

DRAFT



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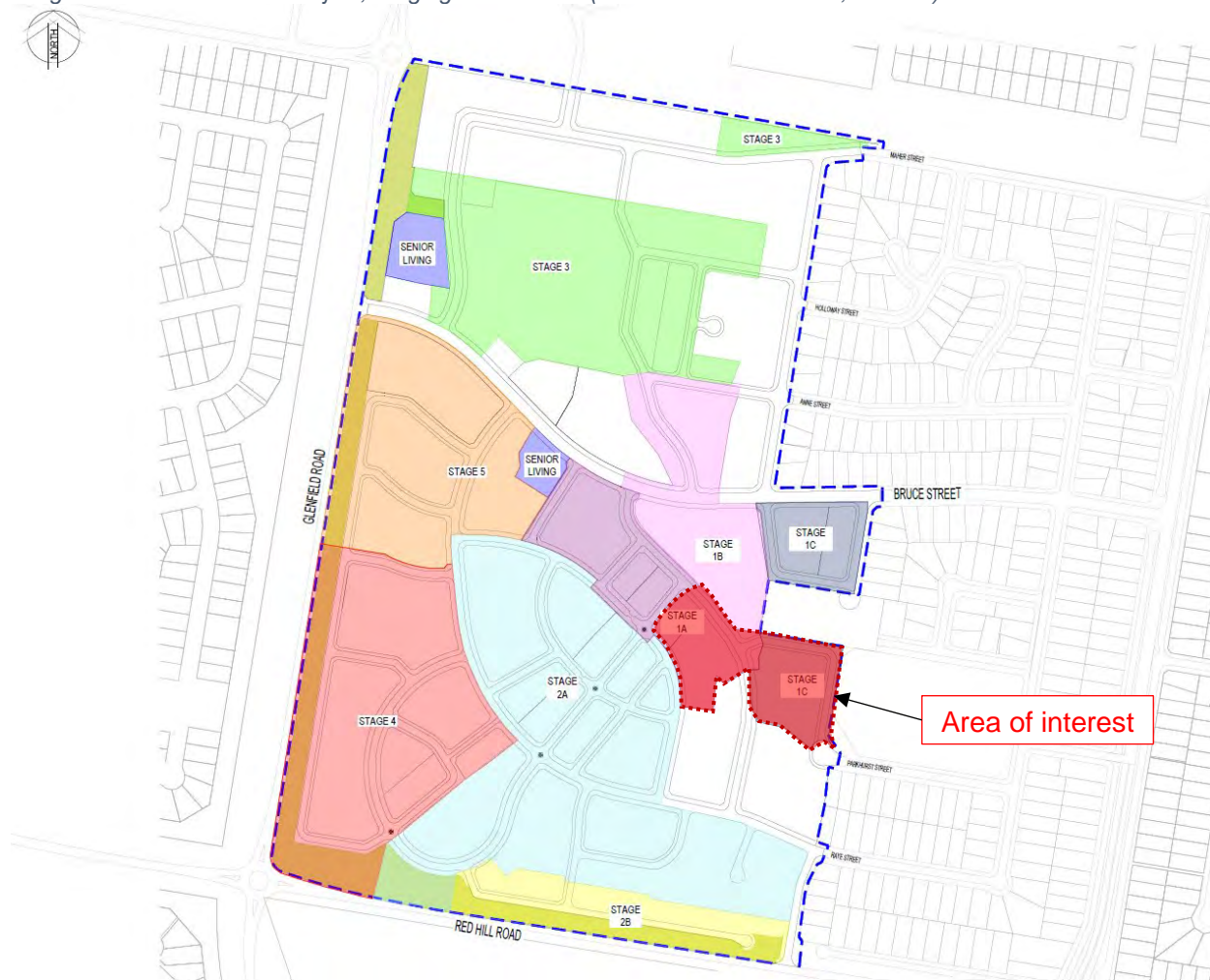
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Project:	<i>Tolland Renewal Project, Wagga Wagga – preliminary flood assessment</i>
Project ID:	<i>230064</i>
Date:	<i>13 September 2023</i>
To:	<i>John Sutcliffe, Stantec</i>
Version:	<i>A (DRAFT)</i>
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1. Introduction

Stantec has engaged GRC Hydro to undertake preliminary flood modelling for the Tolland Renewal Project in the Wagga Wagga City Council LGA. The analysis presented herein focuses on the assessment of flood behaviour for an area of interest near Parkhurst Street and Lockett Place, where residential development is proposed at the location of an existing channel. The area of interest is shaded red in Image 1 below.

Image 1: Tolland Renewal Project, Staging Master Plan (DWG 50521067-C1015, Stantec)



The area of interest comprises the southern areas of Stages 1A and 1C as presented in Staging Master Plan (DWG 50521067-C1015), which includes two future development areas with a dwelling density of 1,200 m³/s, and two new streets formed by the extension of Parkhurst Street and Lockett Place.

The project is situated in the ‘Wagga Wagga Major Overland Flow Floodplain Risk Management Study and Plan’ (MOFFS) (WMAwater, 2021) study area. The area is defined as flood affected by the MOFFS due to overland flow flooding, with flow arriving to the area of interest from the south-east via trunk stormwater and overland flows along Parkhurst Street.

2. Scope of this Assessment

The focus of this assessment is to utilise Council’s MOFFS flood model to assess flood behaviour for the area of interest presented in Image 1, with modelling of a high level hydraulic concept design as described in Section 5.2.

The following issues are not considered as part of the current assessment and may require consideration during later design stages:

- Management of stormwater/flood flows for the Tolland Renewal Project for areas other than the area of interest described in Image 1;
- Consideration of site drainage and provision for On-Site Detention (OSD) to account for potential future increases to impervious surface fraction due to development;
- Consideration of compliance with Council’s flood planning policy;
- Preparation of a Flood Impact and Risk Assessment as per LU01 requirements;
- Review of the Council MOFFS report and associated TUFLOW model. The Council TUFLOW model was used without modification to assess Existing Conditions.

The analysis presented herein is a high-level hydraulic assessment only. Coordination with a civil design has not been undertaken and is required for future design stages.

3. Proposed Design

A Master Plan prepared by Stantec which provides concept details of the development is contained in Attachment A. Key to this preliminary flood assessment, the plans show:

- The extension of Parkhurst Street and Lockett Place;
- New medium density residential development areas;
- A trunk stormwater deviation of the exiting Parkhurst Street stormwater system around the proposed development area.

Flooding modelling has been undertaken for a high-level hydraulic concept based on the Master Plan design. Details of the model adjustments to simulate the design are described in Section 4.2.

4. Flood Modelling Approach

The MOFFS report and associated TUFLOW model (WMAwater, 2021) was provided by Council and was used as the basis of the analysis presented herein. Relevant details of the model build are described in the following sections.

4.1 Existing Conditions Model Build

The MOFFS ‘City Area’ TUFLOW model was used to assess Existing (baseline) Conditions. The model was provided with limited metadata and was utilised to inform of baseline conditions without modification. A summary of key model parameters/methods is described below:

- TUFLOW version ‘2017-09-AC’ with the ‘HPC’ solver was applied (this is the same solver used by the Council flood model).
- Australian Rainfall and Runoff (ARR) 2019 design runs were modelled. Due to a lack of metadata, a critical duration assessment was undertaken to determine the critical storm duration for each Annual Exceedance Probability (AEP) event. The metadata did contain the critical storm temporal patterns for each duration and AEP, and accordingly, only the critical storms were assessed. The resultant storms used in design flood modelling are presented in Table 1.

Table 1: Critical storm duration for each event

Event	Duration	Temporal Pattern*
20% AEP	120 mins	3952
10% AEP	120 mins	3901
5% AEP	120 mins	3901
2% AEP	120 mins	3935
1% AEP	120 mins	3935
PMF	60 mins	GSDM

* Critical storm temporal patterns were supplied as part of the Council TUFLOW model metadata.

- Tailwater in scenario ‘TW002Y’ was applied as determined by the Council TUFLOW model metadata.
- Hydraulic roughness parameters from the MOFFS TUFLOW model (2021) were retained as presented Table 2.

Table 2: Adopted Manning’s Values

Surface Type	Manning’s value
Pasture	0.045
1D Cross Section Elements	0.04
Low Density Lots	0.06
Ponds and other water bodies	0.03
Newly built/resurfaced road	0.018
Industrial	0.07
Roads	0.022
Creek permanent water	0.04
Vegetation	0.1
Vegetated creek	0.08
Railway	0.06
Select 1D cross section (Crooked Creek)	0.06

- The TUFLOW model was run for the Existing Conditions scenario for the 20% AEP, 10% AEP, 5% AEP, 2% AEP, 1% AEP and PMF events.

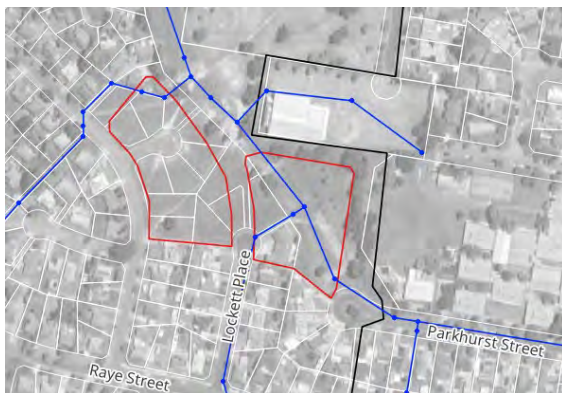
4.2 Proposed Conditions Model Build

The Existing Conditions model was modified to incorporate a hydraulic concept design which aimed to meet the expected design intent of the Master Plan design proposed by Stantec (see Section 3). It should be noted that no design surface was available for analysis. Future design stages would be required to update the model with the incorporation of survey to better understand the impact of the proposed development.

The following model updates were made to assess concept Proposed Conditions flood behaviour:

- Proposed residential lots in the area of interest shown in Image 1 were raised by ~0.3 m above the surrounding ground levels and the existing channel through this area was filled to simulate potential future conditions associated with development.
- A Mannings roughness value of 0.2 was applied to proposed residential lots in the area of interest, to simulate potential future residential development. This value is consistent with the recommendations in ARR2019.
- Ground levels in the Parkhurst Street road easement were retained as per existing levels.
- Existing Trunk stormwater from Parkhurst Street was deviated around the proposed residential areas following the alignment of the proposed road extension (see Image 2). These pipes connected into the existing culverts to the northwest of the site. The existing and proposed stormwater culverts for the deviated portion of the network are 2 x DN1050. Bend losses were modelled using TUFLOW Englund method.
- A large inlet structure (unlimited inlet capacity) was modelled at the upstream end of the deviated stormwater system.
- Stormwater from Lockett Place was also deviated around the area proposed for residential development following the road alignment (see Image 2).

Image 2: Existing and Proposed stormwater network



Existing stormwater network



Proposed stormwater network

- The TUFLOW model was run for the Proposed Conditions scenario for the 20% AEP, 10% AEP, 5% AEP, 2% AEP, 1% AEP and PMF events.

5. Hydraulic Model Results

5.1 Existing Conditions Model Results

Existing Conditions peak flood depths and levels are presented in:

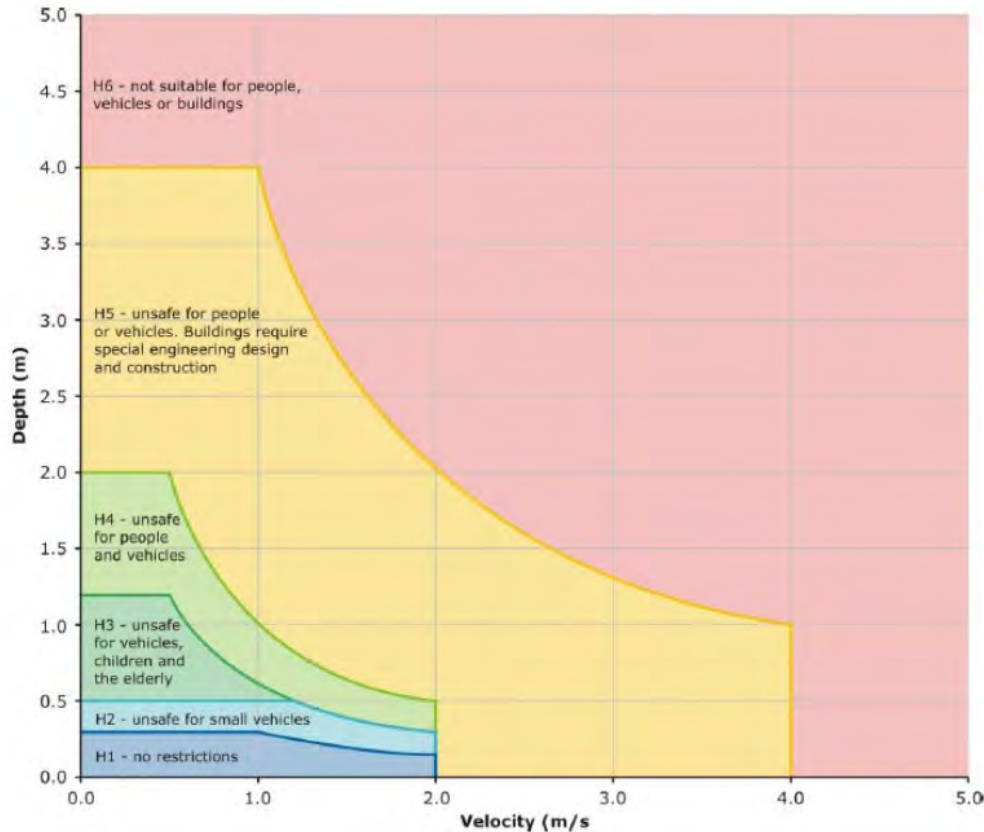
- Figure 1: 1% AEP Peak Flood Depths and Levels – Existing Conditions
- Figure 2: PMF Peak Flood Depths and Levels - Existing Conditions

Existing Conditions flood hazard categories are presented in:

- Figure 3: 1% AEP Peak Flood Hazard – Existing Conditions
- Figure 4: PMF Peak Flood Hazard – Existing Conditions

Flood hazard values were derived using the methodology outlined in ARR2019 which considers flow hydraulic characteristics of velocity and depth as presented in Image 3, to determine flood hazard for various floodplain uses.

Image 3: ARR2019 flood hazard – depth and velocity characteristics



The analysis shows:

- The majority of flood water arrives to the area of interest from east as overland/stormwater flows via Parkhurst Street.
- Minor drainage flows arrive to the site from Lockett Place;
- Flows drains into an existing open channel through the proposed residential areas in the area of interest;
- The area of interest is affected by overland flow flooding, with typically shallow/low hazard flows with depths of less than 50 mm and a H1 hazard category in the 1% AEP event. Depths of up to approximately 0.4 m with H2 hazard category are noted in the existing channel for this event.
- During the PMF, flood depths are typically less than 0.15 m (H1) for the area of interest, with depths of up to 0.7 m in the existing channel, with an associated H3/H4 hazard category.

5.2 Proposed Conditions Model Results

Proposed Conditions peak flood depths and levels are presented in:

- Figure 5: 1% AEP Peak Flood Depths & Levels - Proposed Conditions
- Figure 6: PMF Peak Flood Depths & Levels - Proposed Conditions

Proposed Conditions flood hazard categories are presented in:

- Figure 7: 1% AEP Peak Flood Hazard - Proposed Conditions
- Figure 8: PMF Peak Flood Hazard - Proposed Conditions

The analysis shows:

- Proposed residential areas are flood free during a 1% AEP event, with shallow (<0.05 m)/low hazard (H1) flows affecting surrounding roads;
- During the PMF, a portion of the Stage 1C site is subject to shallow (<0.05 m)/low hazard (H1) flows and the proposed Parkhurst Street extension is expected to be affected by H2 hazard flooding which is unsafe for small vehicles.

6. Flood Impact Assessment

A comparison of Existing and Proposed Conditions peak flood levels are presented in:

- Figure 9: 20% AEP Flood Impact - Proposed Conditions
- Figure 10: 10% AEP Flood Impact - Proposed Conditions
- Figure 11: 5% AEP Flood Impact - Proposed Conditions
- Figure 12: 2% AEP Flood Impact - Proposed Conditions
- Figure 13: 1% AEP Flood Impact - Proposed Conditions
- Figure 14: PMF AEP Flood Impact - Proposed Conditions

The preliminary analysis shows:

- No adverse impacts affecting properties outside of the Tolland Renewal Project for events up to and including the 1% AEP flood event.
- Localised changes in flood level are noted within the Tolland Renewal Project area along Dennis Crescent and the Lockett Place extension. Flows in these areas would be managed through appropriate road and stormwater design developed during future design stages.
- Localised increases in flood level are noted along the proposed Parkhurst Street extension. However, flood hazard on this road is low at H1 during the 1% AEP event and H2 during the PMF. Road and stormwater design should be developed during later design stages to manage flood and drainage risks.
- Localised increases in flood level are noted within the existing open channel directly downstream of the development, to the west of Wagga Wagga Brethren. These increases are due to minor changes to the discharge locations of upstream stormwater systems. The impacts are noted to be confined to the existing stormwater channel and do not adversely impact surrounding properties;
- Generally reduced flood levels upstream of the site are noted around Parkhurst Street due to the addition of a large flood inlet structure;
- A minor increase in flood level of less than 0.1 m is noted to affect the Wagga Wagga Brethren during the PMF.
- An area of impact of typically less than 0.03 m is noted during the PMF extending to properties to the north of Bruce Street.

7. Recommendations for Future Analysis

As noted, the modelling undertaken herein comprises a high-level hydraulic concept design assessment. Future design stages may require consideration of the following:

- Management of local flooding/stormwater issues due to local rainfall within the Tolland Renewal Project area;

- Consideration of potential future increases to impervious surface fraction due to the development and provision for On-Site Detention (OSD) to manage impacts to downstream flows;
- An assessment of compliance to Council’s flood planning policy;
- Preparation of a Flood Impact and Risk Assessment as per LU01 requirements;
- Detailed review of the Council MOFFS report and associated TUFLOW model, with incorporation of ground and stormwater survey for critical flow paths in the vicinity of the area of interest, and upstream.
- Flood modelling of a fully coordinated civil design, inclusive of proposed finish surface levels and stormwater design.
- Consideration of extreme flood event and blockage risks due to building over an overland flow path. Best practise would allow for adequate overland flow conveyance to manage these risks. This may require that the Parkhurst Street and bordering areas of Stage 1C provision for an overland flow path.
- PMF flood hazard on Parkhurst Street should be considered.

8. Conclusions

Stantec has engaged GRC Hydro to undertake preliminary flood modelling for the Tolland Renewal Project in the Wagga Wagga City Council LGA. The analysis presented herein focuses on the assessment of flood behaviour for an area of interest near Parkhurst Street and Lockett Place, where residential development is proposed at the location of an existing channel.

The project is situated in the ‘Wagga Wagga Major Overland Flow Floodplain Risk Management Study and Plan’ (MOFFS) (WMAwater, 2021) study area, within the City Area model domain. The area is defined as flood affected by the MOFFS due to overland flow flooding, with flow arriving to the area of interest from the south-east via trunk stormwater and overland flows along Parkhurst Street.

The MOFFS TUFLOW model was used to define Existing Conditions flood behaviour for the site. A high-level hydraulic concept design was developed to assess a Proposed Conditions scenario. The concept was developed based on the Master Plan prepared by Stantec (Attachment A). It should be noted that no design surface was available for analysis and all modelling presented herein should be considered high-level hydraulic concept type modelling. Future design stages would be required to update the model with the incorporation of survey to better understand the impact of the proposed development.

