BUSHFIRE ASSESSMENT REPORT

MODIFICATION to Approved Residential Subdivision

82 Collaroy Parade, Louth Park

Prepared for Newpro25 Pty Ltd

Bushfire Planning Australia

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BPA Reference: 23113 Louth Park

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Disclaimer and Limitation

This report is prepared solely for the Newpro25 Pty Ltd c/- Perception Planning Pty Ltd (the 'Client') for the specific purposes of only for which it is supplied (the 'Purpose'). This report is not for the benefit of any other person; either directly or indirectly and is strictly limited to the purpose and the facts and matters stated in it and will not be used for any other application.

This report is based on the site conditions surveyed at the time the document was prepared. The assessment of the bushfire threat made in this report is made in good faith based on the information available to Bushfire Planning Australia at the time.

The recommendations contained in this report are considered to be minimum standards and they do not guarantee that a building or assets will not be damaged in a bushfire. In the making of these comments and recommendations it should be understood that the focus of this document is to minimise the threat and impact of a bushfire.

Finally, the implementation of the adopted measures and recommendations within this report will contribute to the amelioration of the potential impact of any bushfire upon the development, but they do not and cannot guarantee that the area will not be affected by bushfire at some time.

Document Status: 23113 - Bushfire Assessment Report

Version	Status	Purpose	Author	Review Date
1	Draft	Draft for Review	Katrina Mukevski	20 February 2024
2	Draft	Draft for Client Review	Stuart Greville	5 March 2024
3	Final	Final for Submission	Stuart Greville	12 March 2024
4	FINAL	BAR for Modified Layout	Stuart Greville	18 December 2024

Certification

As the author of this Bushfire Threat Assessment (BAR), I certify this BAR provides the detailed information required by the NSW Rural Fire Service under Clause 45 of the Rural Fires Regulation 2022 and Appendix 2 of Planning for Bushfire Protection 2019 for the purposes of an application for a bush fire safety authority under section 100B(4) of the Rural Fires Act 1997.

BPAD Bushfire Planning & Design Accredited Practitioner Level 2

Stuart Greville

Accredited Bushfire Practitioner

BPAD-26202

Date: 18 December 2024

In signing the above, I declare the report is true and accurate to the best of my knowledge at the time of issue.

Executive Summary

Bushfire Planning Australia (BPA) has been engaged by Newpro25 Pty Ltd c/- Perception Planning Pty Ltd (the 'Client') to undertake a Bushfire Assessment Report (BAR) to support the proposed modifications to the approved subdivision at 82 Collaroy Parade, Louth Park (the 'subject site'); legally known as Lot 2 DP1286289. The modification to the approved development will increase the lot yield from 28 to 30 residential lots.

The NSW Rural Fire Service (RFS) issued a Bush Fire Safety Authority (BFSA) on 1 July 2024 (DA20221206012109-CL55-2) for a nearly identical residential subdivision. Several amendments have subsequently been made to the proposed plan of subdivision including the redesign of the required stormwater detention basin that has enabled the inclusion of an additional 2 lots. An updated BAR has been completed for the amended layout, however the bushfire hazard assessment remains unchanged as there is no change to the development footprint.

This BAR confirms the modified layout is not exposed to a greater bushfire hazard and the only change to any potential hazard is a reduction in the area of land to be revegetated as a *freshwater wetland* within the stormwater basin.

Accordingly, the modified lot design continues to provide safe operational access without compromising the residents opportunity to utilise on street parking.

In summary, the following key recommendations which were adopted by the RFS are restated to ensure the proposed modifications to the approved residential development to achieve the aims and objectives of PBP 2019 and also able to comply with the conditions of the BFSA issued on 1 July 2024:

Asset Protection Zones

1. All land within the site zoned R1 Residential shall be managed as an Inner Protection Area (IPA) as outlined within Appendix 4 of PBP 2019 and the RFS document Standards for asset protection zones;
2. Asset Protection Zones shall be provided as indicated on **Figure 17;** including the approved 20m APZ along the northern boundary wholly within 442 Louth Park Road (Lot 1 DP1286289);
3. A 10m wide temporary APZ is required along the southern boundary. The temporary APZ is not required to be registered on the Certificate of Title and can be managed by a condition of development consent. Any infill development on the affected lots will be subject to further assessment should the *grassland* hazard remain;

Landscaping

4. Consideration should be given to landscaping and fuel loads on site to decrease potential fire hazards on site;

Construction and Design

5. Class 10a and 10b buildings are permissible within the APZs; subject to being separated by no less than 6m from any habitable (Class 1) building constructed on the lot;
6. All future dwellings to be constructed on the proposed lots shall have due regard to the specific considerations given in the National Construction Code: Building Code of Australia (BCA) which makes specific reference to Australian Standard AS3959-2018 Construction of buildings in bushfire prone areas (AS3959-2018) or the NASH Standard Steel Framed Construction in Bushfire Prone Areas;

Access

7. Any temporary turning heads shall be constructed in accordance Appendix A3.3 of PBP 2019;

8. Access roads shall be constructed in accordance with the drawings prepared by GCA Engineering Solutions titled Proposed Subdivision 442 Louth Park Road, Louth Park – Hillview East DA 22-1260 Modification (Project No. 21360C) Revision 14 dated 18 December 2024 (contained in **Appendix A**);
9. Non-perimeter roads (Roads 10, 11 and Collaroy Parade) located within 100m from the permanent bushfire hazard, shall comply with the following general requirements of Table 5.3b of PBP 2019:
    a. Minimum 5.5m wide road width measured kerb to kerb;
    b. Hydrants are located clear of parking areas;
    c. Curves of roads have a minimum inner radius of 6m;
    d. The road crossfall does not exceed 3 degrees; and
    e. A minimum vertical clearance of 4m to any overhanging obstructions, including tree branches is provided.
10. Property Access Roads along the eastern property boundary (accessing lots 114 and 115) are to be in accordance with Table 5.3b of PBP 2019; including a minimum 4m wide carriageway and the provision of a single passing bay;
11. Vegetation within road verges (including swales) to be consistent with a grassland vegetation classification with tree canopy less than 10% at maturity;
12. Vegetation with the stormwater basins; including associated batters shall be planted consistent with a grassland vegetation classification with tree canopy less than 10% at maturity;

Water and Utilities

13. All new lots are to be connected to a reliable water supply network and that suitable fire hydrants are located throughout the development site that are clearly marked and provided for the purposes of bushfire protection. Fire hydrant spacing, sizing and pressure shall comply with AS2419.1 2005 and section 5.3.3 of PBP 2019.

This assessment has been made based on the bushfire hazards observed in and around the site at the time of inspection and production (December 2024) and demonstrates the development has satisfied the aims and objectives of Planning for Bushfire Protection 2019.

Finally, should the above recommendations be implemented, the existing bushfire risk should be suitably mitigated to offer an acceptable level of protection to life and property for those persons and assets occupying the site, but they do not and cannot guarantee that the area will not be affected by bushfire at some time and that property and life damage/loss will not occur.

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Terms and Abbreviations

Abbreviation	Meaning
APZ	Asset Protection Zone
AS2419-2005	Australian Standard – Fire Hydrant Installations
AS3959-2018	Australian Standard – Construction of Buildings in Bush Fire Prone Areas
BAR	Bushfire Assessment Report
BCA	Building Code of Australia
BC Act	NSW Biodiversity Act 2016
BMP	Bush Fire Management Plan
BPA	Bush Fire Prone Area (Also Bushfire Prone Land)
BPL	Bush Fire Prone Land
BPLM	Bush Fire Prone Land Map
BPM	Bush Fire Protection Measures
DoE	Commonwealth Department of the Environment
DPI Water	NSW Department of Primary Industries – Water
DSF	Dry Sclerophyll Forest
EPA Act	NSW Environmental Planning and Assessment Act 1979
EPBC Act	Commonwealth Environment Protection and Biodiversity Conservation Act 1999
FDI	Fire Danger Index
FMP	Fuel Management Plan
ha	hectare
IPA	Inner Protection Area
LGA	Local Government Area
MCC	Maitland City Council
OPA	Outer Protection Area
OEH	NSW Office of Environment and Heritage
PBP 2019	Planning for Bushfire Protection 2019
RF Act	Rural Fires Act 1997
RF Regulation	Rural Fires Regulation
RFS	NSW Rural Fire Service

1. Introduction

Bushfire Planning Australia (BPA) has been appointed by Newpro25 Pty Ltd c/- Perception Planning Pty Ltd (the 'Client') to undertake a Bushfire Assessment Report (BAR) to support the proposed modification to the approved residential subdivision located at 82 Collaroy Parade, Louth Park (the 'subject site'). The proposed modifications will increase the lot yield from 27 to 30 residential allotments. All lots remain within the approved development footprint.

The assessment aims to provide an updated bushfire risk assessment which considers and assesses the bushfire hazard and associated potential bushfire threat relevant to the proposed modifications to the approved development. The assessment outlines the minimum mitigative measures which would be required in accordance with the BAR, provisions of the New South Wales Rural Fire Service (RFS) publication *Planning for Bushfire Protection 2019* (PBP 2019) and the *Rural Fires Regulation 2022*.

1.1. Aims and Objectives

This BAR aims to assess the bushfire threat and recommends a series of bushfire protection measures that aim to minimise the risk of adverse impact of bush fires on life, property and the environment.

This assessment has been undertaken in accordance with Appendix 2 of *Planning for Bushfire Protection 2019* and clause 45 of the *Rural Fires Regulation 2022*. This assessment also addresses the aim and objectives of PBP 2019, being:

- Afford buildings and their occupants protection from exposure to a bushfire;
- Provide for a defendable space to be located around buildings;
- Provide appropriate separation between a hazard and buildings which, in combination with other measures, prevent the likely fire spread to buildings;
- Ensure that appropriate operational access and egress for emergency service personnel and occupants is available;
- Provide for ongoing management and maintenance of bushfire protection measures (BPMs); and
- Ensure that utility services are adequate to meet the needs of firefighters.

2. Site Description

Table 1: Site Description

Address	82 Collaroy Parade, Louth Park
Title	Lot 2 DP1286289
LGA	Maitland City Council
Study Area	7.61 ha
Land Use Zone	R5 Large Lot Residential (**Figure 1**)
Bushfire Prone Land	Bushfire Prone Land. The site is mapped as Vegetation Category 1 and Vegetation Category 3 (**Figure 3**)
Context	The development site is located to the east of Collaroy Parade and is currently vacant of any dwellings or buildings. Vegetation does exist across the site although highly modified. Large rural residential lots exist to the north and east of the site whilst a residential subdivision exists to the west. Vegetation continues to the south, similar to that on site. The site is identified as Louth Park Urban Release Area in the Maitland Local Government Area Bush Fire Planning – Urban Release Area Map.
Topography	Undulating ~15m rise in elevation from the north to the south-eastern corner of the site
Fire Danger Index	100

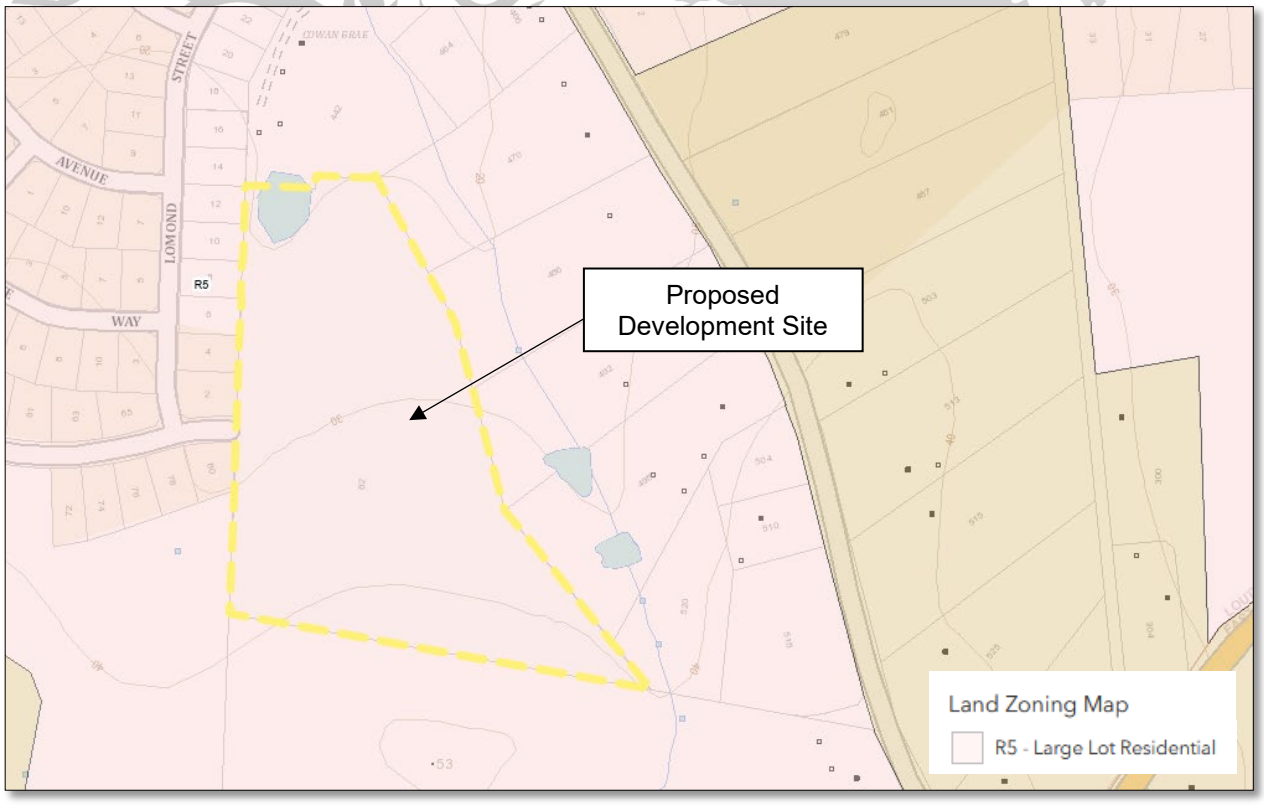

Figure 1: Land Use Zone Map (Maitland Local Environment Plan 2011)

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Figure 2

Site Location

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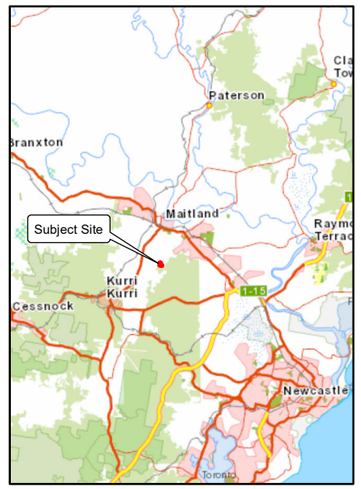

Subject Site
100m Buffer
140m Buffer

SOURCE:
Cadastral Boundary: NSW Department of Finance, Services and Innovation 2023
Basemap: NSW Department of Customer Service 2022

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0 100 200 300 400 500
Meters

A3 Scale: 1:10,000

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2.1. Bushfire Planning - Urban Release Area

The subject site is located within Maitland Local Government Area (LGA) Bushfire Planning - Urban Release Area Map – Section 7 Louth Park as indicated on **Figure 3** and **Figure 4**. As a subdivision of land within an URA, the assessment undertaken as part of the preparation of the BAR may exempt the proposed lots from reassessment of bushfire matters when future land owners are ready to construct a dwelling on their lot/s.

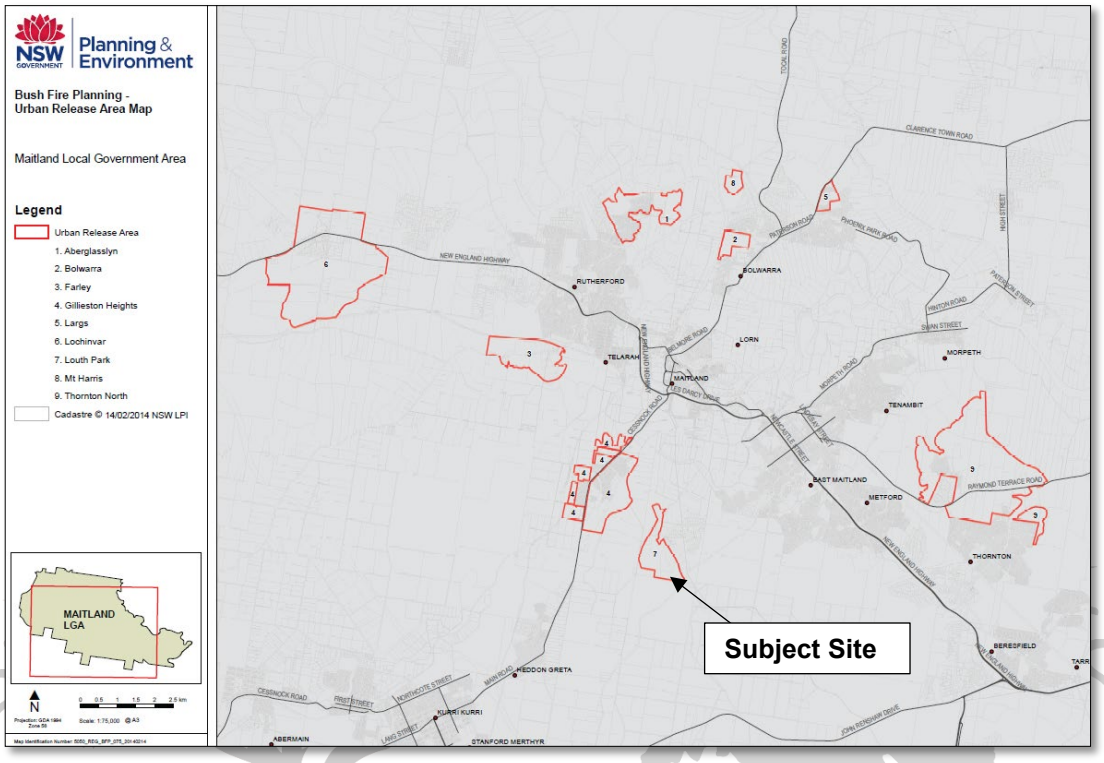

Figure 3: Louth Park URA Area Plan

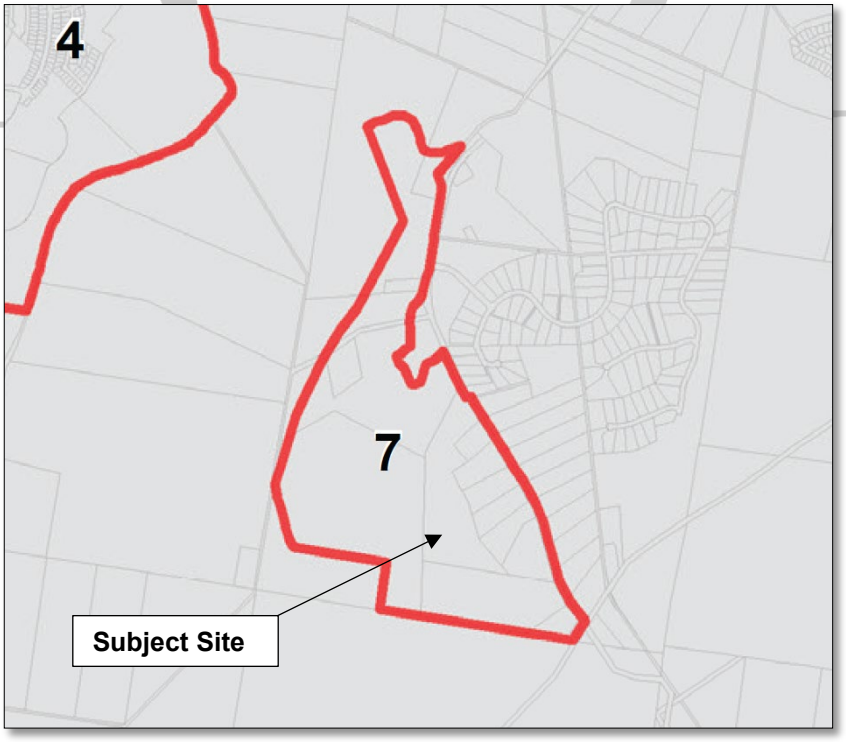

Figure 4: Louth Park URA Area Plan

2.2. Bushfire Prone Land

Bushfire activity is prevalent in landscapes that carry fuel and the two predominant bushfire types are grassland and forest fires. Factors such as topographic characteristics and quantity of fuel loads influence the intensity and spread of fire. The scale of a bushfire hazard is tailored to the characteristics of the hazard, the size and characteristics of the affected population, types of land use exposed to bushfire, predicted development growth pressures and other factors affecting bushfire risk.

Figure 5 demonstrates majority of the site is mapped as Vegetation Category 1 bushfire prone land with exception of the northern portion of the site which is mapped as Vegetation Category 3 and Vegetation Buffer.

Vegetation Category 3 bushfire prone land exists to the north before transitioning to Vegetation Category 1 bushfire prone land, both within 140m of the site.

Vegetation Category 1 bushfire prone land exists to the immediate east, south and south-western corner within and beyond 140m of the site, which transitions to an ecotone of Vegetation Category 3 and Vegetation Buffer bushfire prone land. Vegetation Buffer exists to the west within 140m of the site.

The vegetation to the immediate south of the site is identified as the primary bushfire hazard; however the vegetation will be removed in its entirety (or managed as an APZ/IPA) as part of an approved 25 lot residential development.

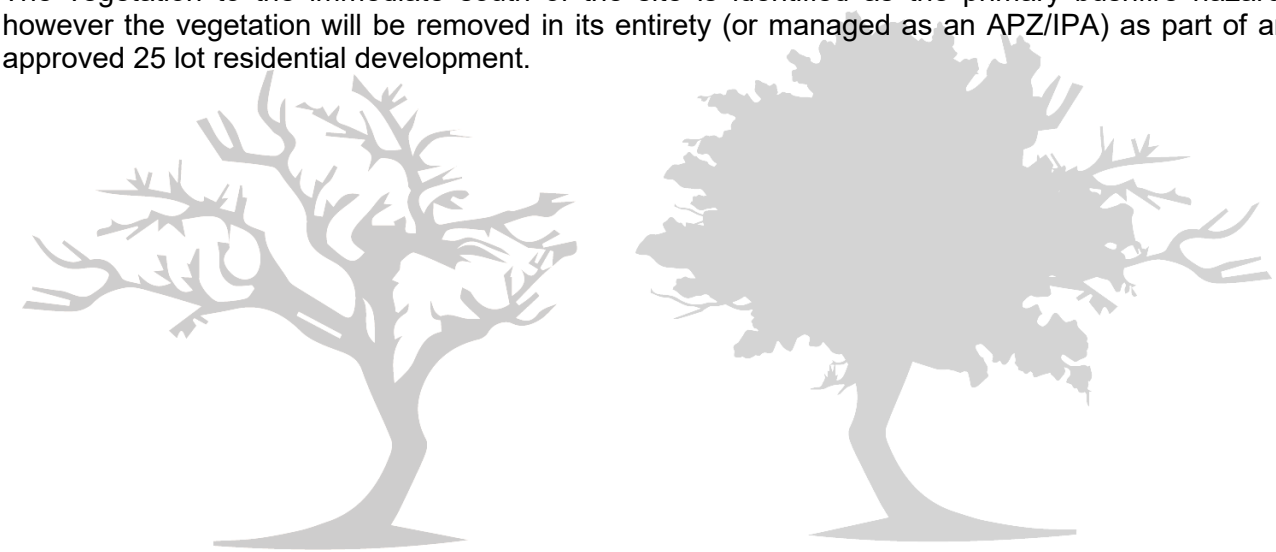

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Figure 5

NSW Bush Fire Prone Land

BUSHFIRE PLANNING AUSTRALIA

Subject Site
100m Buffer
140m Buffer

Bushfire Prone Land

Vegetation Category 1
Vegetation Category 2
Vegetation Category 3
Buffer

SOURCE:
Cadastral Boundary: NSW Department of Finance, Services and Innovation 2023
NSW Bush Fire Prone Land: NSW Rural Fire Service 2022
Aerial Photo: NearMap 23/10/2023

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0 20 40 60 80 100 120
Meters

A3 Scale: 1:2,500

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2.3. Background

The RFS issued a Bush Fire Safety Authority (BFSA) for a 30 lot residential subdivision (**Figure 6**) closely mirroring the proposed 27 lot subdivision on 24 March 2023 (RFS Ref: DA20221206012109-Original-1) The BFSA can be found in **Appendix B**. The BFSA was issued following an assessment of the *Bushfire Assessment Report – Performance Based, Proposed Residential Subdivision*, 442 Louth Park Road, Louth Park prepared by Cool Burn Fire & Ecology dated 19 October 2022. The road network of the approved subdivision was nearly identical to the proposed development including the construction of a 12m wide connecting access road; being the extension of Collaroy Parade from the west through to the recently approved subdivision of the land to the south. Two (2) cul-de-sacs provided access to the remaining lots and a nominal 12m APZ was provided along part of the eastern boundary. The RFS supported the use of the Short Fire Run Methodology to determine the appropriate APZ for the lots with a common boundary along the eastern interface.

Since the issue of the BFSA in March 2023, the proposed subdivision of the subject site has undergone multiple modifications, including adjustments to the layout of proposed roads and the arrangement of lots.

The RFS also issued a BFSA (RFS Ref: DA-2018-04687-CL55-3) on 26 April 2023 for a 25 lot residential subdivision at 526 Louth Park Road (**Figure 7**). Maitland Council subsequently issued development consent (DA/2018/1967) on 13 June 2023. The approved development requires a combination of 10m and 25m APZs along the boundary; including a 10m APZ along the common boundary with the subject site. Furthermore, a 6m wide fire trail will be constructed around the boundary of the approved development in lieu of a public perimeter road.

The approved subdivision will remove the bushfire hazard to the south of the proposed development and also provide a second means of access.

