FLOOD IMPACT & RISK ASSESSMENT

515 Crookwell Rd, Kingsdale

Site: Lot 103 & 104 DP 1007433

Project: 24 large lot Residential Subdivision

DA: TBA

LGA: Goulburn Mulwaree Council

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REFERENCEES:

- Goulburn Mulwaree Council – Development Control Plan 2009
- Goulburn Mulwaree Council – Design Specification 2013
- Australian Rainfall & Runoff – A Guide to Flood Estimation – 2019
- Flood Risk Management Manual: The policy and manual for the management of flood liable land (2023) – Department of Planning and Environment – NSW Government
- Landcom Managing Urban Stormwater Soil and Construction Volume 1 (4th Edition 2004) known as the "blue book".
- Civil Engineering Concept Design & Flood Impact Sheet Set, Red 20027 Revision P0 by CivPlan Pty Ltd dated 5th June 2024
- The Estimation of Probable Maximum Precipitation in Australia: Generalised Short-Duration Method – Commonwealth Bureau of Meterology
- Goulburn Mulwaree Overland Flow Flood Study

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1. Introduction

1.1 Purpose and Scope

The purpose of this Flood Impact and Risk Assessment (FIRA) is to provide support for a planning proposal for the proposed 24 large lot residential subdivision at Lot 103 & 104 DP 1007433 at 515 Crookwell Rd, Kingsdale, NSW. The scope of this FIRA includes assessment of the pre- and post-development conditions and extent of the flood behaviour across the site and surrounding properties. This report will also include the findings of the analysis.

2. Project Overview & Hydrology

2.1 The Site

The site is located Lot 103 & 104 DP 1007433 at 515 Crookwell Rd, Kingsdale, NSW and is within the Goulburn Mulwaree Council LGA and the WaterNSW catchment area. Access to the site is via an unpaved driveway from Crookwell Road which is aligned north to south along the site's eastern boundary. It's a rural residential area is mostly composed of farms and rural properties. The unpaved driveway from Crookwell Road leads to a dwelling and associated sheds in the centre along the eastern boundary of lot 103 DP 1007433.

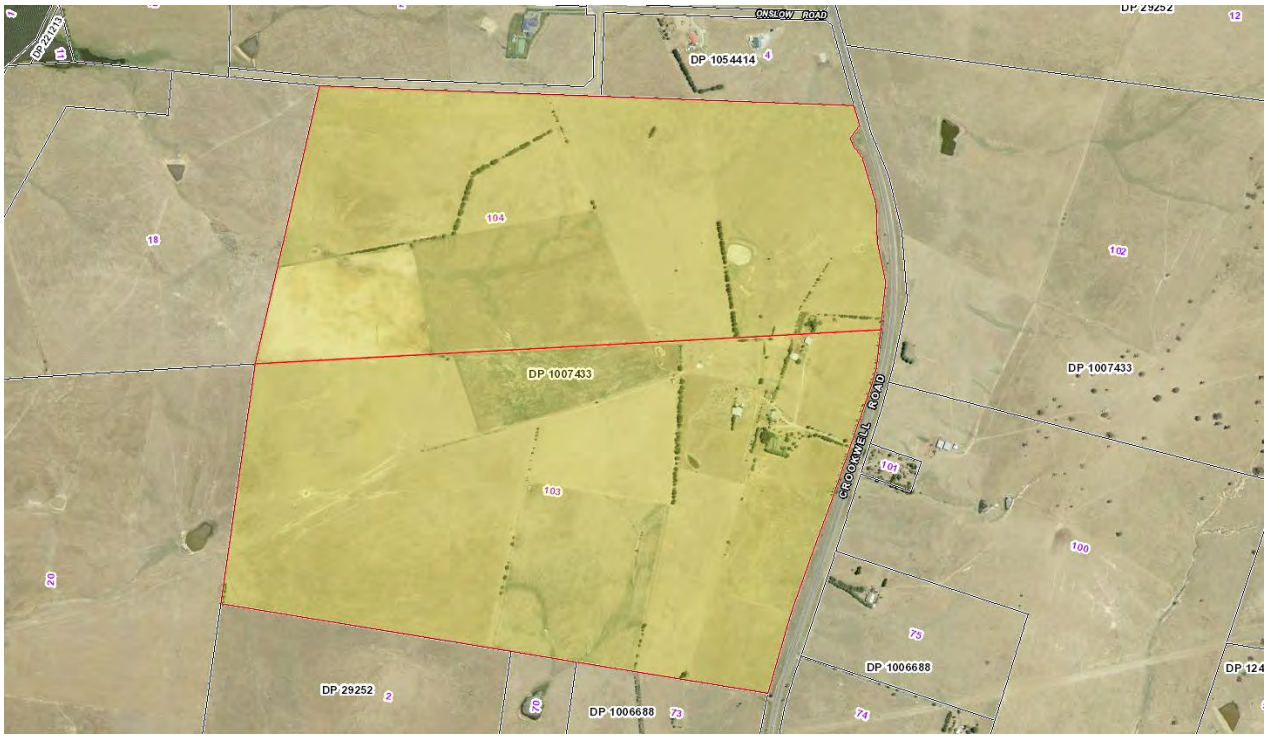

Figure 1: Site Location - NSW Imagery (SIX Maps)

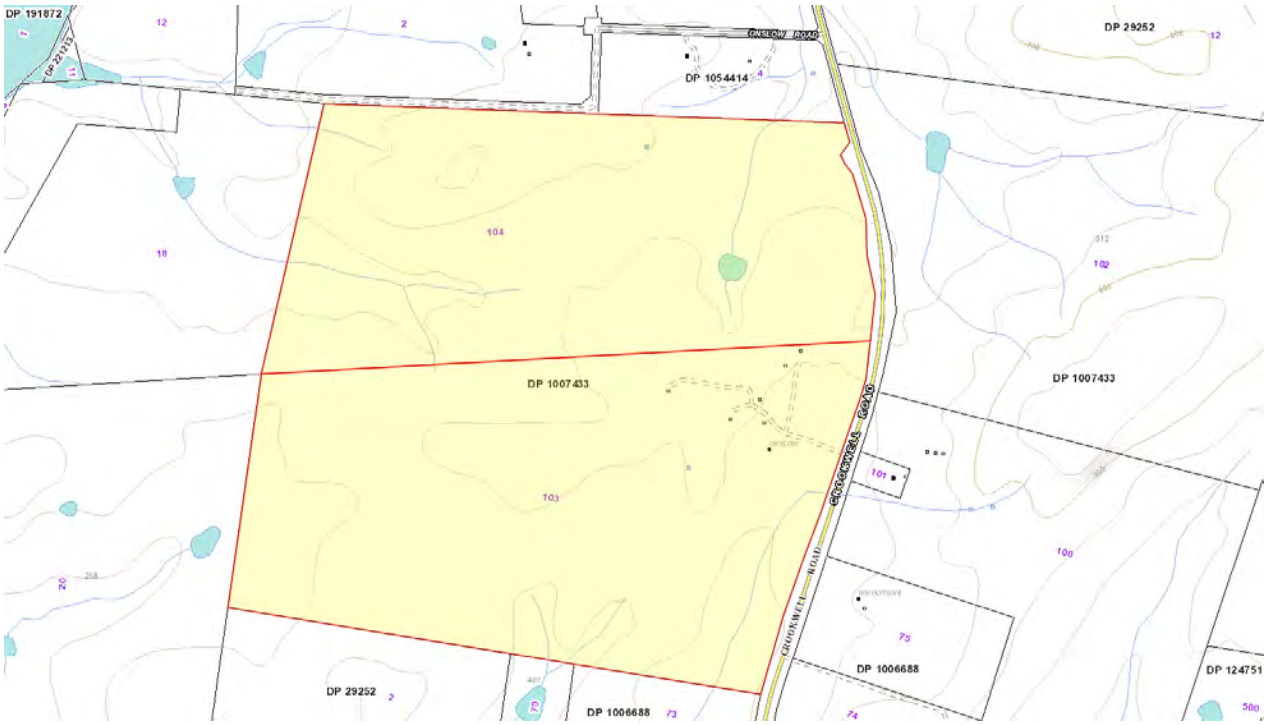

Figure 2: Site Location - NSW Topo (SIX Maps)

The total area of the site is approximately 195.71ha with lot 103 DP 1007433 making up approximately 90.97ha of the area and lot 104 making up approximately 104.74ha. The developable land area of the site only (Figure 3) is being assessed for this report, which is 54.68ha. This area is being considered due to the catchment bypassing nearby Sooley Dam to the west and flowing directly towards the Wollondilly River, downstream of the dam. The area is generally undulating and dips at approximately 6-7% falling from the northern extent at approximately RL 685 to RL 670 approximately 760m to the south.

Currently there is a driveway that leads to the main dwelling and extensions of the driveway that lead to multiple large rural storage sheds and silos west and north of the dwelling. Further north, a gravel road leads to rural sheds and fenced stock yards. The remainder of the property is divided and fenced paddocks for different purposes, including sheep grazing and cropping. A paddock to the south of the dwelling contains a bore (ID: GW050231).

There are four mapped watercourses within the site, running to the south and north of the site. The watercourses to the north flows into nearby Sooley Dam and is considered undevelopable. The dam within the developable area is proposed to be retained as part of the subdivision works and all riparian buffers have been implemented as shown in Figure 3.

2.2 Proposed Development

The subject land is currently the subject of a proposed ongoing planning proposal. The current site is proposed to be subdivided into 24 large residential lots of minimum 2ha as shown in Figure 3.

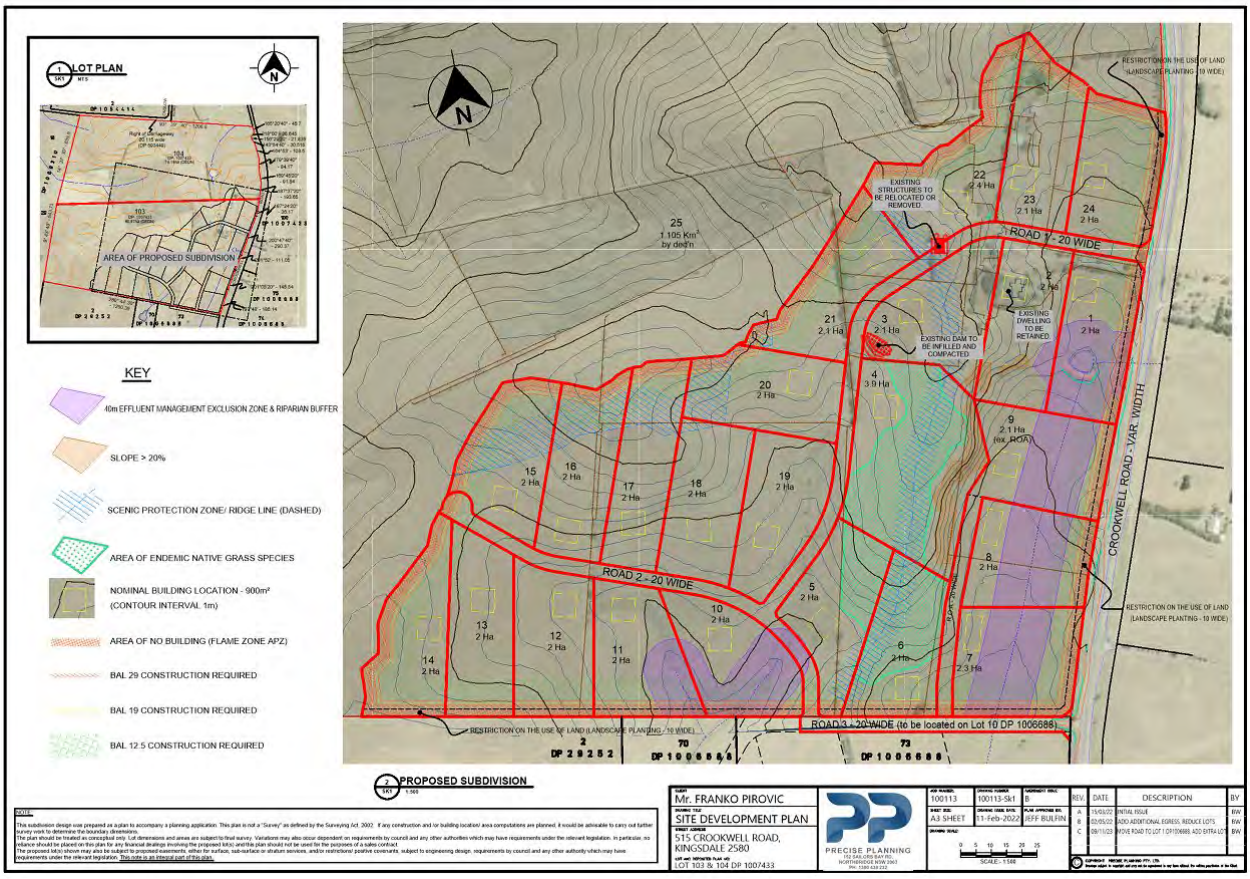

Figure 3: Proposed Development

This report will outline the pre and post-development conditions of the site, and the overland flows through and around the proposed development using hydrology and 2D hydraulic modelling.

3. Hydrological Modelling

3.1 Model Adoption

Hydrological modelling was conducted in DRAINS using RAFTS storage routing model.

RAFTS storage routing models can model larger catchments using a lumped approach by assuming heterogeneity with sub-catchments to account for the storage and retardance of flows that occurs within the sub-catchments. Such models account for slope and roughness and use a loss model to produce a hydrograph at the sub-catchment outlet which can be input into HEC-RAS for unsteady 2D hydraulic flow analysis.

The RAFTS hydrological model was chosen because it is widely used and accepted across Australia within the industry and has been shown to be insensitive to initial conditions.

The DRAINS model configuration is shown in Figure 4.

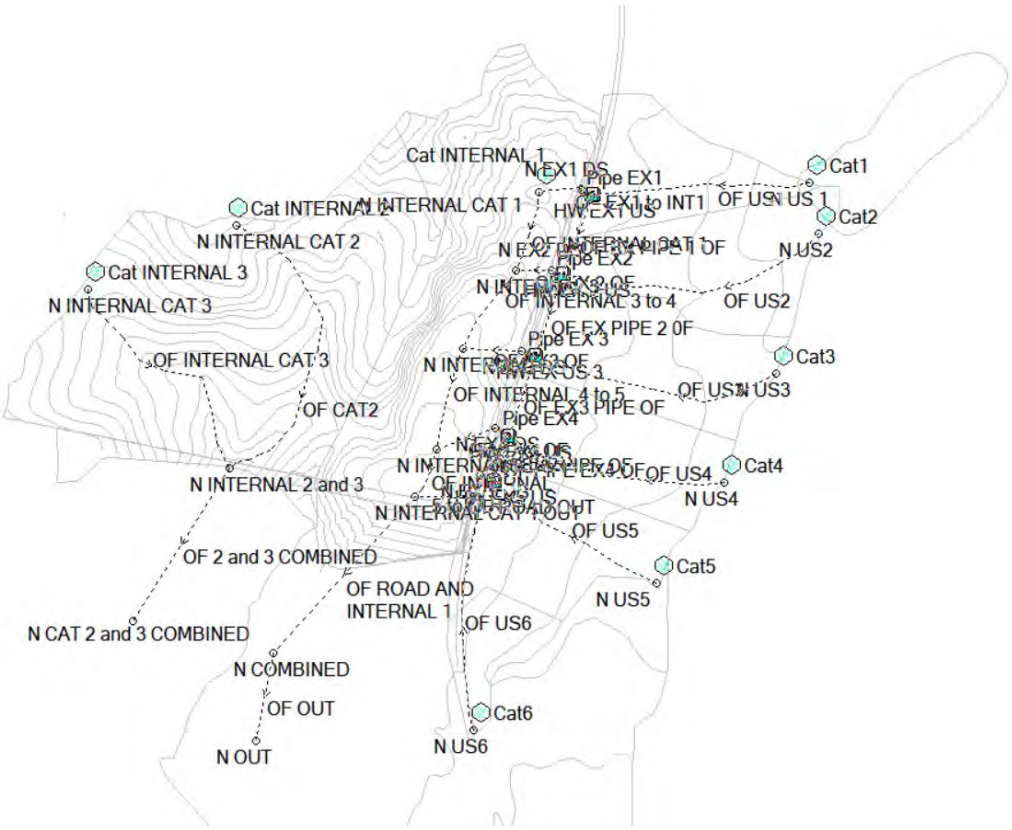

Figure 4: DRAINS Model Configuration

3.2 Catchment Areas

The catchment area draining to through the site was derived using 5m LiDAR Digital Elevation Models (DEM) sourced from ELVIS (http://elevation.fsdf.org.au).

DEM contour data was imported into HEC-HMS to map sub-catchments boundaries and determine their areas and overland flow paths. Impervious percentages for each catchment were determined as per Goulburn Mulwaree Council guidelines for stormwater modelling. Impervious percentages have been confirmed by digitising polygons of impervious areas (i.e. roads and roofs) from aerial photographs. Sub-catchment slopes were derived using slope analysis conducted on the above terrain data.

The Manning's coefficients for the DRAINS (RAFTS) model have been critically analysed for each catchment and overland flow path individually (see Table 1), depending on the land use type and surface. See Figure 5 below for the various Manning's coefficients used for different land applications.

Surface Type	Suggested n Values
Concrete Pipes or Box Sections	0.012
Concrete (trowel finish)	0.012 - 0.015
Concrete (formed, without finishing)	0.013 - 0.018
Concrete (gunite)	0.016 - 0.020
Bricks	0.014 - 0.016
Pitchers or Dressed Stone in Mortar	0.015 - 0.017
Random Stones in Mortar or Rubble Masonry	0.020 - 0.035
Rock Lining or Rip-Rap	0.025 - 0.030
Earth (clear)	0.018 - 0.025
Earth (with weeds or gravel)	0.025 - 0.035
Rock Cut	0.035 - 0.040
Short Grass	0.030 - 0.035
Long Grass	0.035 - 0.050

Channels

Flow across Parks	0.35
Flow across Rural Residential land	0.30
Flow across Residential (2a)	0.21
Flow across Residential (2b)	0.11
Flow across Industrial	0.06
Flow across Commercial	0.04
Flow across Paved Areas	0.01
Flow across Asphalt Roads	0.02
Flow across Gravel Areas	0.02

Overland Flow Retardance

Land Use Type	Manning 'n'
Residential areas – high density	0.2 – 0.5
Residential areas – low density	0.1 – 0.2
Industrial/commercial	0.2 – 0.5
Open pervious areas, minimal vegetation (grassed)	0.03 – 0.05
Open pervious areas, moderate vegetation (shrubs)	0.05 – 0.07
Open pervious areas, thick vegetation (trees)	0.07 – 0.12

Land Use Type	Manning 'n'
Waterways/channels – minimal vegetation	0.02 - 0.04
Waterways/channels – vegetated	0.04 – 0.1
Concrete lined channels	0.015 – 0.02
Paved roads/car park/driveways	0.02 – 0.03
Lakes (no emergent vegetation)	0.015 – 0.35
Wetlands (emergent vegetation)	0.05 – 0.08
Estuaries/Oceans	0.02 – 0.04

Figure 5: ARR19 Book 6 Section 6.2.1 & 6.2.2

The manning's coefficients have also been precisely adopted depending on the type of land cover and surface on the HEC-RAS modelling, which will be detailed on the following topics.

The sub-catchment breakup is shown below in Table 1 and represented on Civil Engineering Concept Design plans, sheet 20027-FIRA-426 which can be found in Appendix A.

Catchment	Area (ha)	Land Use Type	n'	Imp. (%)	Longest Flowpath Length (km)	Longest Flowpath Slope (%)	Description
Cat 1	7.037	Open pervious area, minimal vegatation	0.03	5.0%	0.436	1.6%	Flow affects site
Cat 2	9.576	Open pervious area, minimal vegatation	0.03	4.4%	0.546	6.3%	Flow affects site
Cat 3	9.270	Open pervious area, minimal vegatation	0.03	2.2%	0.503	4.4%	Flow affects site
Cat 4	8.506	Open pervious area, minimal vegatation	0.03	3.2%	0.445	2.2%	Flow affects site
Cat 5	8.504	Open pervious area, minimal vegatation	0.03	6.4%	0.382	7.4%	Flow affects site
Cat 6	3.200	Open pervious area, minimal vegatation	0.03	11.0%	0.500	2.7%	Flow affects site
Cat Internal 1	23.612	Open pervious area, minimal vegatation	0.03	1.6%	0.266	1.3%	Flow affects site
Cat Internal 2	15.704	Open pervious area, minimal vegatation	0.03	0.2%	0.625	2.0%	Flow affects site
Cat Internal 3	16.075	Open pervious area, minimal vegatation	0.03	0.0%	0.490	1.7%	Flow affects site
TOTAL AREA (ha)	**101.484**						

Table 1: Sub-Catchments Summary

3.3 DRAINS Modelling Input Parameters

The parameters adopted for DRAINS hydrological modelling are shown in Table 2.

Parameter	Value Adopted	Justification/ Source
Impervious Area Initial Loss (mm)	1	Typical value for impervious areas.
Impervious Area Continuing Loss (mm/h)	0	Typical value for impervious areas.
Pervious Area Initial Loss (mm)	9.6	The value recommended in ARR Data Hub in accordance with recommended NSW loss hierarchy
Pervious Area Continuing Loss (mm/h)	2.7	The value recommended in ARR Data Hub in accordance with recommended NSW loss hierarchy
BX	1	RAFTS Default
Sub-catchment Area (km^2)	Varies	Refer to Table 1
Impervious Area (%)	Varies	Refer to Table 1 Estimated by digitising polygons of impervious areas (i.e. roads and roofs) from aerial imagery and survey.
Sub-catchment Slope (%)	Varies	Refer to Table 1 Determined from slope analysis of LiDAR DEM data for each sub-catchment.
Manning's 'n'	0.03	Value for open pervious area, minimal vegetation.

Table 2: DRAINS Hydrological Parameters Adopted

3.4 Rainfall Data

IFD design rainfall depth data and temporal patterns were derived in accordance with Australian Rainfall and Runoff (2019) using the bureau of Meteorology's 2019 Rainfall IFD on-line Data System and are provided in Appendix B and C.

The temporal patterns for the East Coast South region were used as this covers the site (latitude -34.698 South, longitude 149.701 East).

A copy of the rainfall depths for the range of storm durations can be found in the Appendix C.

Flows were routed along each link using DRAINS premium hydraulic model which applies the full S.t Venant equations of unsteady flow to overland flow routes. This allows water levels along these routes to be determined accurately, allowing for varied water surface flow profiles, including subcritical and supercritical flows. It also accounts for storage effects in overland flow routes.

3.5 Existing Pipe Road Crossings

The existing pipes along Crookwell Road were represented in the DRAINS model and the parameters for each structure can be seen in Table 3.

DRAINS – Existing Culverts				
DRAINS Culvert Name	**Size (mm)**	**Upstream Invert RL (m)**	**Downstream Invert RL (m)**	**Overflow Description**
PIPE EX 1	750	*675.16*	*675.057*	Along Crookwell Rd, weir height downstream driveway
PIPE EX 2	2x600	*674.001*	*673.285*	Along Crookwell Rd, weir height downstream driveway
PIPE EX 3	450	*672.395*	*671.809*	Along Crookwell Rd, weir height downstream driveway
PIPE EX 4	750	670.93	*669.707*	Along Crookwell Rd, weir height downstream driveway
PIPE EX5	600	670.62	*669.419*	SAG, overflow across Crookwell Rd

Table 3: Overland Flow Paths Results Summary

3.6 Results

The DRAINS model was run in 'premium' hydraulic mode for storm durations ranging from 5 minutes to 9.0 hours for a range of rainfall events: 1%, 0.2% and 0.05% AEP. The 6.0-hour storm was analysed due to the volume of water during the storm event.

The Probable Maximum Flood (PMF) was also analysed using DRAINS model. The Probable Maximum Precipitation has been calculated using the GSDM method in accordance with the document guidelines *The Estimation of Probable Maximum Precipitation in Australia: Generalised Short-Duration Method* prepared by Commonwealth Bureau of Meteorology dated June 2003. The calculations can be found in Appendix D.

Critical storm duration refers to the duration of design storm that will result in the highest peak flood flows or levels at a particular location. The critical duration is influenced by various factors including upstream catchment area and may vary between locations of interest throughout a catchment or study area. With the introduction of ARR 2019 a representative temporal pattern must also be identified which produces a peak flow closest to but not less than the design peak flow (that being the average of peak flows from an ensemble set of 10 temporal patterns).

Table 4 below shows the overland flow paths from DRAINS that have been used as inflow boundary conditions in HEC-RAS for unsteady 2D flow analysis, including peak flows and critical storms for the range of rainfall events analysed as mentioned above.

Flood Impact Assessment - Overland Flow Paths				
DRAINS Flow Path Name	**HEC-RAS Boundary Condition Name**	**AEP**	**Critical Storm**	**Peak Flow**
OF EX1 to INT1	Inflow 1	*1%*	*6 hour burst, Storm 9*	0.372
		0.2%	*6 hour burst, Storm 2*	0.508
		0.05%	*6 hour burst, Storm 9*	0.668
		PMF	*6 hour burst*	0.878
OF EX2	Inflow 2	*1%*	*6 hour burst, Storm 2*	0.240
		0.2%	*6 hour burst, Storm 10*	0.242
		0.05%	*6 hour burst, Storm 5*	0.244
		PMF	*6 hour burst*	0.281
OF EX 3	Inflow 3	*1%*	*6 hour burst, Storm 3*	0.302
		0.2%	*6 hour burst, Storm 1*	0.339
		0.05%	*6 hour burst, Storm 5*	0.346
		PMF	*6 hour burst*	0.397
OF EX 4	Inflow 4	1%	*6 hour, Storm 9*	0.317
		0.2%	*6 hour burst, Storm 5*	0.428
		0.05%	*6 hour burst, Storm 5*	0.576
		PMF	*6 hour burst*	1.15
OF ROAD OUT	Inflow 5	1%	*6 hour burst, Storm 5*	0.304
		0.2%	*6 hour burst, Storm 5*	*0.439*
		0.05%	*6 hour burst, Storm 5*	0.549
		PMF	*6 hour burst*	25.0
OF INTERNAL 1	Internal 1	1%	6 hour burst, Storm 5	1.420
		0.2%	*6 hour burst, Storm 5*	1.94
		0.05%	*6 hour burst, Storm 5*	2.43
		PMF	*6 hour burst*	8.58
OF CAT 2	Inflow 6	1%	6 hour burst, Storm 5	0.998
		0.2%	*6 hour burst, Storm 9*	1.39
		0.05%	*6 hour burst, Storm 2*	1.77
		PMF	*6 hour burst*	5.83
OF INTERNAL 3	Inflow 7	1%	6 hour burst, Storm 5	0.997
		0.2%	6 hour burst, Storm 5	1.37
		0.05%	*6 hour burst, Storm 9*	1.75
		PMF	*6 hour burst*	5.91

Table 4: Overland Flow Paths Results Summary

Appendix C shows the hydrograph data for the respective flow paths extracted from DRAINS model (as described in Table 4) for all rainfall events.

3.7 Calibration

In the absence of recorded gauges within the catchment area, calibration of the hydrologic model was not able to be undertaken in the current study, and model validation approaches were applied to the hydraulic model in comparison to the Goulburn Floodplain Risk Management Study dated July 2022 as described on subject 4.7 of this assessment.

Unfortunately, the Goulburn Floodplain Risk Management Study covers a much larger catchment area, and there are no hydrographs and/or peak flows near the subject site of 515 Crookwell Rd that could be used to calibrate our hydrologic model.

Also, Regional Flood Frequency Estimation Model (RFFEM) is not applicable due to catchment size. See Appendix G for the results of the RFFEM, results have a lower accuracy with catchments of smaller size and shape.

3.8 Post Development Model Adoption

The pre-development hydrological DRAINS model using RAFTS storage routing model and existing Mannings and impervious areas was used for the overland flow paths peak flows. The increase in impervious area will be getting offset by the PSD/SSR calculations represented on Civil Engineering Concept Design plans, sheet 20027-FIRA-426 which can be found in Appendix A. The post development land cover Mannings has been provided within the HEC-RAS model and can be seen in section 4 of this report.

4. Hydraulic Modelling

Modelling was conducted using an unsteady 2D Hydraulic HEC-RAS model.

4.1 Digital Elevation Model (DEM)

A digital elevation model (DEM) over the study area was established using a land survey within the property for more accurate data of the existing condition of the site.

Using this 1m DEM, a two- dimensional flow area (i.e. active cells) was defined over the subject site and surrounding areas over an area large enough to accommodate the expected flows. The survey data used can be seen in Figure 6.

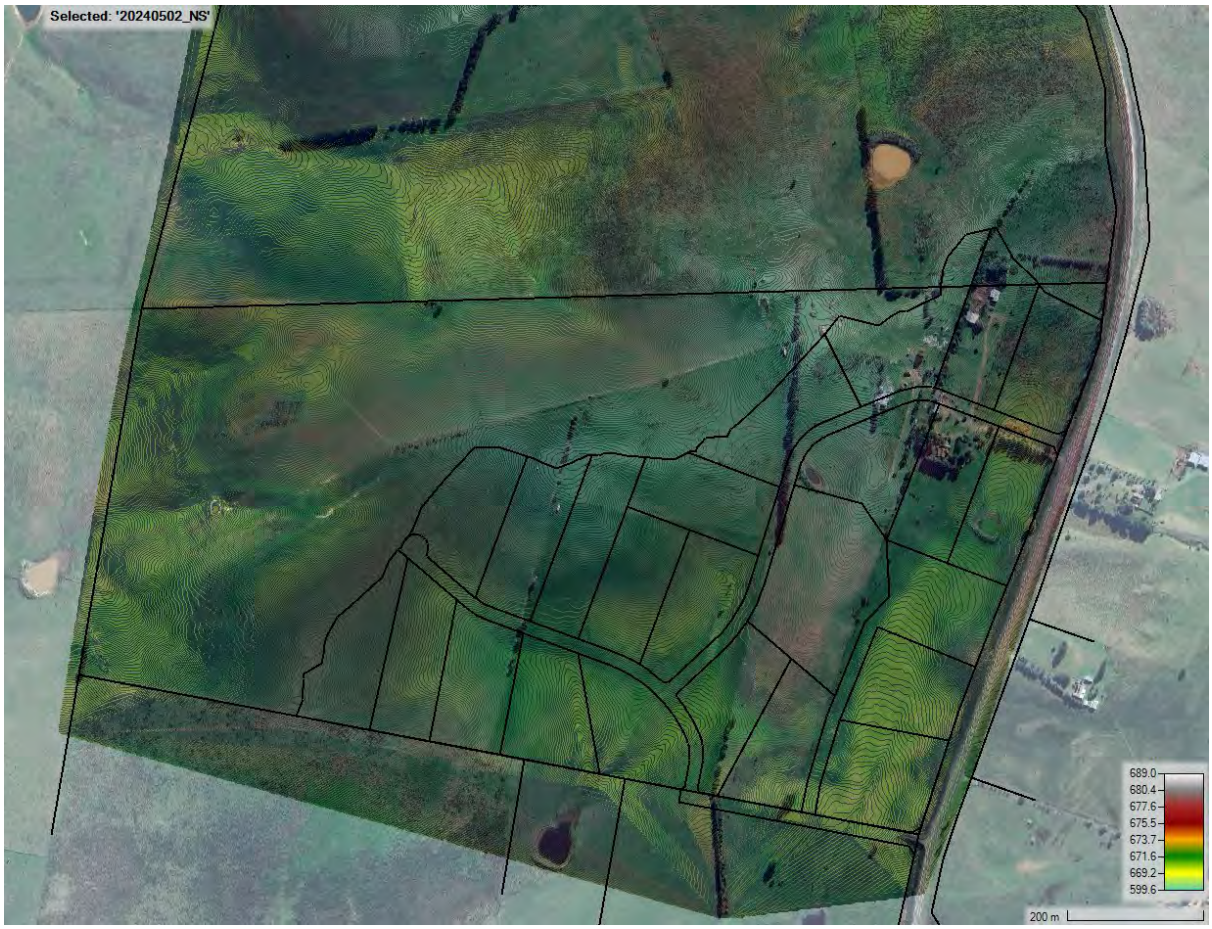

Figure 6: Unmodified DEM (Pre-Development)

The 1m DEM grid was imported into HEC-RAS and used as the basis for development to create the terrain model for the pre- and post-development.

4.2 Surface Modification

The DEM was used as a base surface for the post-development scenario

The post-development scenario was modelled in Civil Site Design, and the design TIN surface has been exported into HEC-RAS and combined with the pre-development DEM to represent the post-development layout to be used for hydraulic analysis.

Terrain modification was used in HEC-RAS to create flow paths which would reflection the onsite environment. Where the post-development scenario surface ties into the existing surface there is a step up which is not representative of the site conditions. A 100m opening was created downstream of culvert 1 through to the existing dam south of the site was created to replicate the existing overland flow path. Smaller 20m openings were created at the inlets and outlets of the culverts to allow to water to enter and exit the culverts with ease. See the two profiles used in Figure 7 below.

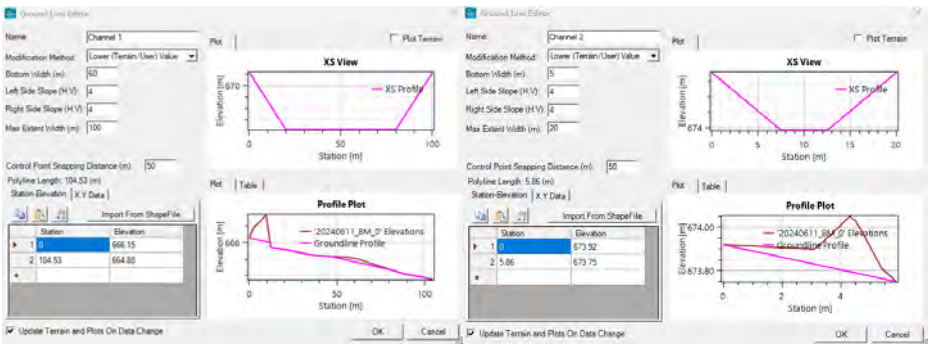

Figure 7: Unmodified DEM (Pre-Development)

The post-development modified surface is shown in Figure 8.

Figure 8: Design Surface (Post-Development)

4.3 2D Flow Area and Boundary Conditions

A two-dimensional flow area (mesh) and geometry has been created for pre and post-development scenarios, extended downstream and upstream of the site to analyse the flow characteristics and the impacts on the adjoining properties.

The flow hydrograph for the upstream boundary conditions was derived from DRAINS using the results for the rainfall events previously mentioned for the internal and external catchments that affect the site and surrounding.

The inflow boundaries were extended along the upstream face of the two-dimensional domain at each location over a sufficient length to enable the model to appropriately distribute the flow to the cells that are wet. At any given time-step, only a portion of the boundary condition line may be wet, therefore only the cells in which the water surface elevation is higher than their outer boundary face terrain will receive water.

Flows leaving the two-dimensional area were defined with a normal depth downstream boundary condition with a friction slope of 4.0% which is based on the gradient of the land at the location of the boundary according to the original 1m DEM surface. The friction slope method uses the Manning's equation to compute a normal depth for each given flow, based on the cross section underneath the two-dimensional boundary condition line and is computed on a per cell basis.

The extension of the flow area and boundary condition lines in HEC-RAS for pre and post development scenarios are shown in figure 9 and 10 below.

Figure 9: 2D Pre Development Flow Area and Boundary Conditions

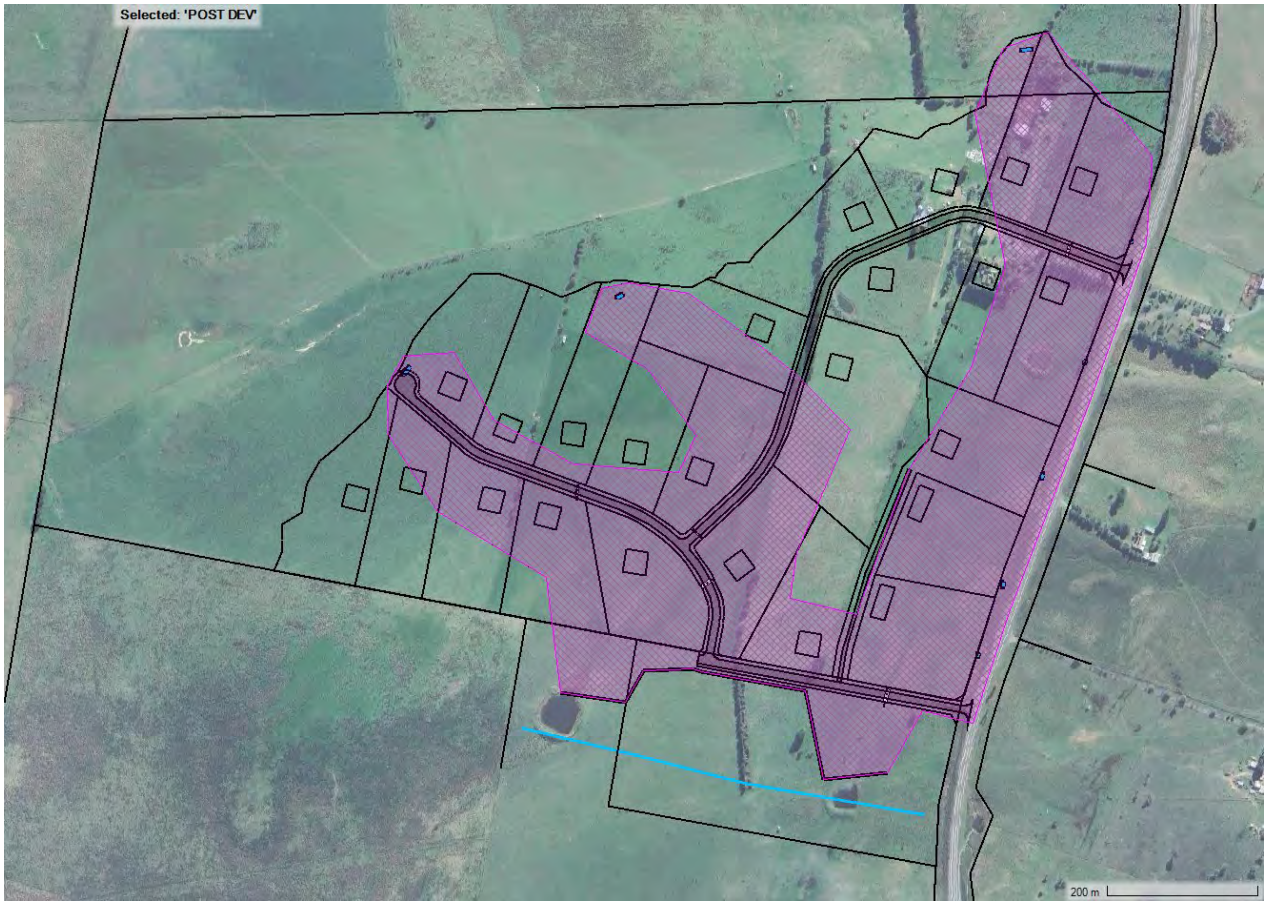

Figure 10: Post Development 2D Flow Area and Boundary Conditions

4.4 2D Hydraulic Model – Manning's Roughness

The Manning's Roughness coefficient was refined on the most critical areas within the 2D flow mesh in HEC-RAS according to the landcover and type of surface that best represents the pre and post-development condition of the subject site and surrounding area and adopted as shown in Table 5 and

Figure 11 and 12 below. The landcover data was obtained from SEED Mapping Portal for pre development.

Description	Manning's (N)
Open Areas with Low/Medium Vegetation	0.03
Roads	0.02

Table 5: 2D Hydraulic Model – Manning's Roughness

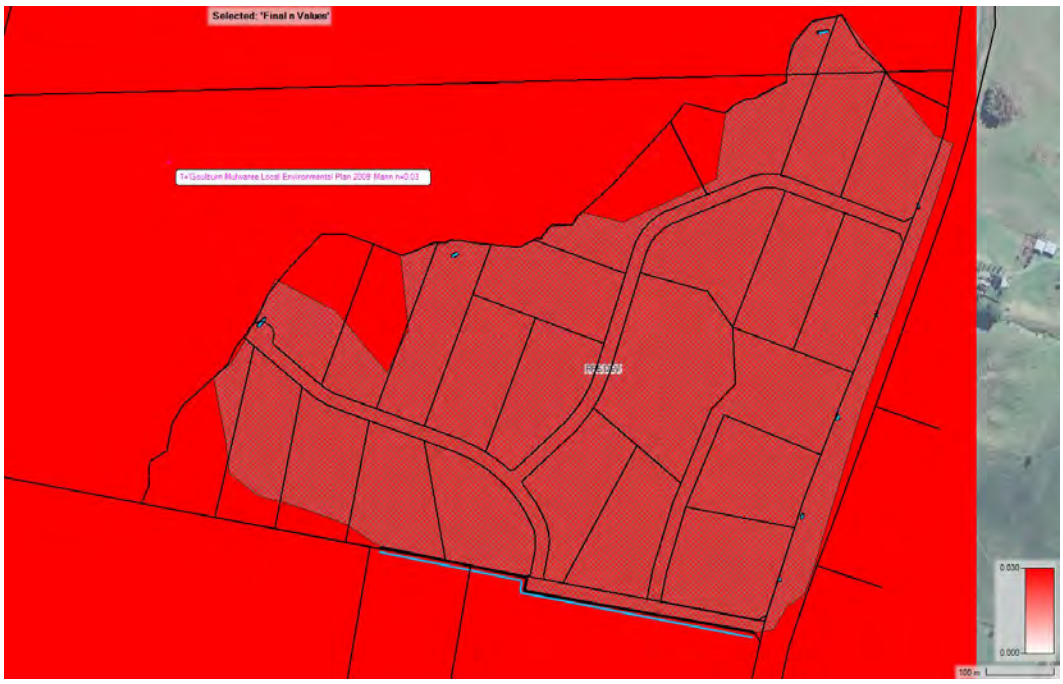

Figure 11: 2D Hydraulic Model – Pre Development Manning's Roughness

Figure 12: 2D Hydraulic Model – Post Development Manning's Roughness

4.5 Hydraulic Structures

The proposed culverts within the development have been included in the HEC-RAS model as a SA/2D Area connection. Figure 13 below shows the location of the proposed hydraulic structures for the post-development scenario.

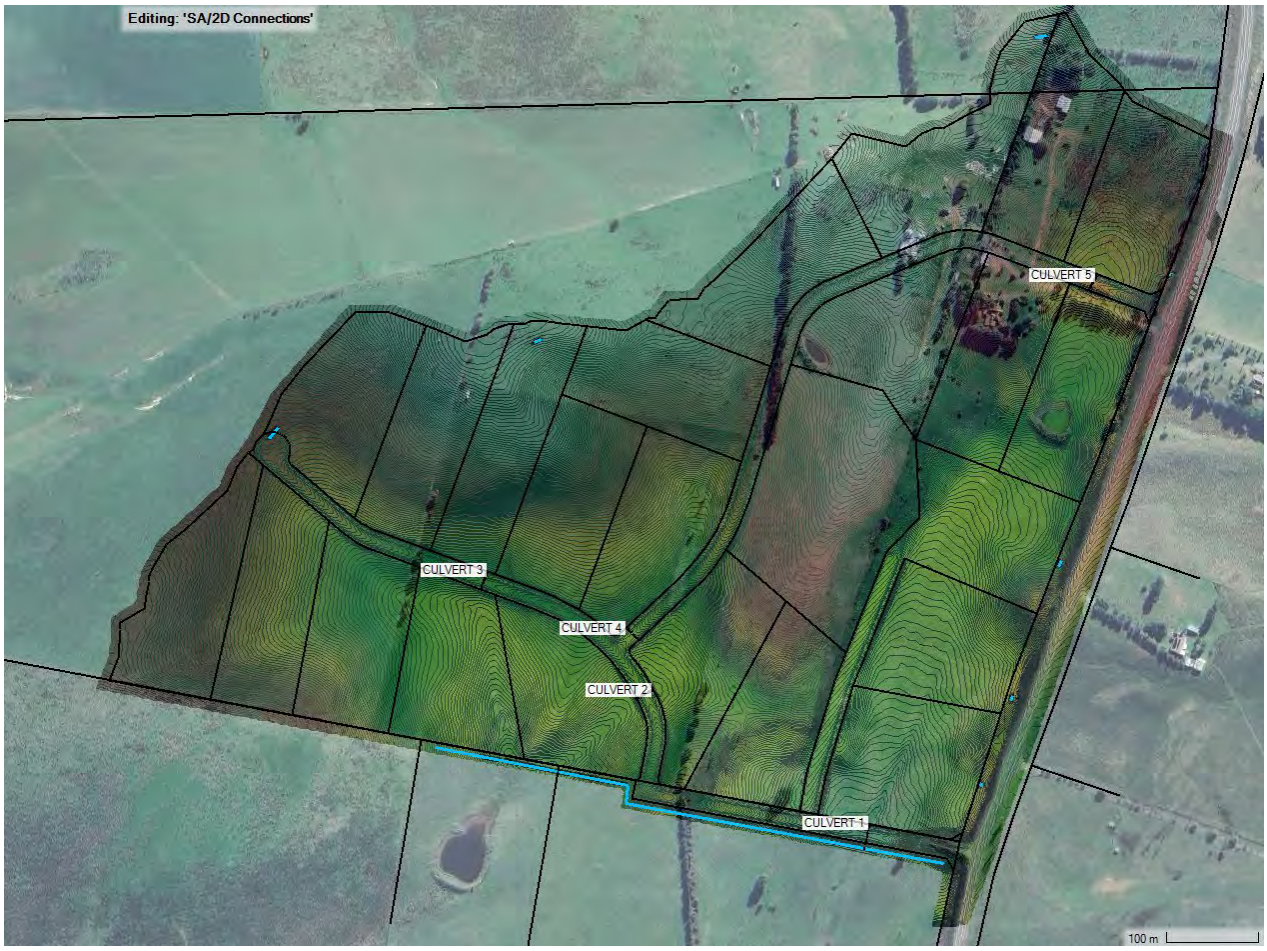

Figure 13: Culvert Locations (Post-Development)

The parameters adopted for the proposed hydraulic structures included on the 2D model are shown in Table 6 below. It is to note that the sizes of these box culverts have been sized using a DRAINS model and are to be sized in more detail at a later stage.

Parameter	Culvert 1	Culvert 2	Culvert 3	Culvert 4	Culvert 5
Size (m)WxH	4.8x0.9	4.8x0.9	2.4x0.9	2.4x0.9	4.8x0.9
Length (m)	22	26	20	19	21
Entrance Loss Coefficient	0.2	0.2	0.2	0.2	0.2
Manning's	0.1	0.1	0.1	0.1	0.1
Upstream Invert RL (m)	666.20	669.91	671.75	671.40	673.9
Downstream Invert RL (m)	666.1	669.86	670.99	670.70	673.88

Table 6: HEC-RAS Culvert Parameters

4.6 Results

The 2D Hydraulic HEC-RAS model was run in unsteady mode with variable timestep controlled by Courant condition using the diffusion wave computational method. The model was used to simulate the flows for the 1%, 0.2%, 0.05% AEP and PMF.

Please refer to the civil engineering & flood impact sheet set provided in Appendix A for the mapped results extracted from HEC-RAS where the flood characteristics (depth, velocity, water surface elevation, d x v and WSE compare) for the pre- and post-development scenarios are shown in detail for the storm events for the 1%, 0.2%, 0.05% AEP and PMF.

All storms display similar characteristics for the pre-development depths and WSE with depths increasing as the event increasing. The areas of greater depths are within the natural watercourse, existing dams and towards the back of lot 24 where the existing site is steep or has existing trees and sheds which may cause the water to build up and increase velocity. For the post development scenario, the water can be seen to travel down the proposed swales and to the sags of the roads where the water will outlet. HEC-RAS cannot model pit and pipe network, therefore it can be seen that the water builds up around the sags which will be dealt with at detailed design phase through a detailed DRAINS model analysing the proposed swales and sags of the roads. The major sags of roads 01, 02 and 03 have all been raised by a minimum of 200mm above the existing surface to allow for the roads to be constructed above the 1% AEP flood waters. There is allowance for these roads to be raised higher during the detailed design phase when the 1% AEP will be analysed to improve overland flows paths. Further design will be undertaken around the intersection of road 01 and 02 to remove the sag on road 01 by changing the cross fall of road 02 at the intersection to one way cross-fall. This will help with the ponding in lot 5 due to the increase in levels where the road 02 sag is.

Figures 1-4 in Appendix B show the 'was dry now wet' comparison between pre and post development scenarios. The main areas that are now wet in the post development scenarios are around the sags of the roads. The sags were forced to be where the existing watercourses flow to allow for the water to go in its natural direction. The sizing of the road crossing and the roadside swales will be undertaken at the detailed design phase which will help relieve these depths and velocities. It is clear via these figures that the development has no major upstream or downstream affects to the surrounding neighbours due to the water continuing along its natural course with no greater flows or depths compared to the pre-development. Figure 15 below shows the areas where the water is now flowing in the post-development scenario. These depths will be reduced with a pit and pipe network along these roads.

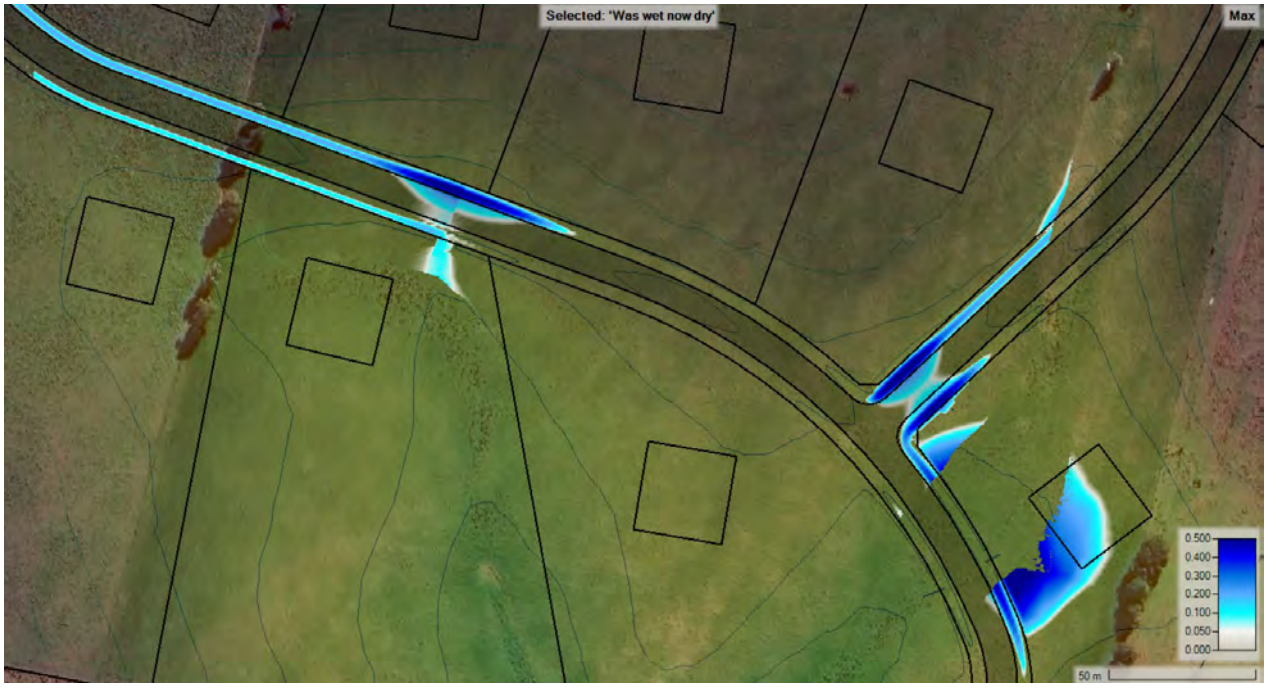

Figure 14: *2D Hydraulic Model – Post Development – Was dry now wet - 1% AEP Event*

Figures 5-8 in Appendix B show the Hazard categories for the pre-development scenarios. The site is mostly hazard category 1 and 2 of the ARR19 Hazard Classifications which is generally safe. The areas of the site which exceed these categories are very steep and the flood water velocities exceed the limiting factor or in existing dams where the depth exceeds the maximum. These maximum values which can be seen in Figure 15 below. Where the water outlet conditions are in the model the hazard category also reaches its maximum due to the velocity of the water leaving the model. These maximum flows are only for a short period of time. The PMF event shows the worst case results for these areas due to the amount of water exceeding the maximum velocity.