The analysis found that the Proposed Conditions model resulted in:

- Proposed residential areas to be flood free for events up to the 1% AEP flood, with shallow (<0.05 m)/low hazard (H1) flows affecting surrounding roads.
- During the PMF, a portion of the Stage 1C site to be subject to shallow (<0.05 m)/low hazard (H1) flows and the proposed Parkhurst Street extension was noted to be impacted by H2 hazard flooding which is unsafe for small vehicles.
- No adverse impacts affecting properties outside of the Tolland Renewal Project for events up to and including the 1% AEP flood event.
- Localised increases in flood level are noted within the existing open channel directly downstream of the development, to the west of Wagga Wagga Brethren. These impacts are noted to be confined to the existing stormwater channel and do not adversely impact surrounding properties;
- A minor increase in flood level of less than 0.1 m is noted to affect the Wagga Wagga Brethren during the PMF.

- An area of impact of typically less than 0.03 m is noted during the PMF extending to properties to the north of Bruce Street.

Based on the analysis presented herein, the proposed Master Plan design for the area of interest is relatively low risk. However, a number of recommendations for further flood modelling analysis are detailed in Section 7 of this report and should be considered during future design stages. This could require provision for an overland flow path along the Parkhurst Street extension, and bordering areas of Stage 1C, to manage extreme flood and blockage risks.

FIGURES

Figure 3: 1% AEP Peak Flood Depths and Levels – Existing Conditions

Figure 4: PMF Peak Flood Depths and Levels - Existing Conditions

Figure 3: 1% AEP Peak Flood Hazard – Existing Conditions

Figure 4: PMF Peak Flood Hazard – Existing Conditions

Figure 5: 1% AEP Peak Flood Depths & Levels - Proposed Conditions

Figure 6: PMF Peak Flood Depths & Levels - Proposed Conditions

Figure 7: 1% AEP Peak Flood Hazard - Proposed Conditions

Figure 8: PMF Peak Flood Hazard - Proposed Conditions

Figure 9: 20% AEP Flood Impact - Proposed Conditions

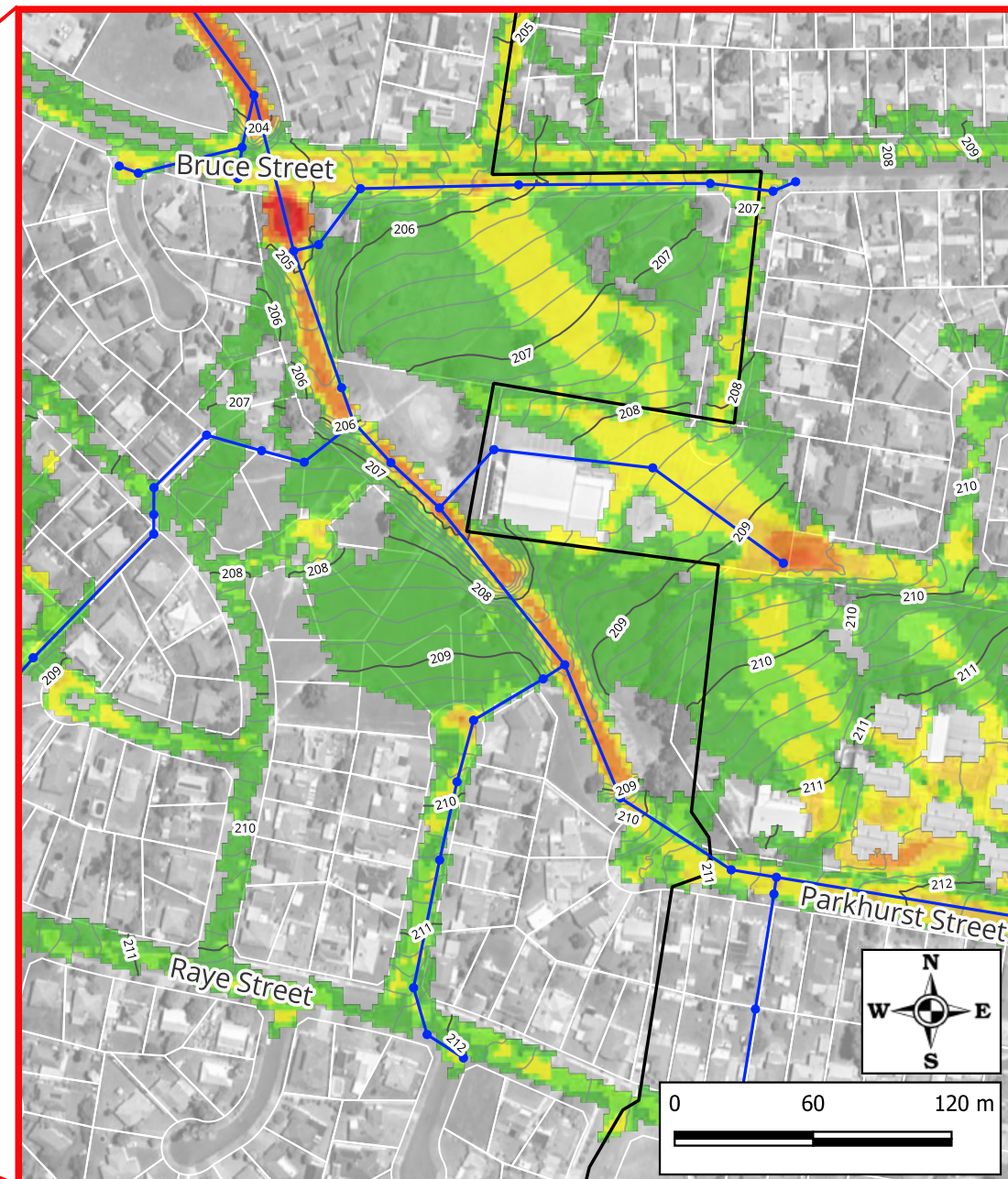
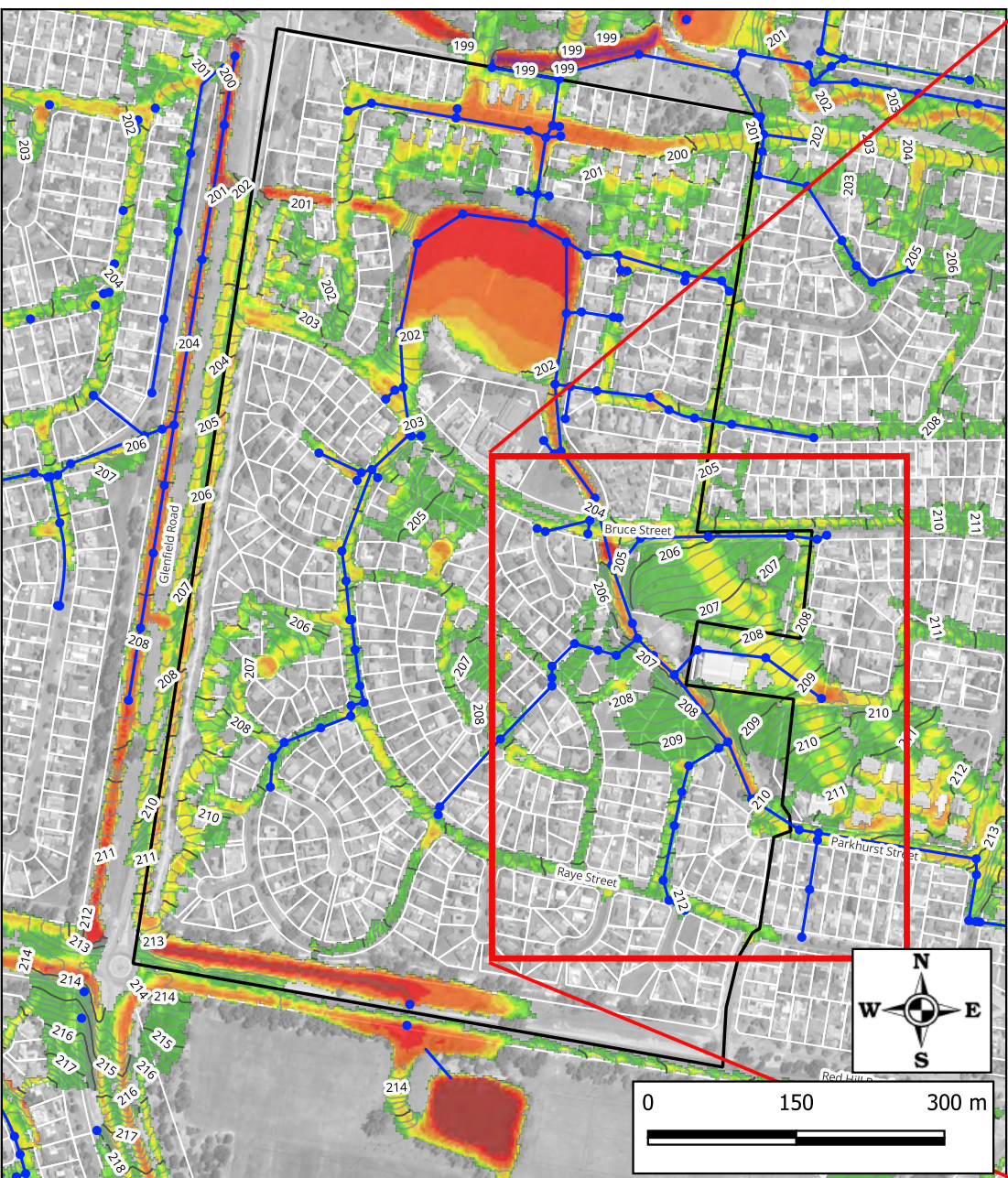
Figure 10: 10% AEP Flood Impact - Proposed Conditions

Figure 11: 5% AEP Flood Impact - Proposed Conditions

Figure 12: 2% AEP Flood Impact - Proposed Conditions

Figure 13: 1% AEP Flood Impact - Proposed Conditions

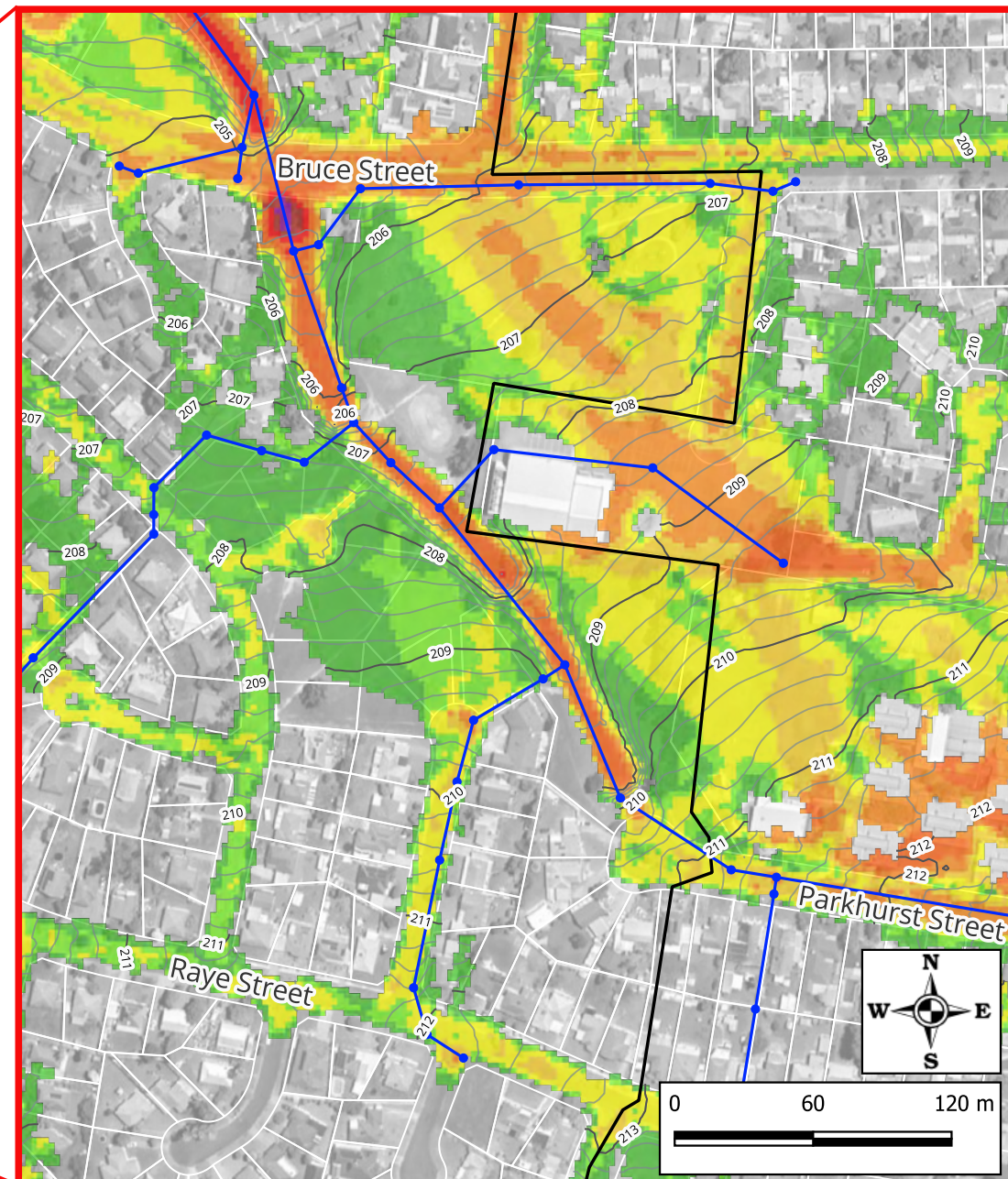
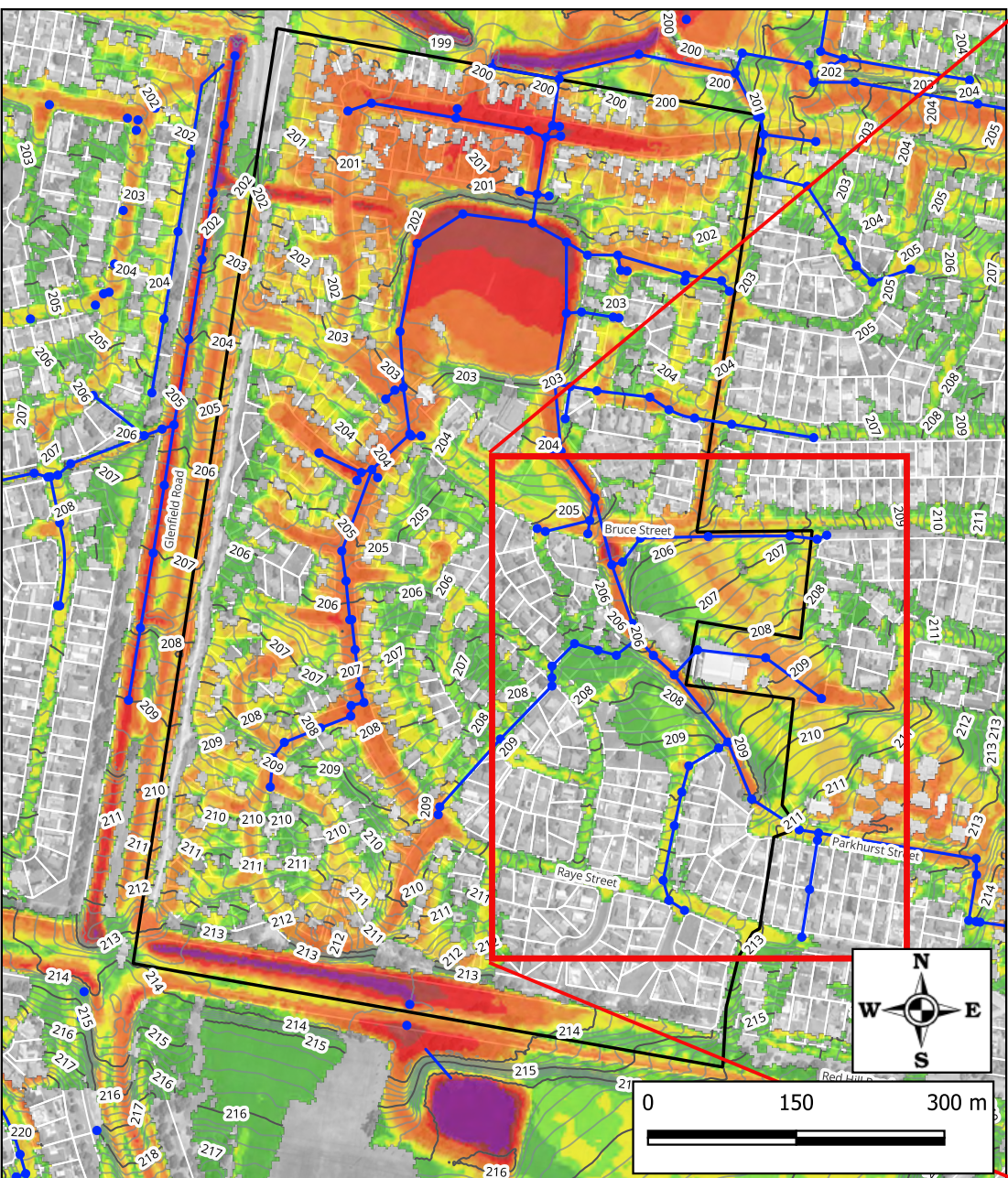
Figure 14: PMF AEP Flood Impact - Proposed Conditions



Subject Site	0 - 0.05	0.3 - 0.5
Cadastral Boundaries	0.05 - 0.1	0.5 - 1.0
Existing Pits	0.1 - 0.2	1.0 - 1.5
Existing Pipes	0.2 - 0.3	1.5 - 2.0
Major Flood Level Contour (mAHD)	> 2.0	
Minor Flood Level Contour (0.2m)		

TITLE: 1% AEP Peak Flood Depths & Levels - Existing Conditions		
PROJECT:	Tolland Renewal Project, Wagga Wagga	PROJECT No. 230064
DATE:	09-2023	SCALE: 1:7,000/3,000
		FIGURE No. 01

