a 12.5m Heavy Rigid Vehicle, with a 19m Articulated Vehicle (AV) as a check vehicle.
- Dual lane approaches on the 3 sub-arterial legs and a single lane entry/exit on distributor/secondary leg.
- A maximum through-movement deflection radius of 100m in accordance with Council's Manual of Engineering Standards.
- Angled kerb ramps at roundabout entry/exit points to transition on-road bike lanes to/from an off-road cycle path, along with pedestrian refuges within each of the islands.

It is noted the final roundabout arrangement and linemarking presented is conceptual in nature and will be further refined at SWC stage.

As per Council request, a suite of heavy vehicle swept paths for the roundabout are included in Appendix C.

3.1.3 Local Area Traffic Management (LATM)

As requested by Council, traffic calming measures have been incorporated into the road network design to manage vehicle on long stretches of road. The following LATM measures have currently been integrated into the internal road network:

- The roundabout, including associated kerb extensions and centre island refuges.
- Additional mid-block pedestrian crossings located along the sub-arterial and bus routes. These have been located to enhance pedestrian access and amenity. Reference should be made to civil drawing MP-C05.01 proposed crossing locations.
- On-road cyclist treatments along sub-arterial roads, including marked/painted crossings of minor road intersections.

3.2 Anambah Road Intersection

The intersection with Anambah Road will form the primary road access for the site. Intersection upgrade works are proposed to facilitate the connection of the subdivision entry road with Anambah Road and will be completed concurrently with Stage 1 of the development.

The design of the intersection has been undertaken based on a reduced 80 km/h signposted speed limit, reduced from the existing 100 km/h limit, resulting in a design speed limit of 90 km/h. It is noted this reduction in speed limit has been discussed with TfNSW who, in correspondence dated 30th April 2025, have advised in-principle support to this reduction.

The proposed intersection configuration is as follows:

- Basic left turn BAL treatment for north-bound, left turning traffic.
- Short lane channelised right turn CHR(S) treatment for south-bound, right turning vehicles.

A concept arrangement of the proposed intersection is shown in Figure 5.

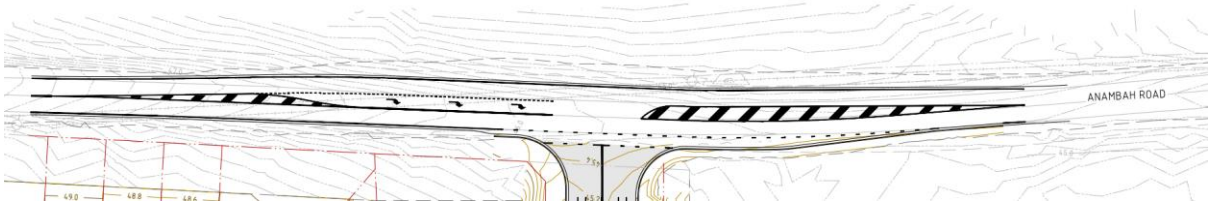


Figure 5 – Concept Anambah Road intersection treatments.

In addition to the intersection widening works, minor verge regrading will be required approximately 190 metres north of the intersection to ensure sufficient sight lines to achieve Safe Intersection Sight Distance (SISD). Based on an initial review, the current sight line over the crest appears to be sufficient for a 90 km/h travel speed with a 1.5 second driver reaction time, noting a typical minimum driver reaction time for rural roads is 2.0 seconds. To increase the sight distance, it is proposed to undertake minor earthworks to regrade the road verge on the inside of the bend, shown indicatively in Figure 6.

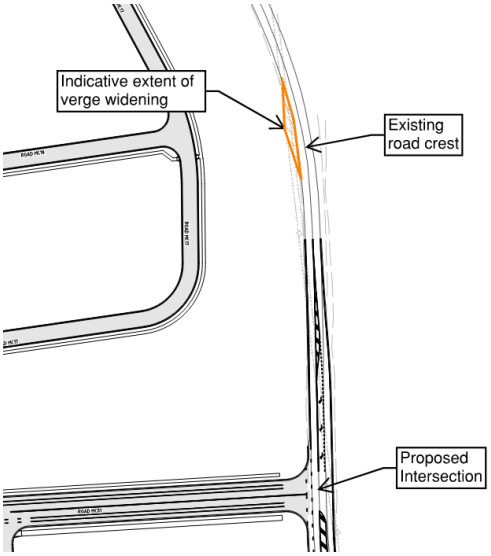


Figure 6 – Indicative extent of Anambah Road verge widening.

It is considered these works will provide an unobstructed sight line suitable for 90 km/h travelling speed with a 2.0 second driver reaction time. Further details to be provided as part of the detailed intersection design at SWC stage.

3.3 River Road

As part of Stage 1 of the development, River Road is proposed to be formalised to function both as a secondary access to the development and to accommodate lead in utilities. The proposed access road will extend from the current end of River Road within the Windella Estate to the limit of permanent road works within Stage 1.

Under normal circumstances, it is intended that public access to the River Road access will be controlled via gated entries at each end, nominally at the existing River Road culdesac within the Windella Estate to the south and at the connection to the proposed internal subdivision road network to the north. Proposed controlled access points are shown indicatively in Figure 7.