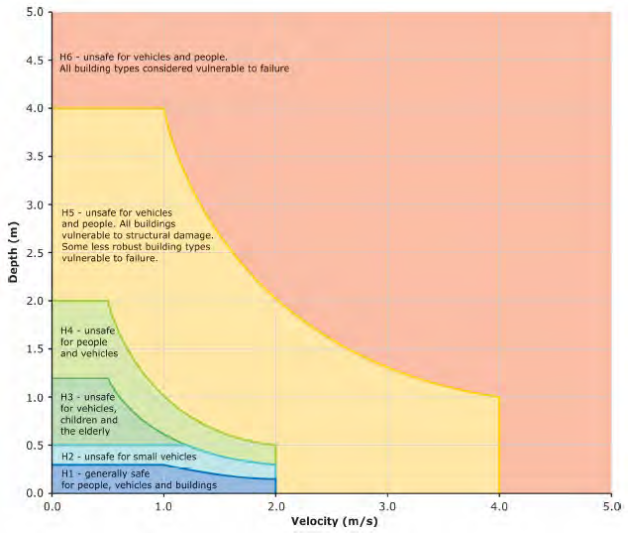

Table 6.7.3. Combined Hazard Curves - Vulnerability Thresholds (Smith et al., 2014)

Hazard Vulnerability Classification	Description
H1	Generally safe for vehicles, people and buildings.
H2	Unsafe for small vehicles.
H3	Unsafe for vehicles. children and the elderly.
H4	Unsafe for vehicles and people.
H5	Unsafe for vehicles and people. All buildings vulnerable to structural damage. Some less robust buildings subject to failure.
H6	Unsafe for vehicles and people. All building types considered vulnerable to failure.

Table 6.7.4. Combined Hazard Curves - Vulnerability Thresholds Classification Limits (Smith et al., 2014)

Hazard Vulnerability Classification	Classification Limit (D and V in combination)	Limiting Still Water Depth (D)	Limiting Velocity (V)
H1	D*V ≤ 0.3	0.3	2.0
H2	D*V ≤ 0.6	0.5	2.0
H3	D*V ≤ 0.6	1.2	2.0
H4	D*V ≤ 1.0	2.0	2.0
H5	D*V ≤ 4.0	4.0	4.0
H6	D*V > 4.0	-	-

Figure 15: ARR19 Book 6 Section 6.7.3 & 6.7.4

Figures 9-12 in Appendix B show the Hazard categories for the post development scenarios. The site is mostly hazard category 1 and 2 of the ARR19 Hazard Classifications which is generally safe. The areas of the site which exceed these categories are very steep and the flood water velocities exceed the limiting factor or in existing dams where the depth exceeds the maximum. These maximum values can be seen in Figure 15. The roadside swales, especially where the sags of the roads are all have higher categories due to the depth of water ponding in these areas. Post development culverts have been modelled as 4.8x0.9m boxed culverts which all have been design with 300mm freeboard to top of soffit. HEC-RAS does not allow for pits along the culverts, therefore water along the sags could not be picked up via these culverts causing greater depths. The sags of the road will be investigated further at detailed design phase via a DRAINS model.

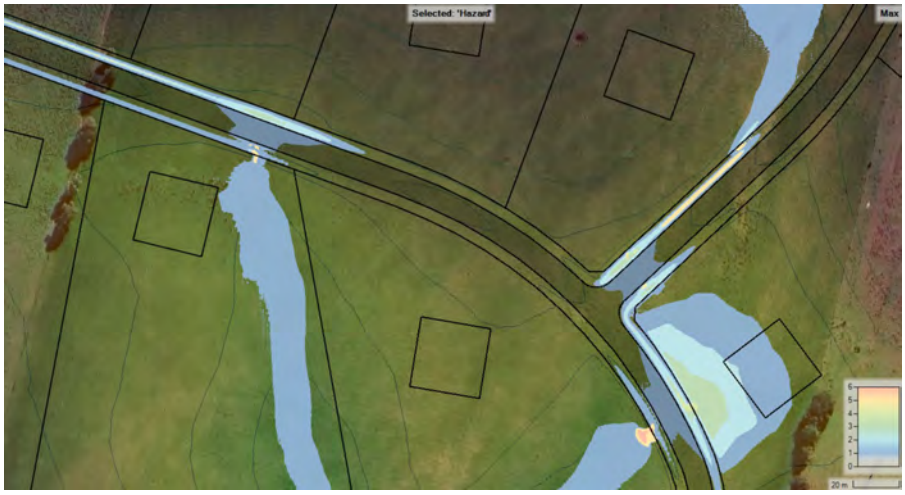

Figure 16: *2D Hydraulic Model – Post Development – Hazard Categories - 1% AEP Event*

Where the outlet conditions are in the model the hazard category reaches its maximum due to the velocity of the water leaving the model and the depth of the water going into the existing dams. These maximum flows are only got for a short period of time. The PMF event shows the worst results for these areas due to the amount of water exceeding the maximum velocity. Access and egress from the site to Crookwell Rd can always be achieved for all storms via road 01. At road 03, where the outlet condition is from the model, the access and egress is cut off in the PMF for two and a half hours of the 6 hour storm. As mentioned before the lots around road 03 back onto Crookwell Rd and can still egress via Road 02 and Road 01 as these areas are category 1 or 2 throughout the whole storm except for the initial wave.

All post-development lots within the mapped watercourses are impacted by flows. The building envelopes of lots 1, 5, 8, 9, 11, 15 and 24 all need to have suitable building envelopes above the 1% AEP flood levels plus a freeboard of 500mm. All mentioned lots are within the hazard category 1 for the 1% event with the sags where the pipe crossings are the only sections where the hazard categories exceed these categories which will be treated via pit and pipe network. FPLs have been added to building envelopes that are affected by the PMF flood water. See table below for all maximum WSE's for the building envelopes of each lot and the Flood Planning Level (FPL) for each lot.

	1% AEP WSE	FPL	PMF WSE
Lot 1	673.37	673.87	673.60
Lot 2	NA	NA	NA
Lot 3	NA	NA	NA
Lot 4	NA	NA	NA
Lot 5	670.28	670.78	670.52
Lot 6	NA	NA	NA
Lot 7	NA	667.81	667.71
Lot 8	668.93	669.43	669.03
Lot 9	669.75	670.25	669.89
Lot 10	NA	NA	NA
Lot 11	670.13	671.22	671.12
Lot 12	NA	672.05	671.95
Lot 13	NA	NA	NA
Lot 14	NA	NA	NA
Lot 15	675.02	675.52	675.19
Lot 16	NA	NA	NA
Lot 17	NA	NA	NA
Lot 18	NA	NA	NA
Lot 19	NA	NA	NA
Lot 20	NA	NA	NA
Lot 21	NA	NA	NA
Lot 22	NA	NA	NA
Lot 23	NA	NA	NA
Lot 24	675.77	676.41	676.31

Table 7: Flood Planning Levels

All FPL's have been checked against the PMF's WSE and all are above the WSE of the PMF event. The water for the 0.05% AEP event is contained within the existing swale but for the PMF it spills at the sag

and affects lot 7 and 12. FPLs have been added to these lots but the depth of water in the swales will be reduced via a pit and pipe network during the detailed design phase.

4.7 2D Hydraulic Model Validation

The pre-development water depth of this assessment has been compared to the Goulburn Mulwaree Overland Flow Flood Study dated September 2022 for the 1% AEP. The comparison is shown in Figures 17 and 18 below.

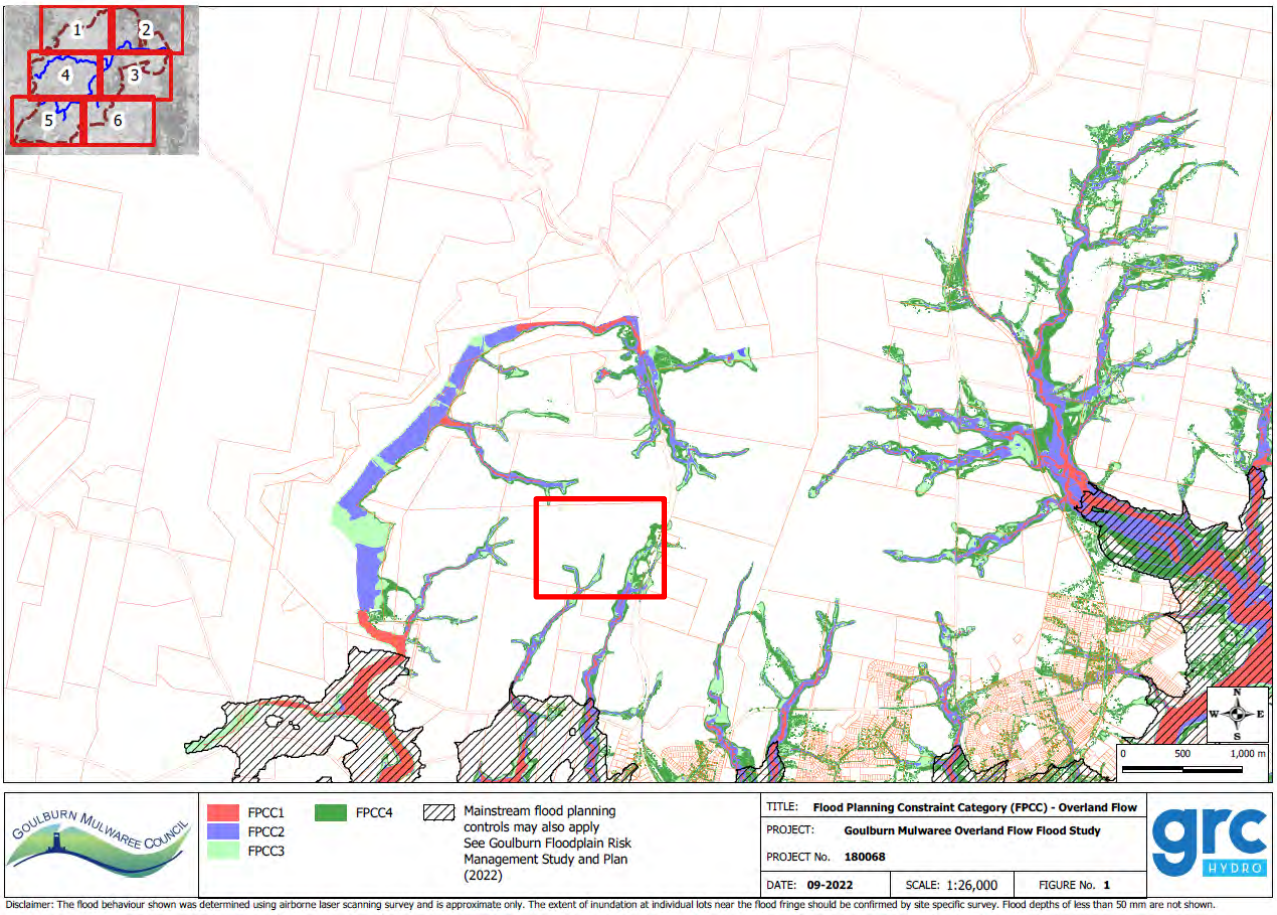

Figure 17: Flood Depth (Goulburn Mulwaree Overland Flow Flood Study) – 1% AEP

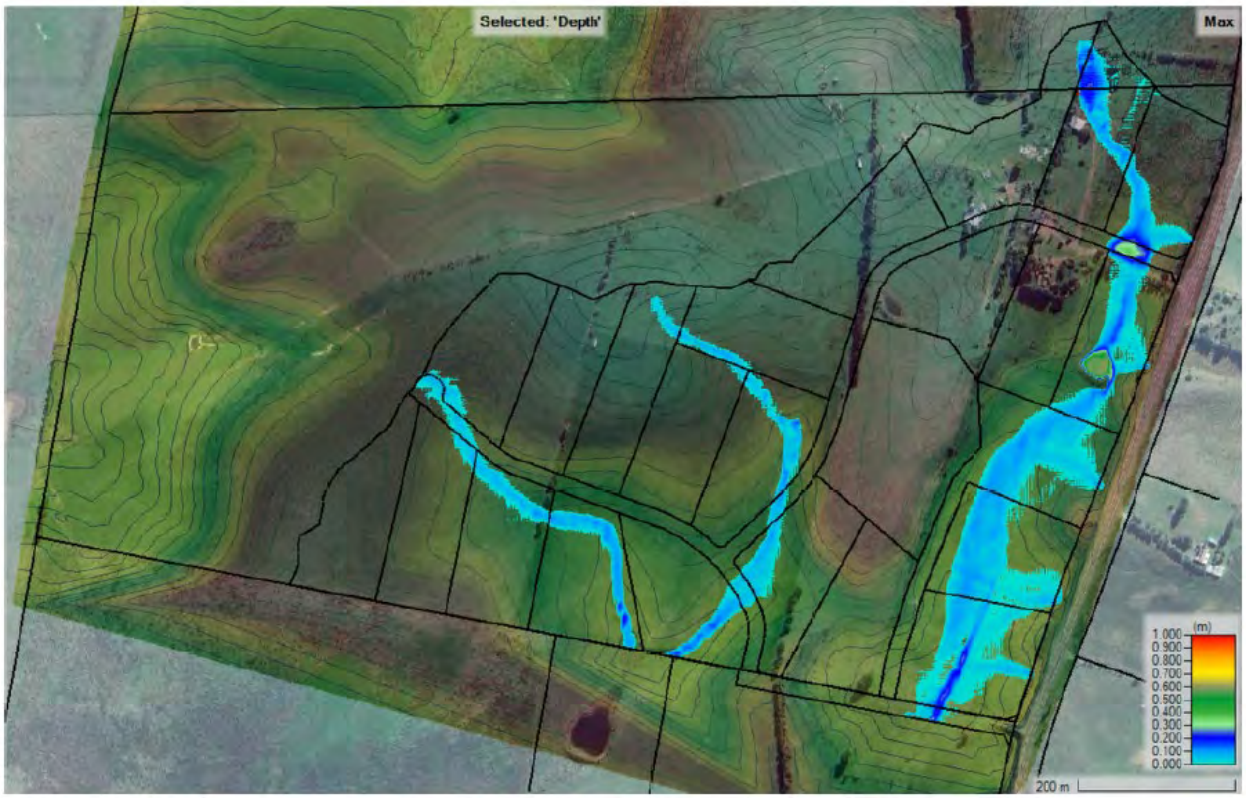

Figure 18: Flood Depth (Subject Study) – 1% AEP

As shown in figures 17 and 18, the flood area of this assessment is similar to the Goulburn Mulwaree Overland Flow Flood Study for the 1% AEP event. Although the figures are not on the same scale, it is observed similarity on both studies' results by comparing the indicated flood mapping. For example, comparing the width of the flood mapping, it is extremely similar on both studies. The Goulburn Flood mapping does not have any depths to compare the results to.

The Goulburn Mulwaree Overland Flow Flood Study is analysing a much larger area and not focused in one subject its which makes it difficult to critically compare the results especially with no depths.

5. Conclusions

This report has summarised the outcomes of a flood impact assessment that was completed to provide support for a planning proposal for the proposed 24 large lot residential subdivision at Lot 103 & 104 DP 1007433 at 515 Crookwell Rd, Kingsdale, NSW, by analysing the flood behaviour for the pre- and post-development scenarios and the impacts on the flood characteristics of the subject site.

Pre- and post-development conditions have been modelled using HEC-RAS and performed using unsteady flow analysis, with internal and external catchments and hydrographic data being analysed with storm durations up to 6.0 hours using DRAINS (RAFTS model). Please refer to civil engineering & flood assessment sheet set reference number 20240613_20027_0-CIVILS- *Revision 0* prepared by CivPlan Pty Ltd in Appendix A for all the flood mappings and analysis performed for this assessment, including depths, velocities, WSE, depth x velocities and WSE comparison map for both scenarios for the 1%, 0.2%, 0.05% AEP and PMF events. All extra results have been shown in Appendix B which includes 'was dry now wet' and hazard categories.

This assessment demonstrates that the development is viable in terms of a flood perspective. Lots 1, 5, 8, 9, 11, 15 and 24 are all affected by the 1% AEP event and need to have building envelopes above the 1% AEP water levels plus 500mm freeboard. These levels have been checked against the PMF and are all above the PMF WSE without any need of retaining walls or fill. Lots 7 and 12 building envelopes are affected by the PMF flood water and both require building envelopes above these levels. Roadside swales throughout this area of the site will be investigated further via a pit and pipe network at the detailed design phase to reduce the depth of water. The major sags of roads 01, 02 and 03 have all been raised by a minimum of 200mm above the existing surface to allow for the roads to be constructed above the 1% AEP flood waters. All roads have minimal depths in the 1% storm and are all have hazard category 1 or 2 which is safe. There is allowance for these roads to be raised higher during the detailed design phase when the 1% AEP will be analysed to improve overland flows paths.

Regarding the impacts caused by the development for all storm events, it's conclusive that the increase in water depth is mostly contained within the development site, with all 'was dry now wet' areas contained to the swales and sags of the proposed roads. All these areas will be dealt with via a pit and pipe network at the detailed design phase. It is clear that the development does not affect the downstream properties of the subject site. The water continues on its natural course with no increase of depth or velocity.

Concluding, the only significant impacts due to the development are observed for the PMF storm event, however this is an extreme rare flood event, very difficult to predict due to uncertainty of the factors and available data. Comparing the pre and post development depths and velocities, the development is not affecting any surrounding properties. There is no increase in velocity or depth of the water exiting the site which will affect the downstream properties. Safe access and egress to the post development lots of the subject site are still maintained with roads 01 and 02 generally categorised as H1 and H2. Further analysis will be undertaken at the detailed design phase to treat areas that exceed the H1 category via a stormwater drainage pit and pipe network with associated overland flow paths.

Appendix A

Catchment Analysis & Flood Maps

515 CROOKWELL RD, KINGSDALE, NSW - LOT 103 & 104 D.P 1007433
24 LOT RESIDENTIAL SUBDIVISION
CIVIL ENGINEERING CONCEPT DESIGN & FLOOD IMPACT ASSESSMENT

GOULBURN MULWAREE COUNCIL PLANNING PROPOSAL APPLICATION

SITE LOCALITY PLAN

1:8000 @ A1

DRAWING SCHEDULE INDEX			
	SHEET	TITLE	REV
CIVIL ENGINEERING CONCEPT DESIGN	20027-401	COVER AND INDEX	P0
	20027-402	GENERAL ARRANGEMENT PLAN	P0
	20027-403	EXISTING AND SITE PREPARATION PLAN	P0
	20027-404	SOIL AND WATER MANAGEMENT PLAN	P0
	20027-405	SOIL AND WATER MANAGEMENT DETAILS	P0
	20027-406	BULK EARTHWORKS PLAN	P0
	20027-407	ROAD LAYOUT PLAN ZONE 1 OF 6	P0
	20027-408	ROAD LAYOUT PLAN ZONE 2 OF 6	P0
	20027-409	ROAD LAYOUT PLAN ZONE 3 OF 6	P0
	20027-410	ROAD LAYOUT PLAN ZONE 4 OF 6	P0
	20027-411	ROAD LAYOUT PLAN ZONE 5 OF 6	P0
	20027-412	ROAD LAYOUT PLAN ZONE 6 OF 6	P0
	20027-413	ROAD 01 MC01 LONGITUDINAL SECTIONS	P0
	20027-414	ROAD 01 MC01 & ROAD 03 MC03 LONGITUDINAL AND TYPICAL SECTIONS	P0
	20027-415	ROAD 02 MC02 LONGITUDINAL SECTIONS	P0
	20027-416	ACCESS ROAD MC04 LONGITUDINAL AND TYPICAL SECTIONS	P0
	20027-417	DRAINAGE LAYOUT PLAN ZONE 1 0F 6	P0
	20027-418	DRAINAGE LAYOUT PLAN ZONE 2 0F 6	P0
	20027-419	DRAINAGE LAYOUT PLAN ZONE 3 0F 6	P0
	20027-420	DRAINAGE LAYOUT PLAN ZONE 4 0F 6	P0
	20027-421	DRAINAGE LAYOUT PLAN ZONE 5 0F 6	P0
	20027-422	DRAINAGE LAYOUT PLAN ZONE 6 0F 6	P0
	20027-423	STORMWATER QUANTITY MODELLING PLAN	P0
	20027-424	STORMWATER QUALITY MODELLING PLAN 1 OF 2	P0
	20027-425	STORMWATER QUALITY MODELLING PLAN 2 OF 2	P0
FLOOD IMPACT ASSESSMENT	20027-426	CATCHMENT ANALYSIS PLAN	P0
	20027-427	DRAINS MODELLING RESULTS	P0
	20027-428	PRE & POST DEVELOPMENT 1% & 0.2% AEP RESULTS - DEPTHS	P0
	20027-429	PRE & POST DEVELOPMENT 0.05% AEP% PMF RESULTS - DEPTHS	P0
	20027-430	PRE & POST DEVELOPMENT 1% & 0.2% AEP RESULTS - WSE	P0
	20027-431	PRE & POST DEVELOPMENT 0.05% AEP & PMF RESULTS - WSE	P0
	20027-432	PRE & POST DEVELOPMENT 1% & 0.2% AEP RESULTS - DxV	P0
	20027-433	PRE & POST DEVELOPMENT 0.05% AEP & PMF - DxV	P0
	20027-434	PRE & POST DEVELOPMENT 1%, 0.2% & 0.05% AEP & PMF - WSE COMPARE	P0

GENERAL OVERVIEW

1:5000 @ A1

0 50 100 150 200 250
SCALE:- 1:5000

0 100 200 300 400 500
SCALE:- 1:8000

SCALE: AS NOTED
SIZE: A1
DATE OF SURVEY: 22 JUNE 2020
DATUM: MGA2020, AHD

SURVEY	AS	REV	DESCRIPTION	DATE
DESIGN	JE	P0	PRELIMINARY PLANNING PROPOSAL DESIGN	13 JUN 24
DRAWN	JE			
CHECKED	TP			
APPROVED	JW			

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JOB NAME: 24 LARGE LOT RESIDENTIAL SUBDIVISION
LOCATION: 515 CROOKWELL RD, KINGSDALE, NSW - LOT 103 & 104 D.P. 1007433
LGA: GOULBURN MULWAREE COUNCIL
CLIENT: ALIMACO PTY LTD C/- PRECISE PLANNING PTY LTD
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DRAWING: COVER AND INDEX

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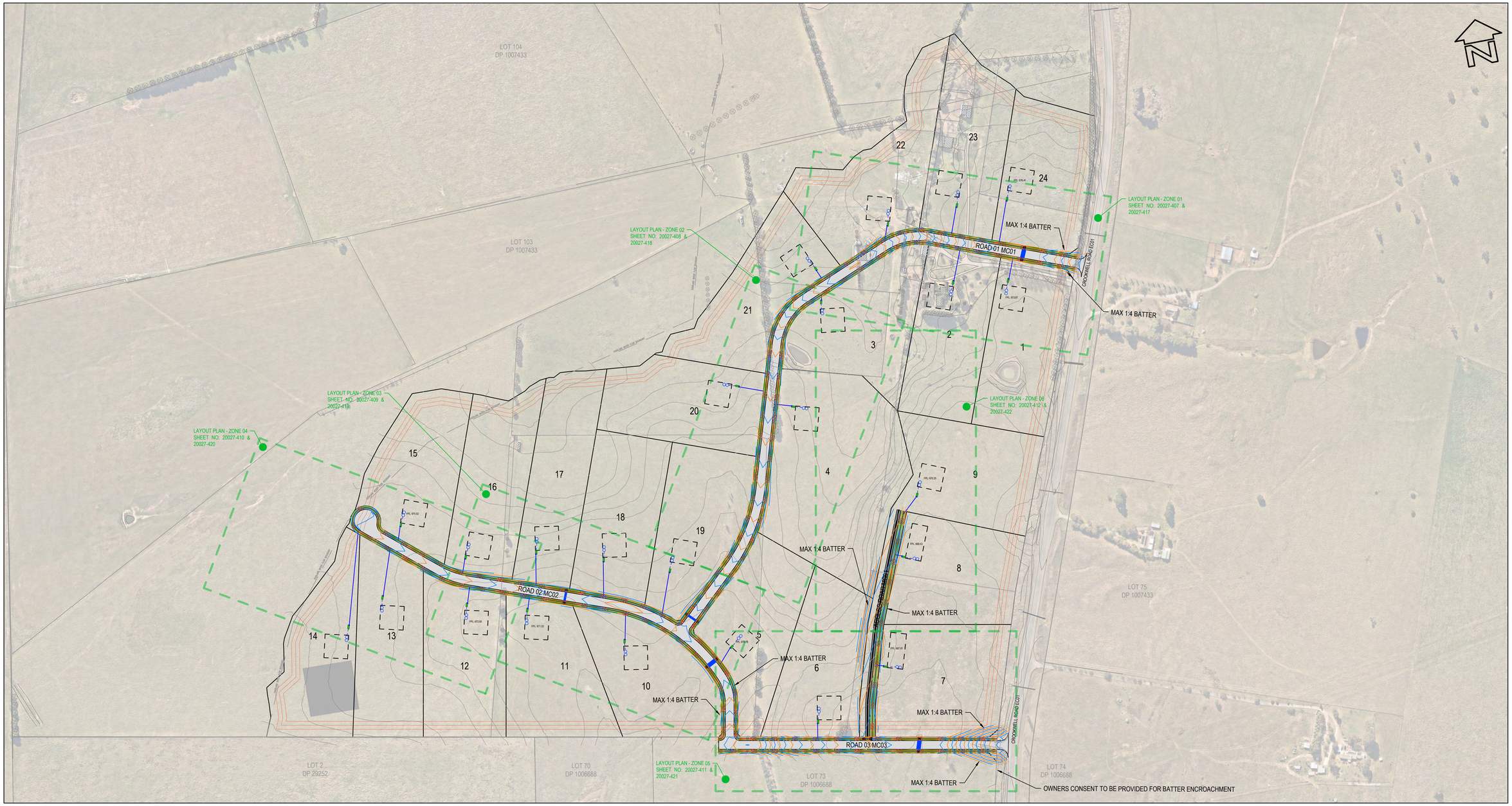
JOB-DRAWING NUMBER	REV
20027-401	P0



GENERAL ARRANGEMENT

1:2500 @ A1

SHEET LEGEND

DESCRIPTION	DETAIL	DESCRIPTION	DETAIL	DESCRIPTION	DETAIL	DESCRIPTION	DETAIL
BARRIER KERB 'KG'	KG	KERB / PEDESTRIAN RAMP		SUB-SOIL AND FLUSH POINTS	SS FS	STORMWATER LOCATION (EXISTING)	SW
ROLL KERB 'RK'	RK	NOMINAL CONTROL LINE		KERB ADAPTOR / OUTLET		SEWER LOCATION (EXISTING)	
EDGE STRIP 'ES'	ES	ROAD PAVEMENT		BUILDING ENVELOPE		WATER LOCATION (EXISTING)	
KERB ONLY 'KO'	KO	PATH PAVING (CONCRETE)		BOUNDARIES		TELSTRA LOCATION (EXISTING)	
MOUNTABLE SF TYPE KERB 'SF'	SK	CONTOURS (MAJOR)	25	TREE AND LANDSCAPING		FIBRE OPTICS LOCATION (EXISTING)	
DISH DRAIN 'DD'	DD	CONTOURS (MINOR)		DRAINAGE PIT - 1.8m PIT WITH LINTEL		ELECTRICAL LOCATION (EXISTING)	
VEHICULAR CROSSING		RETAINING WALL STRUCTURES		DRAINAGE PIT - 2.4m SAG WITH LINTEL		GAS LOCATION (EXISTING)	G

0 25 50 75 100 150

SCALE:- 1:2500

WARNING

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DATUM: MGA2020, AHD

SURVEY	AS		
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APPROVED	JW		

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P0	PRELIMINARY PLANNING PROPOSAL DESIGN	13 JUN 24

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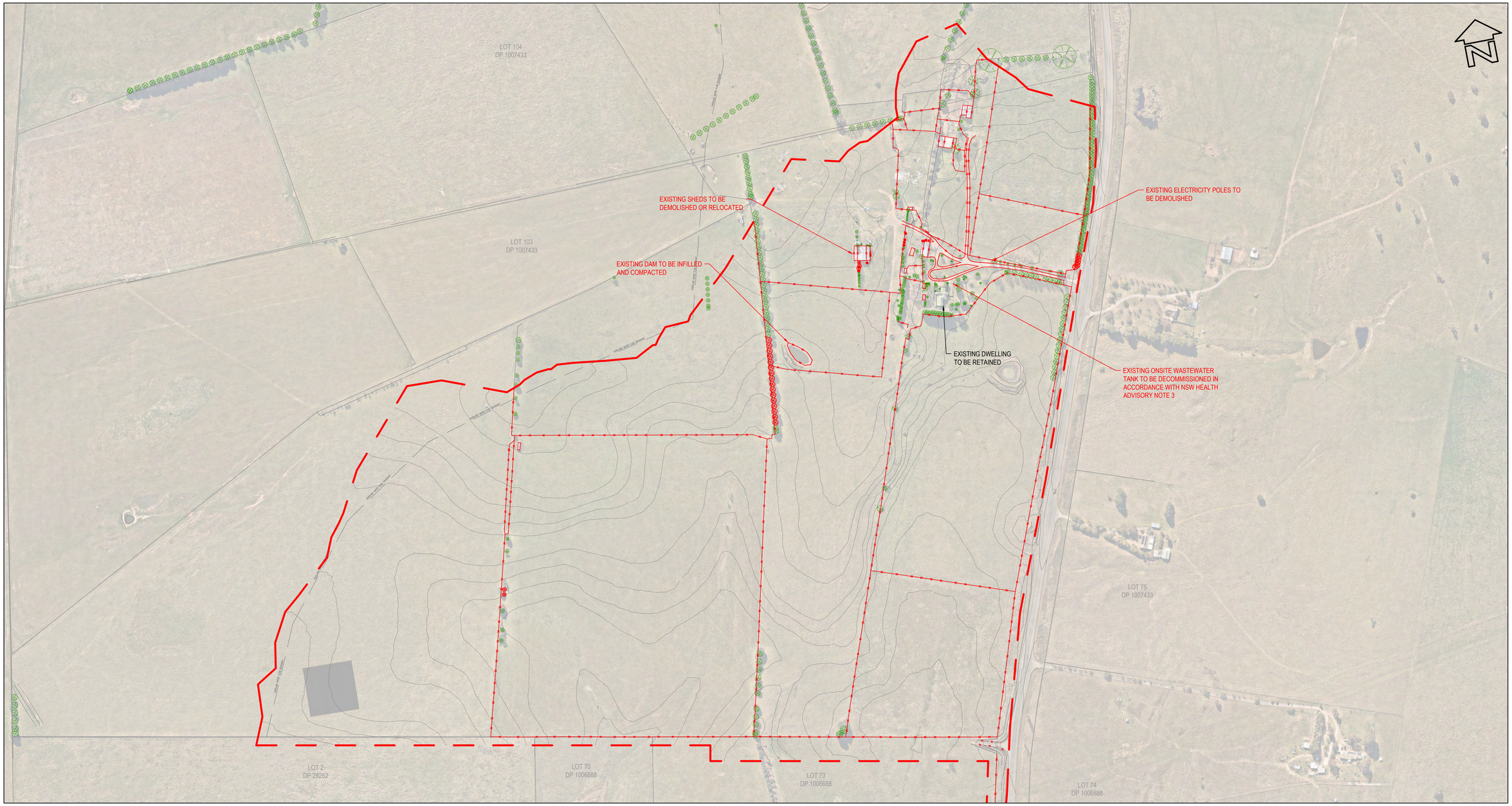
JOB-DRAWING NUMBER	REV
20027-402	P0



EXISTING AND SITE PREPARATION

1:2500 @ A1

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SHEET LEGEND			
DESCRIPTION	DETAIL	DESCRIPTION	DETAIL
DEMOLITION WORKS		GAS LOCATION (SURVEY)	G
TREE TO BE REMOVED		SEWER LOCATION (SURVEY)	S
TREE TO BE RETAINED		STORMWATER LOCATION (SURVEY)	SWD
ELECTRICAL LOCATION (SURVEY)	E	TELSTRA LOCATION (SURVEY)	T
FIBRE OPTICS LOCATION (SURVEY)		WATER LOCATION (SURVEY)	W

DEMOLITION AND SUBSEQUENT LAND REMEDIATION (IF REQUIRED) TO BE UNDERTAKEN IN ACCORDANCE WITH THE DA CONSENT, AUSTRALIAN STANDARDS, SAFEWORK NSW CODES OF PRACTICE AND EPA GUIDELINES

ALL CLEARING IS TO BE CONDUCTED AS APPROVED BY COUNCIL AND UNDER SUPERVISION OF AN ECOLOGIST IN ACCORDANCE WITH THE ECOLOGICAL MANAGEMENT PLAN (EMP).

DECOMMISSION AND BACKFILL ANY EXISTING DAMS UNDER SUPERVISION OF A GEOTECHNICAL ENGINEER AND IN ACCORDANCE WITH APPROVED FLORA AND FAUNAMANAGEMENT PLANS

0 25 50 75 100 150
SCALE:- 1:2500

SCALE: AS NOTED
SIZE: A1
DATE OF SURVEY: 22 JUNE 2020
DATUM: MGA2020, AHD

SURVEY	AS
DESIGN	JE
DRAWN	JE
CHECKED	TP
APPROVED	JW

REV	DESCRIPTION	DATE
P0	PRELIMINARY PLANNING PROPOSAL DESIGN	13 JUN 24

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20027-403	P0

SOIL AND WATER MANAGEMENT PLAN

1:2500 @ A1

SEDIMENT AND EROSION CONTROL NOTES:

1. ALL EROSION AND SEDIMENTATION CONTROLS, TREATMENT AND TESTING ARE TO BE IN ACCORDANCE WITH THE LANDCOM MANAGING URBAN STORMWATER SOILS AND CONSTRUCTION VOLUME 1 (4TH EDITION 2004) KNOWN AS THE "BLUE BOOK".
2. ANY ALTERATIONS AND/OR REMOVAL OF CONTROLS ARE TO BE REVIEWED AND APPROVED BY THE SUPERINTENDENT PRIOR TO ANY CHANGE, INCLUDING AT THE PROJECTS CONCLUSION.
3. DISTURBANCE IS TO BE KEPT TO A MINIMUM.
4. STOCKPILES ARE TO BE STABILISED WITHIN 10 DAYS.
5. AFTER EACH RAIN EVENT ALL EROSION AND SEDIMENTATION CONTROLS ARE TO BE INSPECTED, CLEARED OF SILT AND REINSTATED INTO WORKING ORDER.
6. EROSION AND SEDIMENTATION CONTROLS ARE TO BE MAINTAINED ON A REGULAR BASIS AND ARE TO REMAIN IN WORKING ORDER FOR THE LIFE OF THE PROJECT.
7. DISTURBED AREAS THAT ARE NOT UNDERGOING WORKS ARE TO BE STABILISED WITHIN 10 DAYS, FINISHED WORKS WITHIN 20 DAYS.
8. DISTURBED AREAS THAT ARE NOT UNDERGOING BUILDING WORK OR SOFT LANDSCAPING ARE TO BE STABILITED WITH A MINIMUM OF 100MM TOPSOIL AND SEEDED WITH AN APPROPRIATE MIX FOR THE AREA AND CLIMATE.
9. DUST CONTROLS (STABILISATION, WATERCART, SPRINKLERS ETC) ARE TO BE MAINTAINED THROUGHOUT THE LIFE OF THE PROJECT, IN PARTICULAR DURING DRY AND WINDY PERIODS.

0 25 50 75 100 150
SCALE:- 1:2500

SHEET LEGEND

DESCRIPTION	DETAIL	DESCRIPTION	DETAIL	DESCRIPTION	DETAIL	DESCRIPTION	DETAIL
MAJOR DESIGN CONTOURS	25	GRAVEL INLET FILTER		STRAW BALE FILTER		TOPSOIL STOCKPILES WITH DOWNSTREAM SILT FENCING	
MINOR DESIGN CONTOURS							
SILT FENCE		STABILISED ACCESS / GRID & WHEEL WASH		GEOTEXTILE COVER		TEMPORARY SEDIMENT BASIN	
CLEAN WATER DIVERSION							

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DATE OF SURVEY: 22 JUNE 2020
DATUM: MGA2020, AHD

		REV	DESCRIPTION	DATE
SURVEY	AS	P0	PRELIMINARY PLANNING PROPOSAL DESIGN	13 JUN 24
DESIGN	JE			
DRAWN	JE			
CHECKED	TP			
APPROVED	JW			

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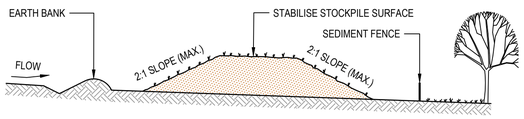
JOB NAME: 24 LARGE LOT RESIDENTIAL SUBDIVISION
LOCATION: 515 CROOKWELL RD, KINGSDALE, NSW - LOT 103 & 104 D.P. 1007433
LGA: GOULBURN MULWAREE COUNCIL
CLIENT: ALIMACO PTY LTD C/- PRECISE PLANNING PTY LTD
DESCRIPTION: PLANNING PROPOSAL
DRAWING: SOIL AND WATER MANAGEMENT PLAN

PRELIMINARY
NOT TO BE USED FOR CONSTRUCTION PURPOSES
RELEASE DATE: 13 JUNE 2024

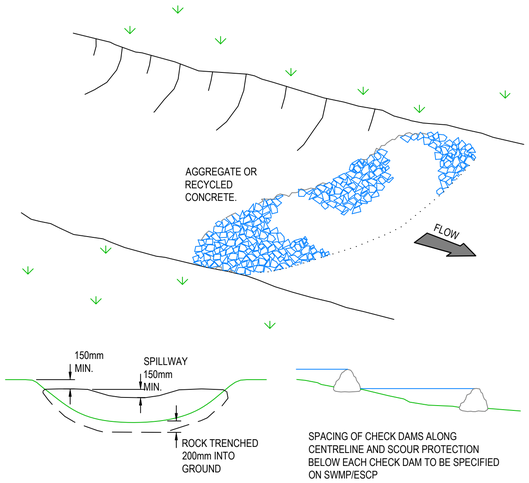
JOB-DRAWING NUMBER	REV
20027-404	P0



CONSTRUCTION NOTES

1. PLACE STOCKPILES MORE THAN 2m (PREFERABLY 5m) FROM EXISTING VEGETATION, CONCENTRATED WATER FLOW, ROADS AND HAZARD AREAS.
2. CONSTRUCT ON THE CONTOUR AS LOW, FLAT, ELONGATED MOUNDS.
3. WHERE THERE IS SUFFICIENT AREA, TOPSOIL STOCKPILES SHALL BE LESS THAN 2m IN HEIGHT.
4. WHERE THEY ARE TO BE IN PLACE FOR MORE THAN 10 DAYS, STABILISE FOLLOWING THE APPROVED ESCP OR SWMP TO REDUCE THE C-FACTOR TO LESS THAN 0.10.
5. CONSTRUCT EARTH BANKS (STANDARD DRAWING 5-5) ON THE UPSLOPE SIDE TO DIVERT WATER AROUND STOCKPILES AND SEDIMENT FENCES (STANDARD DRAWING 6-8) 1 TO 2m DOWNSLOPE.

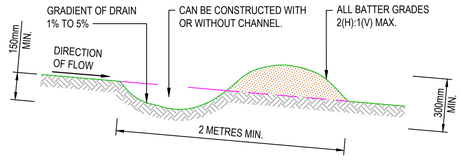
STOCKPILES (SD 4-1)



CONSTRUCTION NOTES

1. CHECK DAMS CAN BE BUILT WITH VARIOUS MATERIALS, INCLUDING ROCKS, LOGS, SANDBAGS AND STRAW BALES. THE MAINTENANCE PROGRAM SHOULD ENSURE THEIR INTEGRITY IS RETAINED, ESPECIALLY WHERE CONSTRUCTED WITH STRAW BALES. IN THE CASE OF BALES, THIS MIGHT REQUIRE THEIR REPLACEMENT EACH TWO TO FOUR MONTHS.
2. TRENCH THE CHECK DAM 200mm INTO THE GROUND ACROSS ITS WHOLE WIDTH. WHERE ROCK IS USED, FILL THE TRENCHES TO AT LEAST 100mm ABOVE THE GROUND SURFACE TO REDUCE THE RISK OF UNDERCUTTING.
3. NORMALLY, THEIR MAXIMUM HEIGHT SHOULD NOT EXCEED 600mm ABOVE THE GULLY FLOOR. THE CENTRE SHOULD ACT AS A SPILLWAY, BEING AT LEAST 150mm LOWER THAN THE OUTER EDGES.
4. SPACE THE DAMS SO THE TOE OF THE UPSTREAM DAM IS LEVEL WITH THE SPILLWAY OF THE NEXT DOWNSTREAM DAM.

ROCK CHECK DAM (SD 5-4)

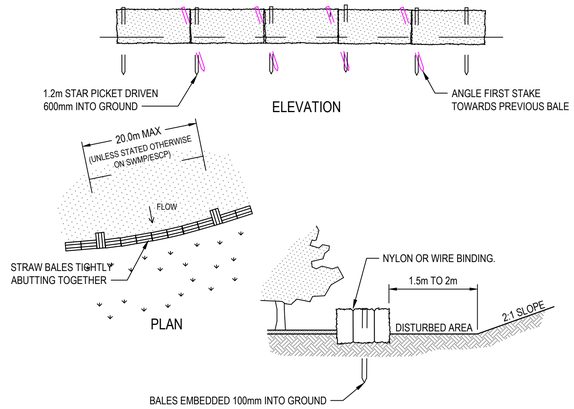


CONSTRUCTION NOTES

1. BUILD WITH GRADIENTS BETWEEN 1 AND 5 PERCENT.
2. AVOID REMOVING TREES AND SHRUBS IF POSSIBLE - WORK AROUND THEM.
3. ENSURE THE STRUCTURES ARE FREE OF PROJECTIONS OR OTHER IRREGULARITIES THAT COULD IMPEDE WATER FLOW.
4. BUILD THE DRAINS WITH CIRCULAR, PARABOLIC OR TRAPEZOIDAL CROSS SECTIONS, NOT V SHAPED.
5. ENSURE THE BANKS ARE PROPERLY COMPACTED TO PREVENT FAILURE.
6. COMPLETE PERMANENT OR TEMPORARY STABILISATION WITHIN 10 DAYS OF CONSTRUCTION.

NOTE: ONLY TO BE USED AS TEMPORARY BANK
WHERE MAXIMUM UPSLOPE LENGTH IS 80 METRES.

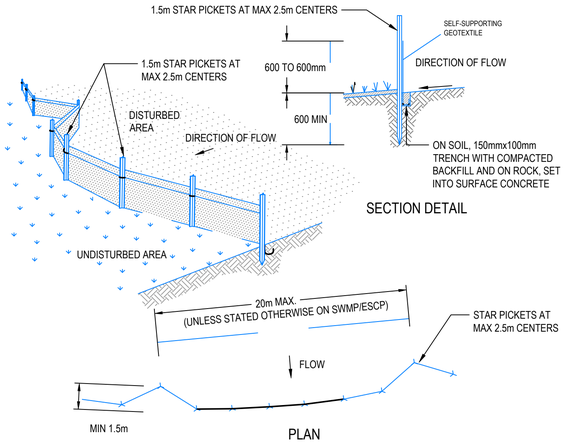
EARTH BANK - LOW FLOW (SD 5-5)



CONSTRUCTION NOTES

1. CONSTRUCT THE STRAW BALE FILTER AS CLOSE AS POSSIBLE TO BEING PARALLEL TO THE CONTOURS OF THE SITE.
2. PLACE BALES LENGTHWISE IN A ROW WITH ENDS TIGHTLY ABUTTING. USE STRAW TO FILL ANY GAPS BETWEEN BALES. STRAWS ARE TO BE PLACED PARALLEL TO GROUND.
3. ENSURE THAT THE MAXIMUM HEIGHT OF THE FILTER IS ONE BALE.
4. EMBED EACH BALE IN THE GROUND 75mm TO 100mm AND ANCHOR WITH TWO 1.2 METRE STAR PICKETS OR STAKES. ANGLE THE FIRST STAR PICKET OR STAKE IN EACH BALE TOWARDS THE PREVIOUSLY LAID BALE. DRIVE THEM 600mm INTO THE GROUND AND, IF POSSIBLE, FLUSH WITH THE TOP OF THE BALES. WHERE STAR PICKETS ARE USED AND THEY PROTRUDE ABOVE THE BALES, ENSURE THEY ARE FITTED WITH SAFETY CAPS.
5. WHERE A STRAW BALE FILTER IS CONSTRUCTED DOWNSLOPE FROM A DISTURBED BATTER, ENSURE THE BALES ARE PLACED 1 TO 2 METRES DOWNSLOPE FROM THE TOE.
6. ESTABLISH A MAINTENANCE PROGRAM THAT ENSURES THE INTEGRITY OF THE BALES IS RETAINED - THEY COULD REQUIRE REPLACEMENT EACH TWO TO FOUR MONTHS.

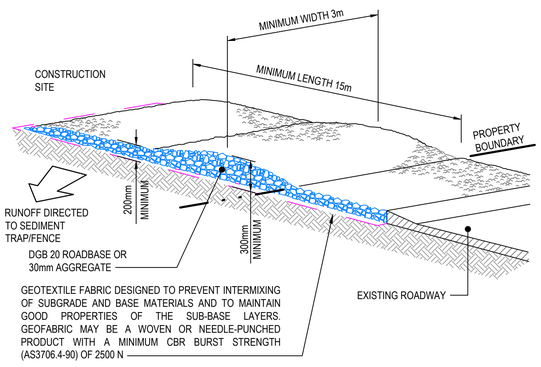
STRAW BALE FILTER (SD 6-7)



CONSTRUCTION NOTES

1. CONSTRUCT SEDIMENT FENCES AS CLOSE AS POSSIBLE TO BEING PARALLEL TO THE CONTOURS OF THE SITE, BUT WITH SMALL RETURNS AS SHOWN IN THE DRAWING TO LIMIT THE CATCHMENT AREA OF ANY ONE SECTION. THE CATCHMENT AREA SHOULD BE SMALL ENOUGH TO LIMIT WATER FLOW IF CONCENTRATED AT ONE POINT TO 50 LITRES PER SECOND IN THE DESIGN STORM EVENT, USUALLY THE 10-YEAR EVENT.
2. CUT A 150mm DEEP TRENCH ALONG THE UPSLOPE LINE OF THE FENCE FOR THE BOTTOM OF THE FABRIC TO BE ENTRENCHED.
3. DRIVE 1.5 METRE LONG STAR PICKETS INTO GROUND AT 2.5 METRE INTERVALS (MAX) AT THE DOWNSLOPE EDGE OF THE TRENCH. ENSURE ANY STAR PICKETS ARE FITTED WITH SAFETY CAPS.
4. FIX SELF-SUPPORTING GEOTEXTILE TO THE UPSLOPE SIDE OF THE POSTS ENSURING IT GOES TO THE BASE OF THE TRENCH. FIX THE GEOTEXTILE WITH WIRE TIES OR AS RECOMMENDED BY THE MANUFACTURER. ONLY USE GEOTEXTILE SPECIFICALLY PRODUCED FOR SEDIMENT FENCING. THE USE OF SHADE CLOTH FOR THIS PURPOSE IS NOT SATISFACTORY.
5. JOIN SECTIONS OF FABRIC AT A SUPPORT POST WITH A 150mm OVERLAP.
6. BACKFILL THE TRENCH OVER THE BASE OF THE FABRIC AND COMPACT IT THOROUGHLY OVER THE GEOTEXTILE.

SEDIMENT FENCE (SD 6-8)



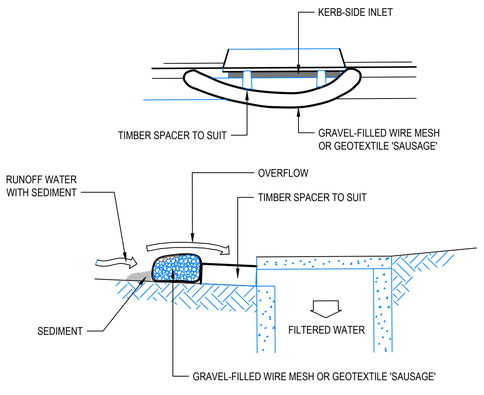
ALTERNATIVE OPTION - VIBRATING ACCESS GRID

PENDING PREFERANCE OF THE NOMINATED MANAGING CONTRACTOR A VIBRATING ACCESS GRID CAN ALSO BE UTLISED DURING CONSTRUCTION. FOR FURTHER DETAILS PLEASE REFER TO THE CATCHMENTS AND CREEKS STANDARD "CONSTRUCTION EXITS - VIBRATION GRIDS - SEDIMENT CONTROL TECHNIQUE - VERSION 2 - APRIL 2010".

CONSTRUCTION NOTES

1. STRIP THE TOPSOIL, LEVEL THE SITE AND COMPACT THE SUBGRADE.
2. COVER THE AREA WITH NEEDLE-PUNCHED GEOTEXTILE.
3. CONSTRUCT A 200mm THICK PAD OVER THE GEOTEXTILE USING ROAD BASE OR 30mm AGGREGATE.
4. ENSURE THE STRUCTURE IS AT LEAST 15 METRES LONG OR TO BUILDING ALIGNMENT AND AT LEAST 3 METRES WIDE.
5. WHERE A SEDIMENT FENCE JOINS ONTO THE STABILISED ACCESS, CONSTRUCT A HUMP IN THE STABILISED ACCESS TO DIVERT WATER TO THE SEDIMENT FENCE.

STABILISED SITE ACCESS (SD 6-14)

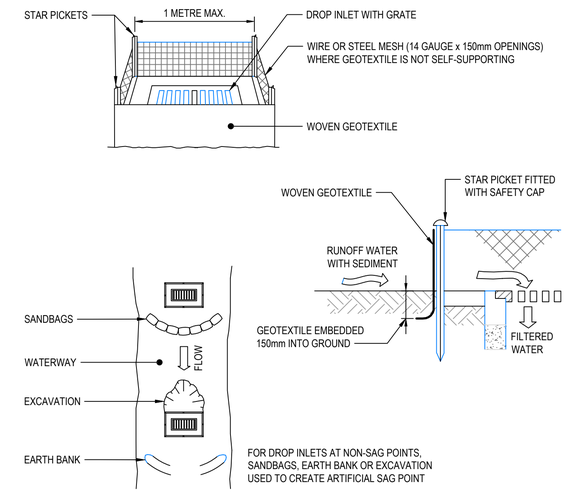


NOTE:THIS PRACTICE ONLY TO BE USED WHERE SPECIFIED IN APPROVED SWMP/ESCP.

