Ordinary Meeting of Council

12 November 2025

UNDER SEPARATE COVER ATTACHMENTS

ITEM 9.4

QUEANBEYAN-PALERANG REGIONAL COUNCIL

Council Meeting Attachment

12 NOVEMBER 2025

ITEM 9.4 FINALISATION OF PLANNING PROPOSAL TO REZONE SUNSET ESTATE - STAGE 2 - 141 GOOGONG ROAD, GOOGONG

ATTACHMENT 1 SUNSET STAGE 2 - PLANNING PROPOSAL - 26 NOVEMBER 2024

URBANE STUDIO

Sunset Stage 2 Planning Proposal

to amend land zoning and minimum lot size and associated controls
141 Googong Road Googong 2620 (Lot 39 DP 1257837)

Submitted to QUEANBEYAN-PALERANG REGIONAL COUNCIL
On behalf of Binowee Developments Pty Ltd

26 November 2024 | 2021-192

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EXECUTIVE SUMMARY

This report has been prepared by Urbane Studio Pty Ltd on behalf of Bionowee Developments (**the Proponent**) and seeks to initiate a Planning Proposal (**PP**) to Queanbeyan-Palerang Regional Council (**Council**) to amend the Queanbeyan-Palerang Regional Local Environmental Plan 2022 (**QPRLEP**) for 141 Googong Road, Googong, NSW (**the Site**). The proposal involves rezoning and adjusting the minimum lot size for parts of the site, following Council's resolution in February 2023.

Key elements of the Planning Proposal include:

- Rezone land containing EPBC Box-Gum Woodland from R1 General Residential to C2 Environmental Conservation.
- Adjust zone boundaries between C2 and R1, including rezoning some C2 land to R1.
- Amend the minimum lot size as follows:
  i. From 10 hectares to 1,000 m² for land rezoned from C2 to R1.
  ii. From 1,000 m² to 10 hectares for land rezoned from R1 to C2.
  iii. From 1,000 m² to 600 m² for a portion of the existing R1 zoned land within the subject area.
- Apply building height of 8.5 m to land rezoned to R1.
- Amend the curtilage of McCawley "Sunset" Homestead Complex in Schedule 5 of the LEP
- Amend associated controls including additional permitted uses, secondary dwelling and dual occupancy to align with the new zone boundaries.

The original Local Environmental Study (**LES**) supporting the 2009 rezoning of Googong township established the current boundaries between the Environmental Conservation (C2) and General Residential (R1) zones for the site. These boundaries were determined using broad-scale geological and ecological mapping at a 1:100,000 scale. While this level of mapping was suitable for the initial rezoning of a large area, it did not accurately capture the nuanced, site-specific characteristics of the land. This has resulted in zoning boundaries that do not align with actual land characteristics, limiting both sustainable development and ecological preservation.

This Planning Proposal aims to adjust these boundaries to better match the on-ground conditions. It proposes rezoning ecologically significant areas currently zoned R1 to C2, while rezoning some C2 areas suitable for residential use to R1. These proposed changes are supported by detailed biodiversity and geotechnical studies, which confirm that the land identified for residential use has low ecological and geotechnical risks. These changes will enable orderly, sustainable growth by leveraging existing infrastructure while protecting significant ecological areas, benefiting both the community and the environment.

It is requested that Council endorse the Planning Proposal and request the Department of Planning, Housing and Infrastructure (**DPHI**) to issue a Gateway determination to commence the process of amending the relevant planning controls and associated maps of the LEP, thereby permitting the logical use of the land for residential subdivision and protecting significant ecological areas.