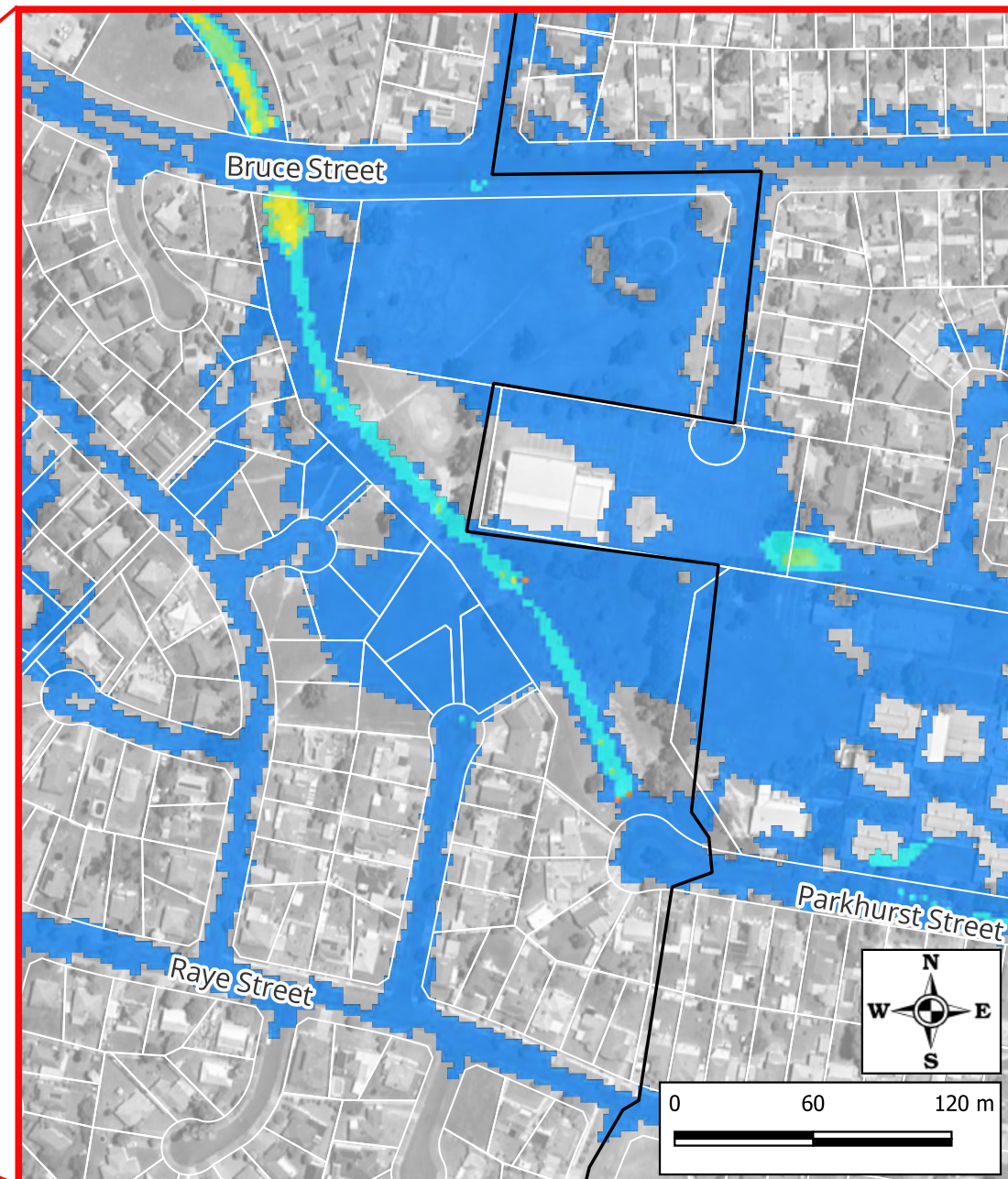
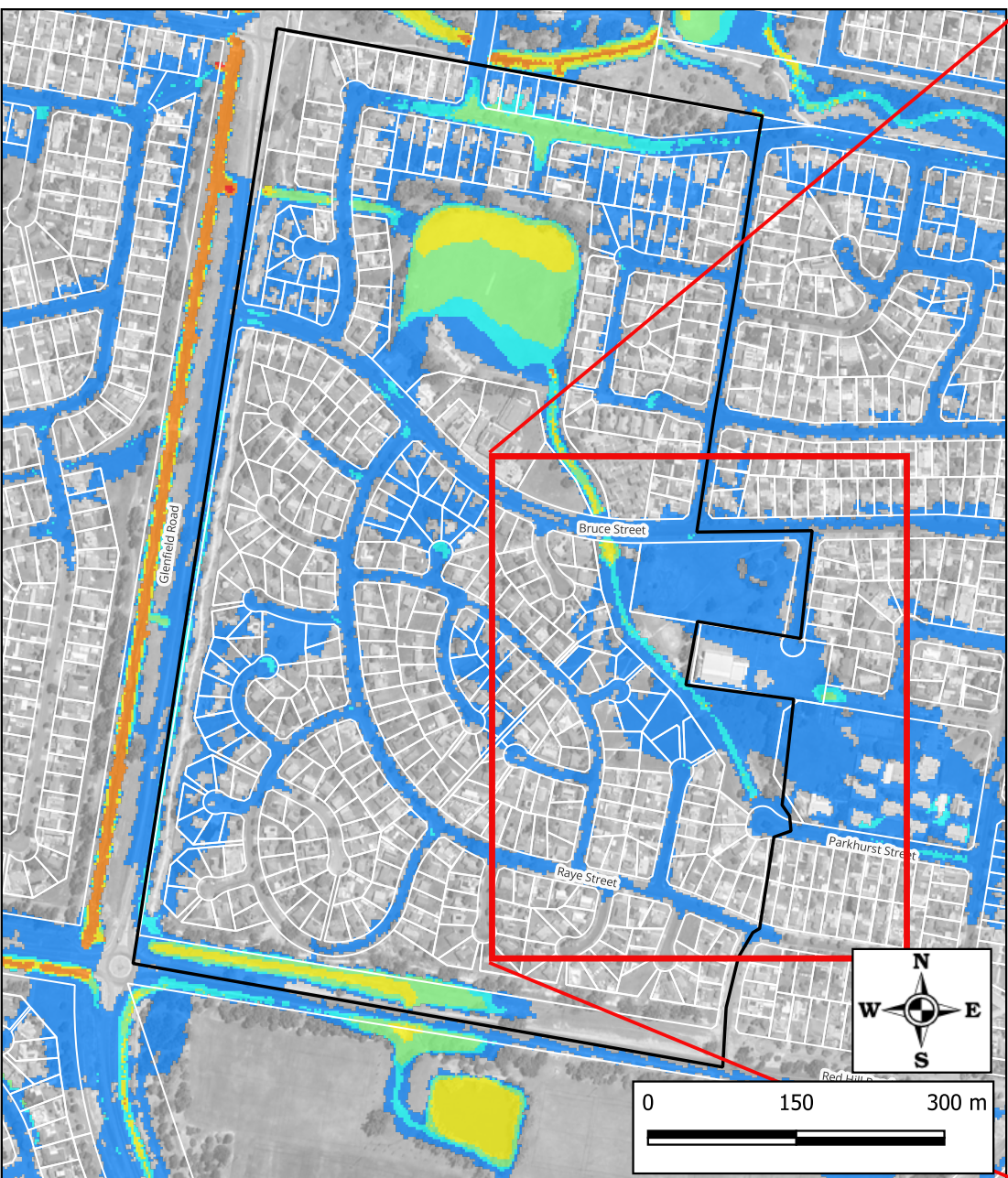




Subject Site	Depths (m)	0.3 - 0.5
Cadastral Boundaries	0 - 0.05	0.5 - 1.0
Existing Pits	0.05 - 0.1	1.0 - 1.5
Existing Pipes	0.1 - 0.2	1.5 - 2.0
Major Flood Level Contour (mAHD)	0.2 - 0.3	> 2.0
Minor Flood Level Contour (0.2m)		

TITLE: PMF Peak Flood Depths & Levels - Existing Conditions		
PROJECT:	Tolland Renewal Project, Wagga Wagga	PROJECT No. 230064
DATE:	09-2023	SCALE: 1:7,000/3,000
		FIGURE No. 02

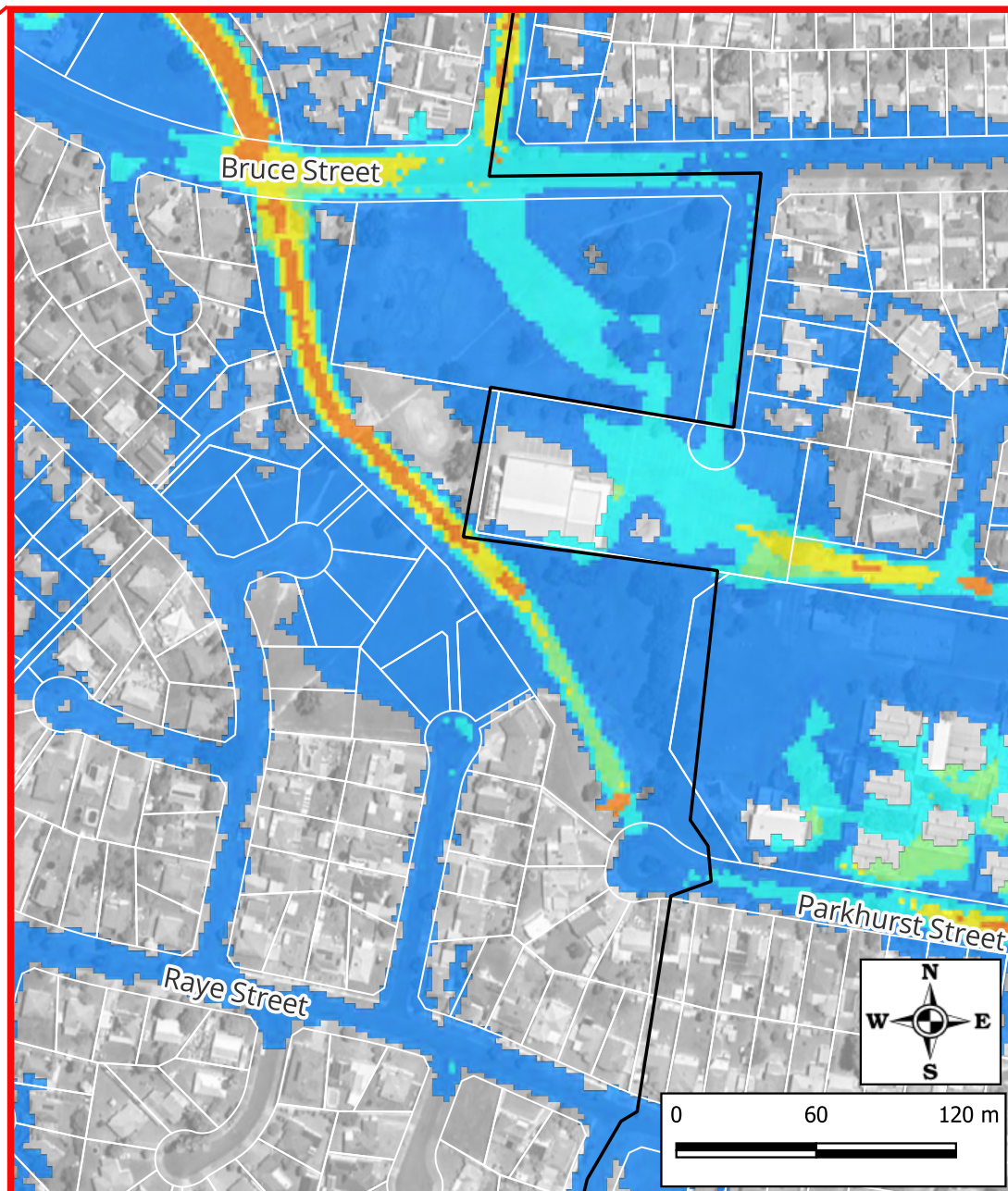
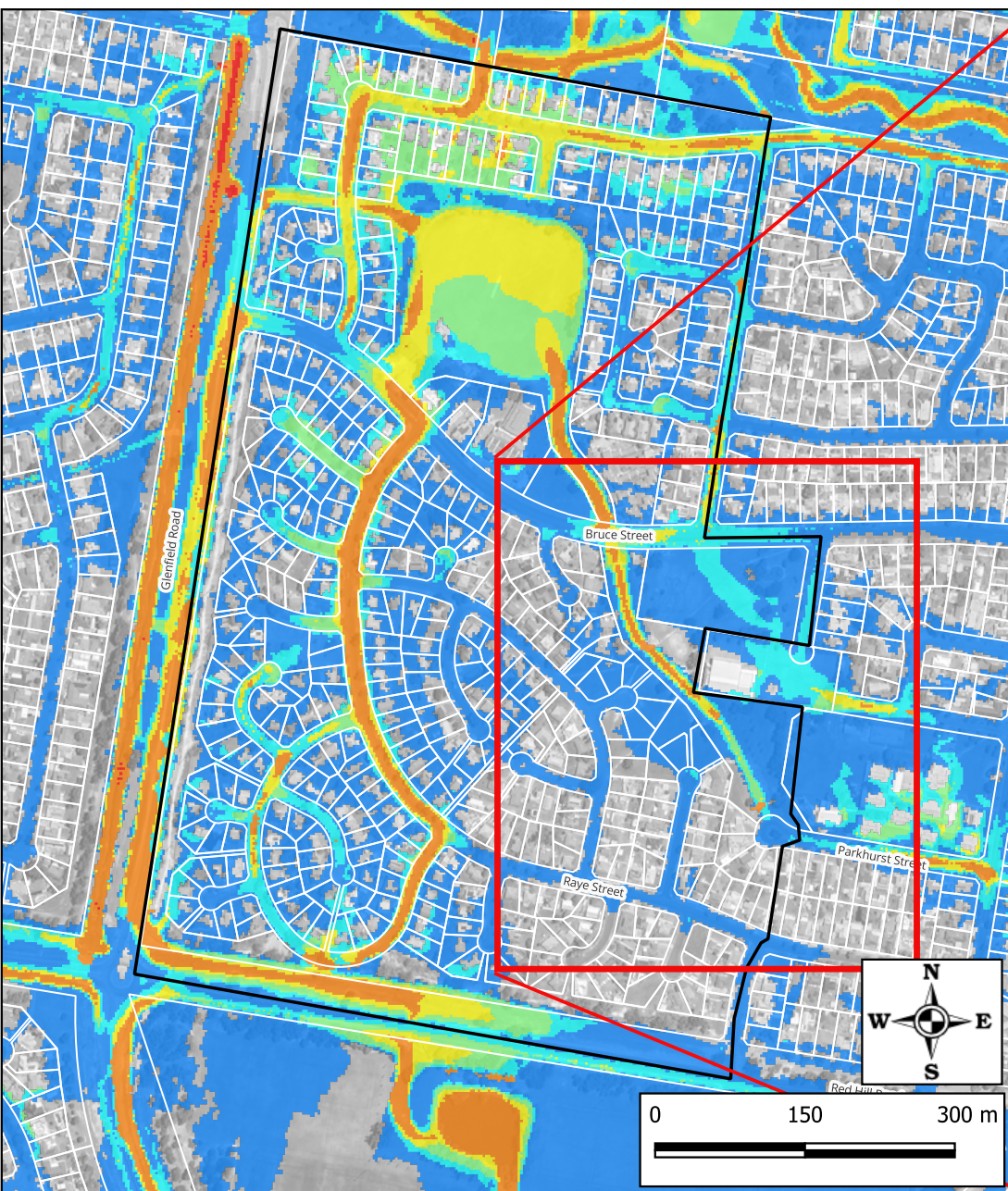




Subject Site	Flood Hazard	H4
Cadastral Boundaries	H1	H5
	H2	H6
	H3	

TITLE: 1% AEP Peak Flood Hazard - Existing Conditions		
PROJECT: Tolland Renewal Project, Wagga Wagga	PROJECT No. 230064	
DATE: 09-2023	SCALE: 1:7,000/3,000	FIGURE No. 03

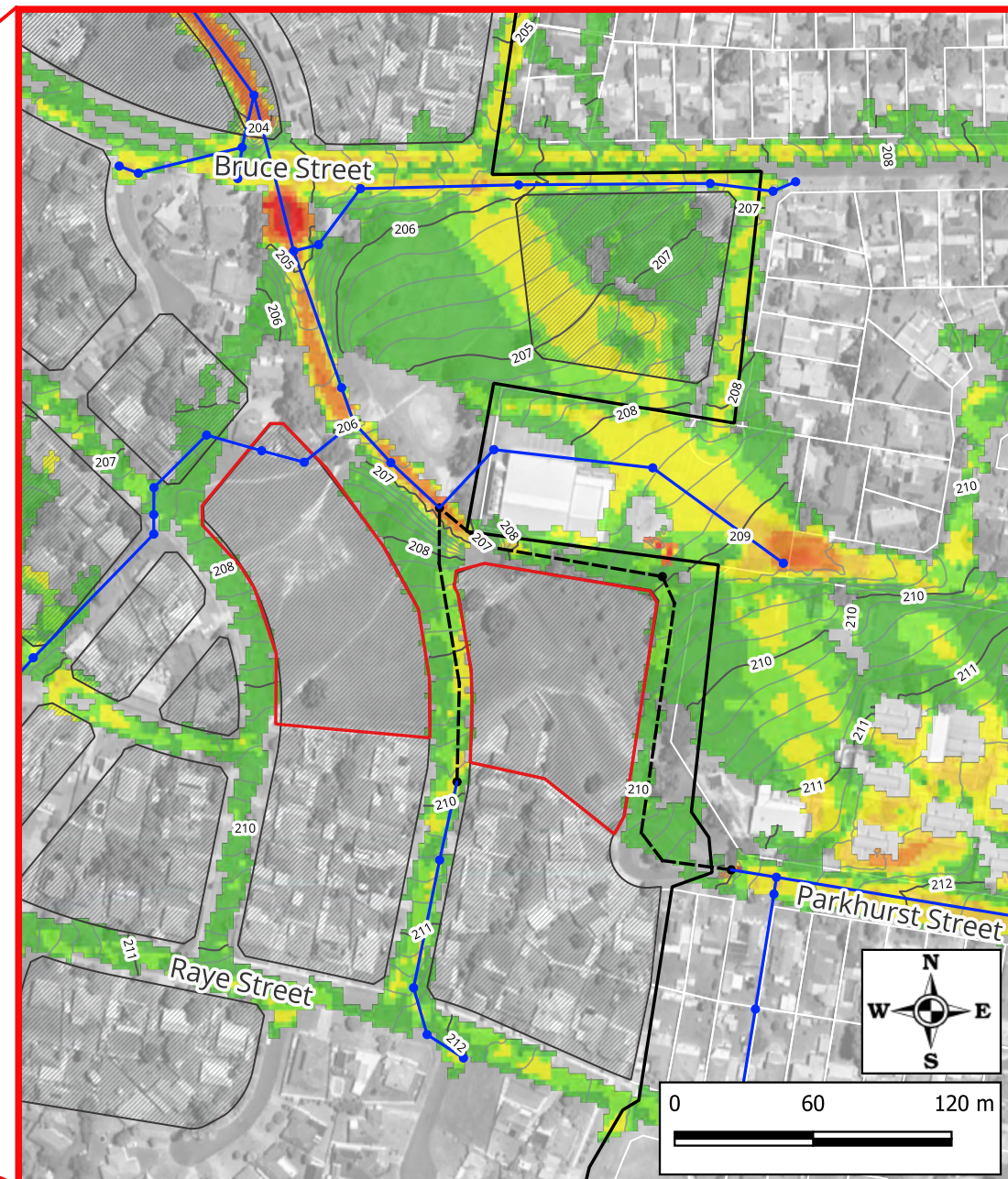
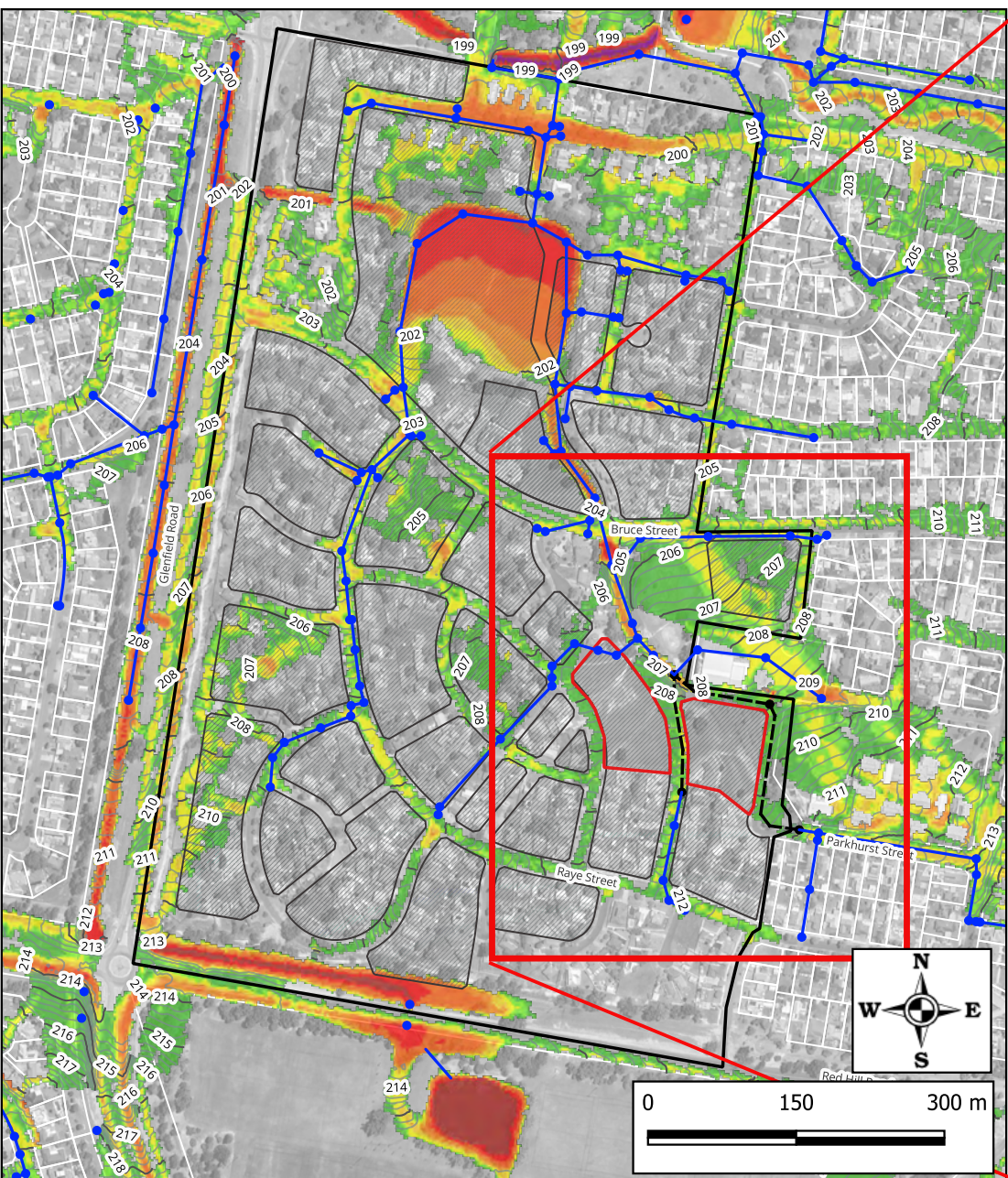