CONSTRUCTION NOTES

1. INSTALL FILTERS TO KERB INLETS ONLY AT SAG POINTS.
2. FABRICATE A SLEEVE MADE FROM GEOTEXTILE OR WIRE MESH LONGER THAN THE LENGTH OF THE INLET PIT AND FILL IT WITH 25mm TO 50mm GRAVEL.
3. FORM AN ELLIPTICAL CROSS-SECTION ABOUT 150mm HIGH x 400mm WIDE.
4. PLACE THE FILTER AT THE OPENING LEAVING AT LEAST A 100mm SPACE BETWEEN IT AND THE KERB INLET. MAINTAIN THE OPENING WITH SPACER BLOCKS.
5. FORM A SEAL WITH THE KERB TO PREVENT SEDIMENT BYPASSING THE FILTER.
6. SANDBAGS FILLED WITH GRAVEL CAN SUBSTITUTE FOR THE MESH OR GEOTEXTILE PROVIDING THEY ARE PLACED SO THAT THEY FIRMLY ABUT EACH OTHER AND SEDIMENT-LADEN WATERS CANNOT PASS BETWEEN.

MESH AND GRAVEL INLET FILTER (SD 6-11)



CONSTRUCTION NOTES

1. FABRICATE A SEDIMENT BARRIER MADE FROM GEOTEXTILE OR STRAW BALES.
2. FOLLOW STANDARD DRAWING 6-7 AND STANDARD DRAWING 6-8 FOR INSTALLATION PROCEDURES FOR THE STRAW BALES OR GEOFABRIC. REDUCE THE PICKET SPACING TO 1 METRE CENTRES.
3. IN WATERWAYS, ARTIFICIAL SAG POINTS CAN BE CREATED WITH SANDBAGS OR EARTH BANKS AS SHOWN IN THE DRAWING.
4. DO NOT COVER THE INLET WITH GEOTEXTILE UNLESS THE DESIGN IS ADEQUATE TO ALLOW FOR ALL WATERS TO BYPASS IT.

GEOTEXTILE INLET FILTER (SD 6-12)

SCALE: AS NOTED
SIZE: A1
DATE OF SURVEY: 22 JUNE 2020
DATUM: MGA2020, AHD

SURVEY	AS		
DESIGN	JE		
DRAWN	JE		
CHECKED	TP		
APPROVED	JW		

REV	DESCRIPTION	DATE
P0	PRELIMINARY PLANNING PROPOSAL DESIGN	13 JUN 24

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LOCATION: 515 CROOKWELL RD, KINGSDALE, NSW - LOT 103 & 104 D.P. 1007433
LGA: GOULBURN MULWAREE COUNCIL
CLIENT: ALIMACO PTY LTD C/- PRECISE PLANNING PTY LTD
DESCRIPTION: PLANNING PROPOSAL
DRAWING: SOIL AND WATER MANAGEMENT DETAILS

PRELIMINARY
NOT TO BE USED FOR CONSTRUCTION PURPOSES
RELEASE DATE: 13 JUNE 2024

JOB-DRAWING NUMBER	REV
20027-405	P0

BULK EARTHWORKS PLAN

1:2500 @ A1

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GDA 2020

DEPTHS TABLE

ELEVATION	COLOUR
5.00 to 4.00	
4.00 to 3.00	
3.00 to 2.00	
2.00 to 1.00	
1.00 to 0.50	
0.50 to 0.00	
0.00 to -0.50	
-0.50 to -1.00	
-1.00 to -2.00	
-2.00 to -3.00	
-3.00 to -4.00	
-4.00 to -5.00	

SHEET LEGEND

DESCRIPTION	DETAIL	DESCRIPTION	DETAIL	DESCRIPTION	DETAIL	DESCRIPTION	DETAIL
BARRIER KERB 'KG'	KG	KERB / PEDESTRIAN RAMP		SUB-SOIL AND FLUSH POINTS	SS SS	STORMWATER LOCATION (EXISTING)	SW
ROLL KERB 'RK'	RK	NOMINAL CONTROL LINE		KERB ADAPTOR / OUTLET		SEWER LOCATION (EXISTING)	S
EDGE STRIP 'ES'	ES	ROAD PAVEMENT		BUILDING ENVELOPE		WATER LOCATION (EXISTING)	W
KERB ONLY 'KO'	KO	PATH PAVING (CONCRETE)		BOUNDARIES		TELSTRA LOCATION (EXISTING)	T
MOUNTABLE SF TYPE KERB 'SF'	SK	CONTOURS (MAJOR)	25	TREE AND LANDSCAPING		FIBRE OPTICS LOCATION (EXISTING)	FO
DISH DRAIN 'DD'	DD	CONTOURS (MINOR)		DRAINAGE PIT - 1.8m PIT WITH LINTEL		ELECTRICAL LOCATION (EXISTING)	E
VEHICULAR CROSSING		RETAINING WALL STRUCTURES		DRAINAGE PIT - 2.4m SAG WITH LINTEL		GAS LOCATION (EXISTING)	G

VOLUME SUMMARY TABLE

ITEM	AMOUNT
TOTAL CUT	11,081m³
TOTAL FILL	9,721m³
NET VOLUME (CUT)	1,360m³
TOTAL CUT AREA	27,855m²
TOTAL FILL AREA	23,530m²
TOTAL WORKS AREA	51,385m²

0 25 50 75 100 150
SCALE:- 1:2500

SCALE: AS NOTED
SIZE: A1
DATE OF SURVEY: 22 JUNE 2020
DATUM: MGA2020, AHD

SURVEY	AS	REV	DESCRIPTION	DATE
DESIGN	JE	P0	PRELIMINARY PLANNING PROPOSAL DESIGN	13 JUN 24
DRAWN	JE			
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APPROVED	JW			

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LGA: GOULBURN MULWAREE COUNCIL
CLIENT: ALIMACO PTY LTD C/- PRECISE PLANNING PTY LTD
DESCRIPTION: PLANNING PROPOSAL
DRAWING: BULK EARTHWORKS PLAN

PRELIMINARY
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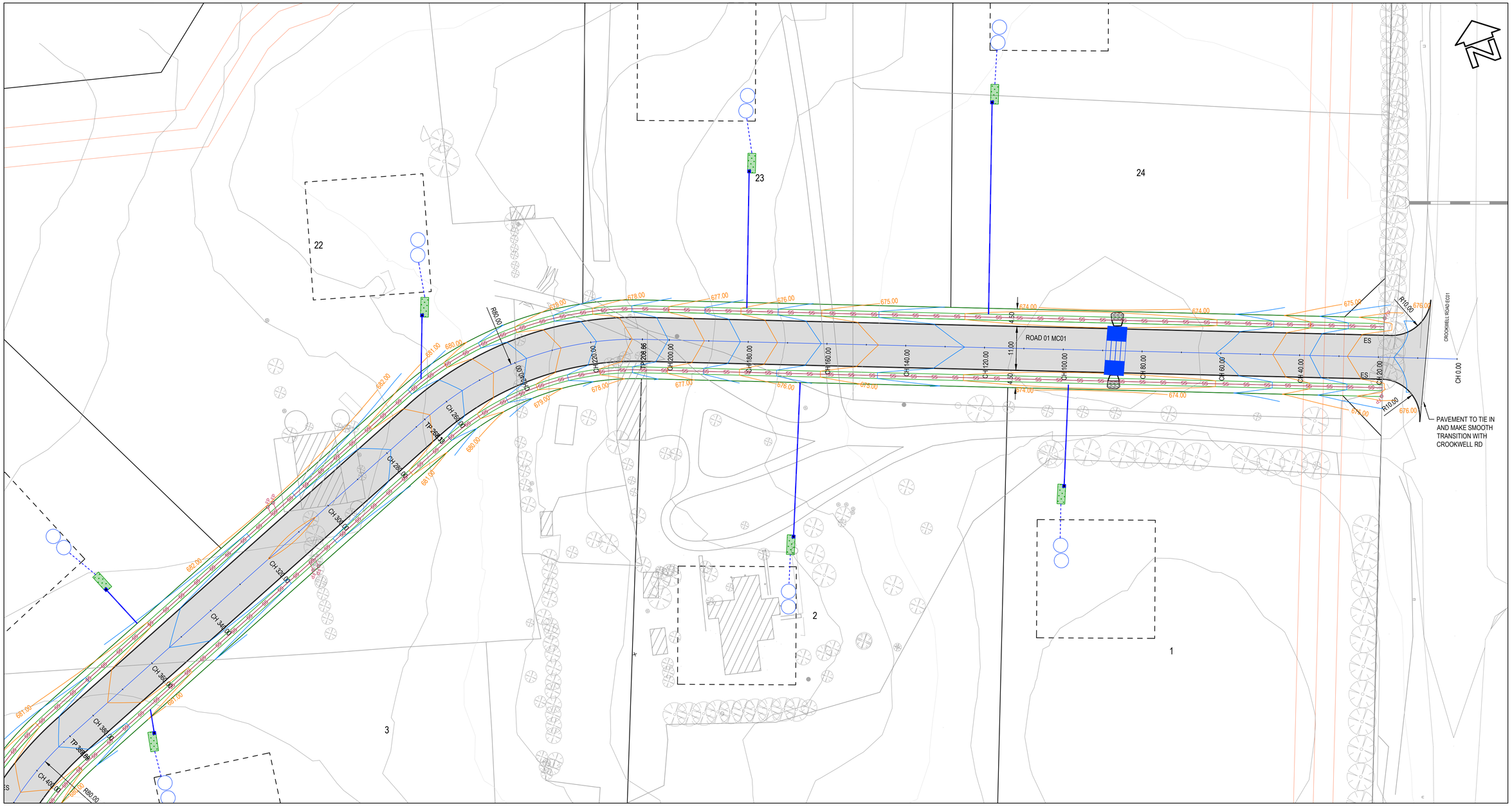
RELEASE DATE: 13 JUNE 2024

JOB-DRAWING NUMBER	REV
20027-406	P0

REFER TO SHEET 20027-408 FOR CONTINUATION



ROAD LAYOUT PLAN ZONE 1

1:500 @ A1

SHEET LEGEND

DESCRIPTION	DETAIL	DESCRIPTION	DETAIL	DESCRIPTION	DETAIL	DESCRIPTION	DETAIL
BARRIER KERB 'KG'	KG	KERB / PEDESTRIAN RAMP		SUB-SOIL AND FLUSH POINTS	SS SS	STORMWATER LOCATION (EXISTING)	SW
ROLL KERB 'RK'	RK	NOMINAL CONTROL LINE		KERB ADAPTOR / OUTLET		SEWER LOCATION (EXISTING)	S
EDGE STRIP 'ES'	ES	ROAD PAVEMENT		BUILDING ENVELOPE		WATER LOCATION (EXISTING)	W
KERB ONLY 'KO'	KO	PATH PAVING (CONCRETE)		BOUNDARIES		TELSTRA LOCATION (EXISTING)	T
MOUNTABLE SF TYPE KERB 'SF'	SK	CONTOURS (MAJOR)	25	TREE AND LANDSCAPING		FIBRE OPTICS LOCATION (EXISTING)	FO
DISH DRAIN 'DD'	DD	CONTOURS (MINOR)		DRAINAGE PIT - 1.8m PIT WITH LINTEL		ELECTRICAL LOCATION (EXISTING)	E
VEHICULAR CROSSING		RETAINING WALL STRUCTURES		DRAINAGE PIT - 2.4m SAG WITH LINTEL		GAS LOCATION (EXISTING)	G

WARNING
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0 5 10 15 20 25
SCALE:- 1:500

SCALE: AS NOTED
SIZE: A1
DATE OF SURVEY: 22 JUNE 2020
DATUM: MGA2020, AHD

SURVEY	AS	
DESIGN	JE	
DRAWN	JE	
CHECKED	TP	
APPROVED	JW	

REV	DESCRIPTION	DATE
P0	PRELIMINARY PLANNING PROPOSAL DESIGN	13 JUN 24

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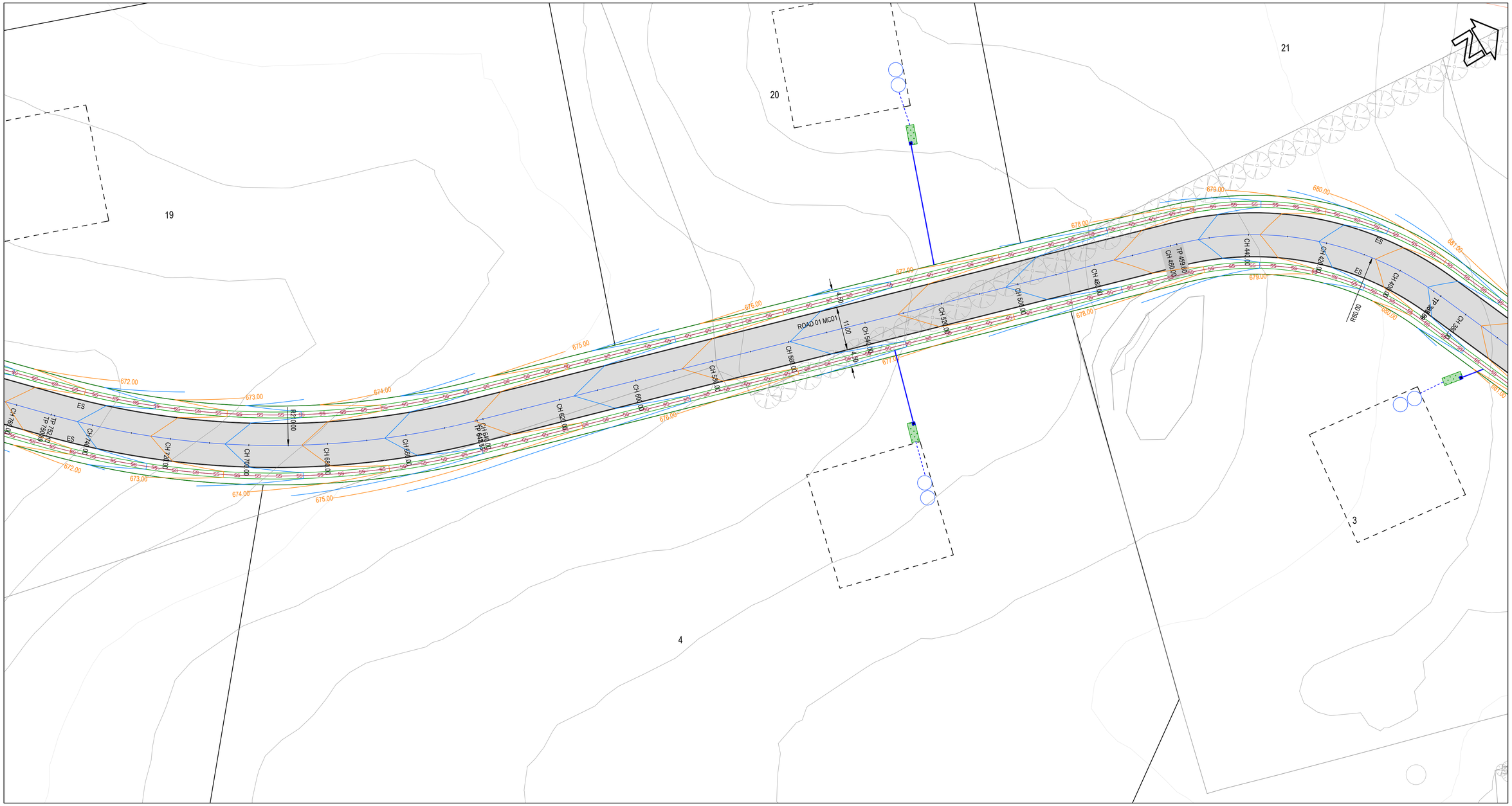
DESCRIPTION: PLANNING PROPOSAL
DRAWING: ROAD LAYOUT PLAN ZONE 1 OF 6

PRELIMINARY
NOT TO BE USED FOR CONSTRUCTION PURPOSES

RELEASE DATE: 13 JUNE 2024

JOB-DRAWING NUMBER	REV
20027-407	P0

REFER TO SHEET 20027-409 FOR CONTINUATION



ROAD LAYOUT PLAN ZONE 2

1:500 @ A1

SHEET LEGEND

DESCRIPTION	DETAIL	DESCRIPTION	DETAIL	DESCRIPTION	DETAIL	DESCRIPTION	DETAIL
BARRIER KERB 'KG'	KG	KERB / PEDESTRIAN RAMP		SUB-SOIL AND FLUSH POINTS	SS SS	STORMWATER LOCATION (EXISTING)	SW
ROLL KERB 'RK'	RK	NOMINAL CONTROL LINE		KERB ADAPTOR / OUTLET		SEWER LOCATION (EXISTING)	
EDGE STRIP 'ES'	ES	ROAD PAVEMENT		BUILDING ENVELOPE		WATER LOCATION (EXISTING)	
KERB ONLY 'KO'	KO	PATH PAVING (CONCRETE)		BOUNDARIES		TELSTRA LOCATION (EXISTING)	
MOUNTABLE SF TYPE KERB 'SF'	SK	CONTOURS (MAJOR)	25	TREE AND LANDSCAPING		FIBRE OPTICS LOCATION (EXISTING)	
DISH DRAIN 'DD'	DD	CONTOURS (MINOR)		DRAINAGE PIT - 1.8m PIT WITH LINTEL		ELECTRICAL LOCATION (EXISTING)	
VEHICULAR CROSSING		RETAINING WALL STRUCTURES		DRAINAGE PIT - 2.4m SAG WITH LINTEL		GAS LOCATION (EXISTING)	G

0 5 10 15 20 25

SCALE:- 1:500

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SCALE: AS NOTED
SIZE: A1
DATE OF SURVEY: 22 JUNE 2020
DATUM: MGA2020, AHD

SURVEY	AS	REV	DESCRIPTION	DATE
DESIGN	JE	P0	PRELIMINARY PLANNING PROPOSAL DESIGN	13 JUN 24
DRAWN	JE			
CHECKED	TP			
APPROVED	JW			

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DESCRIPTION: PLANNING PROPOSAL
DRAWING: ROAD LAYOUT PLAN ZONE 2 OF 6

PRELIMINARY
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RELEASE DATE: 13 JUNE 2024

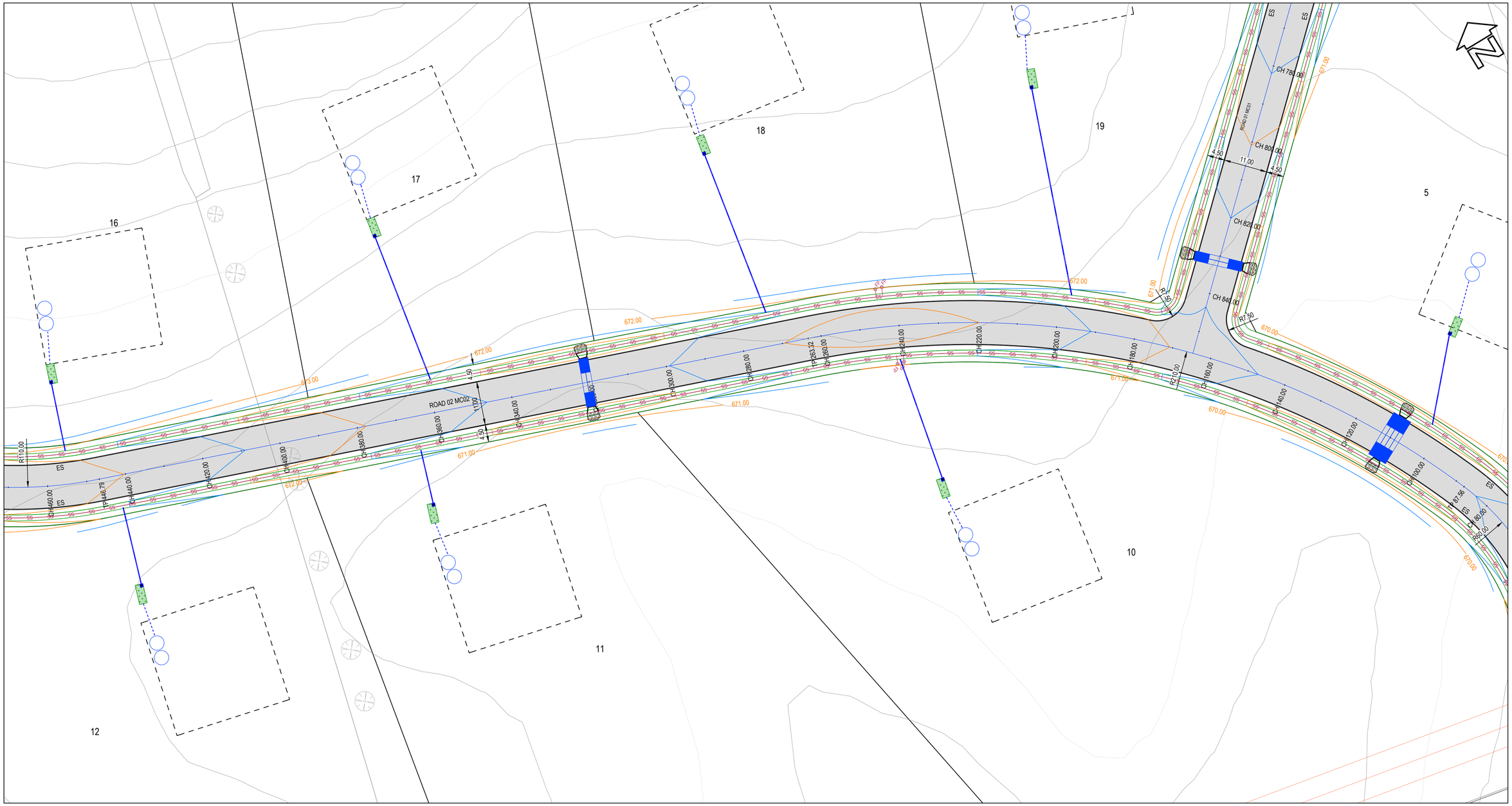
JOB-DRAWING NUMBER	REV
20027-408	P0

REFER TO SHEET 20027-407 FOR CONTINUATION

REFER TO SHEET 20027-408 FOR CONTINUATION

REFER TO SHEET 20027-410 FOR CONTINUATION

REFER TO SHEET 20027-411 FOR CONTINUATION



ROAD LAYOUT PLAN ZONE 3

1:500 @ A1

SHEET LEGEND

DESCRIPTION	DETAIL	DESCRIPTION	DETAIL	DESCRIPTION	DETAIL	DESCRIPTION	DETAIL
BARRIER KERB 'KG'	KG	KERB / PEDESTRIAN RAMP		SUB-SOIL AND FLUSH POINTS	SS SS	STORMWATER LOCATION (EXISTING)	SW
ROLL KERB 'RK'	RK	NOMINAL CONTROL LINE		KERB ADAPTOR / OUTLET		SEWER LOCATION (EXISTING)	
EDGE STRIP 'ES'	ES	ROAD PAVEMENT		BUILDING ENVELOPE		WATER LOCATION (EXISTING)	W
KERB ONLY 'KO'	KO	PATH PAVING (CONCRETE)		BOUNDARIES		TELSTRA LOCATION (EXISTING)	T
MOUNTABLE SF TYPE KERB 'SF'	SK	CONTOURS (MAJOR)	25	TREE AND LANDSCAPING		FIBRE OPTICS LOCATION (EXISTING)	
DISH DRAIN 'DD'	DD	CONTOURS (MINOR)		DRAINAGE PIT - 1.8m PIT WITH LINTEL		ELECTRICAL LOCATION (EXISTING)	E
VEHICULAR CROSSING		RETAINING WALL STRUCTURES		DRAINAGE PIT - 2.4m SAG WITH LINTEL		GAS LOCATION (EXISTING)	G

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0 5 10 15 20 25
SCALE:- 1:500

SCALE: AS NOTED
SIZE: A1
DATE OF SURVEY: 22 JUNE 2020
DATUM: MGA2020, AHD

SURVEY	AS	REV	DESCRIPTION	DATE
DESIGN	JE	P0	PRELIMINARY PLANNING PROPOSAL DESIGN	13 JUN 24
DRAWN	JE			
CHECKED	TP			
APPROVED	JW			

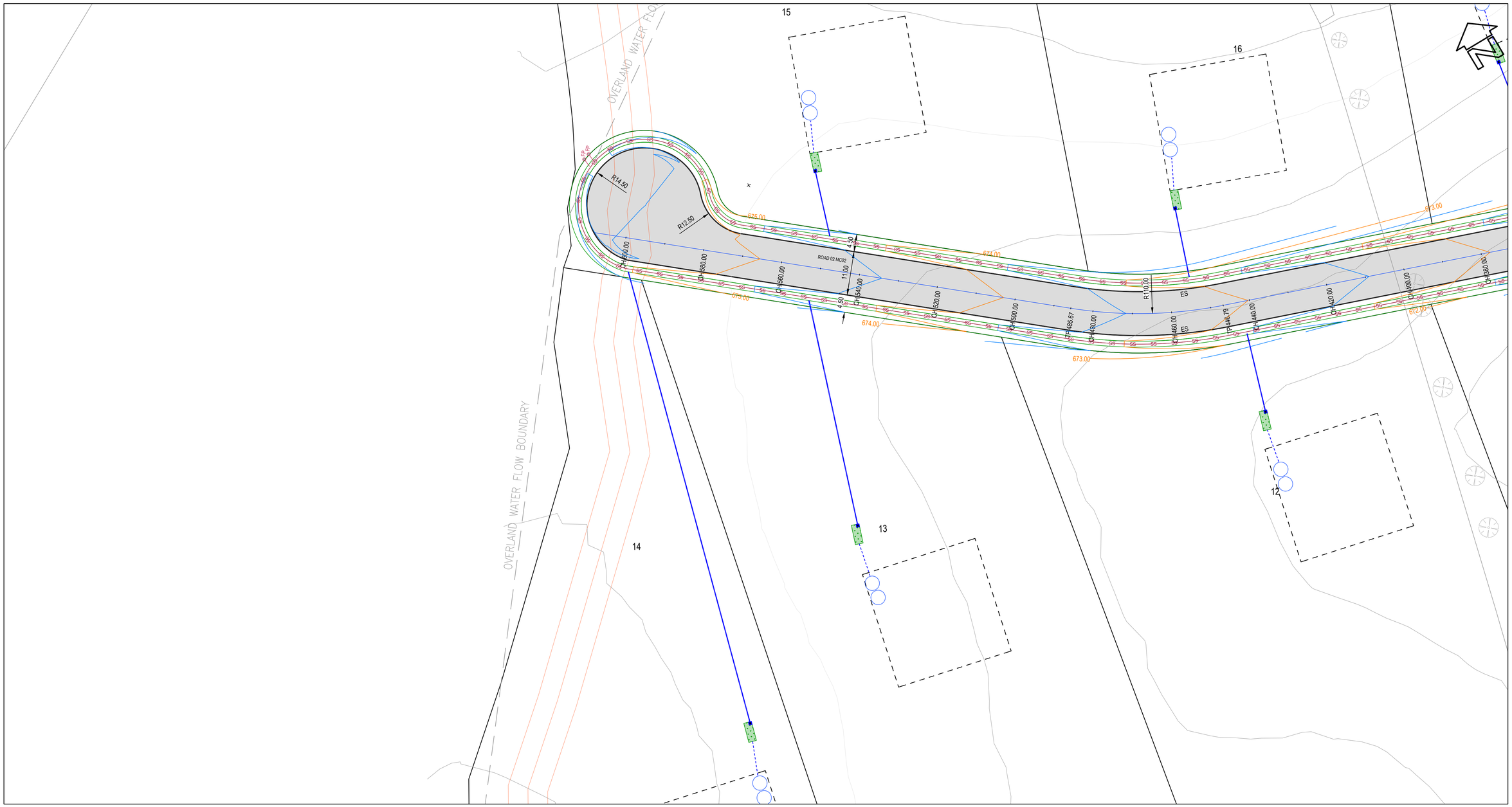
CIVPLAN
DEVELOPMENT & INFRASTRUCTURE CONSULTING
CIVPLAN PTY LTD ABN: 49 620 926 114 | CIVPLAN CONSULTING PTY LTD ABN: 79 157 731 912
SOUTH COAST OFFICE: 390 PRINCES HIGHWAY, BOMADERRY NSW 2541
SYDNEY OFFICE: 152 SAILORS BAY ROAD, NORTHBRIDGE NSW 2063
T: 1800 318 052 E: info@civplan.com.au W: www.civplan.com.au

JOB NAME: 24 LARGE LOT RESIDENTIAL SUBDIVISION
LOCATION: 515 CROOKWELL RD, KINGSDALE, NSW - LOT 103 & 104 D.P. 1007433
LGA: GOULBURN MULWAREE COUNCIL
CLIENT: ALIMACO PTY LTD C/- PRECISE PLANNING PTY LTD
DESCRIPTION: PLANNING PROPOSAL
DRAWING: ROAD LAYOUT PLAN ZONE 3 OF 6

PRELIMINARY
NOT TO BE USED FOR CONSTRUCTION PURPOSES

RELEASE DATE: 13 JUNE 2024

JOB-DRAWING NUMBER	REV
20027-409	P0



ROAD LAYOUT PLAN ZONE 4

1:500 @ A1

REFER TO SHEET 20027-409 FOR CONTINUATION

SHEET LEGEND

DESCRIPTION	DETAIL	DESCRIPTION	DETAIL	DESCRIPTION	DETAIL	DESCRIPTION	DETAIL
BARRIER KERB 'KG'	KG	KERB / PEDESTRIAN RAMP		SUB-SOIL AND FLUSH POINTS	SS SS	STORMWATER LOCATION (EXISTING)	SW
ROLL KERB 'RK'	RK	NOMINAL CONTROL LINE		KERB ADAPTOR / OUTLET		SEWER LOCATION (EXISTING)	S
EDGE STRIP 'ES'	ES	ROAD PAVEMENT		BUILDING ENVELOPE		WATER LOCATION (EXISTING)	W
KERB ONLY 'KO'	KO	PATH PAVING (CONCRETE)		BOUNDARIES		TELSTRA LOCATION (EXISTING)	T
MOUNTABLE SF TYPE KERB 'SF'	SK	CONTOURS (MAJOR)	25	TREE AND LANDSCAPING		FIBRE OPTICS LOCATION (EXISTING)	F
DISH DRAIN 'DD'	DD	CONTOURS (MINOR)		DRAINAGE PIT - 1.8m PIT WITH LINTEL		ELECTRICAL LOCATION (EXISTING)	E
VEHICULAR CROSSING		RETAINING WALL STRUCTURES		DRAINAGE PIT - 2.4m SAG WITH LINTEL		GAS LOCATION (EXISTING)	G

WARNING
BEWARE OF UNDERGROUND SERVICES
THE LOCATION OF UNDERGROUND SERVICES ARE APPROXIMATE ONLY AND THEIR EXACT POSITION SHOULD BE PROVEN ON SITE. NO GUARANTEE IS GIVEN THAT ALL EXISTING SERVICES ARE SHOWN.

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GDA 2020

0 5 10 15 20 25
SCALE:- 1:500

SCALE: AS NOTED
SIZE: A1
DATE OF SURVEY: 22 JUNE 2020
DATUM: MGA2020, AHD

SURVEY	AS	REV	DESCRIPTION	DATE
DESIGN	JE	P0	PRELIMINARY PLANNING PROPOSAL DESIGN	13 JUN 24
DRAWN	JE			
CHECKED	TP			
APPROVED	JW			

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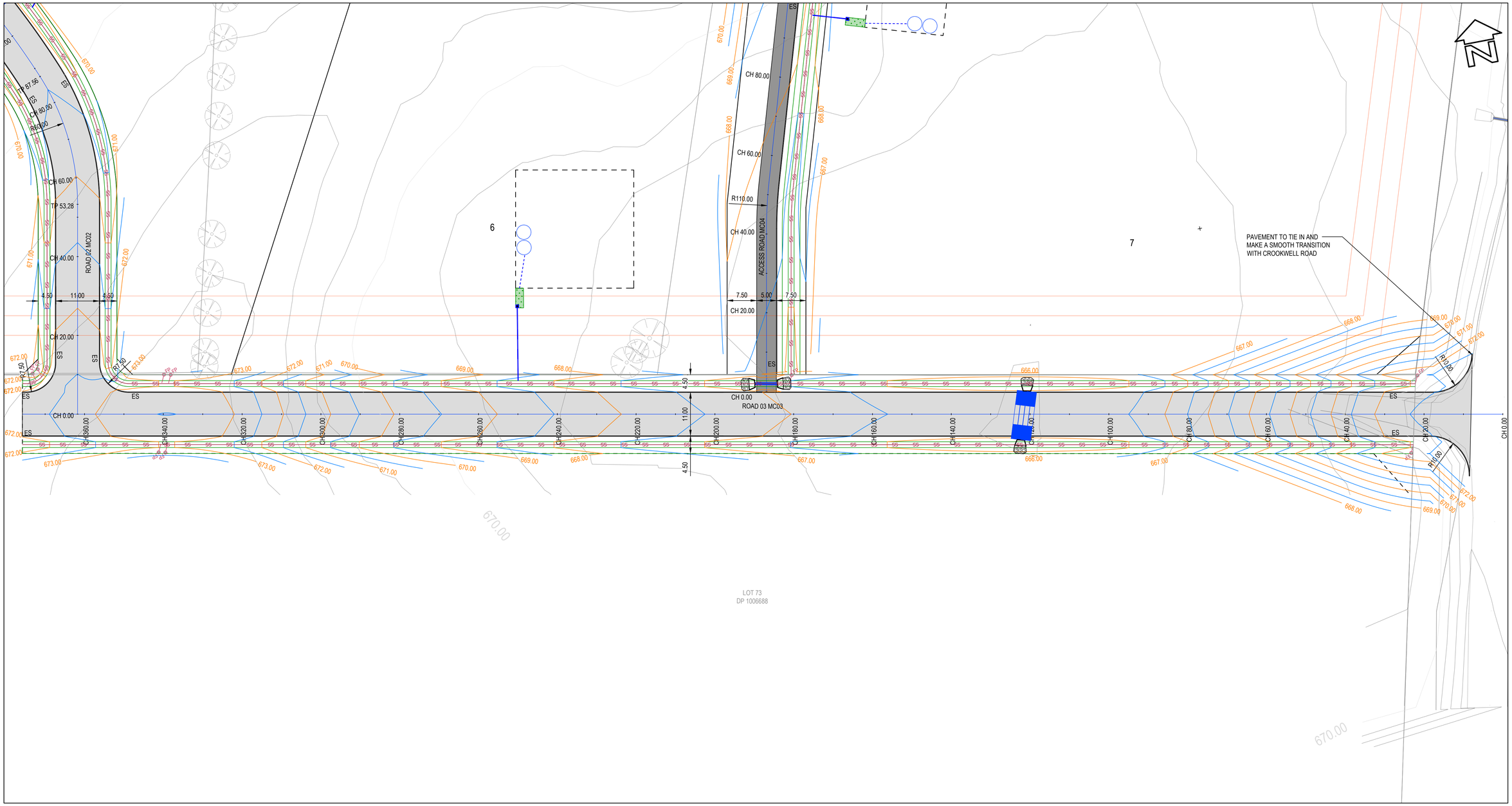
JOB NAME: 24 LARGE LOT RESIDENTIAL SUBDIVISION
LOCATION: 515 CROOKWELL RD, KINGSDALE, NSW - LOT 103 & 104 D.P. 1007433
LGA: GOULBURN MULWAREE COUNCIL
CLIENT: ALIMACO PTY LTD C/- PRECISE PLANNING PTY LTD
DESCRIPTION: PLANNING PROPOSAL
DRAWING: ROAD LAYOUT PLAN ZONE 4 OF 6

PRELIMINARY
NOT TO BE USED FOR CONSTRUCTION PURPOSES
RELEASE DATE: 13 JUNE 2024

JOB-DRAWING NUMBER	REV
20027-410	P0

REFER TO SHEET 20027-412 FOR CONTINUATION

REFER TO SHEET 20027-409 FOR CONTINUATION



ROAD LAYOUT PLAN ZONE 5

1:500 @ A1

SHEET LEGEND

DESCRIPTION	DETAIL	DESCRIPTION	DETAIL	DESCRIPTION	DETAIL	DESCRIPTION	DETAIL
BARRIER KERB 'KG'	KG	KERB / PEDESTRIAN RAMP		SUB-SOIL AND FLUSH POINTS	SS SS	STORMWATER LOCATION (EXISTING)	SW
ROLL KERB 'RK'	RK	NOMINAL CONTROL LINE		KERB ADAPTOR / OUTLET		SEWER LOCATION (EXISTING)	
EDGE STRIP 'ES'	ES	ROAD PAVEMENT		BUILDING ENVELOPE		WATER LOCATION (EXISTING)	W
KERB ONLY 'KO'	KO	PATH PAVING (CONCRETE)		BOUNDARIES		TELSTRA LOCATION (EXISTING)	T
MOUNTABLE SF TYPE KERB 'SF'	SK	CONTOURS (MAJOR)	25	TREE AND LANDSCAPING		FIBRE OPTICS LOCATION (EXISTING)	
DISH DRAIN 'DD'	DD	CONTOURS (MINOR)		DRAINAGE PIT - 1.8m PIT WITH LINTEL		ELECTRICAL LOCATION (EXISTING)	E
VEHICULAR CROSSING		RETAINING WALL STRUCTURES		DRAINAGE PIT - 2.4m SAG WITH LINTEL		GAS LOCATION (EXISTING)	G

0 5 10 15 20 25

SCALE:- 1:500

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GDA 2020

SCALE: AS NOTED
SIZE: A1
DATE OF SURVEY: 22 JUNE 2020
DATUM: MGA2020, AHD

SURVEY	AS	REV	DESCRIPTION	DATE
DESIGN	JE	P0	PRELIMINARY PLANNING PROPOSAL DESIGN	13 JUN 24
DRAWN	JE			
CHECKED	TP			
APPROVED	JW			

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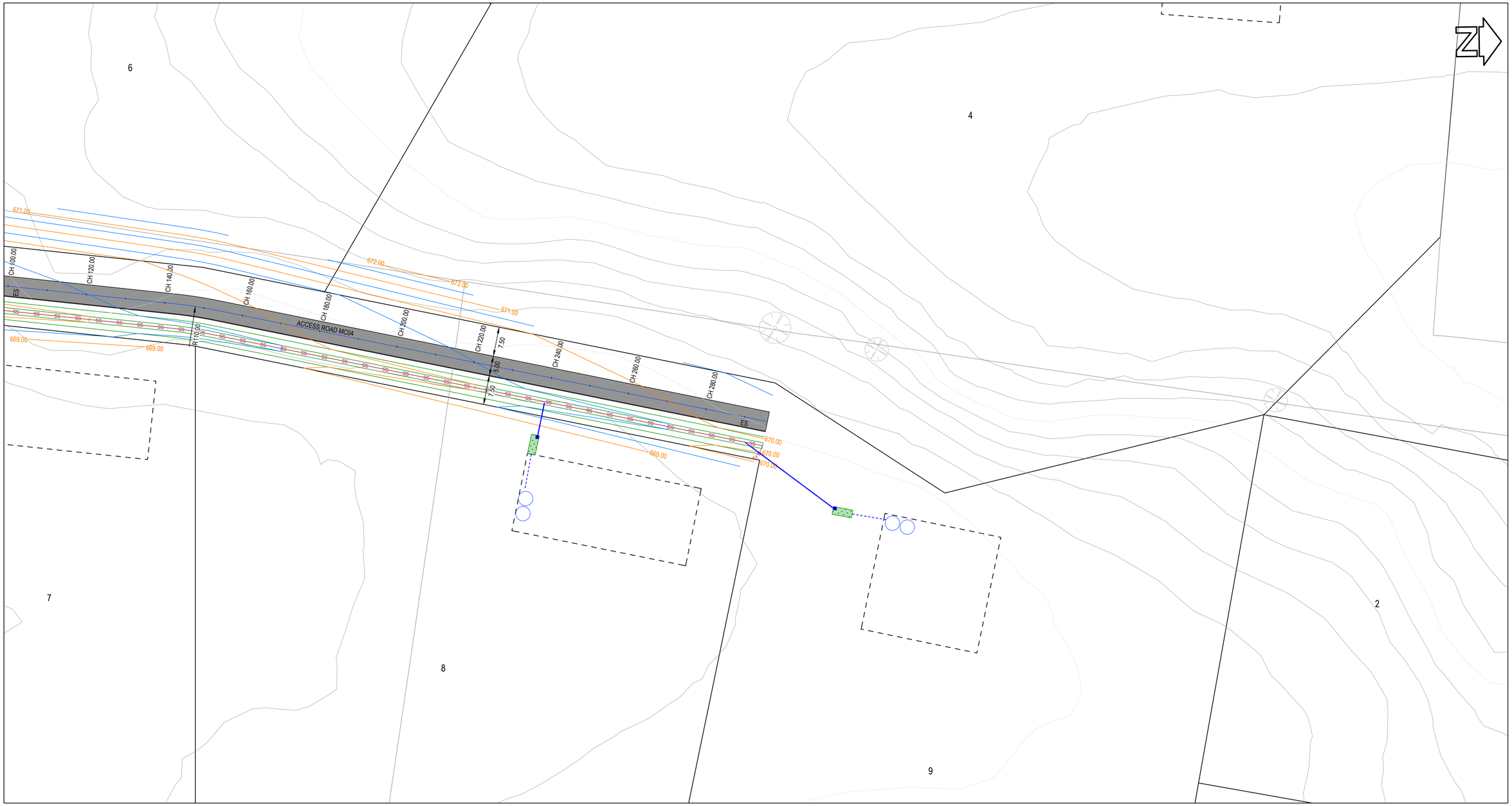
LGA: GOULBURN MULWAREE COUNCIL
CLIENT: ALIMACO PTY LTD C/- PRECISE PLANNING PTY LTD
DESCRIPTION: PLANNING PROPOSAL
DRAWING: ROAD LAYOUT PLAN ZONE 5 OF 6

PRELIMINARY
NOT TO BE USED FOR CONSTRUCTION PURPOSES

RELEASE DATE: 13 JUNE 2024

JOB-DRAWING NUMBER	REV
20027-411	P0



REFER TO SHEET 20027-411 FOR CONTINUATION

ROAD LAYOUT PLAN ZONE 6

1:500 @ A1

SHEET LEGEND

DESCRIPTION	DETAIL	DESCRIPTION	DETAIL	DESCRIPTION	DETAIL	DESCRIPTION	DETAIL
BARRIER KERB 'KG'	KG	KERB / PEDESTRIAN RAMP		SUB-SOIL AND FLUSH POINTS	SS SS	STORMWATER LOCATION (EXISTING)	SW
ROLL KERB 'RK'	RK	NOMINAL CONTROL LINE		KERB ADAPTOR / OUTLET		SEWER LOCATION (EXISTING)	S
EDGE STRIP 'ES'	ES	ROAD PAVEMENT		BUILDING ENVELOPE		WATER LOCATION (EXISTING)	W
KERB ONLY 'KO'	KO	PATH PAVING (CONCRETE)		BOUNDARIES		TELSTRA LOCATION (EXISTING)	T
MOUNTABLE SF TYPE KERB 'SF'	SK	CONTOURS (MAJOR)	25	TREE AND LANDSCAPING		FIBRE OPTICS LOCATION (EXISTING)	FO
DISH DRAIN 'DD'	DD	CONTOURS (MINOR)		DRAINAGE PIT - 1.8m PIT WITH LINTEL		ELECTRICAL LOCATION (EXISTING)	E
VEHICULAR CROSSING		RETAINING WALL STRUCTURES		DRAINAGE PIT - 2.4m SAG WITH LINTEL		GAS LOCATION (EXISTING)	G

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GDA 2020

0 5 10 15 20 25
SCALE:- 1:500

SCALE: AS NOTED
SIZE: A1
DATE OF SURVEY: 22 JUNE 2020
DATUM: MGA2020, AHD

SURVEY	AS	REV	DESCRIPTION	DATE
DESIGN	JE	P0	PRELIMINARY PLANNING PROPOSAL DESIGN	13 JUN 24
DRAWN	JE			
CHECKED	TP			
APPROVED	JW			

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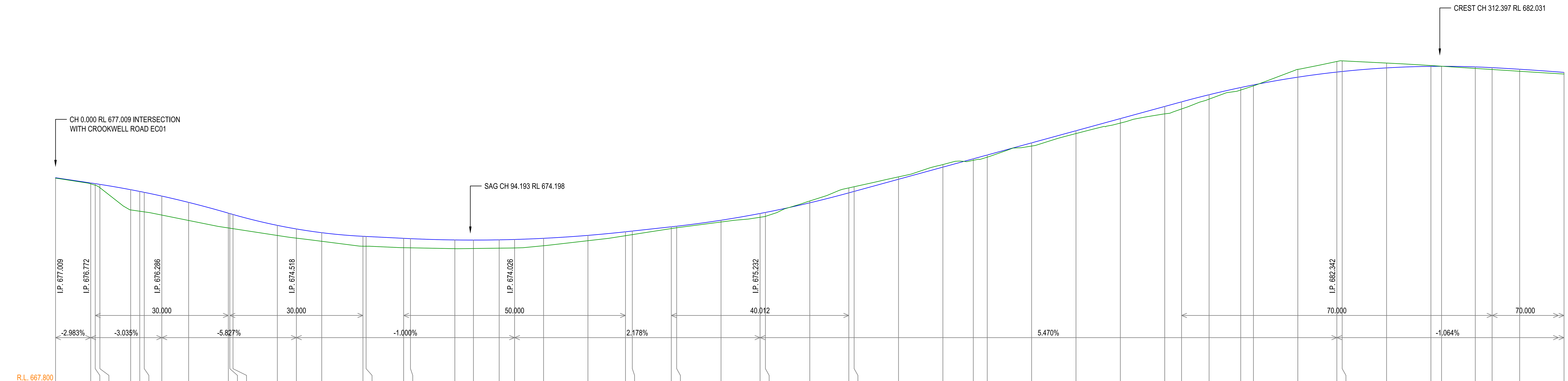
LOCATION: 515 CROOKWELL RD, KINGSDALE, NSW - LOT 103 & 104 D.P. 1007433
LGA: GOULBURN MULWAREE COUNCIL
CLIENT: ALIMACO PTY LTD C/- PRECISE PLANNING PTY LTD
DESCRIPTION: PLANNING PROPOSAL
DRAWING: ROAD LAYOUT PLAN ZONE 6 OF 6

PRELIMINARY
NOT TO BE USED FOR CONSTRUCTION PURPOSES

RELEASE DATE: 13 JUNE 2024

JOB-DRAWING NUMBER	REV
20027-412	P0

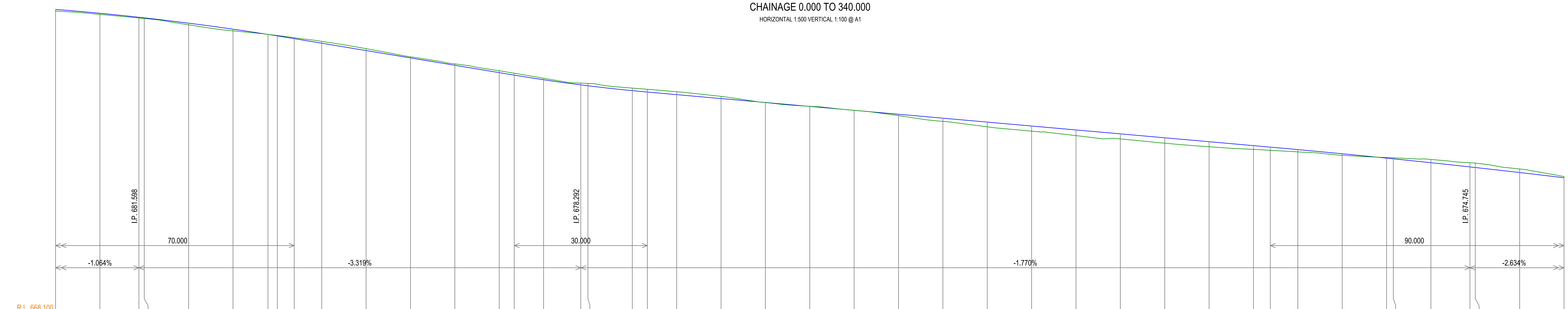


CHAINAGE	EXISTING SURFACE	DESIGN SURFACE	DEPTHS
0.000	676.990	677.009	0.019
7.932	676.731	676.772	0.041
8.951	676.670	676.741	0.071
10.000	676.560	676.709	0.149
16.937	675.556	676.469	0.913
18.984	675.498	676.390	0.892
20.000	675.469	676.349	0.880
23.951	675.325	676.181	0.856
30.000	675.081	675.896	0.815
38.951	674.744	675.412	0.668
39.289	674.734	675.392	0.658
40.000	674.712	675.351	0.639
50.000	674.406	674.860	0.454
54.289	674.285	674.699	0.414
60.000	674.142	674.530	0.388
69.289	673.922	674.368	0.446
70.000	673.921	674.361	0.440
78.462	673.854	674.276	0.422
80.000	673.848	674.262	0.414
90.000	673.810	674.203	0.393
94.193	673.818	674.198	0.380
100.000	673.832	674.208	0.376
103.462	673.842	674.225	0.383
110.000	673.943	674.277	0.334
120.000	674.169	674.409	0.240
128.462	674.395	674.571	0.176
130.000	674.443	674.604	0.161
138.788	674.716	674.796	0.080
140.000	674.753	674.823	0.070
150.000	675.012	675.092	0.080
158.794	675.225	675.396	0.171
160.000	675.267	675.443	0.176
170.000	675.960	675.877	-0.083
178.801	676.549	676.326	-0.223
180.000	676.602	676.392	-0.210
190.000	677.047	676.939	-0.108
200.000	677.602	677.486	-0.116
206.857	677.793	677.861	0.068
210.000	677.935	678.033	0.098
220.000	678.435	678.579	0.144
230.000	678.999	679.126	0.127
240.000	679.471	679.673	0.202
250.000	679.887	680.220	0.333
253.794	680.107	680.428	0.321
260.000	680.551	680.749	0.198
267.129	680.961	681.074	0.113
270.000	681.148	681.192	0.044
280.000	681.893	681.541	-0.352
288.794	682.247	681.771	-0.476
290.000	682.276	681.797	-0.479
300.000	682.176	681.959	-0.217
310.000	682.065	682.028	-0.037
312.397	682.034	682.031	-0.003
320.000	681.936	682.004	0.068
323.794	681.887	681.970	0.083
330.000	681.806	681.898	0.092
340.000	681.682	681.755	0.073

LONGITUDINAL SECTION - ROAD 01 MC01

CHAINAGE 0.000 TO 340.000

HORIZONTAL 1:500 VERTICAL 1:100 @ A1



CHAINAGE	EXISTING SURFACE	DESIGN SURFACE	DEPTHS
340.000	681.682	681.755	0.073
350.000	681.531	681.581	0.050
358.794	681.368	681.400	0.032
360.000	681.346	681.374	0.028
370.000	681.060	681.135	0.075
380.000	680.787	680.863	0.076
387.883	680.628	680.626	-0.002
390.000	680.577	680.560	-0.017
393.794	680.479	680.436	-0.043
400.000	680.314	680.230	-0.084
410.000	679.984	679.898	-0.086
420.000	679.617	679.566	-0.051
430.000	679.297	679.234	-0.063
440.000	678.986	678.902	-0.084
443.393	678.876	678.790	-0.086
450.000	678.647	678.581	-0.066
458.393	678.429	678.350	-0.079
460.000	678.416	678.310	-0.106
470.000	678.205	678.089	-0.116
473.393	678.151	678.026	-0.125
480.000	678.041	677.909	-0.132
490.000	677.832	677.732	-0.100
500.000	677.550	677.555	0.005
510.000	677.383	677.378	-0.005
520.000	677.202	677.201	-0.001
530.000	676.965	677.024	0.059
540.000	676.703	676.847	0.144
550.000	676.458	676.671	0.213
560.000	676.263	676.494	0.231
570.000	676.060	676.317	0.257
580.000	675.911	676.140	0.229
590.000	675.722	675.963	0.241
600.000	675.560	675.786	0.226
610.000	675.439	675.609	0.170
613.794	675.398	675.542	0.144
620.000	675.327	675.430	0.103
630.000	675.171	675.242	0.071
640.000	675.071	675.045	-0.026
641.527	675.059	675.014	-0.045
650.000	674.986	674.838	-0.148
658.794	674.836	674.648	-0.188
660.000	674.821	674.621	-0.200
670.000	674.556	674.395	-0.161
680.000	674.215	674.159	-0.056