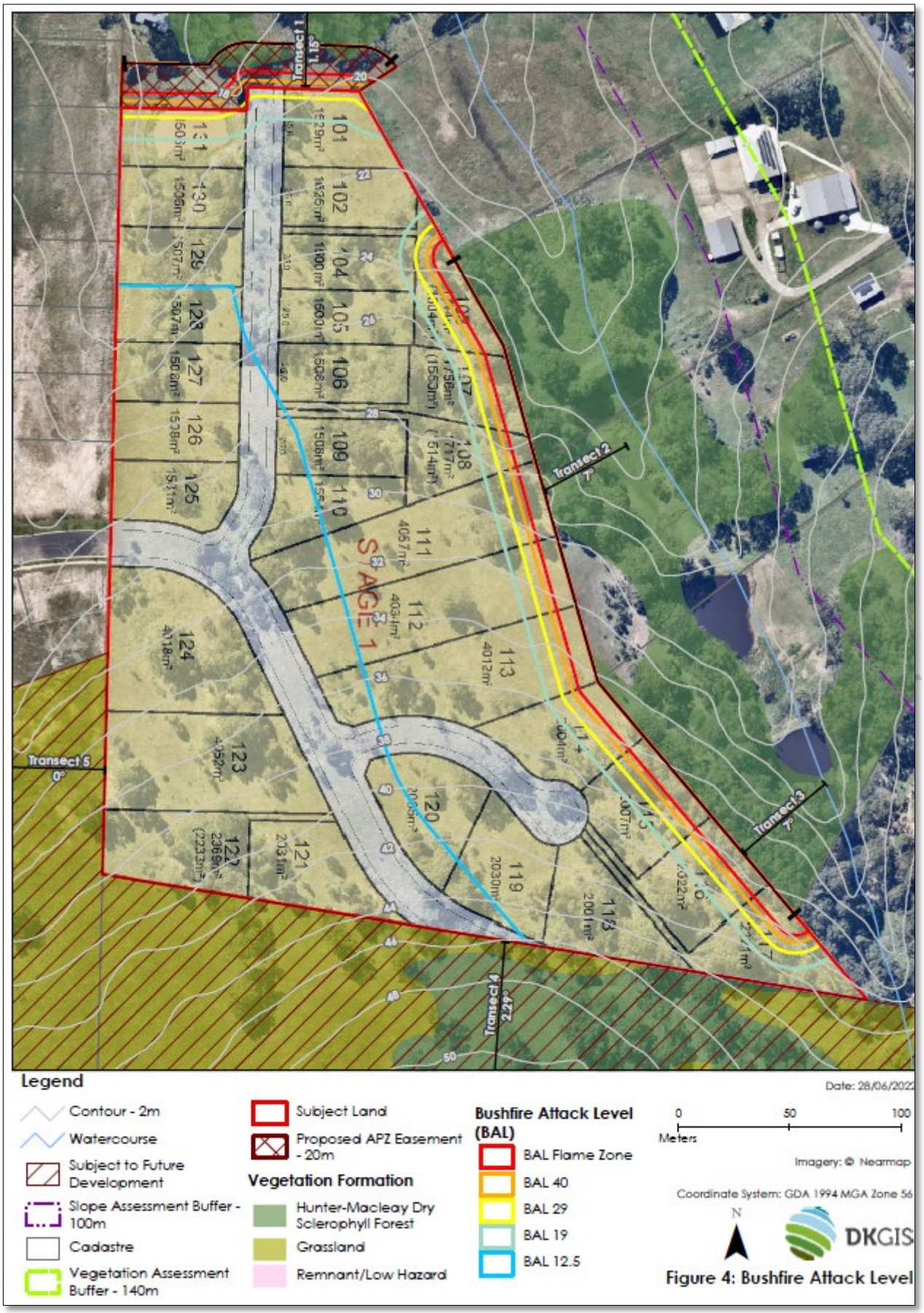

Figure 6: Plan of Subdivision of the subject site approved by the RFS on 24 March 2023

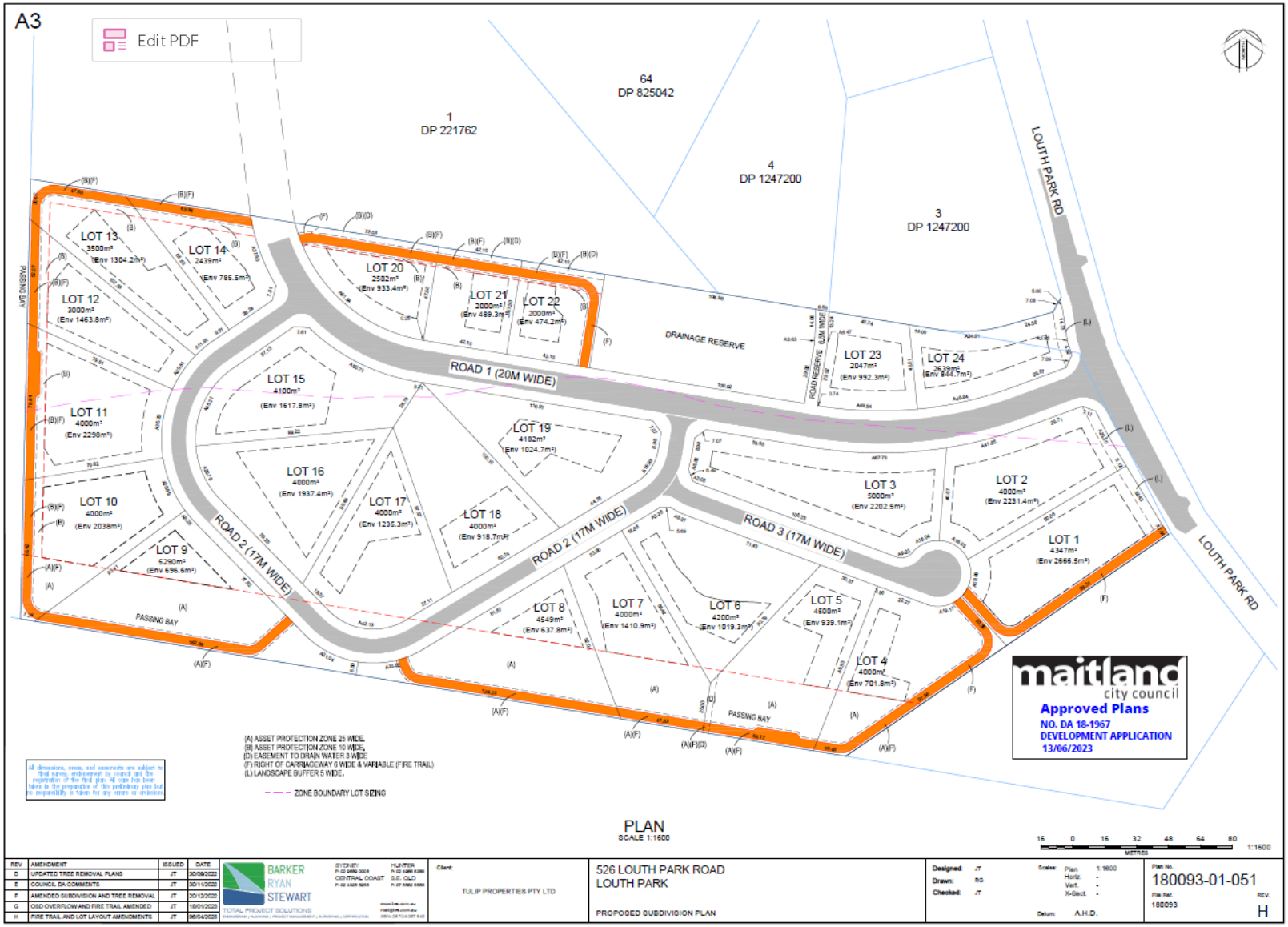

Figure 7: 25 lot residential subdivision approved by the RFS and MCC to the south of the proposed development

2.4. Approved Development

Maitland City Council approved the initial development application (DA/2022/1260) on 27 August 2024 for a 1 into 28 lot Torrens Title Subdivision (including 1 drainage reserve) located at 82 Collaroy Parade, Louth Park as shown in **Figure 8**.

The approved development included the construction of public through roads to the existing residential subdivision to the west via Collaroy Road, and non-perimeter roads to provide access to each lot, associated pathways and ancillary services including a detention basin. Collaroy Parade has been designed to continue into the approved subdivision to the south, which will provide secondary access to Louth Park Road.

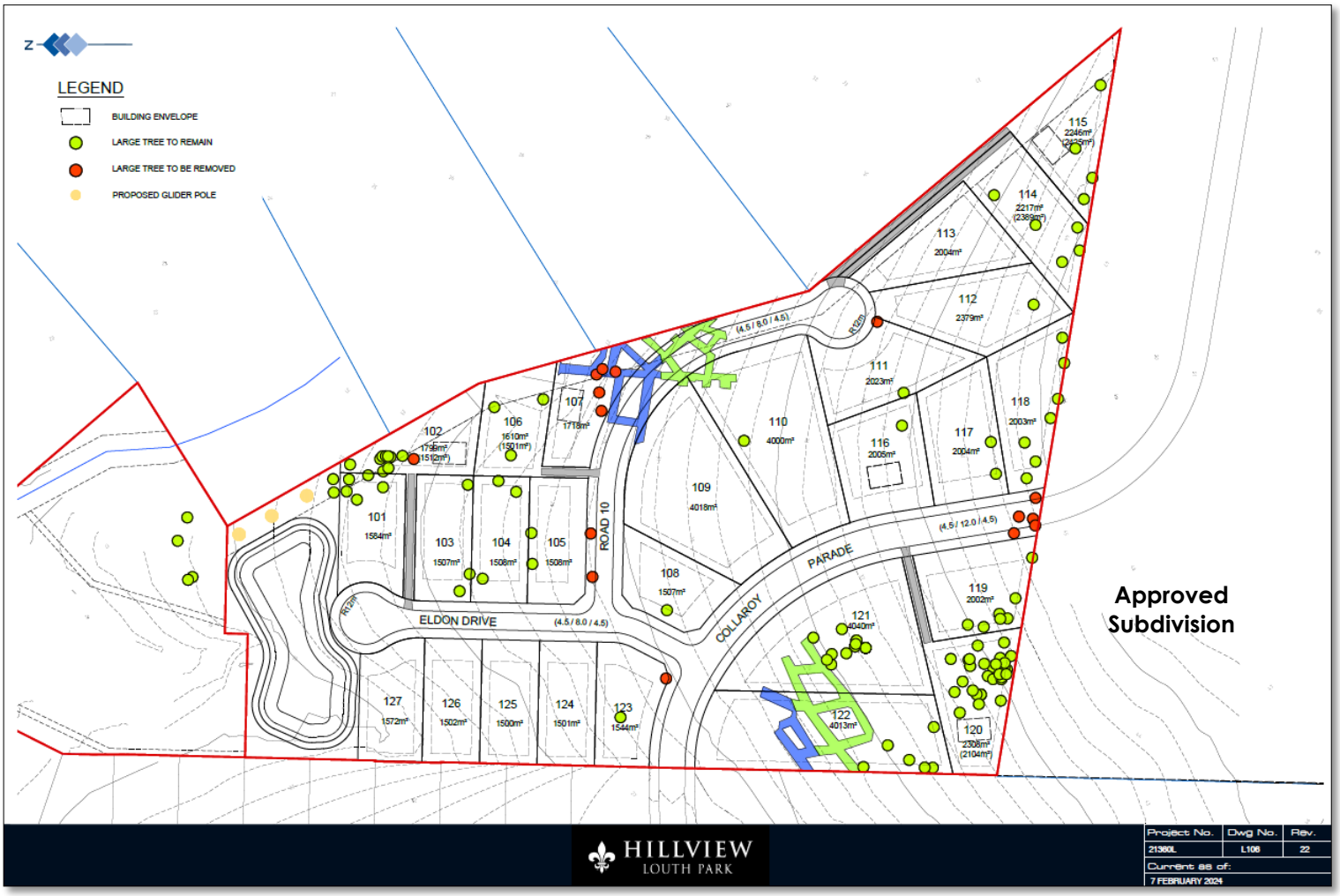

Figure 8: Plan of Approved Subdivision

2.5. Proposed Modification

The proposed modification seeks consent for the redesign of the stormwater infrastructure and an increase in lot yield from 28 to 30 lots. This modification primarily affects the northern portion of the approved development, still within the original development site, as shown in **Figure 9**.

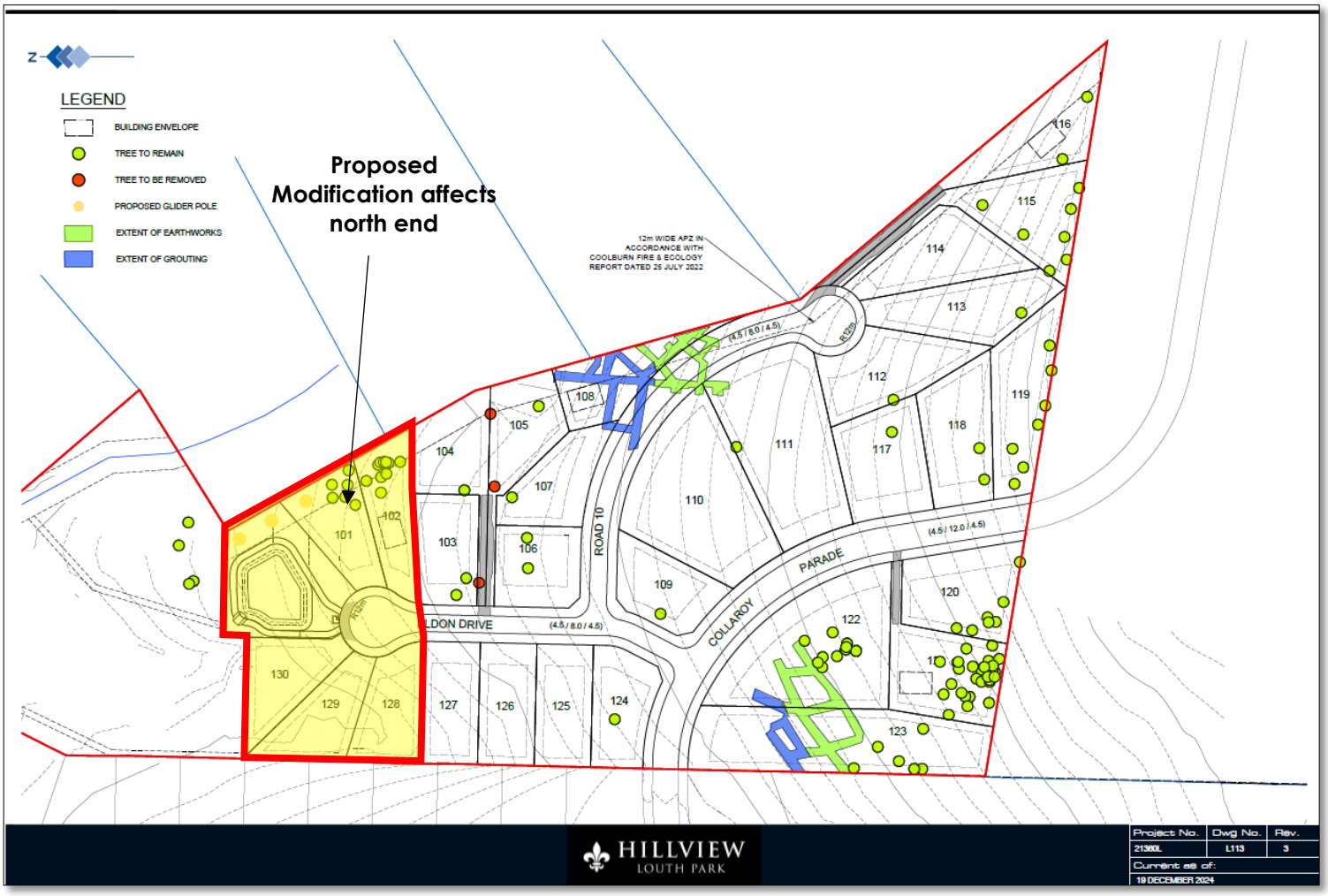

Figure 9: Plan of Proposed Subdivision

3. Bushfire Hazard Assessment

The bushfire hazard assessment will involve quantitative and qualitative assessments of the site. The quantitative assessment includes a detailed site inspection to record and review vegetation communities, slope and aspect both within and surrounding the site. The qualitative assessment will be based on the known bushfire behaviour of the subject land.

3.1. Vegetation Assessment

It is noted there have been no changes or reduction in the bushfire hazard within or surrounding the site subsequent to the original bushfire hazard assessment being completed. Accordingly, this BAR relies on the previous findings contained in the BAR prepared by BPA dated 12 March 2024.

In accordance with PBP 2019, an assessment of the vegetation over a distance of 140m in all directions from the site was undertaken.

Vegetation classification over the site and surrounding area has been carried out as follows:

- Aerial Photograph Interpretation to map the vegetation classification and extent (NearMap historical series);
- Bushfire Assessment Report – Performance Based, Proposed Residential Subdivision, 442 Louth Park Road, Louth Park prepared by Cool Burn Fire & Ecology dated 19 October 2022;
- Reference to NSW State Vegetation Type Formation Department of Planning, Industry and Environment 2023 (**Figure 10**); and
- Biodiversity Development Assessment Report prepared by Habitat Environmental Services (HBT0019_BDAR_V6.0) dated 20 July 2023.

Vegetation that may be considered a bushfire hazard was identified in all directions from the development footprint. The vegetation classification is based on Appendix 1 of PBP 2019; per Keith (2004). The unmanaged fuel loads detailed in the *Comprehensive Vegetation Fuel Loads* published by the NSW Rural Fire Service (RFS) in March 2019 have been adopted for the purpose of assessing the bushfire hazard. The findings of the site inspection were compared to the Keith Vegetation Formations mapping provided by the NSW RFS. The inconsistencies between the mapping sources were quantified during the site inspection.

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Figure 10

NSW State Vegetation Type (Class)

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Subject Site

100m Buffer

140m Buffer

Vegetation Class

Hunter-Macleay Dry Sclerophyll Forests

Not native vegetation

SOURCE:
Cadastral Boundary: NSW Department of Finance, Services and Innovation 2023
NSW Vegetation Type: NSW Department of Planning, Industry and Environment 2022
Aerial photo: NearMap 23/10/2023

N
W E
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0 25 50 75 100 125
Meters

A3 Scale: 1:2,500

File:23113-LouthPark-Fig3-Vegetation-NSW-SVT-231127
Date: 27/11/2023

3.2. Slope Assessment

The slope assessment was undertaken as follows:

- Review of LiDAR point cloud data – including DEM (NSW LPI).

An assessment of the slope over a distance of 140m in the hazard direction from the site boundary was undertaken. The effective slope was then calculated under the classified vegetation where there was a fire run greater than 50m. The topography of the site has been evaluated to identify both the average slope and by identifying the maximum slope present. These values help determine the level of gradient which will most significantly influence the fire behaviour of the site.

A series of figures were produced that demonstrate the slope within 140m from the subject site in several formats, including:

- Digital Elevation Model - **Figure 11**; and
- Slope analysis in gradients of 5 degrees - **Figure 12**.

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Figure 11

Digital Elevation Model

BUSHFIRE PLANNING AUSTRALIA

Subject Site
100m Buffer
140m Buffer
Contour (5m)
Contour (1m)

Elevation (AHD)
High : 52m
Low : 14m

SOURCE:
Cadastral Boundary: NSW Department of Finance, Services and Innovation 2023
Surface analysis: Derived from NEWCASTLE 1m resolution LiDAR: © Department Finance, Services and Innovation 2012.

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A3 Scale: 1:2,500

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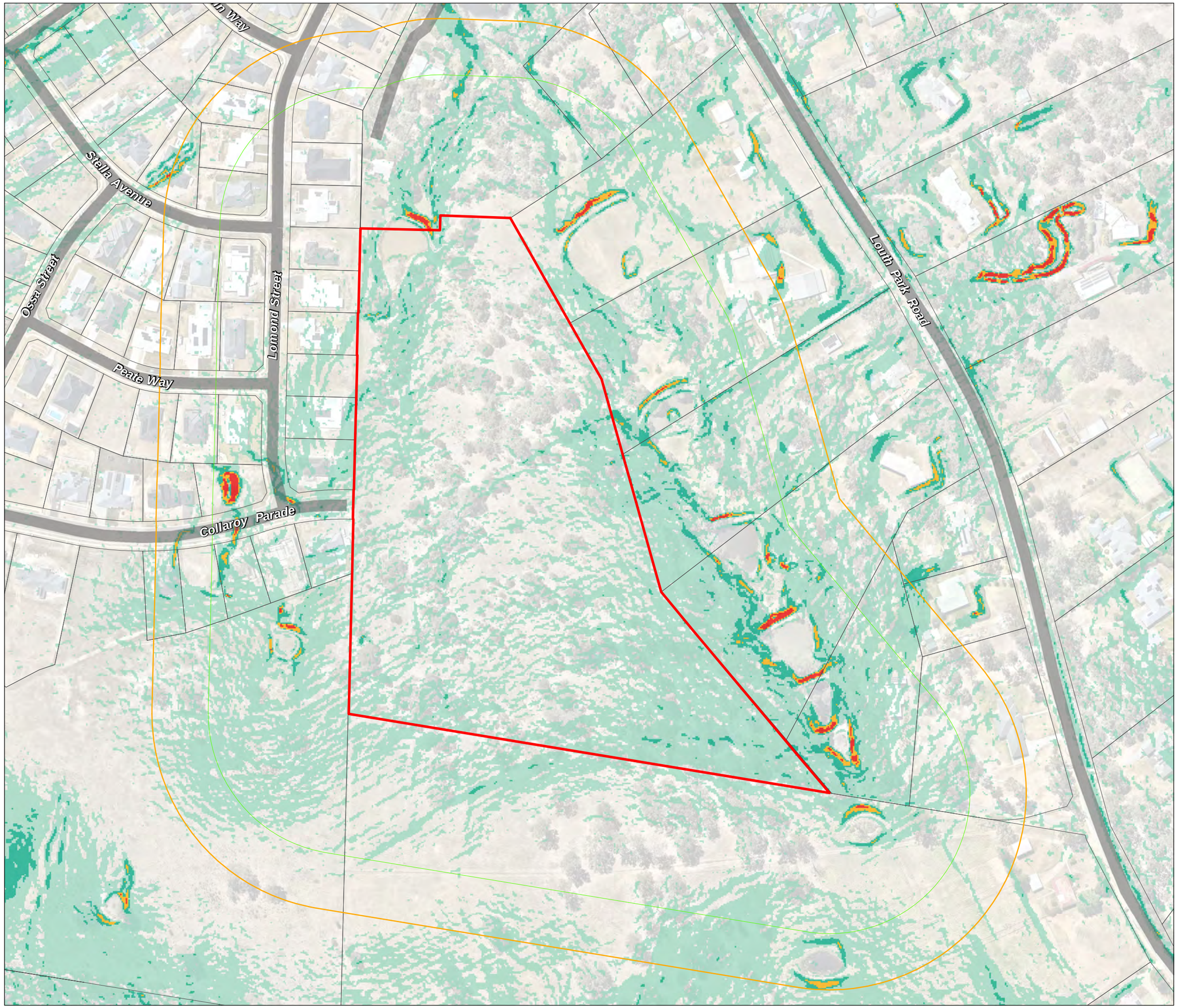

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Figure 12

Slope Analysis: LiDAR

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Subject Site
100m Buffer
140m Buffer

Slope

0° - 5°
5° - 10°
10° - 15°
15°- 20°
>20°

SOURCE:
Cadastral Boundary: NSW Department of Finance, Services and Innovation 2023
Surface analysis: Derived from NEWCASTLE 1m resolution LiDAR: © Department Finance, Services and Innovation 2012.
Aerial photo: NearMap 23/10/2023

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Meters

A3 Scale: 1:2,500

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3.3. Slope & Vegetation Assessment Results

It is noted there have been no changes or reduction in the bushfire hazard within or surrounding the site subsequent to the original bushfire hazard assessment being completed. Accordingly, this BAR relies on the previous findings contained in the BAR prepared by BPA dated 12 March 2024. Several additional transects have been assessed in the northern portion of the site to ensure the modified design has been accurately assessed.

The majority of the development site is an ecotone of *forest* and *grassland* vegetation which will be removed or sufficiently modified as an APZ/IPA to no longer present as a bushfire hazard.

Whilst vegetation to the south and southwest is actively grazed, there is no assurance that it will be reliably maintained < 100mm at all times as required by PBP 2019. In this instance, the vegetation's worst-case potential must be considered therefore for the purpose of this assessment vegetation to the south and southwest are assessed as a *grassland*. Notwithstanding, the property to the south of the subject site has recently obtained development consent for a 25 lot large lot residential subdivision. As part of the approved development, all vegetation within the new lots will be managed as an IPA and no longer be considered a bushfire hazard.

The detention basin located at the northern end of the development will be regraded and seeded with a mixture of native grasses. Although the basin may not be reliably maintained, the basin can be regarded as a low threat due to the minimal fuel load and the small size of the basin. The basin has an area less than 1 hectare (~6,000m^2) and is generally isolated from other large areas of unmanaged vegetation by an approved 20m APZ on the northern side of the basin and cleared land to the east. As a small dry detention basin, there is little opportunity for a self-sustaining bushfire to establish, let alone form into a fully developed bushfire.

The only hazardous vegetation mapped by the SVT mapping was identified as a *forest*, specifically, *Hunter Macleay Dry Sclerophyll Forest* (Hunter Macleay DSF. The vegetation is in low to moderate condition and situated along an intermittent watercourse. The remaining vegetation plays a role in supporting riparian functions, including various small dams and open water channels. These features contribute to the discontinuous tree canopy, which supports the notion that only short fire runs are likely, posing a low risk of bushfires, with sustained canopy fires being improbable.

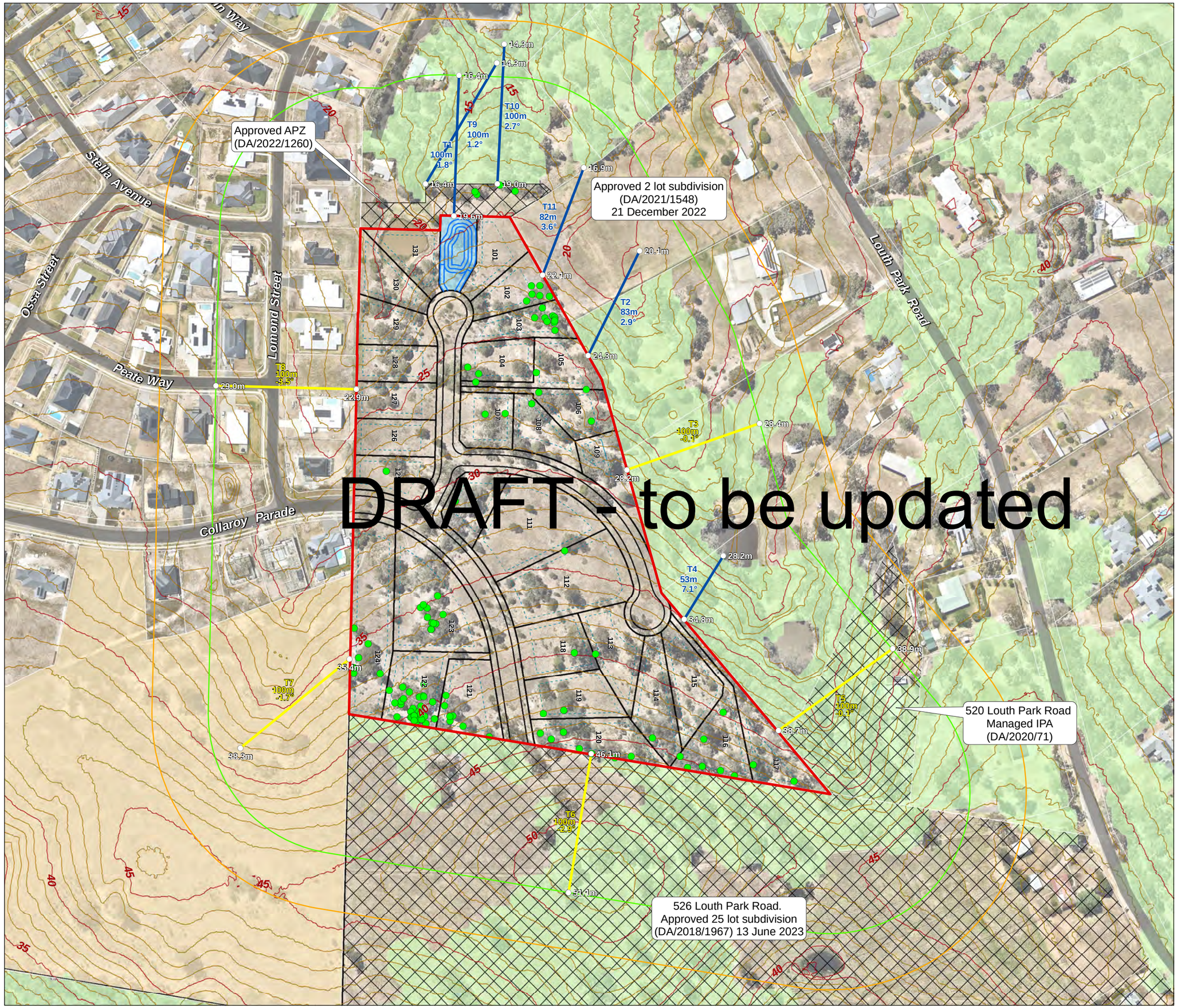
Beyond the southeast corner of the site, all vegetation within the adjoining property (with the exception of a 10m wide riparian zone) at 520 Louth Park Road is required to be managed as an IPA in accordance with the conditions of development consent contained in DA/2020/71.