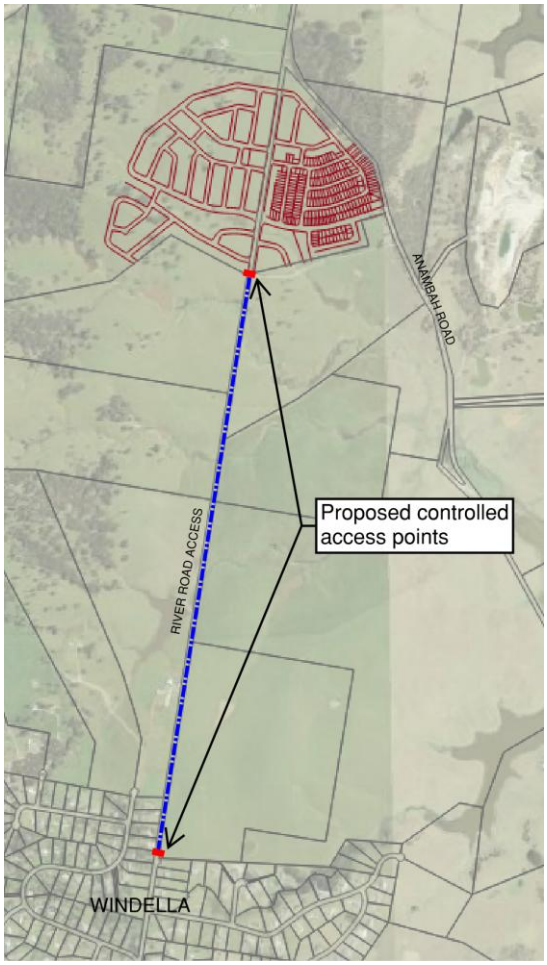


Figure 7 – River Road Access Points.

In addition to providing a secondary vehicular access route to/from the subdivision, the road will contain lead in water and wastewater infrastructure, discussed further in the following sections. A conceptual design for River Road including longitudinal sections and typical cross sections has been included in the Civil DA drawings.

4. Infrastructure Servicing

4.1 Water and Wastewater

Water and wastewater servicing for the broader AURA is described within the Anambah Urban Release Area Water and Wastewater Servicing Strategies prepared by ADW Johnson on behalf of Roche Group.

Following initial consultation with Hunter Water, the proponent has subsequently prepared and submitted to Hunter Water detailed water and wastewater servicing addendum reports, prepared by Northrop. These addendums describe additional arrangements to enable full water and wastewater servicing of the proposed development.

In correspondence dated 22/05/2025 Hunter Water have subsequently provided confirmation of an intent to ensure water and wastewater assets are delivered to service the proposed development, prior to issuing a Compliance Certificate under Section 50 of the Hunter Water Act 1991, and that Hunter Water have no objections to DA Consent Conditions being issued by Council.

The proposed servicing arrangements are summarised in the following sub-sections.

4.1.1 Water Infrastructure

As per the approved Anambah Urban Release Water Servicing Strategy, the development will ultimately be serviced via dual DN375 watermains extending along River Road originating from the New England Highway. Due to elevation variation within the AURA, there will be two separate pressure zones, high and low level. As per the ADWJ strategy, the low-level zone will be supplied via dual DN375 water mains extending along River Road, whilst the high-level zone will require a new booster pump station.

The proposed development will require servicing from both pressure zones. To achieve this it is proposed to extend dual DN200 and DN250 watermains along the proposed River Road access to supply the site. The dual mains will be interconnected via closed valve for security of supply purposes. Construction of a new booster pump station will be required for servicing of high-level lots, nominally those elevated above RL 41.0 mAHD. This will be required under Stage 1 of the development.

It is concluded that the proposed development can be adequately provided a potable water supply.

4.1.2 Sewer Infrastructure

The proposed development will be serviced by an internal sewer gravity network gravitating to two wastewater pump stations, located at the northern and southern extremities of the subject site. The northern basin will pump to the southern gravity network. The southern WWPS will then be pumped via a rising main along River Road to existing trunk gravity sewers along the New England Highway.

4.2 Ausgrid

A preliminary enquiry was lodged with Ausgrid for the proposed development and a response received on 22/10/2024, Ausgrid reference 700009396. In summary:

- The site is in proximity to 2 x existing high voltage feeders. One of these feeders has approximately 3 MVA spare capacity, while the other has limited to no capacity. Ausgrid have advised a project is underway to augment the capacity of the second feeder, with an expected completion date of late 2025.
- In the event additional capacity is required to service the development, Ausgrid's recommended augmentation option is the installation of a new 11kV underground feeder to the development from the Rutherford Zone Substation. A spare circuit breaker is available at the substation for this purpose.

In addition, Ausgrid are currently reviewing preliminary plans for a new zone substation in the Rutherford-Telarah area in the next 10 years (2030s), intended to increase capacity to supply growth areas to the west.