Subject Site	Flood Hazard	H4
Cadastral Boundaries	H1	H5
	H2	H6
	H3	

TITLE: PMF Peak Flood Hazard - Existing Conditions		
PROJECT: Tolland Renewal Project, Wagga Wagga	PROJECT No. 230064	
DATE: 09-2023	SCALE: 1:7,000/3,000	FIGURE No. 04

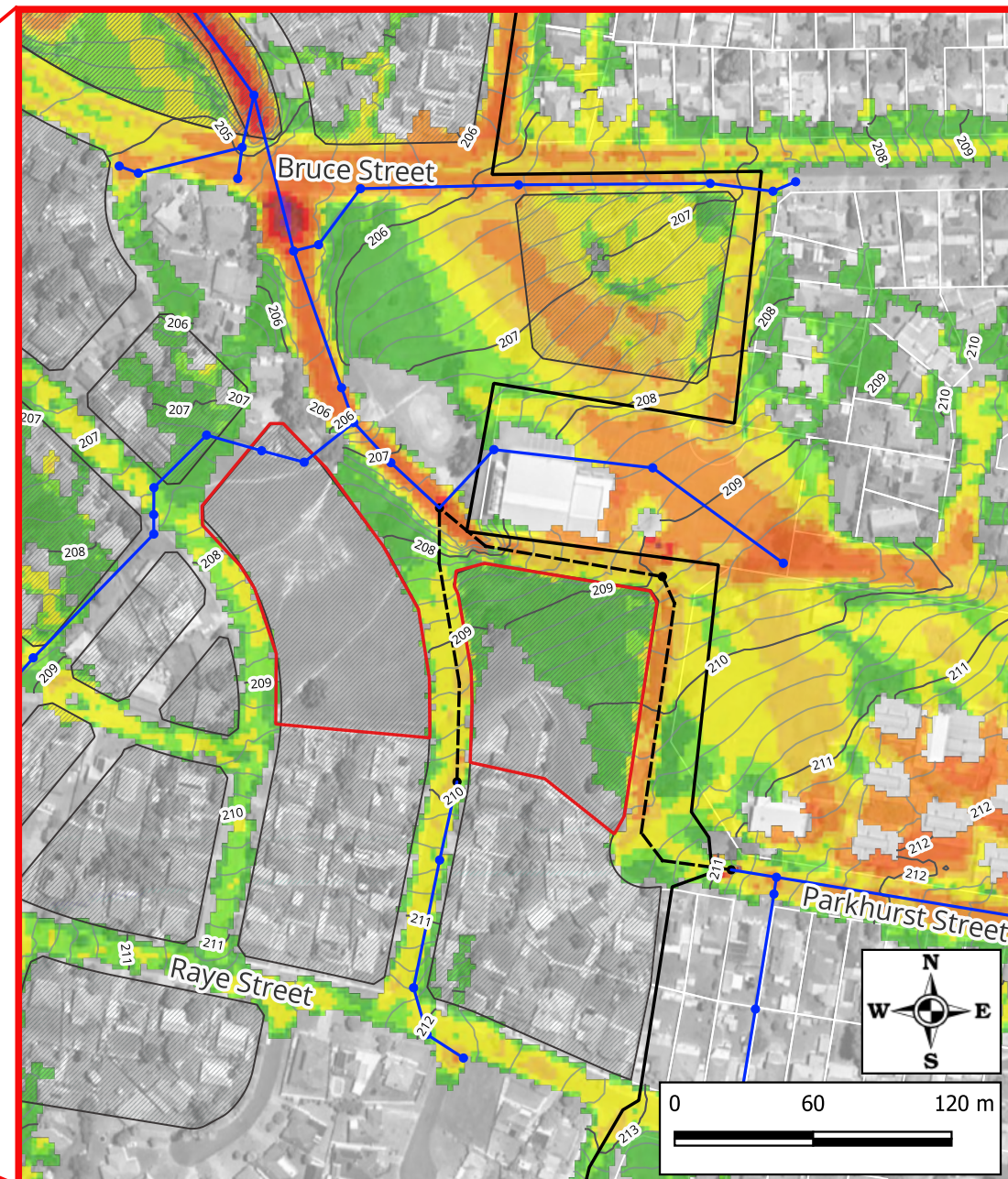
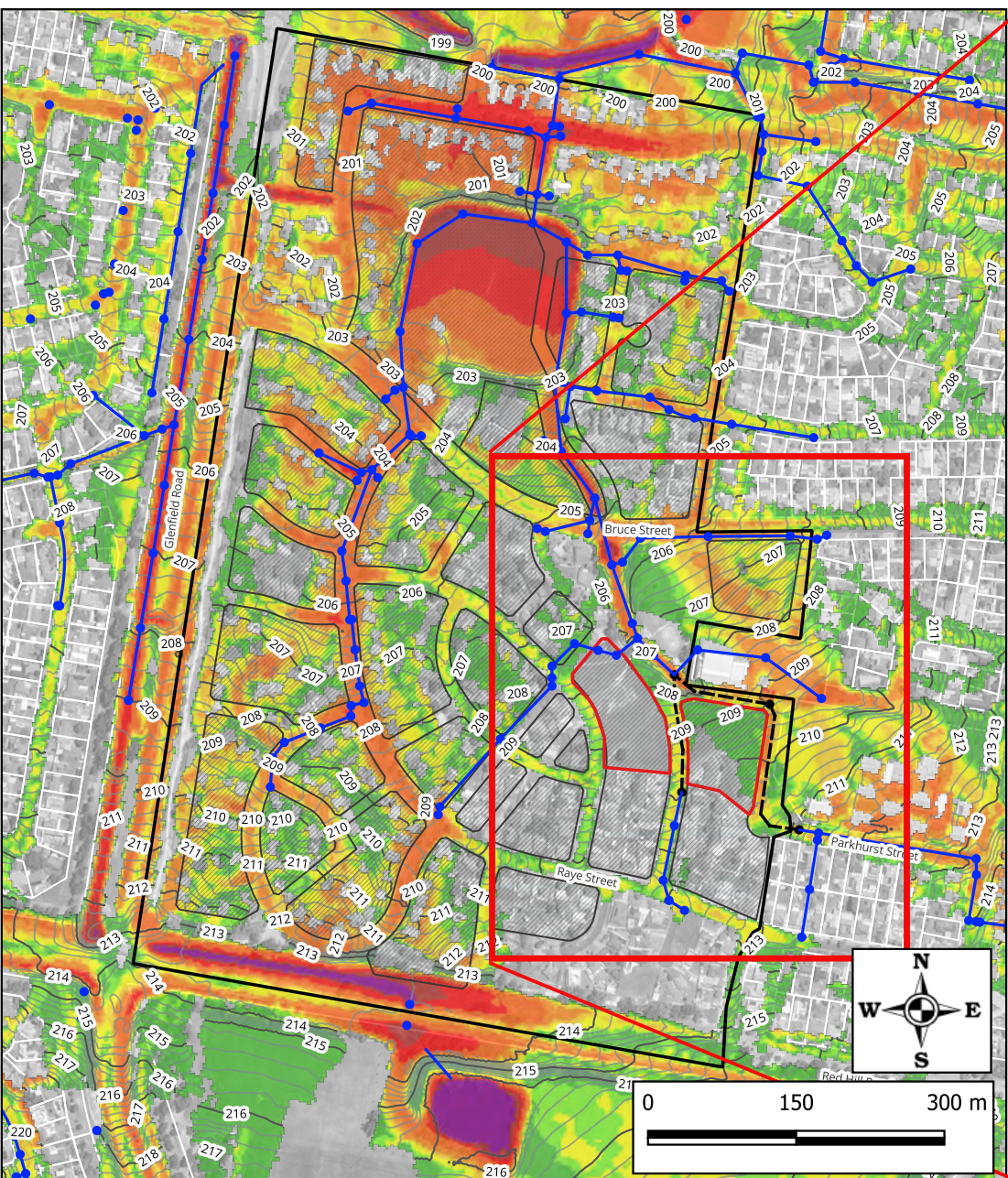




Subject Site	Existing Pipes	Depths (m)	0.3 - 0.5
Cadastral Boundaries	Existing Pits	0 - 0.05	0.5 - 1.0
Proposed Configuration	Proposed Pipes	0.05 - 0.1	1.0 - 1.5
New Development Proposed	Proposed pits	0.1 - 0.2	1.5 - 2.0
Major Flood Level Contour (mAHD)		0.2 - 0.3	> 2.0
Minor Flood Level Contour (0.2m)			

TITLE: 1% AEP Peak Flood Depths & Levels - Proposed Conditions		
PROJECT:	Tolland Renewal Project, Wagga Wagga	PROJECT No. 230064
DATE:	09-2023	SCALE: 1:7,000/3,000
		FIGURE No. 05

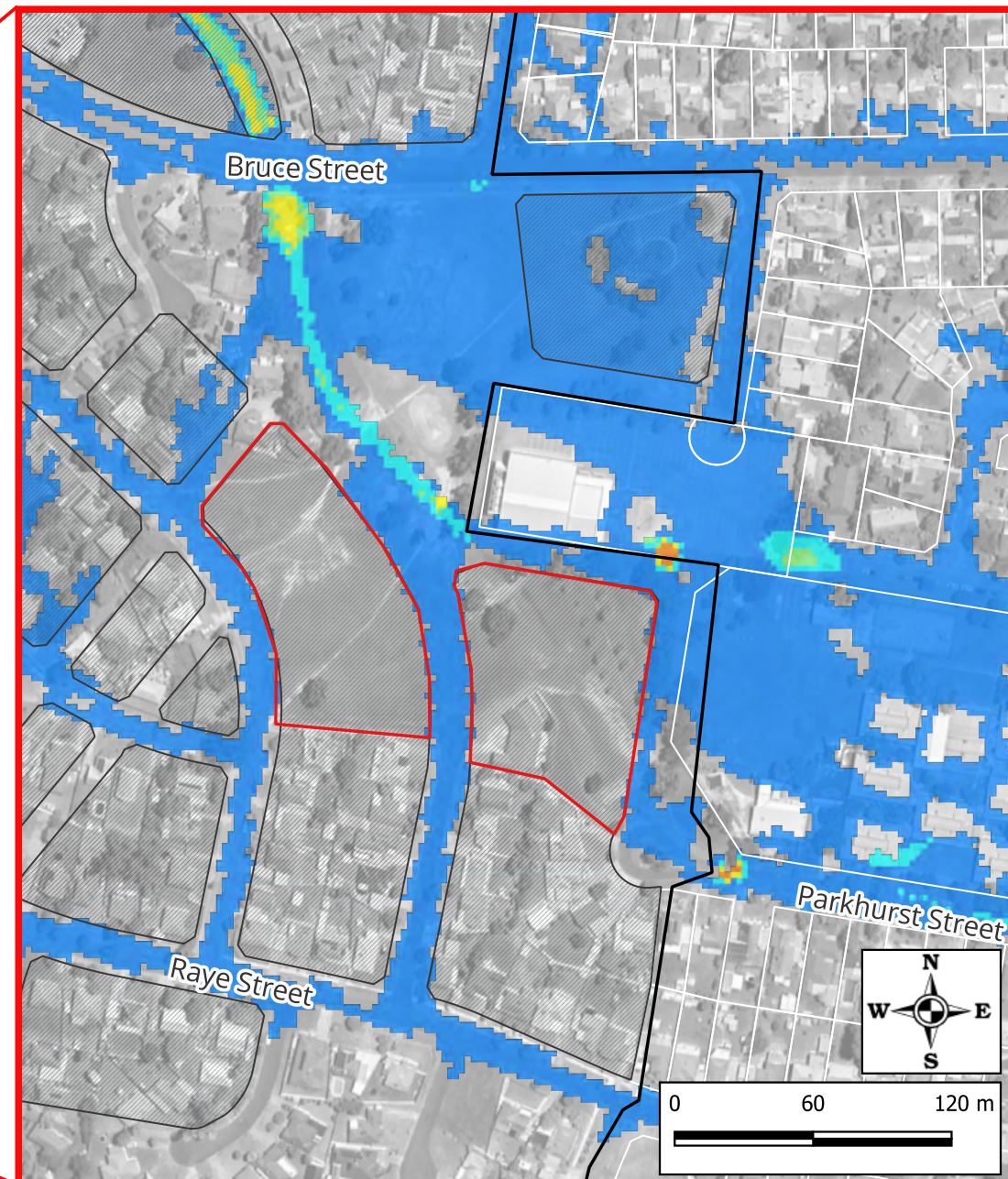
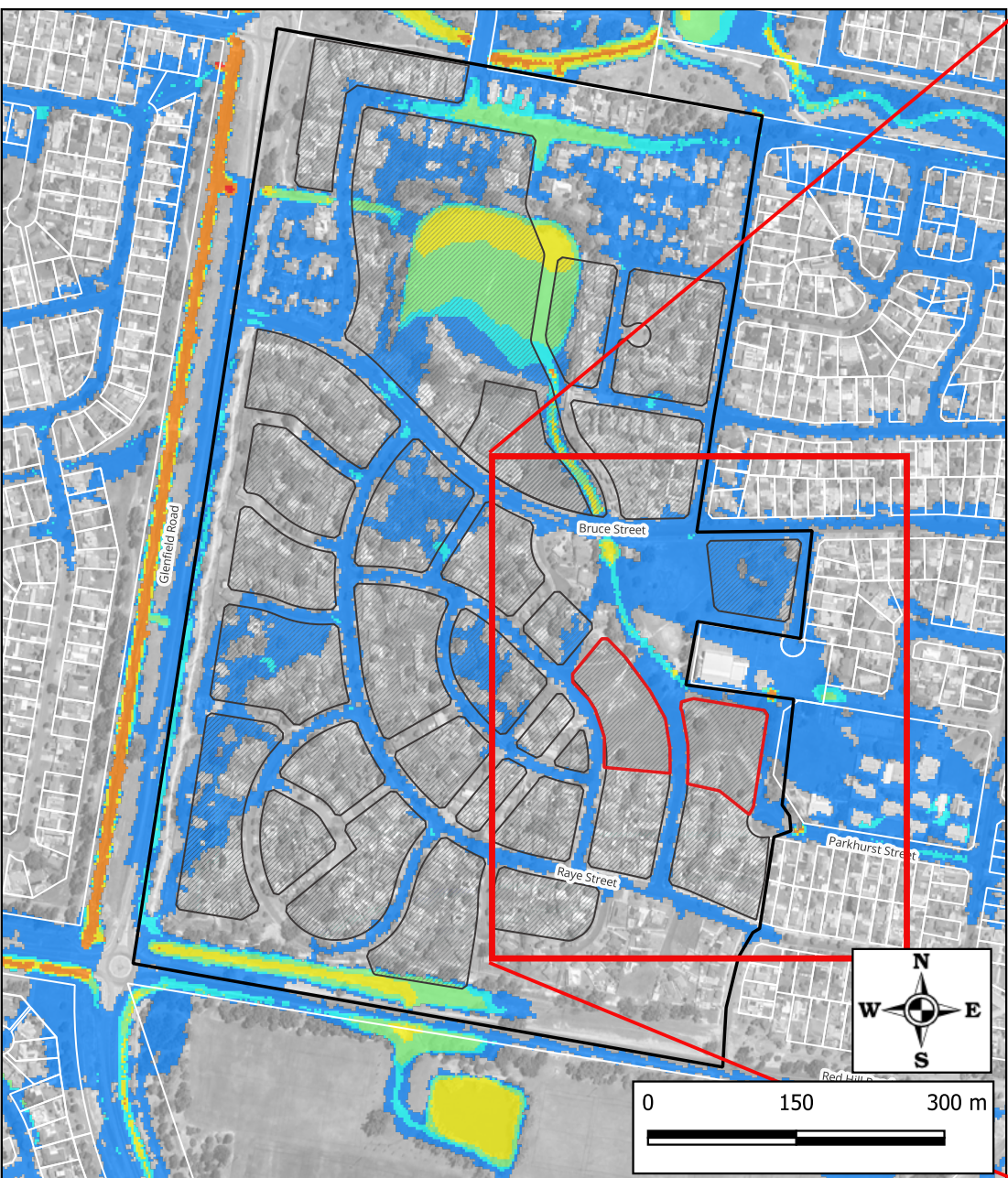




Subject Site	Existing Pipes	Depths (m) 0 - 0.05	0.3 - 0.5
Cadastral Boundaries	Existing Pits	0.05 - 0.1	1.0 - 1.5
Proposed Configuration	Proposed Pipes	0.1 - 0.2	1.5 - 2.0
New Development Proposed	Proposed pits	0.2 - 0.3	> 2.0
Major Flood Level Contour (mAHD)			
Minor Flood Level Contour (0.2m)			

TITLE: PMF Peak Flood Depths & Levels - Proposed Conditions	
PROJECT: Tolland Renewal Project, Wagga Wagga	PROJECT No. 230064
DATE: 09-2023	SCALE: 1:7,000/3,000
	FIGURE No. 06