The vegetation management within the properties to the east aligns with large lot peri-urban development patterns in the area, which limits the accumulation of bushfire fuel, potential fire spread (under 150m), and results in a reduced fire risk. The classification of the vegetation as Hunter Macleay DSF and the consideration of Short Fire Runs (SFR) should be viewed as a conservative and appropriate approach to vegetation classification.

The results of hazard assessment are detailed in **Table 2** and shown in **Figure 12**.

Table 2: Slope and Vegetation Assessment Results

Transect	Vegetation Description	Vegetation Classification (PBP 2019)	Slope
T1 North	Dry grassland stormwater detention basin, approved 20m APZ, transitioning to grassy forest vegetation	*Forest* (Hunter Macleay Dry Sclerophyll Forest – PCT 1600)	1.8° Downslope
T2 North-east	Isolated forest vegetation with managed understorey on the adjoining rural residential property to the north-east of the site. Partial APZ management. Short Fire Run < 80m	*Forest* (Hunter Macleay Dry Sclerophyll Forest – PCT 1600)	2.9° Downslope
T3 East	Isolated forest vegetation with managed understorey on the adjoining rural residential property to the east of the site Short Fire Run <150m	*Forest* (Hunter Macleay Dry Sclerophyll Forest – PCT 1600)	-0.1° Upslope
T4 East	Isolated forest vegetation between the sites eastern boundary and a dam Short Fire Run <53m	*Forest* (Hunter Macleay Dry Sclerophyll Forest – PCT 1600)	7.1° Downslope
T5 South-east	Forest vegetation south-east of the site on adjoining property – managed as an APZ (per DA/2020/71)	Excluded (Managed APZ)	-0.1° Upslope
T6 South	Open grassland with few scattered trees. All vegetation to be removed as part of approved subdivision	Excluded (Managed IPA)	-2.9° Upslope
T7 South-west	Sparse open paddock south-west of the site on adjoining property zoned R5.	*Grassland*	-1.7° Upslope
T8 West	Existing residential properties located to the west of the site	Excluded (Managed land)	-3.5° Upslope
T9 North	Isolated forest vegetation with managed understorey on the adjoining rural residential property to the north of the site, separated by the approved APZ (DA/2022/1260)	*Forest* (Hunter Macleay Dry Sclerophyll Forest – PCT 1600)	1.2° Downslope
T10 North	Isolated forest vegetation with managed understorey on the adjoining rural residential property to the north of the site, separated by the approved APZ (DA/2022/1260)	*Forest* (Hunter Macleay Dry Sclerophyll Forest – PCT 1600)	2.7° Downslope
T11 North-east	Managed land on adjoining rural residential property to the north-east of the site	Excluded (Managed land)	3.6° Downslope



Project: Louth Park
Job No: 23113

Figure 13

Slope & Vegetation Assessment

BUSHFIRE PLANNING AUSTRALIA

- Subject Site
- Contour (5m)
- Contour (1m)
- 100m Buffer
- 140m Buffer
- RL
- Downslope transect
- Upslope transect

Vegetation Class

- Freshwater Wetland
- Grassland
- Hunter-Macleay Dry Sclerophyll Forests (PCT 1600)
- Not native vegetation

SOURCE:
Cadastral Boundary: NSW Department of Finance, Services and Innovation 2023
Vegetation: Bushfire Planning Australia 2024 (based on NSW SVTM - Department of Planning, Industry and Environment 2023)
Aerial photo: NearMap 23/10/2023
Surface analysis: Derived from NEWCASTLE 1m resolution LiDAR: © Department Finance, Services and Innovation 2012.

N W E S

0 25 50 75 100 125
Meters

A3 Scale: 1:2,500

File:23113-LouthPark-Fig6-SlopeVeg-241025

Date: 25/10/2024

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3.4. Significant Environmental Features

There are no known environmental features of significance within the development footprint or the balance of the site. The recommended bushfire protection measures have been designed to minimise any impacts on any identified significant environmental features; including retaining numerous significant trees throughout the site.

3.5. Threatened Species, populations or ecological communities

The area of the site to be affected by the proposed development has been identified to minimise impact on any threatened species, population or EEC. All bushfire mitigation measures; including APZs have considered the existing and potential biodiversity values to minimise impact where possible.

3.6. Aboriginal Objects

A search of the AHIMS database (results contained in **Appendix B**) revealed there are no Aboriginal sites or places recorded near the site. All bushfire mitigation measures, such as APZs have considered this and been designed to minimise disturbing any artefacts if identified.

4. Bushfire Protection Measures

4.1. Asset Protection Zones

An Asset Protection Zone (APZ) is an area surrounding a development that is managed to reduce the bushfire hazard to an acceptable level to mitigate the risk to life and property. The required width of the APZ varies with slope and the type of hazard. An APZ can consist of both an inner protection area (IPA) and an outer protection area (OPA). In this instance all APZs and the balance of the development site shall be managed as an IPA.

4.1.1. Determining the Appropriate Setbacks

To achieve compliance with the performance criteria for APZs (Table 5.3a), the Acceptable Solutions outlined in Table A1.12.2 of PBP 2019 may be adopted as a deemed-to-satisify solution.

Alternatively, the appropriate APZ setback may be determined to achieve the Performance Criteria by adopting a performance-based solution. Based on the unique site characteristics identified by the BAR, the intensity of a bushfire event presented as the radiant heat exposure was calculated at several locations throughout the development site using the NBC Bushfire Attack Assessor V4.1. The nominated fuel loads for the respective vegetation classifications as published by the RFS in March 2019 have been used to determine the APZs and the effective slope obtained from the Digital Elevation Model (DEM) for each transect.

As the site lies within the Maitland City Council LGA, it is assessed under a FDI rating of 100. The Detailed Method (Method 2) outlined in Australian Standard *AS3959-2018 Construction of buildings in bushfire prone areas* was used to calculate the potential level of radiant heat flux generated at the nominated locations (see transects T1-T11). To ensure the APZs achieve the intent of Section 5.3 of PBP 2019, the APZs have been determined to ensure all lots are able to accomomodate a dwelling that will not be exposed to radiant heat levels exceeding 29kW/m^2.

The NBC Bushfire Attack Assessor report detailing the inputs used is contained in **Appendix D**.

Refer to **Table 3** for the recommended APZs

Table 3: Approved and Recommended Asset Protection Zones

Transect	Vegetation Classification (PBP 2019)	Slope Class	APZ PBP 2019 Table A1.12.2	APZ 29kW/m^2
T1 North	*Forest* (Hunter Macleay Dry Sclerophyll Forest – PCT 1600)	1.8° Downslope	29m	18m
T2 North-east	*Forest/ Grassland* (Hunter Macleay Dry Sclerophyll Forest – PCT 1600)	2.9° Downslope	29m	10m[1]
T3 East	*Forest* (Hunter Macleay Dry Sclerophyll Forest – PCT 1600)	-0.1° Upslope	24m	10m[1]
T4 East	*Forest* (Hunter Macleay Dry Sclerophyll Forest – PCT 1600)	7.1° Downslope	36m	11m[1]
T5 South-east	Excluded (Managed APZ)	-0.1° Upslope	N/A	N/A
T6 South	Excluded (Managed IPA)	-2.9° Upslope	10m	10m
T7 South-west	*Grassland*	-1.7° Upslope	24m	15m
T8 West	Excluded (Managed land)	-3.5° Upslope	N/A	N/A
T9 North	*Forest* (Hunter Macleay Dry Sclerophyll Forest – PCT 1600)	1.2° Downslope	29m	18m
T10 North	*Forest* (Hunter Macleay Dry Sclerophyll Forest – PCT 1600)	2.7° Downslope	29m	18m
T11 North-east	Excluded (Managed land)	3.6° Downslope	N/A	N/A

[1] Short Fire Run per Coolburn

4.2. Landscaping and Vegetation Management

In APZs and IPAs, the design and management of the landscaped areas in the vicinity of buildings have the potential to improve the chances of survival of people and buildings. Reduction of fuel does not require the removal of all vegetation. Trees and plants can provide some bushfire protection from strong winds, intense heat and flying embers (by filtering embers) and changing wind patterns.

Generally landscaping in and around a bushfire hazard should consider the following:

- Priority given to retaining species that have a low flammability;
- Priority given to retaining species which do not drop much litter in the bushfire season and which do not drop litter that persists as ground fuel in the bush fire season;
- Priority given to retaining smooth barked species over stringy bark; and
- Create discontinuous or gaps in the vegetation to slow down or break the progress of fire towards the dwellings.

Landscaping within APZs and IPAs should give due regard to fire retardant plants and ensure that fuel loads do not accumulate as a result of the selected plant varieties.

The principles of landscaping for bushfire protection aim to:

- Prevent flame impingement on dwellings;
- Provide a defendable space for property protection;
- Reduce fire spread;
- Deflect and filter embers;
- Provide shelter from radiant heat; and
- Reduce wind speed.

Avoiding understorey planting and regular trimming of the lower limbs of trees also assists in reducing fire penetration into the canopy. Rainforests species such as Syzygium and figs are preferred to species with high fine fuel and/or oil content. Trees with loose, fibrous or stringy bark should be avoided. These trees can easily ignite and encourage ground fire to spread up to, and then through the crown of trees.

Consideration should be given to vegetation fuel loads present on site with particular attention to APZs. Careful thought must be given to the type and physical location of any proposed site landscaping. Inappropriately selected and positioned vegetation has the potential to 'replace' any previously removed fuel load.

Bearing in mind the desired aesthetic and environment sought by site landscaping, some basic principles have been recommended to help minimise the chance of such works contributing to the potential hazard on site.

Whilst it is recognised that fire-retardant plant species are not always the most aesthetically pleasing choice for site landscaping, the need for adequate protection of life and property requires that a suitable balance between visual and safety concerns be considered.

It is reiterated again that it is essential that any landscaped areas and surrounds are subject to ongoing fuel management and reduction to ensure that fine fuels do not build up.

4.3. Access

In the unlikely event of a serious bushfire, it will be essential to ensure that adequate ingress / egress and the provision of defendable space are afforded in the subdivision layout. All dwellings must have direct access to a public road. Section 5.3.2 of PBP 2019 requires a development to provide safe operational access to structures and water supply for emergency services while residents are seeking to evacuate.

The proposed modification retains the approved road layout and design, including road widths. The approved development was a result of a collaborative process between the Project Team, MCC and RFS. The outcomes of the positive consultation resulted in a road design considered appropriate and acceptable by all stakeholders, which was reflected in the conditions of the RFS BFSA which were subsequently adopted by MCC.

All approved roads are designed in accordance with the Maitland City Council development control plan and engineering specifications. Refer to **Appendix A** for the modified development plans indicating the approved access arrangements. Primary access will continue to be provided from the existing Collaroy Parade west of the development site. Additional access to Louth Park Road is provided as an extension from Collaroy Parade into the approved subdivision immediately south of the development site as shown in **Figure 15**.

MCC supported the road design including the 12m wide connecting access road (Collaroy Parade) and the 8m wide internal local streets (non-perimeter roads). Moreover, MCC considered the roads to be sufficiently wide enough to accommodate parking for light vehicles on both sides of road, outside of the primary vehicle carriageway.

In summary, as the proposed modifications do not amend the approved road design, there are no additional requirements or conditions necessary as MCC accepted that the approved road network provides safe, all-weather two-way through roads and safe operational access for emergency service personnel and evacuation purposes; complying with the relevant provisions contained in Section 5.3.2 of PBP 2019.

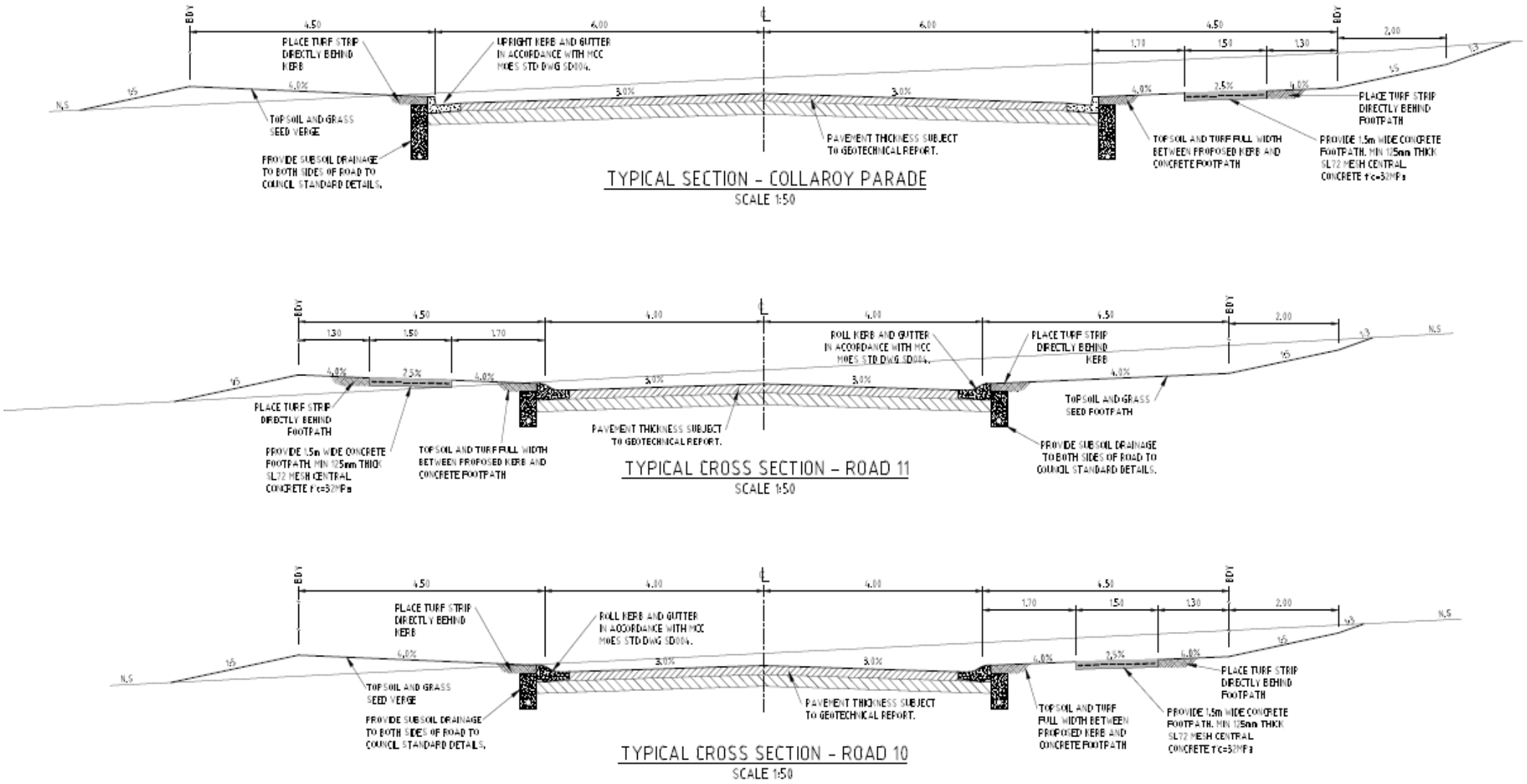


Figure 14: Indicative Road Sections

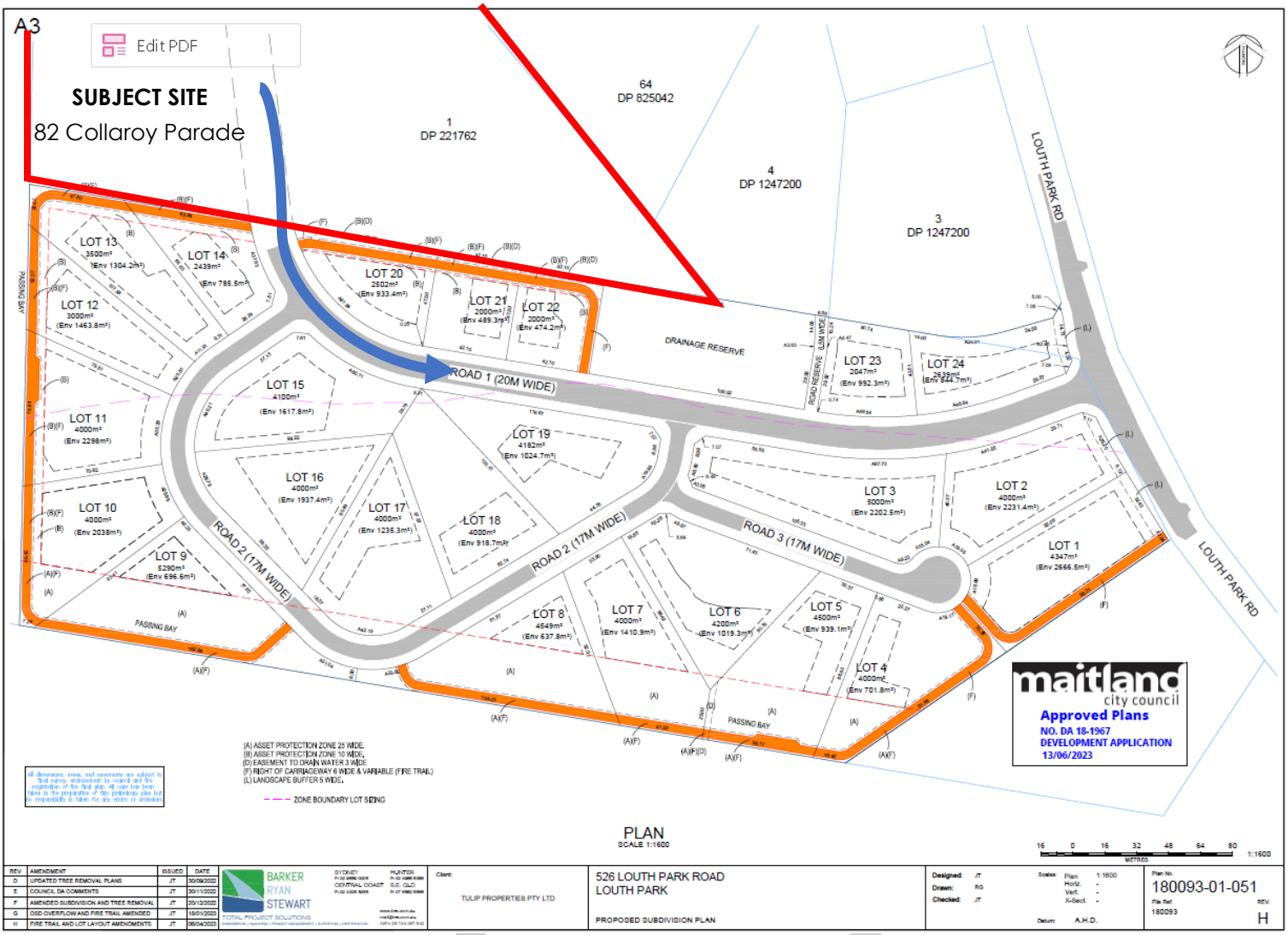


Figure 15: The approved road will connect into the approved subdivision to the south of site

4.4. Services - water, electricity and gas

4.4.1. Water

Fire hydrant spacing, sizing and pressure should comply with AS 2419.1 - 2005. Hydrants are not to be located within any road carriageway.

All sites within the approved development will be connected to the internal reticulated water supply.

4.4.2. Electricity

All electricity services will be located underground as per the approved development.

4.4.3. Gas

Any reticulated or bottled gas should be installed and maintained according to the requirements of the relevant authorities and AS 1596:2014. It is expected that the location of gas services will not lead to ignition of surrounding bushland or the fabric of buildings.

4.5. Construction Standards: Bushfire Attack Level

All buildings must satisfy the Performance Requirements of the National Construction Code: Building Code of Australia (BCA). Part 2.3 of Volume 2 of the BCA applies to dwellings located within designated bushfire areas, which are defined as:

> *Land which has been designated under a power in legislation as being subject, or likely to be subject to, bushfires.*

Accordingly, all forthcoming habitable buildings must satisfy the requirements of Part 3.7.4 of the BCA. The *Deemed-to-Satisfy* (DTS) provision of the BCA can only be achieved if dwellings in bushfire prone areas are constructed in accordance with Australian Standard *AS3959-2018 Construction of buildings in bushfire prone areas*. Alternatively, the DTS provisions can also be achieved if the habitable building is constructed in accordance with the NASH Standard 'Steel Framed Construction in Bushfire Areas'.

Building design and the materials used for construction of future dwellings should be chosen based on the information contained within AS3959-2018, and accordingly the designer/architect should be made aware of this recommendation.

The determinations of the appropriate bushfire attack level (BAL) is based on the maximum potential radiant heat exposure (**Figure 16**). BALs are based upon parameters such as weather modelling, fire-line intensity, flame length calculations, as well as vegetation and fuel load analysis. The determination of the BAL is derived by assessing the:

- Relevant FDI = *100*;
- Flame temperature = *1090K*;
- Slope = *Varied*;
- Vegetation classification = *Forest*; and
- Building location.

To demonstrate the BAL ratings for each transect, **Table 4** has been prepared in accordance with the methodology outlined in the RFS User Guide for Subdivision of Urban Release Areas on Bush Fire Prone land to represent the BALs required. The required BALs are indicated in **Figure 17**.

Due to the low bushfire risk and the variable land management surrounding the lots and the large size of the proposed lots, it is considered onerous for Class 10a buildings to be prohibited within the nominated APZs. Therefore, and in accordance with AS3959-2018, it is recommended that Class 10a buildings are permissible within the prescribed APZs, subject to the structures being located no less than 6m from the primary dwelling.

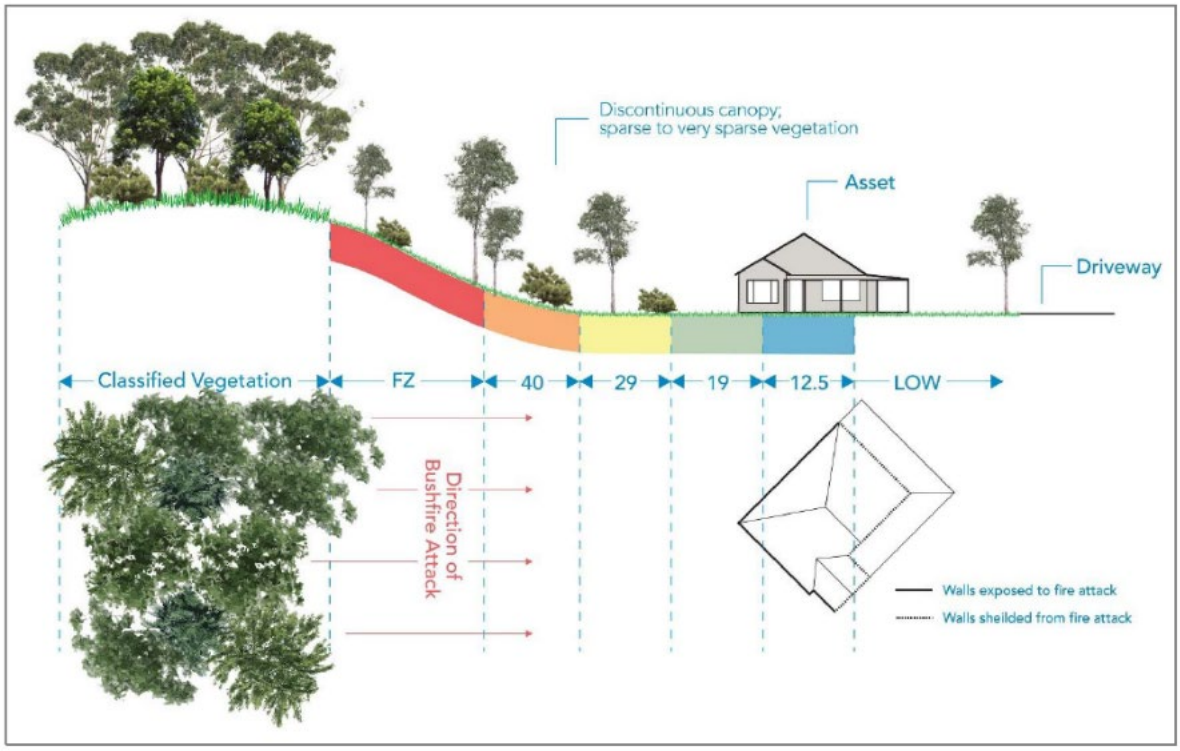
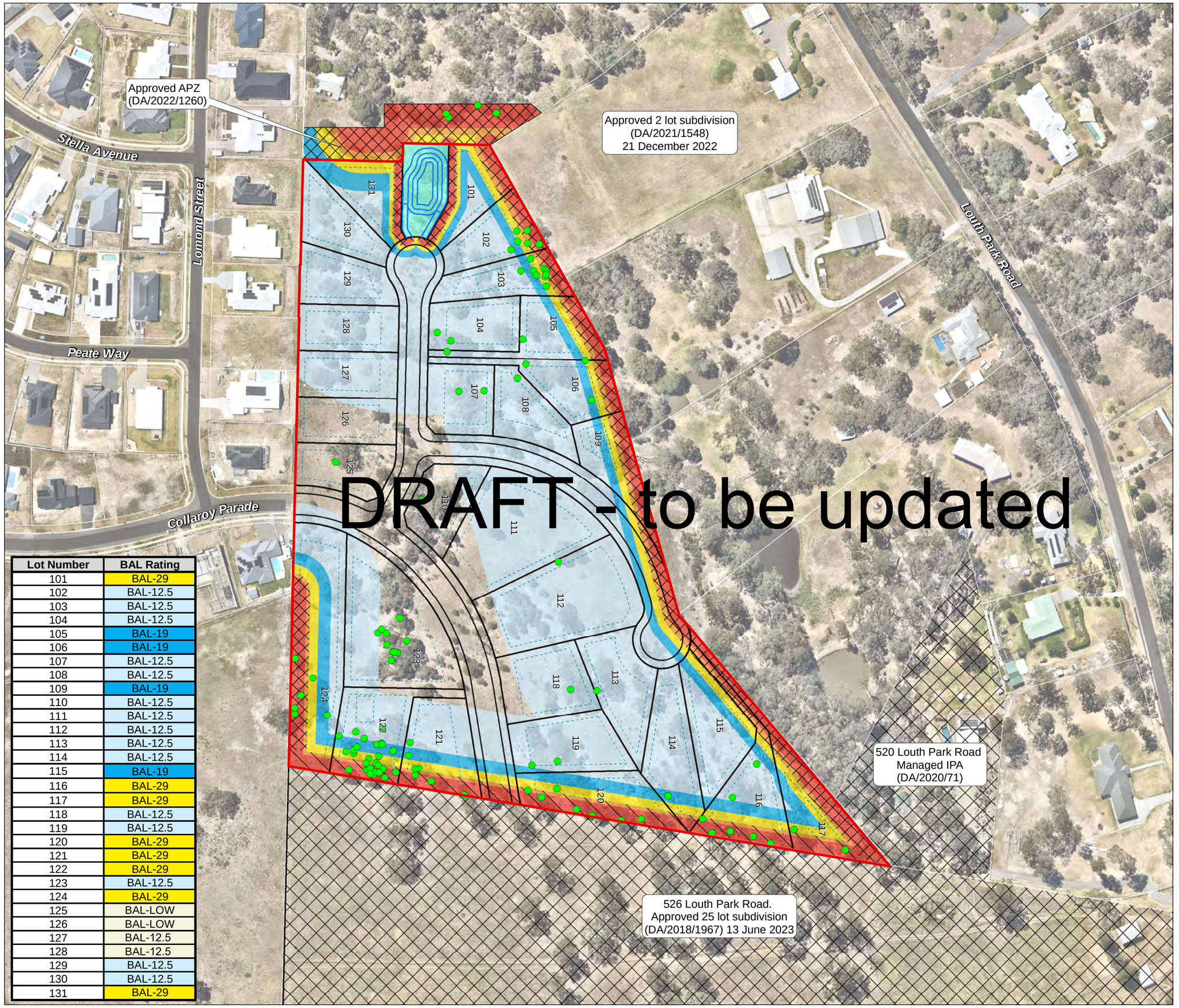