Appendix A - MUSIC Link Report

LAKE MACQUARIE CITY COUNCIL

MUSIC-*link* Report

Project Details		Company Details	
Project:	559 Anambah Road Anambah	**Company:**	Northrop
Report Export Date:	28/05/2025	**Contact:**	Andrew Killen
Catchment Name:	NL222055-01_559 Anambah Rd_MUSIC Model_ZF FULL SITE Humeguard [C]	**Address:**	215 Pacific Highway Charlestown
Catchment Area:	62.49ha	**Phone:**	0249431777
Impervious Area*:	121.8%	**Email:**	akillen@northrop.com.au
Rainfall Station:			
Modelling Time-step:	6 Minutes		
Modelling Period:	1/01/1999 - 31/12/2008 11:54:00 PM		
Mean Annual Rainfall:	902mm		
Evapotranspiration:	1408mm		
MUSIC Version:	6.3.0		
MUSIC-link data Version:	6.35		
Study Area:	North Region		
Scenario:	North Region		

* takes into account area from all source nodes that link to the chosen reporting node, excluding Import Data Nodes

Treatment Train Effectiveness		Treatment Nodes		Source Nodes	
Node: Post-Development Node	**Reduction**	**Node Type**	**Number**	**Node Type**	**Number**
Flow	2.4%	Bio Retention Node	5	Urban Source Node	9
TSS	80.4%	GPT Node	8		
TP	61.8%				
TN	48.2%				
GP	97.8%				

Comments

NOTE: A successful self-validation check of your model does not constitute an approved model by Lake Macquarie City Council

MUSIC-*link* now in MUSIC by eWater – leading software for modelling stormwater solutions

Passing Parameters

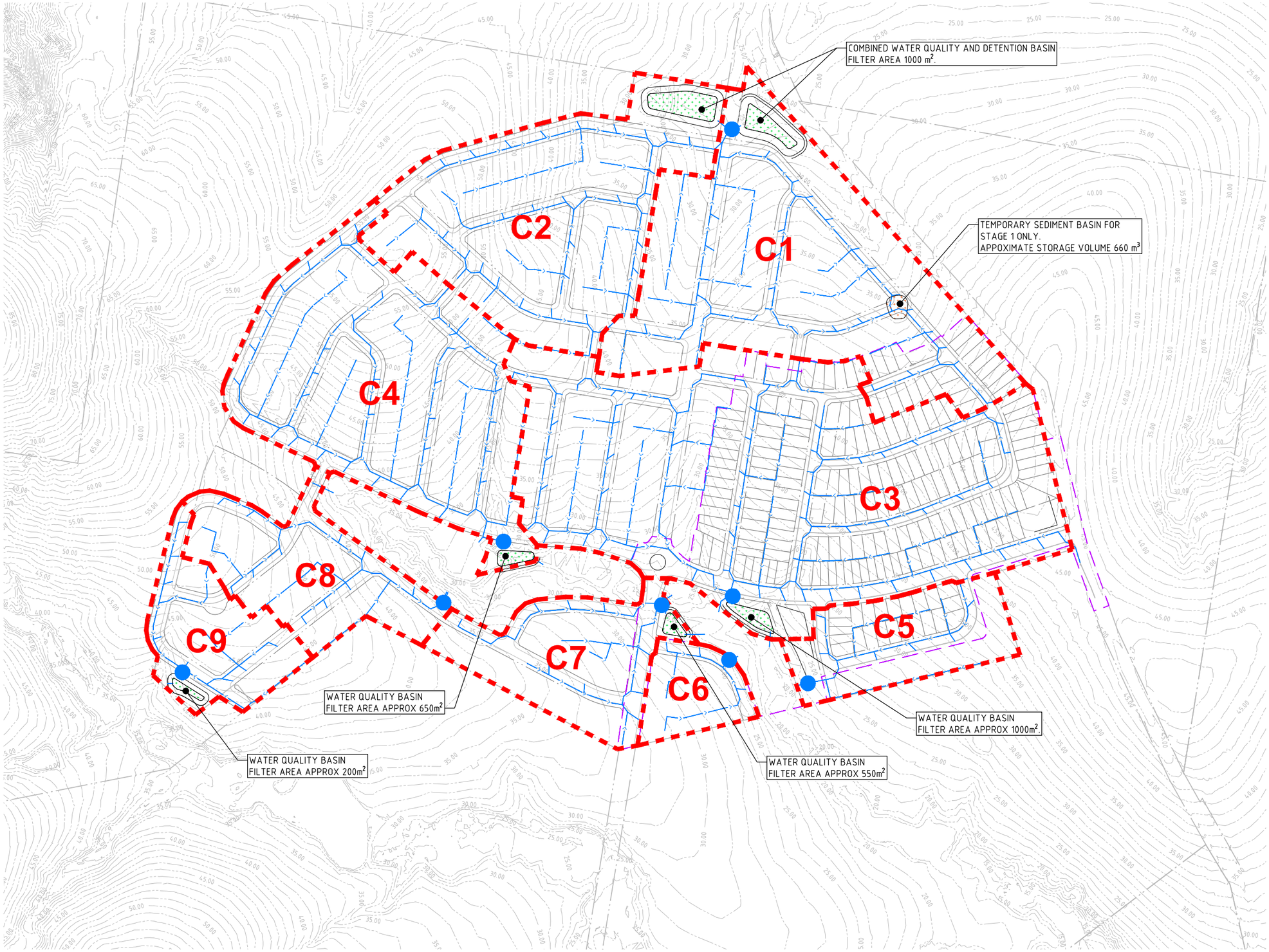
Node Type	Node Name	Parameter	Min	Max	Actual
Bio	Bioretention 1	Hi-flow bypass rate (cum/sec)	None	None	1335
Bio	Bioretention 1	PET Scaling Factor	2.1	2.1	2.1
Bio	Bioretention 2	Hi-flow bypass rate (cum/sec)	None	None	1000
Bio	Bioretention 2	PET Scaling Factor	2.1	2.1	2.1
Bio	Bioretention 3	Hi-flow bypass rate (cum/sec)	None	None	540
Bio	Bioretention 3	PET Scaling Factor	2.1	2.1	2.1
Bio	Bioretention 4	Hi-flow bypass rate (cum/sec)	None	None	540
Bio	Bioretention 4	PET Scaling Factor	2.1	2.1	2.1
Bio	Bioretention 5	Hi-flow bypass rate (cum/sec)	None	None	540
Bio	Bioretention 5	PET Scaling Factor	2.1	2.1	2.1
GPT	HG18	Hi-flow bypass rate (cum/sec)	None	None	0.6
GPT	HG18	Hi-flow bypass rate (cum/sec)	None	None	0.6
GPT	HG18	Hi-flow bypass rate (cum/sec)	None	None	0.6
GPT	HG18	Hi-flow bypass rate (cum/sec)	None	None	0.6
GPT	HG18	Hi-flow bypass rate (cum/sec)	None	None	0.6
GPT	HG30	Hi-flow bypass rate (cum/sec)	None	None	1.33
GPT	HG35	Hi-flow bypass rate (cum/sec)	None	None	1.54
GPT	HG35	Hi-flow bypass rate (cum/sec)	None	None	1.54
Post	Post-Development Node	% Load Reduction	None	None	2.4
Post	Post-Development Node	GP % Load Reduction	70	None	97.8
Post	Post-Development Node	TN % Load Reduction	45	None	48.2
Post	Post-Development Node	TP % Load Reduction	45	None	61.8
Post	Post-Development Node	TSS % Load Reduction	80	None	80.4
Urban	Catch 1 (10.95)	Area Impervious (ha)	None	None	7.147
Urban	Catch 1 (10.95)	Area Pervious (ha)	None	None	3.802
Urban	Catch 1 (10.95)	Total Area (ha)	None	None	10.95
Urban	Catch 2 (8.84)	Area Impervious (ha)	None	None	5.770
Urban	Catch 2 (8.84)	Area Pervious (ha)	None	None	3.069
Urban	Catch 2 (8.84)	Total Area (ha)	None	None	8.84
Urban	Catch 3 (18.15)	Area Impervious (ha)	None	None	11.83
Urban	Catch 3 (18.15)	Area Pervious (ha)	None	None	6.316
Urban	Catch 3 (18.15)	Total Area (ha)	None	None	18.15
Urban	Catch 4 (10.06)	Area Impervious (ha)	None	None	6.528
Urban	Catch 4 (10.06)	Area Pervious (ha)	None	None	3.531
Urban	Catch 4 (10.06)	Total Area (ha)	None	None	10.06
Urban	Catch 5 (3.01)	Area Impervious (ha)	None	None	1.953
Urban	Catch 5 (3.01)	Area Pervious (ha)	None	None	1.056
Urban	Catch 5 (3.01)	Total Area (ha)	None	None	3.01
Urban	Catch 6 (1.38)	Area Impervious (ha)	None	None	0.900
Urban	Catch 6 (1.38)	Area Pervious (ha)	None	None	0.479