LONGITUDINAL SECTION

LONGITUDINAL SECTION - ROAD 01 MC01

CHAINAGE 340.000 TO 680.000

HORIZONTAL 1:500 VERTICAL 1:100 @ A1

0 0.5 1 1.5 2 2.5 5
SCALE:- 1:100

0 5 10 15 20 25
SCALE:- 1:500

SCALE: AS NOTED
SIZE: A1
DATE OF SURVEY: 22 JUNE 2020
DATUM: MGA2020, AHD

SURVEY	AS	
DESIGN	JE	
DRAWN	JE	
CHECKED	TP	
APPROVED	JW	

REV	DESCRIPTION	DATE
P0	PRELIMINARY PLANNING PROPOSAL DESIGN	13 JUN 24

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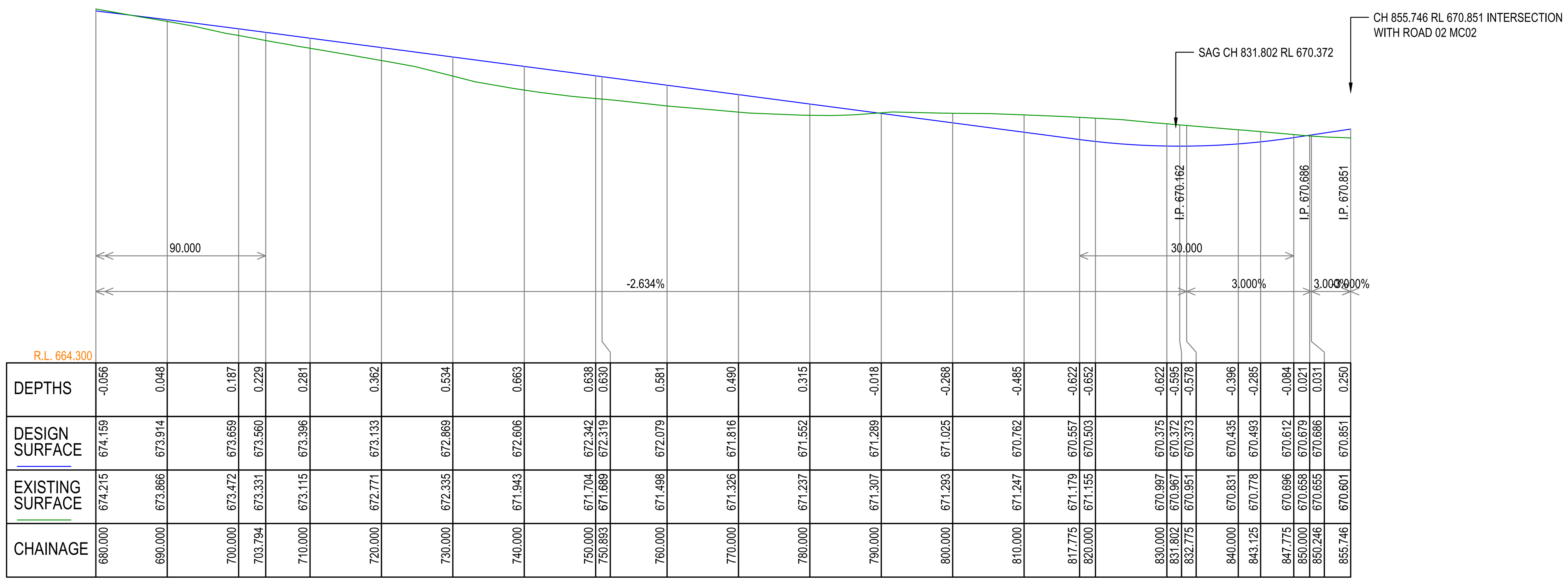
LGA: GOULBURN MULWAREE COUNCIL
CLIENT: ALIMACO PTY LTD C/- PRECISE PLANNING PTY LTD
DESCRIPTION: PLANNING PROPOSAL
DRAWING: ROAD 01 MC01 LONGITUDINAL

PRELIMINARY
NOT TO BE USED FOR CONSTRUCTION PURPOSES
RELEASE DATE: 13 JUNE 2024

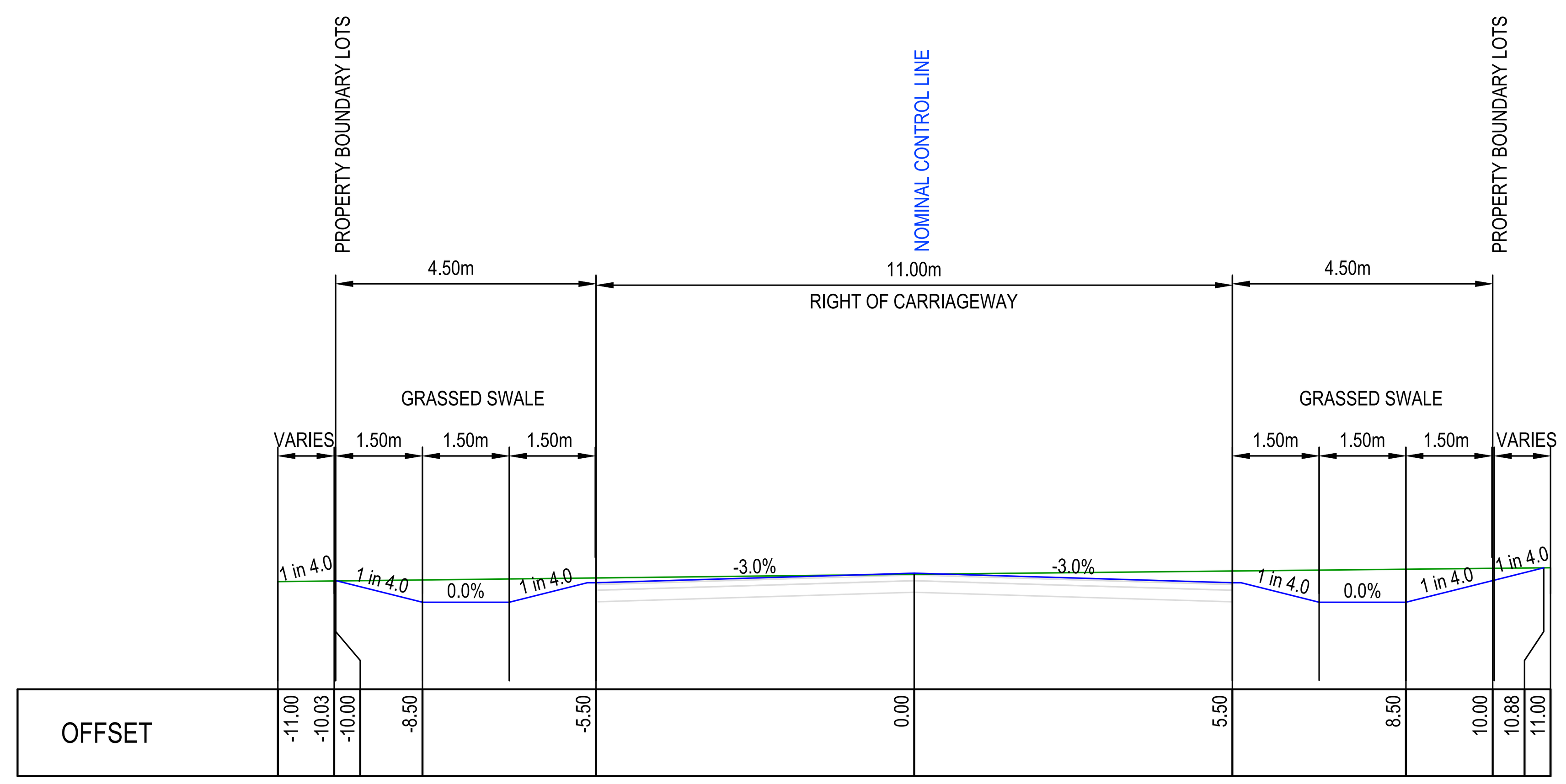
JOB-DRAWING NUMBER	REV
20027-413	P0



LONGITUDINAL SECTION - ROAD 01 MC01

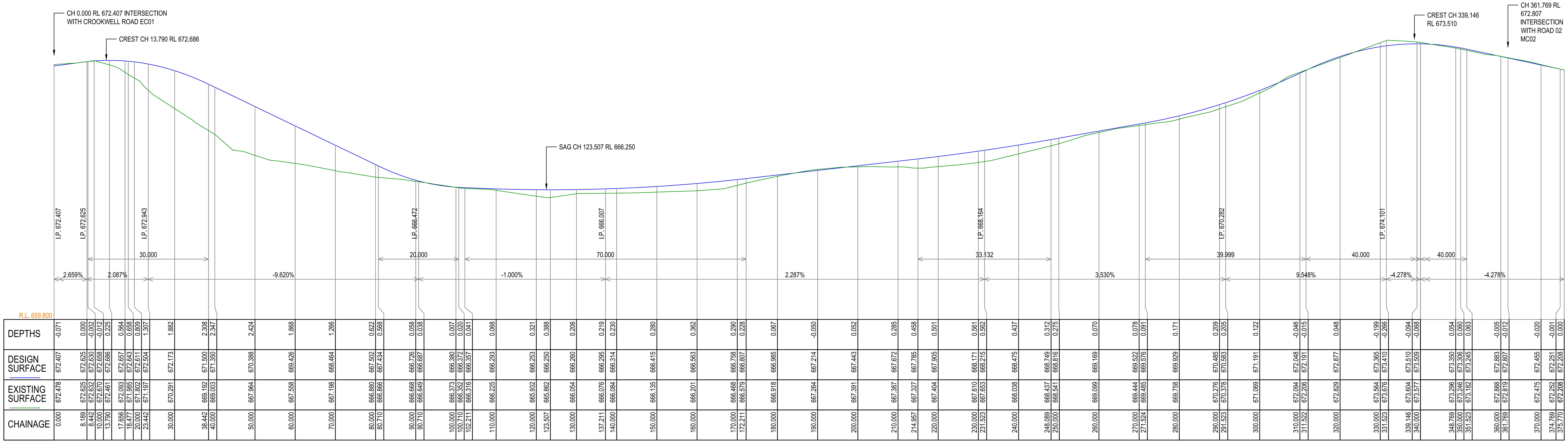
CHAINAGE 680.000 TO 855.746

HORIZONTAL 1:500 VERTICAL 1:100 @ A1



TYPICAL SECTION - ROAD 01 MC01, ROAD 02 MC02 & ROAD 03 MC03

HORIZONTAL 1:100 VERTICAL 1:100 @ A1



LONGITUDINAL SECTION - ROAD 03 MC03

CHAINAGE 0.000 TO 375.770

HORIZONTAL 1:500 VERTICAL 1:100 @ A1

SCALE:- 1:100

SCALE:- 1:500

SCALE: AS NOTED	SURVEY	AS	REV	DESCRIPTION	DATE
SIZE: A1	DESIGN	JE	P0	PRELIMINARY PLANNING PROPOSAL DESIGN	13 JUN 24
DATE OF SURVEY: 22 JUNE 2020	DRAWN	JE			
DATUM: MGA2020, AHD	CHECKED	TP			
	APPROVED	JW			

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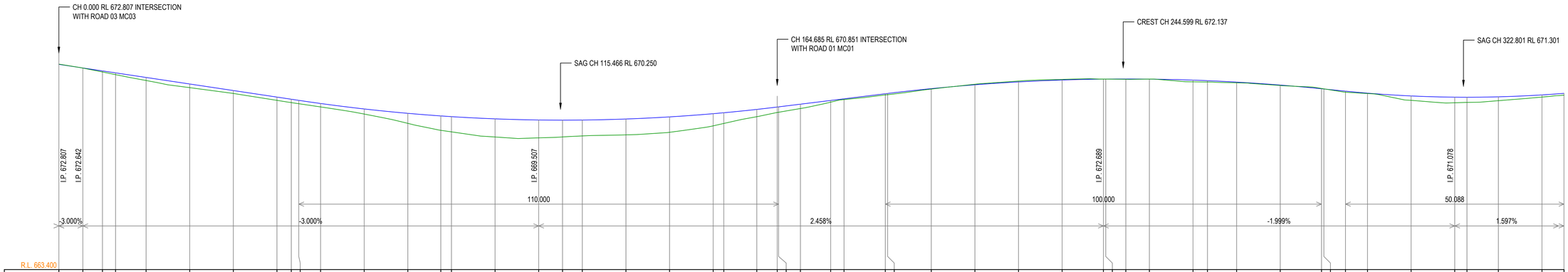
LOCATION: 515 CROOKWELL RD, KINGSDALE, NSW - LOT 103 & 104 D.P. 1007433
LGA: GOULBURN MULWAREE COUNCIL
CLIENT: ALIMACO PTY LTD C/- PRECISE PLANNING PTY LTD
DESCRIPTION: PLANNING PROPOSAL
DRAWING: ROAD 01 MC01 & ACCESS ROAD MC04 LONGITIDINAL AND TYPICAL SECTIONS

PRELIMINARY
NOT TO BE USED FOR CONSTRUCTION PURPOSES
RELEASE DATE: 13 JUNE 2024

JOB-DRAWING NUMBER	REV
20027-414	P0



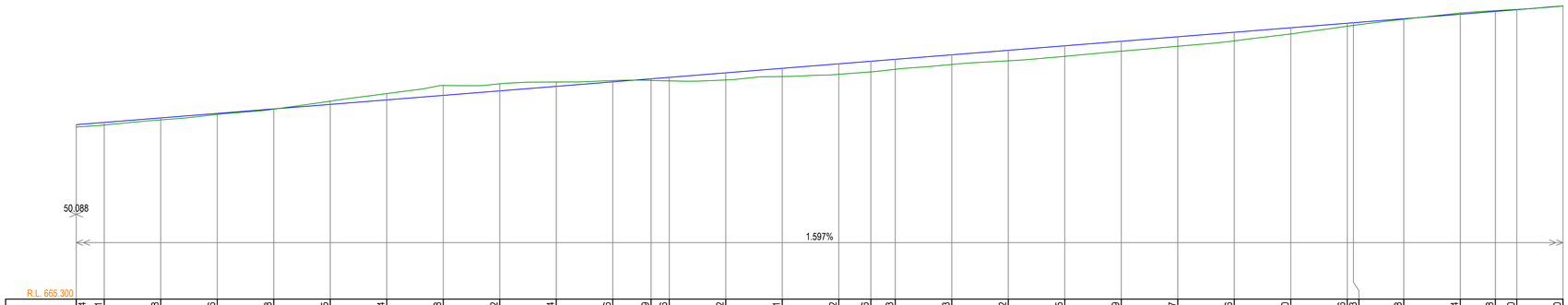
R.L. 663.400

CHAINAGE	0.000	5.500	10.000	12.999	20.000	30.000	40.000	50.000	53.283	55.000	60.000	70.000	80.000	87.558	90.000	100.000	110.000	115.466	120.000	130.000	140.000	150.000	152.436	160.000	164.685	165.000	170.000	176.935	180.000	189.459	190.000	200.000	210.000	220.000	230.000	239.459	240.000	244.599	250.000	260.000	263.317	270.000	280.000	289.459	290.000	294.956	300.000	310.000	320.000	322.801	330.000	340.000	345.044
DEPTHS	-0.012	0.005	0.049	0.081	0.140	0.167	0.134	0.150	0.154	0.154	0.157	0.234	0.459	0.660	0.698	0.831	0.819	0.770	0.729	0.726	0.706	0.557	0.491	0.333	0.250	0.247	0.199	0.078	0.034	0.054	0.056	0.019	-0.024	-0.040	-0.027	-0.001	0.001	0.013	-0.001	0.077	0.060	0.032	0.019	-0.013	-0.007	0.050	0.017	0.201	0.256	0.238	0.177	0.099	0.084
DESIGN SURFACE	672.807	672.642	672.507	672.417	672.207	671.907	671.607	671.307	671.208	671.157	671.013	670.763	670.562	670.443	670.411	670.309	670.257	670.250	670.255	670.302	670.399	670.546	670.589	670.742	670.851	670.859	670.981	671.152	671.227	671.460	671.473	671.694	671.871	672.042	672.090	672.131	672.133	672.137	672.131	672.084	672.059	671.994	671.858	671.689	671.676	671.579	671.487	671.359	671.303	671.301	671.319	671.407	671.478
EXISTING SURFACE	672.819	672.637	672.458	672.336	672.067	671.740	671.473	671.157	671.054	671.003	670.856	670.529	670.103	669.783	669.713	669.478	669.438	669.480	669.526	669.576	669.693	669.989	670.098	670.409	670.601	670.612	670.782	671.074	671.193	671.406	671.417	671.675	671.895	672.042	672.117	672.132	672.132	672.124	672.132	672.007	671.999	671.962	671.839	671.702	671.685	671.529	671.470	671.158	671.047	671.063	671.142	671.308	671.394

LONGITUDINAL SECTION - ROAD 02 MC02

CHAINAGE 0.000 TO 345.044

HORIZONTAL 1:500 VERTICAL 1:100 @ A1



R.L. 665.300

CHAINAGE	345.044	350.000	360.000	370.000	380.000	390.000	400.000	410.000	420.000	430.000	440.000	446.785	460.000	470.000	480.000	485.675	490.000	500.000	510.000	520.000	530.000	540.000	550.000	560.000	570.000	571.090	580.000	590.000	596.209	600.000	608.173
DEPTHS	0.084	0.091	0.068	0.036	0.008	-0.115	-0.224	-0.348	-0.262	-0.154	-0.046	0.059	0.126	0.252	0.291	0.372	0.376	0.353	0.343	0.372	0.375	0.349	0.337	0.306	0.220	0.106	0.093	0.018	-0.044	-0.028	-0.010	0.000
DESIGN SURFACE	671.478	671.557	671.717	671.877	672.036	672.196	672.356	672.516	672.675	672.835	672.995	673.103	673.154	673.314	673.474	673.634	673.724	673.793	673.953	674.113	674.272	674.432	674.592	674.752	674.911	675.071	675.088	675.231	675.390	675.490	675.550	675.681
EXISTING SURFACE	671.394	671.466	671.649	671.841	672.028	672.311	672.580	672.864	672.927	672.989	673.041	673.044	673.028	673.062	673.183	673.262	673.348	673.440	673.610	673.741	673.897	674.083	674.255	674.446	674.691	674.965	674.995	675.213	675.434	675.518	675.560	675.681

LONGITUDINAL SECTION - ROAD 02 MC02

CHAINAGE 345.044 TO 608.173

HORIZONTAL 1:500 VERTICAL 1:100 @ A1

0 0.5 1 1.5 2 2.5 5
SCALE:- 1:100

0 5 10 15 20 25
SCALE:- 1:500

SCALE: AS NOTED
SIZE: A1
DATE OF SURVEY: 22 JUNE 2020
DATUM: MGA2020, AHD

SURVEY	AS	REV	DESCRIPTION	DATE
DESIGN	JE	P0	PRELIMINARY PLANNING PROPOSAL DESIGN	13 JUN 24
DRAWN	JE			
CHECKED	TP			
APPROVED	JW			

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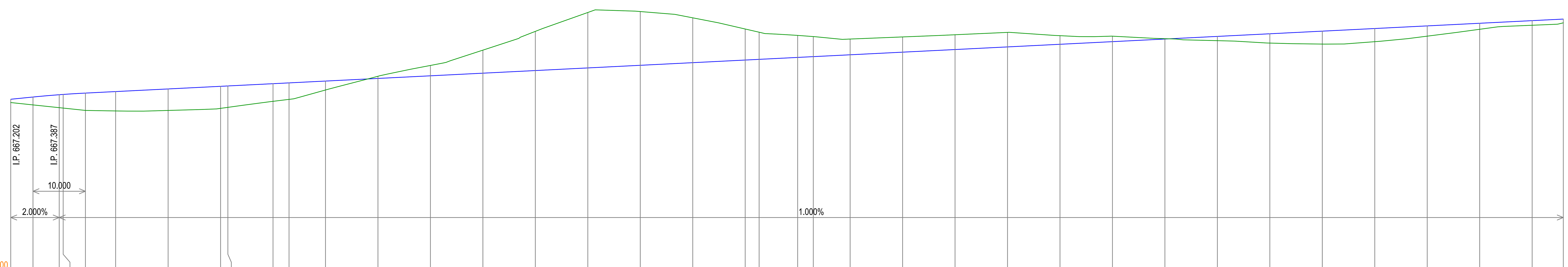
SYDNEY OFFICE: 152 SAILORS BAY ROAD, NORTHBRIDGE NSW 2063
T: 1800 318 052 E: info@civplan.com.au W: www.civplan.com.au

JOB NAME: 24 LARGE LOT RESIDENTIAL SUBDIVISION
LOCATION: 515 CROOKWELL RD, KINGSDALE, NSW - LOT 103 & 104 D.P. 1007433
LGA: GOULBURN MULWAREE COUNCIL
CLIENT: ALIMACO PTY LTD C/- PRECISE PLANNING PTY LTD
DESCRIPTION: PLANNING PROPOSAL
DRAWING: ROAD 02 MC02 LONGITUDIONAL SECTIONS

PRELIMINARY
NOT TO BE USED FOR CONSTRUCTION PURPOSES
RELEASE DATE: 13 JUNE 2024

JOB-DRAWING NUMBER	REV
20027-415	P0



DEPTHS	0.127	0.300	0.492	0.519	0.660	0.737	0.817	0.838	0.814	0.671	0.627	0.340	-0.084
DESIGN SURFACE	667.202	667.287	667.374	667.385	667.437	667.494	667.594	667.694	667.708	667.794	667.825	667.894	667.994
EXISTING SURFACE	667.075	666.987	666.882	666.866	666.777	666.757	666.777	666.856	666.894	667.123	667.198	667.554	668.078
CHAINAGE	0.000	4.244	9.244	10.000	14.244	20.000	30.000	40.000	41.391	50.000	53.052	60.000	70.000

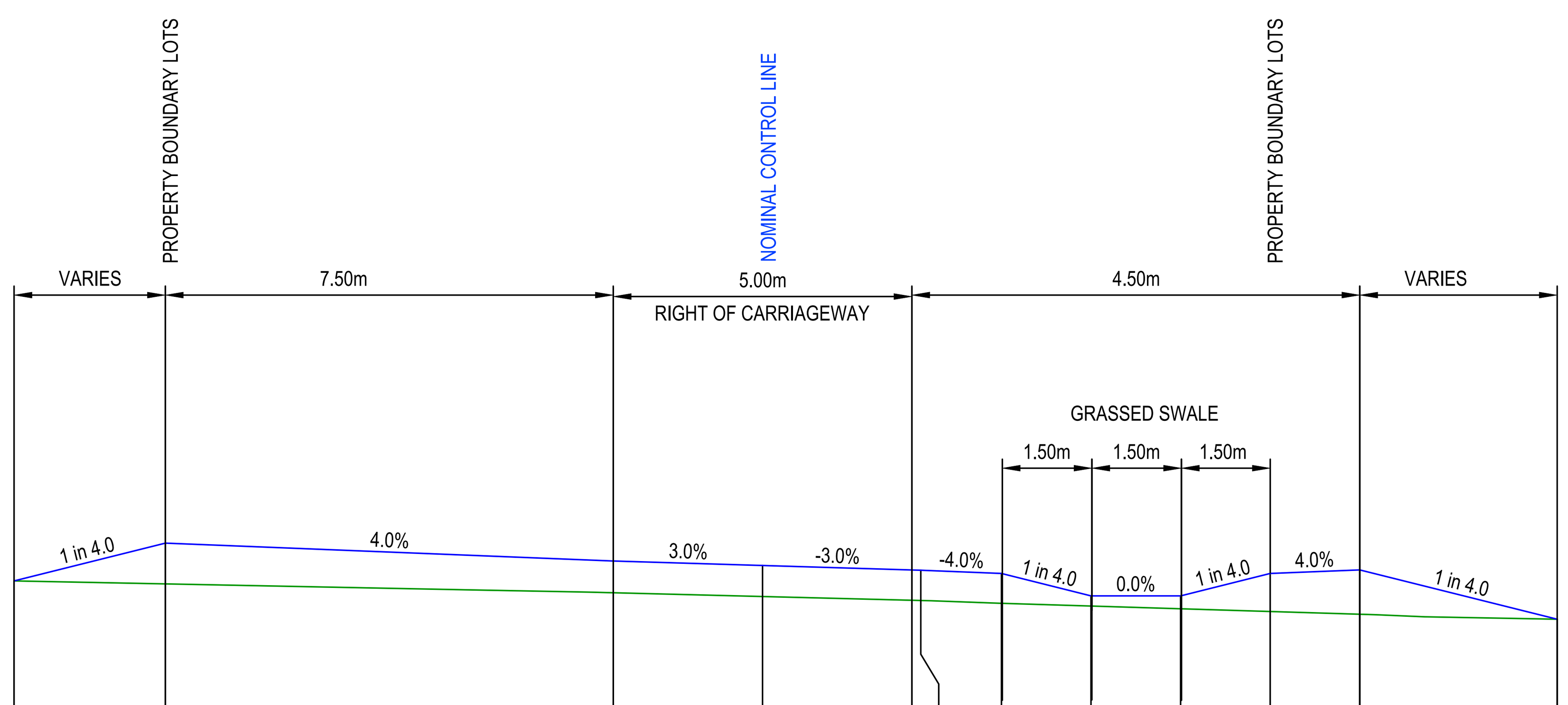
DEPTHS	-0.395	-0.878	-1.492	-2.111	-2.047	-1.707	-1.182	-1.034	-0.838	-0.764	-0.599	-0.580
DESIGN SURFACE	668.094	668.194	668.294	668.394	668.494	668.594	668.694	668.721	668.794	668.824	668.894	668.994
EXISTING SURFACE	668.489	669.072	669.786	670.505	670.541	670.301	669.876	669.755	669.632	669.588	669.493	669.574
CHAINAGE	80.000	90.000	100.000	110.000	120.000	130.000	140.000	142.654	150.000	152.976	160.000	170.000

DEPTHS	-0.563	-0.553	-0.328	-0.209	-0.013	0.162	0.354	0.492	0.501	0.390	0.229	0.175	0.143
DESIGN SURFACE	669.094	669.194	669.294	669.394	669.494	669.594	669.694	669.794	669.894	669.994	670.094	670.194	670.254
EXISTING SURFACE	669.657	669.747	669.622	669.603	669.507	669.432	669.340	669.302	669.393	669.604	669.865	670.019	670.111
CHAINAGE	180.000	190.000	200.000	210.000	220.000	230.000	240.000	250.000	260.000	270.000	280.000	290.000	295.937

LONGITUDINAL SECTION - ACCESS ROAD MC04

CHAINAGE 0.000 TO 295.937

HORIZONTAL 1:500 VERTICAL 1:100 @ A1



OFFSET	-12.53	-10.00	-2.50	0.00	2.50	2.65	4.00	5.50	7.00	8.50	10.00	13.31

TYPICAL SECTION - ACCESS ROAD MC04

HORIZONTAL 1:100 VERTICAL 1:100 @ A1

0 0.5 1 1.5 2 2.5 5
SCALE:- 1:100

0 5 10 15 20 25
SCALE:- 1:500

SCALE: AS NOTED	SURVEY	AS	REV	DESCRIPTION	DATE	
SIZE: A1	DESIGN	JE	P0	PRELIMINARY PLANNING PROPOSAL DESIGN	13 JUN 24	
DATE OF SURVEY: 22 JUNE 2020	DRAWN	JE				
DATUM: MGA2020, AHD	CHECKED	TP				
	APPROVED	JW				

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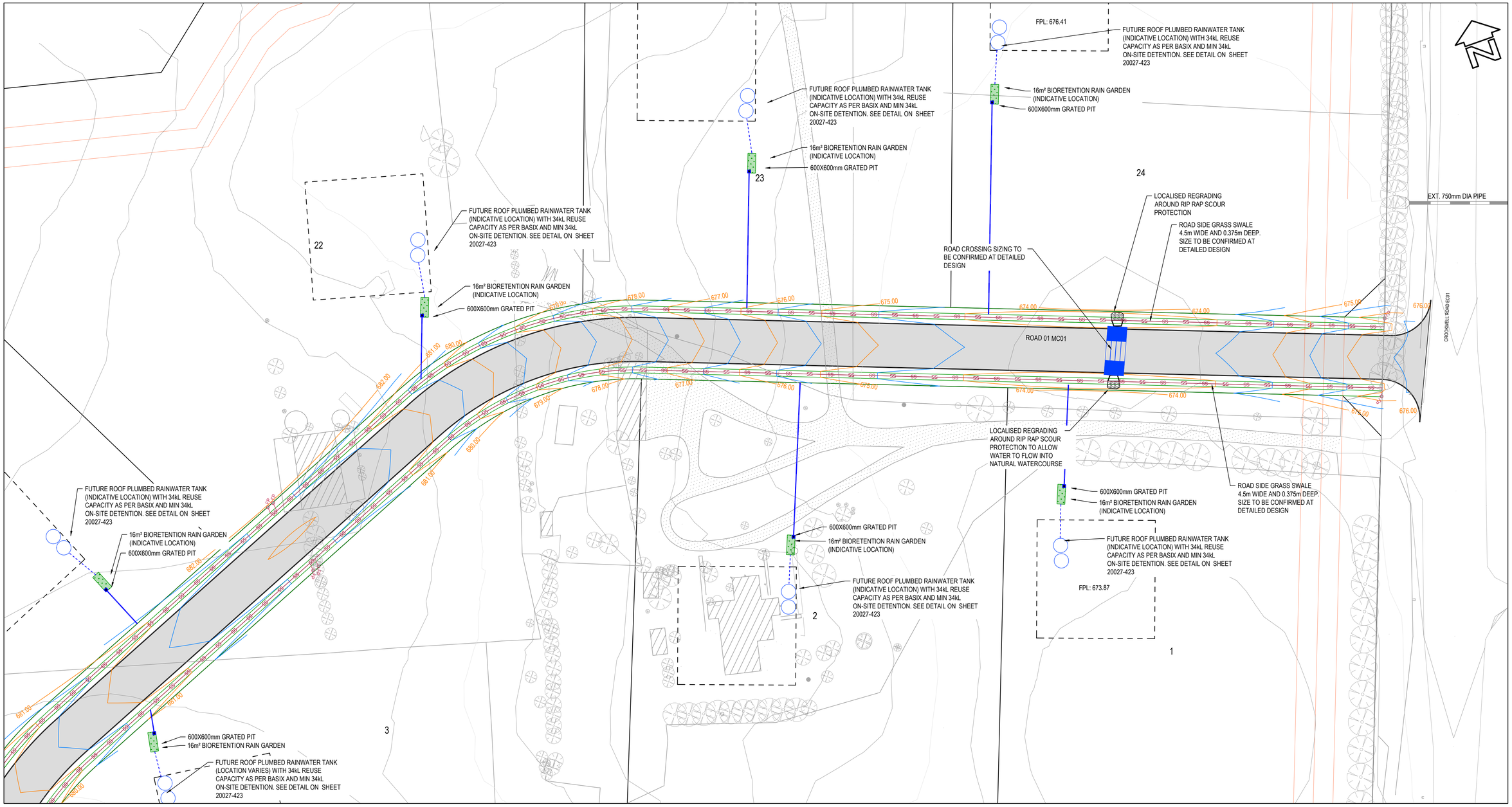
SYDNEY OFFICE: 152 SAILORS BAY ROAD, NORTHBRIDGE NSW 2063
T: 1800 318 052 E: info@civplan.com.au W: www.civplan.com.au

JOB NAME: 24 LARGE LOT RESIDENTIAL SUBDIVISION
LOCATION: 515 CROOKWELL RD, KINGSDALE, NSW - LOT 103 & 104 D.P. 1007433
LGA: GOULBURN MULWAREE COUNCIL
CLIENT: ALIMACO PTY LTD C/- PRECISE PLANNING PTY LTD
DESCRIPTION: PLANNING PROPOSAL
DRAWING: ACCESS ROAD MC04 LONGITUDIONAL AND TYPICAL SECTIONS

PRELIMINARY
NOT TO BE USED FOR CONSTRUCTION PURPOSES
RELEASE DATE: 13 JUNE 2024

JOB-DRAWING NUMBER	REV
20027-416	P0



DRAINAGE LAYOUT PLAN ZONE 1

1:500 @ A1

SHEET LEGEND			
EXISTING DRAINAGE PIPE	SWD	CONCRETE HEADWALL AND RIP RAP	
STORMWATER DRAINAGE PIPE		DRAINAGE PIT MARKERS	
DRAINAGE PIT - 1.8m PIT WITH LINTEL		SUB-SOIL AND FLUSH POINTS	SS SS
DRAINAGE PIT - 2.4m SAG WITH LINTEL		KERB ADAPTOR / OUTLET	
INTERALLOTMENT DRAINAGE PIT (IAD)		ACO GRATED DRAIN OR SIMILAR	
GRATED PIT AND CONC. SURROUND		RAINWATER TANK	RWT

DRAINAGE CONSTRUCTION NOTES:

1. WHERE INTERALLOTMENT DRAINAGE CONNECTIONS HAVE NOT BEEN CONSTRUCTED, KERB OUTLET ADAPTORS ARE TO BE INSTALLED AT EACH LOT KERB FRONTAGE ON THE DOWNSTREAM END IN ACCORDANCE WITH COUNCIL REQUIREMENTS.
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0 5 10 15 20 25
SCALE:- 1:500

WARNING
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GDA 2020

SCALE: AS NOTED
SIZE: A1
DATE OF SURVEY: 22 JUNE 2020
DATUM: MGA2020, AHD

SURVEY	AS	REV	DESCRIPTION	DATE
DESIGN	JE	P0	PRELIMINARY PLANNING PROPOSAL DESIGN	13 JUN 24
DRAWN	JE			
CHECKED	TP			
APPROVED	JW			

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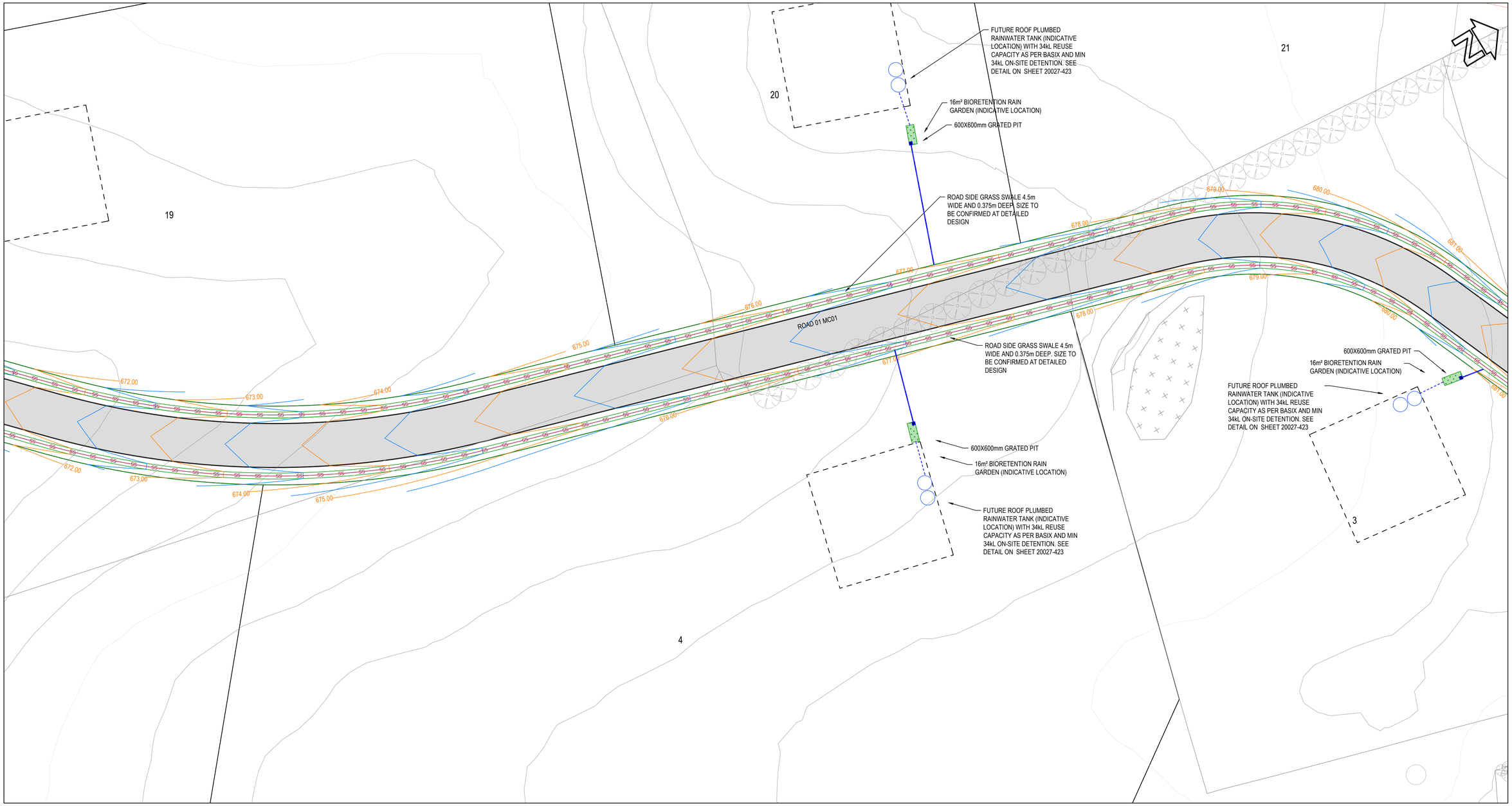
JOB NAME: 24 LARGE LOT RESIDENTIAL SUBDIVISION
LOCATION: 515 CROOKWELL RD, KINGSDALE, NSW - LOT 103 & 104 D.P. 1007433
LGA: GOULBURN MULWAREE COUNCIL
CLIENT: ALIMACO PTY LTD C/- PRECISE PLANNING PTY LTD
DESCRIPTION: PLANNING PROPOSAL
DRAWING: DRAINAGE LAYOUT PLAN ZONE 1 OF 6

PRELIMINARY
NOT TO BE USED FOR CONSTRUCTION PURPOSES
RELEASE DATE: 13 JUNE 2024

JOB-DRAWING NUMBER	REV
20027-417	P0

REFER TO SHEET 20027-416 FOR CONTINUATION



REFER TO SHEET 20027-417 FOR CONTINUATION

DRAINAGE LAYOUT PLAN ZONE 2

1:500 @ A1

SHEET LEGEND			
EXISTING DRAINAGE PIPE	SWD	CONCRETE HEADWALL AND RIP RAP	
STORMWATER DRAINAGE PIPE		DRAINAGE PIT MARKERS	
DRAINAGE PIT - 1.8m PIT WITH LINTEL		SUB-SOIL AND FLUSH POINTS	SS SS
DRAINAGE PIT - 2.4m SAG WITH LINTEL		KERB ADAPTOR / OUTLET	
INTERALLOTMENT DRAINAGE PIT (IAD)		ACO GRATED DRAIN OR SIMILAR	
GRATED PIT AND CONC. SURROUND		RAINWATER TANK	RWT

DRAINAGE CONSTRUCTION NOTES:

1. WHERE INTERALLOTMENT DRAINAGE CONNECTIONS HAVE NOT BEEN CONSTRUCTED, KERB OUTLET ADAPTORS ARE TO BE INSTALLED AT EACH LOT KERB FRONTAGE ON THE DOWNSTREAM END IN ACCORDANCE WITH COUNCIL REQUIREMENTS.
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0 5 10 15 20 25
SCALE:- 1:500

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GDA 2020

SCALE: AS NOTED
SIZE: A1
DATE OF SURVEY: 22 JUNE 2020
DATUM: MGA2020, AHD

SURVEY	AS		
DESIGN	JE		
DRAWN	JE		
CHECKED	TP		
APPROVED	JW		

REV	DESCRIPTION	DATE
P0	PRELIMINARY PLANNING PROPOSAL DESIGN	13 JUN 24

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JOB NAME: 24 LARGE LOT RESIDENTIAL SUBDIVISION
LOCATION: 515 CROOKWELL RD, KINGSDALE, NSW - LOT 103 & 104 D.P. 1007433
LGA: GOULBURN MULWAREE COUNCIL
CLIENT: ALIMACO PTY LTD C/- PRECISE PLANNING PTY LTD
DESCRIPTION: PLANNING PROPOSAL
DRAWING: DRAINAGE LAYOUT PLAN ZONE 2 OF 6

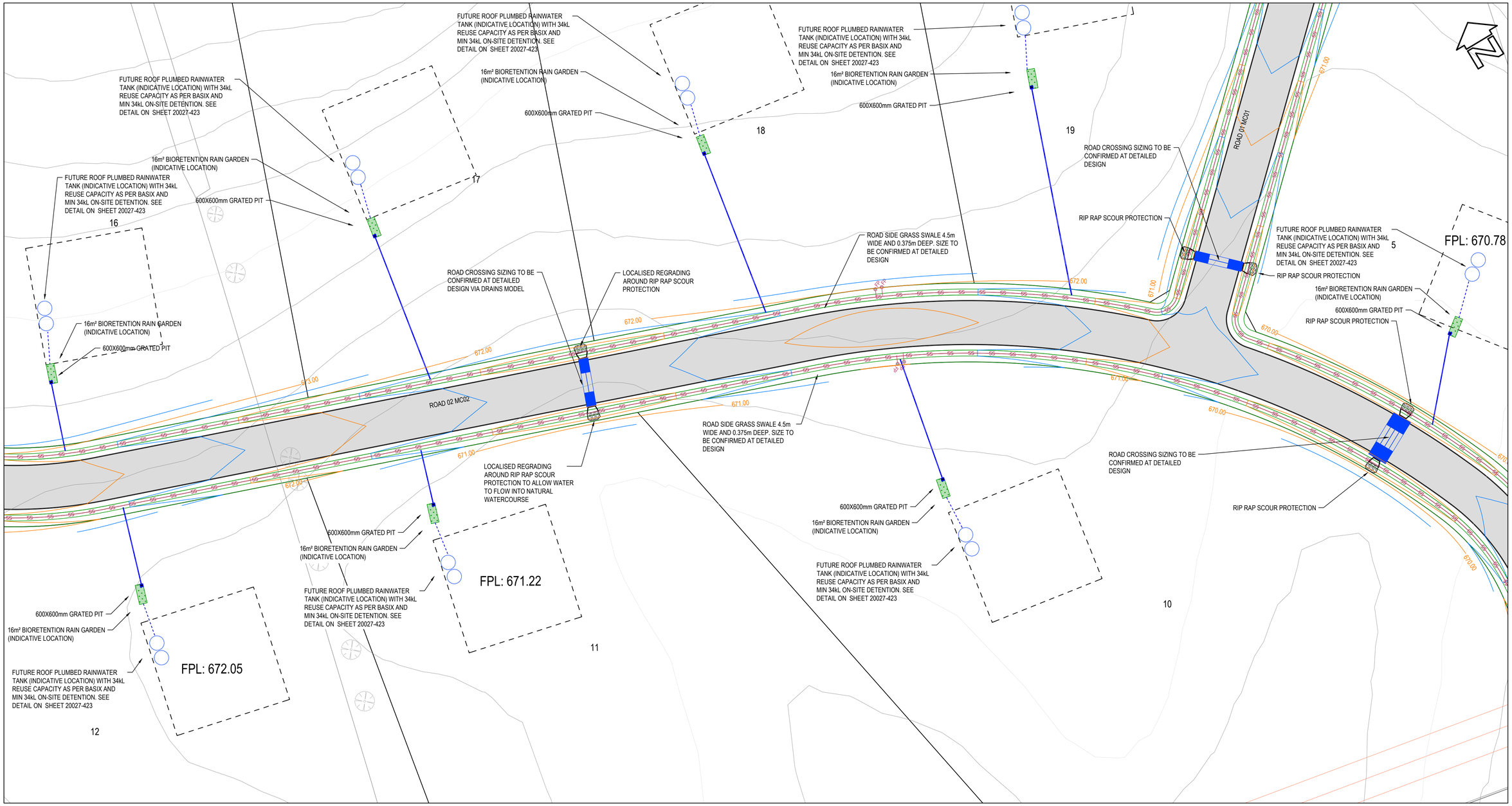
PRELIMINARY
NOT TO BE USED FOR CONSTRUCTION PURPOSES
RELEASE DATE: 13 JUNE 2024

JOB-DRAWING NUMBER	REV
20027-418	P0

REFER TO SHEET 20027-418 FOR CONTINUATION

REFER TO SHEET 20027-420 FOR CONTINUATION

REFER TO SHEET 20027-421 FOR CONTINUATION



DRAINAGE LAYOUT PLAN ZONE 3

1:500 @ A1

SHEET LEGEND			
EXISTING DRAINAGE PIPE	SWD	CONCRETE HEADWALL AND RIP RAP	
STORMWATER DRAINAGE PIPE		DRAINAGE PIT MARKERS	
DRAINAGE PIT - 1.8m PIT WITH LINTEL		SUB-SOIL AND FLUSH POINTS	
DRAINAGE PIT - 2.4m SAG WITH LINTEL		KERB ADAPTOR / OUTLET	
INTERALLOTMENT DRAINAGE PIT (IAD)		ACO GRATED DRAIN OR SIMILAR	
GRATED PIT AND CONC. SURROUND		RAINWATER TANK	RWT

DRAINAGE CONSTRUCTION NOTES:

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0 5 10 15 20 25

SCALE:- 1:500

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GDA 2020

SCALE: AS NOTED
SIZE: A1
DATE OF SURVEY: 22 JUNE 2020
DATUM: MGA2020, AHD

SURVEY	AS	REV	DESCRIPTION	DATE
DESIGN	JE	P0	PRELIMINARY PLANNING PROPOSAL DESIGN	13 JUN 24
DRAWN	JE			
CHECKED	TP			
APPROVED	JW			

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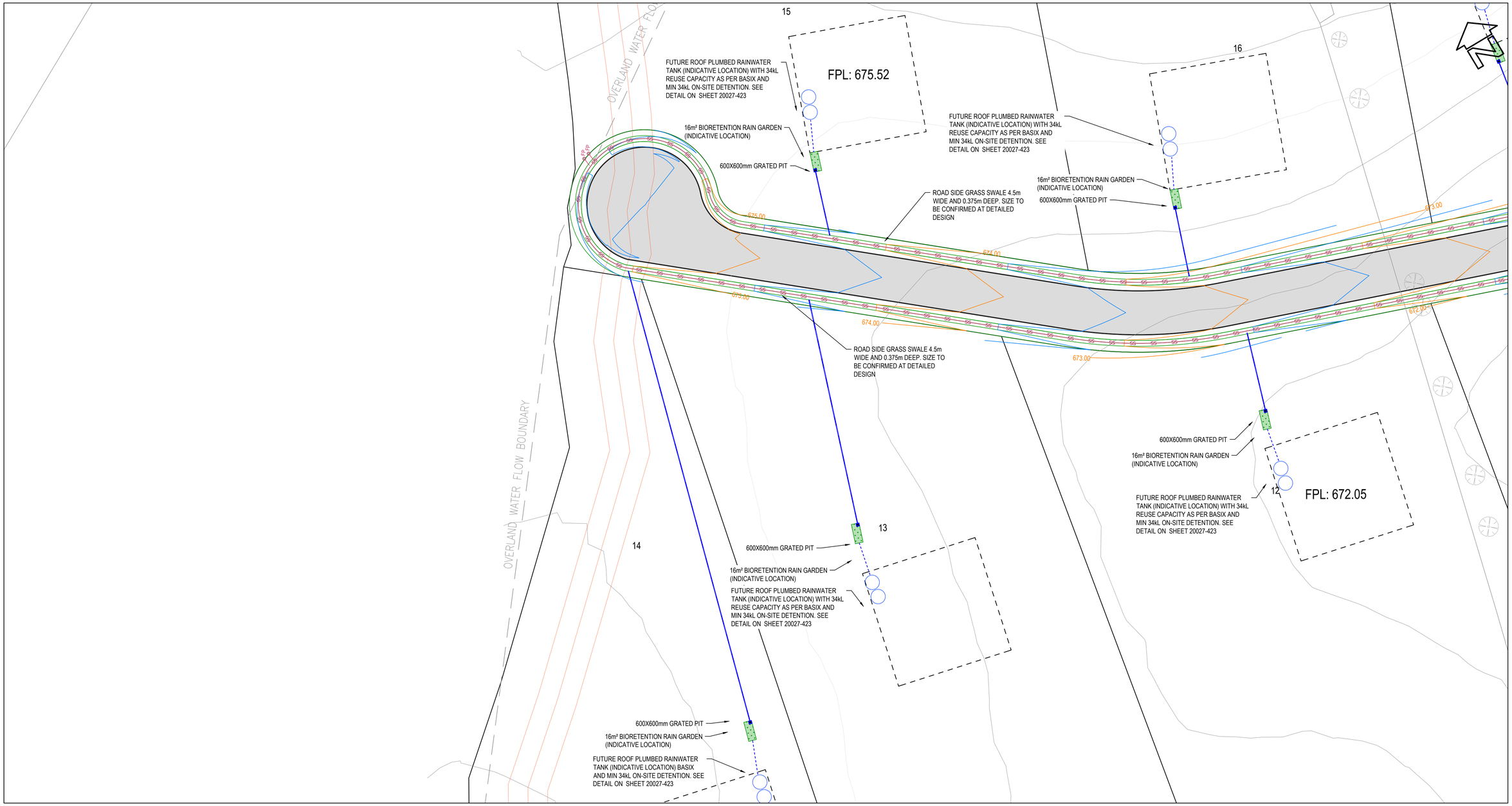
JOB NAME: 24 LARGE LOT RESIDENTIAL SUBDIVISION
LOCATION: 515 CROOKWELL RD, KINGSDALE, NSW - LOT 103 & 104 D.P. 1007433
LGA: GOULBURN MULWAREE COUNCIL
CLIENT: ALIMACO PTY LTD C/- PRECISE PLANNING PTY LTD
DESCRIPTION: PLANNING PROPOSAL
DRAWING: DRAINAGE LAYOUT PLAN ZONE 3 OF 6

PRELIMINARY
NOT TO BE USED FOR CONSTRUCTION PURPOSES
RELEASE DATE: 13 JUNE 2024

JOB-DRAWING NUMBER	REV
20027-419	P0



DRAINAGE LAYOUT PLAN ZONE 4

1:500 @ A1

SHEET LEGEND			
EXISTING DRAINAGE PIPE	SWD	CONCRETE HEADWALL AND RIP RAP	
STORMWATER DRAINAGE PIPE		DRAINAGE PIT MARKERS	
DRAINAGE PIT - 1.8m PIT WITH LINTEL		SUB-SOIL AND FLUSH POINTS	SS SS
DRAINAGE PIT - 2.4m SAG WITH LINTEL		KERB ADAPTOR / OUTLET	
INTERALLOTMENT DRAINAGE PIT (IAD)		ACO GRATED DRAIN OR SIMILAR	
GRATED PIT AND CONC. SURROUND		RAINWATER TANK	RWT

DRAINAGE CONSTRUCTION NOTES:

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0 5 10 15 20 25
SCALE:- 1:500

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GDA 2020

REFER TO SHEET 20027-419 FOR CONTINUATION

REFER TO SHEET 20027-419 FOR CONTINUATION

SCALE: AS NOTED
SIZE: A1
DATE OF SURVEY: 22 JUNE 2020
DATUM: MGA2020, AHD

SURVEY	AS		
DESIGN	JE		
DRAWN	JE		
CHECKED	TP		
APPROVED	JW		

REV	DESCRIPTION	DATE
P0	PRELIMINARY PLANNING PROPOSAL DESIGN	13 JUN 24

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T: 1800 318 052 E: info@civplan.com.au W: www.civplan.com.au