Figure 16: Bushfire Attack Level

Table 4: Approved Bushfire Attack Levels (BALs)

Transect	Vegetation Classification (PBP 2019)	Slope	APZ Provided	Distance from Hazard	Bushfire Attack Level (BAL)
T5, T6, T8 & T11	Excluded (Low threat vegetation, Managed Land, Approved APZ)	Various	N/A	N/A	BAL-LOW
T1, T9 & T10	*Forest* (Hunter Macleay Dry Sclerophyll Forest – PCT 1600)	0.0° < 5.0° Downslope	18m	0m-<14m	BAL-FZ
				14m-<18m	BAL-40
				18m-<26m	BAL-29
				26m-<36m	BAL-19
				36m-<100m	BAL-12.5
T2 & T3	*Forest* (Hunter Macleay Dry Sclerophyll Forest – PCT 1600)	0.0° < 5.0° Downslope	10m[1]	0m-<8m	BAL-FZ
				8m-<10m	BAL-40
				10m-<12m	BAL-29
				12m-<18m	BAL-19
				18m-<100m	BAL-12.5
T4	*Forest* (Hunter Macleay Dry Sclerophyll Forest – PCT 1600)	7.1° Downslope	11m[1]	0m-<8m	BAL-FZ
				8m-<11m	BAL-40
				11m-<14m	BAL-29
				14m-<18m	BAL-19
				18m-<100m	BAL-12.5
Detention Basin	*Freshwater Wetland*	Flat	5m	0m-<8m	BAL-FZ
				8m-<10m	BAL-40
				10m-<15m	BAL-29
				15m-<22m	BAL-19
				22m-<100m	BAL-12.5
T7	*Grassland*	-1.7° Upslope	15m	0m-<8m	BAL-FZ
				8m-<10m	BAL-40
				10m-<15m	BAL-29
				15m-<22m	BAL-19
				22m-<50m	BAL-12.5

[1] Short Fire Run



Lot Number	BAL Rating
101	BAL-29
102	BAL-12.5
103	BAL-12.5
104	BAL-12.5
105	BAL-19
106	BAL-19
107	BAL-12.5
108	BAL-12.5
109	BAL-19
110	BAL-12.5
111	BAL-12.5
112	BAL-12.5
113	BAL-12.5
114	BAL-12.5
115	BAL-19
116	BAL-29
117	BAL-29
118	BAL-12.5
119	BAL-12.5
120	BAL-29
121	BAL-29
122	BAL-29
123	BAL-12.5
124	BAL-29
125	BAL-LOW
126	BAL-LOW
127	BAL-12.5
128	BAL-12.5
129	BAL-12.5
130	BAL-12.5
131	BAL-29

Project: Louth Park
Job No: 23113

Figure 17

Subdivision BAL Plan

BUSHFIRE PLANNING AUSTRALIA

Subject Site

Tree to be retained

Freshwater Wetland

Asset Protection Zone

Temporary

Permanent

Required Bushfire Attack Levels (AS3959-2018)

BAL - FZ

BAL - 40

BAL - 29

BAL - 19

BAL - 12.5

SOURCE:

Cadastral Boundary: NSW Department of Finance, Services and Innovation 2023
Aerial photo: NearMap 23/10/2023

N
W E
S

0 25 50 75 100
Meters

A3 Scale: 1:2,000

File:23113-LouthPark-Fig7-BALs-241212

Date: 12/12/2024

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4.6. Emergency Services

The RFS Lower Hunter Fire Control Centre is located at 11 Mount Vincent Road, East Maitland, approximately 4km or 5 minutes drive away from the site (**Figure 18**). This station would likely be first responders with support from a NSW Fire & Rescue Station located at 14 Church Street, Maitland (7.1kms) if required (**Figure 19**).

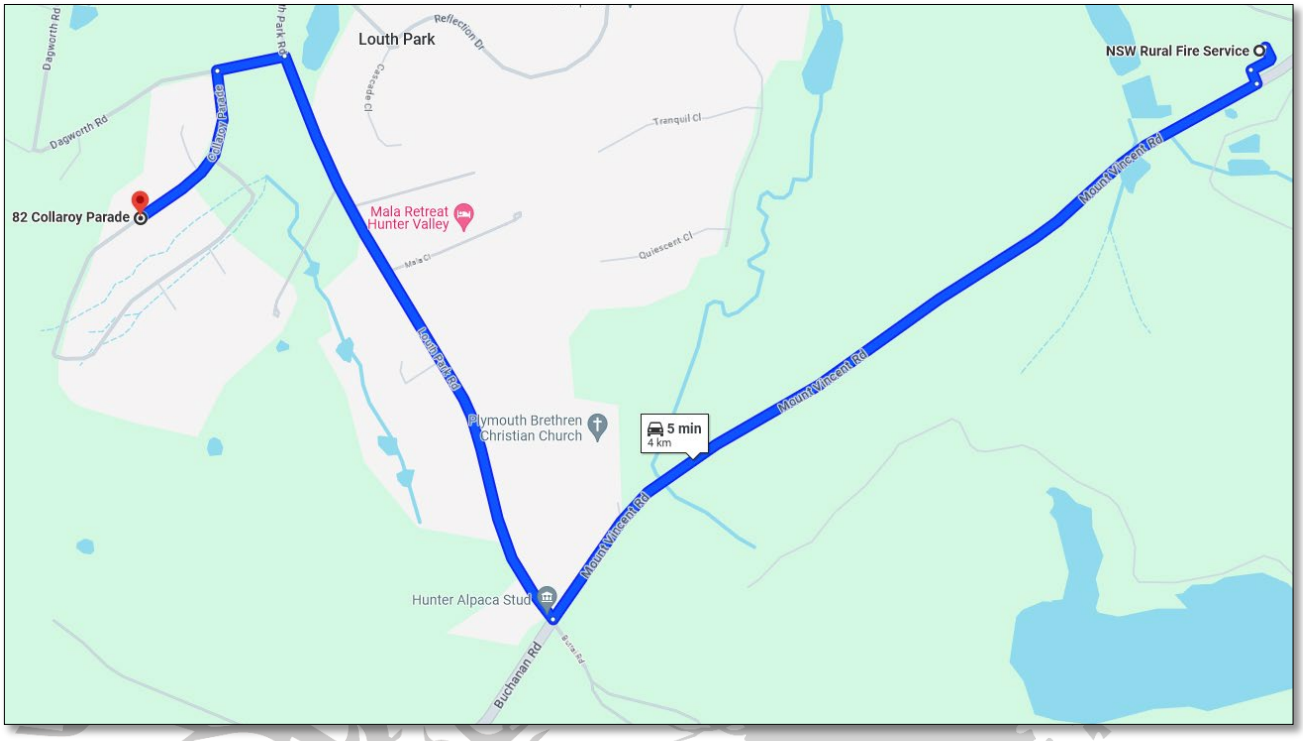


Figure 18: Lower Hunter Fire Control Centre

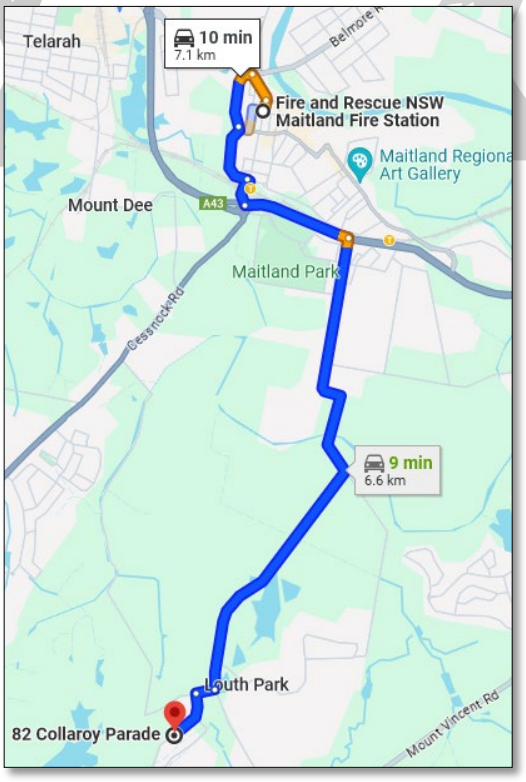


Figure 19: NSW Fire & Rescue - Maitland

5. Conclusion and Recommendations

Bushfire Planning Australia has undertaken a Bushfire Assessment Report for the proposed modification to the approved residential subdivision (DA/2022/1260) located at 82 Collaroy Parade, Louth Park.

The proposed modification seeks consent for the redesign of the stormwater infrastructure and an increase in lot yield from 28 to 30 lots. This modification primarily affects the northern portion of the approved development, still within the original development footprint.

This BAR found the site was exposed to a low to medium bushfire hazard located immediately south of the proposed site that will be removed as part of an approved residential subdivision. Although the predominant vegetation found in isolated patches to the east of the site is consistent with a *forest* vegetation formation, the majority of the landscape has a cleared understorey contained within large lot rural residential properties. In this regard there is no consistent or uniform bushfire hazard that would sustain a fully developed bushfire.

Overall, it was found the surrounding bushfire hazard has been substantially reduced due to recently constructed residential subdivisions and also several approved subdivisions; including the subdivision immediately to the south of the site that also provides secondary access to the proposed development. The implications of the removal and ongoing management of surrounding vegetation and the improved access arrangements significantly reduce the level of risk future residents will be exposed to.

This BAR confirms the modified layout is not exposed to a greater bushfire hazard and the only change to any potential hazard is a reduction in the area of land to be revegetated as a *freshwater wetland* within the stormwater basin.

Accordingly, the modified lot design continues to provide safe operational access without compromising the residents opportunity to utilise on street parking.

In summary, the following key recommendations which were adopted by the RFS are restated to ensure the proposed modifications to the approved residential development to achieve the aims and objectives of PBP 2019 and also able to comply with the conditions of the BFSA issued on 1 July 2024:

Asset Protection Zones

1. All land within the site zoned R1 Residential shall be managed as an Inner Protection Area (IPA) as outlined within Appendix 4 of PBP 2019 and the RFS document Standards for asset protection zones;
2. Asset Protection Zones shall be provided as indicated on **Figure 17** and **Appendix E;** including the approved 20m APZ along the northern boundary wholly within 442 Louth Park Road (Lot 1 DP1286289);
3. A 10m wide temporary APZ is required along the southern boundary. The temporary APZ is not required to be registered on the Certificate of Title and can be managed by a condition of development consent. Any infill development on the affected lots will be subject to further assessment should the *grassland* hazard remain;

Landscaping

4. Consideration should be given to landscaping and fuel loads on site to decrease potential fire hazards on site;

Construction and Design

5. Class 10a and 10b buildings are permissible within the APZs; subject to being separated by no less than 6m from any habitable (Class 1) building constructed on the lot;
6. All future dwellings to be constructed on the proposed lots shall have due regard to the specific considerations given in the National Construction Code: Building Code of Australia

(BCA) which makes specific reference to Australian Standard AS3959-2018 Construction of buildings in bushfire prone areas (AS3959-2018) or the NASH Standard Steel Framed Construction in Bushfire Prone Areas;

Access

7. Any temporary turning heads shall be constructed in accordance Appendix A3.3 of PBP 2019;
8. Access roads shall be constructed in accordance with the drawings prepared by GCA Engineering Solutions titled Proposed Subdivision 442 Louth Park Road, Louth Park – Hillview East DA 22-1260 Modification (Project No. 21360C) Revision 14 dated 18 December 2024 (contained in **Appendix A**);
9. Non-perimeter roads (Roads 10, 11 and Collaroy Parade) located within 100m from the permanent bushfire hazard, shall comply with the following general requirements of Table 5.3b of PBP 2019:
    f. Minimum 5.5m wide road width measured kerb to kerb;
    g. Hydrants are located clear of parking areas;
    h. Curves of roads have a minimum inner radius of 6m;
    i. The road crossfall does not exceed 3 degrees; and
    j. A minimum vertical clearance of 4m to any overhanging obstructions, including tree branches is provided.
10. Property Access Roads along the eastern property boundary (accessing lots 114 and 115) are to be in accordance with Table 5.3b of PBP 2019; including a minimum 4m wide carriageway and the provision of a single passing bay;
11. Vegetation within road verges (including swales) to be consistent with a grassland vegetation classification with tree canopy less than 10% at maturity;
12. Vegetation with the stormwater basins; including associated batters shall be planted consistent with a grassland vegetation classification with tree canopy less than 10% at maturity;

Water and Utilities

13. All new lots are to be connected to a reliable water supply network and that suitable fire hydrants are located throughout the development site that are clearly marked and provided for the purposes of bushfire protection. Fire hydrant spacing, sizing and pressure shall comply with AS2419.1 2005 and section 5.3.3 of PBP 2019.

This assessment has been made based on the bushfire hazards observed in and around the site at the time of inspection and production (December 2024) and demonstrates the development has satisfied the aims and objectives of Planning for Bushfire Protection 2019.

Finally, should the above recommendations be implemented, the existing bushfire risk should be suitably mitigated to offer an acceptable level of protection to life and property for those persons and assets occupying the site, but they do not and cannot guarantee that the area will not be affected by bushfire at some time and that property and life damage/loss will not occur.

6. References

- Keith (2004). Ocean Shores to Desert Dunes – The Native Vegetation of New South Wales and the ACT.
- NSW Rural Fire Service (2005). *Standards for Asset Protection Zones*. NSW Rural Fire Service.
- NSW Rural Fire Service (2019). Planning for Bushfire Protection – A Guide for Councils, Planners, Fire Authorities, Developers and Home Owners.
- Ramsay, GC and Dawkins, D (1993). *Building in Bushfire-prone Areas – Information and Advice*. CSIRO and Standards Australia.
- Rural Fires and Environmental Assessment Legislation Amendment Act 2002.
- Standards Australia (2018). AS 3959-2018: Construction of Buildings in Bushfire-prone Areas.

Appendix A: Plan of Proposed Modification

PROPOSED SUBDIVISION - HILLVIEW EAST

442 LOUTH PARK ROAD, LOUTH PARK

DA 22-1260 MODIFICATION

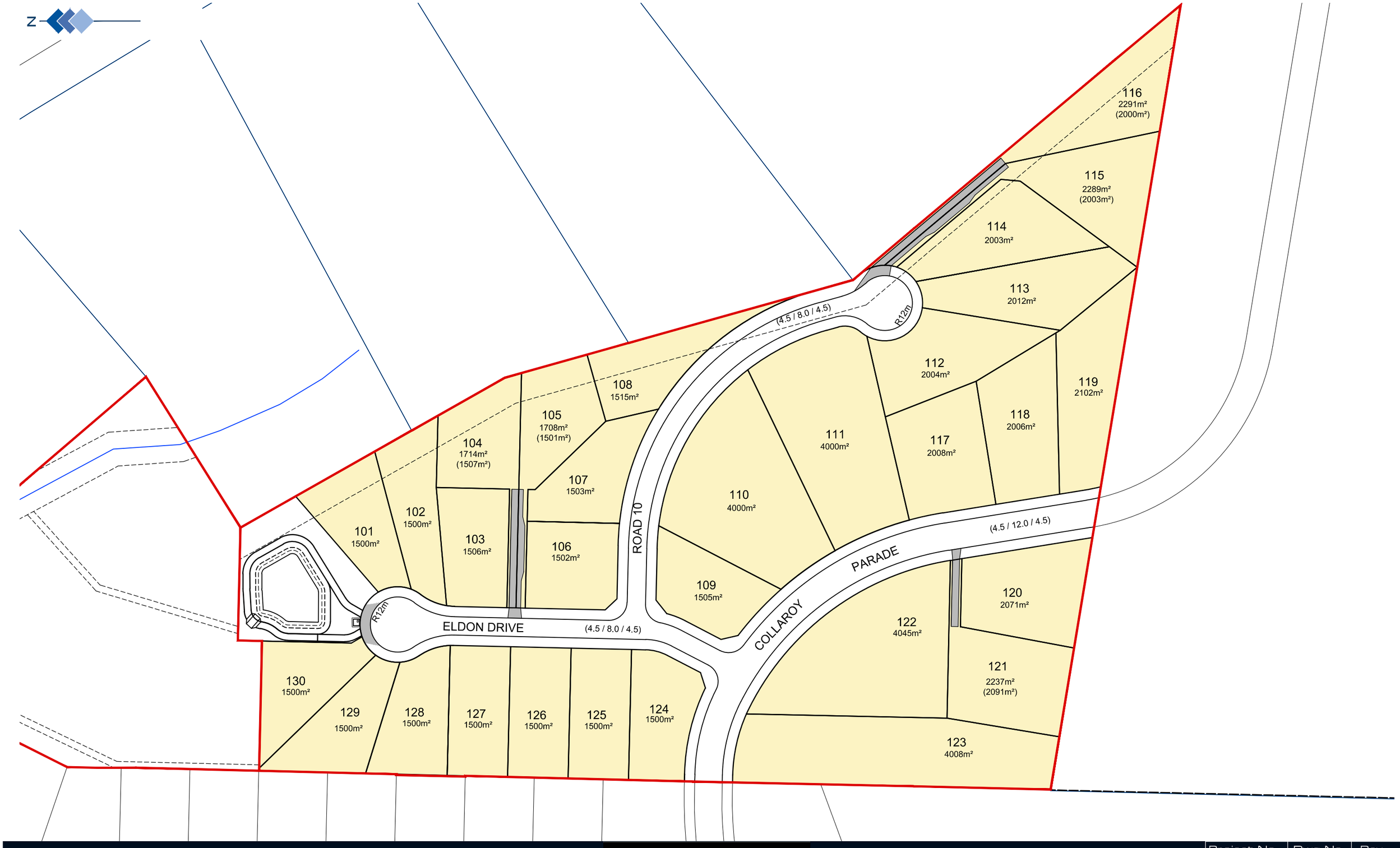
CLIENT: NEWPRO25 PTY LTD

CONSENT AUTHORITY: MAITLAND CITY COUNCIL

DATE: DECEMBER 2024

HILLVIEW
LOUTH PARK

Project No.	Dwg No.	Rev.
21360L	L110	3
Current as of:		
19 DECEMBER 2024		



HILLVIEW
LOUTH PARK

Project No.	Dwg No.	Rev.
21360L	L111	3
Current as of:		
19 DECEMBER 2024		

LEGEND

- BUILDING ENVELOPE
- TREE TO REMAIN
- TREE TO BE REMOVED
- PROPOSED GLIDER POLE
- EXTENT OF EARTHWORKS
- EXTENT OF GROUTING

12m WIDE APZ IN ACCORDANCE WITH COOLBURN FIRE & ECOLOGY REPORT DATED 25 JULY 2022

ELDON DRIVE (4.5 / 8.0 / 4.5)

ROAD 10

PARADE (4.5 / 12.0 / 4.5)

COLLAROY

R12m

(4.5 / 8.0 / 4.5)

HILLVIEW
LOUTH PARK

Project No.	Dwg No.	Rev.
21360L	L113	3
Current as of:		
19 DECEMBER 2024		

PROPOSED SUBDIVISION - HILLVIEW EAST

442 LOUTH PARK ROAD - LOUTH PARK

DA 22-1260 MODIFICATION

CLIENT: NEWPRO25 PTY LTD

CONSENT AUTHORITY: MAITLAND CITY COUNCIL

DATE: DECEMBER 2024

DWG No.	SHEET TITLE	REV
C00	COVER SHEET	14
C01	GENERAL ARRANGEMENT PLAN	14
C02	PLAN SHEET (1 OF 2)	14
C03	PLAN SHEET (2 OF 2)	14
C04	COLLAROY PARADE LONGITUDINAL SECTION	13
C05	COLLAROY PARADE CROSS SECTIONS (1 OF 3)	13
C06	COLLAROY PARADE CROSS SECTIONS (2 OF 3)	13
C07	COLLAROY PARADE CROSS SECTIONS (3 OF 3)	13
C08	RESERVED	
C09	ROAD 11 LONGITUDINAL SECTION	13
C10	ROAD 11 CROSS SECTIONS (1 OF 2)	13
C11	ROAD 11 CROSS SECTIONS (2 OF 2)	13
C12	ROAD 10 LONGITUDINAL SECTION	13
C13	ROAD 10 CROSS SECTIONS (1 OF 3)	13
C14	ROAD 10 CROSS SECTIONS (2 OF 3)	13
C15	ROAD 10 CROSS SECTIONS (3 OF 3)	13
C16	TYPICAL SECTIONS, DETAILS AND NOTES	13
C17	ACCESSWAY LOT 104 & 105 TYPICAL DETAILS	14
C18	ACCESSWAY LOT 104 & 105 LONGITUDINAL AND CROSS SECTIONS	14
C19	RESERVED	
C20	RESERVED	
C21	ACCESSWAY LOT 115, 116 & 121 TYPICAL DETAILS	14
C22	ACCESSWAY LOT 115/116 LONGITUDINAL SECTION	14
C23	ACCESSWAY LOT 115/116 CROSS SECTIONS	14
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PRELIMINARY ISSUE
NOT FOR CONSTRUCTION

REVISION	Description	Drawn	App'd	Date
14	BASIN AMENDMENTS	A.M	I.H	18.12.24
13	LAYOUT REVISED	DB	IH	14.11.24

North

Scale

Designed AM

Scale -

Cad Reference 21360C dC00 r14

Project Approval
IAN HILL (B.E)
Consulting Civil Engineer

Client

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PROPOSED SUBDIVISION
442 LOUTH PARK ROAD
LOUTH PARK - HILLVIEW EAST
COVER SHEET

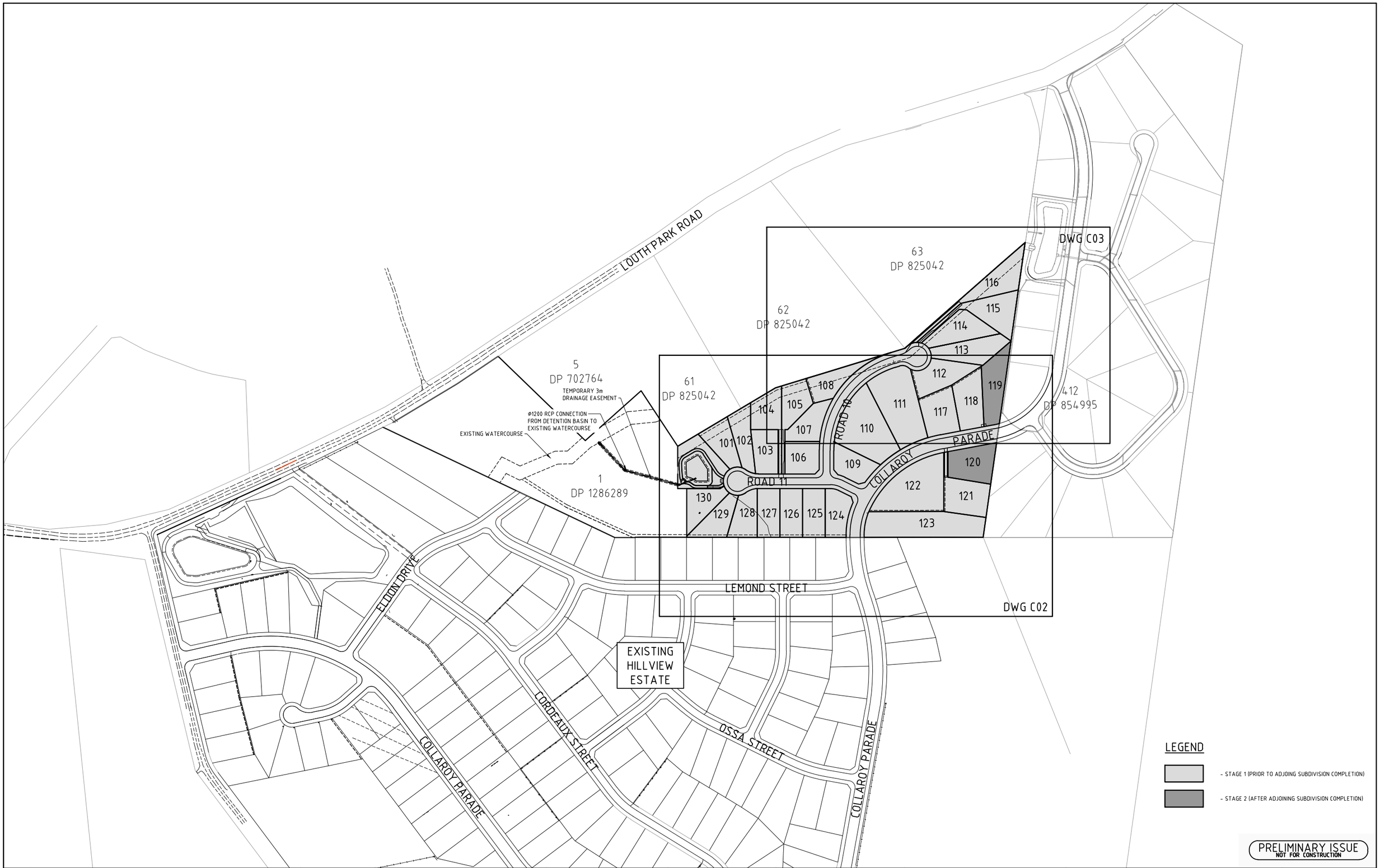
Project No 21360C

Drawing No C00

Revision 14

A1 SHEET

PLOT DATE: 18/12/2024 4:40:47 PM CAD FILE: Q:\21\21360 442 Louth Park Road (Hillview East)\02_CAD\AutoCAD\Civil\21360C dC00 r14.dwg



PRELIMINARY ISSUE
NOT FOR CONSTRUCTION

REVISION	Description	Drawn	App'd	Date
9	GENERAL REVISION	A.M	I.H	01.07.24
8	GENERAL AMENDMENT	A.M	I.H	16.05.24
7	GENERAL AMENDMENTS	A.M	I.H	15.05.24
5	LAYOUT AMENDMENTS	A.M	I.H	05.03.24
14	BASIN AMENDMENTS	A.M	I.H	18.12.24
13	REVISED LAYOUT	DB	IH	14.11.24
10-12	NOT ISSUED			

North

Scale
0 10 20 30 40m
1:500 (A1) 1:1000 (A3)

Designed A.M
Scale 1:500
Cad Reference 21360C dC01 r14
Project Approval
IAN HILL (B.E)
Consulting Civil Engineer

Client

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PROPOSED SUBDIVISION
442 LOUTH PARK ROAD
LOUTH PARK - HILLVIEW EAST
GENERAL ARRANGEMENT PLAN

Project No 21360C
Drawing No C01
Revision 14
A1 SHEET

PLOT DATE: 18/12/2024 4:40:50 PM
CAD FILE: Q:\21\21360 442 Louth Park Road (Hillview East)\02_CAD\AutoCAD\Civil\21360C dC01 r14.dwg

LEGEND

- SITE REGRADE
- ACCESSWAY
- FOOTPATH
- LOC — LIMIT OF CONSTRUCTION
- KR1 — KERB RETURN NUMBER
- 1 — PIT NUMBER
- PROPOSED STORMWATER PIPE
- EXISTING STORMWATER PIPE
- FUTURE STORMWATER PIPE
- EKI PIT
- SAG PIT
- IAD PIT
- EXISTING EKI PIT
- EXISTING SAG PIT
- EXISTING IAD PIT
- SUBSOIL DRAINAGE, FLUSH POINT
- PROPOSED SEWER
- PROPOSED WATER
- DESIGN CONTOURS MAJOR
- DESIGN CONTOURS MINOR
- NATURAL CONTOURS MAJOR
- NATURAL CONTOURS MINOR
- REGRADE CONTOUR
- SITE REGRADE LEVEL

62
DP 825042

PROPOSED GRASS LINED SWALE AT REAR OF LOTS
BASE WIDTH = 1.0m
TOP WIDTH = 3.0m
DEPTH = 0.25
BATTER SLOPES =1v:4h

3.0m WIDE IAD EASEMENT

12m WIDE ASSET PROTECTION ZONE

PROPOSED BIORETENTION/DETENTION BASIN

TOP OF BANK	= R.L 20.10
Q100 TOP WATER LEVEL	= R.L 19.60
BIORETENTION TOP WATER LEVEL	= R.L 19.35
BIORETENTION INVERT LEVEL	= R.L 19.05
FILTER MEDIA SURFACE AREA	= 45m²
WATER QUALITY STORAGE DEPTH	= 0.3m
FILTER MEDIA DEPTH	= 0.40m
INTERNAL BATTERS	= 1v:5h
EXTERNAL BATTERS	= 1v:4h

REFER DWG C27 FOR DETAILS

PROVIDE 5 STRAND WIRE RURAL FENCE ALONG BOUNDARY

3m WIDE TEMPORARY EASEMENT FOR DRAINAGE

REFER DWG C27 FOR BIORETENTION BASIN DETAILS

PROVIDE 'NO PARKING' SIGNS TO CULDESAC BULB

R5-40 (L)

PROPOSED 5.0m WIDE ACCESSWAY 51.7m LONG WITHIN 8m BATTLEAXE HANDLE IN ACCORDANCE WITH MCC STD DWG SD012, REFER DWG C17 FOR DETAILS

PROVIDE 6.0m WIDE PASSING BAY 20m LONG IN ACCORDANCE WITH SECTION 3.2.2 AS 2890.1

TRANSITION FROM UPRIGHT KERB TO ROLL KERB AT TP (TYP.)