Only certain parameters are reported when they pass validation

Node Type	Node Name	Parameter	Min	Max	Actual
Urban	Catch 6 (1.38)	Total Area (ha)	None	None	1.38
Urban	Catch 7 (3.67)	Area Impervious (ha)	None	None	2.395
Urban	Catch 7 (3.67)	Area Pervious (ha)	None	None	1.274
Urban	Catch 7 (3.67)	Total Area (ha)	None	None	3.67
Urban	Catch 8 (3.72)	Area Impervious (ha)	None	None	2.414
Urban	Catch 8 (3.72)	Area Pervious (ha)	None	None	1.305
Urban	Catch 8 (3.72)	Total Area (ha)	None	None	3.72
Urban	Catch 9 (2.71)	Area Impervious (ha)	None	None	1.748
Urban	Catch 9 (2.71)	Area Pervious (ha)	None	None	0.961
Urban	Catch 9 (2.71)	Total Area (ha)	None	None	2.71

Only certain parameters are reported when they pass validation

Appendix B – Stormwater Quality Catchment Plan



LEGEND

- PROPOSED BOUNDARY LINE
- EXISTING BOUNDARY LINE
- STAGE 1 RELEASE EXTENT
- EXISTING CONTOURS (0.5m INTERVAL)
- C1 — WATER QUALITY SUB-CATCHMENT
- PROPOSED WATER QUALITY BASIN
- PROPOSED TEMPORARY WATER QUALITY BASIN
- PROPOSED STORMWATER PIPE
- PROPOSED GROSS POLLUTANT TRAP