JOB NAME: 24 LARGE LOT RESIDENTIAL SUBDIVISION
LOCATION: 515 CROOKWELL RD, KINGSDALE, NSW - LOT 103 & 104 D.P. 1007433
LGA: GOULBURN MULWAREE COUNCIL
CLIENT: ALIMACO PTY LTD C/- PRECISE PLANNING PTY LTD
DESCRIPTION: PLANNING PROPOSAL
DRAWING: DRAINAGE LAYOUT PLAN ZONE 4 OF 6

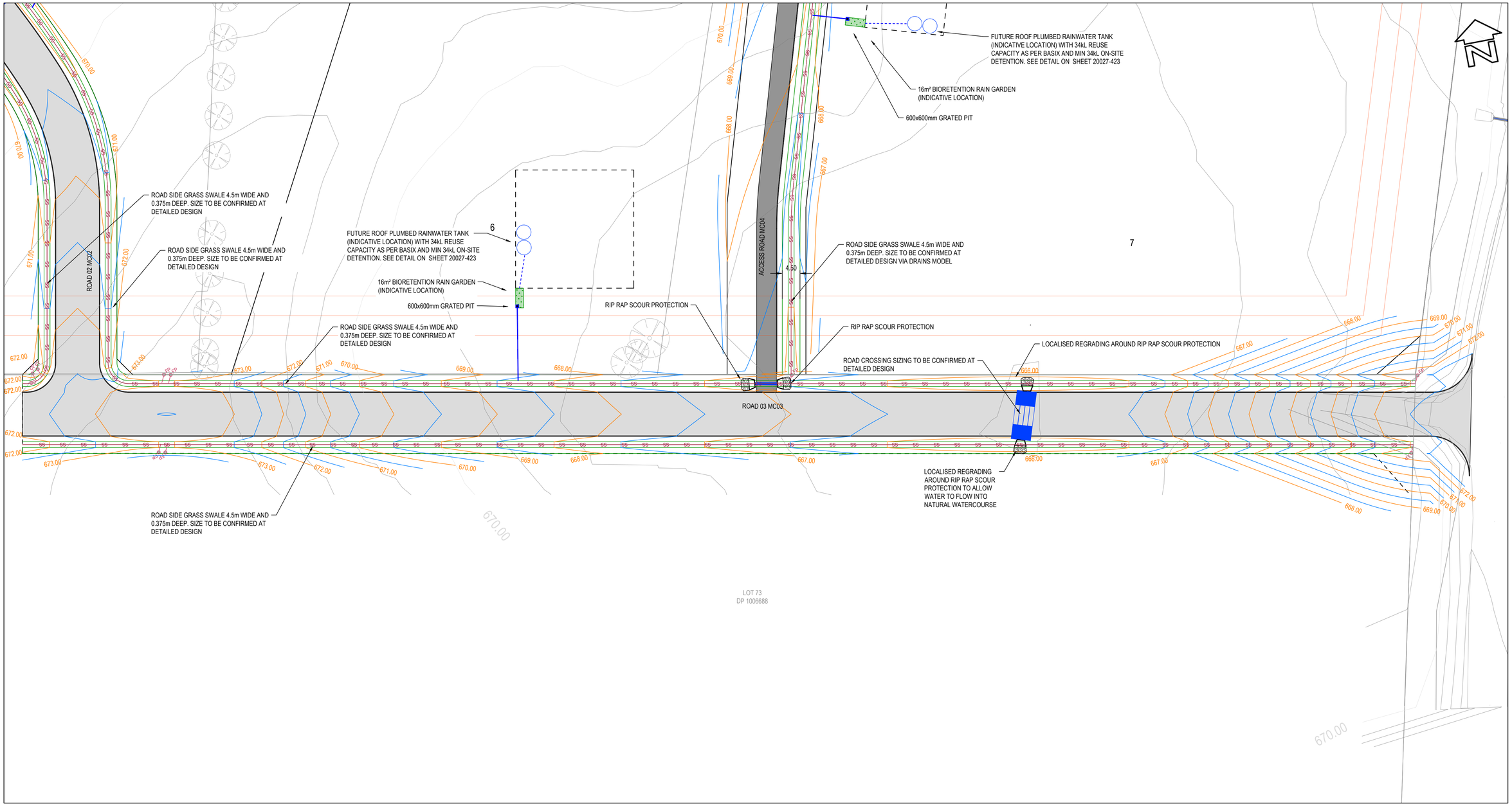
PRELIMINARY
NOT TO BE USED FOR CONSTRUCTION PURPOSES

RELEASE DATE: 13 JUNE 2024

JOB-DRAWING NUMBER	REV
20027-420	P0

REFER TO SHEET 20027-422 FOR CONTINUATION

REFER TO SHEET 20027-419 FOR CONTINUATION



DRAINAGE LAYOUT PLAN ZONE 5

1:500 @ A1

SHEET LEGEND			
EXISTING DRAINAGE PIPE	SWD	CONCRETE HEADWALL AND RIP RAP	
STORMWATER DRAINAGE PIPE		DRAINAGE PIT MARKERS	
DRAINAGE PIT - 1.8m PIT WITH LINTEL		SUB-SOIL AND FLUSH POINTS	
DRAINAGE PIT - 2.4m SAG WITH LINTEL		KERB ADAPTOR / OUTLET	
INTERALLOTMENT DRAINAGE PIT (IAD)		ACO GRATED DRAIN OR SIMILAR	
GRATED PIT AND CONC. SURROUND		RAINWATER TANK	RWT

DRAINAGE CONSTRUCTION NOTES:

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0 5 10 15 20 25
SCALE:- 1:500

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GDA 2020

SCALE: AS NOTED
SIZE: A1
DATE OF SURVEY: 22 JUNE 2020
DATUM: MGA2020, AHD

SURVEY	AS	REV	DESCRIPTION	DATE
DESIGN	JE	P0	PRELIMINARY PLANNING PROPOSAL DESIGN	13 JUN 24
DRAWN	JE			
CHECKED	TP			
APPROVED	JW			

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DEVELOPMENT & INFRASTRUCTURE CONSULTING
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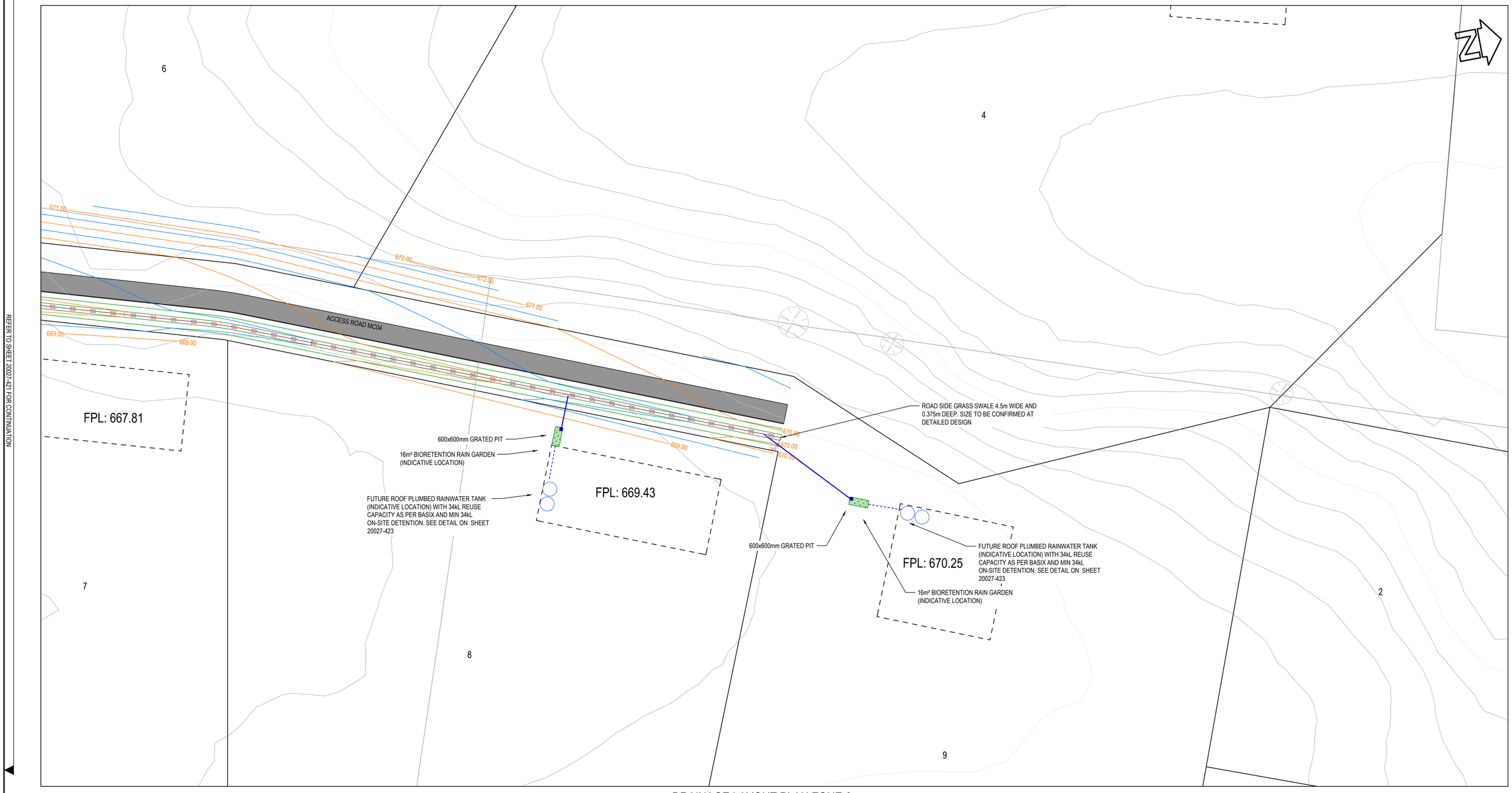
SYDNEY OFFICE: 152 SAILORS BAY ROAD, NORTHBRIDGE NSW 2063
T: 1800 318 052 E: info@civplan.com.au W: www.civplan.com.au

JOB NAME: 24 LARGE LOT RESIDENTIAL SUBDIVISION
LOCATION: 515 CROOKWELL RD, KINGSDALE, NSW - LOT 103 & 104 D.P. 1007433
LGA: GOULBURN MULWAREE COUNCIL
CLIENT: ALIMACO PTY LTD C/- PRECISE PLANNING PTY LTD
DESCRIPTION: PLANNING PROPOSAL
DRAWING: DRAINAGE LAYOUT PLAN ZONE 5 OF 6

PRELIMINARY
NOT TO BE USED FOR CONSTRUCTION PURPOSES
RELEASE DATE: 13 JUNE 2024

JOB-DRAWING NUMBER	REV
20027-421	P0



DRAINAGE LAYOUT PLAN ZONE 6

1:500 @ A1

SHEET LEGEND			
EXISTING DRAINAGE PIPE	SWD	CONCRETE HEADWALL AND RIP RAP	
STORMWATER DRAINAGE PIPE		DRAINAGE PIT MARKERS	
DRAINAGE PIT - 1.8m PIT WITH LINTEL		SUB-SOIL AND FLUSH POINTS	SS SS
DRAINAGE PIT - 2.4m SAG WITH LINTEL		KERB ADAPTOR / OUTLET	
INTERALLOTMENT DRAINAGE PIT (IAD)		ACO GRATED DRAIN OR SIMILAR	
GRATED PIT AND CONC. SURROUND		RAINWATER TANK	RWT

DRAINAGE CONSTRUCTION NOTES:

1. WHERE INTERALLOTMENT DRAINAGE CONNECTIONS HAVE NOT BEEN CONSTRUCTED, KERB OUTLET ADAPTORS ARE TO BE INSTALLED AT EACH LOT KERB FRONTAGE ON THE DOWNSTREAM END IN ACCORDANCE WITH COUNCIL REQUIREMENTS.
2. ANY CUSTOM PIT AND HEADWALLS ARE TO BE DESIGNED BY A QUALIFIED STRUCTURAL ENGINEER AND INSPECTED DURING CONSTRUCTION BY THE NOMINATED MANAGING CONSULTANT AND COUNCIL. DESIGN DETAILS ARE TO BE SUBMITTED TO COUNCIL FOR APPROVAL PRIOR TO COMMENCEMENT OF WORKS.

0 5 10 15 20 25
SCALE:- 1:500

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GDA 2020

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DATUM: MGA2020, AHD

		REV	DESCRIPTION	DATE
SURVEY	AS	P0	PRELIMINARY PLANNING PROPOSAL DESIGN	13 JUN 24
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DESCRIPTION: PLANNING PROPOSAL
DRAWING: DRAINAGE LAYOUT PLAN ZONE 6 OF 6

PRELIMINARY
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JOB-DRAWING NUMBER	REV
20027-422	P0

CATCHMENT SUMMARY				
PRE-DEVELOPMENT				
SITE	55.47	ha	1%	IMPERVIOUS
POST-DEVELOPMENT				
SITE - ROADS	4.31	ha	60%	IMPERVIOUS
SITE - LOTS	51.16	ha	2.7%	IMPERVIOUS

NOTE: THE UNDISTURBED VEGETATED AREA IS NOT INCLUDED ON THE STORMWATER QUANTITY AND QUALITY CALCULATIONS

LOT PERMISSIBLE SITE DISCHARGE (PSD) REQUIREMENT

CRITICAL STORM (% AEP)	PRE DEV SITE (m3/s)	POST DEV LOTS (m3/s)	POST DEV ROADS (m3/s)	PRE DEV SITE - POST DEV ROADS (m3/s)	PSD REQUIRED FOR LOTS (m3/s/ha)	L/s/ha
50	1.57	1.62	0.39	1.18	0.02	21.24
20	3.23	3.29	0.66	2.57	0.05	46.31
10	3.89	3.86	0.80	3.09	0.06	55.74
5	4.51	4.46	0.93	3.58	0.06	64.48
2	5.76	5.71	1.14	4.62	0.08	83.29
1	6.62	5.57	1.33	5.29	0.10	95.36

CONSIDERED LOT AREA: 55.47ha

CRITICAL STORM IS THE MEDIAN OF THE RELEVANT 1 MIN TO 2 HOUR DURATION USING ARR2019 PROTOCOLS

SITE STORAGE (SSR) REQUIREMENT

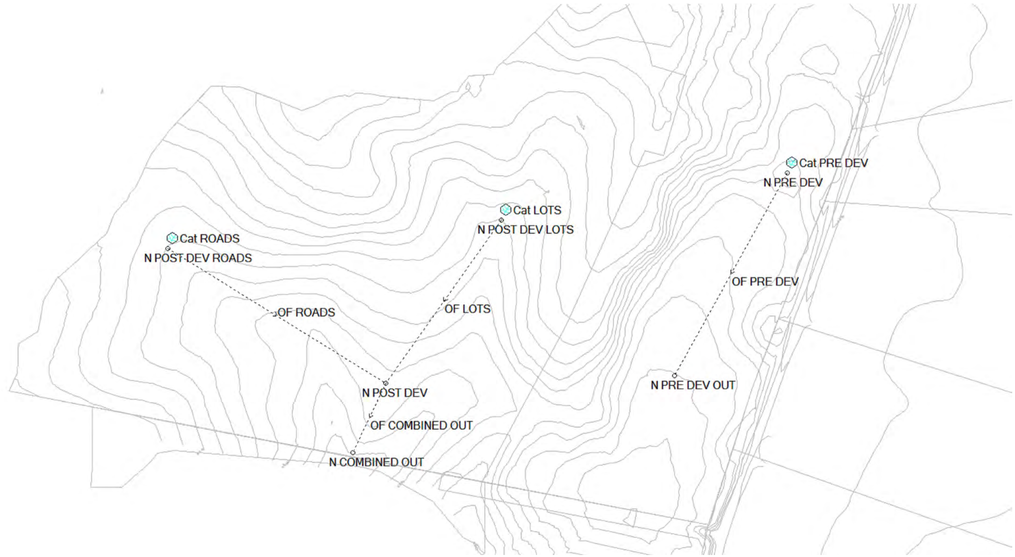
CRITICAL STORM (% AEP)	PRE DEV VOL (m3)	POST DEV VOL (m3)	SSR FOR LOTS (m3)	m3/ha
1(2hr)	23491.5	24436.2	944.7	17

SUMMARY

EACH LOT IS TO :

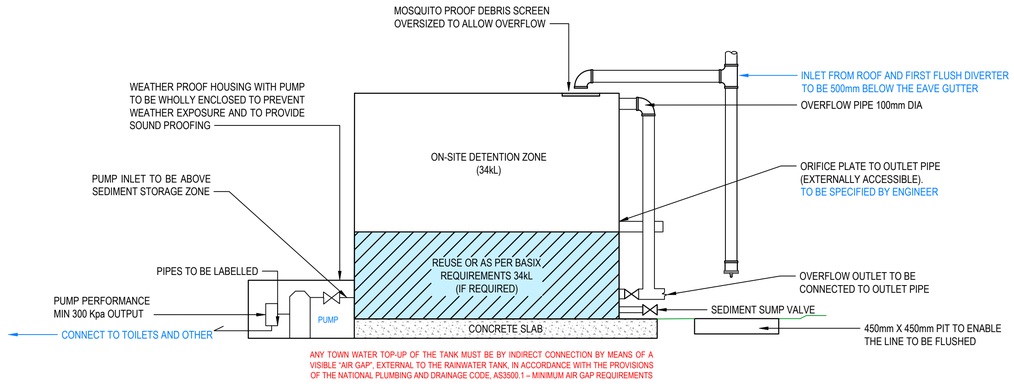
- PROVIDE 17m³/ha OF OSD TO SATISFY THE SITE STORAGE REQUIREMENT (SSR)
- COMPLY WITH THE FOLLOWING PERMISSIBLE SITE DISCHARGE (PSD) FLOWS NOTING THAT THE FINAL DWELLING DESIGN TO BE CHECKED BY A COMPETENT ENGINEER:

% AEP	L/s/ha
50	21
20	46
10	56
5	64
2	83
1	95



DRAINS MODEL SET-UP: PSD SSR

NTS



TYPICAL RAINWATER / OSD AT-SOURCE TANK

NTS

SCALE: AS NOTED
SIZE: A1
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DESCRIPTION: PLANNING PROPOSAL
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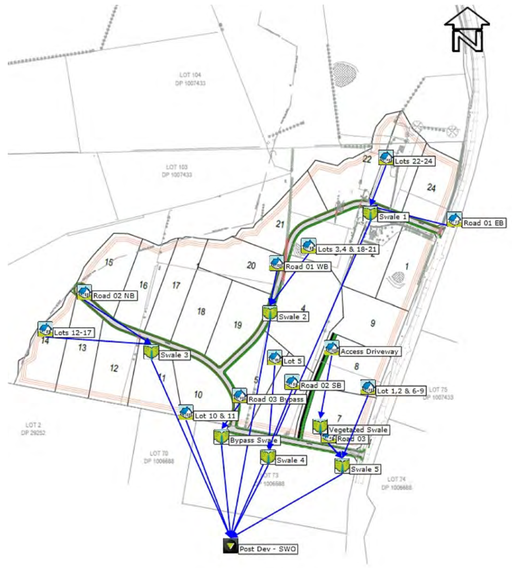
RELEASE DATE: 13 JUNE 2024

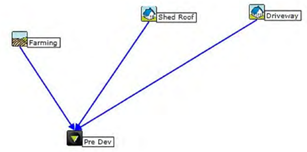
JOB-DRAWING NUMBER	REV
20027-423	P0

WATER QUALITY CATCHMENT PLAN

1:5000 @ A1



	Residual Load		Percent Red...
	Pre Dev	Post Dev - SWO	Post Dev - SWO
Flow (ML/yr)	35.425	49.936	4.562
Total Suspended Solids (kg/yr)	6341.697	995.029	87.725
Total Phosphorus (kg/yr)	17.107	6.786	57.262
Total Nitrogen (kg/yr)	115.624	79.247	21.483
Gross Pollutants (kg/yr)	45.968	0	100



STORMWATER QUALITY MODELLING LAYOUT PLAN

NTS @ A1

LOTS 22-24 VIA SWALE: 6.454ha @ 0% IMPERVIOUS

ROAD 01 EB VIA SWALE: 0.628ha @ 60% IMPERVIOUS

LOTS 3,4 & 18-21 VIA SWALE: 14.119ha @ 0% IMPERVIOUS

ROAD 01 WB VIA SWALE: 1.129ha @ 60% IMPERVIOUS

LOTS 12-17 VIA SWALE: 12.109ha @ 0% IMPERVIOUS

ROAD 02 NB VIA SWALE: 0.786ha @ 60% IMPERVIOUS

LOT 5 VIA SWALE: 2.000ha @ 0% IMPERVIOUS

ROAD 02 NB VIA SWALE: 0.403ha @ 60% IMPERVIOUS

LOTS 1,2 & 6-9 VIA SWALE: 12.473ha @ 0% IMPERVIOUS

ROAD 03 EB VIA SWALE: 0.642ha @ 60% IMPERVIOUS

ACCESS DRIVEWAY VIA SWALE: 0.583ha @ 60% IMPERVIOUS

LOTS 10 & 11 BYPASS: 4.010ha @ 0% IMPERVIOUS

ROAD 03 BYPASS: 0.054ha @ 60% IMPERVIOUS

515 CROOKWELL MUSIC CATCHMENT			
SUBDIVISION WORKS ONLY			
LOTS 22-24	6.454	ha	0% IMP
ROAD 01 EB	0.628	ha	60% IMP
LOTS 3,4 & 18-21	14.119	ha	0% IMP
ROAD 01 WB	1.129	ha	60% IMP
LOTS 12-17	12.109	ha	0% IMP
ROAD 02 NB	0.786	ha	60% IMP
LOT 5	2.000	ha	0% IMP
ROAD 02 SB	0.403	ha	60% IMP
LOTS 1,2 & 6-9	12.473	ha	0% IMP
ROAD 03 EB	0.642	ha	60% IMP
ACCESS DRIVEWAY	0.583	ha	60% IMP
LOTS 10 & 11	4.010	ha	0% IMP
ROAD 03 BYPASS	0.054	ha	60% IMP

515 CROOKWELL MUSIC CATCHMENT			
PRE DEV			
AGRICULTURE	55.074	ha	0% IMP
DWELLING/SHED	0.116	ha	100% IMP
DRIVEWAY	0.199	ha	50% IMP

SCALE: AS NOTED
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DESCRIPTION: PLANNING PROPOSAL
DRAWING: STORMWATER QUALITY MODELLING PLAN 1 OF 2

PRELIMINARY
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JOB-DRAWING NUMBER	REV
20027-424	P0

WATER QUALITY CATCHMENT PLAN

1:5000 @ A1

LOTS 22-24 VIA SWALE:
3xROOF: 0.108ha @100% IMP TO 34kL RWT
3xDRIVEWAY: 0.053ha @50% IMP TO 16m³ BIO RAINGARDEN
5.914ha @ 0% IMP

LOTS 12-17 VIA SWALE:
6xROOF: 0.216ha @100% IMP TO 34kL RWT
6xDRIVEWAY: 0.105ha @50% IMP TO 16m³ BIO RAINGARDEN
11.788ha @ 0% IMP

LOTS 1,2 & 6-9 VIA SWALE:
6xROOF: 0.216ha @100% IMP TO 34kL RWT
6xDRIVEWAY: 0.105ha @50% IMP TO 16m³ BIO RAINGARDEN
12.152ha @ 0% IMP

ROAD 03 BYPASS:
0.054ha @ 60% IMPERVIOUS

ROAD 01 EB VIA SWALE:
0.628ha @ 60% IMPERVIOUS

ROAD 02 NB VIA SWALE:
0.786ha @ 60% IMPERVIOUS

ROAD 03 EB VIA SWALE:
0.642ha @ 60% IMPERVIOUS

LOTS 3,4 & 18-21 VIA SWALE:
6xROOF: 0.216ha @100% IMP TO 34kL RWT
6xDRIVEWAY: 0.105ha @50% IMP TO 16m³ BIO RAINGARDEN
13.798ha @ 0% IMP

LOT 5 VIA SWALE:
1xROOF: 0.036ha @100% IMP TO 34kL RWT
1xBE: 0.018ha @50% IMP TO 16m³ BIO RAINGARDEN
1.946ha @ 0% IMP

ACCESS DRIVEWAY VIA SWALE:
0.583ha @ 60% IMPERVIOUS

ROAD 01 WB VIA SWALE:
1.129ha @ 60% IMPERVIOUS

ROAD 02 NB VIA SWALE:
0.403ha @ 60% IMPERVIOUS

LOTS 10 & 11 BYPASS :
2xROOF: 0.072ha @100% IMP TO 34kL RWT
2xDRIVEWAY: 0.035ha @50% IMP TO BYPASS
3.903ha @ 0% IMP

515 CROOKWELL MUSIC CATCHMENT

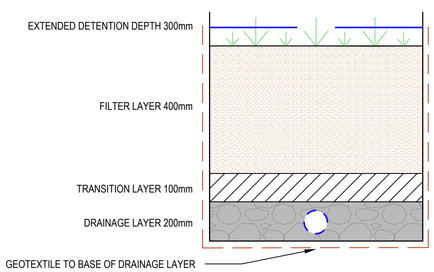
POST DEVELOPMENT

LOTS 22-24	6.454	ha	0% IMP	3xROOF: 0.108ha @100% IMP 3xDRIVEWAY: 0.053ha @50% IMP 6.293ha @ 0% IMP
ROAD 01 EB	0.628	ha	60% IMP	
LOTS 3,4 & 18-21	14.119	ha	0% IMP	6xROOF: 0.216ha @100% IMP 6xDRIVEWAY: 0.105ha @50% IMP 13.798ha @ 0% IMP
ROAD 01 WB	1.129	ha	60% IMP	
LOTS 12-17	12.109	ha	0% IMP	6xROOF: 0.216ha @100% IMP 6xDRIVEWAY: 0.105ha @50% IMP 11.788ha @ 0% IMP
ROAD 02 NB	0.786	ha	60% IMP	
LOT 5	2.000	ha	0% IMP	1xROOF: 0.036ha @100% IMP 1xDRIVEWAY: 0.018ha @50% IMP 1.946ha @ 0% IMP
ROAD 02 SB	0.403	ha	60% IMP	
LOTS 1,2 & 6-9	12.473	ha	0% IMP	6xROOF: 0.216ha @100% IMP 6xDRIVEWAY: 0.105ha @50% IMP 12.152ha @ 0% IMP
ROAD 03 EB	0.642	ha	60% IMP	
ACCESS DRIVEWAY	0.583	ha	60% IMP	
LOTS 10 & 11	4.010	ha	0% IMP	2xROOF: 0.072ha @100% IMP 2xDRIVEWAY: 0.035ha @50% IMP 3.903ha @ 0% IMP
ROAD 03 BYPASS	0.054	ha	60% IMP	

515 CROOKWELL MUSIC CATCHMENT

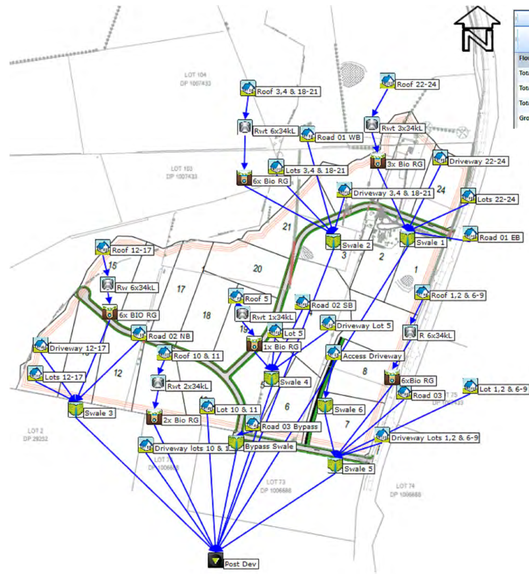
PRE DEV

AGRICULTURE	55.074	ha	0% IMP
DWELLING/SHED	0.116	ha	100% IMP
DRIVEWAY	0.199	ha	50% IMP

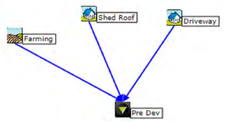


BIOFILTRATION MEDIA DETAIL

NTS @ A1



	Sources		Residual Load		Percent Reduction	
	Pre Dev	Post Dev	Pre Dev	Post Dev	Pre Dev	Post Dev
Flow (ML/yr)	35.425	54.426	35.425	48.999	0	9.971
Total Suspended Solids (kg/yr)	6699.068	9563.144	6699.068	1183.914	-2.715E-14	87.62
Total Phosphorus (kg/yr)	17.057	16.501	17.057	6.847	2.083E-14	58.509
Total Nitrogen (kg/yr)	114.977	106.571	114.977	80.711	0	24.266
Gross Pollutants (kg/yr)	45.968	799.264	45.968	4.163	0	99.479



STORMWATER QUALITY MODELLING LAYOUT PLAN

NTS @ A1

BIORETENTION DETAILS:

EXTENDED DETENTION DEPTH

300mm EXTENDED DETENTION DEPTH IS TO BE PROVIDED.

NUTRIENT REMOVAL PLANTS

TO BE BASED ON THE GUIDELINE FOR WATER SENSITIVE CITIES 2015 'ADOPTION GUIDELINES FOR STORMWATER BIOFILTRATION SYSTEMS'.
VEGETATION SELECTION TO BE CAREX, MELALEUCA, JANCUS, GOODENIA AND FINCINIA PLANTED AT DENSITY OF 8-12/m². RIVER ROCKS (20-40mm) TO BE SPREAD ON TOP OF THE FILTER LAYER APPROX 50-75mm THICK.

FILTER LAYER

THE FILTER MATERIAL SHALL BE WASHED SAND OF SILICEOUS OR CALCAREOUS ORIGIN THAT HAS BEEN MINED AND PROCESSED. NATURAL TOPSOIL AND SOILS ARE NOT SUITABLE. MATERIAL IS TO MEET THE FOLLOWING SPECIFICATIONS:

- SATURATED HYDRAULIC CONDUCTIVITY 100-200mm/hr (TEST USING ASTM F1815-06)
- TOTAL NITROGEN CONTENT OF FILTER MEDIA 400mg/kg
- ORTHOSPHOSPHATE CONTENT OF FILTER MEDIA 40mg/kg

PARTICLE SIZE DISTRIBUTION		
DESCRIPTION	PROPORTION	GRADING
CLAY & SILT	<3%	<0.05mm
VERY FINE SAND	5-30%	0.05-0.15mm
FINE SAND	10-30%	0.15-0.25mm
MEDIUM TO COARSE SAND	40-60%	0.25-1.0mm
COARSE SAND	7-10%	1.0-2.0mm
FINE GRAVEL	<3%	2.0-3.4mm

TRANSITION LAYER

TRANSITION LAYER IS REQUIRED WHEN THE DRAINAGE LAYER IS A FINE GRAVEL AND IS RECOMMENDED TO BE A COARSE SAND, GENERALLY 100mm THICK.

DRAINAGE LAYER

THE DRAINAGE LAYER IS 200mm THICK MINIMUM AND IS RECOMMENDED TO BE 4-7mm BLUE METAL DRAINAGE AGGREGATE WITH 100mm DIA SLOTTED PIPE. SCORIA IS NOT ACCEPTABLE.

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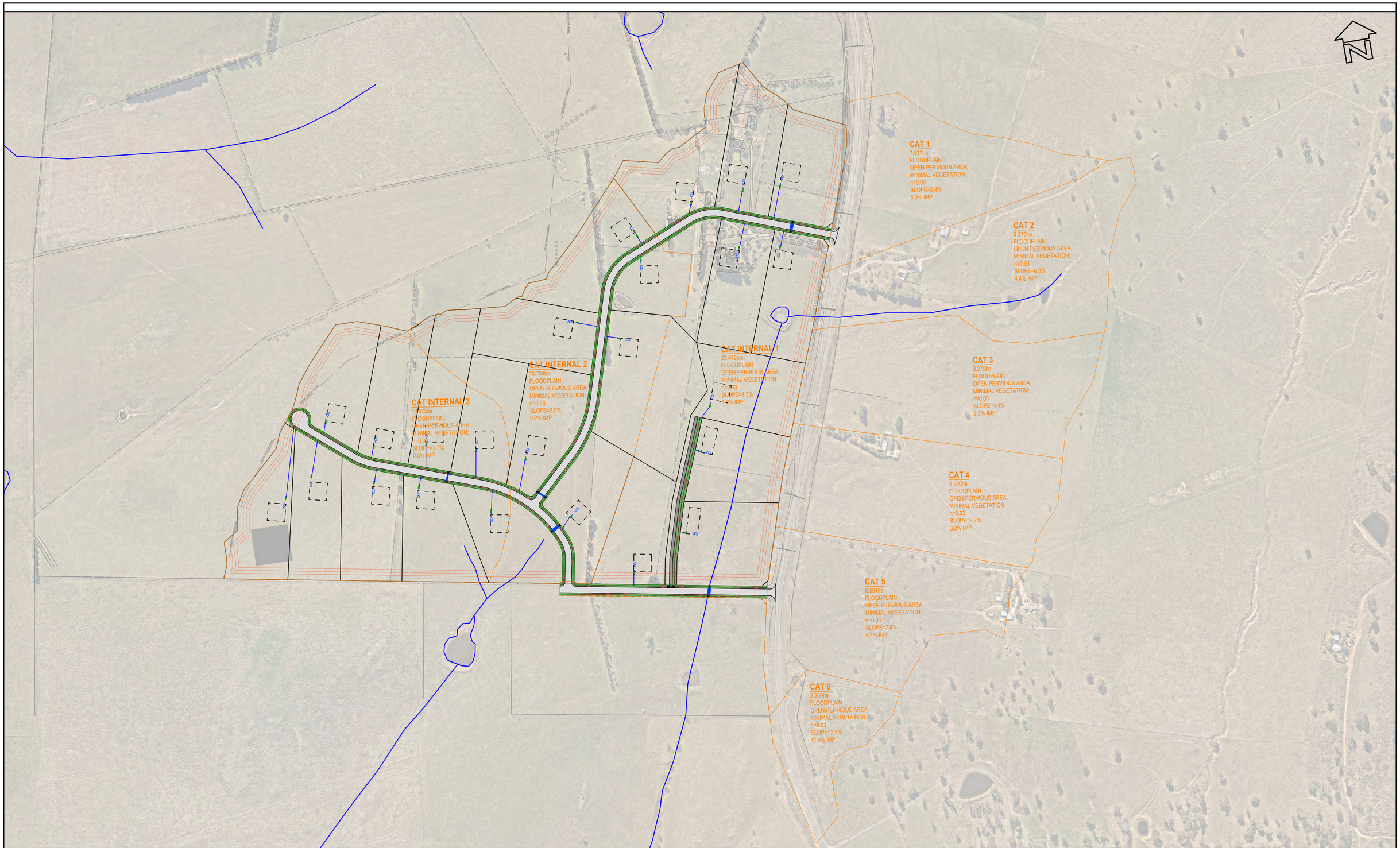
20027-425	P0



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CATCHMENT ANALYSIS PLAN

1:3000 @ A1

0 50 100 150

SCALE:- 1:3000

SCALE: AS NOTED
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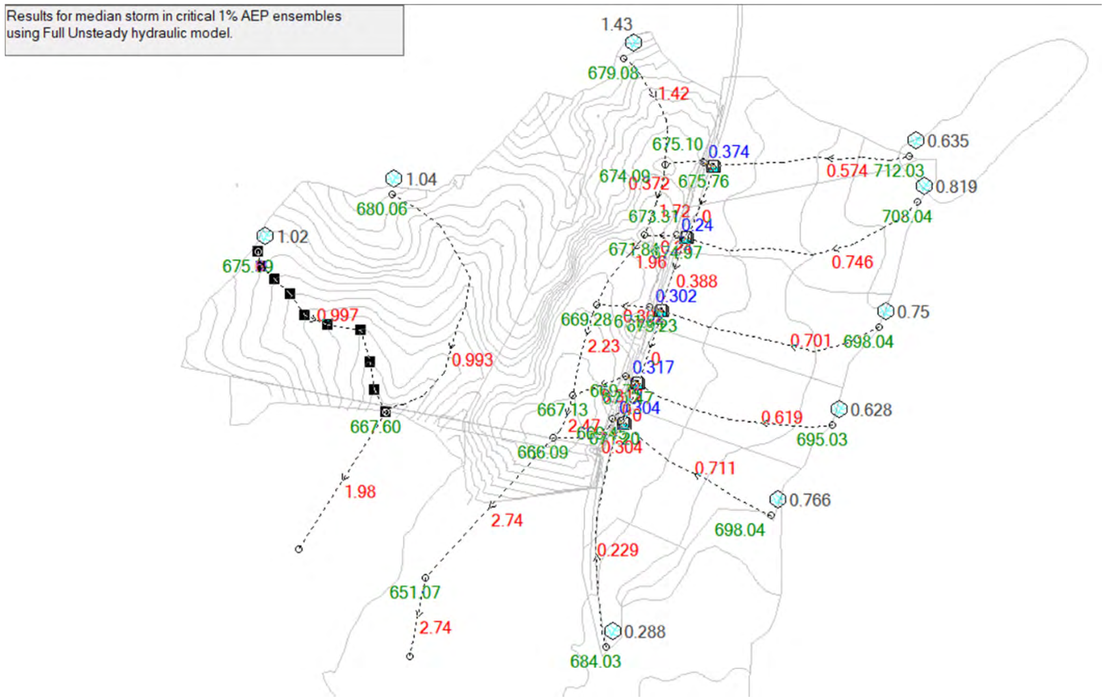
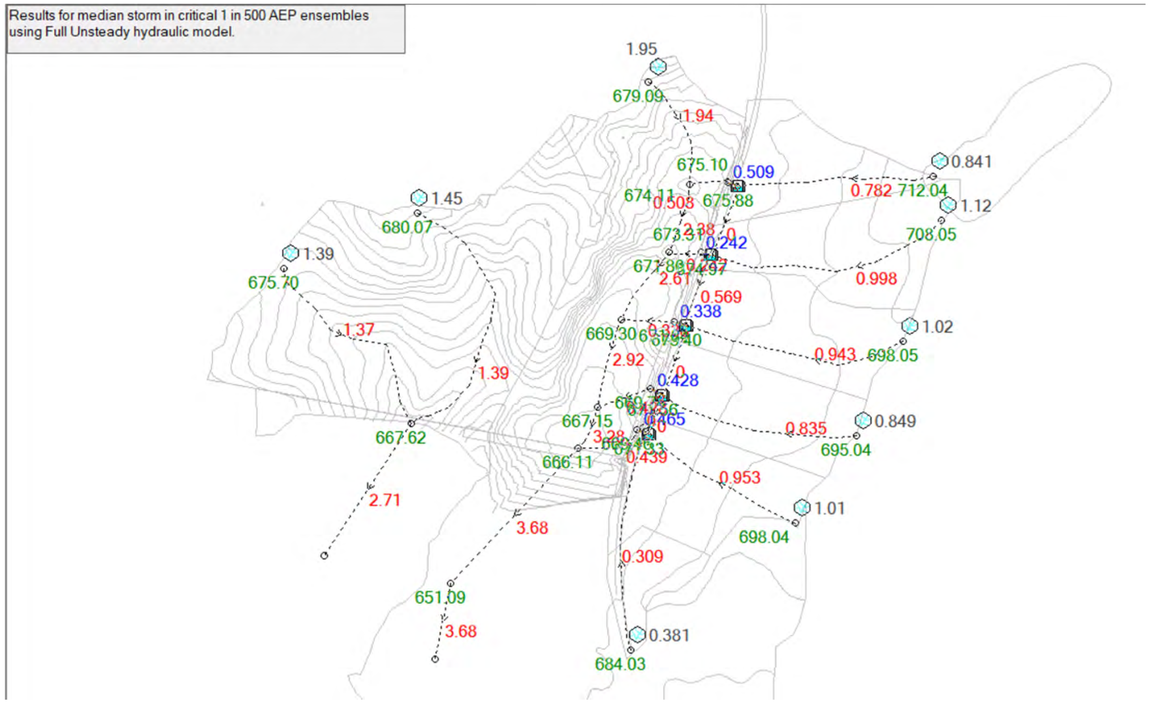
JOB-DRAWING NUMBER	REV
20027-426	P0



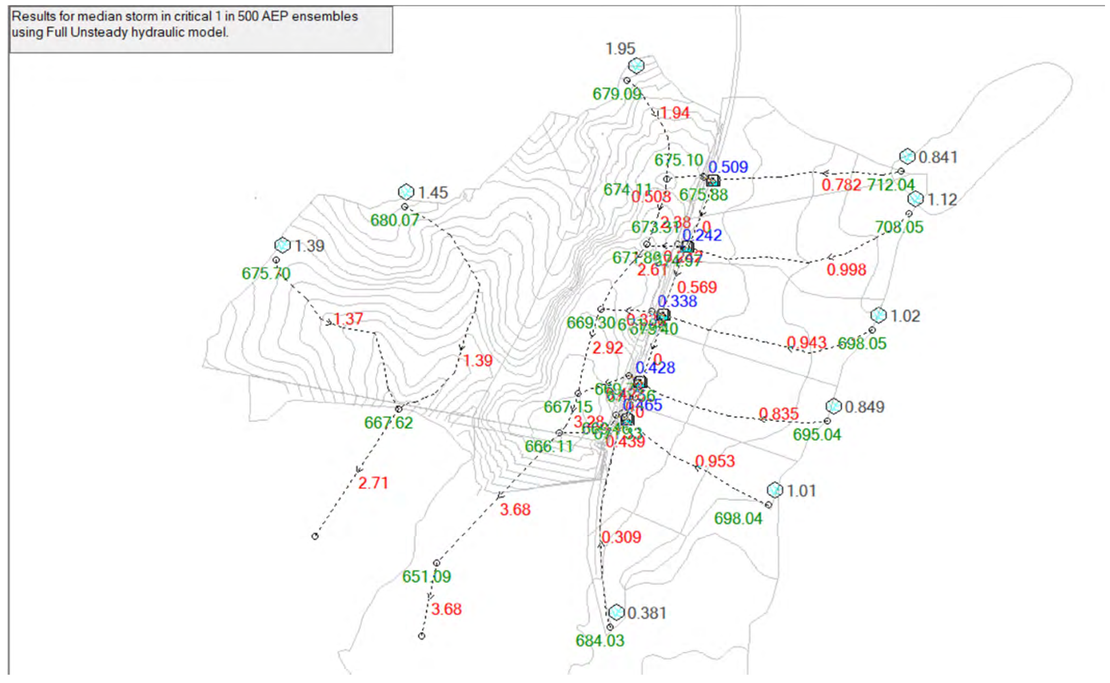
DRAINS (RAFTS MODELLING) RESULTS 1% AEP

NTS



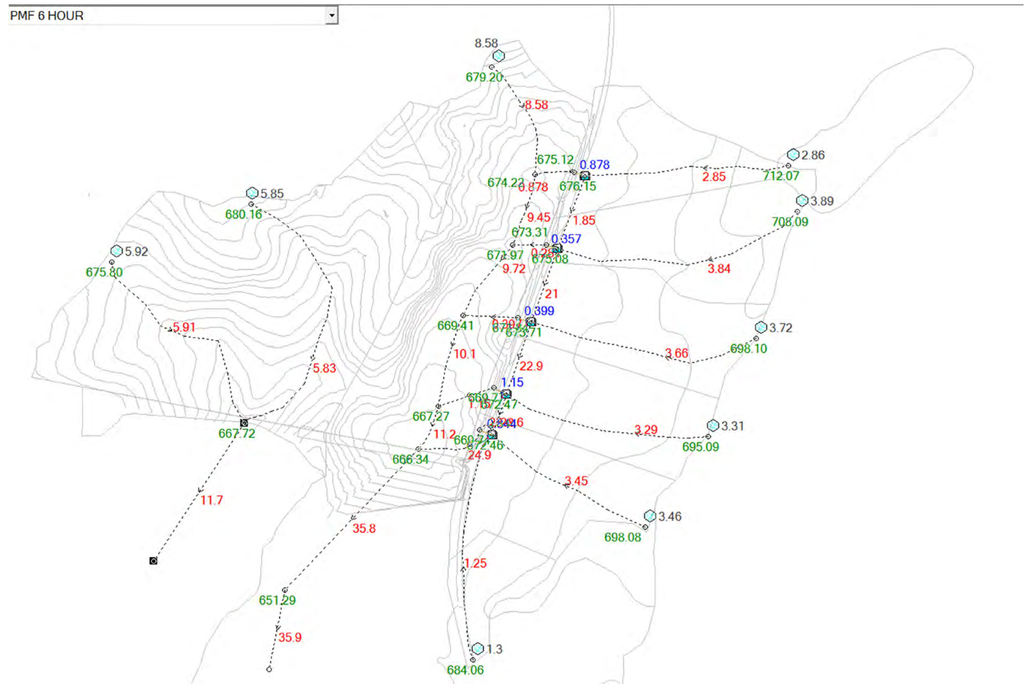
DRAINS (RAFTS MODELLING) RESULTS 0.2% AEP

NTS



DRAINS (RAFTS MODELLING) RESULTS 0.05% AEP

NTS



DRAINS (RAFTS MODELLING) RESULTS PMF

NTS

SCALE: AS NOTED	SURVEY	AS	REV	DESCRIPTION	DATE
SIZE: A1	DESIGN	JE	P0	PRELIMINARY PLANNING PROPOSAL DESIGN	13 JUN 24
DATE OF SURVEY: 22 JUNE 2020	DRAWN	JE			
DATUM: MGA2020, AHD	CHECKED	TP			
	APPROVED	JW			

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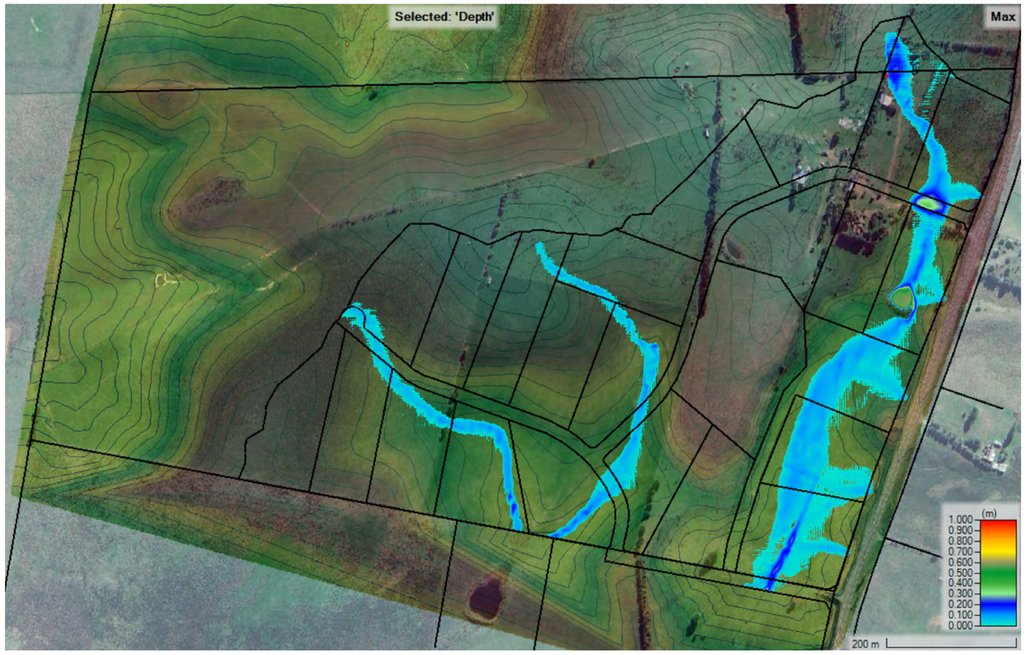
CLIENT:	ALIMACO PTY LTD C/- PRECISE PLANNING PTY LTD
DESCRIPTION:	PLANNING PROPOSAL
DRAWING:	DRAINS MODELLING RESULTS