ROAD 10

ROAD 11

ROLL KERB AND GUTTER

PROPOSED 1.5m WIDE CONCRETE FOOTPATH

PROVIDE PRAM RAMPS IN ACCORDANCE WITH MCC MOES STD DWG SD019 (TYP.)

1:5 FILL BATTER

GROSS POLLUTANT TRAP
HUMEGARD HG18 OR EQUIVALENT
TREATABLE FLOW RATE = 0.600m³/s

SITE REGRADING TO REMOVE EXISTING GULLY

PROPOSED GRASS LINED SWALE AT REAR OF LOTS
BASE WIDTH = 1.0m
TOP WIDTH = 3.0m
DEPTH = 0.25
BATTER SLOPES =1v:4h

PROVIDE 5 STRAND WIRE RURAL FENCE ALONG BOUNDARY

MATCH EXISTING LEVELS AT BOUNDARY

3.0m WIDE IAD EASEMENT

MAKE SMOOTH CONNECTION WITH EXISTING

REMOVE EXISTING GUIDEPOST AND CHEVRON BOARD

EXISTING DRAINAGE

COLLAROY PARADE

PROVIDE 'FLAG SIGN' TYPE BUS STOP IN ACCORDANCE WITH MCC STD DWG SD023

CROSSFALL AT BUSSTOP BETWEEN BACK OF KERB AND BACK OF FOOTPATH TO BE 2.5%

UPRIGHT KERB AND GUTTER

PROVIDE 6m LAYBACK KERB TO ACCESSWAY

PROPOSED 3.0m WIDE ACCESSWAY 29.5m LONG WITHIN 5m BATTLEAXE HANDLE IN ACCORDANCE WITH MCC STD DWG SD012, REFER DWG C21 FOR DETAILS

PROVIDE 12.0m TEMPORARY TURNING HEAD WITH 2 COAT SEAL AND REFLECTIVE GUIDEPOSTS PAINTED WHITE AT 1.2m CENTRES (TYP.) IF ADJOINING SUBDIVISION NOT CONSTRUCTED

COMBINED 1:5/1:3 CUT BATTER

CONNECT TO EXISTING ROAD IN ADJOINING SUBDIVISION TO THE SOUTH

ERECT D4-5 CHEVRON BOARD

5.5m x 3m EASEMENT FOR ELECTRICAL KIOSK

1.5m WIDE IAD EASEMENT

CT1517/635

CT1353/188

CT1395/634

CT1580/368

412
DP 854995

PRELIMINARY ISSUE
NOT FOR CONSTRUCTION

REVISION	Description	Drawn	App'd	Date
14	BASIN AMENDMENTS	A.M	I.H	18.12.24
13	REVISED LAYOUT	DB	IH	14.11.24
12	COUNCIL COMMENTS	A.M	I.H	12.08.24
11	BASIN AMENDMENTS	A.M	I.H	06.08.24
10	SIGNAGE AMENDMENTS	A.M	I.H	04.07.24
9	COUNCIL COMMENTS	A.M	I.H	27.06.24
8	GENERAL AMENDMENT	A.M	I.H	16.05.24

North

Scale
0 10 20 30 40m
1:500 (A1) 1:1000 (A3)

Designed A.M
Scale 1:500
Cad Reference 21360C dC02 r14
Project Approval
IAN HILL (B.E)
Consulting Civil Engineer

Client

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PROPOSED SUBDIVISION
442 LOUTH PARK ROAD
LOUTH PARK - HILLVIEW EAST

PLAN SHEET (1 OF 2)

Project No 21360C
Drawing No C02
Revision 14
A1 SHEET

PLOT DATE: 18/12/2024 4:40:54 PM
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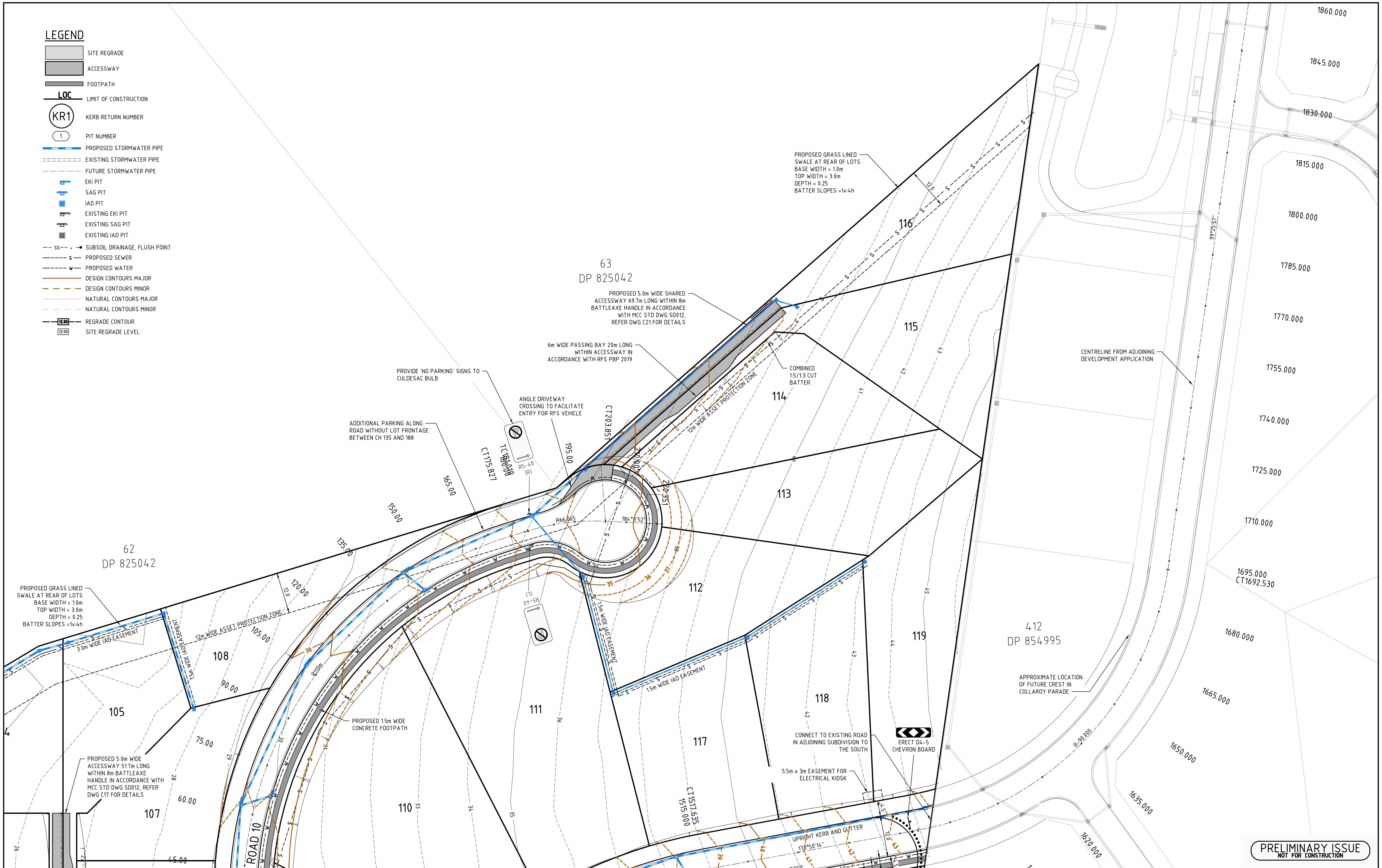

LEGEND
SITE REGRADE
ACCESSWAY
FOOTPATH
LOC
LIMIT OF CONSTRUCTION
KR1
KERB RETURN NUMBER
1
PIT NUMBER
PROPOSED STORMWATER PIPE
EXISTING STORMWATER PIPE
FUTURE STORMWATER PIPE
EKI PIT
SAG PIT
IAD PIT
EXISTING EKI PIT
EXISTING SAG PIT
EXISTING IAD PIT
SS
SUBSOIL DRAINAGE, FLUSH POINT
S
PROPOSED SEWER
W
PROPOSED WATER
DESIGN CONTOURS MAJOR
DESIGN CONTOURS MINOR
NATURAL CONTOURS MAJOR
NATURAL CONTOURS MINOR
12.00
REGRADE CONTOUR
12.00
SITE REGRADE LEVEL
63
DP 825042
62
DP 825042
412
DP 854995
PROPOSED GRASS LINED SWALE AT REAR OF LOTS BASE WIDTH = 1.0m TOP WIDTH = 3.0m DEPTH = 0.25 BATTER SLOPES =1v:4h
PROPOSED 5.0m WIDE SHARED ACCESSWAY 69.7m LONG WITHIN 8m BATTLEAXE HANDLE IN ACCORDANCE WITH MCC STD DWG SD012, REFER DWG C21 FOR DETAILS
6m WIDE PASSING BAY 20m LONG WITHIN ACCESSWAY IN ACCORDANCE WITH RFS PBP 2019
PROVIDE 'NO PARKING' SIGNS TO CULDESAC BULB
ANGLE DRIVEWAY CROSSING TO FACILITATE ENTRY FOR RFS VEHICLE
ADDITIONAL PARKING ALONG ROAD WITHOUT LOT FRONTAGE BETWEEN CH 135 AND 188
COMBINED 1:5/1:3 CUT BATTER
12m WIDE ASSET PROTECTION ZONE
CENTRELINE FROM ADJOINING DEVELOPMENT APPLICATION
R5-40 (R)
R5-40 (L)
CT175.827
CT203.851
R66.065
184°3'52"
3.0m WIDE IAD EASEMENT
1.5m WIDE IAD EASEMENT
R110m
ROAD 10
PROPOSED 1.5m WIDE CONCRETE FOOTPATH
PROPOSED 5.0m WIDE ACCESSWAY 51.7m LONG WITHIN 8m BATTLEAXE HANDLE IN ACCORDANCE WITH MCC STD DWG SD012, REFER DWG C17 FOR DETAILS
CONNECT TO EXISTING ROAD IN ADJOINING SUBDIVISION TO THE SOUTH
5.5m x 3m EASEMENT FOR ELECTRICAL KIOSK
ERECT D4-5 CHEVRON BOARD
UPRIGHT KERB AND GUTTER
170°50'14"
CT1517.635
1515.000
APPROXIMATE LOCATION OF FUTURE CREST IN COLLAROY PARADE
R-90.000
99°25'57"
1695.000
CT1692.530
105 107 108 110 111 112 113 114 115 116 117 118 119
PRELIMINARY ISSUE
NOT FOR CONSTRUCTION
North
Scale
0 10 20 30 40m
1:500 (A1) 1:1000 (A3)

REVISION	Description	Drawn	App'd	Date
9	COUNCIL COMMENTS	A.M	I.H	27.06.24
6	WATER AND SEWER ADDED	DB	IH	22.03.24
5	LAYOUT AMENDMENTS	A.M	I.H	04.03.24
14	LOT NUMBER AMENDMENTS	A.M	I.H	18.12.24
13	REVISED LAYOUT	DB	IH	14.11.24
11-12	NOT ISSUED			
10	SIGNAGE AMENDMENTS	A.M	I.H	04.07.24

Designed: A.M
Scale: 1:500
Cad Reference: 21360C dC03 r14
Project Approval: IAN HILL (B.E) Consulting Civil Engineer
Client

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PROPOSED SUBDIVISION
442 LOUTH PARK ROAD
LOUTH PARK - HILLVIEW EAST

PLAN SHEET (2 OF 2)

Project No: 21360C
Drawing No: C03
Revision: 14
A1 SHEET

PLOT DATE: 18/12/2024 4:40:58 PM
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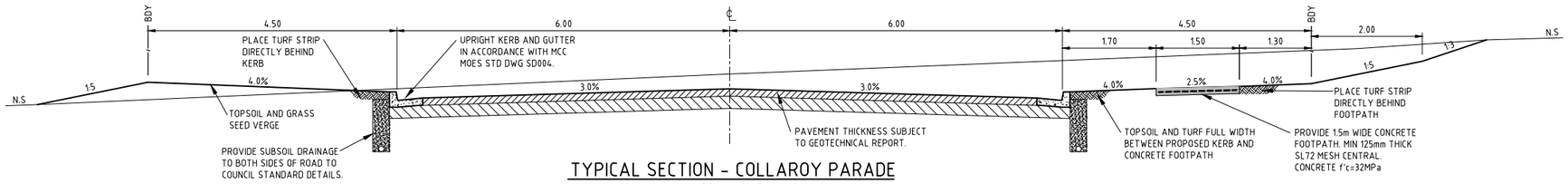
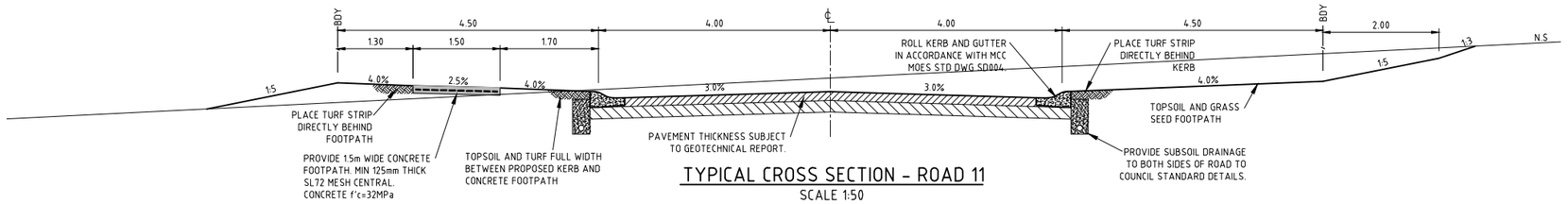


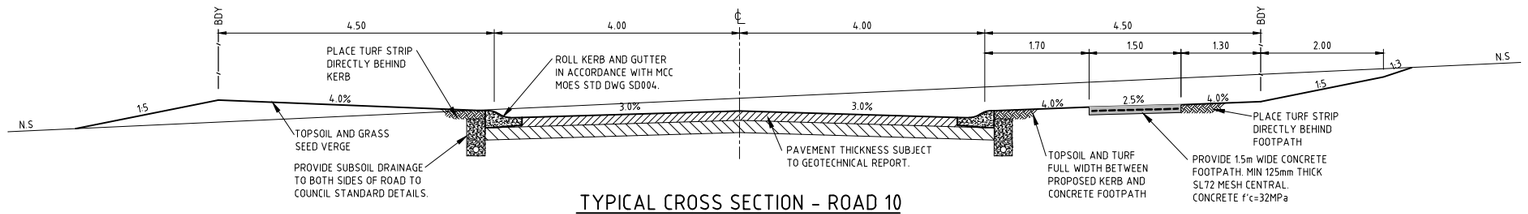
TYPICAL SECTION - COLLAROY PARADE

SCALE 1:50



TYPICAL CROSS SECTION - ROAD 11

SCALE 1:50



TYPICAL CROSS SECTION - ROAD 10

SCALE 1:50

NOTES:

1. ALL DIMENSIONS OF EASEMENTS AND LOTS ARE SUBJECT TO REGISTRATION OF DEPOSITED PLAN.
2. ALL WORK SHALL BE CARRIED OUT IN ACCORDANCE WITH THE APPROVED PLANS SUBJECT TO MAITLAND CITY COUNCIL'S MANUAL OF ENGINEERING STANDARDS.
3. EROSION CONTROL DEVICES AND SILTATION TRAPS TO BE INSTALLED BEFORE SITE IS DISTURBED IN ACCORDANCE WITH THE ATTACHED EROSION AND SEDIMENTATION CONTROL PLAN. COUNCIL IS TO INSPECT ALL EROSION AND SEDIMENT CONTROLS PRIOR TO ANY WORK COMMENCING.
4. DENUDED AREAS TO BE SEEDED IMMEDIATELY UPON COMPLETION OF TOP SOIL SPREADING.
5. ALL REINFORCED CONC. STORMWATER DRAINAGE PIPES ARE TO BE RUBBER RING JOINTED.
6. ALL EKI PIT GRATES TO BE SADDINGTONS GGLCD OR SIMILAR WITH RHS FRONT AND BACK.
7. ALL PITS DEEPER THAN 1.2m ARE TO BE CONSTRUCTED WITH STEP IRONS IN ACCORDANCE WITH MCC MANUAL OF ENGINEERING STANDARDS STD DWG SD039, SD043 AND ARE TO HAVE INCREASED INTERNAL DIMENSIONS TO ALLOW ACCESS IN ACCORDANCE WITH CONFINED SPACE REGULATIONS.
8. ALL STREET DRAINAGE PITS TO BE CONSTRUCTED IN ACCORDANCE WITH MCC MANUAL OF ENGINEERING STANDARDS SD039.
9. ALL INTERALLOTMENT DRAINAGE PITS TO BE CONSTRUCTED IN ACCORDANCE WITH MCC MANUAL OF ENGINEERING STANDARDS SD043.
10. ALL INTERALLOTMENT DRAINAGE PIPES TO BE SEWER GRADE uPVC (UNLESS OTHERWISE SHOWN) OR AN APPROVED EQUIVALENT. THE MINIMUM SLOPE OF INTERALLOTMENT DRAINAGE LINES SHALL BE 1%, THE INTERALLOTMENT DRAINAGE LINE SHALL BE A MINIMUM OF 0.5m FROM THE BOUNDARY AND LOCATED IN AN EASEMENT 1.5m WIDE.
11. ALL EXISTING UNDERGROUND SERVICES MUST BE LOCATED AND EXPOSED PRIOR TO EARTHWORKS COMMENCING AND IT IS THE RESPONSIBILITY OF THOSE PERSONS USING THIS PLAN TO CONFIRM BOTH POSITION & LEVEL OF THESE UTILITIES IN CONJUNCTION WITH THE APPROPRIATE AUTHORITY.
12. SUBSOIL DRAINS ARE TO BE PROVIDED IN ACCORDANCE WITH COUNCIL'S STD DWG SD035 AND SD032, AND WHERE NECESSARY, AS DIRECTED BY COUNCIL DURING WORKS.
13. PAVEMENT THICKNESS TO BE IN ACCORDANCE WITH THE RECOMMENDATIONS OF THE APPROVED GEOTECHNICAL REPORT AND TO THE SATISFACTION OF MAITLAND CITY COUNCIL. PAVEMENT DESIGN, PAVEMENT MATERIALS AND DEPTH TO BE APPROVED BY THE SUBDIVISION AND DEVELOPMENT ENGINEER ACTING AS THE PRINCIPAL CERTIFIER FOLLOWING SUBGRADE INSPECTION.
14. EASEMENT FOR BATTER TO BE CREATED WHERE FILL BATTERS ARE 3(H):1(V) OR STEEPER OR WHERE DEPTH OF FILL AT BOUNDARY EXCEEDS 600mm.
15. WORKING HOURS ON SITE SHALL BE IN ACCORDANCE WITH EPA & COUNCIL REQUIREMENTS.
16. VEHICULAR ACCESS AND ALL SERVICES ARE TO BE MAINTAINED AT ALL TIMES TO ADJOINING PROPERTIES AFFECTED BY CONSTRUCTION WORKS.
17. MAINTENANCE ON THE SEEDED AND TURFED AREAS SHALL BE OVER A 3 MONTH PERIOD. TURF THE FULL WIDTH OF ALL EARTH DISH DRAINS. LAY 600mm WIDE TURF STRIPS TO EACH SIDE OF CONCRETE ACCESSWAYS, PATHWAYS, AT THE REAR OF ALL KERB AND GUTTERING AND AT THE TOP OF CUT BATTERS. MULCH (IF AVAILABLE FROM SITE CLEARING) AND SEED ALL OTHER DISTURBED AREAS, INCLUDING TRENCHES. NO PERMANENT MULCH/WOODCHIP IS PERMITTED WITHIN FLOWPATHS AND PUBLIC AREAS.
18. ALL PERAMBULATOR RAMPS TO BE CONSTRUCTED AS SHOWN ON PLANS AND IN ACCORDANCE WITH MAITLAND CITY COUNCIL'S MANUAL OF ENGINEERING STANDARDS STD DWG SD019.
19. TRAFFIC CONTROL MEASURES TO BE IN ACCORDANCE WITH AS 1742.3-1996.
20. ALL LEVELS MUST BE OBTAINED FROM ESTABLISHED BENCH MARKS AS DIRECTED BY THE SUPERVISOR.
21. THE CONTRACTOR IS TO ENSURE THAT ALL THE NECESSARY SERVICE PIPE CONDUITS AND FITTINGS ARE IN PLACE PRIOR TO THE FINAL WEARING COURSE BEING LAID.
22. PROVIDE STREET NAME SIGNS AT ALL INTERSECTIONS, DOUBLE BLADED WHERE NECESSARY IN ACCORDANCE WITH MCC MANUAL OF ENGINEERING STANDARDS STD DWG SD029.
23. ALL SITE FILLING TO BE CONTROLLED FILL TO AS3798 WITH TESTING TO BE CARRIED OUT BY A NATA REGISTERED LABORATORY.
24. PAVEMENT PROOF ROLLING AND LEVEL CHECKS, DENSITY AND BENKELMAN BEAM TESTING TO BE IN ACCORDANCE WITH COUNCIL'S MANUAL OF ENGINEERING STANDARDS.
25. ALL FILL MATERIAL WITHIN LOTS INCLUDING BATTERS SHALL BE PLACED IN ACCORDANCE WITH AS3978 TO LEVEL 1 INSPECTION AND TESTING.
26. WHERE APPROVED CONSTRUCTION WORK REQUIRES THE REMOVAL OF TREES, THE CONTRACTOR IS TO ENGAGE THE SERVICES OF A SUITABLY QUALIFIED ECOLOGIST TO INSPECT THE SITE AND IDENTIFY ANY TREE WHICH IS LIKELY TO BE A HABITAT TREE. THE ECOLOGIST IS ALSO TO BE ON SITE DURING THE FELLING OF ANY IDENTIFIED TREE AND ENSURE THAT ANY DISPLACED OR INJURED WILDLIFE IS COLLECTED AND FORWARDED TO AN APPROPRIATE WILDLIFE RESCUE SERVICE. THE ECOLOGIST IS TO REPORT TO COUNCIL ON ACTION TAKEN AS PART OF TREE CLEARING OPERATIONS.