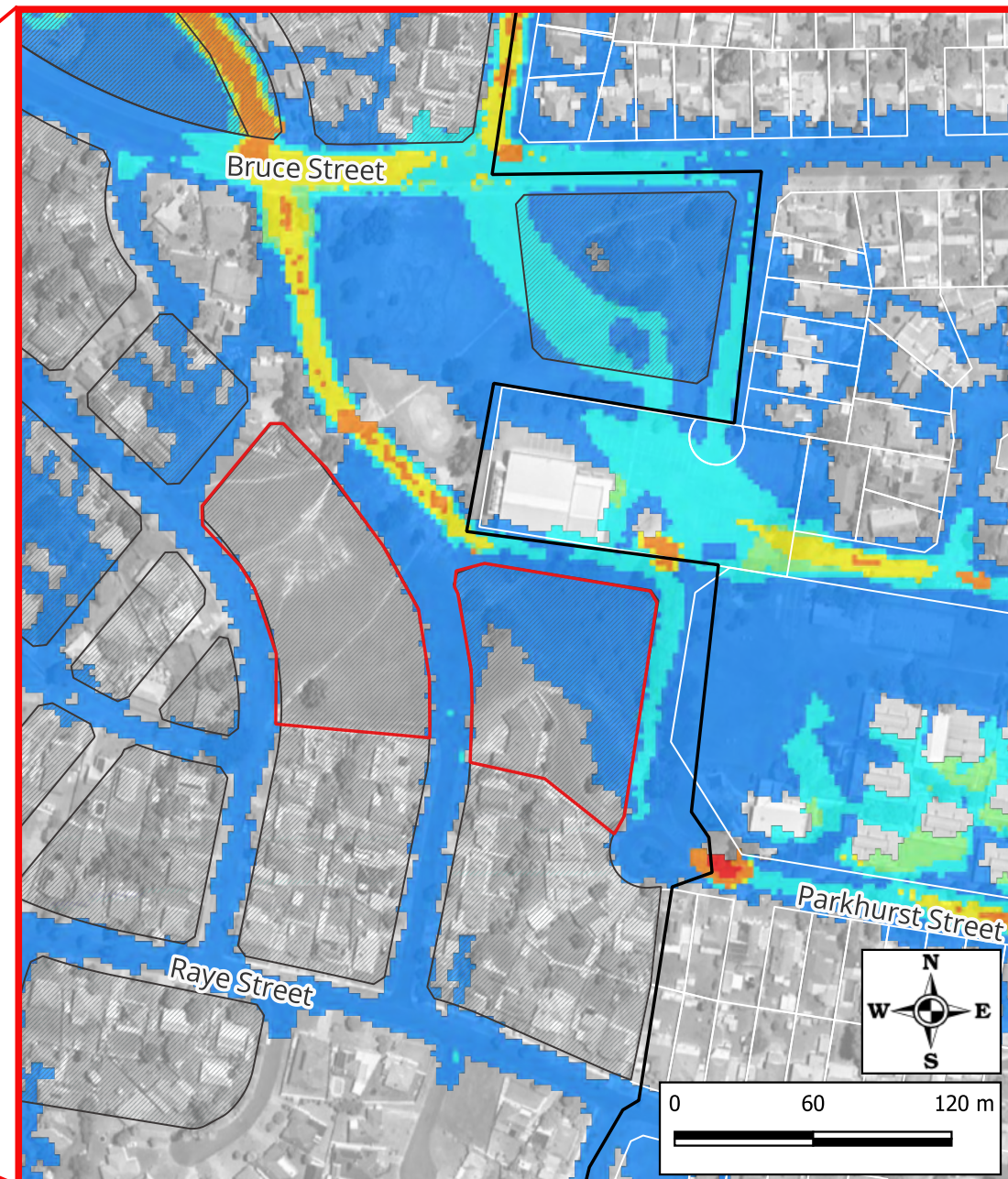
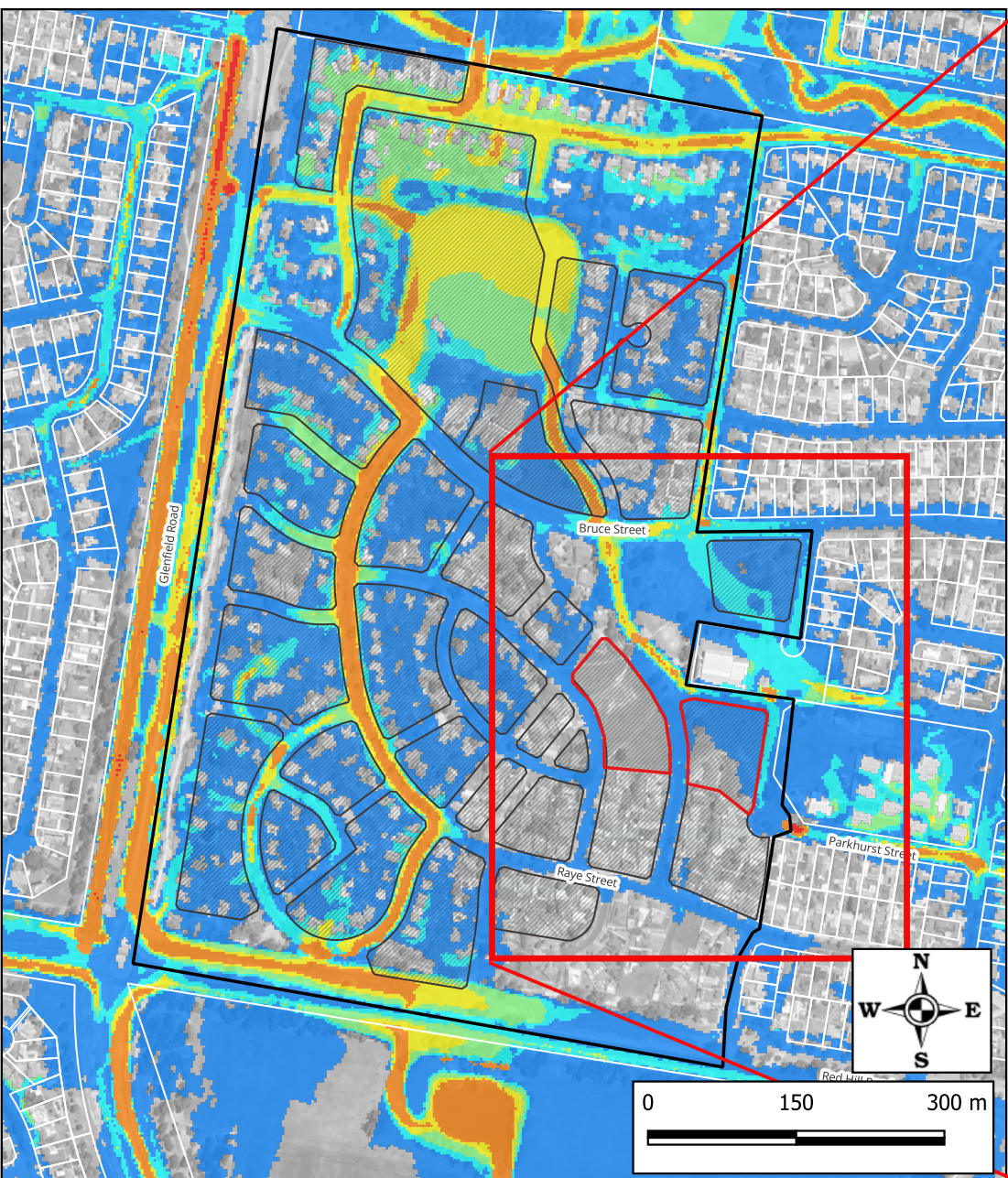




Subject Site	Flood Hazard H4
Cadastral Boundaries	Flood Hazard H5
Proposed Configuration	Flood Hazard H6
New Development Proposed	Flood Hazard H3
	Flood Hazard H1
	Flood Hazard H2

TITLE: 1% AEP Peak Flood Hazard - Proposed Conditions		
PROJECT: Tolland Renewal Project, Wagga Wagga	PROJECT No. 230064	
DATE: 09-2023	SCALE: 1:7,000/3,000	FIGURE No. 07

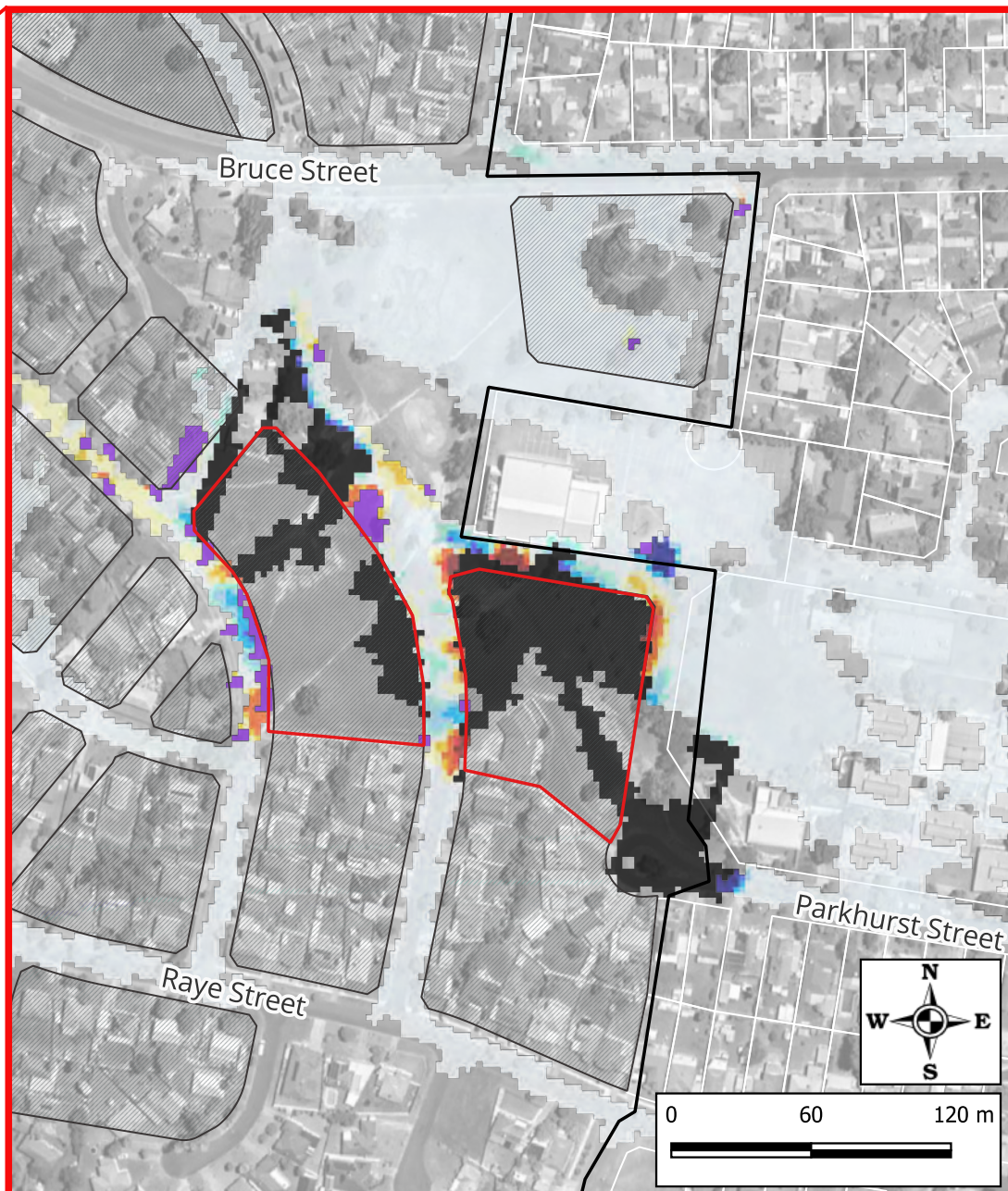




Subject Site	Flood Hazard H1	H4
Cadastral Boundaries	H2	H5
Proposed Configuration	H3	H6
New Development Proposed		

TITLE: PMF Peak Flood Hazard - Proposed Conditions		
PROJECT: Tolland Renewal Project, Wagga Wagga	PROJECT No. 230064	
DATE: 09-2023	SCALE: 1:7,000/3,000	FIGURE No. 08

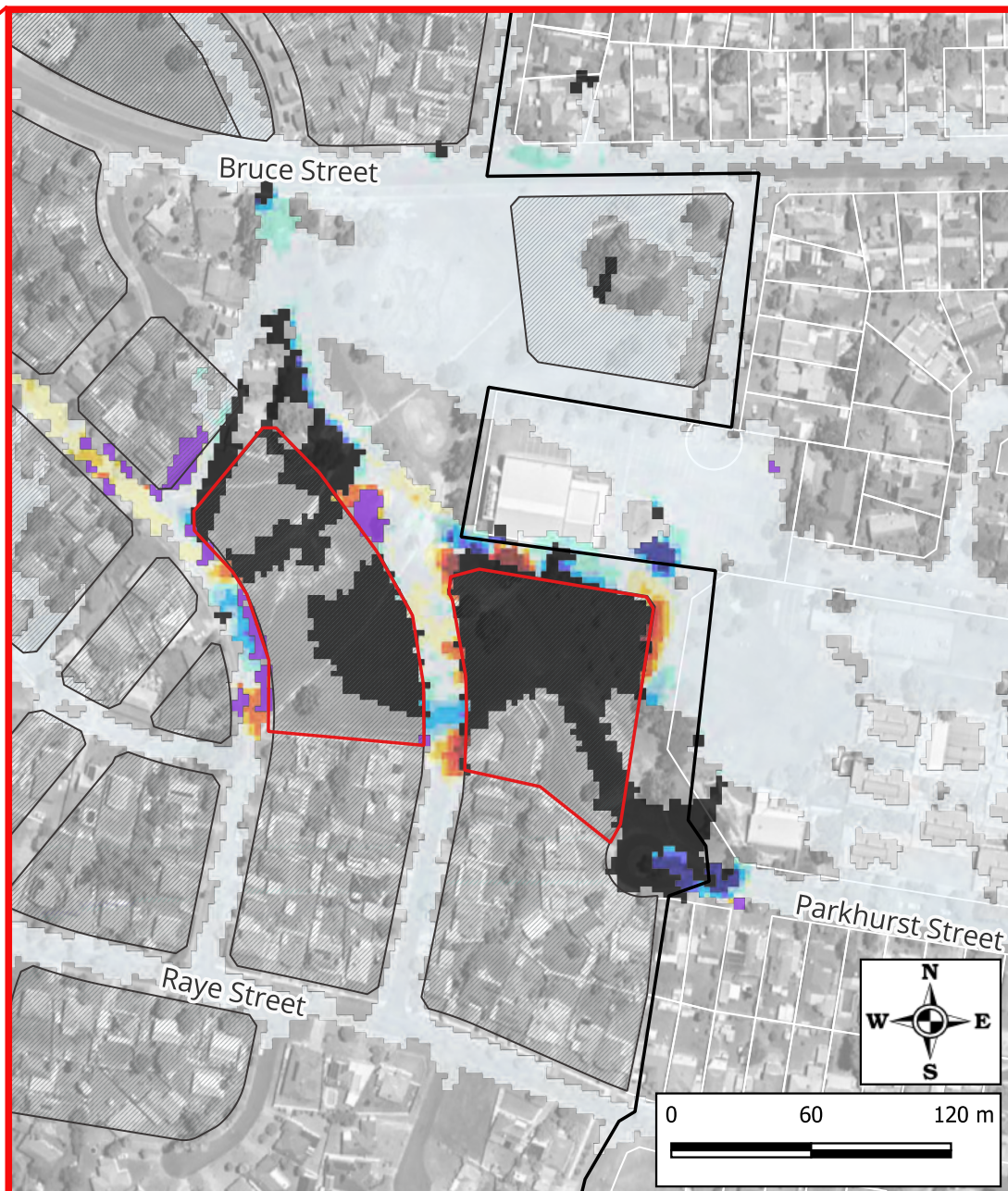




Flood Impact	30mm to 10mm decrease	> 150mm increase
Was wet - now dry	No Change (+/- 10mm)	Was dry - now wet
> 150mm decrease	10mm to 30mm increase	Subject Site
150mm to 100mm decrease	30mm to 50mm increase	Cadastral Boundaries
100mm to 50mm decrease	50mm to 100mm increase	Proposed Configuration
50mm to 30mm decrease	100mm to 150mm increase	New Development Proposed

TITLE: 20% AEP Flood Impact - Proposed Conditions		
PROJECT:	Tolland Renewal Project, Wagga Wagga	PROJECT No. 230064
DATE:	09-2023	SCALE: 1:7,000/3,000
		FIGURE No. 09

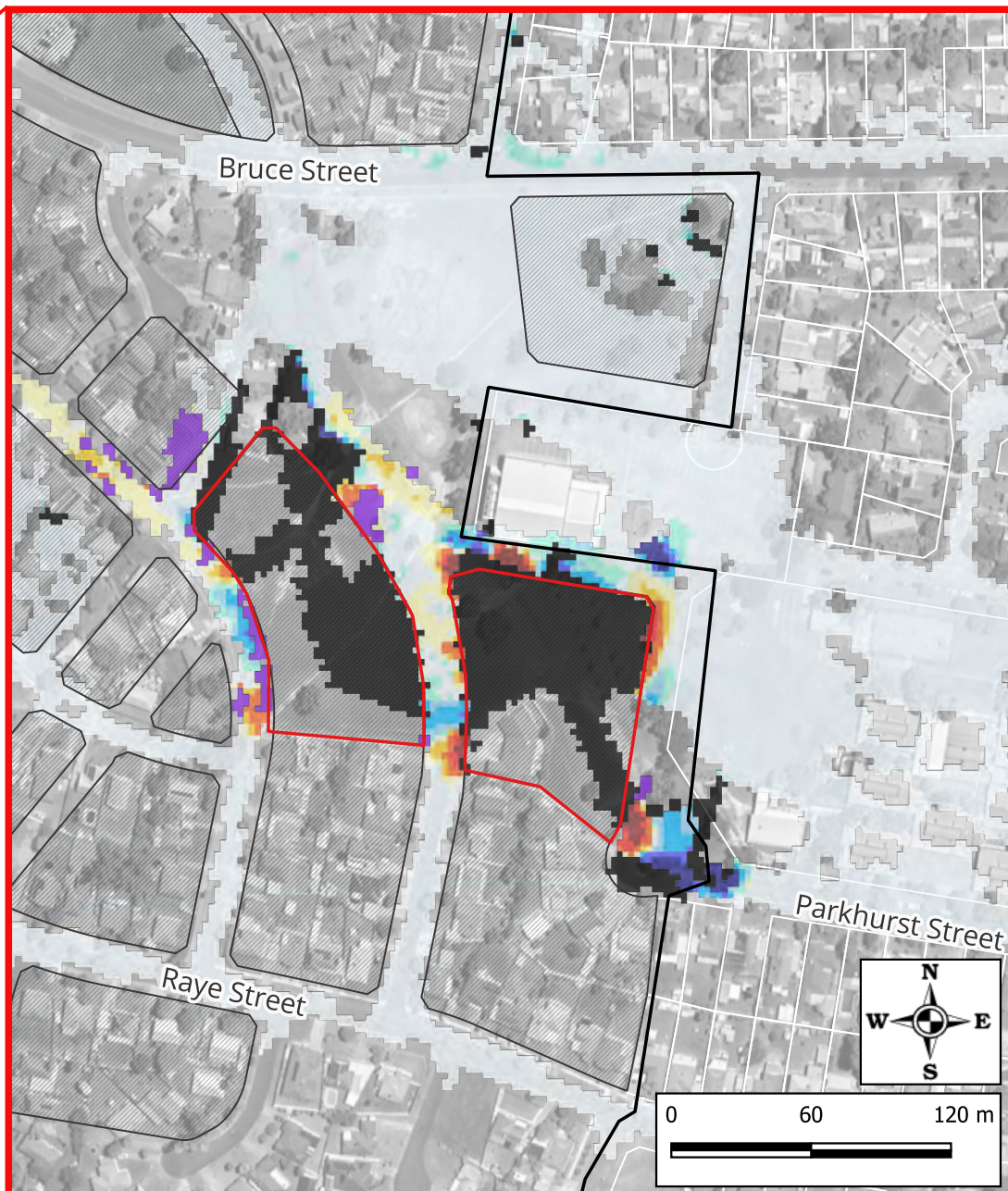




Flood Impact	30mm to 10mm decrease	> 150mm increase
Was wet - now dry	No Change (+/- 10mm)	Was dry - now wet
> 150mm decrease	10mm to 30mm increase	Subject Site
150mm to 100mm decrease	30mm to 50mm increase	Cadastral Boundaries
100mm to 50mm decrease	50mm to 100mm increase	Proposed Configuration
50mm to 30mm decrease	100mm to 150mm increase	New Development Proposed