PRELIMINARY
NOT TO BE USED FOR CONSTRUCTION PURPOSES

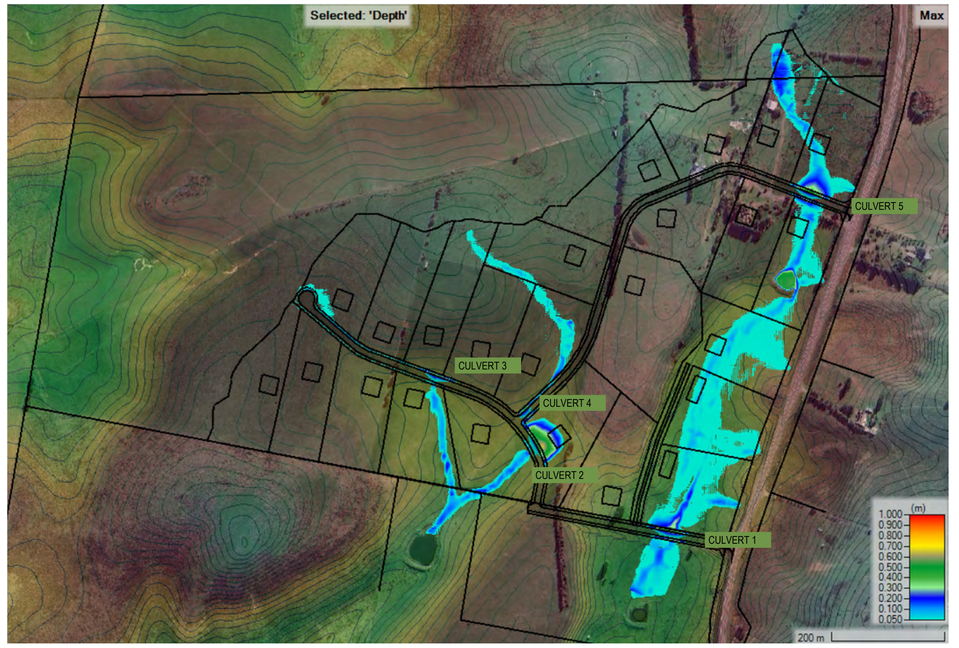
RELEASE DATE: 13 JUNE 2024

JOB-DRAWING NUMBER	REV
20027-427	P0



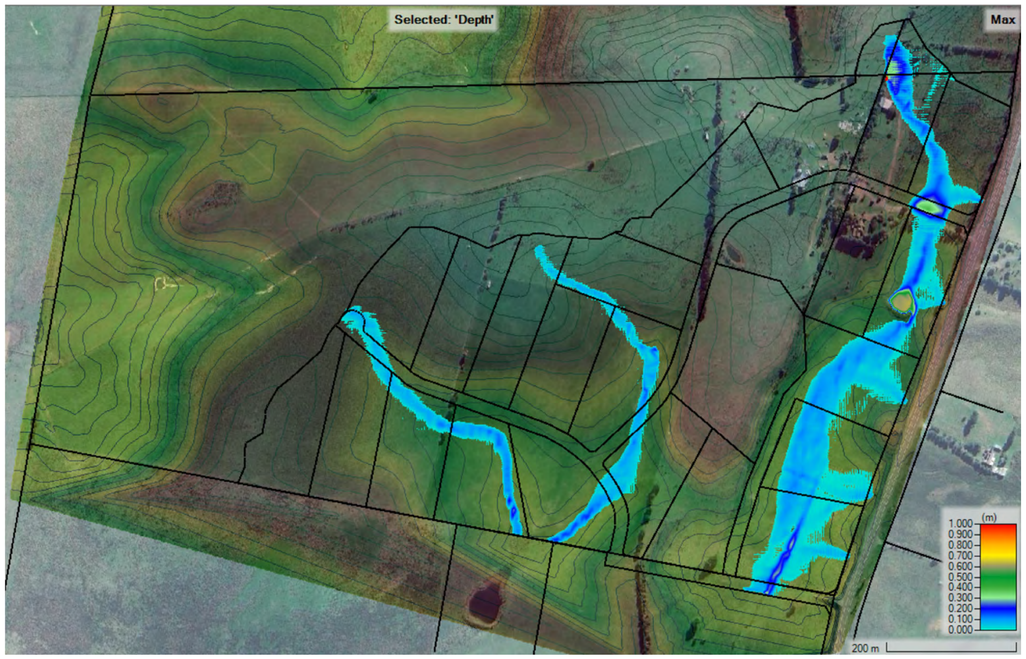
PRE DEVELOPMENT- 1% AEP - DEPTHS

NTS



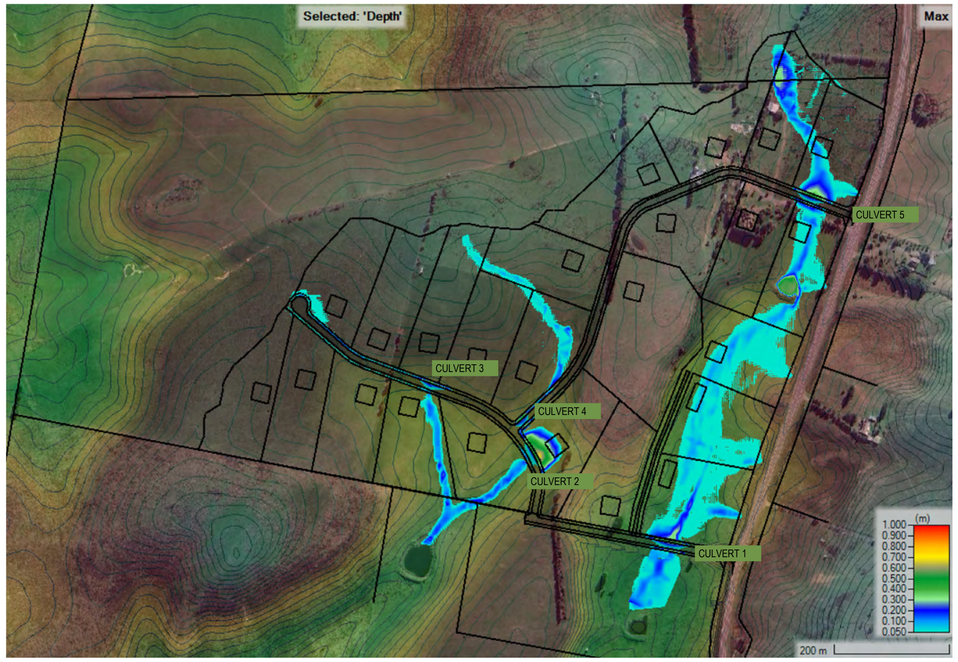
POST DEVELOPMENT- 1% AEP - DEPTHS

NTS



PRE DEVELOPMENT- 0.2% AEP - DEPTHS

NTS



POST DEVELOPMENT- 0.2% AEP - DEPTHS

NTS

SCALE: AS NOTED
SIZE: A1
DATE OF SURVEY: 22 JUNE 2020
DATUM: MGA2020, AHD

SURVEY	AS		
DESIGN	JE		
DRAWN	JE		
CHECKED	TP		
APPROVED	JW		

REV	DESCRIPTION	DATE
P0	PRELIMINARY PLANNING PROPOSAL DESIGN	13 JUN 24

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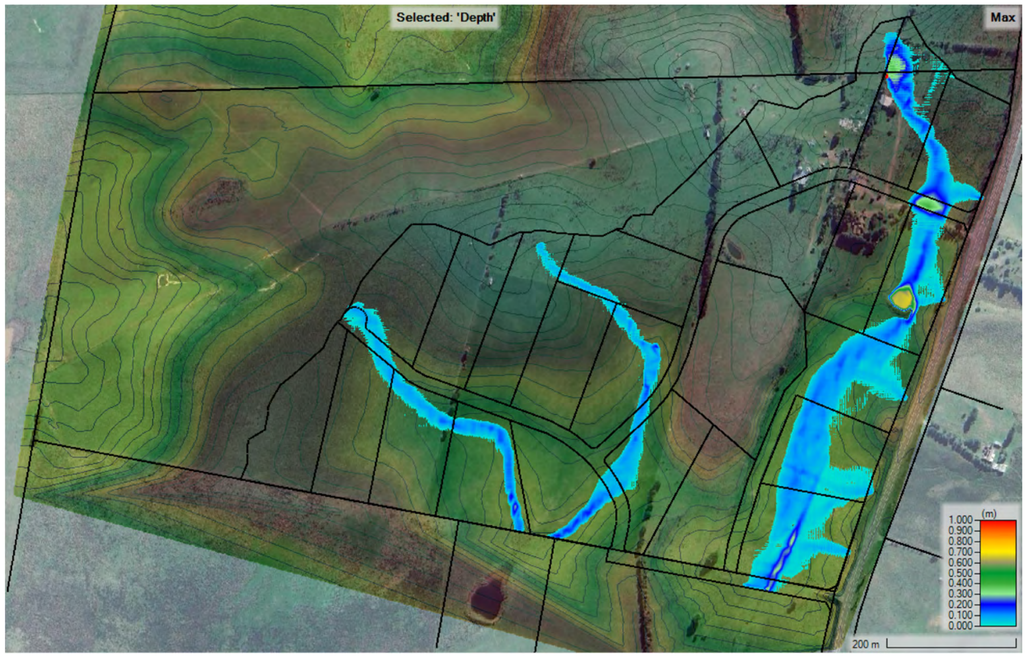
CLIENT: ALIMACO PTY LTD C/- PRECISE PLANNING PTY LTD
DESCRIPTION: PLANNING PROPOSAL
DRAWING: PRE DEVELOPMENT & POST DEVELOPMENT 1% & 0.2% AEP RESULTS - DEPTHS

PRELIMINARY
NOT TO BE USED FOR CONSTRUCTION PURPOSES

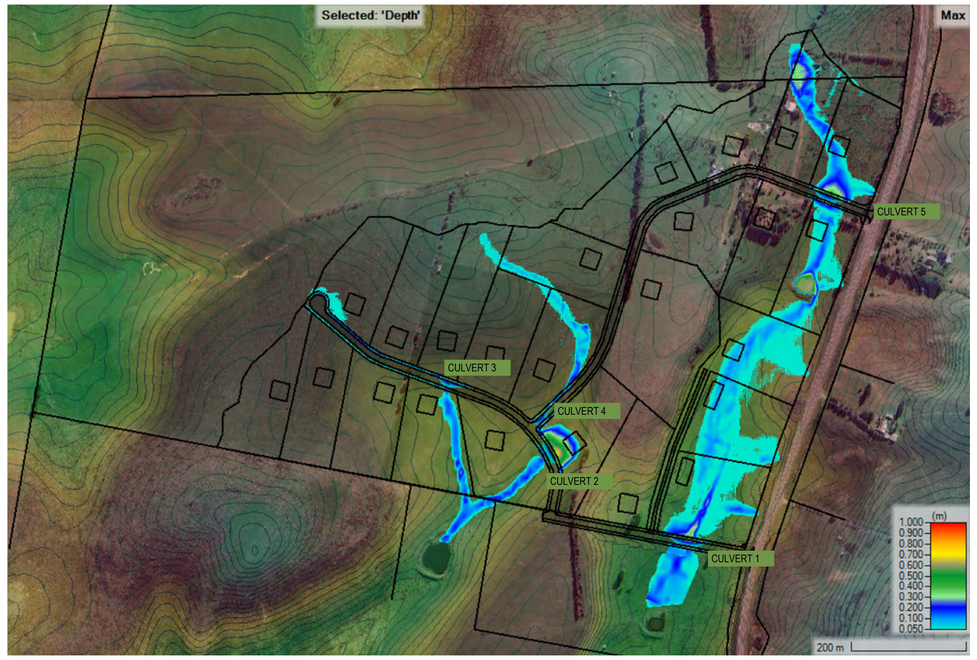
RELEASE DATE: 13 JUNE 2024

JOB-DRAWING NUMBER	REV
20027-428	P0



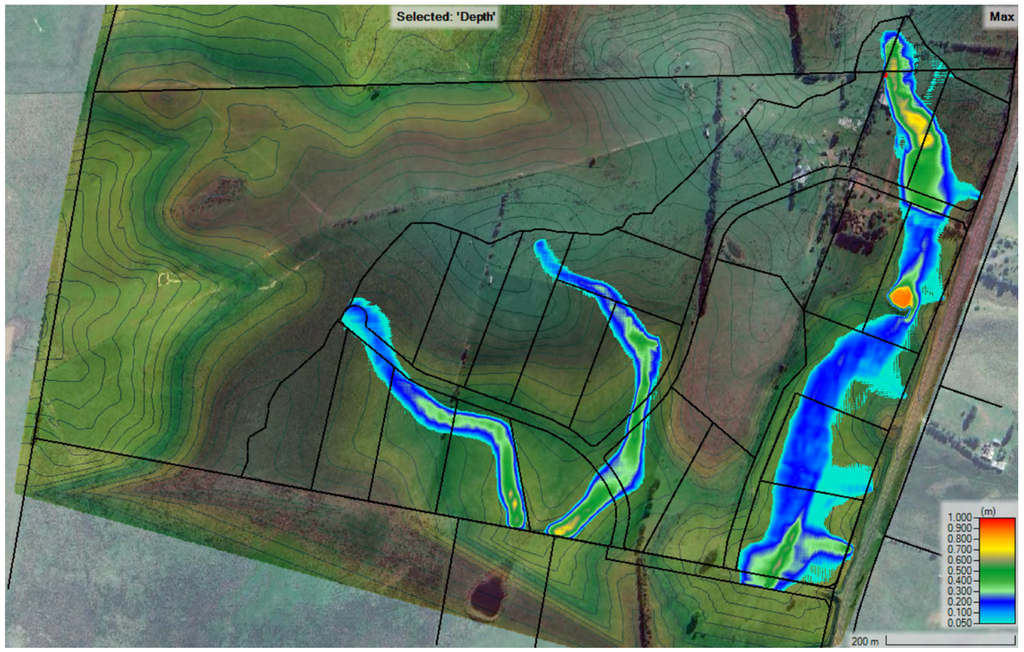
PRE DEVELOPMENT- 0.05% AEP - DEPTHS

NTS



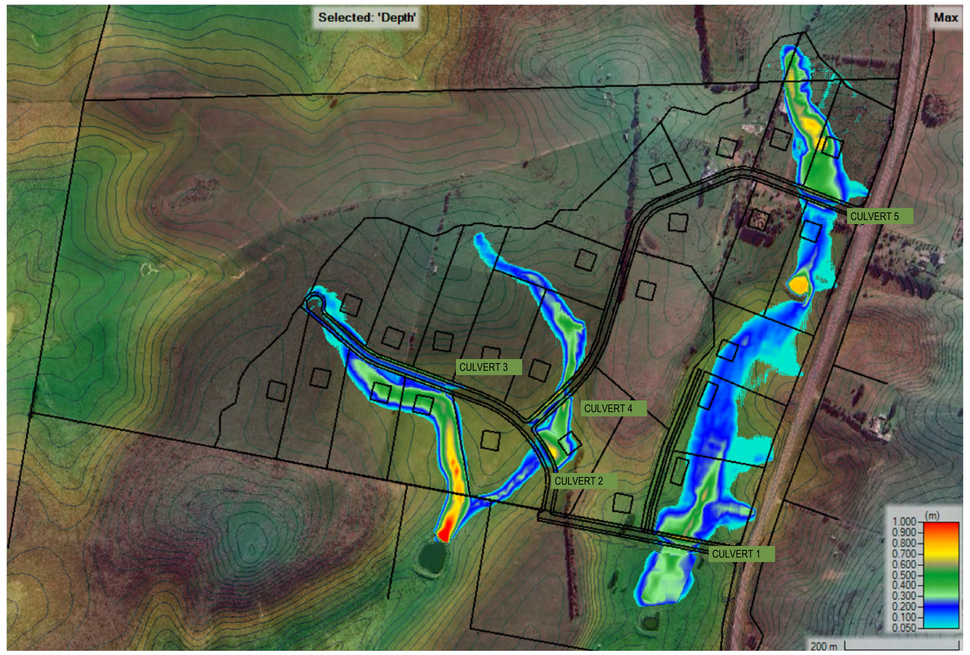
POST DEVELOPMENT- 0.05% AEP - DEPTHS

NTS



PRE DEVELOPMENT- PMF - DEPTHS

NTS



POST DEVELOPMENT- PMF - DEPTHS

NTS

SCALE: AS NOTED
SIZE: A1
DATE OF SURVEY: 22 JUNE 2020
DATUM: MGA2020, AHD

SURVEY	AS		
DESIGN	JE		
DRAWN	JE		
CHECKED	TP		
APPROVED	JW		

REV	DESCRIPTION	DATE
P0	PRELIMINARY PLANNING PROPOSAL DESIGN	13 JUN 24

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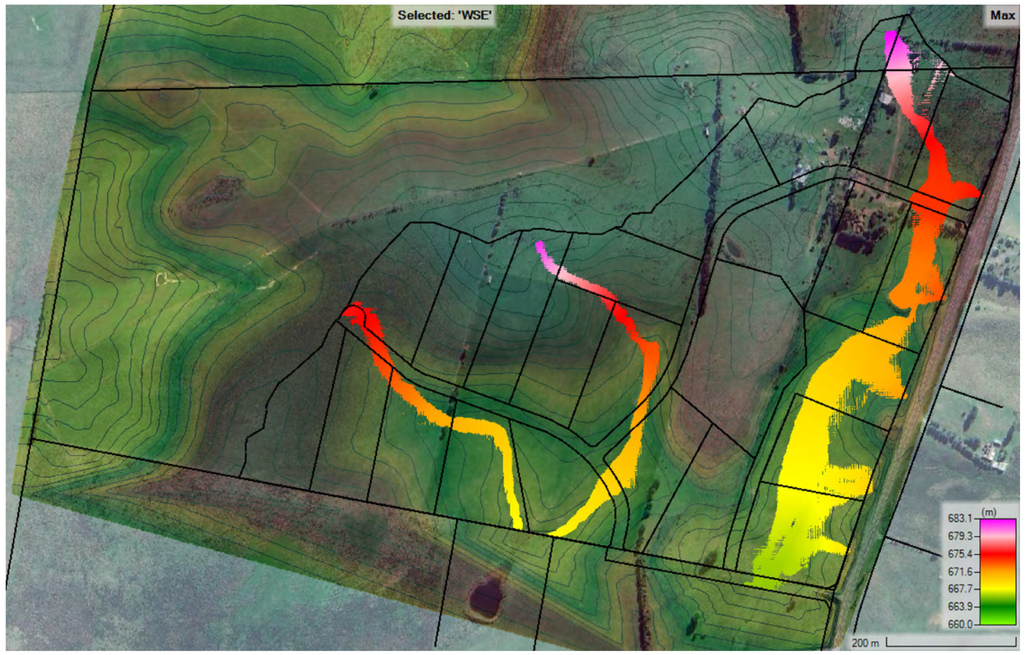
LGA: GOULBURN MULWAREE COUNCIL
CLIENT: ALIMACO PTY LTD C/- PRECISE PLANNING PTY LTD
DESCRIPTION: PLANNING PROPOSAL
DRAWING: PRE & POST DEVELOPMENT 0.05% AEP% PMF RESULTS - DEPTHS

PRELIMINARY
NOT TO BE USED FOR CONSTRUCTION PURPOSES

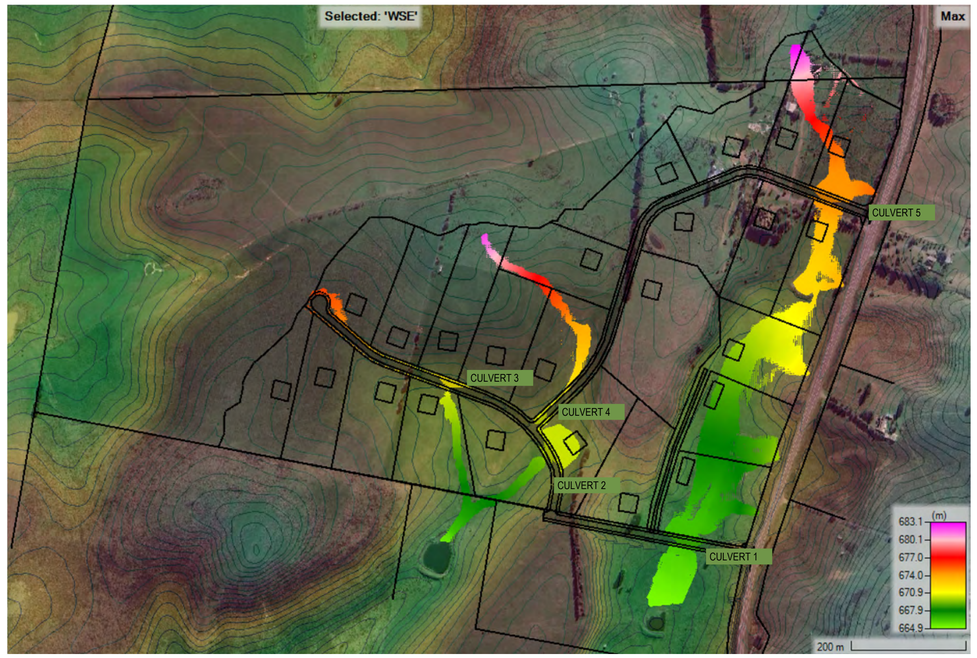
RELEASE DATE: 13 JUNE 2024

JOB-DRAWING NUMBER	REV
20027-429	P0



PRE DEVELOPMENT- 1% AEP - WSE

NTS



POST DEVELOPMENT- 1% AEP - WSE

NTS

PRE DEVELOPMENT- 0.2% AEP - WSE

NTS

POST DEVELOPMENT- 0.2% AEP - WSE

NTS

SCALE: AS NOTED	SURVEY	AS	REV	DESCRIPTION	DATE
SIZE: A1	DESIGN	JE	P0	PRELIMINARY PLANNING PROPOSAL DESIGN	13 JUN 24
DATE OF SURVEY: 22 JUNE 2020	DRAWN	JE			
DATUM: MGA2020, AHD	CHECKED	TP			
	APPROVED	JW			

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DESCRIPTION: PLANNING PROPOSAL
DRAWING: PRE & POST DEVELOPMENT 1% & 0.2% AEP RESULTS - WSE

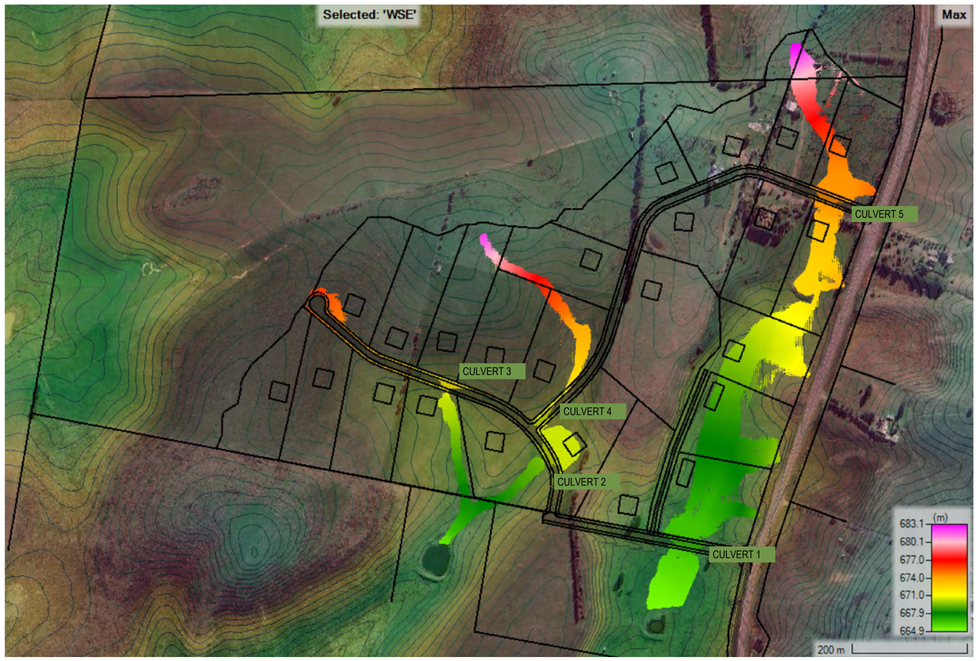
PRELIMINARY
NOT TO BE USED FOR CONSTRUCTION PURPOSES

RELEASE DATE: 13 JUNE 2024

JOB-DRAWING NUMBER	REV
20027-430	P0

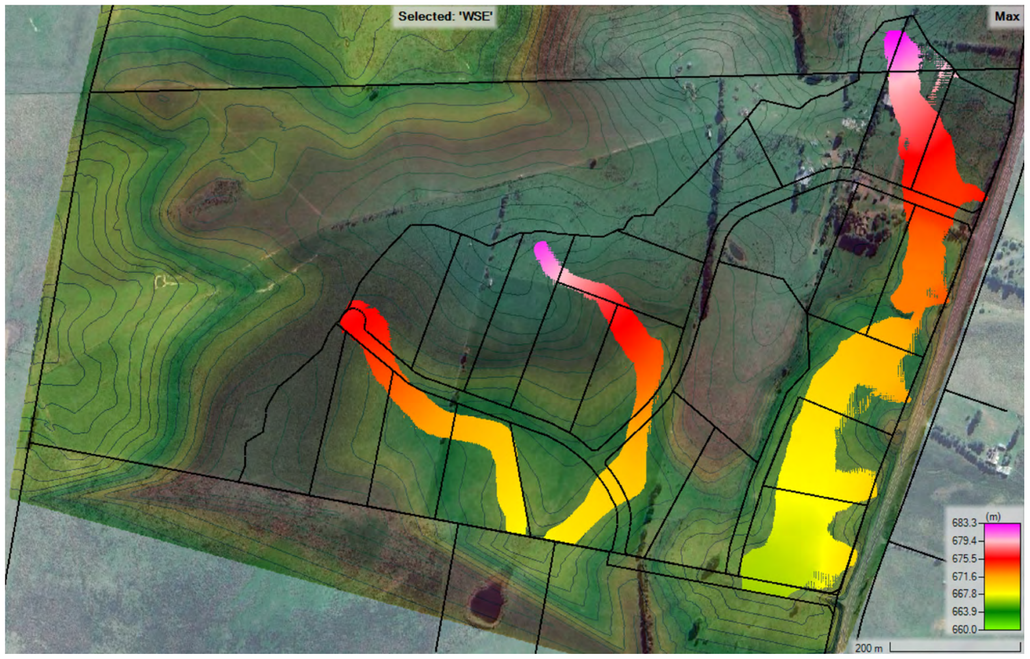
PRE DEVELOPMENT- 0.05% AEP - WSE

NTS



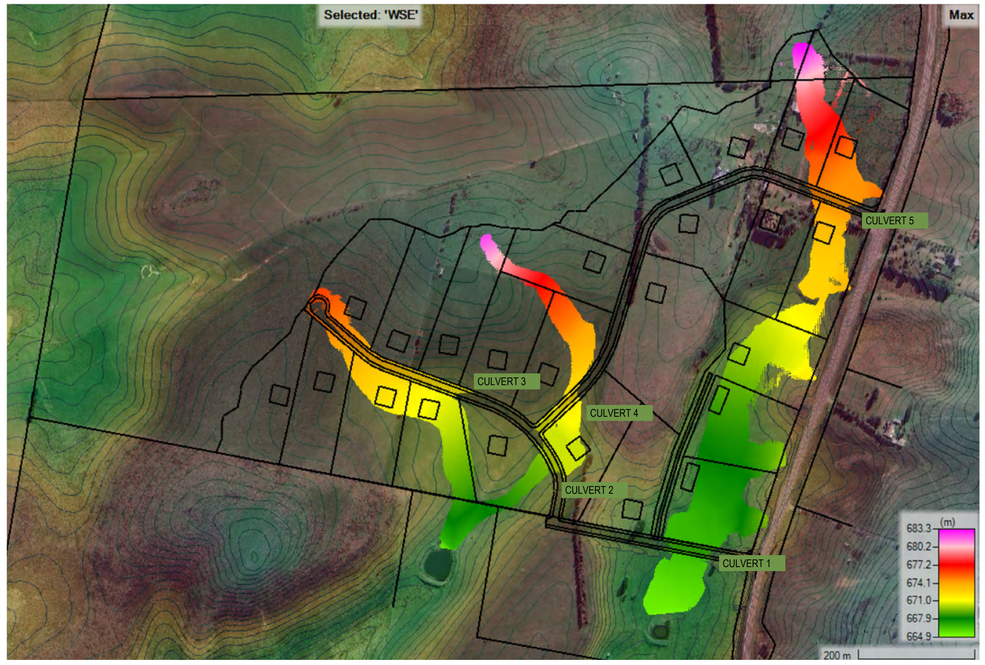
POST DEVELOPMENT- 0.05% AEP - WSE

NTS



PRE DEVELOPMENT- PMF - WSE

NTS



POST DEVELOPMENT- PMF - WSE

NTS

SCALE: AS NOTED	SURVEY	AS	REV	DESCRIPTION	DATE
SIZE: A1	DESIGN	JE	P0	PRELIMINARY PLANNING PROPOSAL DESIGN	13 JUN 24
DATE OF SURVEY: 22 JUNE 2020	DRAWN	JE			
DATUM: MGA2020, AHD	CHECKED	TP			
	APPROVED	JW			

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DRAWING: PRE & POST DEVELOPMENT 0.05% AEP & PMF RESULTS - WSE

PRELIMINARY
NOT TO BE USED FOR CONSTRUCTION PURPOSES

RELEASE DATE: 13 JUNE 2024

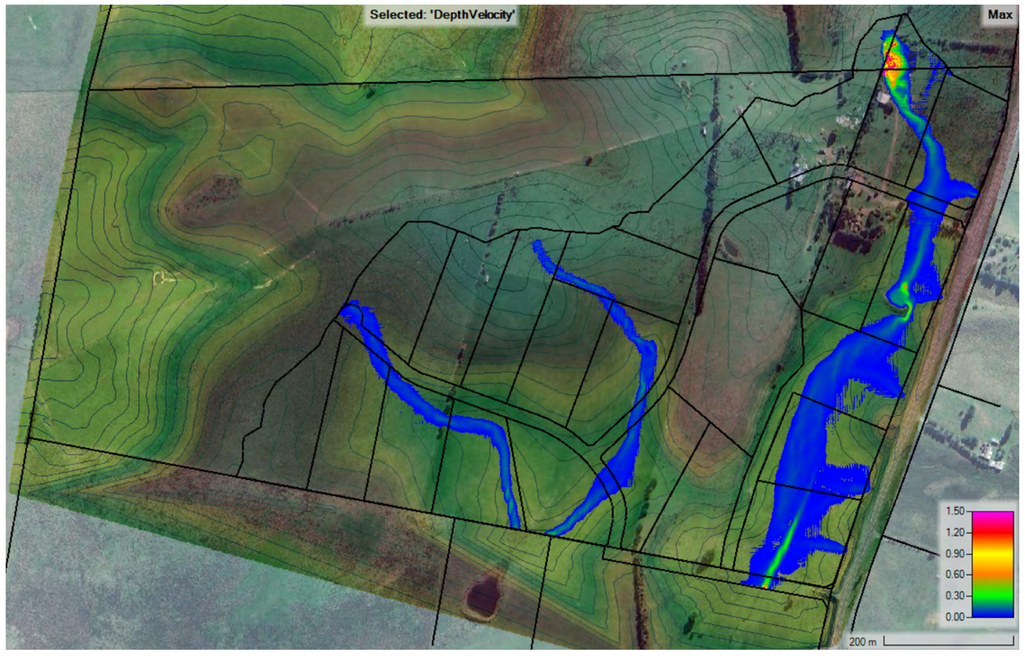
JOB-DRAWING NUMBER	REV
20027-431	P0

PRE DEVELOPMENT- 1% AEP - DxV

NTS

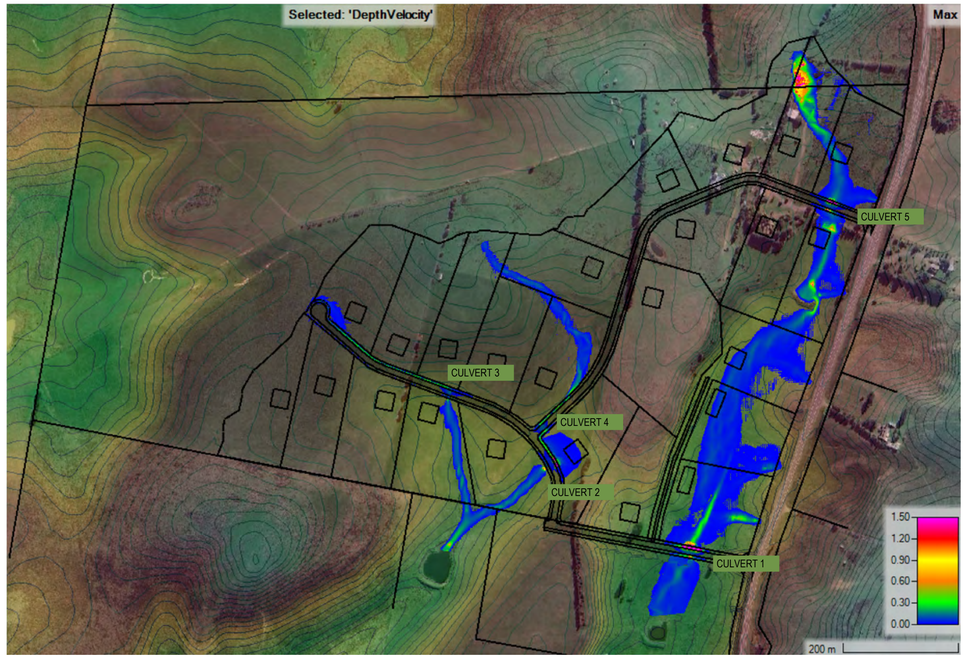
POST DEVELOPMENT- 1% AEP - DxV

NTS



PRE DEVELOPMENT- 0.2% AEP - DxV

NTS



POST DEVELOPMENT- 0.2% AEP - DxV

NTS

SCALE: AS NOTED
SIZE: A1
DATE OF SURVEY: 22 JUNE 2020
DATUM: MGA2020, AHD

SURVEY	AS		
DESIGN	JE		
DRAWN	JE		
CHECKED	TP		
APPROVED	JW		

REV	DESCRIPTION	DATE
P0	PRELIMINARY PLANNING PROPOSAL DESIGN	13 JUN 24

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DESCRIPTION: PLANNING PROPOSAL
DRAWING: PRE & POST DEVELOPMENT 1% & 0.2% AEP RESULTS - DxV

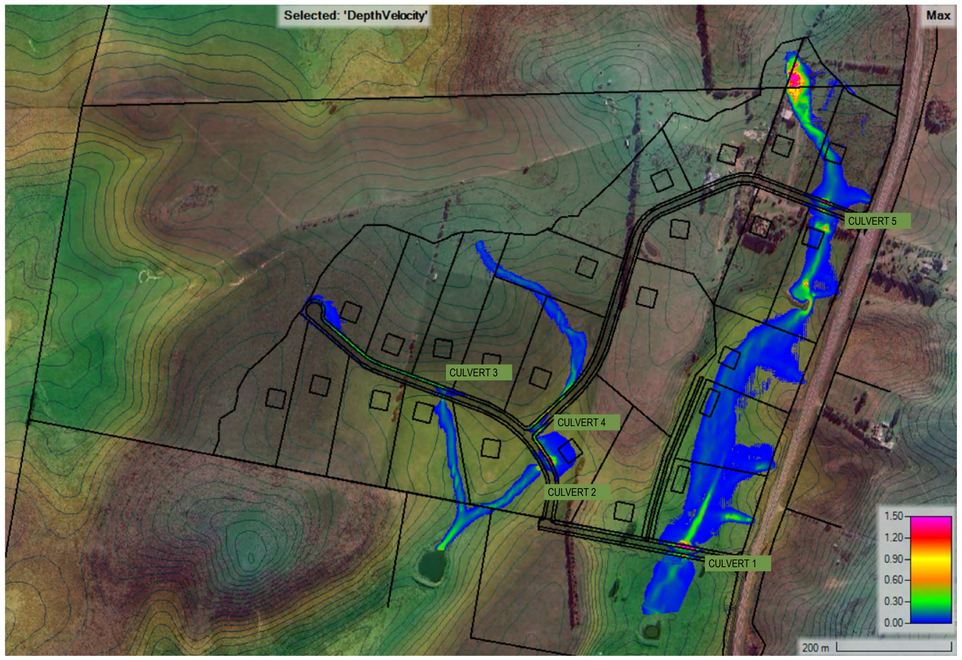
PRELIMINARY
NOT TO BE USED FOR CONSTRUCTION PURPOSES

RELEASE DATE: 13 JUNE 2024

JOB-DRAWING NUMBER	REV
20027-432	P0

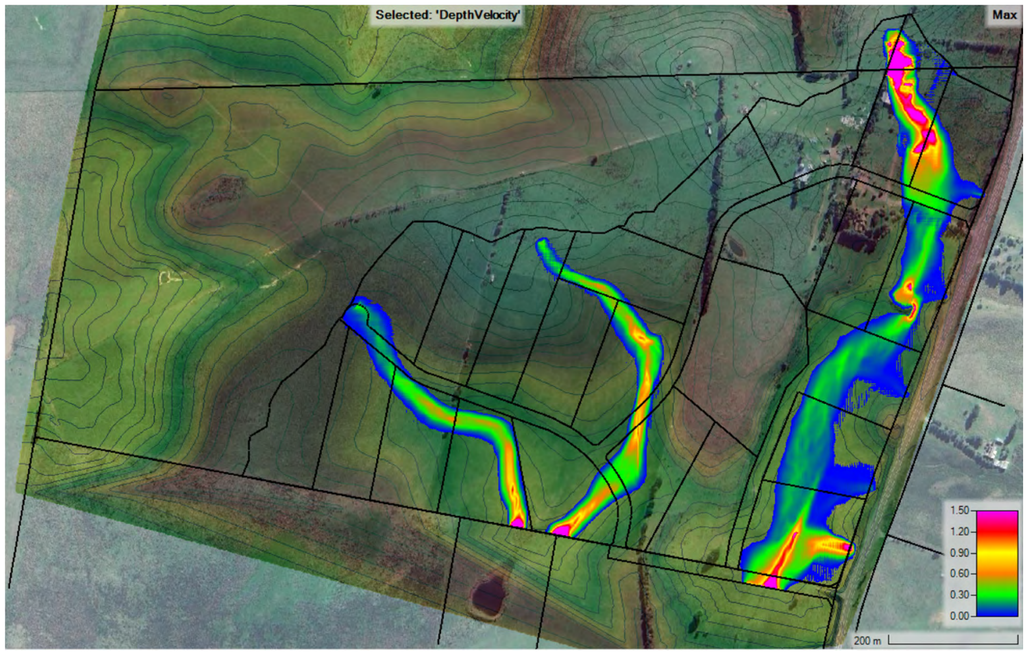
PRE DEVELOPMENT- 0.05% AEP - DxV

NTS



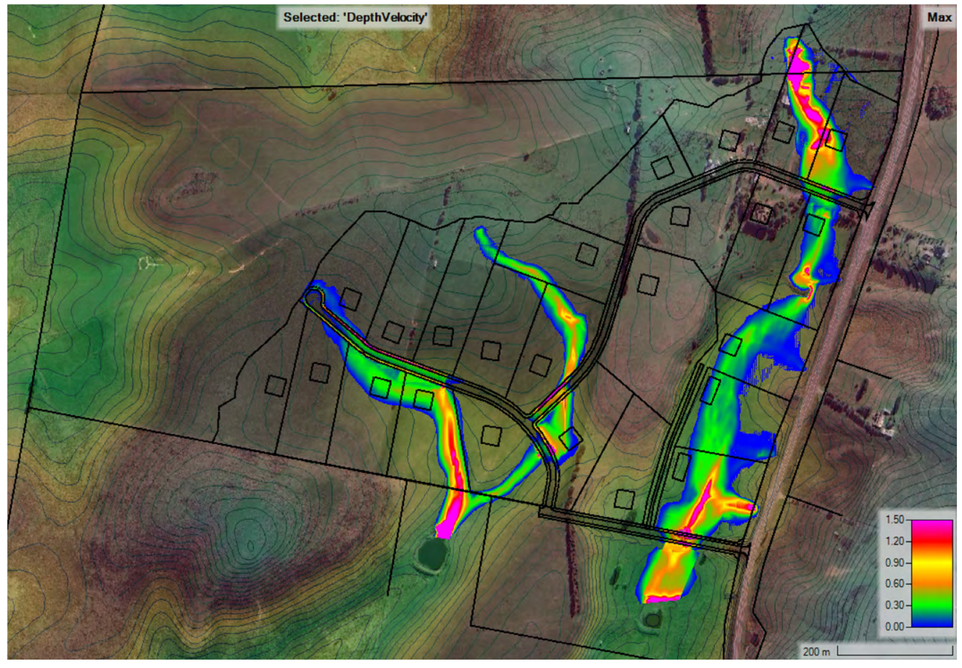
POST DEVELOPMENT- 0.05% AEP - DxV

NTS



PRE DEVELOPMENT- PMF - DxV

NTS



POST DEVELOPMENT- PMF - DxV

NTS

SCALE: AS NOTED
SIZE: A1
DATE OF SURVEY: 22 JUNE 2020
DATUM: MGA2020, AHD

SURVEY	AS		
DESIGN	JE	P0	PRELIMINARY PLANNING PROPOSAL DESIGN
DRAWN	JE		
CHECKED	TP		
APPROVED	JW		

REV	DESCRIPTION	DATE
P0	PRELIMINARY PLANNING PROPOSAL DESIGN	13 JUN 24

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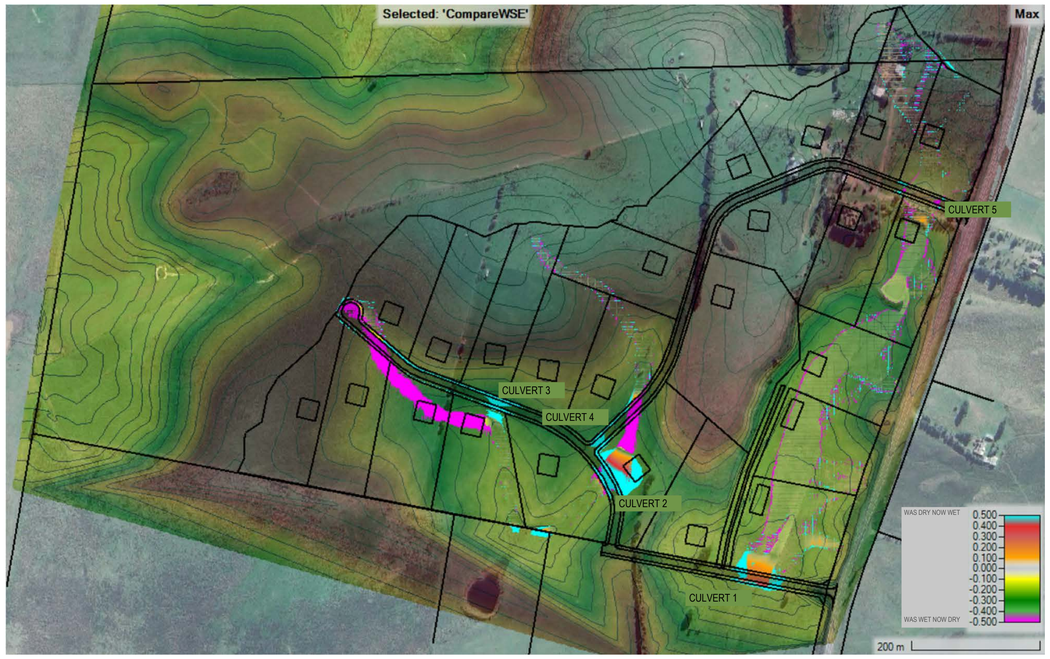
CLIENT: ALIMACO PTY LTD C/- PRECISE PLANNING PTY LTD
DESCRIPTION: PLANNING PROPOSAL
DRAWING: PRE & POST DEVELOPMENT 0.05% AEP & PMF - DxV

PRELIMINARY
NOT TO BE USED FOR CONSTRUCTION PURPOSES

RELEASE DATE: 13 JUNE 2024

JOB-DRAWING NUMBER	REV
20027-433	P0



PRE & POST DEVELOPMENT- 1% AEP - WSE COMPARE

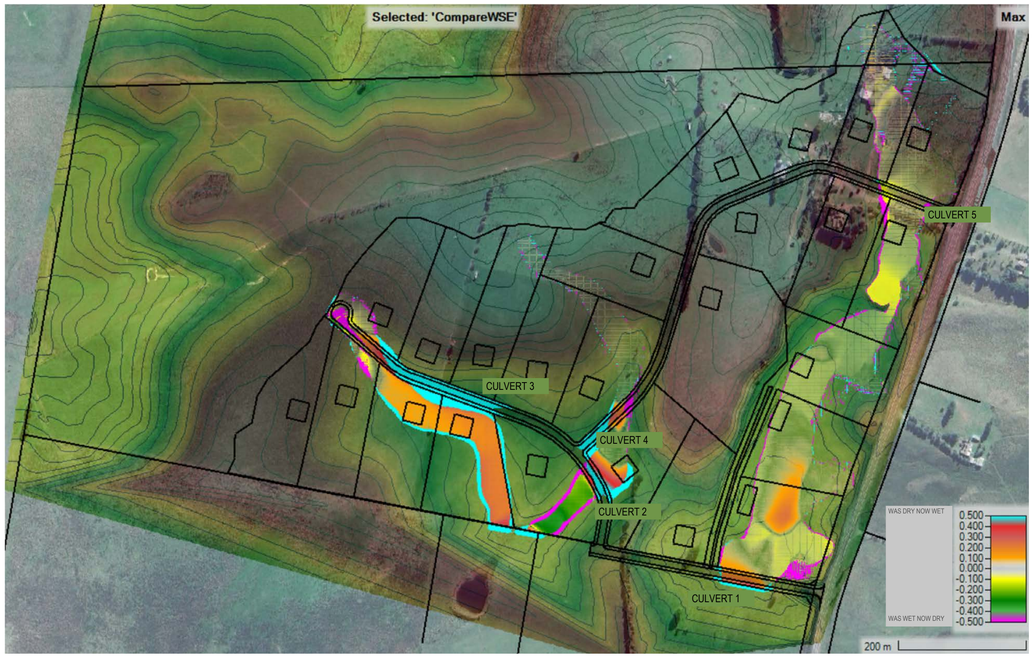
NTS

PRE & POST DEVELOPMENT- 0.2% AEP - WSE COMPARE

NTS

PRE & POST DEVELOPMENT- 0.05% AEP - WSE COMPARE

NTS



PRE & POST DEVELOPMENT- PMF - WSE COMPARE

NTS

SCALE: AS NOTED
SIZE: A1
DATE OF SURVEY: 22 JUNE 2020
DATUM: MGA2020, AHD

SURVEY	AS		
DESIGN	JE		
DRAWN	JE		
CHECKED	TP		
APPROVED	JW		

REV	DESCRIPTION	DATE
P0	PRELIMINARY PLANNING PROPOSAL DESIGN	13 JUN 24

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DESCRIPTION: PLANNING PROPOSAL
DRAWING: PRE & POST DEVELOPMENT 1%, 0.2% & 0.05% AEP & PMF - WSE COMPARE