ABBREVIATIONS

ACHA	Aboriginal Cultural Heritage Assessment
AEP	Annual Exceedance Probability
AHD	Australian Height Datum
AHIP	Aboriginal Heritage Impact Permit
APZ	Asset Protection Zone
BC Act	Biodiversity Conservation Act 2016 (NSW)
BDAR	Biodiversity Development Assessment Report
CC	Climate Change
CSP	Community Strategic Plan
DA	Development Application
DPHI	Department of Planning, Housing, and Infrastructure
DoS	Degree of Saturation (traffic modeling metric)
EP&A Act	Environmental Planning and Assessment Act 1979
EPBC Act	Environment Protection and Biodiversity Conservation Act 1999
LES	Local Environmental Study
LEP	Local Environmental Plan
LGA	Local Government Area
LSPS	Local Strategic Planning Statement
PAD	Potential Archaeological Deposits
PMF	Probable Maximum Flood
PP	Planning Proposal
QPRLEP	Queanbeyan-Palerang Regional Local Environmental Plan 2022
SEPP	State Environmental Planning Policy
URA	Urban Release Area
VPA	Voluntary Planning Agreement

1. INTRODUCTION

1.1 OVERVIEW

This report has been prepared by Urbane Studio Pty Ltd on behalf of Bionowee Developments (**the Proponent**) and aims to initiate a Planning Proposal to amend the Queanbeyan-Palerang Regional Local Environmental Plan 2022 (**QPRLEP**) concerning part of the land at 141 Googong Road, Googong (**the site**).

Following the consideration of a detailed scoping proposal by Council on 22 February 2023, Council resolved to proceed as follows:

Minute 043/23 Item 9.1 Scoping Proposal PP.2022.0001 - Residential Rezoning - 141 Googong Road, Googong (Sunset)

That Council:

1. Supports the progression of the Scoping Proposal for the rezoning of part of Lot 39 DP 1257837 No. 141 Googong Road, Googong, to a Planning Proposal, subject to the following:
    a. the area of threatened ecological communities and in particular the EPBC BoxGum Woodland that is currently zoned R1 General Residential, being rezoned the C2 Environmental Conservation; and
    b. the payment of the fees outlined in Council's Fees and Charges for the preparation of a Complex Planning Proposal.
2. Considers the merits of entering into a Local Planning Agreement with the landowner of Lot 39 DP 1257837 No. 141 Googong Road, Googong, for the C2 Environmental Conservation zoned land and riparian corridors, as part of the Planning Proposal preparation and consultation stage.

This report has been prepared in reference to above and in compliance with *Section 3.33* of the *Environmental Planning and Assessment Act 1979* (**EP&A Act**) and the relevant Department of Planning, Housing and Infrastructure (**DPHI**), *Local Environmental Plan Making Guideline, August 2023*, to support changes to the LEP.

1.2 REPORT STRUCTURE

This report is structured to provide the following information and addresses the key requirements of a Planning Proposal set out in *Section 3.33* of the *EP&A Act*:

- Overview of the site history, description of the site and its context.
- Outline of the statutory and strategic planning context.
- Description of the proposed amendment to the existing LEP and intended effects of the amendments.

- Statement of the objectives and intended outcomes of the proposal.
- Summary of the justification of the proposal, including an environmental assessment.
- Description of the community consultation process that would be expected to be undertaken before consideration is given to making of the planning instrument.
- Indicative project timeline.
- Conclusion and justification.

1.3 ACCOMPANYING DOCUMENTATION

The Planning Proposal is accompanied by the following consultant documentation.

Table 1 | Planning Proposal Documentation

Role/Discipline	Consultant	Reference
Biodiversity Development Assessment Report	**Capital Ecology**	Attachment A
Flood Impact Assessment	**Spiire**	Attachment B
Geotechnical Assessment - Urban Capability	**Douglas partner**	Attachment C
Aboriginal Cultural Heritage Assessment	**Past Traces**	Attachment D
Bushfire Strategic Study	**Ember bushfire consulting**	Attachment E
Traffic Impact Statement	**SCT consulting**	Attachment F
Visual Impact Assessment	**Urbaine design group**	Attachment G
Infrastructure Capacity Statement	**Spiire**	Attachment H
QPRC Heritage Adviser's Report - Sunset Homestead	**QPRC**	Attachment I
Concept Master Plan	**Urbane Studio**	Attachment J

2. SITE CONTEXT

2.1 SUBJECT SITE

This planning proposal relates to Sunset Estate's Stage 2 which is located at 141 Googong Road, Googong (**the site**) within the Queanbeyan *Palerang Local Government Area* (**LGA**). The site is legally described as Lot 39 DP 1257837 and is owned by Binowee Developments Pty Ltd who are also the proponent. The site and its surrounding context are shown in Figure 1.