PRELIMINARY ISSUE
NOT FOR CONSTRUCTION

REVISION	Description	Drawn	App'd	Date
13	REVISED LAYOUT	DB	IH	14.11.24
6-12	NOT ISSUED			
5	GENERAL REVISION	A.M	I.H	04.03.24
4	LAYOUT AMENDMENTS	A.M	I.H	30.03.23
3	LAYOUT AMENDMENTS	A.M	I.H	14.03.23
1	ORIGINAL ISSUE	A.M	I.H	08.06.22

North

Scale
0 1 2 3 4m
1:50 (A1) 1:100 (A3)

Designed A.M | Scale AS SHOWN
Cad Reference 21360C dC16 r13
Project Approval
IAN HILL (B.E)
Consulting Civil Engineer

Client

GCA ENGINEERING SOLUTIONS
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1 HARTLEY DRIVE, THORNTON NSW 2322
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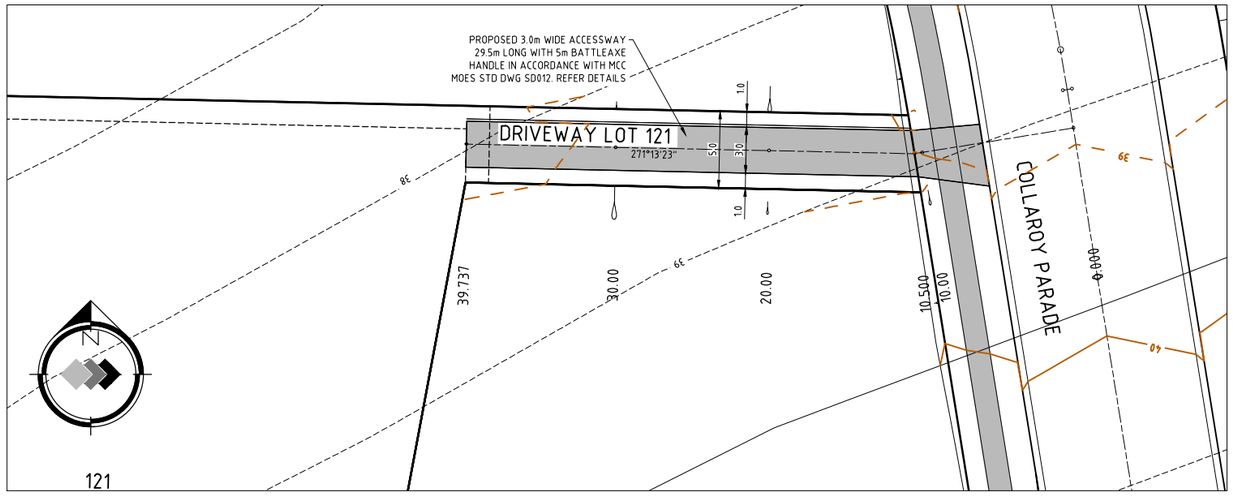
PROPOSED SUBDIVISION
442 LOUTH PARK ROAD
LOUTH PARK - HILLVIEW EAST

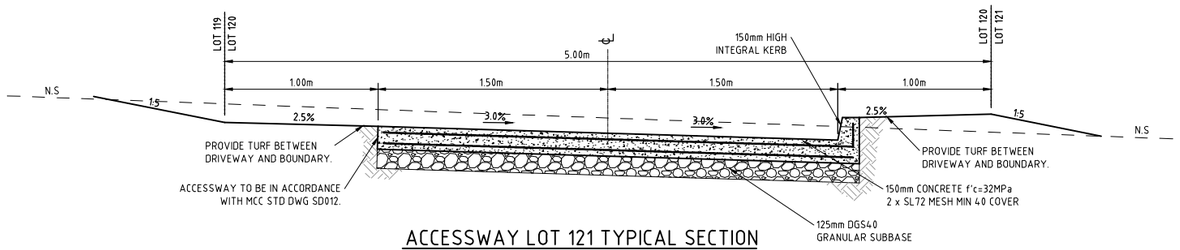
TYPICAL SECTIONS, DETAILS AND NOTES

Project No 21360C
Drawing No C16 | Revision 13
A1 SHEET

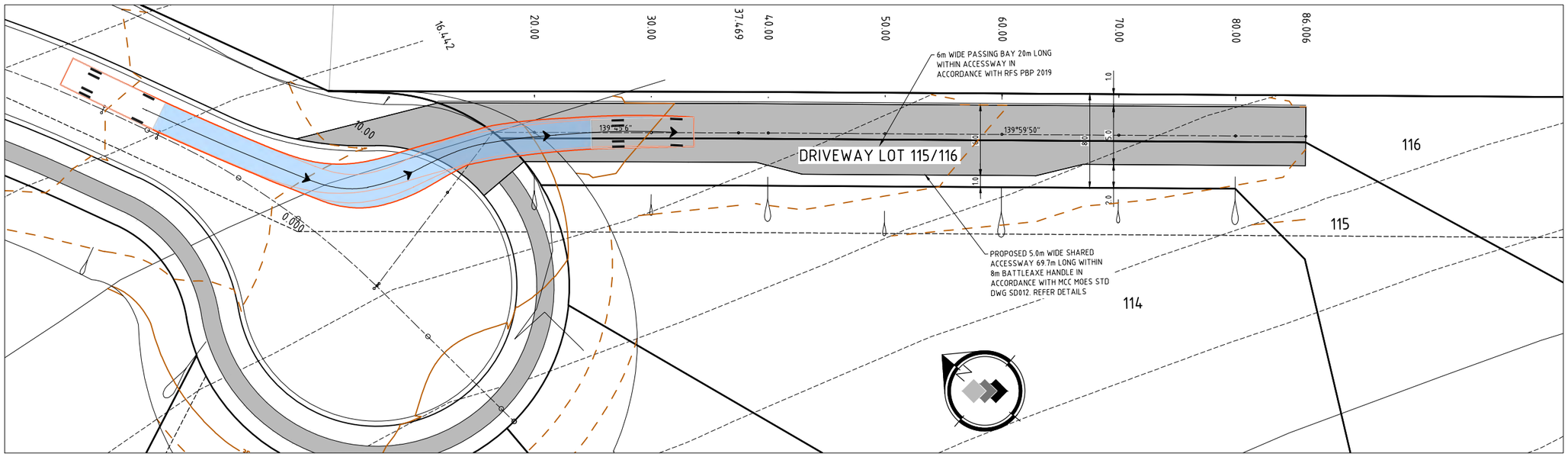
PLOT DATE: 18/12/2024 4:41:25 PM
CAD FILE: Q:\21\21360 442 Louth Park Road (Hillview East)\02_CAD\AutoCAD\Civil\21360C dC16 r13.dwg



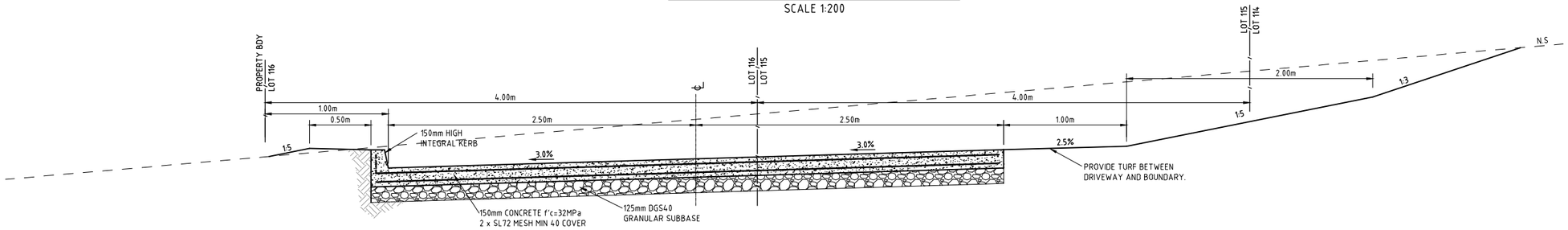
ACCESSWAY LOT 121 DETAIL PLAN
SCALE 1:200



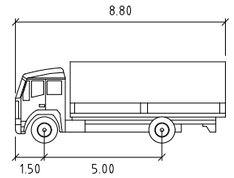
ACCESSWAY LOT 121 TYPICAL SECTION
SCALE 1:20



ACCESSWAY LOT 115 / 116 DETAIL PLAN
SCALE 1:200



ACCESSWAY LOT 115 / 116 TYPICAL SECTION
SCALE 1:20



MRV

	meters
Width	: 2.50
Track	: 2.50
Lock to Lock Time	: 6.0
Steering Angle	: 34.0

PRELIMINARY ISSUE
NOT FOR CONSTRUCTION

REVISION	Description	Drawn	App'd	Date
13	REVISED LAYOUT	DB	IH	14.11.24
10-12	NOT ISSUED			
9	COUNCIL COMMENTS	DB	IH	27.06.24
6-8	NOT ISSUED			
5	LAYOUT AMENDMENTS	A.M	I.H	04.03.24
3	LAYOUT AMENDMENTS	A.M	I.H	14.03.23
14	LOT NUMBER AMENDMENTS	A.M	I.H	18.12.24

North

Scale
0 400 800 1200 1600mm
1:20 (A1) 1:40 (A3)
0 4 8 12 16m
1:200 (A1) 1:400 (A3)

Designed A.M
Scale AS SHOWN
Cad Reference 21360C dC21 r14
Project Approval
IAN HILL (B.E)
Consulting Civil Engineer

Client

GCA ENGINEERING SOLUTIONS
A.B.N. 92 086 017 745
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PROPOSED SUBDIVISION
442 LOUTH PARK ROAD
LOUTH PARK - HILLVIEW EAST
ACCESSWAY LOT 115,116 & 121 TYPICAL DETAILS

Project No 21360C
Drawing No C21
Revision 14
A1 SHEET

PLOT DATE: 18/12/2024 4:41:37 PM
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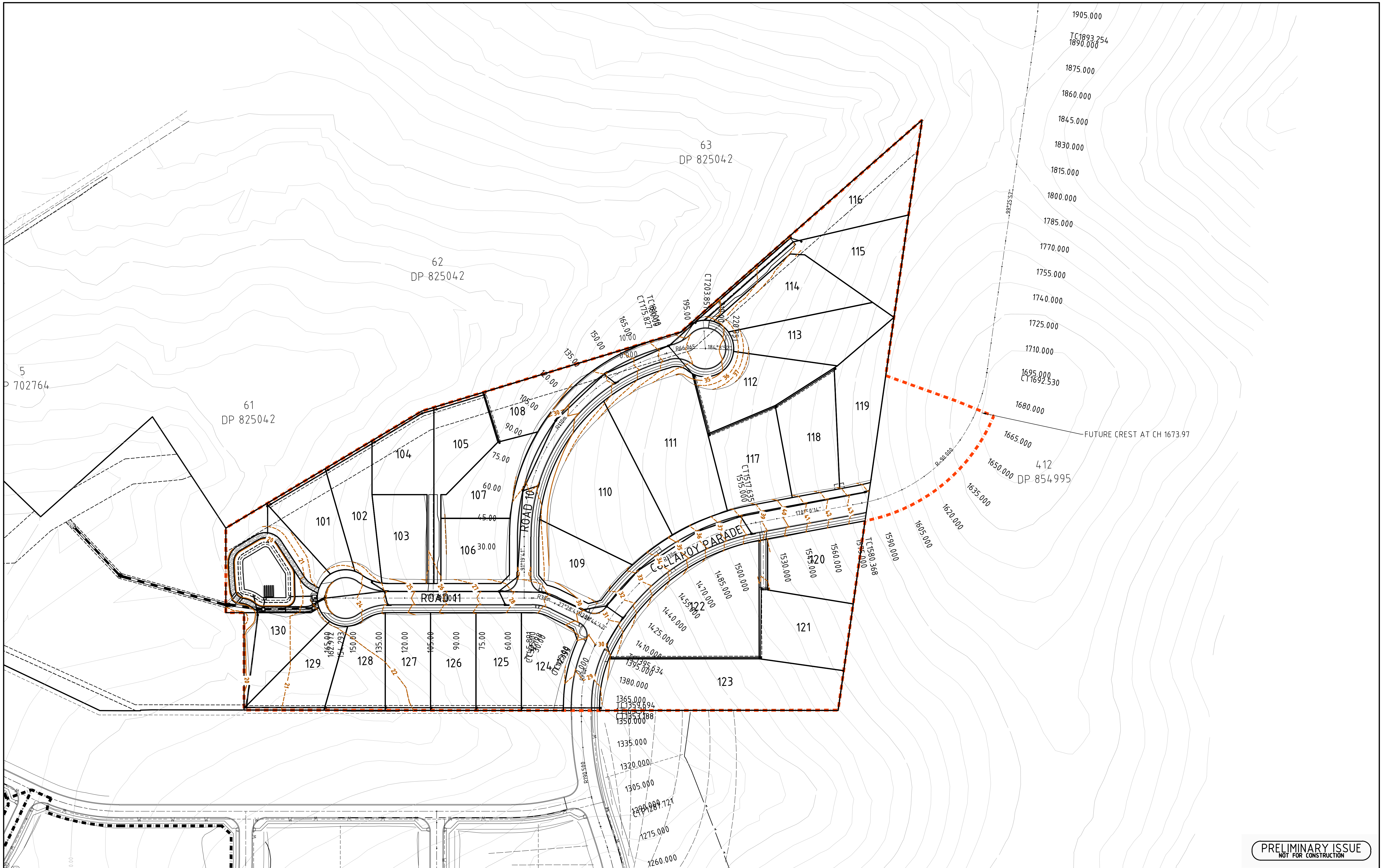

REVISION	Description	Drawn	App'd	Date
13	REVISED LAYOUT	D.B	I.H	14.11.24
10-12	NOT ISSUED			
9	GENERAL REVISION	A.M	I.H	01.07.24
7	GENERAL REVISION	A.M	I.H	15.05.24
5	LAYOUT AMENDMENTS	A.M	I.H	04.02.24
4	LAYOUT AMENDMENTS	A.M	I.H	30.03.23
14	BASIN AMENDMENTS	A.M	I.H	18.12.24

North

Scale
0 20 40 60 80m
1:1000 (A1) 1:2000 (A3)

Designed: A.M
Scale: 1:1000
Cad Reference: 21360C dC25 r14
Project Approval: IAN HILL (B.E) Consulting Civil Engineer

Client

GCA ENGINEERING SOLUTIONS
A.B.N. 92 086 017 745
1 HARTLEY DRIVE, THORNTON NSW 2322
PO BOX 3337, THORNTON NSW 2322
PHONE: (02) 4964 1811

PROPOSED SUBDIVISION
442 LOUTH PARK ROAD
LOUTH PARK - HILLVIEW EAST

OVERALL CATCHMENT PLAN

Project No: 21360C
Drawing No: C25
Revision: 14
A1 SHEET

PLOT DATE: 18/12/2024 4:41:47 PM
CAD FILE: Q:\21\21360 442 Louth Park Road (Hillview East)\02__CAD\AutoCAD\Civil\21360C dC25 r14.dwg

REVISION	Description	Drawn	App'd	Date
13	REVISED LAYOUT	D.B	I.H	14.11.24
10-12	NOT ISSUED			
9	COUNCIL COMMENTS	A.M	I.H	01.07.24
7	GENERAL REVISION	A.M	I.H	15.05.24
5	LAYOUT AMENDMENTS	A.M	I.H	04.03.24
4	LAYOUT AMENDMENTS	A.M	I.H	30.03.23
14	BASIN AMENDMENTS	A.M	I.H	18.12.24

North

Scale
0 20 40 60 80m
1:1000 (A1) 1:2000 (A3)

Designed A.M
Scale 1:1000
Cad Reference 21360C dC26 r14
Project Approval
IAN HILL (B.E)
Consulting Civil Engineer

Client

GCA ENGINEERING SOLUTIONS
A.B.N. 92 086 017 745
1 HARTLEY DRIVE, THORNTON NSW 2322
PO BOX 3337, THORNTON NSW 2322
PHONE: (02) 4964 1811

PROPOSED SUBDIVISION
442 LOUTH PARK ROAD
LOUTH PARK - HILLVIEW EAST
EARTHWORKS PLAN

Project No 21360C
Drawing No C26
Revision 14
A1 SHEET

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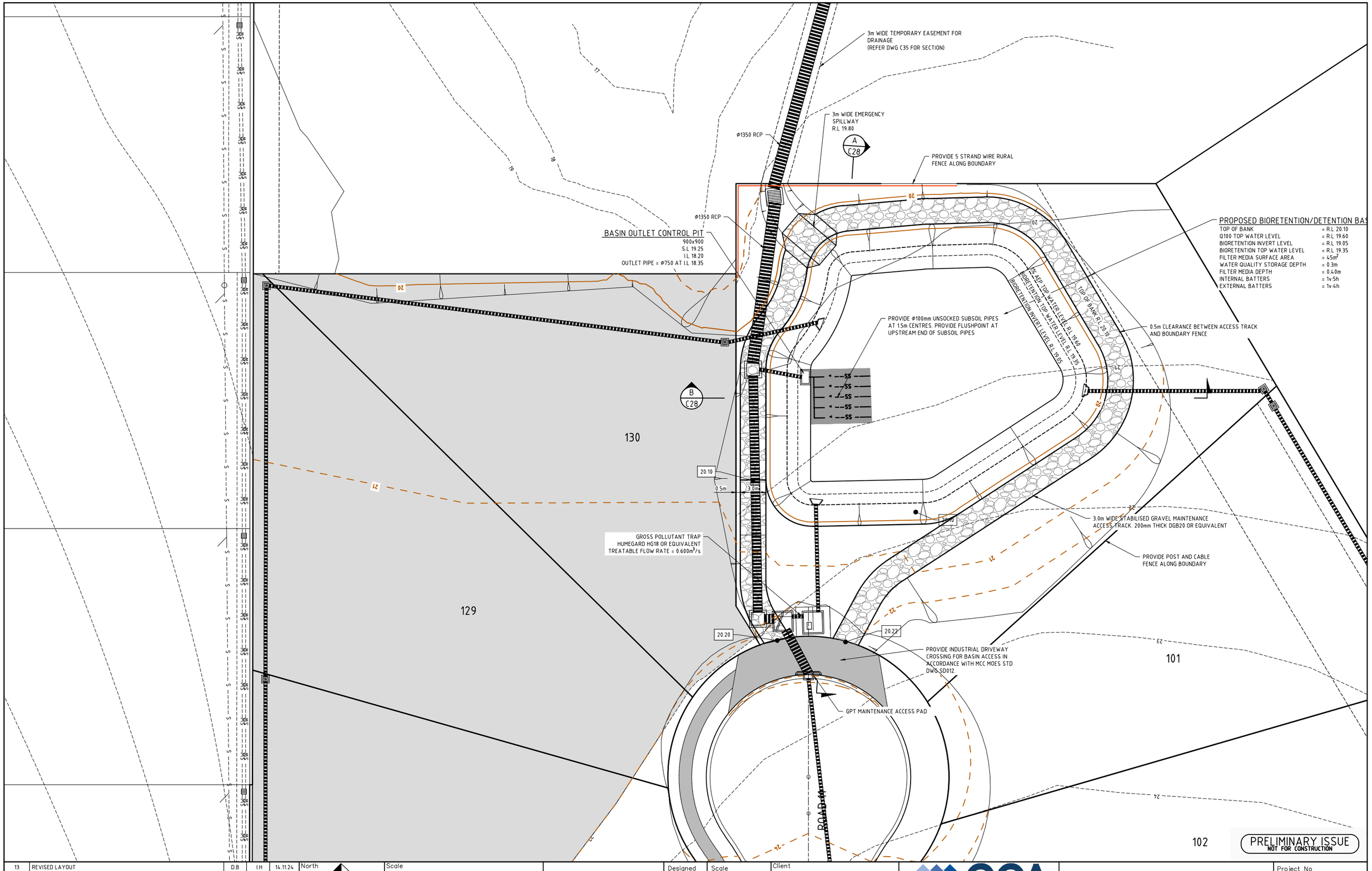

REVISION	Description	Drawn	App'd	Date
13	REVISED LAYOUT	D.B	I.H	14.11.24
12	COUNCIL COMMENTS	A.M	I.H	12.08.24
11	BASIN AMENDMENTS	A.M	I.H	06.08.24
9	COUNCIL COMMENTS	A.M	I.H	27.06.24
7	GENERAL AMENDMENTS	A.M	I.H	15.05.24
5	LAYOUT AMENDMENTS	A.M	I.H	04.03.24
14	BASIN AMENDMENTS	A.M	I.H	18.12.24

North

Scale
0 4 8 12 16m
1:200 (A1) 1:400 (A3)

Designed A.M
Scale 1:200
Cad Reference 21360C dC27 r14
Project Approval
IAN HILL (B.E)
Consulting Civil Engineer

Client

GCA ENGINEERING SOLUTIONS
A.B.N. 92 086 017 745
1 HARTLEY DRIVE, THORNTON NSW 2322
PO BOX 3337, THORNTON NSW 2322
PHONE: (02) 4964 1811

PROPOSED SUBDIVISION
442 LOUTH PARK ROAD
LOUTH PARK - HILLVIEW EAST
BIORETENTION BASIN PLAN

Project No 21360C
Drawing No C27
Revision 14
A1 SHEET

PLOT DATE: 18/12/2024 4:41:56 PM
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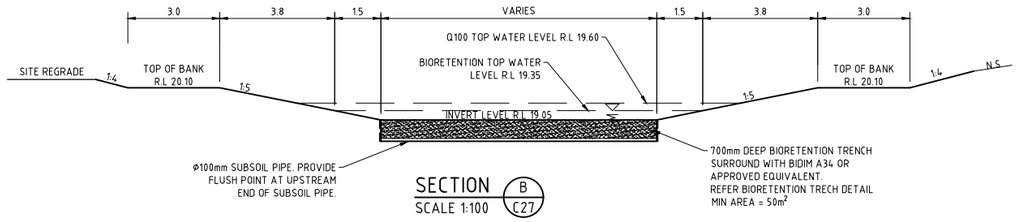
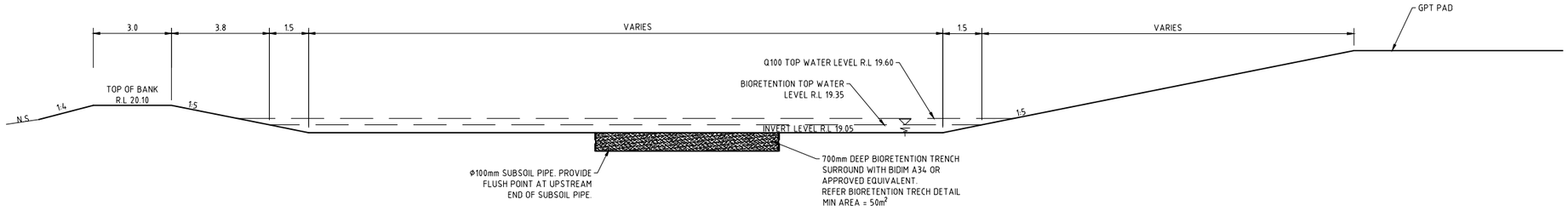
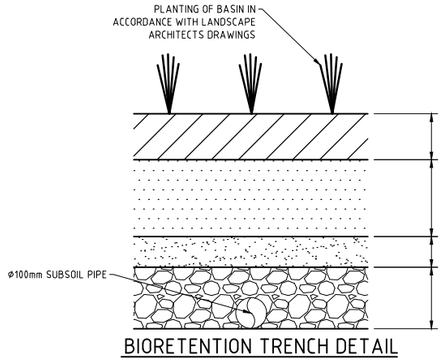


SECTION B / C27
SCALE 1:100



SECTION A / C27
SCALE 1:100



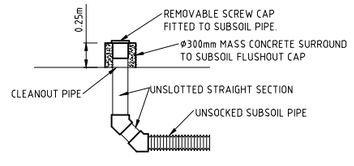
150mm OF TEMPORARY TOPSOIL ABOVE BIORETENTION AREA (TO BE REPLACED WITH 150mm FILTER MEDIA UPON 80% OF HOUSING CONSTRUCTED OR 2 YEARS AFTER RELEASE OF SUBDIVISION CERTIFICATE

250mm DEEP FILTER MEDIA (SANDY LOAM)
SATURATED HYDRAULIC CONDUCTIVITY 36mm-180mm/HOUR
PARTICLE SIZES FOR THE SANDY LOAM - CLAY PARTICLES 5%-15%, SILT PARTICLES LESS THAN 30%, SAND PARTICLES 50%-70%
TN CONTENT 800mg/kg
ORTHOPHOSPHATE CONTENT 50mg/Kg

100mm DEEP TRANSITION LAYER (COURSE SAND)
SATURATED HYDRAULIC CONDUCTIVITY 360mm-3600mm/HOUR
PARTICLE SIZES FOR THE COURSE SAND 1mm

200mm DEEP DRAINAGE LAYER (FINE GRAVEL)
SATURATED HYDRAULIC CONDUCTIVITY 3600mm-36000mm/HOUR
PARTICLE SIZES FOR THE FINE GRAVEL 2-4mm

BIORETENTION TRENCH DETAIL
SCALE 1:10



FLUSH POINT TYPICAL DETAIL
N.T.S

PRELIMINARY ISSUE
NOT FOR CONSTRUCTION

REVISION	Description	Drawn	App'd	Date
14	BASIN AMENDMENTS	A.M	I.H	18.12.24
13	REVISED LAYOUT	D.B	I.H	14.11.24
10-12	NOT ISSUED			
9	COUNCIL COMMENTS	A.M	I.H	01.07.24
7	GENERAL AMENDMENTS	A.M	I.H	15.05.24
5	LAYOUT AMENDMENTS	A.M	I.H	04.03.24
4	ORIGINAL ISSUE	A.M	I.H	31.03.23

North

Scale
0 200 400 600 800mm
1:10 (A1) 1:20 (A3)
0 2 4 6 8m
1:100 (A1) 1:200 (A3)

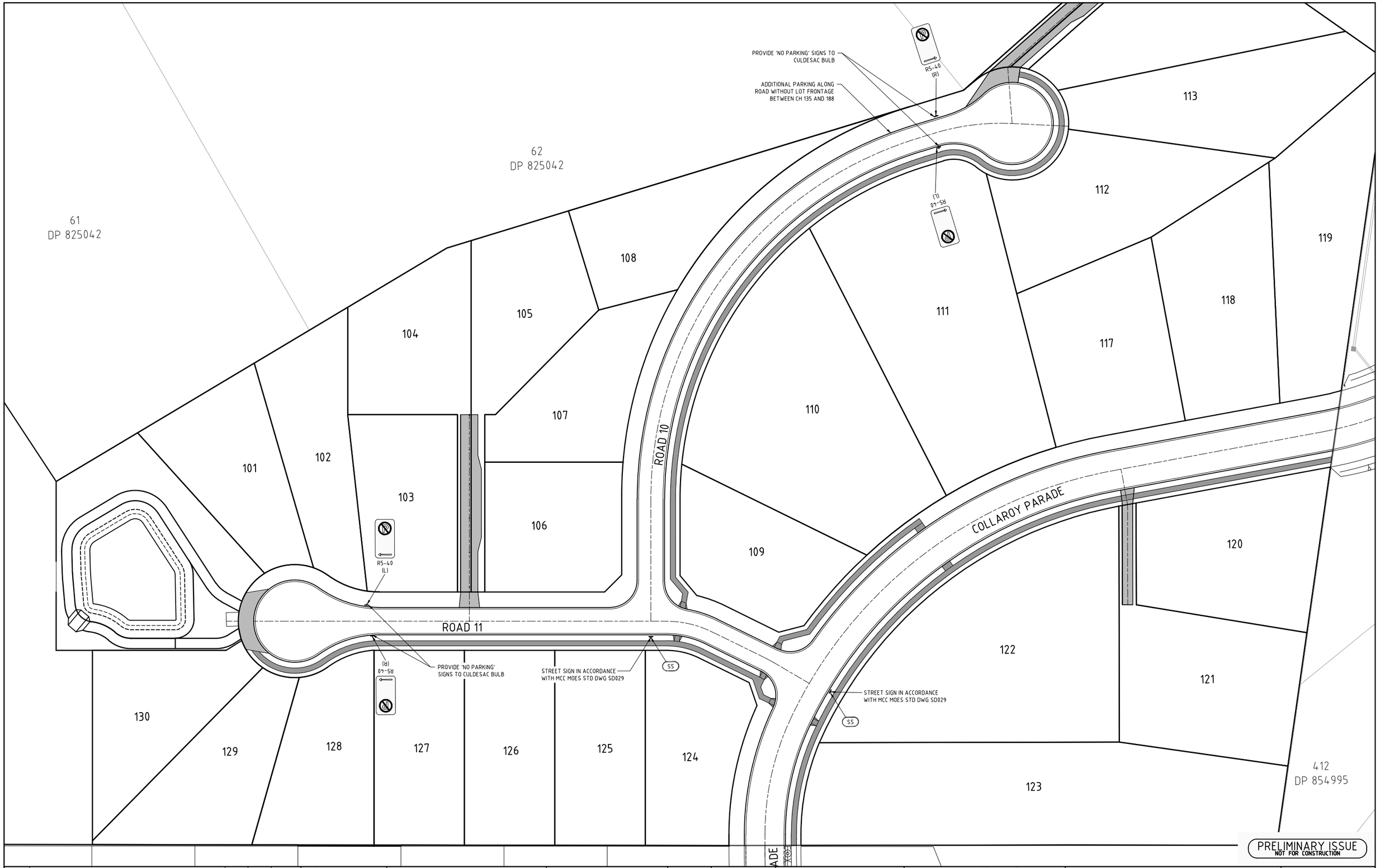
Designed A.M
Scale 1:100/1:10
Cad Reference 21360C dC28 r14
Project Approval
IAN HILL (B.E)
Consulting Civil Engineer

Client

GCA ENGINEERING SOLUTIONS
A.B.N. 92 086 017 745
1 HARTLEY DRIVE, THORNTON NSW 2322
PO BOX 3337, THORNTON NSW 2322
PHONE: (02) 4964 1811

PROPOSED SUBDIVISION
442 LOUTH PARK ROAD
LOUTH PARK - HILLVIEW EAST
BIORETENTION BASIN DETAILS

Project No 21360C
Drawing No C28
Revision 14
A1 SHEET



PRELIMINARY ISSUE
NOT FOR CONSTRUCTION

REVISION	Description	Drawn	App'd	Date
13	REVISED LAYOUT	D.B	I.H	14.11.24
11-12	NOT ISSUED			
10	SIGNAGE AMENDMENTS	A.M	I.H	04.07.24
9	GENERAL REVISION	A.M	I.H	01.07.24
7	GENERAL REVISION	A.M	I.H	15.05.24
5	LAYOUT AMENDMENTS	A.M	I.H	04.03.24
14	LOT NUMBER AMENDMENTS	A.M	I.H	09.06.22