EXHIBIT A

NOT FOR CONSTRUCTION

DRAWN: J.STAUB DESIGNED: A.TURNBULL JOB MANAGER: L.MCRAE VERIFIER: X.XXXX

REVISION	DESCRIPTION	ISSUED	VER'D	APP'D	DATE
A	ISSUED FOR INFORMATION	JS		AT	14.08.24
B	ISSUED FOR INFORMATION	JS		AT	27.08.24
C	ISSUED FOR INFORMATION	JS		AK	28.05.25

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ABN 81 094 433 100

PROJECT: **ANAMBAH SUBDIVISION GOSFORTH 2320**

DRAWING TITLE: **ENGINEERING REPORT**

EXHIBIT A - WATER QUALITY CATCHMENT PLAN

JOB NUMBER: **NL222055-01**

DRAWING NUMBER: **CSK09.01** REVISION: **C**

Date: 28.05.2025 2:56 PM Plotted By: ANDREW KILLEN Found: O:\5 Pre-July 24 Projects\Newcastle\YEAR 2022 Jobs\NL222055-01 - 559 Anambah Road, Gosforth\0 - Drawings\CIVIL\02-SKETCH\CSK09.01-STORMWATER CATCHMENTS\NL222055-01-CSK09.01-SW CATCHMENTS.dwg

Appendix C – Roundabout Swept Paths

VEHICLE MOVEMENTS

- VEHICLE BODY
- VEHICLE WHEELS
- VEHICLE LATERAL CLEARANCE (0.3m FROM BODY)
- VEHICLE LATERAL CLEARANCE (0.5m FROM BODY)

DISCLAIMER

THE VEHICLE SWEPT PATHS / TEMPLATES PROVIDED HAVE BEEN PRODUCED USING SIMULATION SOFTWARE AND ARE TO BE USED AS A GUIDE ONLY. THESE SIMULATIONS MAY NOT REFLECT ACTUAL DRIVER BEHAVIOUR AND / OR EXPERIENCE UNDER ACTUAL DRIVING CONDITIONS.

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VEHICLE PROFILE

SINGLE UNIT TRUCK/BUS (12.5m)

OVERALL LENGTH	12.500m
OVERALL WIDTH	2.500m
OVERALL BODY HEIGHT	4.300m
TRACK WIDTH	2.500m
LOCK-TO-LOCK TIME	6.00s
KERB TO KERB TURNING RADIUS	15.000m

DRAWN: J.STAUB DESIGNED: A.KILLEN JOB MANAGER: L.MCRAE VERIFIER: L.MCRAE

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PROJECT: **PROPOSED SUBDIVISION 559 ANAMBAH ROAD GOSFORTH NSW 2320**

MASTERPLAN DA

DRAWING TITLE: **CIVIL ENGINEERING PACKAGE**

SWEPT PATH PLAN - SHEET 1

JOB NUMBER: **NL222055-01**

DRAWING NUMBER: **CSK-C09.01** REVISION: **A**

DRAWING SHEET SIZE = A1

Date: 28.05.2025 5:08 PM Plotted By: JACOB STAUB Found: O:\5 Pre-July 24 Projects\Newcastle\YEAR 2022 Jobs\NL222055-01 - 559 Anambah Road, Gosforth\0 - Drawings\CIVIL\03-CAD\MP-MASTERPLAN\NL222055-01-CSK-C09.01-SWEPT PATHS.dwg

VEHICLE MOVEMENTS

- VEHICLE BODY
- VEHICLE WHEELS
- VEHICLE LATERAL CLEARANCE (0.3m FROM BODY)
- VEHICLE LATERAL CLEARANCE (0.5m FROM BODY)

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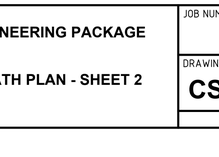
VEHICLE PROFILE



SINGLE UNIT TRUCK/BUS (12.5m)

OVERALL LENGTH	12.500m
OVERALL WIDTH	2.500m
OVERALL BODY HEIGHT	4.300m
TRACK WIDTH	2.500m
LOCK-TO-LOCK TIME	6.00s
KERB TO KERB TURNING RADIUS	15.000m

DRAWN: JSTAUB DESIGNED: AKILLEN JOB MANAGER: LMCRAE VERIFIER: LMCRAE

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PROJECT: **PROPOSED SUBDIVISION 559 ANAMBAH ROAD GOSFORTH NSW 2320**

MASTERPLAN DA

DRAWING TITLE: **CIVIL ENGINEERING PACKAGE**

SWEPT PATH PLAN - SHEET 2

JOB NUMBER: **NL222055-01**

DRAWING NUMBER: **CSK-C09.02** REVISION: **A**

DRAWING SHEET SIZE = A1

Date: 28.05.2025 9:08 PM Plotted By: JACOB STAUB Found: O:\6 Pre-July 24 Projects\Newcastle\YEAR 2022 Jobs\NL222055-01 - 559 Anambah Road, Gosforth\03 - Drawings\CIVIL\03-CAD\MP-MASTERPLAN\NL222055-01-CSK-C09.01-SWEPT PATHS.dwg

VEHICLE MOVEMENTS

- VEHICLE BODY
- VEHICLE WHEELS
- VEHICLE LATERAL CLEARANCE (0.3m FROM BODY)
- VEHICLE LATERAL CLEARANCE (0.5m FROM BODY)