TITLE: 10% AEP Flood Impact - Proposed Conditions		
PROJECT:	Tolland Renewal Project, Wagga Wagga	PROJECT No. 230064
DATE:	09-2023	SCALE: 1:7,000/3,000
		FIGURE No. 10

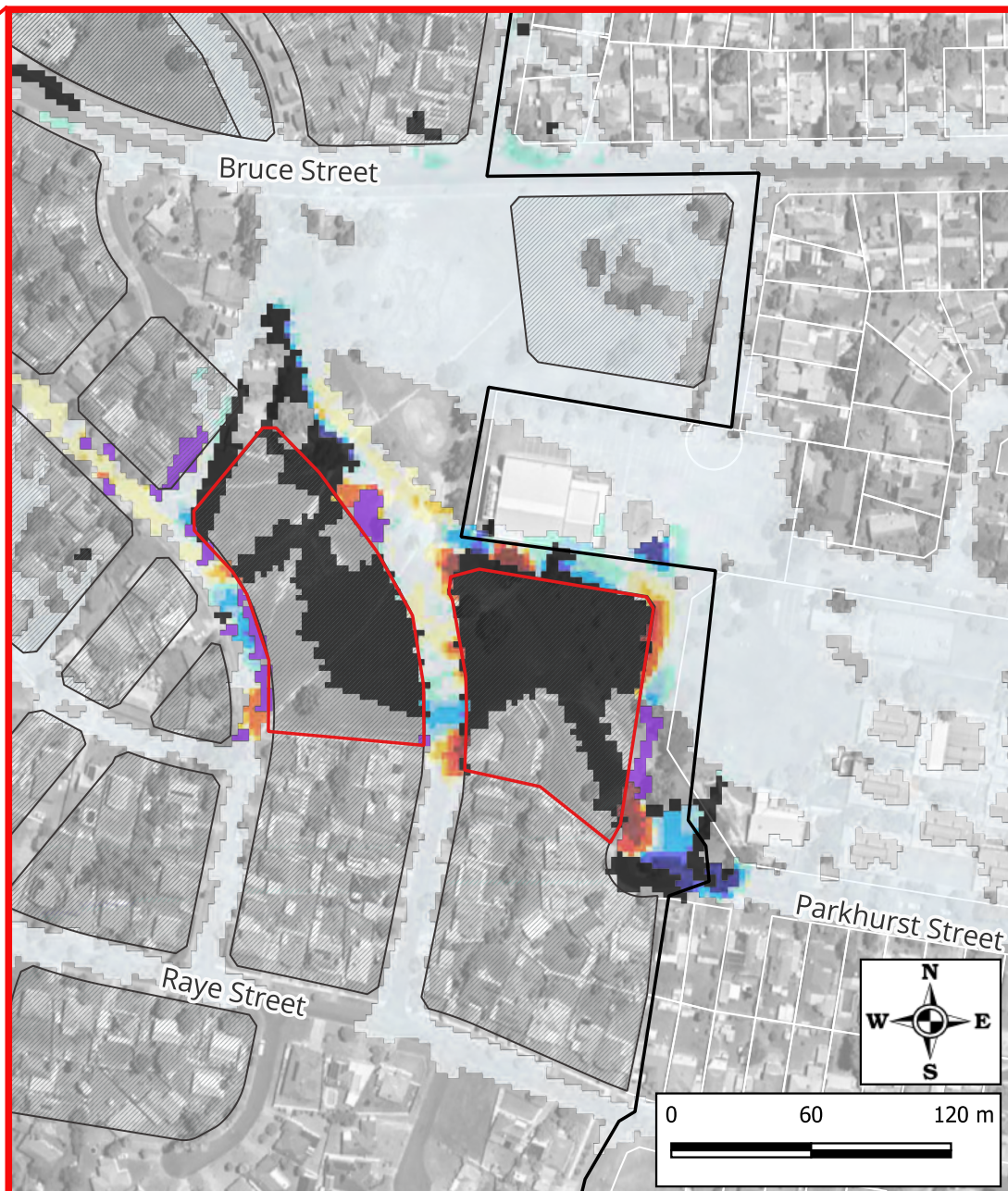




Flood Impact	30mm to 10mm decrease	> 150mm increase
Was wet - now dry	No Change (+/- 10mm)	Was dry - now wet
> 150mm decrease	10mm to 30mm increase	Subject Site
150mm to 100mm decrease	30mm to 50mm increase	Cadastral Boundaries
100mm to 50mm decrease	50mm to 100mm increase	Proposed Configuration
50mm to 30mm decrease	100mm to 150mm increase	New Development Proposed

TITLE: 5% AEP Flood Impact - Proposed Conditions		
PROJECT:	Tolland Renewal Project, Wagga Wagga	PROJECT No. 230064
DATE:	09-2023	SCALE: 1:7,000/3,000
		FIGURE No. 11

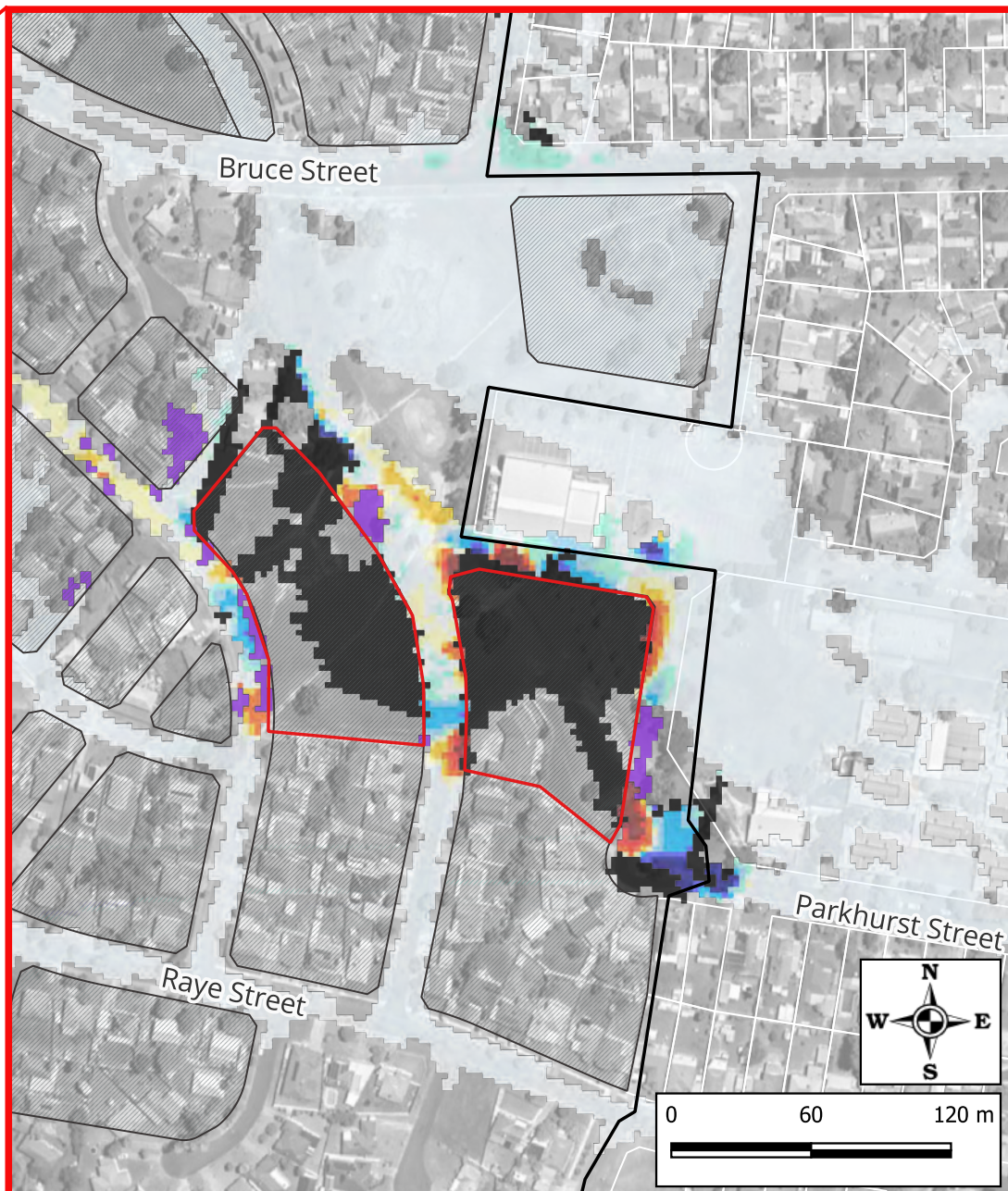




Flood Impact	30mm to 10mm decrease	> 150mm increase
Was wet - now dry	No Change (+/- 10mm)	Was dry - now wet
> 150mm decrease	10mm to 30mm increase	Subject Site
150mm to 100mm decrease	30mm to 50mm increase	Cadastral Boundaries
100mm to 50mm decrease	50mm to 100mm increase	Proposed Configuration
50mm to 30mm decrease	100mm to 150mm increase	New Development Proposed

TITLE: 2% AEP Flood Impact - Proposed Conditions		
PROJECT:	Tolland Renewal Project, Wagga Wagga	PROJECT No. 230064
DATE:	09-2023	SCALE: 1:7,000/3,000
		FIGURE No. 12

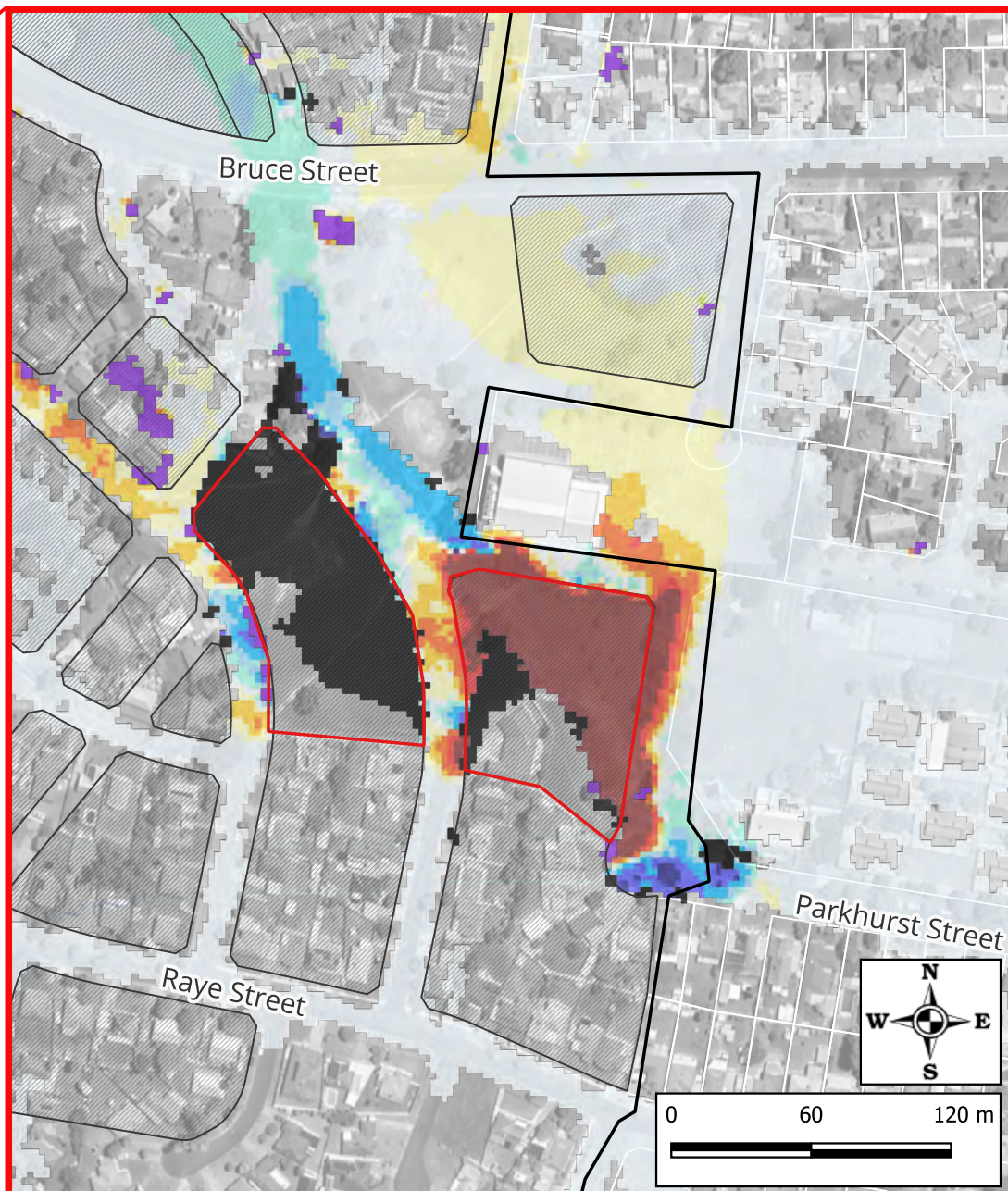




Flood Impact	30mm to 10mm decrease	> 150mm increase
Was wet - now dry	No Change (+/- 10mm)	Was dry - now wet
> 150mm decrease	10mm to 30mm increase	Subject Site
150mm to 100mm decrease	30mm to 50mm increase	Cadastral Boundaries
100mm to 50mm decrease	50mm to 100mm increase	Proposed Configuration
50mm to 30mm decrease	100mm to 150mm increase	New Development Proposed

TITLE: 1% AEP Flood Impact - Proposed Conditions		
PROJECT:	Tolland Renewal Project, Wagga Wagga	PROJECT No. 230064
DATE:	09-2023	SCALE: 1:7,000/3,000
		FIGURE No. 13





Flood Impact	30mm to 10mm decrease	> 150mm increase
Was wet - now dry	No Change (+/- 10mm)	Was dry - now wet
> 150mm decrease	10mm to 30mm increase	Subject Site
150mm to 100mm decrease	30mm to 50mm increase	Cadastral Boundaries
100mm to 50mm decrease	50mm to 100mm increase	Proposed Configuration
50mm to 30mm decrease	100mm to 150mm increase	New Development Proposed

TITLE: PMF Flood Impact - Proposed Conditions		
PROJECT:	Tolland Renewal Project, Wagga Wagga	PROJECT No. 230064
DATE:	09-2023	SCALE: 1:7,000/3,000
		FIGURE No. 14



ATTACHMENT A

NSW DEPARTMENT OF PLANNING, INDUSTRY AND ENVIRONMENT

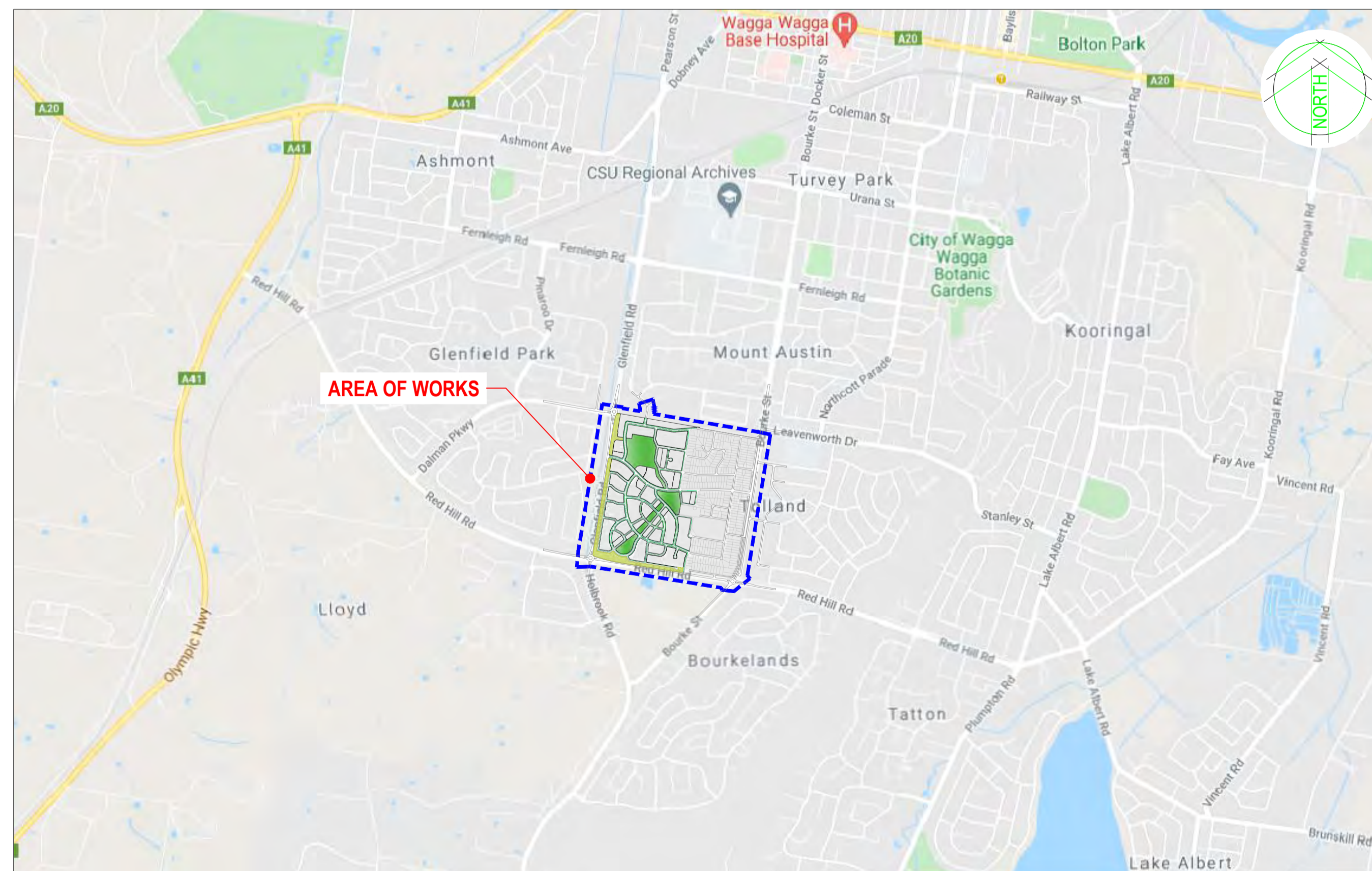
TOLLAND RENEWAL PROJECT

TOLLAND, WAGGA WAGGA

MASTER PLANS - COVER SHEET AND LOCALITY PLAN

April 2023

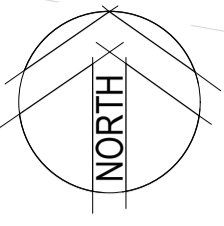
FOR CONCEPT APPROVAL



LOCALITY PLAN
 NOT TO SCALE

SCHEDULE OF DRAWINGS	
DRAWING No.	DESCRIPTION
50521067-C1001	COVER SHEET, DRAWING LIST AND LOCALITY PLAN
50521067-C1010	NEIGHBOURHOOD MASTER PLAN
50521067-C1015	STAGING MASTER PLAN
50521067-C1020	STORMWATER MASTER PLAN
50521067-C1025	WATER MASTER PLAN
50521067-C1030	SEWER MASTER PLAN
50521067-C1035	ROAD HIERARCHY MASTER PLAN
50521067-C1040	TYPICAL ROAD SECTIONS
50521067-C1045	ACTIVE TRAVEL MASTER PLAN
50521067-C1050	BUS ROUTES MASTER PLAN
50521067-C1055	BIODIVERSITY MASTER PLAN
50521067-C1060	PUBLIC OPEN SPACE MASTER PLAN
50521067-C1065	LANDSCAPE MASTER PLAN
50521067-C1070	STREET TREE MASTER PLAN
50521067-C1075	COMMUNITY & OPERATIONAL LAND MASTER PLAN