North

Scale
0 10 20 30 40m
1:500 (A1) 1:1000 (A3)

Designed A.M
Scale 1:500
Cad Reference 21360C dC29 r14
Project Approval
IAN HILL (B.E)
Consulting Civil Engineer

Client

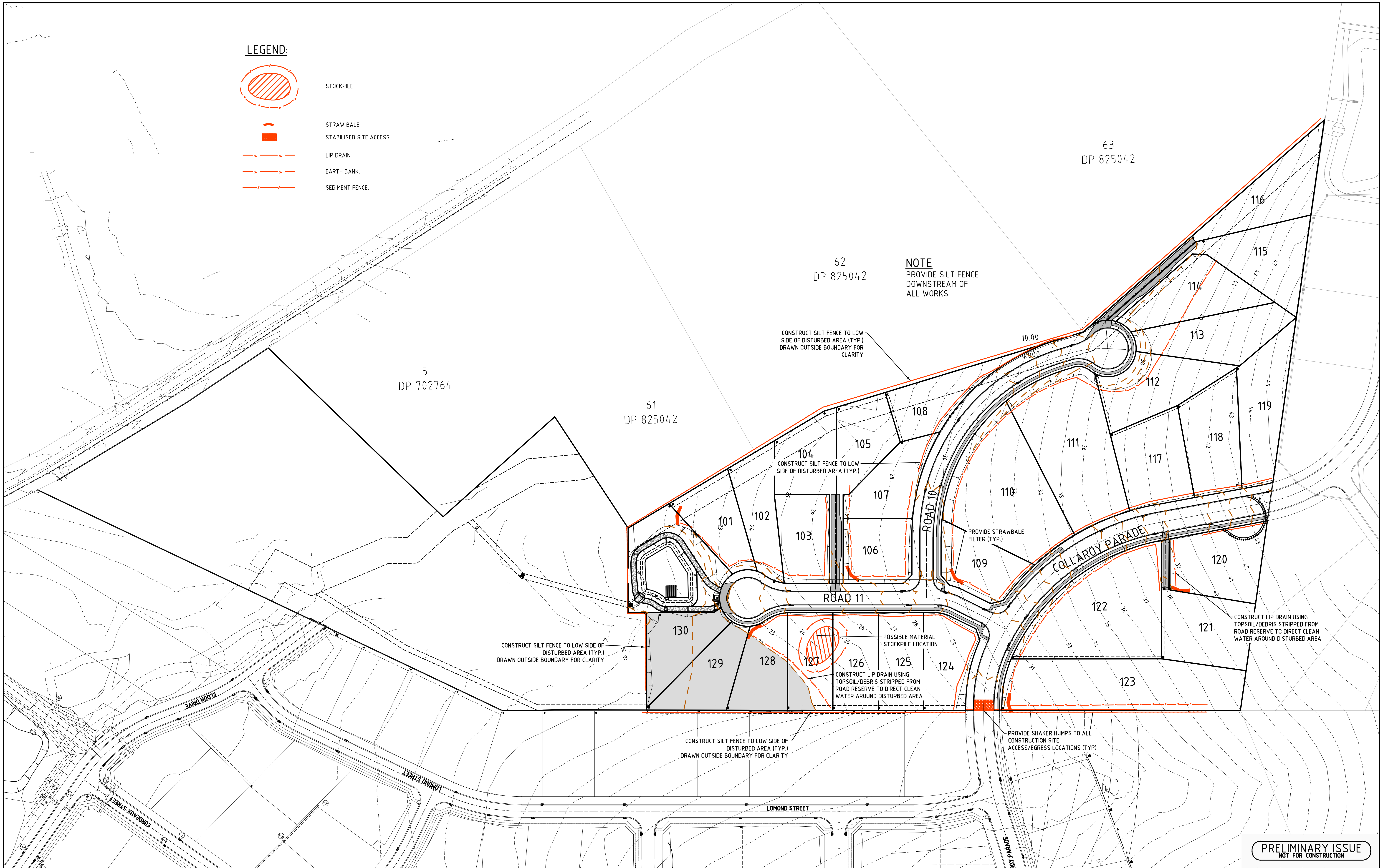
GCA ENGINEERING SOLUTIONS
A.B.N. 92 086 017 745
1 HARTLEY DRIVE, THORNTON NSW 2322
PO BOX 3337, THORNTON NSW 2322
PHONE: (02) 4964 1811

PROPOSED SUBDIVISION
442 LOUTH PARK ROAD
LOUTH PARK - HILLVIEW EAST

LINEMARKING AND SIGNAGE PLAN

Project No 21360C
Drawing No C29
Revision 14
A1 SHEET

PLOT DATE: 18/12/2024 4:42:02 PM
CAD FILE: Q:\21\21360 442 Louth Park Road (Hillview East)\02_CAD\AutoCAD\Civil\21360C dC29 r14.dwg


LEGEND:
STOCKPILE
STRAW BALE.
STABILISED SITE ACCESS.
LIP DRAIN.
EARTH BANK.
SEDIMENT FENCE.
5
DP 702764
61
DP 825042
62
DP 825042
63
DP 825042
NOTE
PROVIDE SILT FENCE
DOWNSTREAM OF
ALL WORKS
CONSTRUCT SILT FENCE TO LOW SIDE OF DISTURBED AREA (TYP.) DRAWN OUTSIDE BOUNDARY FOR CLARITY
CONSTRUCT SILT FENCE TO LOW SIDE OF DISTURBED AREA (TYP.)
10.00
0.000
101
102
103
104
105
106
107
108
109
110
111
112
113
114
115
116
117
118
119
120
121
122
123
124
125
126
127
128
129
130
ROAD 10
ROAD 11
COLLAROY PARADE
PROVIDE STRAWBALE FILTER (TYP.)
POSSIBLE MATERIAL STOCKPILE LOCATION
CONSTRUCT LIP DRAIN USING TOPSOIL/DEBRIS STRIPPED FROM ROAD RESERVE TO DIRECT CLEAN WATER AROUND DISTURBED AREA
CONSTRUCT SILT FENCE TO LOW SIDE OF DISTURBED AREA (TYP.) DRAWN OUTSIDE BOUNDARY FOR CLARITY
PROVIDE SHAKER HUMPS TO ALL CONSTRUCTION SITE ACCESS/EGRESS LOCATIONS (TYP)
ELDON DRIVE
LOMOND STREET
CORDEAUX STREET
COLLAROY PARADE
PRELIMINARY ISSUE
NOT FOR CONSTRUCTION

REVISION	Description	Drawn	App'd	Date
13	REVISED LAYOUT	D.B	I.H	14.11.24
10-12	NOT ISSUED			
9	GENERAL REVISION	A.M	I.H	01.07.24
7	GENERAL REVISION	A.M	I.H	15.05.24
5	LAYOUT AMENDMENTS	A.M	I.H	04.03.24
4	LAYOUT AMENDMENTS	A.M	I.H	30.03.23
14	BASIN AMENDMENTS	A.M	I.H	18.12.24

North

Scale
0 20 40 60 80m
1:1000 (A1) 1:2000 (A3)

Designed: A.M
Scale: 1:1000
Cad Reference: 21360C dC30 r14
Project Approval: IAN HILL (B.E) Consulting Civil Engineer

Client

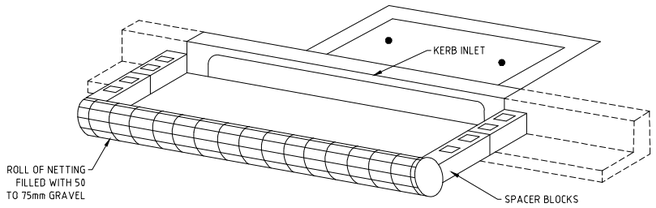
GCA ENGINEERING SOLUTIONS
A.B.N. 92 086 017 745
1 HARTLEY DRIVE, THORNTON NSW 2322
PO BOX 3337, THORNTON NSW 2322
PHONE: (02) 4964 1811

PROPOSED SUBDIVISION
442 LOUTH PARK ROAD
LOUTH PARK - HILLVIEW EAST

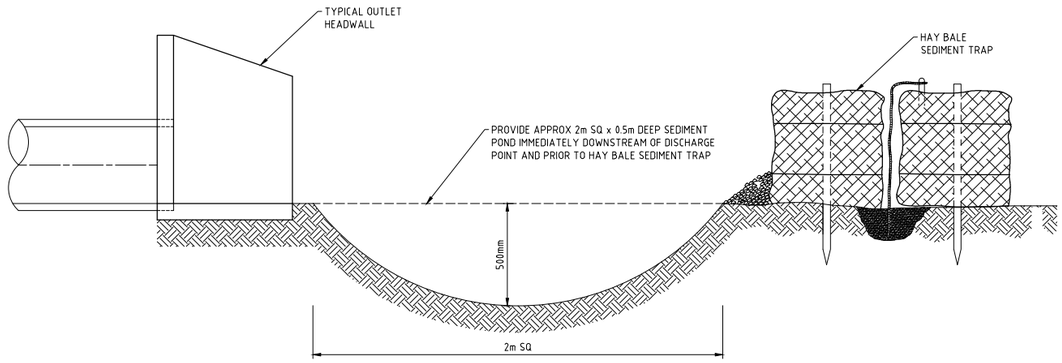
SOIL AND WATER MANAGEMENT PLAN

Project No: 21360C
Drawing No: C30
Revision: 14
A1 SHEET

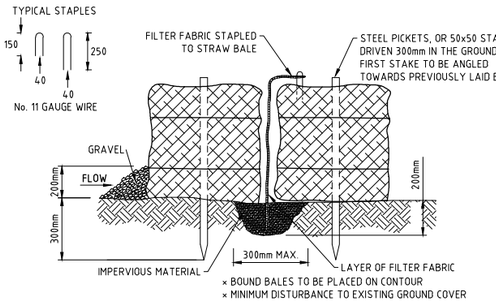
PLOT DATE: 18/12/2024 4:42:05 PM CAD FILE: Q:\21\21360 442 Louth Park Road (Hillview East)\02__CAD\AutoCAD\Civil\21360C dC30 r14.dwg



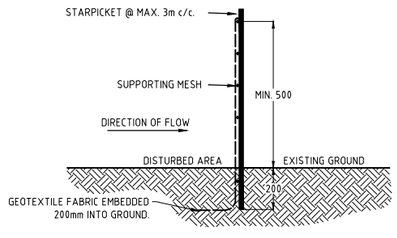
SEDIMENT BARRIER OF STORMWATER PITS
N.T.S



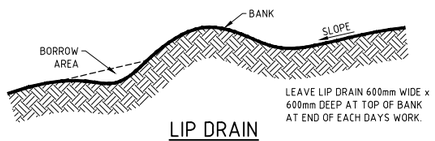
TYPICAL SEDIMENT TREATMENT AT DISCHARGE LOCATION
N.T.S



HAY BALE DETAIL
N.T.S



SEDIMENT FENCE.



LIP DRAIN
N.T.S

TYPICAL CONSTRUCTION SCHEDULE

	WEEK							
	1	2	3	4	5	6	7	8
CONSTRUCT ALL TEMPORARY SEDIMENT BASINS	▨							
PLACE SILT FENCE ALONG ROAD BOUNDARIES AS SHOWN	▨							
PLACE SILT FENCE BELOW AREAS TO BE REGRADED	▨							
CONSTRUCT ALL DIVERSION BANKS CATCHING CLEAN WATER	▨							
ROAD CONSTRUCTION AND REGRADING		▨	▨	▨	▨	▨	▨	
PLACE SILT FENCE AROUND TOPSOIL STOCKPILES		▨						
PLACE SEDIMENT BARRIERS AROUND STORMWATER PITS AT COMPLETION OF DRAINAGE			▨	▨				
PLACE STRIP TURF PARALLEL TO DESIGN CONTOURS ALONG ROAD AS SHOWN								▨

EROSION CONTROL

1. EROSION CONTROL DEVICES AND SILTATION TRAPS TO BE INSTALLED BEFORE SITE IS DISTURBED IN ACCORDANCE WITH N.S.W. DEPARTMENT OF CONSERVATION AND LAND MANAGEMENT GUIDELINES AND APPROVED BY COUNCIL INSPECTOR.
2. ALL PERIMETER AND CONTROL MEASURES ARE TO BE PLACED PRIOR TO OR AS THE FIRST STEP IN EARTHWORKS AND/OR CLEARING.
3. SILT TO BE REMOVED FROM TEMPORARY SEDIMENT CONTROL BASINS AS DIRECTED BY COUNCIL INSPECTOR OR DEPARTMENT OF LAND AND WATER CONSERVATION REPRESENTATIVE TO MAINTAIN SILTATION STORAGE CAPACITY IN TEMPORARY BASINS.
4. FILTRATION BUFFER ZONES ARE TO BE FENCED OFF AND ACCESS PROHIBITED TO ALL PLANT AND MACHINERY.
5. HAY BALE BARRIERS AND GEOFABRIC FENCES ARE TO BE CONSTRUCTED TO TOE OF BATTER PRIOR TO COMMENCEMENT OF EARTHWORKS IMMEDIATELY AFTER CLEARING OF VEGETATION BEFORE REMOVAL OF TOPSOIL.
6. SANDBAGS TO BE USED DURING ROAD CONSTRUCTION TO DIVERT STORMWATER INTO PITS WHEN SUBGRADE IS UP TO KERB LEVEL.
7. ALL TEMPORARY EARTH BERMS, DIVERSION AND SILT DAM EMBANKMENTS ARE TO BE MACHINE COMPACTED, SEEDED & MULCHED FOR TEMPORARY VEGETATION COVER AS SOON AS THEY HAVE BEEN FORMED.
8. CLEAN WATER IS TO BE DIVERTED AWAY FROM DISTURBED GROUND AND INTO DRAINAGE SYSTEM.
9. ALL SEDIMENT TRAPPING STRUCTURES AND DEVICES ARE TO BE INSPECTED AFTER STORMS FOR STRUCTURAL DAMAGE OR CLOGGING. TRAPPED MATERIAL IS TO BE REMOVED TO A SAFE APPROVED LOCATION.
10. ALL TOPSOIL IS TO BE STOCKPILED ON SITE FOR RE-USE (AWAY FROM TREES AND DRAINAGE LINES). MEASURES SHALL BE APPLIED TO PREVENT EROSION OF THE STOCKPILES.
11. ALL FILLS ARE TO BE LEFT WITH A LIP AT THE TOP OF THE SLOPE AT THE END OF EACH DAYS EARTHWORKS. THE HEIGHT OF THE LIP SHALL BE A MINIMUM OF 200mm.
12. ALL CUT AND FILL SLOPES ARE TO BE SEEDED AND MULCHED WITHIN 10 DAYS OF COMPLETION OF FORMATION.
13. UNDERSCRUBBING OF VEGETATION TO BE RESTRICTED TO SLASHING TO MINIMISE SOIL DISTURBANCE.
14. UPON COMPLETION OF ALL EARTHWORKS OR AS DIRECTED BY COUNCIL, SOIL CONSERVATION TREATMENTS SHALL BE APPLIED TO RENDER AREAS THAT HAVE BEEN DISTURBED, EROSION PROOF WITHIN 14 DAYS.
15. DENUDED AREAS TO BE STRIP TURFED OR HYDROMULCH SEEDED WITH THE SEED MIX BELOW OR APPROVED BY DEPARTMENT OF LAND AND WATER CONSERVATION REPRESENTATIVE, WITHIN 14 DAYS OF PRACTICAL COMPLETION OF EARTHWORKS. STRIPS ARE TO BE PLACED ACROSS THE CONTOUR AT RIGHT ANGLES TO THE DIRECTION OF SLOPE.

HYDROMULCH SEEDMIXES

SUMMER MIX		AUTUMN MIX	
MATERIAL	APPLICATION RATE	MATERIAL	APPLICATION RATE
JAPANESE MILLET	30 Kg/Ha	OATS	20 Kg/Ha
COUCH	10 Kg/Ha	RYE GRASS	10 Kg/Ha
CARPET GRASS	10 Kg/Ha	RED CLOVER	5 Kg/Ha
HAIFA WHITE CLOVER	5 Kg/Ha	WHITE CLOVER	5 Kg/Ha
BINDER	200 l/Ha	COUCH	10 Kg/Ha
PULP	1000 Kg/Ha	FERTILISER ENRICHER	300 Kg/Ha
FERTILISER	300 Kg/Ha	OR	
		DYNAMIC LIFTER	1000Kg/Ha

16. THE AREA OVER ALL STORMWATER AND SEWER LINES NOT WITHIN ROAD RESERVES IS TO BE MULCHED AND SEEDED WITHIN 14 DAYS AFTER BACKFILL.
17. NO MORE THAN 150m OF TRENCH IS TO BE OPEN AT ANY ONE TIME.
18. AREAS OVER ELECTRICITY, TELEPHONE AND GAS SUPPLY TRENCHES ARE TO BE SEEDED AND MULCHED BY THE RELEVANT AUTHORITY WITHIN 14 DAYS AFTER BACKFILL.
19. ALL FOOTPATHS, BERMS AND BATTERS AND SITE REGRADING AREAS ARE TO BE TOPSOILED WITH MINIMUM 75mm OF SELECTED SITE TOPSOIL AND GRASSED.
20. STRIPS OF TURF ARE TO BE PLACED IMMEDIATELY BEHIND THE KERB AND GUTTER ON ALL NEW ROADS AND AT LOCATIONS AS DETERMINED BY COUNCIL'S SUPERVISING OFFICER.
21. ALL FINAL EROSION PREVENTION MEASURES INCLUDING THE ESTABLISHMENT OF GRASSING ARE TO BE COMPLETED PRIOR TO THE SUBDIVISION FINAL INSPECTION. ALL EROSION DEVICES ARE TO BE MAINTAINED UNTIL THE END OF THE MAINTENANCE PERIOD.

PRELIMINARY ISSUE
NOT FOR CONSTRUCTION

REVISION	Description	Drawn	App'd	Date
13	REVISED LAYOUT	D.B	I.H	14.11.24
6-12	NOT ISSUED			
5	GENERAL REVISION	A.M	I.H	04.03.24
4	DRAWING NUMBER CHANGE	A.M	I.H	30.03.23
3	GENERAL REVISION'	A.M	I.H	17.03.23
1	ORIGINAL ISSUE	A.M	I.H	09.06.22

North

Scale

Designed A.M | Scale N.T.S.

Cad Reference 21360C dC31 r13

Project Approval
IAN HILL (B.E)
Consulting Civil Engineer

Client

GCA ENGINEERING SOLUTIONS
A.B.N. 92 086 017 745
1 HARTLEY DRIVE, THORNTON NSW 2322
PO BOX 3337, THORNTON NSW 2322
PHONE: (02) 4964 1811

PROPOSED SUBDIVISION
442 LOUTH PARK ROAD
LOUTH PARK - HILLVIEW EAST
SOIL AND WATER MANAGEMENT DETAILS

Project No 21360C

Drawing No C31 | Revision 13

A1 SHEET

PLOT DATE: 18/12/2024 4:42:07 PM
CAD FILE: Q:\21\21360 442 Louth Park Road (Hillview East)\02_CAD\AutoCAD\Civil\21360C dC31 r13.dwg

LEGEND:

SUB CATCHMENT BOUNDARY

(3-1) PROPOSED PIT NUMBER

(6-2) EXISTING PIT NUMBER

ALL EXISTING UNDERGROUND SERVICES MUST BE LOCATED AND EXPOSED PRIOR TO EARTHWORKS COMMENCING AND IT IS THE RESPONSIBILITY OF THOSE PERSONS USING THIS PLAN TO CONFIRM BOTH POSITION & LEVEL OF THESE UTILITIES IN CONJUNCTION WITH THE APPROPRIATE AUTHORITY.

ROAD 10

ROAD 11

COLLAROY PARADE

LOMOND STREET

INCREASED AREA TO EXISTING PIT 52-6 = 511m²

INCREASED AREA TO EXISTING PIT 52-5 = 437m²

REDUCED AREA TO EXISTING PIT 52-3 = 3100m²

412 DP 854995

PRELIMINARY ISSUE
NOT FOR CONSTRUCTION

REVISION	Description	Drawn	App'd	Date
13	REVISED LAYOUT	D.B	I.H	14.11.24
10-12	NOT ISSUED			
9	GENERAL AMENDMENTS	A.M	I.H	01.07.24
7	GENERAL REVISION	A.M	I.H	15.05.24
5	LAYOUT AMENDMENTS	A.M	I.H	04.03.24
4	DRAWING NUMBER CHANGE	A.M	I.H	30.03.23
3	ORIGINAL ISSUE	A.M	I.H	20.03.23

North

Scale
0 10 20 30 40m
1:500 (A1) 1:1000 (A3)

Designed A.M
Scale 1:500
Cad Reference 21360C dC32 r13
Project Approval
IAN HILL (B.E)
Consulting Civil Engineer

Client

GCA ENGINEERING SOLUTIONS
A.B.N. 92 086 017 745
1 HARTLEY DRIVE, THORNTON NSW 2322
PO BOX 3337, THORNTON NSW 2322
PHONE: (02) 4964 1811

PROPOSED SUBDIVISION
442 LOUTH PARK ROAD
LOUTH PARK - HILLVIEW EAST
EXISTING CATCHMENT PLAN

Project No 21360C
Drawing No C32
Revision 13
A1 SHEET

PLOT DATE: 18/12/2024 4:42:11 PM
CAD FILE: Q:\21\21360 442 Louth Park Road (Hillview East)\02_CAD\AutoCAD\Civil\21360C dC32 r13.dwg

Appendix B: AHIMS Search Results

AHIMS Web Services (AWS)
Search Result

Your Ref/PO Number : 23113 Louth Park

Client Service ID : 868681

Katrina Greville

21 Costata Crescent
Adamstown New South Wales 2289

Attention: Katrina Greville

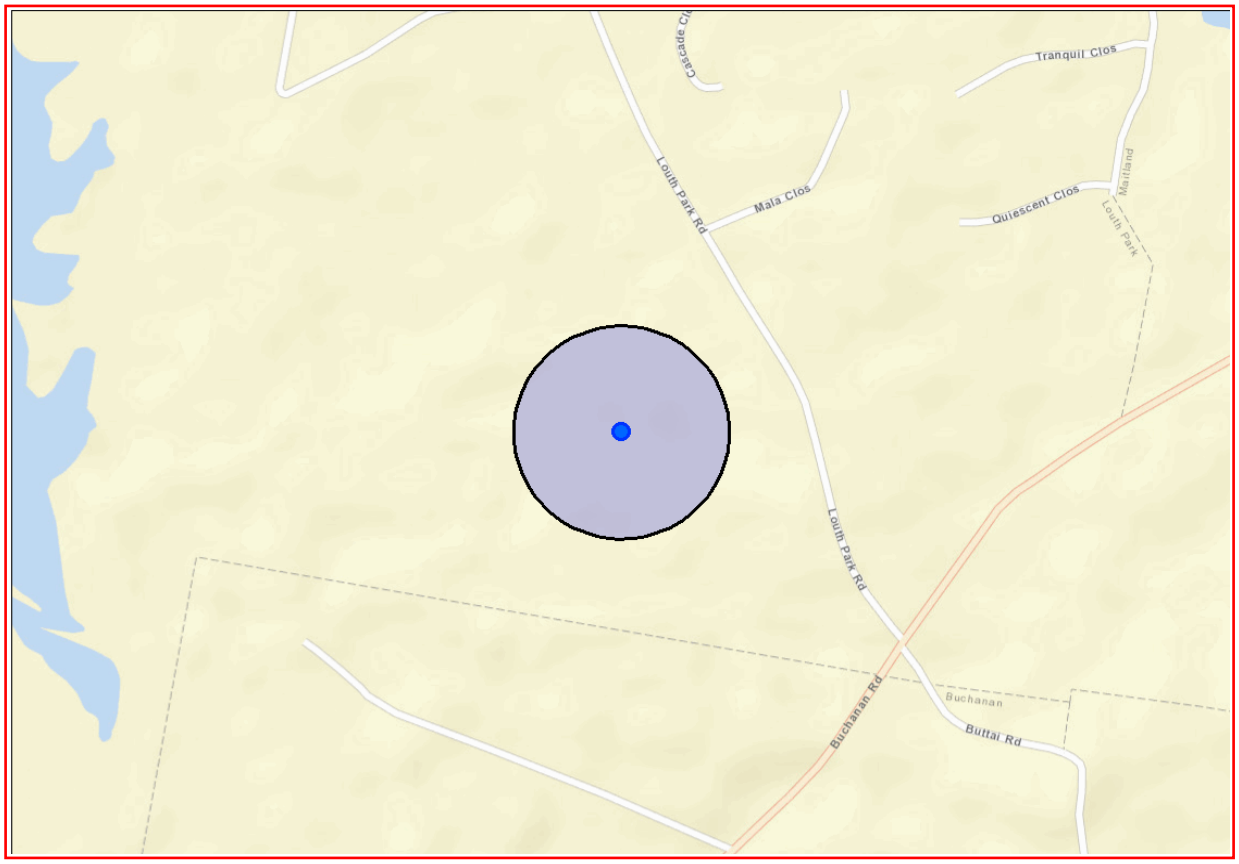
Email: klmukevski@bigpond.com

Date: 29 February 2024

Dear Sir or Madam:

AHIMS Web Service search for the following area at Address : 82 COLLAROY PARADE LOUTH PARK 2320 with a Buffer of 200 meters, conducted by Katrina Greville on 29 February 2024.

The context area of your search is shown in the map below. Please note that the map does not accurately display the exact boundaries of the search as defined in the paragraph above. The map is to be used for general reference purposes only.



A search of Heritage NSW AHIMS Web Services (Aboriginal Heritage Information Management System) has shown that:

0	**Aboriginal sites are recorded in or near the above location.**
0	**Aboriginal places have been declared in or near the above location. ***

If your search shows Aboriginal sites or places what should you do?

- You must do an extensive search if AHIMS has shown that there are Aboriginal sites or places recorded in the search area.
- If you are checking AHIMS as a part of your due diligence, refer to the next steps of the Due Diligence Code of practice.
- You can get further information about Aboriginal places by looking at the gazettal notice that declared it. Aboriginal places gazetted after 2001 are available on the NSW Government Gazette (https://www.legislation.nsw.gov.au/gazette) website. Gazettal notices published prior to 2001 can be obtained from Heritage NSW upon request

Important information about your AHIMS search

- The information derived from the AHIMS search is only to be used for the purpose for which it was requested. It is not be made available to the public.
- AHIMS records information about Aboriginal sites that have been provided to Heritage NSW and Aboriginal places that have been declared by the Minister;
- Information recorded on AHIMS may vary in its accuracy and may not be up to date. Location details are recorded as grid references and it is important to note that there may be errors or omissions in these recordings,
- Some parts of New South Wales have not been investigated in detail and there may be fewer records of Aboriginal sites in those areas. These areas may contain Aboriginal sites which are not recorded on AHIMS.
- Aboriginal objects are protected under the National Parks and Wildlife Act 1974 even if they are not recorded as a site on AHIMS.
- This search can form part of your due diligence and remains valid for 12 months.