DISCLAIMER

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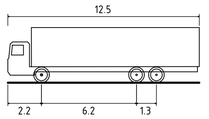
VEHICLE PROFILE



SINGLE UNIT TRUCK/BUS (12.5m)

OVERALL LENGTH	12.500m
OVERALL WIDTH	2.500m
OVERALL BODY HEIGHT	4.300m
TRACK WIDTH	2.500m
LOCK-TO-LOCK TIME	6.00s
KERB TO KERB TURNING RADIUS	15.000m

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MASTERPLAN DA

DRAWING TITLE: **CIVIL ENGINEERING PACKAGE**

SWEPT PATH PLAN - SHEET 3

JOB NUMBER: **NL222055-01**

DRAWING NUMBER: **CSK-C09.03** REVISION: **A**

DRAWING SHEET SIZE = A1

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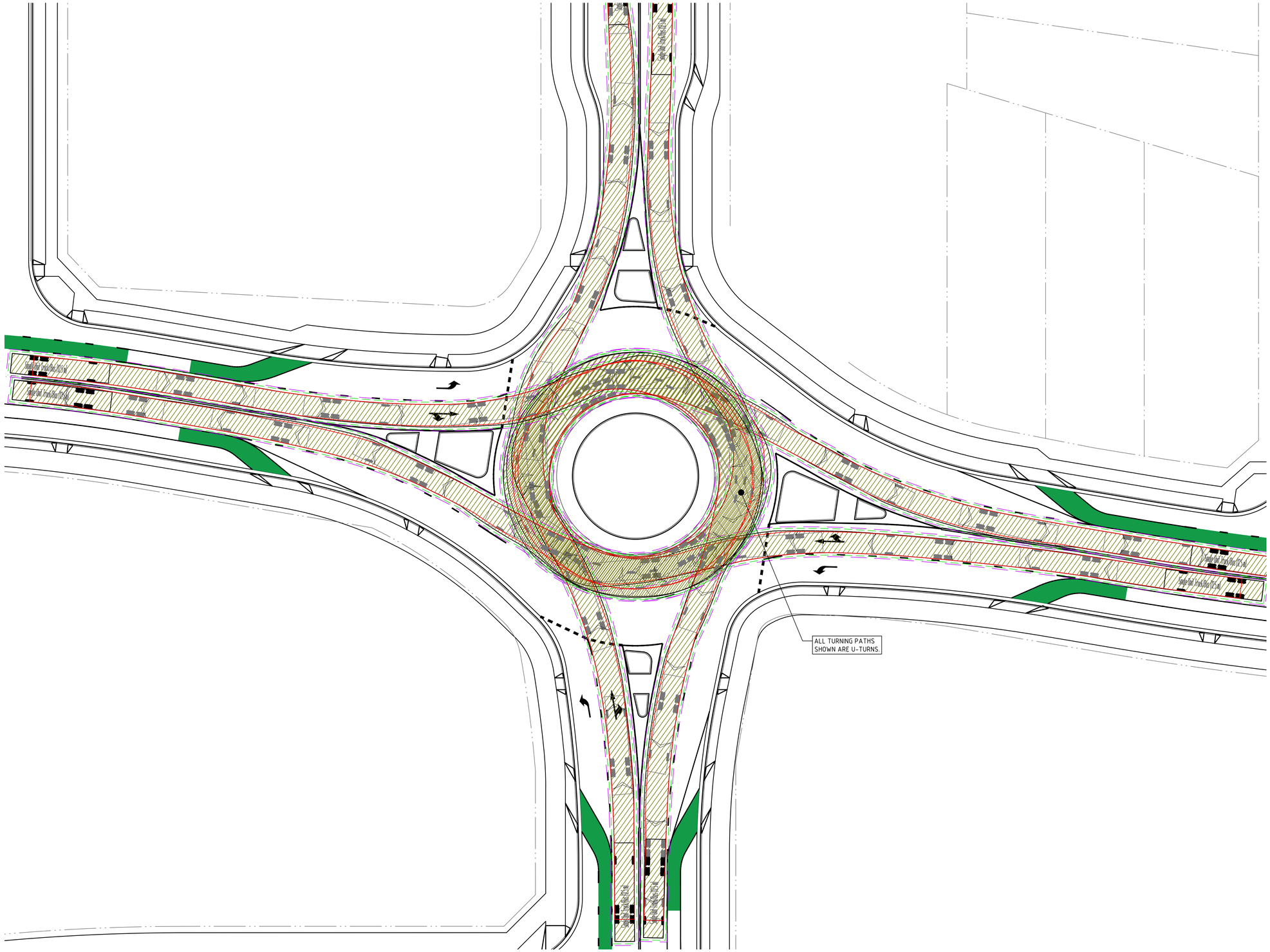

VEHICLE MOVEMENTS

- VEHICLE BODY
- VEHICLE WHEELS
- VEHICLE LATERAL CLEARANCE (0.3m FROM BODY)
- VEHICLE LATERAL CLEARANCE (0.5m FROM BODY)

DISCLAIMER

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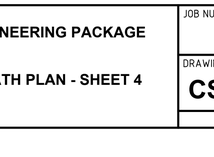
VEHICLE PROFILE



SINGLE UNIT TRUCK/BUS (12.5m)