DRAWINGS UNDER REVIEW

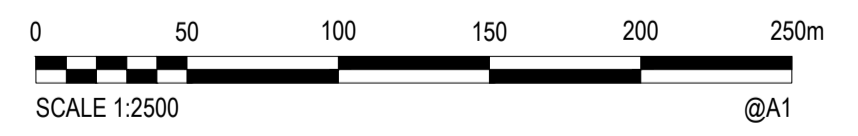


ID	AREA (m ²)	TARGET DWELLING YIELD
A	10,534	13
B	10,012	19
C	11,285	14
D	20,305	27
E	5,046	40
F	2,307	4
G	3,072	9
H	3,638	7
I	11,425	16
J	11,305	18
K	6,192	76
L	4,234	5
M	7,728	13
N	7,190	11
O	2,500	20
P	7,130	17
Q	1,424	7
R	3,981	30
S	2,590	7
T	7,187	14
U	12,111	23
V	11,193	21
W	4,689	8
X	1,570	8
Y	2,488	8
Z	1,797	8
AA	900	4
AB	12,969	27
AC	16,205	31
AD	12,843	38
AE	2,617	8
AF	5,768	15
AG	2,390	8
AH	1,686	5
AI	2,390	10
AJ	10,653	25
AK	5,034	12
AL	6,008	17
AM	19,736	36
Total	272,132	679

LEGEND

- LIMIT OF WORKS
- PROPOSED LAND USE**
 - MAXIMUM AREA PER DWELLING = 1,200m²
 - MAXIMUM AREA PER DWELLING = 400m²
 - MAXIMUM AREA PER DWELLING = 200m²
 - PUBLIC OPEN SPACE PARKS / RECREATIONAL AREAS
 - PROPOSED ROAD VERGE
 - PRIMARY FRONTAGE
 - ROADS
 - ACTIVATED FRONTAGE WITH PERMEABLE FENCING OVERLOOKING PUBLIC OPEN SPACE
- EXISTING**
 - NEIGHBOURHOOD CENTRE
 - SCHOOL
 - EXISTING VEGETATION BUFFER / COMMUNITY LAND

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			Des.	Verif.	Appd.
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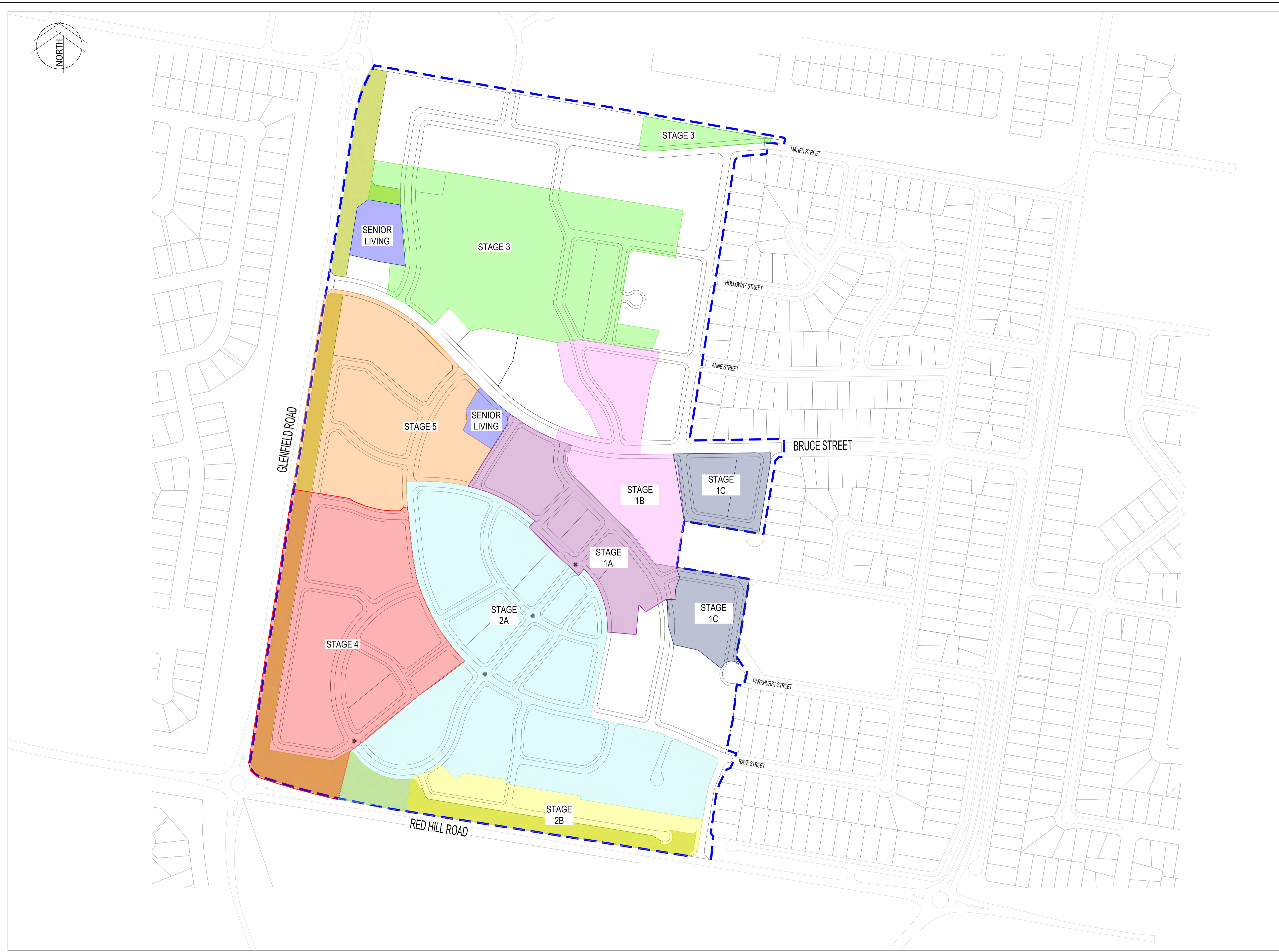
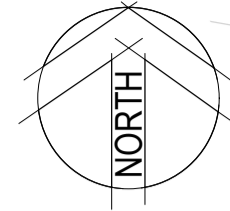
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Checked	AS	Date	16/03/2023
Designed	TMJS	Date	16/03/2023
Verified	JS	Date	16/03/2023
Approved	GZ		

Client	NSW DEPARTMENT OF PLANNING, INDUSTRY AND ENVIRONMENT
Project	TOLLAND RENEWAL PROJECT TOLLAND, WAGGA WAGGA
Title	NEIGHBOURHOOD MASTER PLAN
	SHEET 1 OF 1

Status	FOR CONCEPT APPROVAL NOT TO BE USED FOR CONSTRUCTION PURPOSES				
Mar-23	AHD	Scale	1:2500	Size	A1
Drawing Number			50521067-C1010	Revision	
				A	



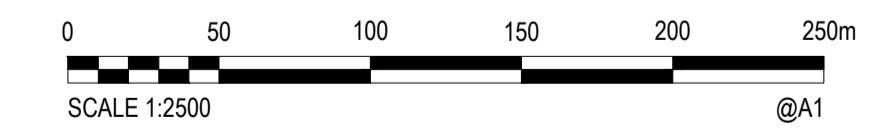
LEGEND

- LIMIT OF WORKS
- STAGE 1A
- STAGE 1B
- STAGE 1C
- STAGE 2A
- STAGE 2B
- STAGE 3
- STAGE 4
- STAGE 5
- SENIOR LIVING

INDICATIVE TIMELINE

STAGE	EXPECTED COMPLETION DATE
1A	2024
1B	2025
1C	2025
2A	2026
2B	2027
3	2028
4	2029
5	2030
SENIOR LIVING	2025

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XREFs: \\ef-block\Btry_X-PROP_NBRH_LAYT_X-PROP_NBRH_RD_Z55_X-PROP_ROAD_LAYT_X-PROP_STAG
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AS	16/03/2023	TOLLAND RENEWAL PROJECT
Designed	Date	Project
TMJS	16/03/2023	TOLLAND, WAGGA WAGGA
Verified	Date	Title
JS	16/03/2023	STAGING MASTER PLAN
Approved		
GZ		SHEET 1 OF 1

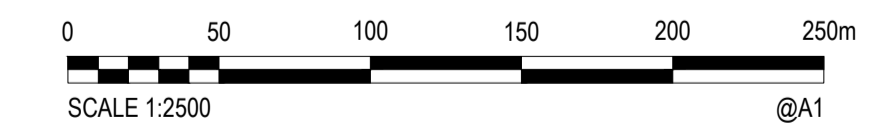
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NOT TO BE USED FOR CONSTRUCTION PURPOSES			
Mar-23	AHD	Scale	Size
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Drawing Number		Revision	
50521067-C1015		A	



LEGEND

- LIMIT OF WORKS
- PROPOSED STORMWATER
- EXISTING STORMWATER
- PROPOSED POND
- PROPOSED ROCK RIP RAP

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XREFs: Xref-Block Bdry, X-PROP, NBRH_LAYT, Xref-BLK_RD_Z55, X-PROP, ROAD_LAYT, X-PROP, SERV, X-EX, Stormwater
 CAD File: C:\Project\Wise-Drive\Stantec\304-100000304\100720\Drawings\Build\Masterplans\50521067-C1020-SWMP.dwg

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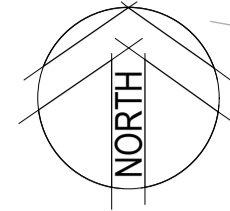
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Checked	AS	Date	16/03/2023
Designed	TMJS	Date	16/03/2023
Verified	JS	Date	16/03/2023
Approved	GZ		

Client	NSW DEPARTMENT OF PLANNING, INDUSTRY AND ENVIRONMENT
Project	TOLLAND RENEWAL PROJECT TOLLAND, WAGGA WAGGA
Title	STORMWATER MASTER PLAN
	SHEET 1 OF 1

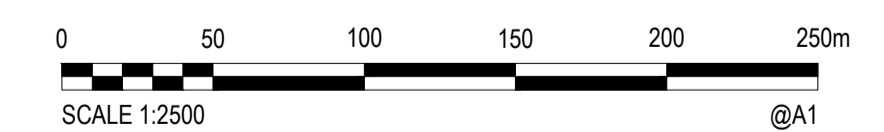
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Mar-23	AHD	Scale	1:2500	Size	A1
Drawing Number	50521067-C1025			Revision	A



LEGEND

- - - LIMIT OF WORKS
- PROPOSED WATER
- EXISTING WATER

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Checked	Date	Project
AS	16/03/2023	TOLLAND RENEWAL PROJECT
Designed	Date	Location
TMJS	16/03/2023	TOLLAND, WAGGA WAGGA
Verified	Date	Title
JS	16/03/2023	WATER MASTER PLAN
Approved		
GZ		SHEET 1 OF 1

Status			
FOR CONCEPT APPROVAL			
NOT TO BE USED FOR CONSTRUCTION PURPOSES			
Mar-23	AHD	Scale	Size
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Drawing Number			Revision
50521067-C1030			A

DATE PLOTTED: 25 May 2023 2:35 PM BY: PIGRAM, DAVID

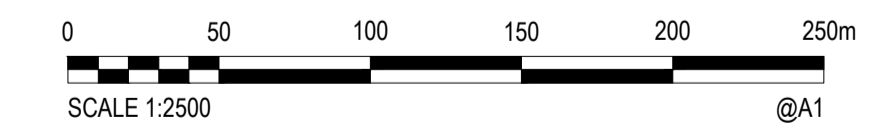
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LEGEND

- - - LIMIT OF WORKS
- PROPOSED SEWER
- EXISTING SEWER

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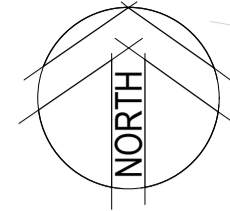


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Checked	AS	Date	16/03/2023
Designed	TM/JS	Date	16/03/2023
Verified	JS	Date	16/03/2023
Approved	GZ		

Client	NSW DEPARTMENT OF PLANNING, INDUSTRY AND ENVIRONMENT
Project	TOLLAND RENEWAL PROJECT TOLLAND, WAGGA WAGGA
Title	SEWER MASTER PLAN
	SHEET 1 OF 1

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Drawing Number	50521067-C1030			Revision A



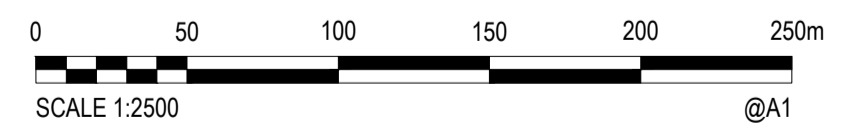
LEGEND

--- LIMIT OF WORKS

ROAD HIERACHY

- COLLECTOR
- LOCAL ACCESS
- ACCESS STREET
- LANEWAYS

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Rev.	Date	Description	ML/AS	JS	GZ
			Des.	Verif.	Appd.
A	16/03/2023	PRELIMINARY			



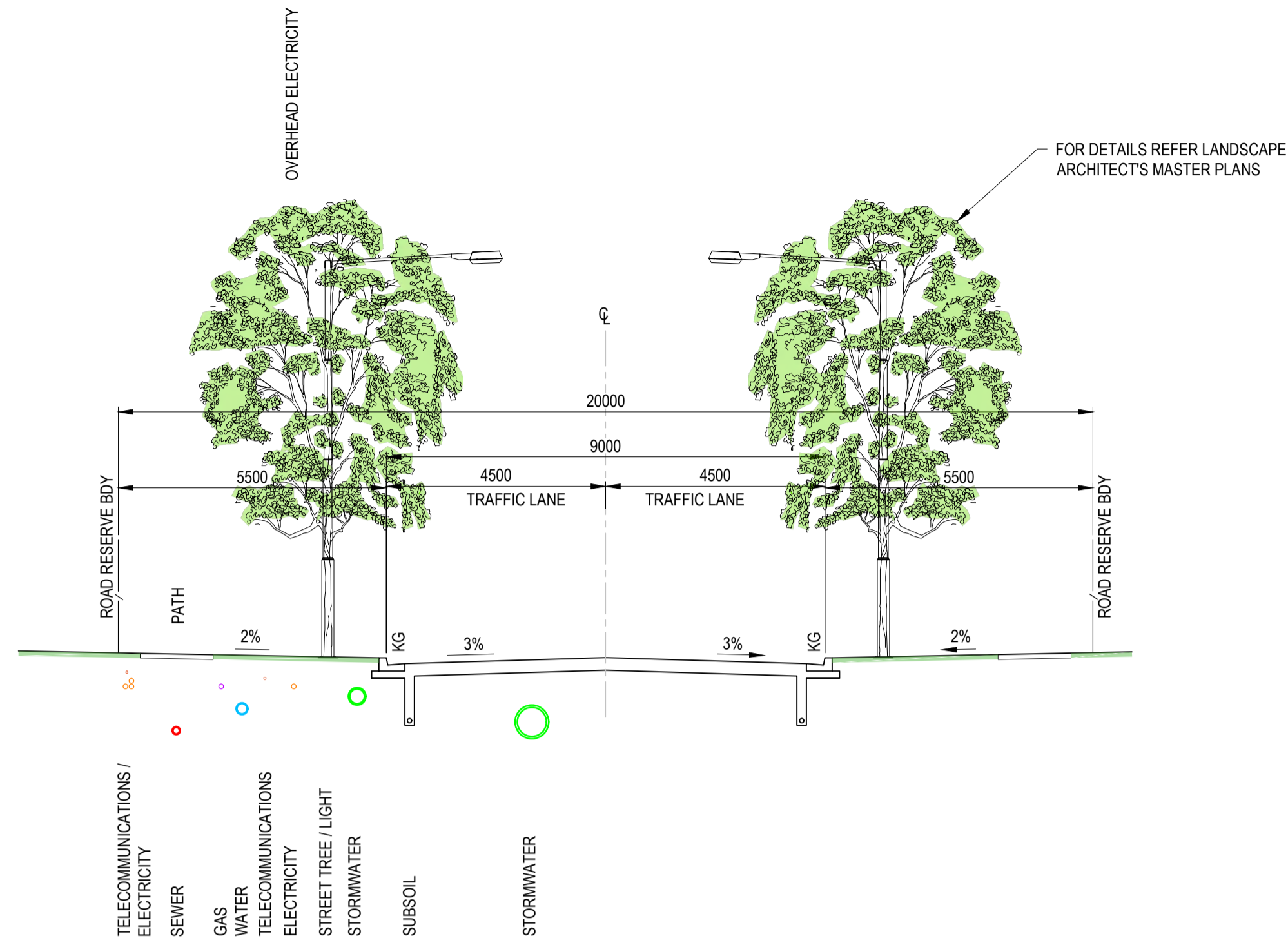
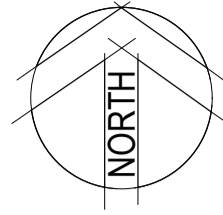
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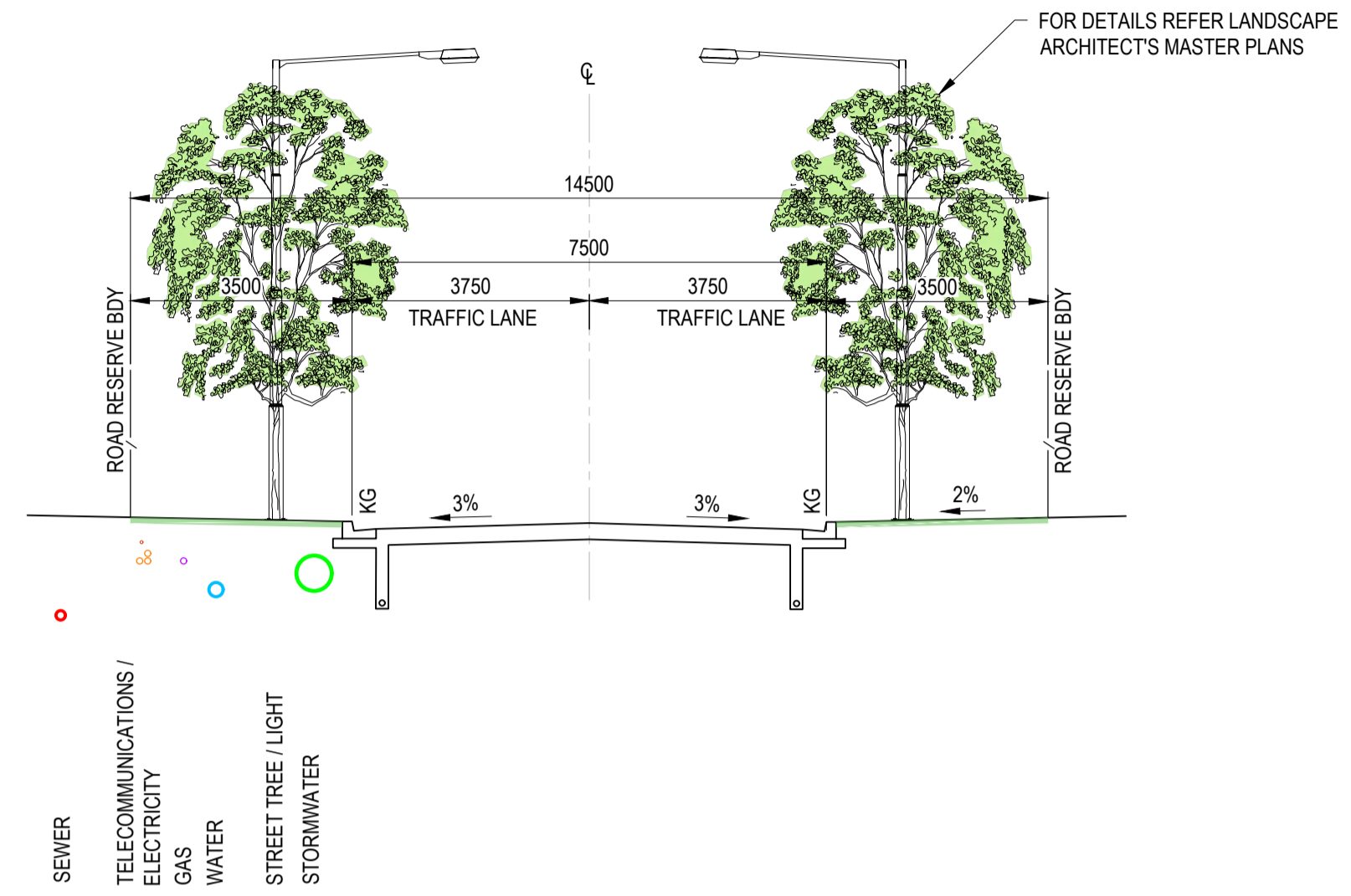
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Checked	AS	Date	16/03/2023
Designed	TM/JS	Date	16/03/2023
Verified	JS	Date	16/03/2023
Approved	GZ		