Level 6, 10 Valentine Ave, Parramatta 2150
Locked Bag 5020 Parramatta NSW 2124
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Appendix C: Planning for Bushfire Protection 2019 Compliance Table

Table 1: Aims and Objectives of Planning for Bushfire Protection 2019

Objectives	Satisfied	Comment
➢ Afford buildings and their occupants protection from exposure to a bush fire	✓	All lots; including the additional 2 new lots within the modified development are provided with sufficient separation from the nearest bushfire hazard.
➢ Provide for a defendable space to be located around buildings	✓	Defendable space by way of an APZ is provided between all approved and the 2 new lots and the bushfire hazard to ensure radiant heat levels are below critical limits (29kW/m^2).
➢ Provide appropriate separation between a hazard and buildings, which, in combination with other measures, prevent the likely fire spread to buildings	✓	Appropriate APZs are provided between the approved and additional lots and the hazard, which in addition to other mitigation measures such as suitable construction, will provide an acceptable level of protection to the buildings, and prevent the spread of fire to the buildings and onto adjoining buildings.
➢ Ensure that safe operational access and egress for emergency service personnel and residents is available	✓	The approved road design will not be modified. The approved roads are accessed from Collaroy Parade and the southern residential development (when completed).
➢ Provide for ongoing management and maintenance of BPMs	✓	All owners will be responsible for the management and maintenance of the private property.
➢ Ensure that utility services are adequate to meet the needs of firefighters	✓	The development includes all essential utility services to meet the needs of firefighters; including a reliable water supply.

Table 2: Performance Criteria and Acceptable Solutions for residential subdivisions (Chapter 5 PBP 2019)

Intent of Measure	Performance Criteria	Acceptable Solution	Complies	Comment
			✓ - Acceptable Solution AS - Alternative Solution	
5.3.1 **ASSET PROTECTION ZONES** Table 5.3a To provide sufficient space and maintain reduced fuel loads, so as to ensure radiant heat levels at buildings are below critical limits and to prevent direct flame contact with a building.	Potential building footprints must not be exposed to radiant heat levels exceeding 29kW/m^2 on each proposed lot.	APZs are provided in accordance with Tables A1.12.2 and A1.12.3 based on the FFDI.	✓	Both additional lots and all approved lots will be exposed to a maximum potential radiant heat level no greater than 29kW/m^2.
	APZs are managed and maintained to prevent the spread of a fire towards the building.	The APZ is managed in accordance with the requirements of Appendix 4	✓	All new landowners will be required to manage their respective lot as an IPA.
	The APZ is provided in perpetuity.	APZs are wholly within the boundaries of the development site.	✓	There are no exceptional circumstances that would require an APZ to be located external to the development site.
	APZ maintenance is practical, soil stability is not compromised and the potential for crown fires is negated.	The APZ is not located on lands with a slope exceeding 18°	✓	The site and surrounding properties are relatively flat. There is a slight downslope towards the riparian corridor located to the east of the site.
LANDSCAPING	Landscaping is designed and managed to minimise flame contact and radiant heat to buildings, and the potential for wind-driven embers to cause ignitions.	Landscaping is in accordance with APZ standards (see Appendix 4). Fencing is constructed in accordance with section 7.6.	✓	All new landscaping has considered the requirements of APZs per Appendix 4. All new fencing will be colorbond or similar non-combustible material.
5.3.2 **ACCESS (General Requirements)** **Table 5.3b** To provide safe operational access for emergency services personnel in suppressing a bush fire, while residents are accessing or egressing an area.	Fire fighters are provided with safe all weather access to structures	Property access roads are two-wheel drive, all-weather roads	✓	Public road access will be provided by Collaroy Parade and several non-perimeter roads. All approved roads will be constructed in accordance with Council engineering specifications and satisfy the Performance Criteria in Table 5.3b.
		Perimeter roads are provided for residential subdivisions of three or more allotments	✓	
		Subdivisions of three or more allotments have more than one access in and out of the development		
		Traffic management devices are constructed to not prohibit access by emergency services vehicles.	✓	

Intent of Measure	Performance Criteria	Acceptable Solution	Complies	Comment
			✓ - Acceptable Solution AS - Alternative Solution	
		Access roads must provide suitable turning areas in accordance with Appendix 3.	✓	
ACCESS ROAD CAPACITY	The capacity of access roads is adequate for firefighting vehicles.	The capacity of road surfaces and any bridges/ causeways is sufficient to carry fully loaded firefighting vehicles (up to 23 tonnes); bridges and causeways are to clearly indicate load rating.	✓	
ACCESS TO WATER	There is appropriate access to water supply.	Hydrants are located outside of parking reserves and road carriageways to ensure accessibility to reticulated water for fire suppression.	✓	All proposed and approved lots are able to be connected to a reticulated water supply.
		Hydrants are provided in accordance with AS2419.1:2005	✓	
		There is suitable access for Category 1 fire appliance to within 4m of the static water supply where no reticulated supply is available.	✓	
PERIMETER ROADS	Perimeter access roads are designed to allow safe access and egress for medium rigid firefighting vehicles while occupants are evacuating as well as providing a safe operational environment for emergency service personnel during firefighting and emergency management on the interface.	There are two-way sealed roads.	✓	The approved extension to Collaroy Parade is 12m wide kerb to kerb. Collaroy Parade will also be extended into the approved subdivision to south and provide access to Louth Park Road. All roads, including perimeter roads, will be constructed in accordance with PBP 2019.
		8m carriageway width kerb to kerb.	✓	
		Hydrants are to be located clear of parking areas.	✓	
		There are through roads, and these are linked to the internal road system at an interval of no greater than 500m.	✓	
		Curves of roads have a minimum inner radius of 6m.	✓	
		The maximum grade road is 15° and average grade is 10°.	✓	
		The road crossfall does not exceed 3°.	✓	
		A minimum vertical clearance of 4m to any overhanging obstructions, including tree branches.	✓	

Intent of Measure	Performance Criteria	Acceptable Solution	Complies	Comment
			✓ - Acceptable Solution AS - Alternative Solution	
NON-PERIMETER ROADS	Non-perimeter access roads are designed to allow safe access and egress for medium rigid firefighting vehicles while occupants are evacuating.	Minimum 5.5m width kerb to kerb.	✓	Multiple non-perimeter 8m wide kerb to kerb carriageways will be provided as part of the approved development. All roads, including non-perimeter roads, will be constructed in accordance with PBP 2019.
		Parking is provided outside of the carriageway.	✓	
		Hydrants are to be located clear of parking areas.	✓	
		There are through roads, and these are linked to the internal road system at an interval of no greater than 500m.	✓	
		Curves of roads have a minimum inner radius of 6m.	✓	
		The maximum grade road is 15° and average grade is 10°.	✓	
		The road crossfall does not exceed 3°.	✓	
		A minimum vertical clearance of 4m to any overhanging obstructions, including tree branches	✓	
5.3.3 **SERVICES** **Table 5.3c** To provide adequate services for water for the protection of buildings during and after the passage of a bushfire, and not to locate gas and electricity so as not to contribute to the risk of fire to a building. **WATER**	Adequate water supplies is provided for firefighting purposes	Reticulated water is to be provided to the development, where available	✓	A reticulated water supply is provided.
		A static water supply is provided where no reticulated water is available	**N/A**	
		Static water supplies shall comply with Table 5.3d	**N/A**	
	Water supplies are located at regular intervals	Fire hydrant spacing, design and sizing comply with AS2419.1:2005;	✓	A reticulated water supply is provided.
		Hydrants are not located within any road carriageway;	✓	
	The water supply is accessible and reliable for firefighting operations	Reticulated water supply to urban subdivisions uses a ring main system for areas with perimeter roads.	✓	A reticulated water supply is provided.
	Flows and pressures are appropriate	Fire hydrant flows and pressures comply with AS2419.1:2005.	✓	
	The integrity of the water supply is maintained	All above ground water service pipes are metal, including and up to any taps.	**Able to comply**	

Intent of Measure	Performance Criteria	Acceptable Solution	Complies	Comment
			✓ - Acceptable Solution AS - Alternative Solution	
ELECTRICITY	Location of electricity services limits the possibility of ignition of surrounding bushland or the fabric of buildings.	Where practicable, electrical transmission lines are underground.	✓	The proposed new lots will be connected to the existing underground electricity service.
		Where overhead electrical transmission lines are proposed as follows: → lines are installed with short pole spacing (30 metres), unless crossing gullies, gorges or riparian areas; and → no part of a tree is closer to a power line than the distance set out in accordance with the specifications in ISSC3 Guideline for Managing Vegetation Near Power Lines	N/A	
GAS	Location of gas services will not lead to ignition of surrounding bushland or the fabric of buildings.	Reticulated or bottled gas is installed and maintained in accordance with AS 1596:2014 and the requirements of relevant authorities, metal piping is to be used.	✓	Any new gas connections will be underground and will be unlikely to create an additional hazard risk to surrounding bushland.
		All fixed gas cylinders are kept clear of all flammable materials to a distance of 10 metres and shielded on the hazard side.		
		Connections to and from gas cylinders are metal		
		Polymer-sheathed flexible gas supply lines are not used; and		
		Above-ground gas service pipes are metal, including and up to any outlets.		

Appendix D: NBC Modelling Report

NBC Bushfire Attack Assessment Report V4.1

AS3959 (2018) Appendix B - Detailed Method 2

Print Date: 19/12/2024 **Assessment Date:** 4/03/2024

Site Street Address: 23113 82 Collaroy Parade, Louth Park

Assessor: Stuart Greville; Bushfire Planning Australia

Local Government Area: Maitland **Alpine Area:** No

Equations Used

Transmissivity: Fuss and Hammins, 2002
Flame Length: RFS PBP, 2001/Vesta/Catchpole
Rate of Fire Spread: Noble et al., 1980
Radiant Heat: Drysdale, 1985; Sullivan et al., 2003; Tan et al., 2005
Peak Elevation of Receiver: Tan et al., 2005
Peak Flame Angle: Tan et al., 2005
Short Fire Run - Methodology for Assessing Bush Fire Risk for Low Risk Vegetation May 2019 NSW RFS

Run Description: Basin

Vegetation Information

Vegetation Type:	Freshwater Wetlands		
Vegetation Group:	Shrub & Heath		
Vegetation Slope:	0 Degrees	**Vegetation Slope Type:**	Downslope
Surface Fuel Load(t/ha):	4.4	**Overall Fuel Load(t/ha):**	4.4
Vegetation Height(m):	1	Only Applicable to Shrub/Scrub and Vesta	

Site Information

Site Slope	0 Degrees	**Site Slope Type:**	Downslope
Elevation of Receiver(m)	5.2	**APZ/Separation(m):**	4

Fire Inputs

Veg./Flame Width(m):	32.94	**Flame Temp(K):**	1090

Radiant Heat Shielding Inputs

Shield Height(m):	0.1	**Shield Width(m):**	0

Calculation Parameters

Flame Emissivity:	95	**Relative Humidity(%):**	25
Heat of Combustion(kJ/kg	18600	**Ambient Temp(K):**	308
Moisture Factor:	5	**FDI:**	100

Program Outputs

Level of Construction:	BAL 19	**Peak Elevation of Receiver(m):**	1.72
Radiant Heat(kW/m2):	16.73	**Fire Intensity(kW/m):**	5233
Flame Length(m):	3.98	**Flame Angle (degrees):**	89
Shielded View Factor:	0	**Maximum View Factor:**	0.248
Rate Of Spread (km/h):	2.3	**Inner Protection Area(m):**	4
Transmissivity:	0.888	**Outer Protection Area(m):**	0

Short Fire Run Calculations

Fire Run(m):	90	**Length to Breadth Ratio:**	2.82
Full Ellipse Length(m):	566.08	**Headfire Backfire Ratio:**	29.85
Travel Duration (mins):	0.32	**Total Ellipse Length(m):**	93.01
ROS and H/B Ratio:	291.1		

BAL Thresholds	**BAL-40:**	**BAL-29:**	**BAL-19:**	**BAL-12.5:**	**10 kw/m2:**	**Elevation of Receiver:**
Asset Protection Zone(m):	3	5	7	10	16	3

Run Description: T1 - Property north of 20m APZ

Vegetation Information

Vegetation Type:	Hunter Macleay DSF		
Vegetation Group:	Dry Sclerophyll Forests (Shrub/Grass)		
Vegetation Slope:	1.8 Degrees	**Vegetation Slope Type:**	Downslope
Surface Fuel Load(t/ha):	14	**Overall Fuel Load(t/ha):**	24.6
Vegetation Height(m):	0.9	Only Applicable to Shrub/Scrub and Vesta	

Site Information

Site Slope	0 Degrees	**Site Slope Type:**	Downslope
Elevation of Receiver(m)	Default	**APZ/Separation(m):**	18

Fire Inputs

Veg./Flame Width(m):	100	**Flame Temp(K):**	1090

Radiant Heat Shielding Inputs

Shield Height(m):	0	**Shield Width(m):**	0

Calculation Parameters

Flame Emissivity:	95	**Relative Humidity(%):**	25
Heat of Combustion(kJ/kg	18600	**Ambient Temp(K):**	308
Moisture Factor:	5	**FDI:**	100

Program Outputs

Level of Construction:	BAL 29	**Peak Elevation of Receiver(m):**	6.88
Radiant Heat(kW/m2):	27.13	**Fire Intensity(kW/m):**	24177
Flame Length(m):	15.32	**Flame Angle (degrees):**	64
Shielded View Factor:	0	**Maximum View Factor:**	0.421
Rate Of Spread (km/h):	1.9	**Inner Protection Area(m):**	14
Transmissivity:	0.848	**Outer Protection Area(m):**	4

Short Fire Run Calculations

Fire Run(m):	30	**Length to Breadth Ratio:**	2.82
Full Ellipse Length(m):	566.08	**Headfire Backfire Ratio:**	29.85
Travel Duration (mins):	0.11	**Total Ellipse Length(m):**	31
ROS and H/B Ratio:	291.1		

BAL Thresholds	**BAL-40:**	**BAL-29:**	**BAL-19:**	**BAL-12.5:**	**10 kw/m2:**	**Elevation of Receiver:**
Asset Protection Zone(m):	13	17	25	35	54	6

Run Description: T11

Vegetation Information

Vegetation Type:	Grassland		
Vegetation Group:	Grassland		
Vegetation Slope:	3.6 Degrees	**Vegetation Slope Type:**	Downslope
Surface Fuel Load(t/ha):	6	**Overall Fuel Load(t/ha):**	6
Vegetation Height(m):	0	Only Applicable to Shrub/Scrub and Vesta	

Site Information

Site Slope	0 Degrees	**Site Slope Type:**	Downslope
Elevation of Receiver(m)	Default	**APZ/Separation(m):**	10

Fire Inputs

Veg./Flame Width(m):	100	**Flame Temp(K):**	1090

Radiant Heat Shielding Inputs

Shield Height(m):	0	**Shield Width(m):**	0

Calculation Parameters

Flame Emissivity:	95	**Relative Humidity(%):**	25
Heat of Combustion(kJ/kg	18600	**Ambient Temp(K):**	308
Moisture Factor:	5	**FDI:**	130

Program Outputs

Level of Construction:	BAL 40	**Peak Elevation of Receiver(m):**	4.27
Radiant Heat(kW/m2):	32.36	**Fire Intensity(kW/m):**	67163
Flame Length(m):	9.77	**Flame Angle (degrees):**	61
Shielded View Factor:	0	**Maximum View Factor:**	0.488
Rate Of Spread (km/h):	21.67	**Inner Protection Area(m):**	10
Transmissivity:	0.873	**Outer Protection Area(m):**	0

Short Fire Run Calculations

Fire Run(m):	0	**Length to Breadth Ratio:**	0
Full Ellipse Length(m):	0	**Headfire Backfire Ratio:**	0
Travel Duration (mins):	0	**Total Ellipse Length(m):**	0
ROS and H/B Ratio:	0		

BAL Thresholds	**BAL-40:**	**BAL-29:**	**BAL-19:**	**BAL-12.5:**	**10 kw/m2:**	**Elevation of Receiver:**
Asset Protection Zone(m):	0	0	0	0	0	0

Run Description: T2 - north-east (part APZ/IPA)

Vegetation Information

Vegetation Type:	Hunter Macleay DSF		
Vegetation Group:	Dry Sclerophyll Forests (Shrub/Grass)		
Vegetation Slope:	2.9 Degrees	**Vegetation Slope Type:**	Downslope
Surface Fuel Load(t/ha):	14	**Overall Fuel Load(t/ha):**	24.6
Vegetation Height(m):	0.9	Only Applicable to Shrub/Scrub and Vesta	

Site Information

Site Slope	0 Degrees	**Site Slope Type:**	Downslope
Elevation of Receiver(m)	Default	**APZ/Separation(m):**	10

Fire Inputs

Veg./Flame Width(m):	30.38	**Flame Temp(K):**	1090

Radiant Heat Shielding Inputs

Shield Height(m):	0	**Shield Width(m):**	0

Calculation Parameters

Flame Emissivity:	95	**Relative Humidity(%):**	25
Heat of Combustion(kJ/kg	18600	**Ambient Temp(K):**	308
Moisture Factor:	5	**FDI:**	100

Program Outputs

Level of Construction:	BAL 29	**Peak Elevation of Receiver(m):**	3.73
Radiant Heat(kW/m2):	26.79	**Fire Intensity(kW/m):**	26083
Flame Length(m):	8.52	**Flame Angle (degrees):**	61
Shielded View Factor:	0	**Maximum View Factor:**	0.404
Rate Of Spread (km/h):	2.05	**Inner Protection Area(m):**	10
Transmissivity:	0.872	**Outer Protection Area(m):**	0

Short Fire Run Calculations

Fire Run(m):	83	**Length to Breadth Ratio:**	2.82
Full Ellipse Length(m):	68.74	**Headfire Backfire Ratio:**	29.85
Travel Duration (mins):	2.43	**Total Ellipse Length(m):**	85.78
ROS and H/B Ratio:	35.35		

BAL Thresholds	**BAL-40:**	**BAL-29:**	**BAL-19:**	**BAL-12.5:**	**10 kw/m2:**	**Elevation of Receiver:**
Asset Protection Zone(m):	6	9	13	18	26	6

Run Description: T3 - east

Vegetation Information

Vegetation Type: Hunter Macleay DSF

Vegetation Group: Dry Sclerophyll Forests (Shrub/Grass)

Vegetation Slope: 0 Degrees **Vegetation Slope Type:** Level

Surface Fuel Load(t/ha): 14 **Overall Fuel Load(t/ha):** 24.6

Vegetation Height(m): 0.9 Only Applicable to Shrub/Scrub and Vesta

Site Information

Site Slope 0 Degrees **Site Slope Type:** Downslope

Elevation of Receiver(m) Default **APZ/Separation(m):** 10

Fire Inputs

Veg./Flame Width(m): 54.91 **Flame Temp(K):** 1090

Radiant Heat Shielding Inputs

Shield Height(m): 0 **Shield Width(m):** 0

Calculation Parameters

Flame Emissivity: 95 **Relative Humidity(%):** 25

Heat of Combustion(kJ/kg 18600 **Ambient Temp(K):** 308

Moisture Factor: 5 **FDI:** 100

Program Outputs

Level of Construction: BAL 29 **Peak Elevation of Receiver(m):** 3.42

Radiant Heat(kW/m2): 24.05 **Fire Intensity(kW/m):** 21353

Flame Length(m): 7.37 **Flame Angle (degrees):** 68

Shielded View Factor: 0 **Maximum View Factor:** 0.364

Rate Of Spread (km/h): 1.68 **Inner Protection Area(m):** 10

Transmissivity: 0.869 **Outer Protection Area(m):** 0

Short Fire Run Calculations

Fire Run(m): 150 **Length to Breadth Ratio:** 2.82

Full Ellipse Length(m): 56.27 **Headfire Backfire Ratio:** 29.85

Travel Duration (mins): 5.36 **Total Ellipse Length(m):** 155.02

ROS and H/B Ratio: 28.94

BAL Thresholds	BAL-40:	BAL-29:	BAL-19:	BAL-12.5:	10 kw/m2:	Elevation of Receiver:
Asset Protection Zone(m):	5	8	12	18	28	6

Run Description: T4 - northeast down into dam/ riparian corridor

Vegetation Information

Vegetation Type: Hunter Macleay DSF

Vegetation Group: Dry Sclerophyll Forests (Shrub/Grass)

Vegetation Slope: 7.1 Degrees **Vegetation Slope Type:** Downslope

Surface Fuel Load(t/ha): 14 **Overall Fuel Load(t/ha):** 24.6

Vegetation Height(m): 0.9 Only Applicable to Shrub/Scrub and Vesta

Site Information

Site Slope 0 Degrees **Site Slope Type:** Downslope

Elevation of Receiver(m) Default **APZ/Separation(m):** 11

Fire Inputs

Veg./Flame Width(m): 19.4 **Flame Temp(K):** 1090

Radiant Heat Shielding Inputs

Shield Height(m): 0 **Shield Width(m):** 0

Calculation Parameters

Flame Emissivity: 95 **Relative Humidity(%):** 25

Heat of Combustion(kJ/kg 18600 **Ambient Temp(K):** 308

Moisture Factor: 5 **FDI:** 100

Program Outputs

Level of Construction: BAL 29 **Peak Elevation of Receiver(m):** 4.2

Radiant Heat(kW/m2): 27.17 **Fire Intensity(kW/m):** 34851

Flame Length(m): 10.51 **Flame Angle (degrees):** 53

Shielded View Factor: 0 **Maximum View Factor:** 0.41

Rate Of Spread (km/h): 2.74 **Inner Protection Area(m):** 11

Transmissivity: 0.872 **Outer Protection Area(m):** 0

Short Fire Run Calculations

Fire Run(m): 53 **Length to Breadth Ratio:** 2.82

Full Ellipse Length(m): 91.85 **Headfire Backfire Ratio:** 29.85

Travel Duration (mins): 1.16 **Total Ellipse Length(m):** 54.78

ROS and H/B Ratio: 47.23

BAL Thresholds	BAL-40:	BAL-29:	BAL-19:	BAL-12.5:	10 kw/m2:	Elevation of Receiver:
Asset Protection Zone(m):	8	11	14	18	24	6

Run Description: T6 - south into approved development site

Vegetation Information

Vegetation Type:	Grassland		
Vegetation Group:	Grassland		
Vegetation Slope:	2.9 Degrees	**Vegetation Slope Type:**	Upslope
Surface Fuel Load(t/ha):	6	**Overall Fuel Load(t/ha):**	6
Vegetation Height(m):	0	Only Applicable to Shrub/Scrub and Vesta	

Site Information

Site Slope	0 Degrees	**Site Slope Type:**	Downslope
Elevation of Receiver(m)	Default	**APZ/Separation(m):**	10

Fire Inputs

Veg./Flame Width(m):	100	**Flame Temp(K):**	1090

Radiant Heat Shielding Inputs

Shield Height(m):	0	**Shield Width(m):**	0

Calculation Parameters

Flame Emissivity:	95	**Relative Humidity(%):**	25
Heat of Combustion(kJ/kg	18600	**Ambient Temp(K):**	308
Moisture Factor:	5	**FDI:**	130

Program Outputs

Level of Construction:	BAL 29	**Peak Elevation of Receiver(m):**	3.59
Radiant Heat(kW/m2):	25.75	**Fire Intensity(kW/m):**	42889
Flame Length(m):	7.81	**Flame Angle (degrees):**	67
Shielded View Factor:	0	**Maximum View Factor:**	0.389
Rate Of Spread (km/h):	13.84	**Inner Protection Area(m):**	10
Transmissivity:	0.87	**Outer Protection Area(m):**	0

Short Fire Run Calculations

Fire Run(m):	0	**Length to Breadth Ratio:**	0
Full Ellipse Length(m):	0	**Headfire Backfire Ratio:**	0
Travel Duration (mins):	0	**Total Ellipse Length(m):**	0
ROS and H/B Ratio:	0		

BAL Thresholds	**BAL-40:**	**BAL-29:**	**BAL-19:**	**BAL-12.5:**	**10 kw/m2:**	**Elevation of Receiver:**
Asset Protection Zone(m):	0	0	0	0	0	0

Run Description: T7 - southwest

Vegetation Information

Vegetation Type:	Grassland		
Vegetation Group:	Grassland		
Vegetation Slope:	1.7 Degrees	**Vegetation Slope Type:**	Upslope
Surface Fuel Load(t/ha):	6	**Overall Fuel Load(t/ha):**	6
Vegetation Height(m):	0	Only Applicable to Shrub/Scrub and Vesta	

Site Information

Site Slope	0 Degrees	**Site Slope Type:**	Downslope
Elevation of Receiver(m)	Default	**APZ/Separation(m):**	10

Fire Inputs

Veg./Flame Width(m):	100	**Flame Temp(K):**	1090

Radiant Heat Shielding Inputs

Shield Height(m):	0	**Shield Width(m):**	0

Calculation Parameters

Flame Emissivity:	95	**Relative Humidity(%):**	25
Heat of Combustion(kJ/kg	18600	**Ambient Temp(K):**	308
Moisture Factor:	5	**FDI:**	130

Program Outputs

Level of Construction:	BAL 29	**Peak Elevation of Receiver(m):**	3.72
Radiant Heat(kW/m2):	26.86	**Fire Intensity(kW/m):**	46591
Flame Length(m):	8.14	**Flame Angle (degrees):**	66
Shielded View Factor:	0	**Maximum View Factor:**	0.406
Rate Of Spread (km/h):	15.03	**Inner Protection Area(m):**	10
Transmissivity:	0.87	**Outer Protection Area(m):**	0

Short Fire Run Calculations

Fire Run(m):	0	**Length to Breadth Ratio:**	0
Full Ellipse Length(m):	0	**Headfire Backfire Ratio:**	0
Travel Duration (mins):	0	**Total Ellipse Length(m):**	0
ROS and H/B Ratio:	0		

BAL Thresholds	**BAL-40:**	**BAL-29:**	**BAL-19:**	**BAL-12.5:**	**10 kw/m2:**	**Elevation of Receiver:**
Asset Protection Zone(m):	0	0	0	0	0	0

Run Description: T9 & T10

Vegetation Information

Vegetation Type:	Hunter Macleay DSF		
Vegetation Group:	Dry Sclerophyll Forests (Shrub/Grass)		
Vegetation Slope:	2.7 Degrees	**Vegetation Slope Type:**	Downslope
Surface Fuel Load(t/ha):	14	**Overall Fuel Load(t/ha):**	24.6
Vegetation Height(m):	0.9	Only Applicable to Shrub/Scrub and Vesta	

Site Information

Site Slope	0 Degrees	**Site Slope Type:**	Downslope
Elevation of Receiver(m)	Default	**APZ/Separation(m):**	18

Fire Inputs

Veg./Flame Width(m):	100	**Flame Temp(K):**	1090

Radiant Heat Shielding Inputs

Shield Height(m):	0	**Shield Width(m):**	0

Calculation Parameters

Flame Emissivity:	95	**Relative Humidity(%):**	25
Heat of Combustion(kJ/kg	18600	**Ambient Temp(K):**	308
Moisture Factor:	5	**FDI:**	100

Program Outputs

Level of Construction:	BAL 29	**Peak Elevation of Receiver(m):**	7.18
Radiant Heat(kW/m2):	28.58	**Fire Intensity(kW/m):**	25726
Flame Length(m):	16.11	**Flame Angle (degrees):**	63
Shielded View Factor:	0	**Maximum View Factor:**	0.443
Rate Of Spread (km/h):	2.02	**Inner Protection Area(m):**	14
Transmissivity:	0.849	**Outer Protection Area(m):**	4

Short Fire Run Calculations

Fire Run(m):	0	**Length to Breadth Ratio:**	0
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Travel Duration (mins):	0	**Total Ellipse Length(m):**	0
ROS and H/B Ratio:	0		

BAL Thresholds	**BAL-40:**	**BAL-29:**	**BAL-19:**	**BAL-12.5:**	**10 kw/m2:**	**Elevation of Receiver:**
Asset Protection Zone(m):	14	18	26	36	56	6