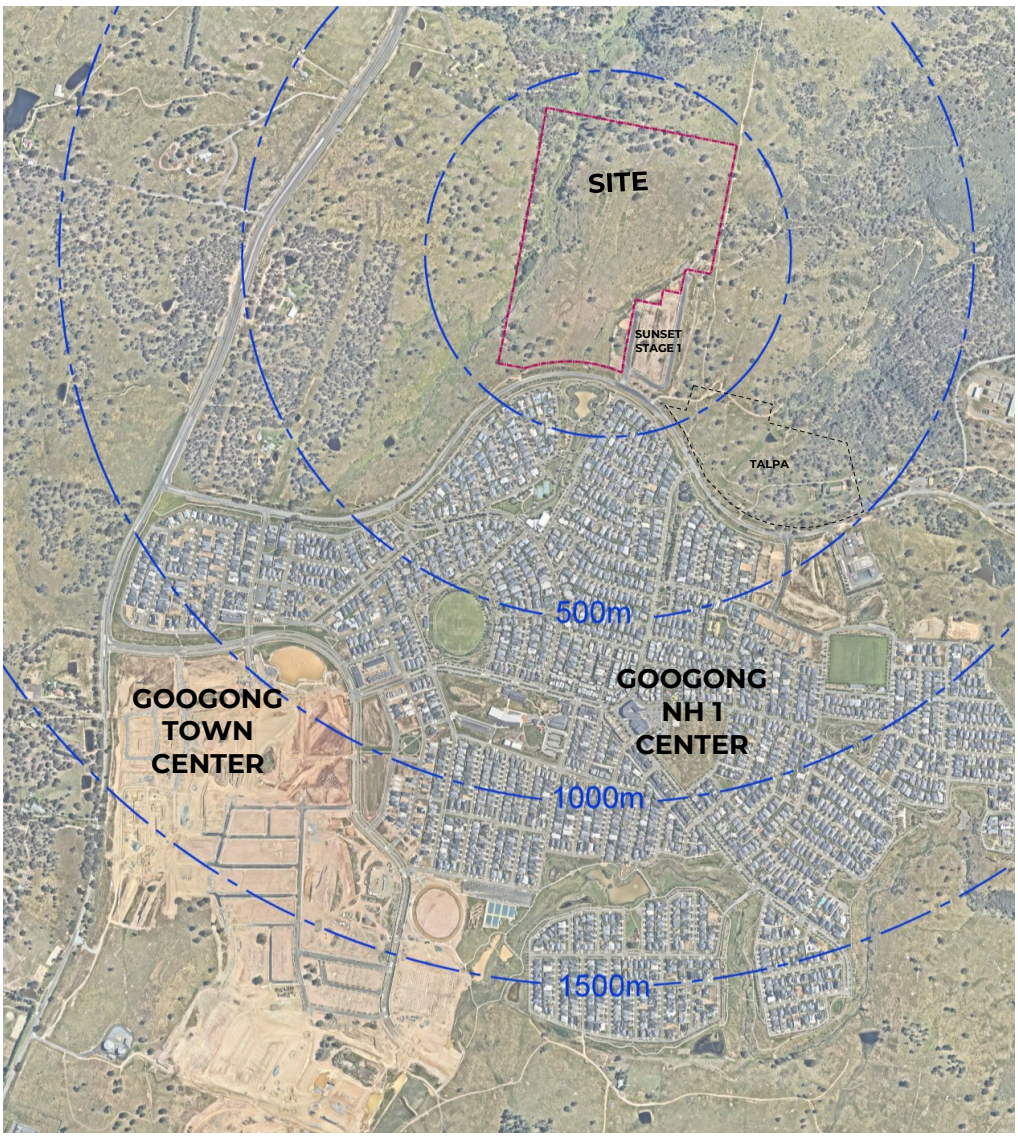


Figure 1 | Site Location and Context

2.2 IMMEDIATE SITE INTERFACES

The site is located on the northern side of Googong Road, directly across Googong Township, providing excellent accessibility and proximity to local amenities. It is bordered by:

- Residential development and Googong Township to the south.
- Stage 1 of Sunset Estate to the southeast, comprising 38 residential lots, with the proposed Talpa Estate subdivision further east. Additionally, a 20-meter-wide right-of-way runs along the eastern boundary of the site.
- Large-lot rural residential and agricultural properties to the north and west, characterized by a mix of native and exotic pastures, remnants of vegetation, and scattered trees.
- Largely intact remnant woodland and forest to the northeast, which extends towards the Queanbeyan River corridor.

The site has excellent proximity to local transport and a range of amenities and services:

- 2 minutes from the Googong Town Centre
- 2 minutes from Rockley Oval
- 3 minutes from Googong Anglican School
- 4 minutes from Googong Public School
- 4 minutes from Googong Common
- 5 minutes from Googong Foreshore
- 9 minutes from the Jerrabomberra Town Centre
- 12 minutes from Queanbeyan City
- 25 minutes from Canberra Airport
- 30 minutes from Canberra City

This location offers convenient access to community facilities and natural landscapes, making it an appealing choice for potential residents looking for both accessibility and quality of life.

2.3 SITE CHARACTERISTICS

The site covers an area of approximately 30.7 hectares and features a predominantly rectangular shape, characterized by a 345-meter curved frontage along the southern boundary, adjacent to Googong Road. Positioned along a ridgeline that trends from southwest to northeast, the topography is primarily flat, with elevations averaging around 730 meters Australian Height Datum (AHD) in the central and eastern areas. The land gently slopes from the ridgeline toward the northwest and southeast, with gradients varying from a mild 1V:60H along the crest to a steeper 1V:3H descending into the gully on the western side.

Two second-order ephemeral streams traverse the site, flowing northeast toward the Queanbeyan River, located approximately 2 km away. These streams are heavily infested with weeds and lack native riparian vegetation, offering habitat primarily to common local species of water birds, reptiles,

and amphibians. Overall, the vegetation on the site is sparse, featuring scattered mature trees in the central and north eastern area, while denser clusters are found along the northern and western boundaries.

Figure 2 | Stream Order
Source: Esri

3. EXISTING PLANNING CONTROLS

3.1 BACKGROUND

In 2002, council identified 1,390 hectares of land at Googong for potential residential development. To facilitate this, a Local Environmental Study **(LES)** was undertaken by Willana Associates, which