OVERALL LENGTH	12.500m
OVERALL WIDTH	2.500m
OVERALL BODY HEIGHT	4.300m
TRACK WIDTH	2.500m
LOCK-TO-LOCK TIME	6.00s
KERB TO KERB TURNING RADIUS	15.000m

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ABN 81 094 433 100

PROJECT: **PROPOSED SUBDIVISION 559 ANAMBAH ROAD GOSFORTH NSW 2320**

MASTERPLAN DA

DRAWING TITLE: **CIVIL ENGINEERING PACKAGE**

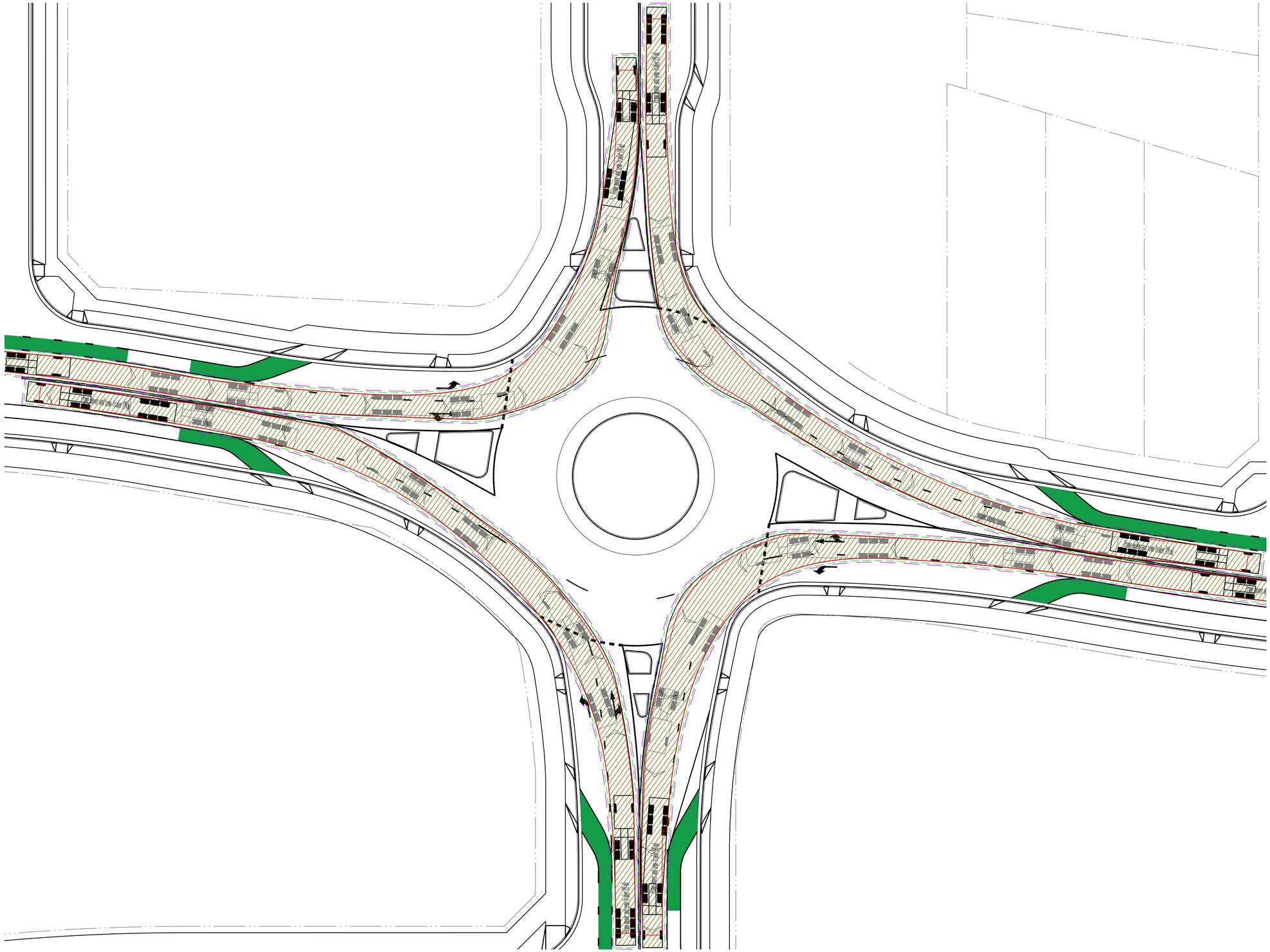
SWEPT PATH PLAN - SHEET 4

JOB NUMBER: **NL222055-01**

DRAWING NUMBER: **CSK-C09.04** REVISION: **A**

DRAWING SHEET SIZE = A1

Date: 28.05.2025 9:08 PM Plotted By: JACOB STAUB Found: O:\6 Pre-July 24 Projects\Newcastle\YEAR 2022 Jobs\NL222055-01 - 559 Anambah Road, Gosforth\O - Drawings\CIVIL\03-CAD\MP-MASTERPLAN\NL222055-01-CSK-C09.01-SWEPT PATHS.dwg



VEHICLE MOVEMENTS

- VEHICLE BODY
- VEHICLE WHEELS
- VEHICLE LATERAL CLEARANCE (0.3m FROM BODY)
- VEHICLE LATERAL CLEARANCE (0.5m FROM BODY)