Client	NSW DEPARTMENT OF PLANNING, INDUSTRY AND ENVIRONMENT
Project	TOLLAND RENEWAL PROJECT TOLLAND, WAGGA WAGGA
Title	ROAD HIERARCHY MASTER PLAN
	SHEET 1 OF 1

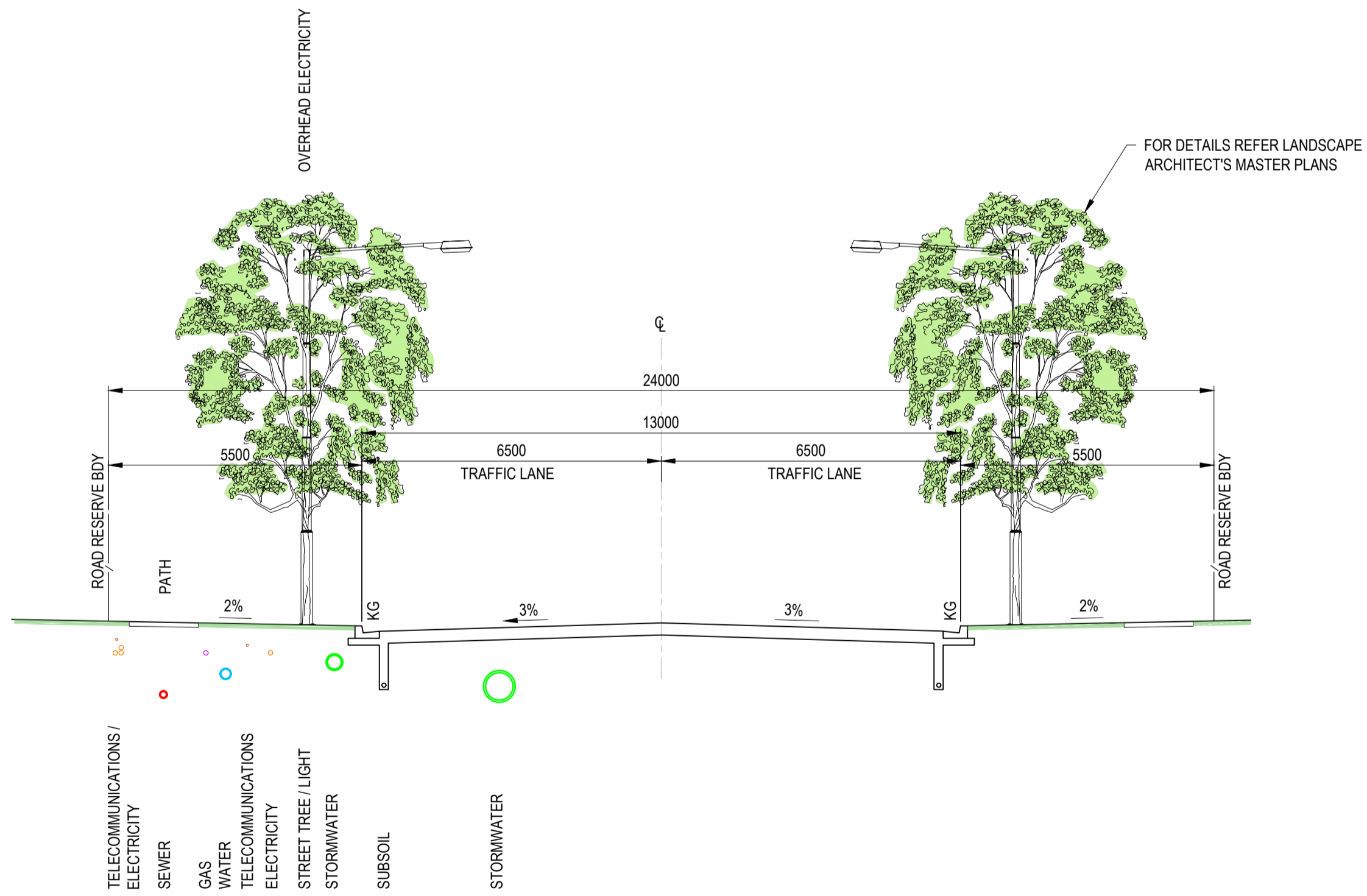
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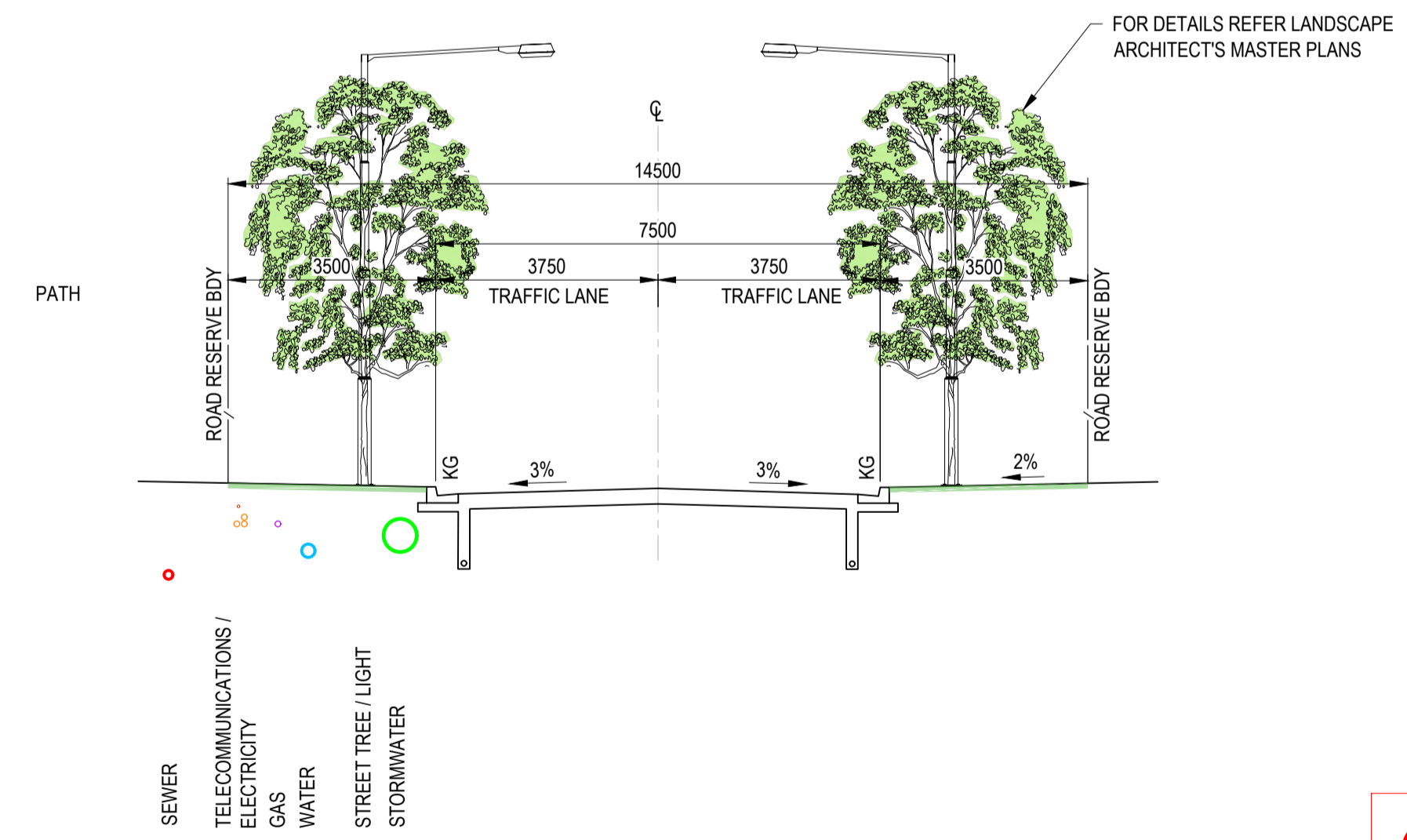
TYPICAL SECTION - LOCAL ACCESS
SCALE 1:100



TYPICAL SECTION - LANE WAY
SCALE 1:100

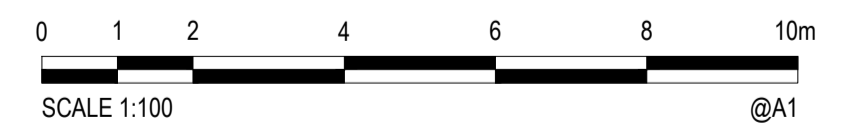


TYPICAL SECTION - COLLECTOR
SCALE 1:100



TYPICAL SECTION - ACCESS STREET
SCALE 1:100

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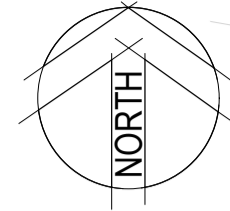
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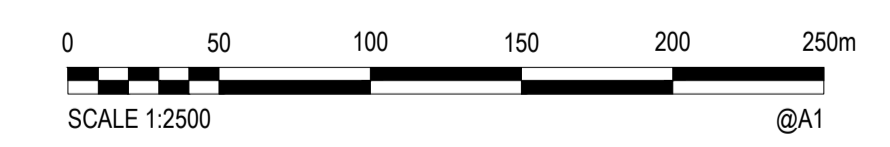
Drawn DP	Date 16/03/2023	Client NSW DEPARTMENT OF PLANNING, INDUSTRY AND ENVIRONMENT
Checked AS	Date 16/03/2023	Project TOLLAND RENEWAL PROJECT TOLLAND, WAGGA WAGGA
Designed TM/JS	Date 16/03/2023	Status FOR CONCEPT APPROVAL NOT TO BE USED FOR CONSTRUCTION PURPOSES
Verified JS	Date 16/03/2023	Scale 1:100
Approved GZ		Size A1
Title TYPICAL ROAD SECTIONS		Drawing Number 50521067-C1040
SHEET 1 OF 1		Revision A



LEGEND

- - - LIMIT OF WORKS
- - - PROPOSED SHARED PATH (2.5m)
- - - PROPOSED PATH (1.5m)
- - - EXISTING PATH (1.5m)
- █ PROPOSED WOMBAT CROSSING

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			Des.	Verif.	Appd.
A	16/03/2023	PRELIMINARY			

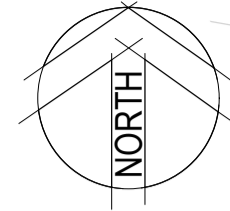


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Checked	Date	Project
AS	16/03/2023	TOLLAND RENEWAL PROJECT
Designed	Date	Project
TM/JS	16/03/2023	TOLLAND, WAGGA WAGGA
Verified	Date	Title
JS	16/03/2023	ACTIVE TRAVEL MASTER PLAN
Approved		
GZ		SHEET 1 OF 1

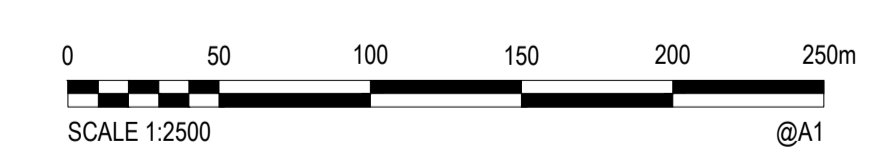
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FOR CONCEPT APPROVAL		1:2500		A1	
NOT TO BE USED FOR CONSTRUCTION PURPOSES					
Drawing Number		Revision			
50521067-C1045		A			



LEGEND

- LIMIT OF WORKS
- BUS ROUTE

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XREFS: X:\PROP_NBRH_LAYT:\X-PROP_ROAD_LAYT:\Xef\BLK_RD_Z55_Xef\Block B.dwg
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Rev.	Date	Description	ML/AS	JS	GZ
			Des.	Verif.	Appd.
A	16/03/2023	PRELIMINARY			



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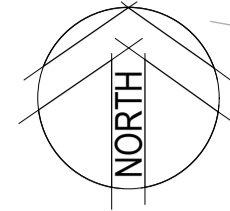
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Checked	AS	Date	16/03/2023
Designed	TMJS	Date	16/03/2023
Verified	JS	Date	16/03/2023
Approved	GZ		

Client	NSW DEPARTMENT OF PLANNING, INDUSTRY AND ENVIRONMENT
Project	TOLLAND RENEWAL PROJECT TOLLAND, WAGGA WAGGA
Title	BUS ROUTES MASTER PLAN
	SHEET 1 OF 1

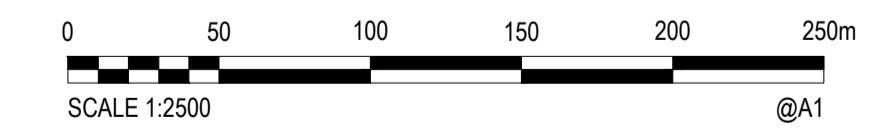
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	NOT TO BE USED FOR CONSTRUCTION PURPOSES				
Mar-23	AHD	Scale	1:2500	Size	A1
Drawing Number			50521067-C1050	Revision	
				A	



NOTE :
 A REVIEW OF THE NSW BIODIVERSITY VALUES MAP AND THRESHOLD TOOL HAS NOT IDENTIFIED ANY AREAS OF HIGH BIODIVERSITY CONSTRAINTS WITHIN THE PROPOSED DEVELOPMENT BOUNDARY. LOCAL ECOLOGICAL ASSESSMENTS WILL BE UNDERTAKEN AS PART OF SUBSEQUENT INVESTIGATIONS TO FURTHER INFORM DESIGN.

LEGEND
 - - - - - LIMIT OF WORKS

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Rev.	Date	Description	ML/AS	JS	GZ
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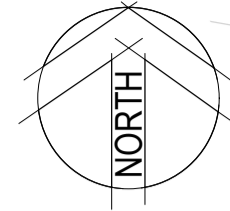


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Drawn	DP	Date	16/03/2023
Checked	AS	Date	16/03/2023
Designed	TM/JS	Date	16/03/2023
Verified	JS	Date	16/03/2023
Approved	GZ		

Client	NSW DEPARTMENT OF PLANNING, INDUSTRY AND ENVIRONMENT
Project	TOLLAND RENEWAL PROJECT TOLLAND, WAGGA WAGGA
Title	BIODIVERSITY MASTER PLAN
	SHEET 1 OF 1

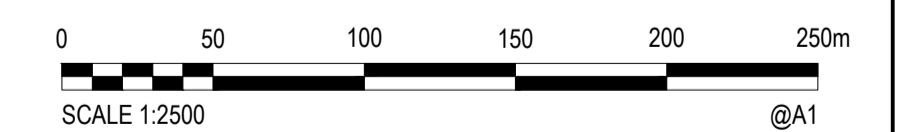
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	NOT TO BE USED FOR CONSTRUCTION PURPOSES			
	Mar-23	AHD	Scale 1:2500	Size A1
Drawing Number	50521067-C1055			Revision A



LEGEND

- LIMIT OF WORKS
- PUBLIC OPEN SPACE
- EXISTING VEGETATION BUFFER / COMMUNITY LAND

CONFIDENTIAL



Rev.	Date	Description	ML/AS	JS	GZ
			Des.	Verif.	Appd.
A	16/03/2023	PRELIMINARY			

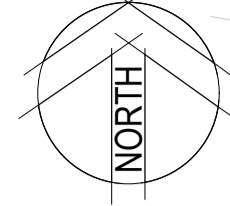


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Drawn	Date	Client
DP	16/03/2023	NSW DEPARTMENT OF PLANNING, INDUSTRY AND ENVIRONMENT
Checked	Date	Project
AS	16/03/2023	TOLLAND RENEWAL PROJECT
Designed	Date	
TMJS	16/03/2023	TOLLAND, WAGGA WAGGA
Verified	Date	Title
JS	16/03/2023	PUBLIC OPEN SPACE MASTER PLAN
Approved		
GZ		SHEET 1 OF 1

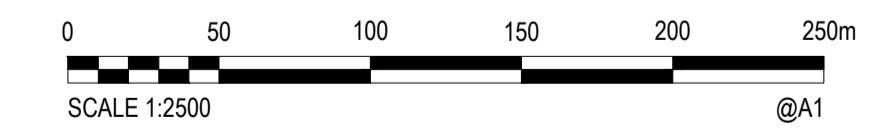
Status			
FOR CONCEPT APPROVAL			
NOT TO BE USED FOR CONSTRUCTION PURPOSES			
Mar-23	AHD	Scale	Size
		1:2500	A1
Drawing Number			Revision
50521067-C1060			A



LEGEND

- LIMIT OF WORKS
- PROPOSED ROAD VERGE
- PROPOSED ROADS
- STREET TREES

CONFIDENTIAL



Rev.	Date	Description	ML/AS	JS	GZ
			Des.	Verif.	Appd.
A	16/03/2023	PRELIMINARY			



**Planning,
Industry &
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Drawn	Date
DP	16/03/2023
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AS	16/03/2023
Designed	Date
TMJS	16/03/2023
Verified	Date
JS	16/03/2023
Approved	
GZ	

Client	NSW DEPARTMENT OF PLANNING, INDUSTRY AND ENVIRONMENT
Project	TOLLAND RENEWAL PROJECT TOLLAND, WAGGA WAGGA
Title	STREET TREE MASTER PLAN
	SHEET 1 OF 1

Status	FOR CONCEPT APPROVAL NOT TO BE USED FOR CONSTRUCTION PURPOSES			
Mar-23	AHD	Scale	Size	A1
Drawing Number		1:2500		
50521067-C1070		Revision		
		A		