PRELIMINARY
NOT TO BE USED FOR CONSTRUCTION PURPOSES
RELEASE DATE: 13 JUNE 2024

JOB-DRAWING NUMBER	REV
20027-434	P0

Appendix B

HEC RAS Results

Figure 1: 1% AEP Event – Flood Impact – Was Dr Now Wet

Commented [TP1]: Insert new screenshots with updated labels

Figure 2: 0.2% AEP Event – Flood Impact – Was Dr Now Wet

Figure 3: 0.05% AEP Event – Flood Impact – Was Dr Now Wet

Figure 4: 1% AEP Event – Flood Impact – Was Dr Now Wet

Figure 5: 1% AEP Event – ARR2019 Hazard Classification– Pre-Development

Figure 6: 0.2% AEP Event – ARR2019 Hazard Classification– Pre-Development

Figure 7: 0.05% AEP Event – ARR2019 Hazard Classification– Pre-Development

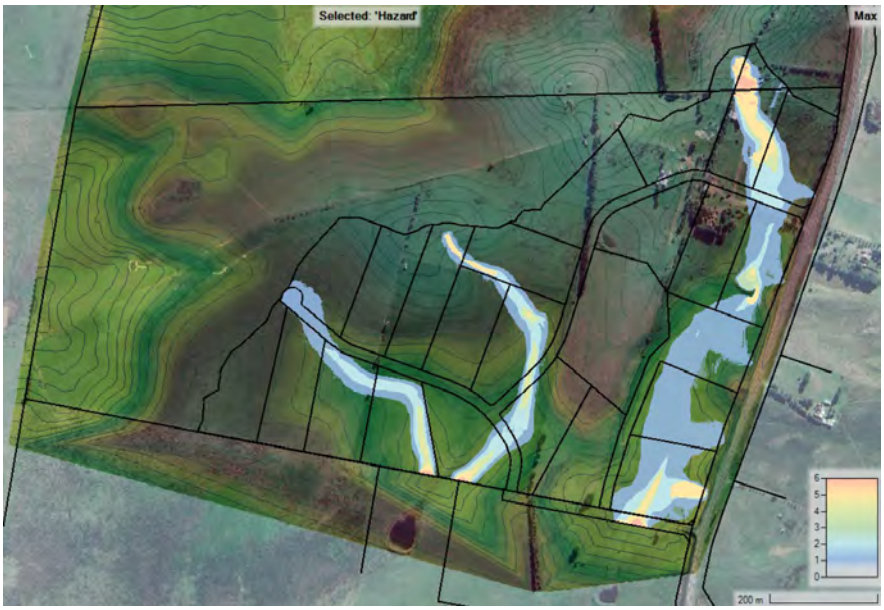


Figure 8: PMF Event – ARR2019 Hazard Classification– Pre-Development

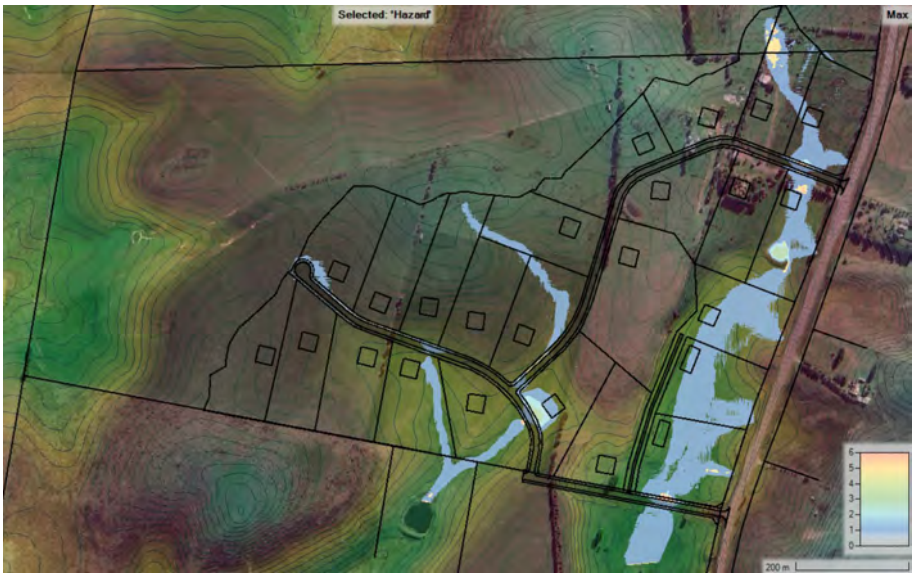


Figure 9: 1% AEP Event – ARR2019 Hazard Classification– Post-Development

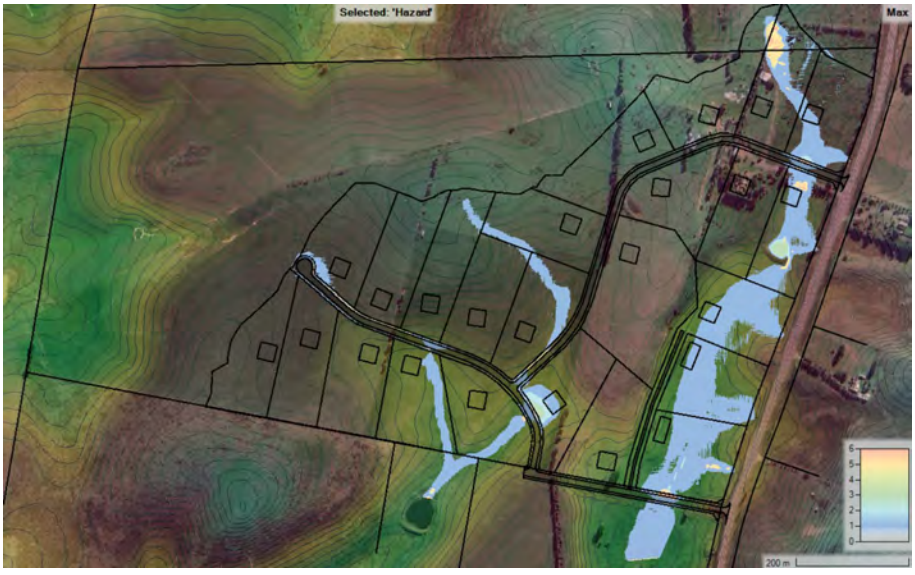


Figure 10: 0.2% AEP Event – ARR2019 Hazard Classification– Post-Development

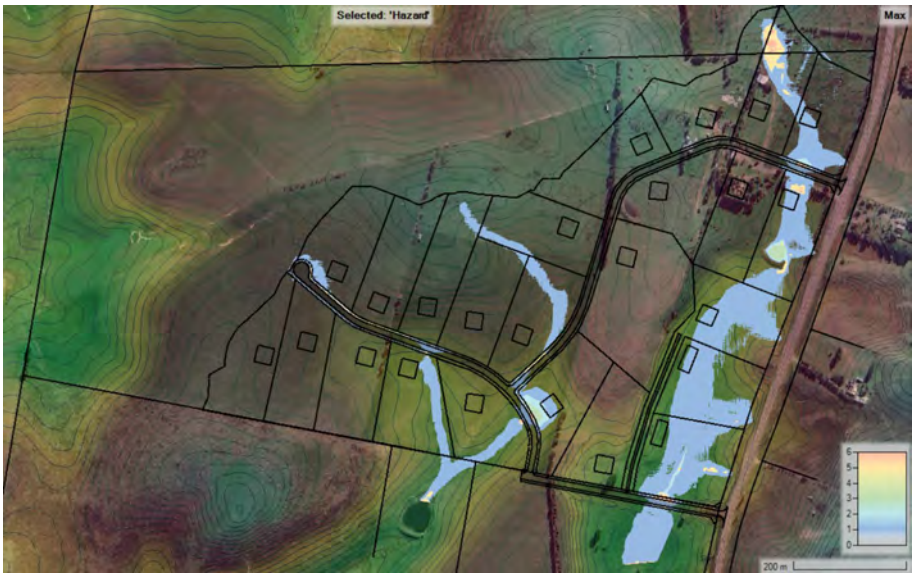


Figure 11: 0.05% AEP Event – ARR2019 Hazard Classification– Post-Development

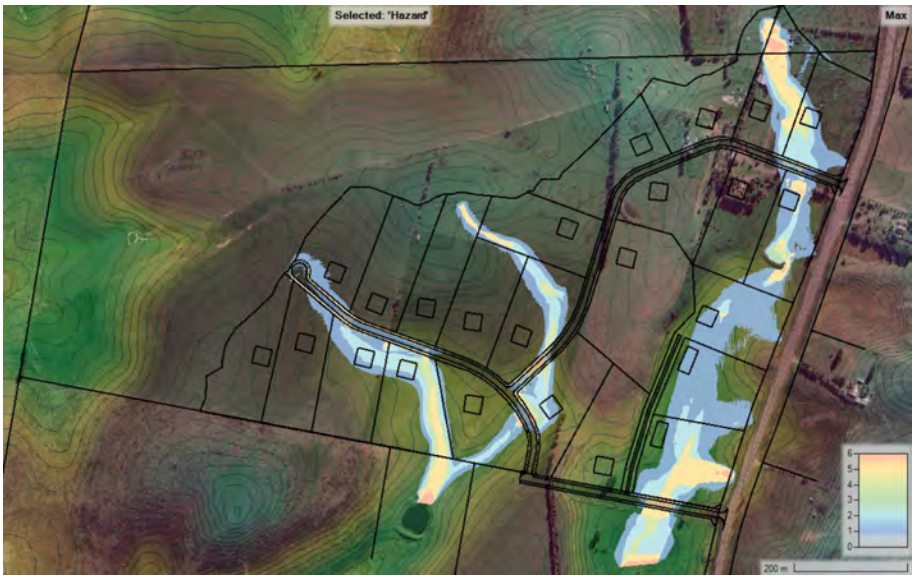


Figure 12: PMF Event – ARR2019 Hazard Classification– Post-Development

Appendix C

Inflow Hydrographs

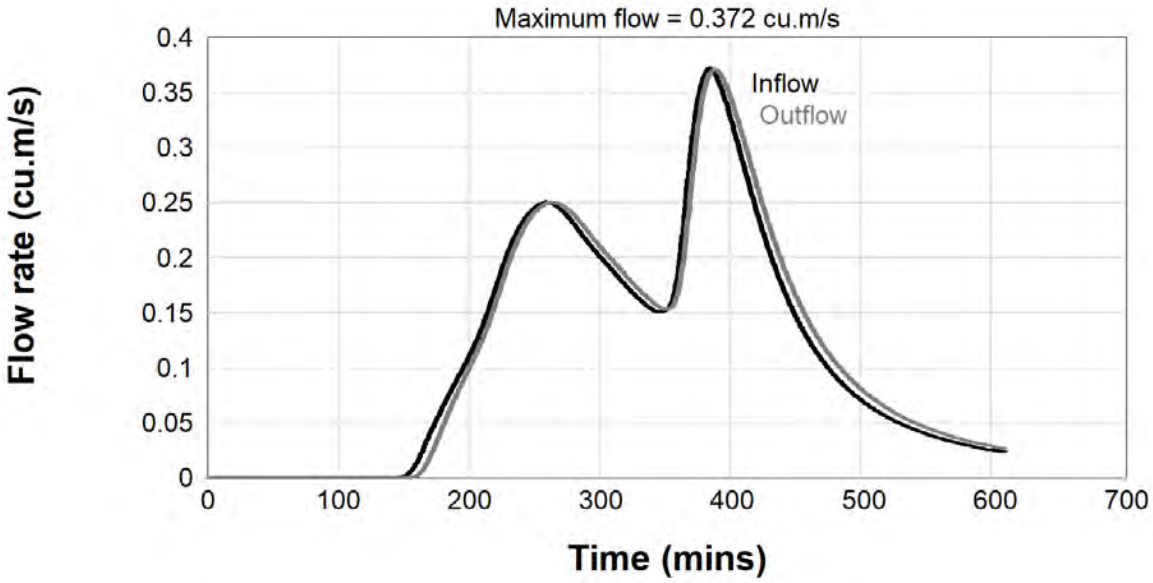


Figure 1: 1% AEP Event – EX1 to INT1 – 6 hour burst, Storm 9

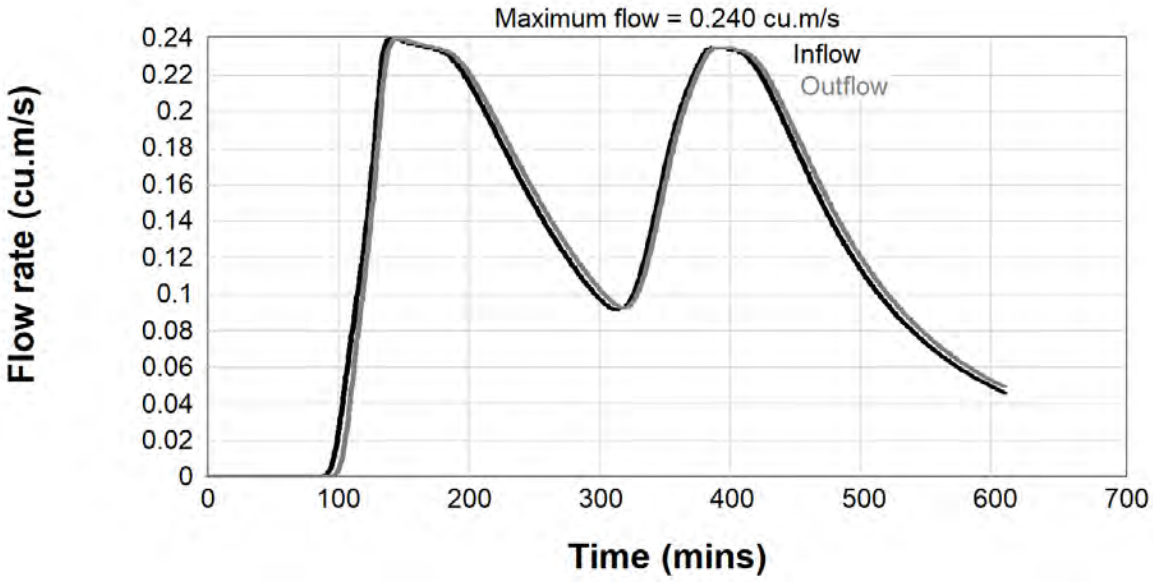


Figure 2: 1% AEP Event – EX2 OF – 6 hour burst, Storm 2

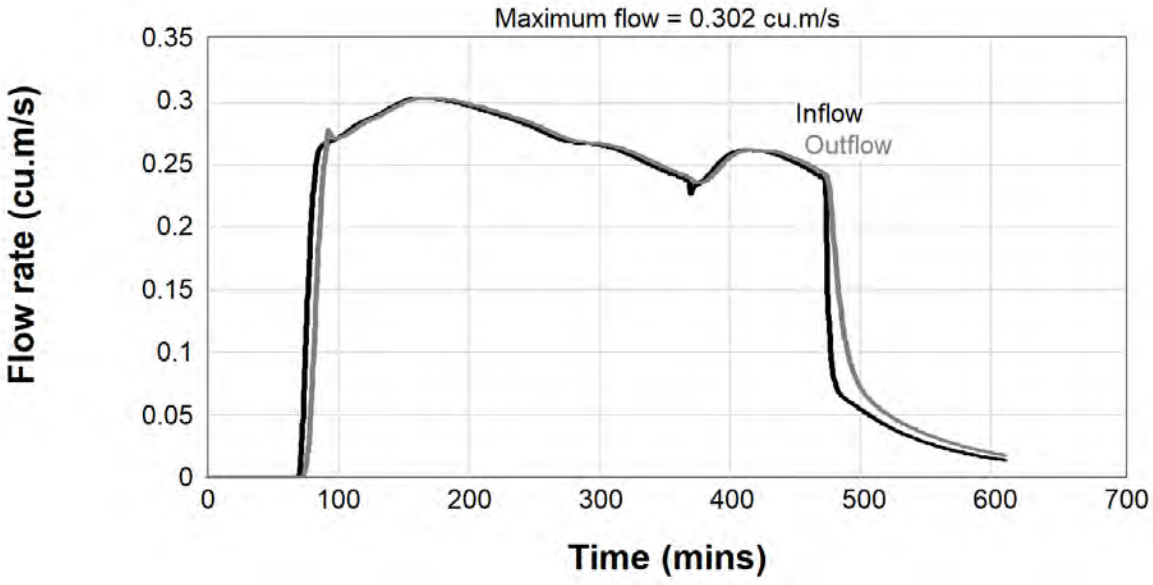


Figure 3: 1% AEP Event – EX3 OF – 6 hour burst, Storm 3

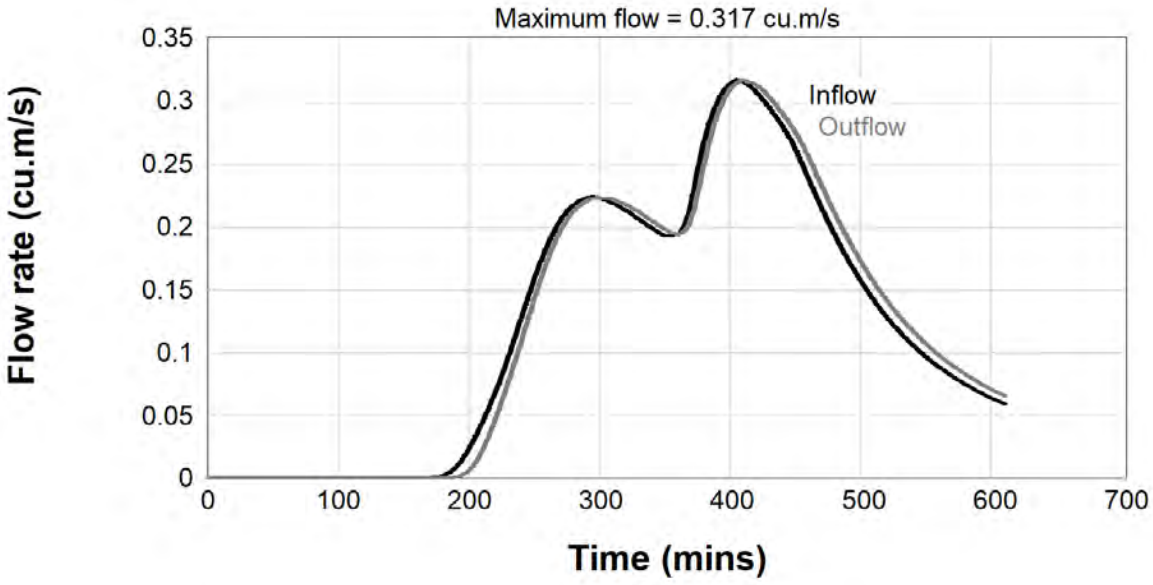


Figure 4: 1% AEP Event – EX4 OF – 6 hour burst, Storm 9

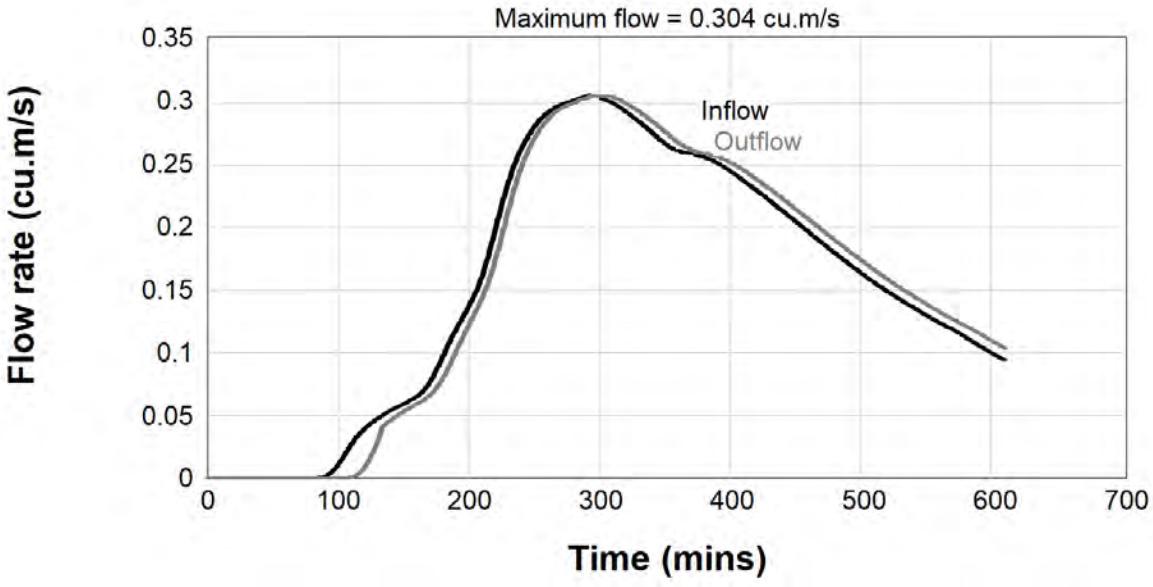


Figure 5: 1% AEP Event – ROAD OUT – 6 hour burst, Storm 5

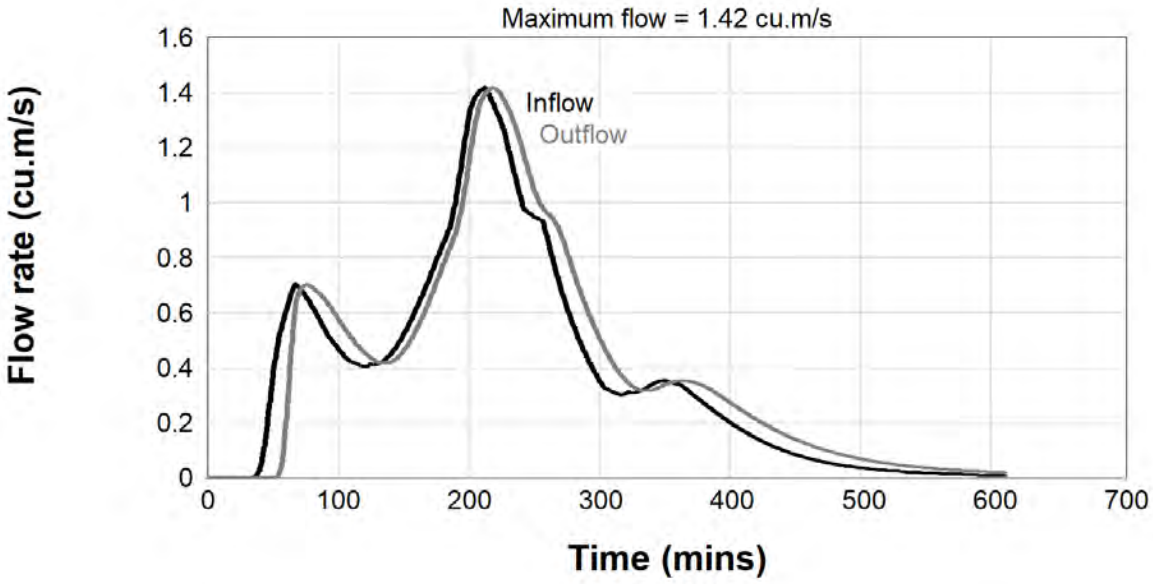


Figure 6: 1% AEP Event – INTERNAL 1 – 6 hour burst, Storm 5

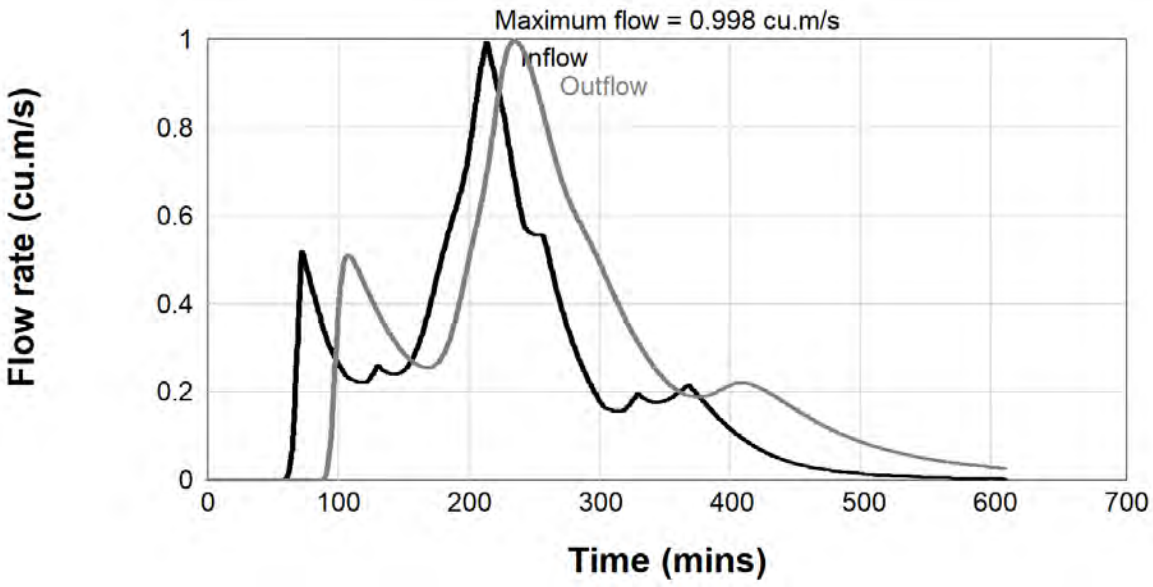


Figure 7: 1% AEP Event – CAT2 – 6 hour burst, Storm 5

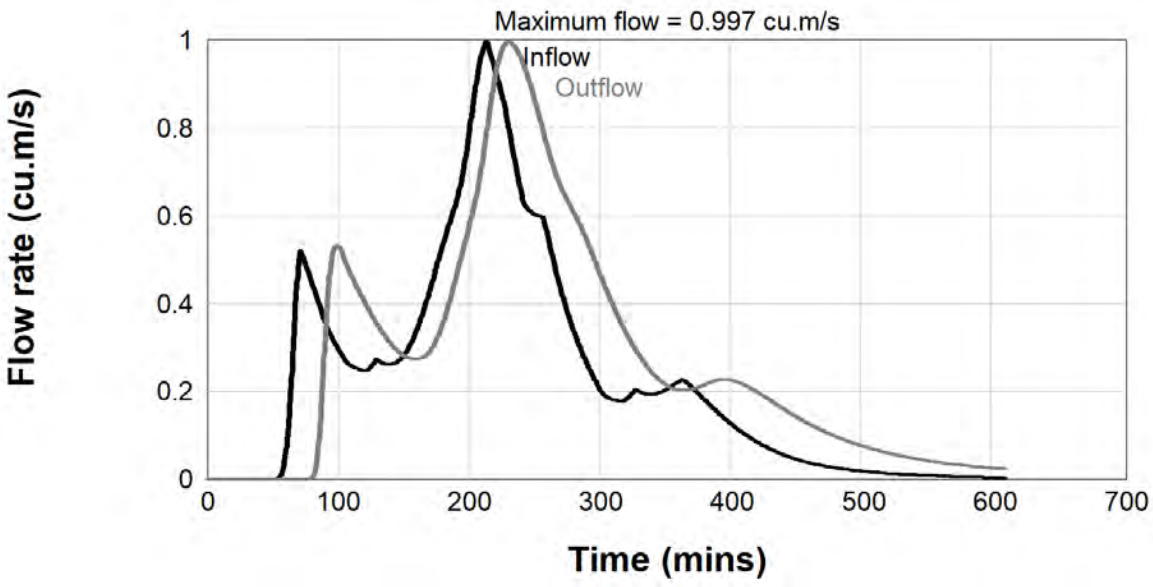


Figure 8: 1% AEP Event – INTERNAL CAT 3 – 6 hour burst, Storm 5

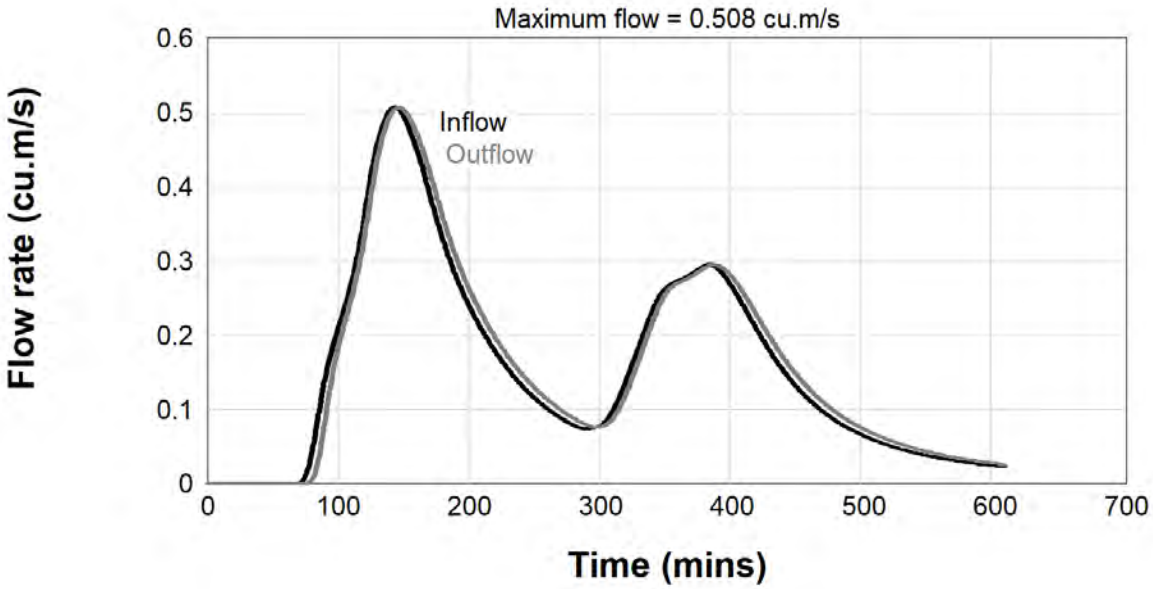


Figure 9: 0.2% AEP Event – EX1 to INT1 – 6 hour burst, Storm 2

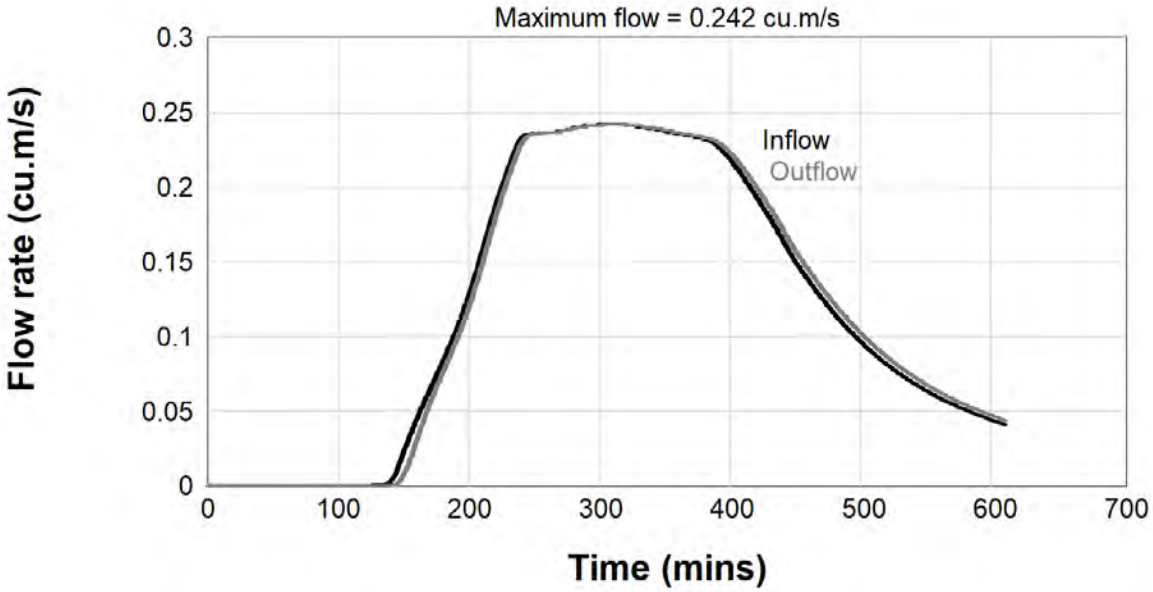


Figure 10: 0.2% AEP Event – EX2 OF - 6 hour burst, Storm 10

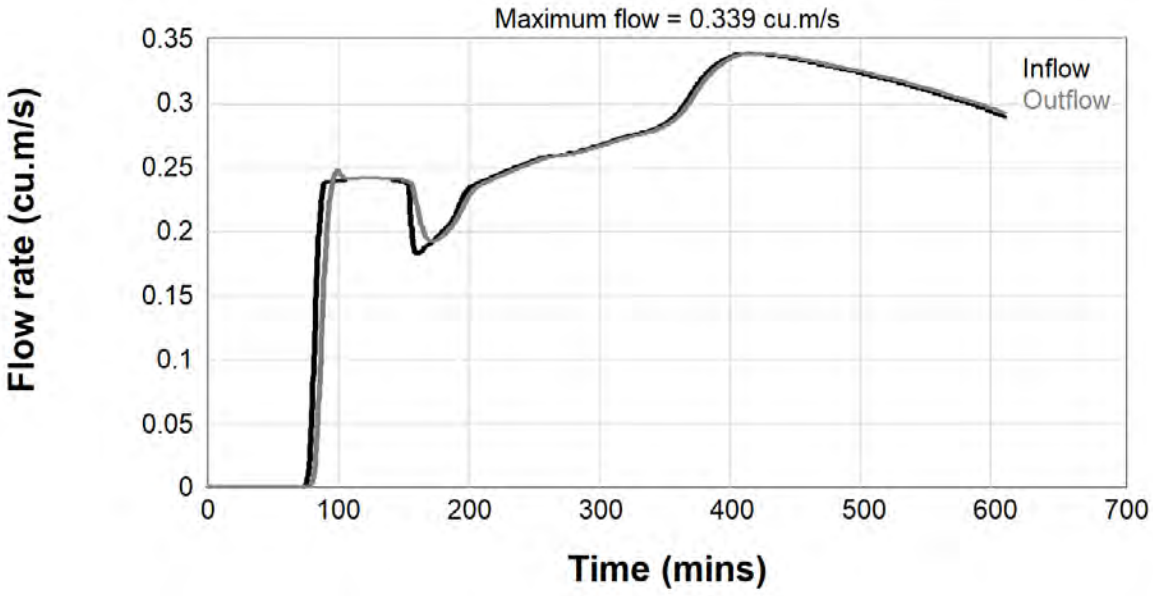


Figure 11: 0.2% AEP Event – EX3 OF - 6 hour burst, Storm 1

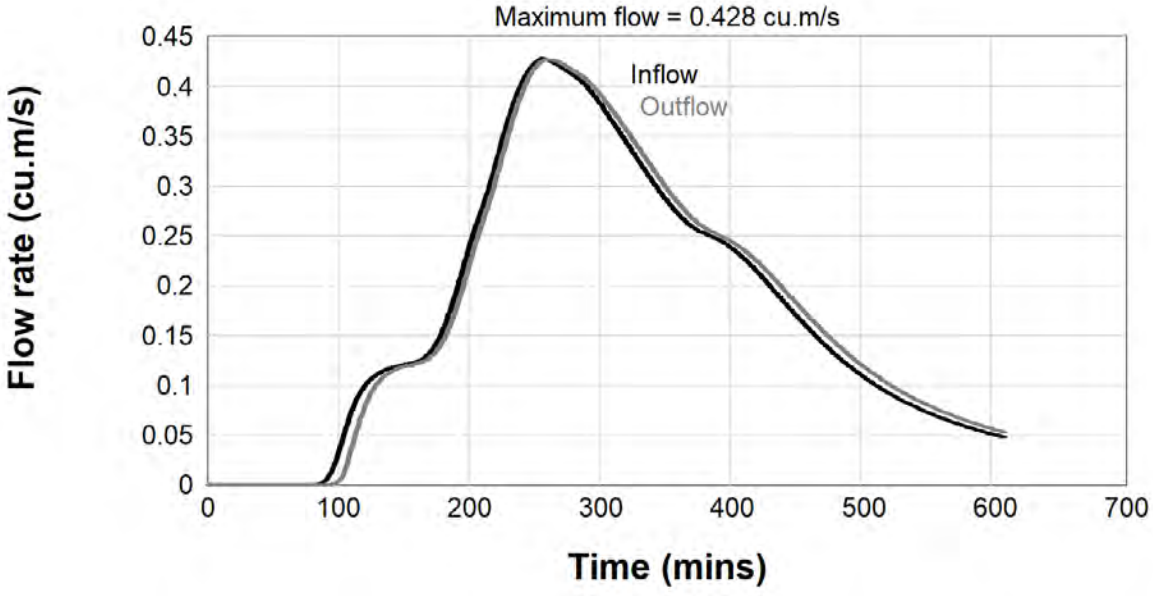


Figure 12: 0.2% AEP Event – EX4 OF - 6 hour burst, Storm 5

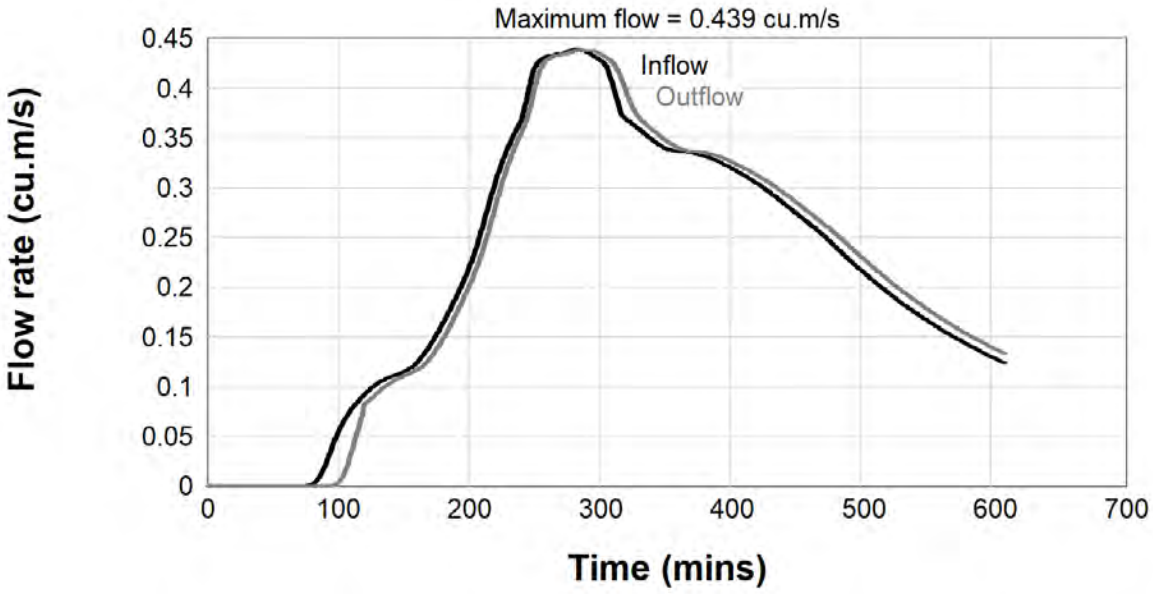


Figure 13: 0.2% AEP Event – ROAD OUT - 6 hour burst, Storm 5

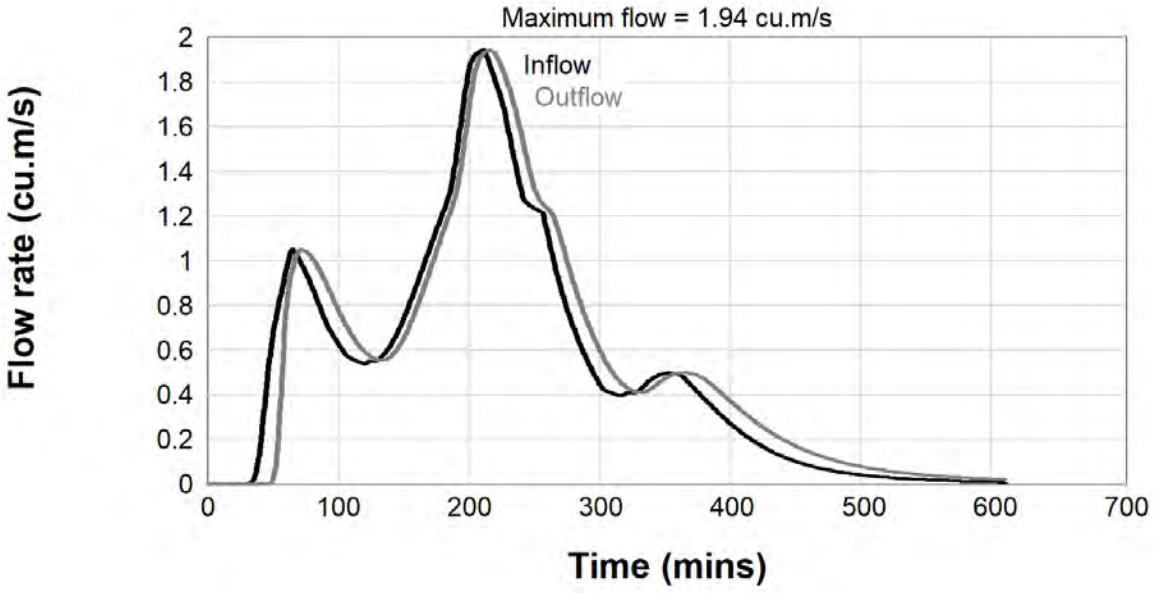


Figure 14: 0.2% AEP Event – INTERNAL 1 - 6 hour burst, Storm 5

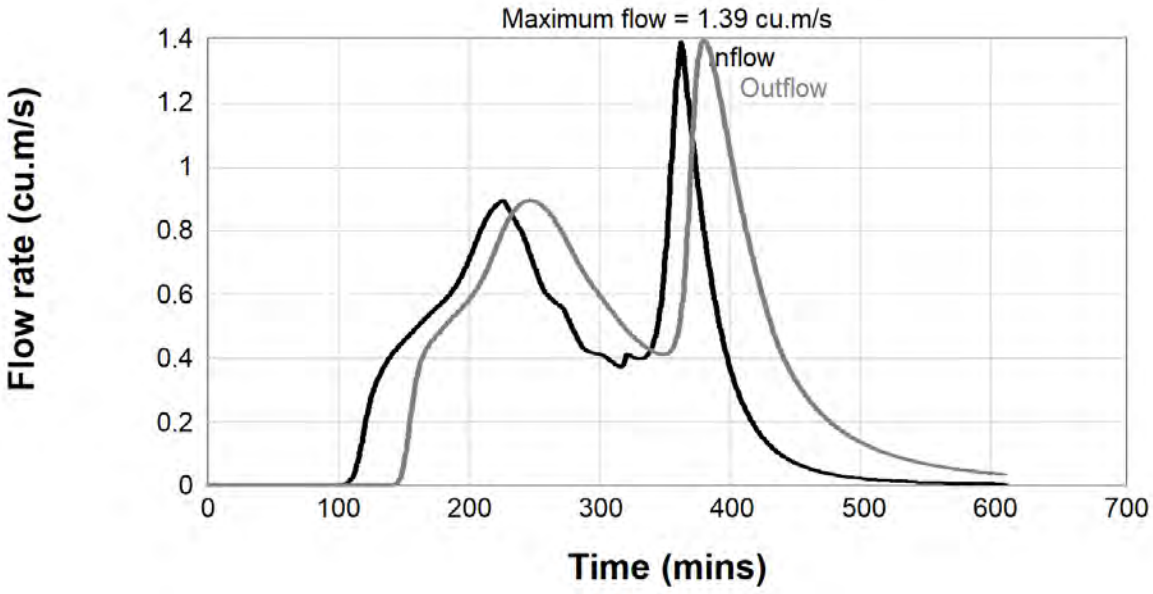


Figure 15: 0.2% AEP Event – CAT2 - 6 hour burst, Storm 9

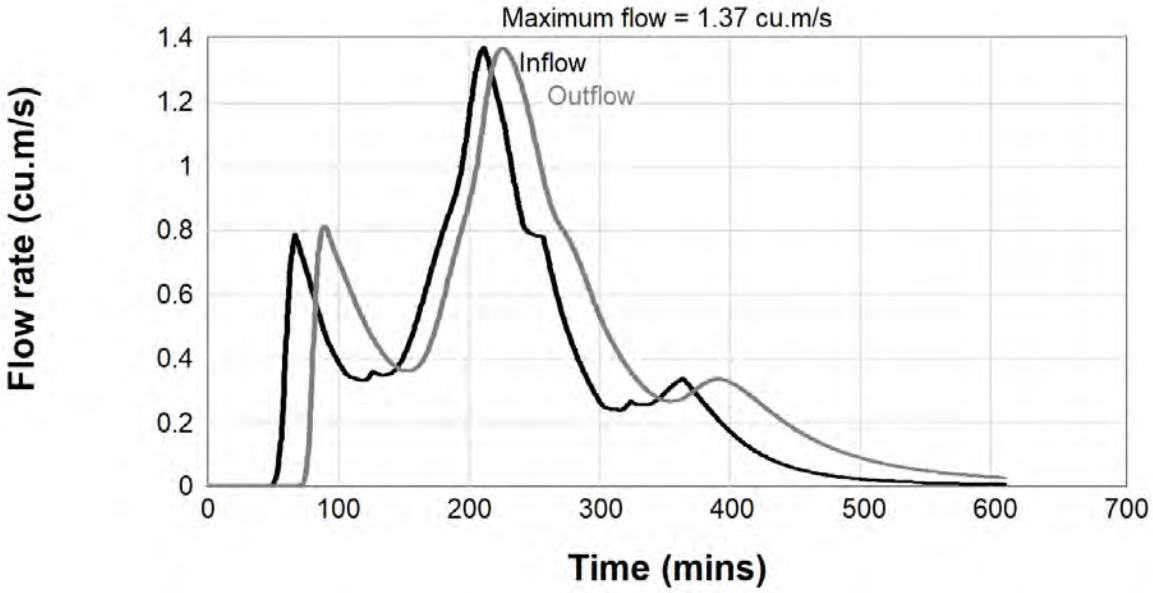


Figure 16: 0.2% AEP Event – INTERNAL CAT 3 - 6 hour burst, Storm 5

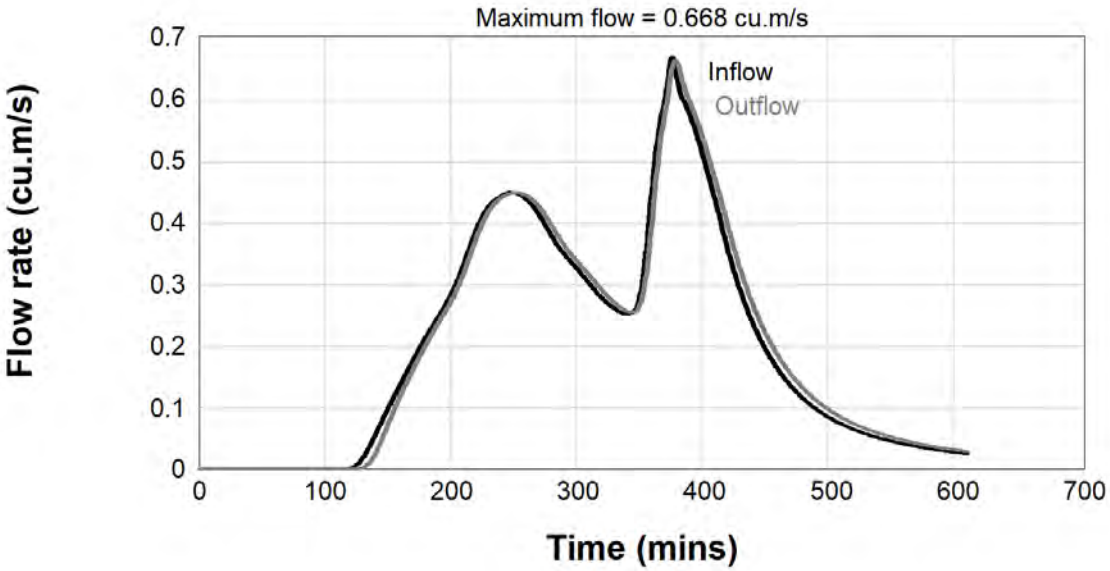


Figure 17: 0.05% AEP Event – EX1 to INT1 – 6 hour burst, Storm 9

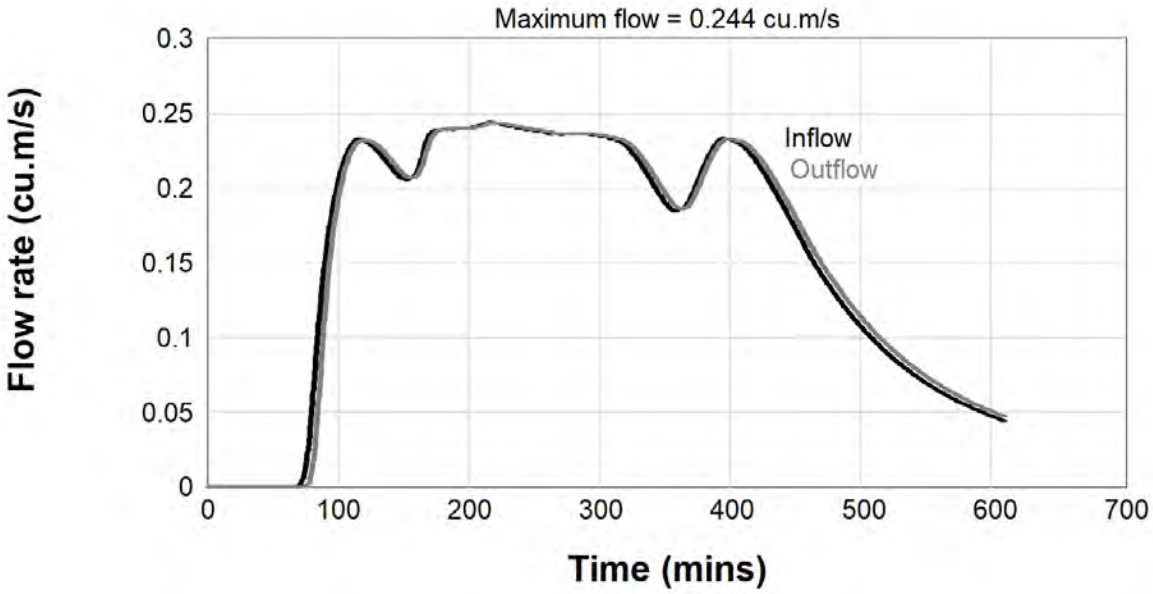


Figure 18: 0.05% AEP Event – EX2 OF 6 hour burst, Storm 5

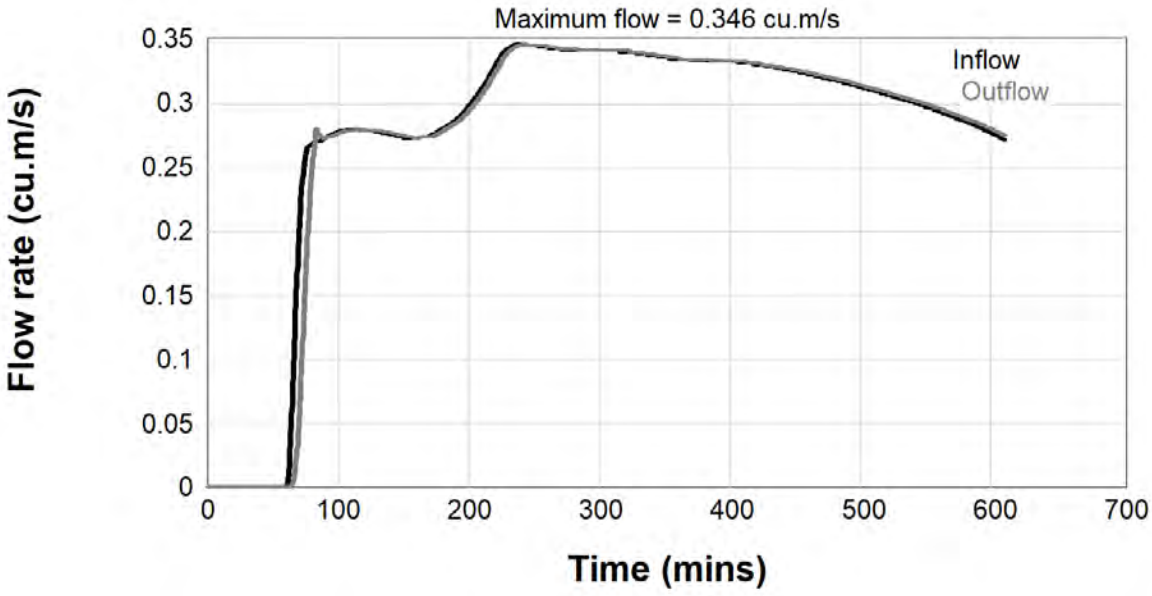


Figure 19: 0.05% AEP Event – EX3 OF - 6 hour burst, Storm 5

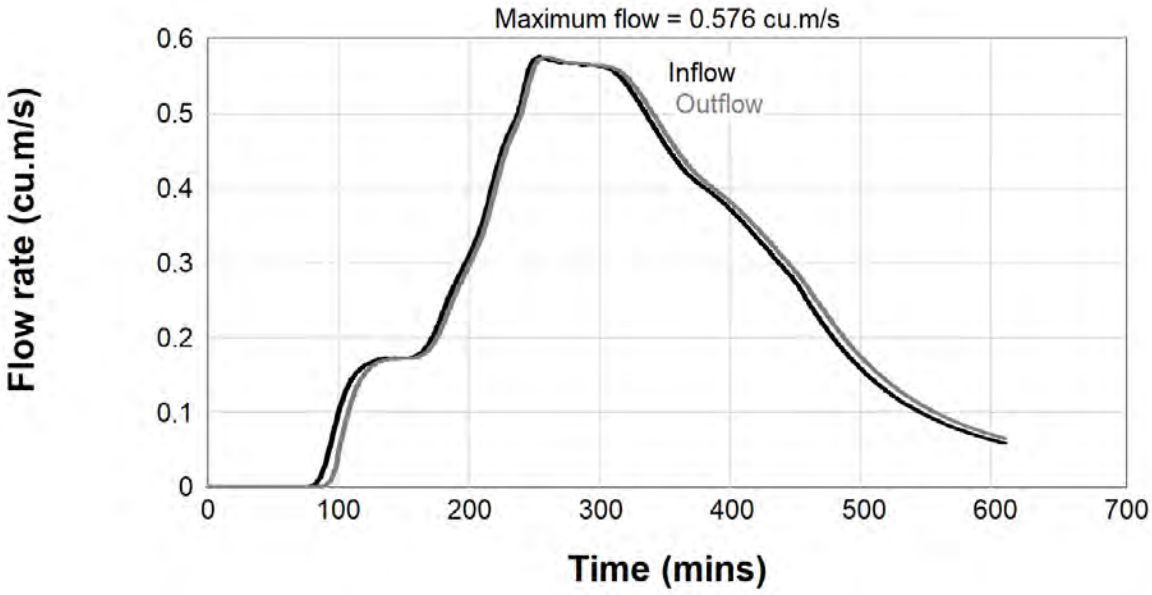


Figure 20: 0.05% AEP Event – EX4 OF - 6 hour burst, Storm 5

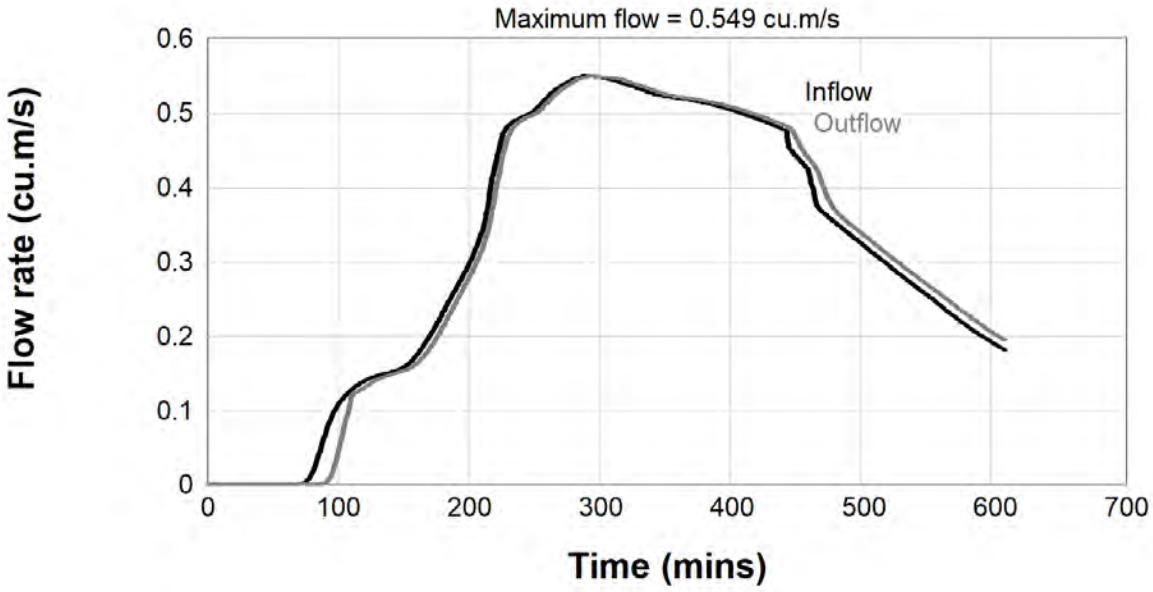


Figure 21: 0.05% AEP Event – ROAD OUT - 6 hour burst, Storm 5

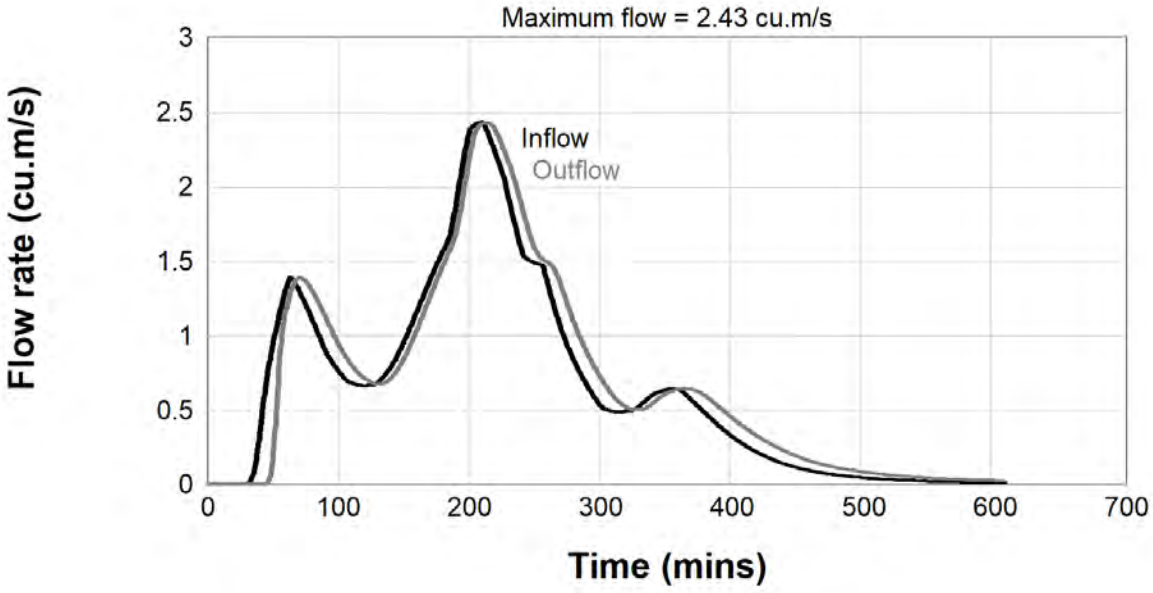


Figure 22: 0.05% AEP Event – INTERNAL 1 - 6 hour burst, Storm 5

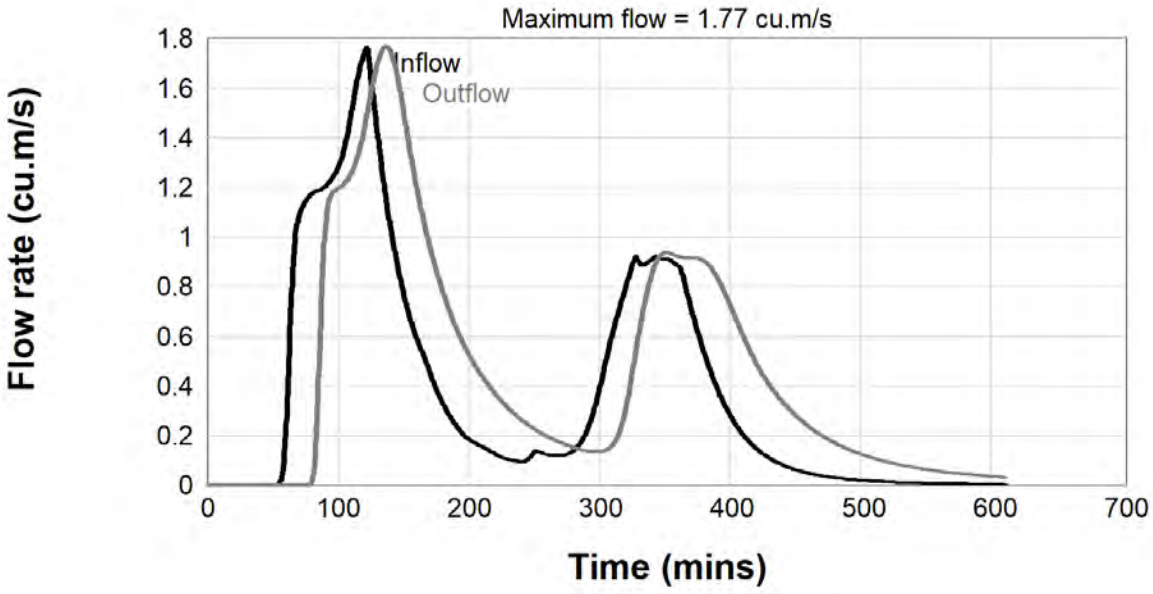


Figure 23: 0.05% AEP Event – CAT2 - 6 hour burst, Storm 2

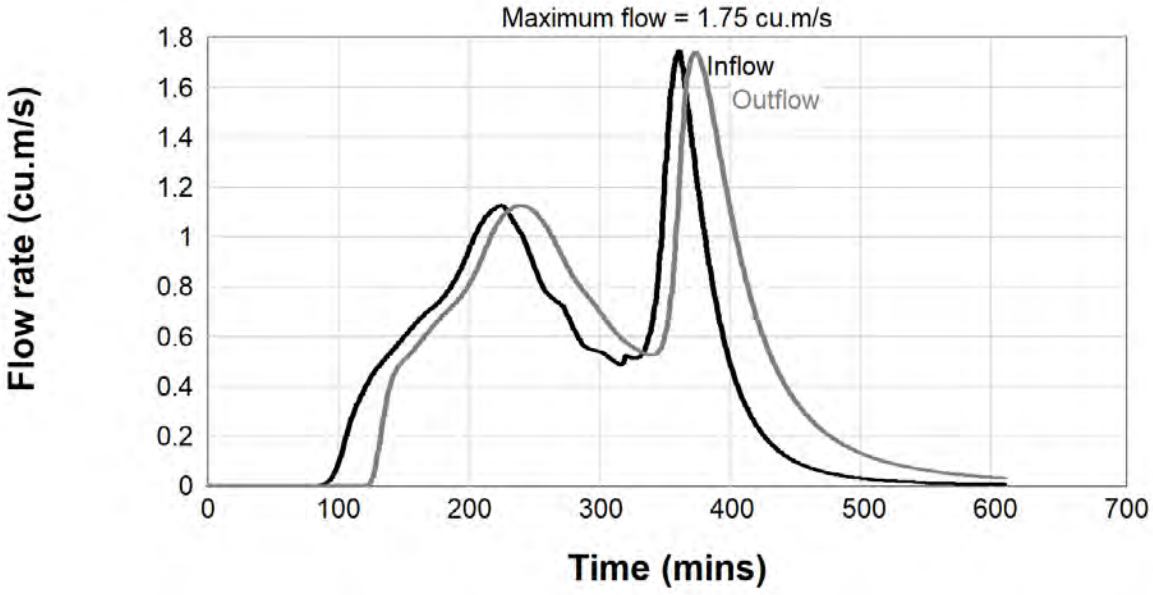


Figure 24: 0.05% AEP Event – INTERNAL CAT 3 - 6 hour burst, Storm 9

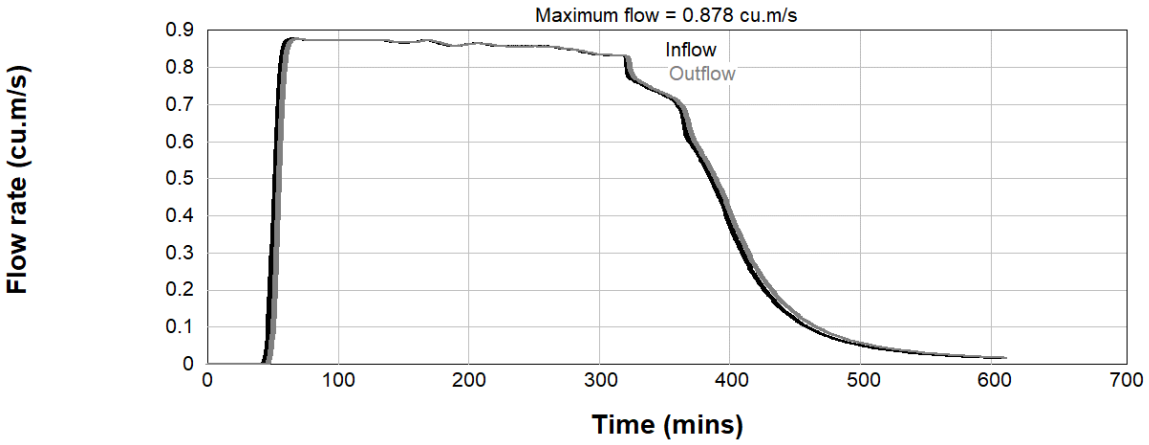


Figure 25: PMF Event – EX1 to INT1 – 6 hour

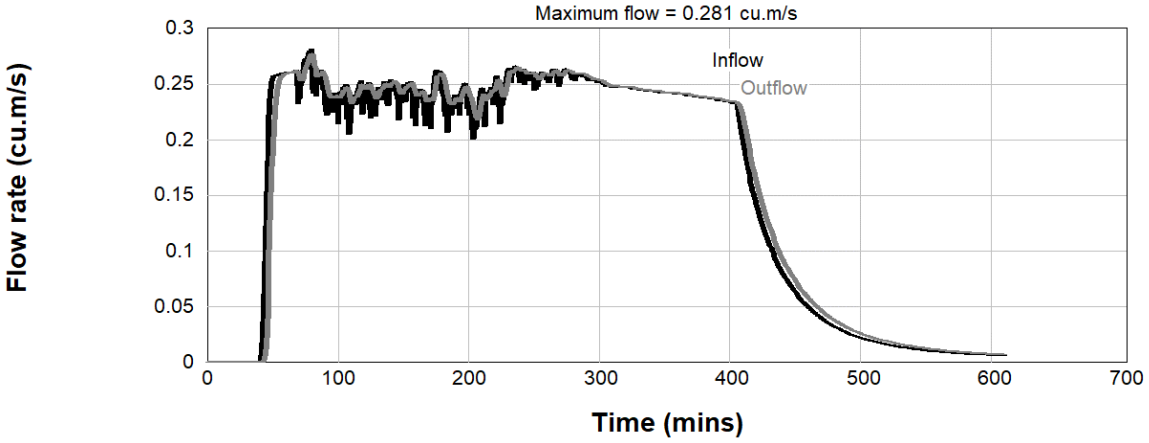


Figure 26: PMF Event – EX2 OF - 6 hour

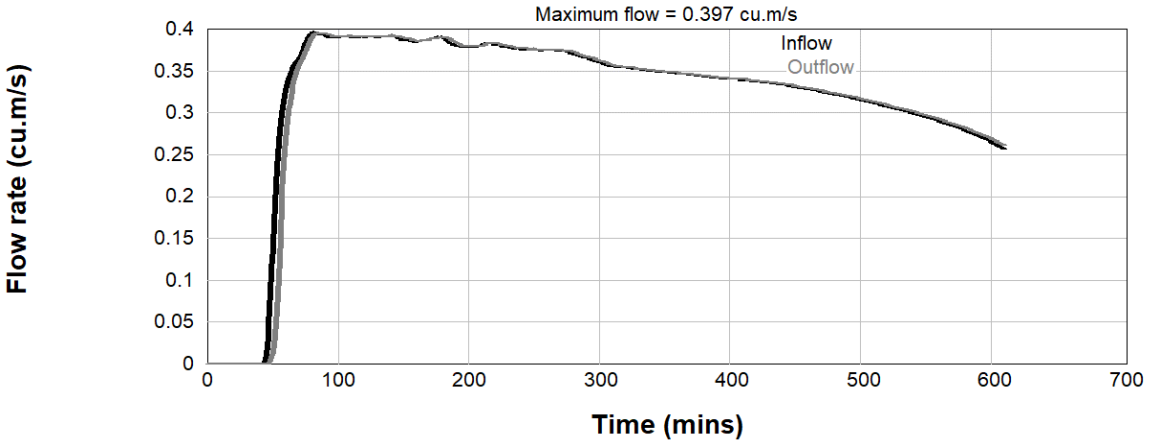


Figure 27: PMF Event – EX3 OF - 6 hour

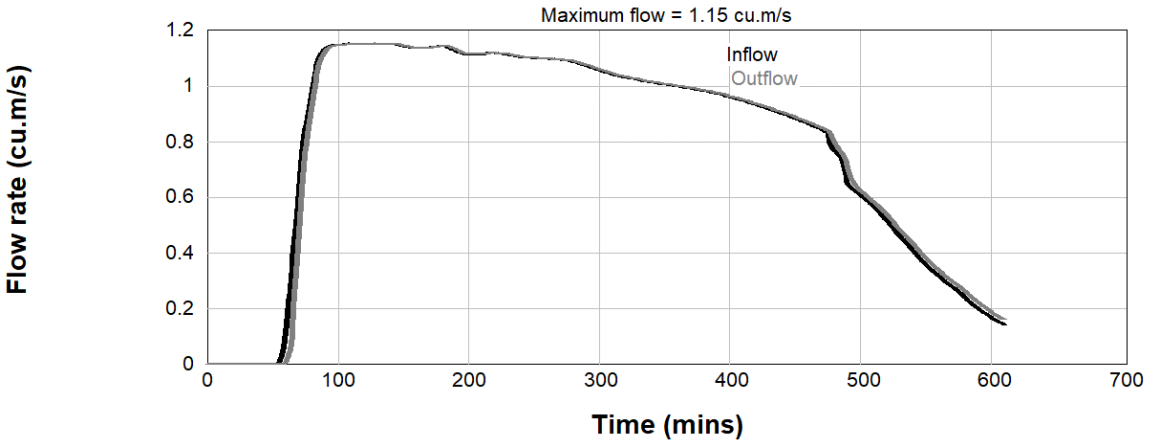


Figure 28: PMF Event – EX4 OF - 6 hour

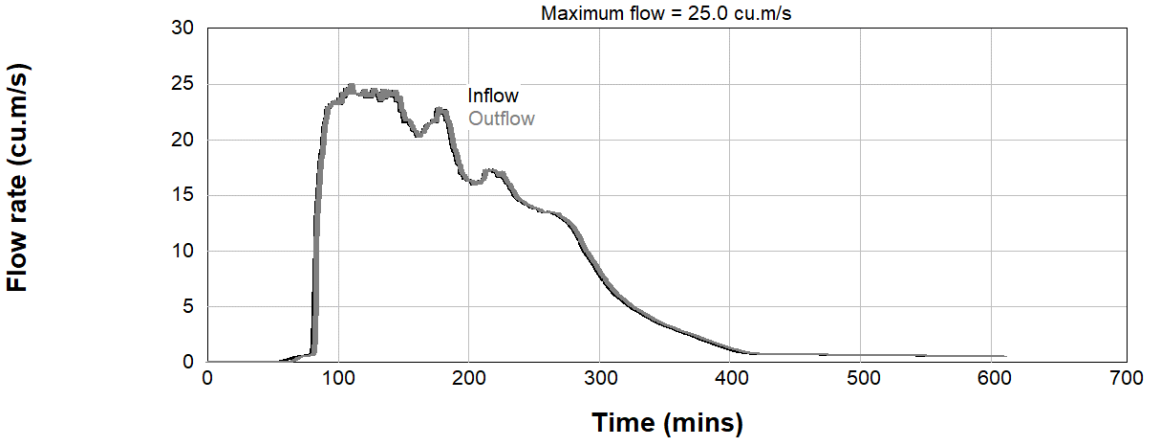


Figure 29: PMF Event – ROAD OUT - 6 hour

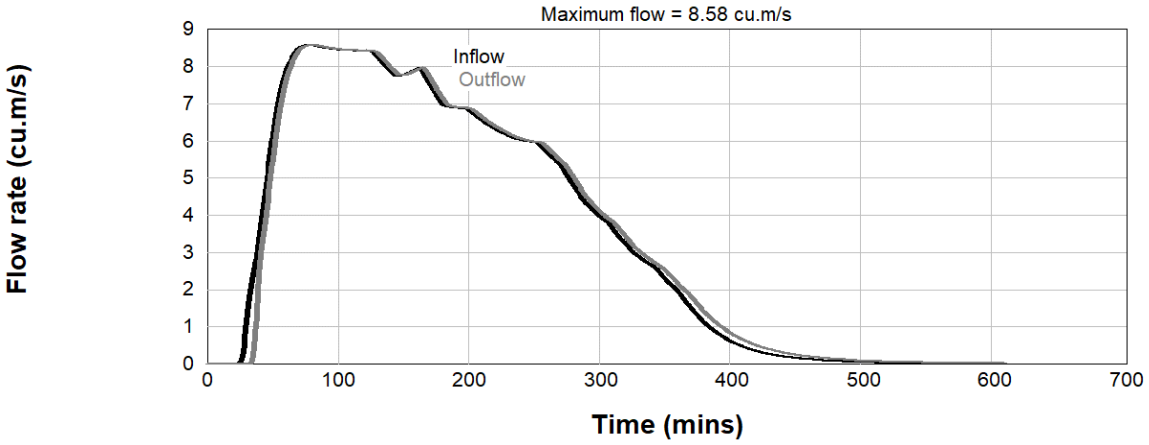


Figure 30: PMF Event – INTERNAL 1 - 6 hour

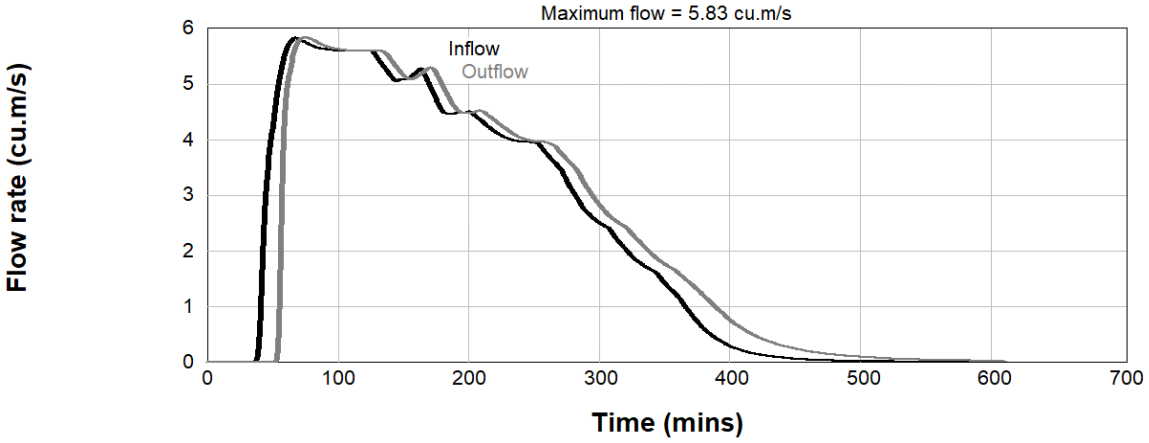


Figure 31: PMF Event – CAT2 - 6 hour

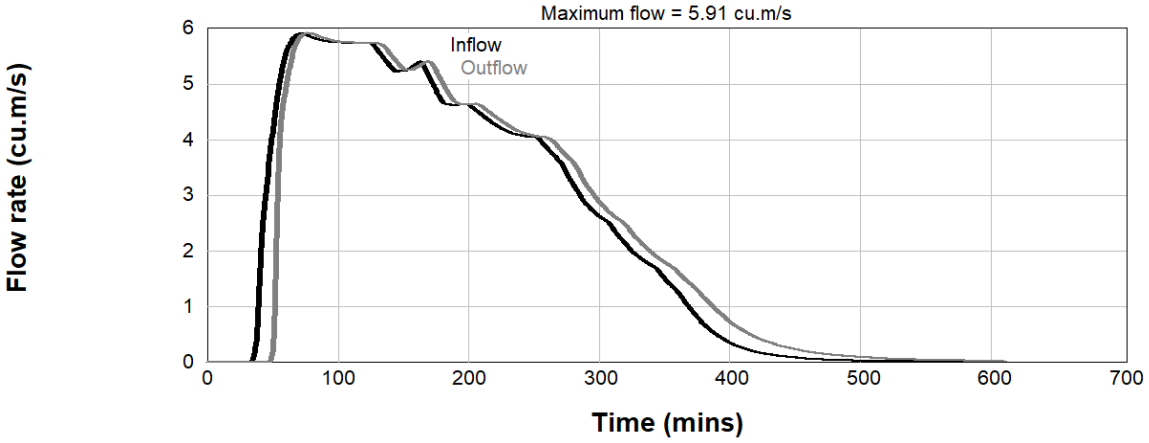


Figure 32: PMF Event – INTERNAL CAT 3 - 6 hour

Appendix D

ARR Hub Data

Australian Rainfall & Runoff Data Hub - Results

Input Data

Longitude	149.701
Latitude	-34.698
Selected Regions (clear)	
River Region	show
ARF Parameters	show
Storm Losses	show
Temporal Patterns	show
Areal Temporal Patterns	show
BOM IFDs	show
Median Preburst Depths and Ratios	show
10% Preburst Depths	show
25% Preburst Depths	show
75% Preburst Depths	show
90% Preburst Depths	show
Interim Climate Change Factors	show
Probability Neutral Burst Initial Loss (./nsw_specific)	show

Data

River Region

Division	South East Coast (NSW)
River Number	12
River Name	Hawkesbury River

Layer Info

Time Accessed	13 May 2024 12:29PM
Version	2016_v1

ARF Parameters

$$ARF = Min\left\{1, \left[1 - a\left(Area^{b} - c\log_{10}Duration\right)Duration^{-d} + eArea^{f}Duration^{g}\left(0.3 + \log_{10}AEP\right) + h10^{iArea\frac{Duration}{1440}}\left(0.3 + \log_{10}AEP\right)\right]\right\}$$

Zone	a	b	c	d	e	f	g	h	i
SE Coast	0.06	0.361	0.0	0.317	8.11e-05	0.651	0.0	0.0	0.0

Short Duration ARF

$$ARF = Min\left[1, 1 - 0.287\left(Area^{0.265} - 0.439\log_{10}(Duration)\right).Duration^{-0.36} + 2.26\ \text{x}\ 10^{-3}\ \text{x}\ Area^{0.226}.Duration^{0.125}\left(0.3 + \log_{10}(AEP)\right) + 0.0141\ \text{x}\ Area^{0.213}\ \text{x}\ 10^{-0.021\frac{(Duration-180)^{2}}{1440}}\left(0.3 + \log_{10}(AEP)\right)\right]$$

Layer Info

Time Accessed	13 May 2024 12:29PM
Version	2016_v1

Storm Losses

Note: Burst Loss = Storm Loss - Preburst

Note: These losses are only for rural use and are **NOT FOR DIRECT USE** in urban areas

Note: As this point is in NSW the advice provided on losses and pre-burst on the NSW Specific Tab of the ARR Data Hub (./nsw_specific) is to be considered. In NSW losses are derived considering a hierarchy of approaches depending on the available loss information. The continuing storm loss information from the ARR Datahub provided below should only be used where relevant under the loss hierarchy (level 5) and where used is to be multiplied by the factor of 0.4.

ID	17778.0
Storm Initial Losses (mm)	16.0
Storm Continuing Losses (mm/h)	2.7

Layer Info

Time Accessed	13 May 2024 12:29PM
Version	2016_v1

Temporal Patterns | Download (.zip) (static/temporal_patterns/TP/ECsouth.zip)

code	ECsouth
Label	East Coast South

Layer Info

Time Accessed	13 May 2024 12:29PM
Version	2016_v2

Areal Temporal Patterns | Download (.zip) (./static/temporal_patterns/Areal/Areal_ECsouth.zip)

code	ECsouth
arealabel	East Coast South

Layer Info

Time Accessed	13 May 2024 12:29PM
Version	2016_v2

BOM IFDs

Click here (http://www.bom.gov.au/water/designRainfalls/revised-ifd/?year=2016&coordinate_type=dd&latitude=-34.698&longitude=149.701&sdmin=true&sdhr=true&sdday=true&user_label=) to obtain the IFD depths for catchment centroid from the BoM website

Layer Info

Time Accessed	13 May 2024 12:29PM

Median Preburst Depths and Ratios

Values are of the format depth (ratio) with depth in mm

min (h)\AEP(%)	50	20	10	5	2	1
60 (1.0)	0.7 (0.039)	0.4 (0.017)	0.2 (0.007)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)
90 (1.5)	1.9 (0.091)	1.1 (0.039)	0.5 (0.017)	0.0 (0.000)	0.1 (0.001)	0.1 (0.002)
120 (2.0)	0.2 (0.008)	0.2 (0.006)	0.2 (0.005)	0.1 (0.004)	0.2 (0.004)	0.2 (0.003)
180 (3.0)	0.1 (0.005)	0.8 (0.023)	1.2 (0.031)	1.7 (0.037)	1.1 (0.022)	0.7 (0.013)
360 (6.0)	1.7 (0.048)	1.1 (0.024)	0.7 (0.013)	0.3 (0.006)	1.0 (0.015)	1.5 (0.020)
720 (12.0)	0.2 (0.005)	1.9 (0.032)	3.1 (0.043)	4.2 (0.051)	6.9 (0.070)	8.9 (0.081)
1080 (18.0)	0.0 (0.000)	3.0 (0.042)	5.0 (0.058)	6.8 (0.069)	9.9 (0.083)	12.1 (0.090)
1440 (24.0)	0.0 (0.000)	0.3 (0.003)	0.4 (0.004)	0.6 (0.005)	3.7 (0.027)	6.0 (0.039)
2160 (36.0)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.6 (0.004)	1.0 (0.006)
2880 (48.0)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)
4320 (72.0)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)

Layer Info

Time Accessed	13 May 2024 12:29PM
Version	2018_v1
Note	Preburst interpolation methods for catchment wide preburst has been slightly altered. Point values remain unchanged.

10% Preburst Depths

Values are of the format depth (ratio) with depth in mm

min (h)\AEP(%)	50	20	10	5	2	1
60 (1.0)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)
90 (1.5)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)
120 (2.0)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)
180 (3.0)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)
360 (6.0)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)
720 (12.0)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)
1080 (18.0)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)
1440 (24.0)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)
2160 (36.0)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)
2880 (48.0)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)
4320 (72.0)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)

Layer Info

Time Accessed	13 May 2024 12:29PM
Version	2018_v1
Note	Preburst interpolation methods for catchment wide preburst has been slightly altered. Point values remain unchanged.

25% Preburst Depths

Values are of the format depth (ratio) with depth in mm

min (h)\AEP(%)	50	20	10	5	2	1
60 (1.0)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)
90 (1.5)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)
120 (2.0)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)
180 (3.0)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)
360 (6.0)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)
720 (12.0)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)
1080 (18.0)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)
1440 (24.0)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)
2160 (36.0)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)
2880 (48.0)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)
4320 (72.0)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)

Layer Info

Time Accessed	13 May 2024 12:29PM
Version	2018_v1
Note	Preburst interpolation methods for catchment wide preburst has been slightly altered. Point values remain unchanged.

75% Preburst Depths

Values are of the format depth (ratio) with depth in mm