DISCLAIMER

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VEHICLE PROFILE

PRIME MOVER AND SEMI TRAILER (19m)

OVERALL LENGTH	19.000m
OVERALL WIDTH	2.500m
OVERALL BODY HEIGHT	4.300m
TRACK WIDTH	2.500m
LOCK-TO-LOCK TIME	6.00s
KERB TO KERB TURNING RADIUS	15.000m

DRAWN: J.STAUB DESIGNED: A.KILLEN JOB MANAGER: L.MCRAE VERIFIER: L.MCRAE

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SCALE 1:250@ A1

0 2.5 5 7.5 10 12.5m

NORTHROP
Newcastle
Level 1, 215 Pacific Hwy, Charlestown NSW 2290
Ph (02) 4943 1777 Email newcastle@northrop.com.au
ABN 81 094 433 100

PROJECT: **PROPOSED SUBDIVISION 559 ANAMBAH ROAD GOSFORTH NSW 2320**

MASTERPLAN DA

DRAWING TITLE: **CIVIL ENGINEERING PACKAGE**

SWEPT PATH PLAN - SHEET 5

JOB NUMBER: **NL222055-01**

DRAWING NUMBER: **CSK-C09.05** REVISION: **A**

DRAWING SHEET SIZE = A1

Date: 28.05.2025 9:08 PM Plotted By: JACOB STAUB Found: O:\6 Pre-July 24 Projects\Newcastle\YEAR 2022 Jobs\NL222055-01 - 559 Anambah Road, Gosforth\03 - Drawings\CIVIL\03-CAD\MP-MASTERPLAN\NL222055-01-CSK-C09.01-SWEPT PATHS.dwg

VEHICLE MOVEMENTS

- VEHICLE BODY
- VEHICLE WHEELS
- VEHICLE LATERAL CLEARANCE (0.3m FROM BODY)
- VEHICLE LATERAL CLEARANCE (0.5m FROM BODY)

DISCLAIMER

THE VEHICLE SWEPT PATHS / TEMPLATES PROVIDED HAVE BEEN PRODUCED USING SIMULATION SOFTWARE AND ARE TO BE USED AS A GUIDE ONLY. THESE SIMULATIONS MAY NOT REFLECT ACTUAL DRIVER BEHAVIOUR AND / OR EXPERIENCE UNDER ACTUAL DRIVING CONDITIONS.

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VEHICLE PROFILE

PRIME MOVER AND SEMI TRAILER (19m)

OVERALL LENGTH	19.000m
OVERALL WIDTH	2.500m
OVERALL BODY HEIGHT	4.300m
TRACK WIDTH	2.500m
LOCK-TO-LOCK TIME	6.00s
KERB TO KERB TURNING RADIUS	15.000m

DRAWN: J.STAUB DESIGNED: A.KILLEN JOB MANAGER: L.MCRAE VERIFIER: L.MCRAE

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MASTERPLAN DA

DRAWING TITLE: CIVIL ENGINEERING PACKAGE

SWEPT PATH PLAN - SHEET 6

JOB NUMBER: NL222055-01

DRAWING NUMBER: CSK-C09.06 REVISION: A

DRAWING SHEET SIZE = A1

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VEHICLE MOVEMENTS

- VEHICLE BODY
- VEHICLE WHEELS
- VEHICLE LATERAL CLEARANCE (0.3m FROM BODY)
- VEHICLE LATERAL CLEARANCE (0.5m FROM BODY)

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VEHICLE PROFILE

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TRACK WIDTH	2.500m
LOCK-TO-LOCK TIME	6.00s
KERB TO KERB TURNING RADIUS	15.000m

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MASTERPLAN DA

DRAWING TITLE: CIVIL ENGINEERING PACKAGE

SWEPT PATH PLAN - SHEET 7

JOB NUMBER: NL222055-01

DRAWING NUMBER: CSK-C09.07

REVISION: A

DRAWING SHEET SIZE = A1

Date : 28.05.2025 5:08 PM Plotted By : JACOB STAUB Found : O:\5 Pre-July 24 Projects\Newcastle\YEAR 2022 Jobs\NL222055-01 - 559 Anambah Road, Gosforth\CI - Drawings\CIVIL\03-CAD\MP-MASTERPLAN\NL222055-01-CSK-C09.01-SWEPT PATHS.dwg

ALL TURNING PATHS SHOWN ARE U-TURNS.

VEHICLE MOVEMENTS

- VEHICLE BODY
- VEHICLE WHEELS
- VEHICLE LATERAL CLEARANCE (0.3m FROM BODY)
- VEHICLE LATERAL CLEARANCE (0.5m FROM BODY)

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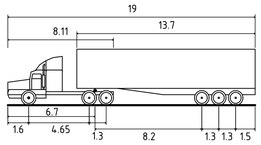
VEHICLE PROFILE



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MASTERPLAN DA

DRAWING TITLE: CIVIL ENGINEERING PACKAGE

SWEPT PATH PLAN - SHEET 8

JOB NUMBER: NL222055-01

DRAWING NUMBER: CSK-C09.08 REVISION: A

DRAWING SHEET SIZE = A1

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