min (h)\AEP(%)	50	20	10	5	2	1
60 (1.0)	10.9 (0.601)	7.0 (0.292)	4.4 (0.159)	2.0 (0.063)	5.2 (0.142)	7.6 (0.188)
90 (1.5)	7.6 (0.366)	7.0 (0.258)	6.7 (0.211)	6.3 (0.176)	10.2 (0.246)	13.1 (0.287)
120 (2.0)	8.6 (0.377)	11.0 (0.369)	12.6 (0.365)	14.2 (0.361)	12.9 (0.285)	12.0 (0.240)
180 (3.0)	11.2 (0.423)	12.5 (0.363)	13.4 (0.335)	14.2 (0.314)	12.4 (0.237)	11.0 (0.191)
360 (6.0)	13.2 (0.384)	13.9 (0.309)	14.4 (0.274)	14.8 (0.247)	20.1 (0.287)	24.1 (0.309)
720 (12.0)	9.7 (0.213)	13.4 (0.222)	15.9 (0.223)	18.3 (0.222)	32.0 (0.327)	42.2 (0.384)
1080 (18.0)	2.2 (0.041)	9.9 (0.138)	15.0 (0.176)	19.9 (0.200)	31.8 (0.268)	40.7 (0.304)
1440 (24.0)	0.5 (0.008)	4.2 (0.053)	6.7 (0.070)	9.1 (0.081)	21.8 (0.161)	31.4 (0.205)
2160 (36.0)	0.0 (0.000)	1.6 (0.017)	2.6 (0.023)	3.6 (0.027)	9.3 (0.058)	13.5 (0.075)
2880 (48.0)	0.0 (0.000)	1.2 (0.012)	2.1 (0.017)	2.8 (0.020)	7.1 (0.041)	10.4 (0.052)
4320 (72.0)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.6 (0.003)	1.1 (0.005)

Layer Info

Time Accessed	13 May 2024 12:29PM
Version	2018_v1
Note	Preburst interpolation methods for catchment wide preburst has been slightly altered. Point values remain unchanged.

90% Preburst Depths

Values are of the format depth (ratio) with depth in mm

min (h)\AEP(%)	50	20	10	5	2	1
60 (1.0)	28.5 (1.574)	22.9 (0.953)	19.1 (0.685)	15.5 (0.489)	22.0 (0.600)	26.8 (0.664)
90 (1.5)	20.7 (0.998)	23.8 (0.873)	25.8 (0.817)	27.8 (0.775)	24.8 (0.601)	22.6 (0.497)
120 (2.0)	19.0 (0.830)	23.0 (0.770)	25.7 (0.742)	28.3 (0.720)	28.4 (0.627)	28.5 (0.571)
180 (3.0)	19.9 (0.752)	24.5 (0.712)	27.6 (0.692)	30.5 (0.675)	29.6 (0.565)	28.9 (0.499)
360 (6.0)	24.6 (0.714)	29.5 (0.654)	32.7 (0.623)	35.8 (0.597)	50.2 (0.716)	60.9 (0.780)
720 (12.0)	21.6 (0.476)	36.3 (0.601)	46.0 (0.646)	55.4 (0.672)	72.4 (0.741)	85.2 (0.775)
1080 (18.0)	15.0 (0.282)	26.7 (0.373)	34.5 (0.405)	42.0 (0.423)	62.5 (0.527)	77.9 (0.581)
1440 (24.0)	14.3 (0.243)	16.8 (0.209)	18.5 (0.193)	20.1 (0.179)	38.2 (0.283)	51.8 (0.338)
2160 (36.0)	6.8 (0.102)	10.8 (0.116)	13.4 (0.120)	15.9 (0.121)	34.3 (0.216)	48.0 (0.266)
2880 (48.0)	4.1 (0.056)	12.5 (0.123)	18.0 (0.147)	23.4 (0.161)	32.1 (0.183)	38.6 (0.194)
4320 (72.0)	1.2 (0.015)	6.8 (0.061)	10.6 (0.078)	14.2 (0.088)	11.6 (0.060)	9.6 (0.044)

Layer Info

Time Accessed	13 May 2024 12:29PM
Version	2018_v1
Note	Preburst interpolation methods for catchment wide preburst has been slightly altered. Point values remain unchanged.

Interim Climate Change Factors

	RCP 4.5	RCP6	**RCP 8.5**
2030	**0.869 (4.3%)**	0.783 (3.9%)	**0.983 (4.9%)**
2040	**1.057 (5.3%)**	1.014 (5.1%)	**1.349 (6.8%)**
2050	**1.272 (6.4%)**	1.236 (6.2%)	**1.773 (9.0%)**
2060	**1.488 (7.5%)**	1.458 (7.4%)	**2.237 (11.5%)**
2070	**1.676 (8.5%)**	1.691 (8.6%)	**2.722 (14.2%)**
2080	**1.810 (9.2%)**	1.944 (9.9%)	**3.209 (16.9%)**
2090	**1.862 (9.5%)**	2.227 (11.5%)	**3.679 (19.7%)**

Layer Info

Time Accessed	13 May 2024 12:29PM
Version	2019_v1
Note	ARR recommends the use of RCP4.5 and RCP 8.5 values. These have been updated to the values that can be found on the climate change in Australia website.

Probability Neutral Burst Initial Loss

min (h)\AEP(%)	**50.0**	**20.0**	**10.0**	**5.0**	**2.0**	**1.0**
60 (1.0)	11.0	7.2	7.1	8.0	7.4	5.4
90 (1.5)	11.3	7.7	7.2	7.3	6.3	4.7
120 (2.0)	11.7	7.8	6.8	7.1	6.1	4.3
180 (3.0)	11.3	7.7	7.0	7.4	6.7	4.6
360 (6.0)	10.7	8.0	8.1	7.6	7.1	3.7
720 (12.0)	11.8	8.5	8.4	7.7	6.9	1.9
1080 (18.0)	13.9	9.7	9.1	7.8	7.6	2.0
1440 (24.0)	14.7	12.1	12.3	12.3	9.1	3.7
2160 (36.0)	16.2	13.7	14.2	15.3	10.5	6.0
2880 (48.0)	16.8	13.9	13.7	15.3	11.5	9.1
4320 (72.0)	17.7	15.1	15.1	17.2	14.8	10.8

Layer Info

Time Accessed	13 May 2024 12:29PM
Version	2018_v1
Note	As this point is in NSW the advice provided on losses and pre-burst on the NSW Specific Tab of the ARR Data Hub (./nsw_specific) is to be considered. In NSW losses are derived considering a hierarchy of approaches depending on the available loss information. Probability neutral burst initial loss values for NSW are to be used in place of the standard initial loss and pre-burst as per the losses hierarchy.

Download TXT (downloads/a494c836-1967-44bf-a9fb-c73e07d4dd63.txt)

Download JSON (downloads/fa8447a8-4138-4853-a28c-ec7edfb5a084.json)

Generating PDF... (downloads/472eb7a3-ac71-4ada-99b8-db20f6319389.pdf)

Appendix E

IDF Data

Australian Government
Bureau of Meteorology

Location

Label: Not provided

Latitude: -34.698 [Nearest grid cell: 34.6875 (S)]

Longitude: 149.701 [Nearest grid cell: 149.7125 (E)]

IFD Design Rainfall Depth (mm)

Issued: 13 May 2024

Rainfall depth for Durations, Exceedance per Year (EY), and Annual Exceedance Probabilities (AEP).
FAQ for New ARR probability terminology

	Annual Exceedance Probability (AEP)						
Duration	**63.2%**	**50%#**	**20%***	**10%**	**5%**	**2%**	**1%**
1 min	1.46	1.64	2.21	2.59	2.96	3.44	3.80
2 min	2.43	2.70	3.52	4.07	4.59	5.25	5.74
3 min	3.35	3.73	4.91	5.69	6.44	7.39	8.11
4 min	4.17	4.67	6.19	7.21	8.18	9.44	10.4
5 min	4.90	5.50	7.35	8.58	9.77	11.3	12.5
10 min	7.60	8.58	11.6	13.7	15.7	18.3	20.2
15 min	9.37	10.6	14.4	16.9	19.4	22.6	25.1
20 min	10.7	12.1	16.3	19.2	22.0	25.6	28.4
25 min	11.7	13.2	17.9	21.0	24.0	27.9	30.8
30 min	12.6	14.2	19.1	22.4	25.6	29.7	32.8
45 min	14.7	16.4	21.9	25.6	29.1	33.7	37.1
1 hour	16.2	18.1	24.0	27.9	31.7	36.6	40.4
1.5 hour	18.7	20.7	27.2	31.6	35.8	41.3	45.5
2 hour	20.6	22.9	29.9	34.6	39.3	45.3	50.0
3 hour	23.9	26.4	34.4	39.9	45.2	52.4	57.9
4.5 hour	27.8	30.8	40.1	46.6	53.0	61.7	68.5
6 hour	31.1	34.4	45.0	52.5	59.9	70.1	78.1
9 hour	36.4	40.4	53.4	62.7	72.0	84.9	95.1
12 hour	40.7	45.3	60.4	71.3	82.3	97.7	110
18 hour	47.4	53.0	71.7	85.3	99.3	119	134
24 hour	52.4	58.8	80.4	96.2	113	135	153
30 hour	56.3	63.5	87.4	105	123	148	168
36 hour	59.5	67.2	93.0	112	132	159	180
48 hour	64.4	72.9	102	123	145	175	199
72 hour	70.7	80.3	113	136	161	194	220
96 hour	74.8	85.0	119	144	170	204	231
120 hour	77.9	88.4	123	149	175	210	238

144 hour	80.5	91.2	126	152	178	215	243
168 hour	82.8	93.6	129	155	181	218	248

Note:
The 50% AEP IFD **does not** correspond to the 2 year Average Recurrence Interval (ARI) IFD. Rather it corresponds to the 1.44 ARI.
* The 20% AEP IFD **does not** correspond to the 5 year Average Recurrence Interval (ARI) IFD. Rather it corresponds to the 4.48 ARI.

This page was created at **12:37 on Monday 13 May 2024 (AEST)**

Appendix F

PMF Calculations

GSDM Calculation Sheet

Location Information				
Catchment	Kingsdale	Area (km2)	5.65	
State	NSW	Duration Limit (hrs)	6	
Latitude	-34.698	Longitude	149.701	
Proportion of Area Considered:				
Smooth S= (0.0 - 1.0)	1	Rough R= (0.0-1.0)	0	
Elevation Adjustment Factor (EAF)				
Mean Elevation (m AHD)			900	
Adjustment for Eelvation (-0.05 per 300m above 1500m)			0	
EAF = (0.85-1.00)			1	
Moisture Adjustment Factor (MAF)				
MAF = (0.40 - 1.00)			0.66	

PMP Values				
Duarion (hrs)	Initial Depth - Smooth	Initial Depth - Rough	PMP Estimate	Rounded PMP Estimate (nearest 10mm)
0.25	220		145	150
0.50	323		213	210
0.75	410		271	270
1.0	474		313	310
1.5	545		360	360
2.0	610		403	400
2.5	650		429	430
3.0	682		450	450
4.0	750		495	500
5.0	808		533	530
6.0	853		563	560

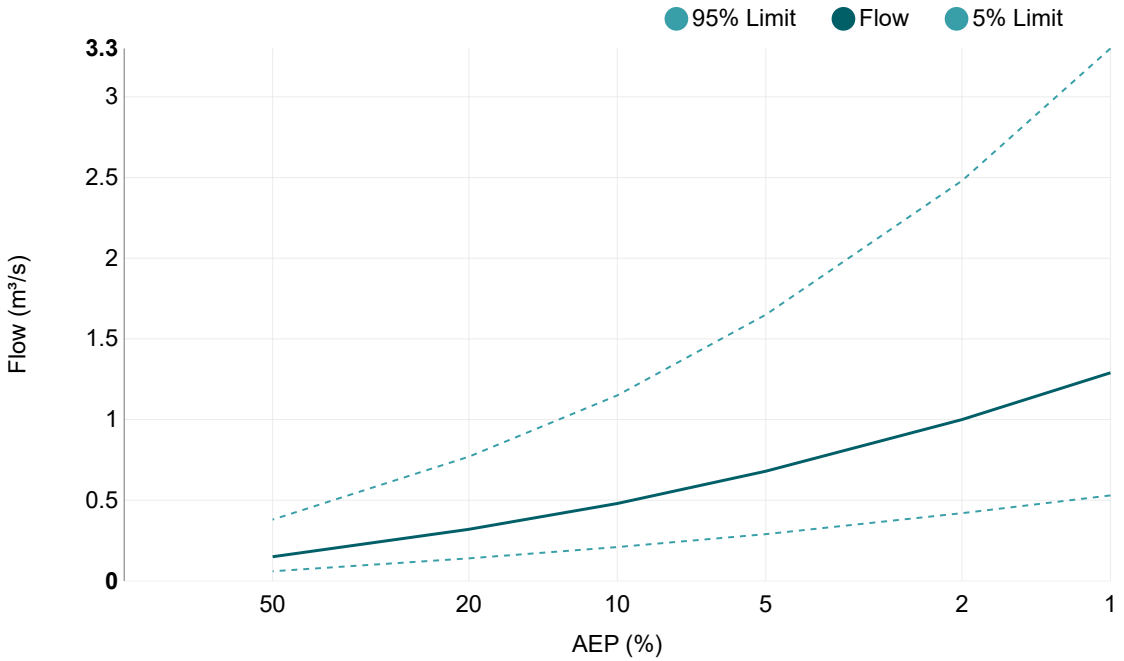
Design Temporarl Distibution of Short Duration PMP

			% of time	0	5	10	15	20
			% of PMP	0	4	10	18	25
Duration (hours)	(mins)	PMP						
0.25	15	150	Time (hrs)	0	0.0125	0.025	0.0375	0.05
			Time (mins)	0	0.75	1.5	2.25	3
			mm	0	6	15	27	37.5
			mm/period	0	6	9	12	10.5
			mm/hr	0	480	720	960	840
			FOR DRAINS					**750**
0.50	30	210	Time (hrs)	0	0.025	0.05	0.075	0.1
			Time (mins)	0	1.5	3	4.5	6
			mm	0	8.4	21	37.8	52.5
			mm/period	0	8.4	12.6	16.8	14.7
			mm/hr	0	336	504	672	588
			FOR DRAINS			**420**		**630**
0.75	45	270	Time (hrs)	0	0.0375	0.075	0.1125	0.15
			Time (mins)	0	2.25	4.5	6.75	9
			mm	0	10.8	27	48.6	67.5
			mm/period	0	10.8	16.2	21.6	18.9
			mm/hr	0	288	432	576	504
			FOR DRAINS					**450**
1.00	60	310	Time (hrs)	0	0.05	0.1	0.15	0.2
			Time (mins)	0	3	6	9	12
			mm	0	12.4	31	55.8	77.5
			mm/period	0	12.4	18.6	24.8	21.7
			mm/hr	0	248	372	496	434
			FOR DRAINS		**248**	**372**	**496**	**434**
1.50	90	360	Time (hrs)	0	0.075	0.15	0.225	0.3
			Time (mins)	0	4.5	9	13.5	18
			mm	0	14.4	36	64.8	90
			mm/period	0	14.4	21.6	28.8	25.2
			mm/hr	0	192	288	384	336
			FOR DRAINS			**240**		**360**
2.00	120	400	Time (hrs)	0	0.1	0.2	0.3	0.4
			Time (mins)	0	6	12	18	24
			mm	0	16	40	72	100
			mm/period	0	16	24	32	28
			mm/hr	0	160	240	320	280

Appendix G

RFFEM Outputs

Results | Regional Flood Frequency Estimation Model



*The catchment has unusual shape. Results have lower accuracy and may not be directly applicable in practice.

AEP (%)	Discharge (m^3/s)	Lower Confidence Limit (5%) (m^3/s)	Upper Confidence Limit (95%) (m^3/s)
50	0.150	0.0600	0.380
20	0.320	0.140	0.770
10	0.480	0.210	1.15
5	0.680	0.290	1.65

Input Data

Date/Time	2024-06-05 08:19
Catchment Name	515 Crookwell
Latitude (Outlet)	-34.734
Longitude (Outlet)	149.678
Latitude (Centroid)	-34.701
Longitude (Centroid)	149.71
Catchment Area (km^2)	1.01
Distance to Nearest Gauged Catchment (km)	18.69
50% AEP 6 Hour Rainfall Intensity (mm/h)	5.75087
2% AEP 6 Hour Rainfall Intensity (mm/h)	11.736698
Rainfall Intensity Source (User/Auto)	Auto
Region	East Coast

AEP (%)	Discharge (m^3/s)	Lower Confidence Limit (5%) (m^3/s)	Upper Confidence Limit (95%) (m^3/s)
2	1.00	0.420	2.48
1	1.29	0.530	3.30

Input Data	
Region Version	RFFE Model 2016 v1
Region Source (User/Auto)	Auto
Shape Factor	4.67*
Interpolation Method	Natural Neighbour
Bias Correction Value	-0.342

Statistics

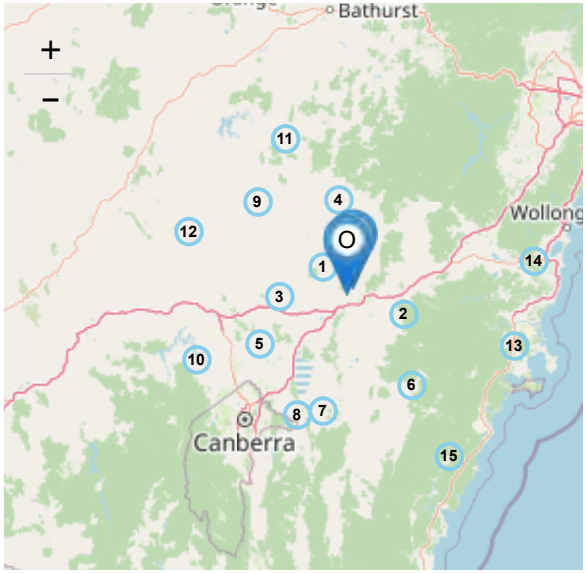
Variable	Value	Standard Dev
Mean	-1.974	0.428
Standard Dev	0.881	0.138
Skew	0.092	0.026

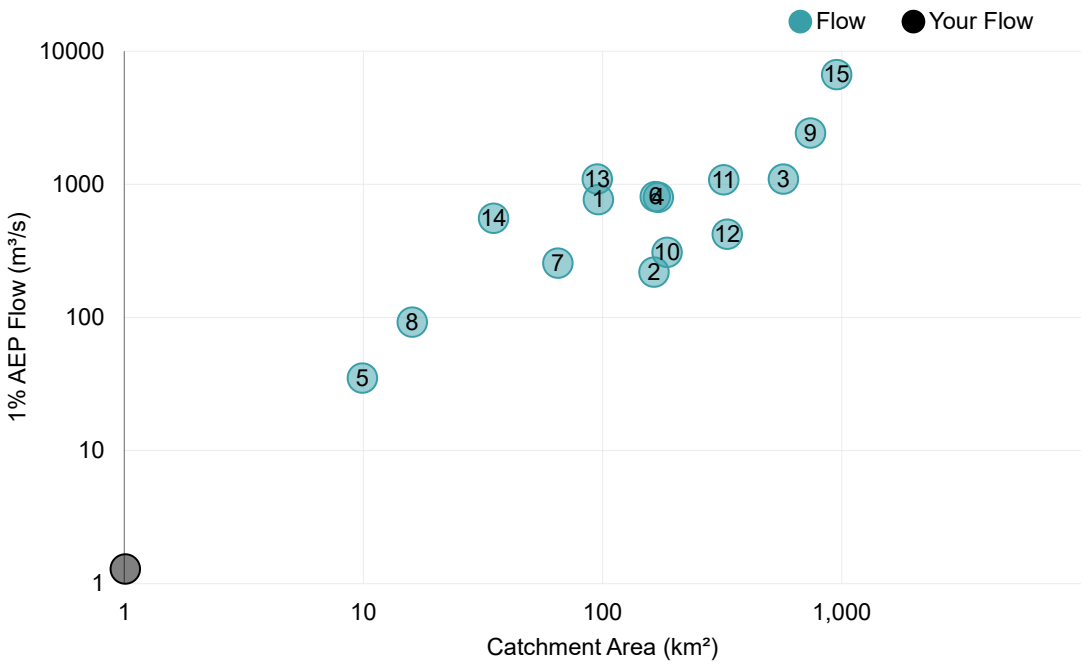
Note: These statistics come from the nearest gauged catchment. Details.

Correlation		
1.000		
-0.330	1.000	
0.170	-0.280	1.000

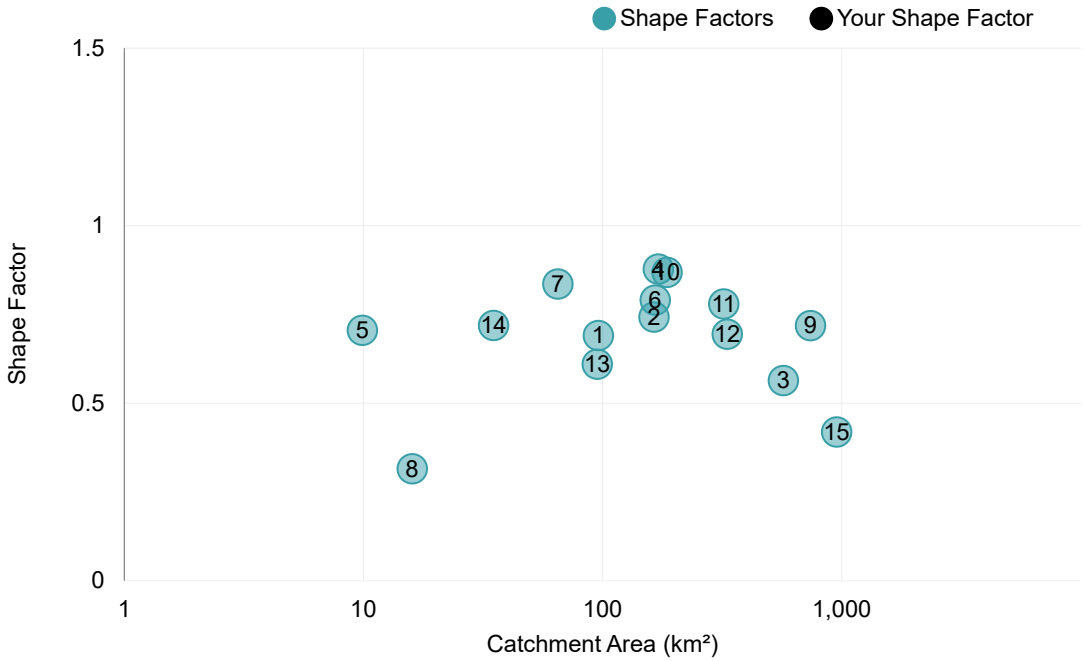
Note: These statistics are common to each region. Details.

1% AEP Flow vs Catchment Area

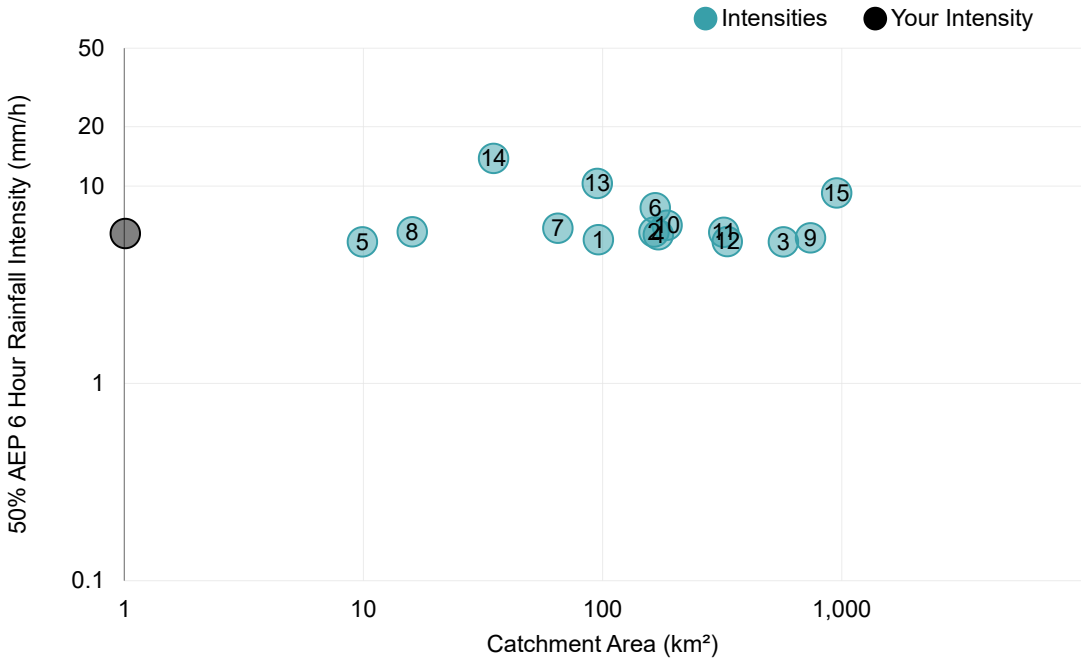




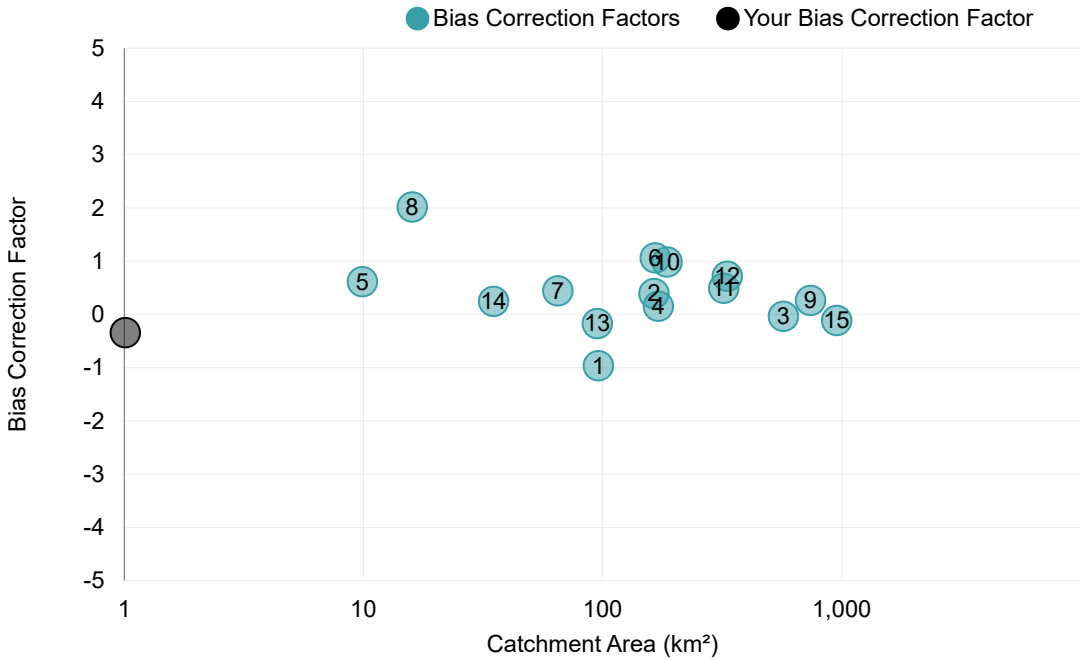
Shape Factor vs Catchment Area



Intensity vs Catchment Area



Bias Correction Factor vs Catchment Area



Download

TXT Nearby JSON

Method by Dr Ataur Rahman and Dr Khaled Haddad from Western Sydney University for the Australian Rainfall and Runoff Project. Full description of the project can be found at the project page (http://arr.ga.gov.au/revision-projects/project-list/projects/project-5) on the ARR website. Send any questions regarding the method or project here (mailto:admin@arr-software.org).

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