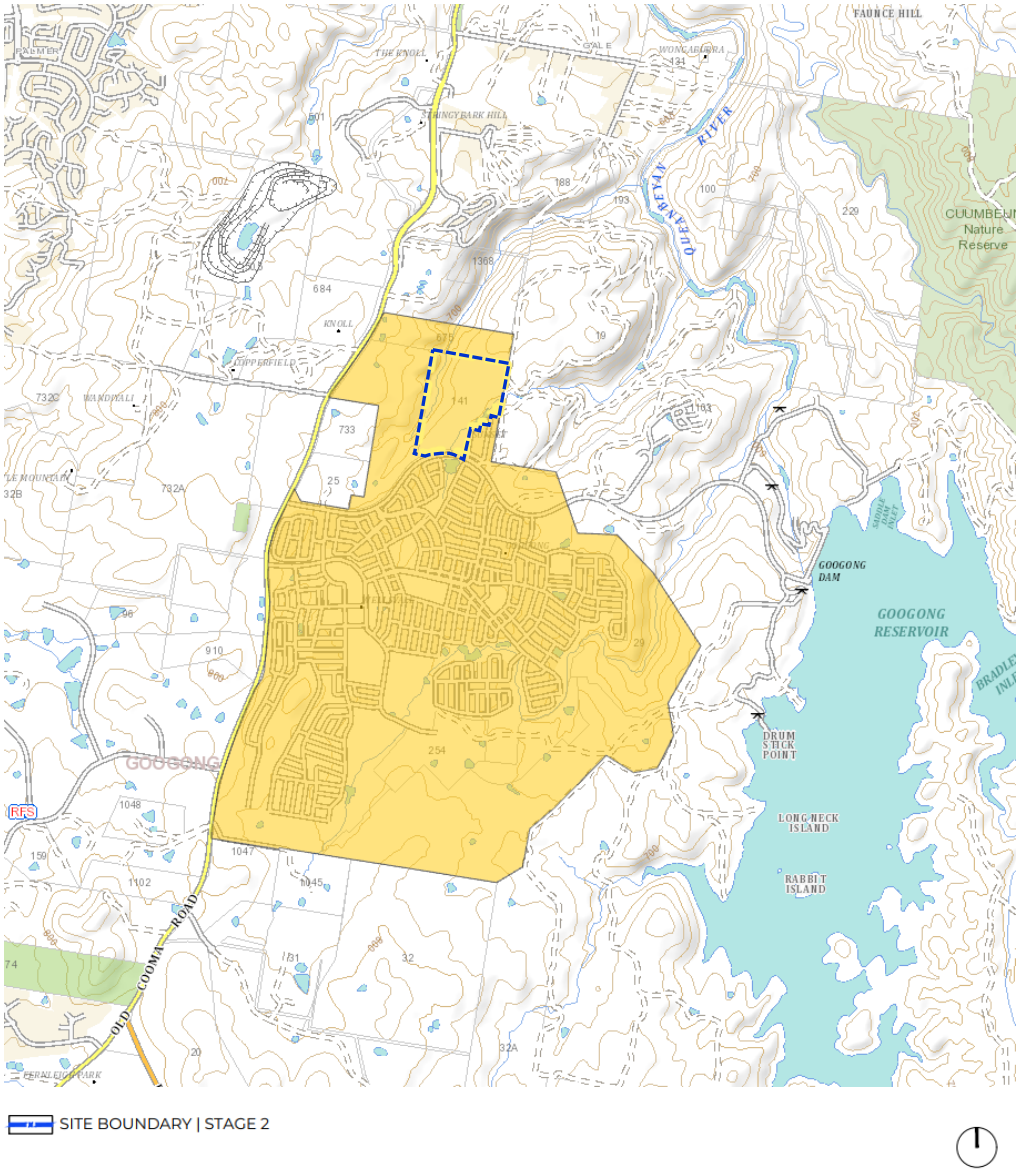


Figure 3 | Urban Release Area (URA)

Source: NSW Planning Portal

ultimately supported the rezoning of the Googong Urban Release Area **(URA)** in 2009. The extent of URA is depicted in Figure below, with the site subject to this planning proposal outlined in dashed blue.

The LES was based on broad-scale geological and ecological mapping at a 1:100,000 scale. While this approach was appropriate for initiating the rezoning of such a large area, it lacked the granularity needed to fully capture the site-specific constraints and opportunities inherent to the land effectively. This lack of detail has potentially limited the optimal utilization of certain portions of the land.

The current zoning of R1 General Residential and C2 Environmental Conservation for the site were established during the 2009 rezoning of Googong Township, as recommended by the LES. Specifically, the C2 Environmental Conservation zoning was applied to part of the 86 hectares located on the northern side of Googong Road (highlighted in red in Figure 4, an area identified for its environmental sensitivity at the time. This land was recognized as potentially suitable for rezoning to Environmental Protection or for further investigation into private ownership and management strategies.

In its recommendations for areas suitable for low-density or eco-living development, the LES also noted that " *The potential for these parcels to sustain urban development is constrained by their proximity to environmentally sensitive areas; ... and visual prominence (in the case of the two pockets to the north of Googong Road).* [the site] *... Residential densities and housing forms within these pockets would need to demonstrate appropriate responses to the adjoining rural residential*

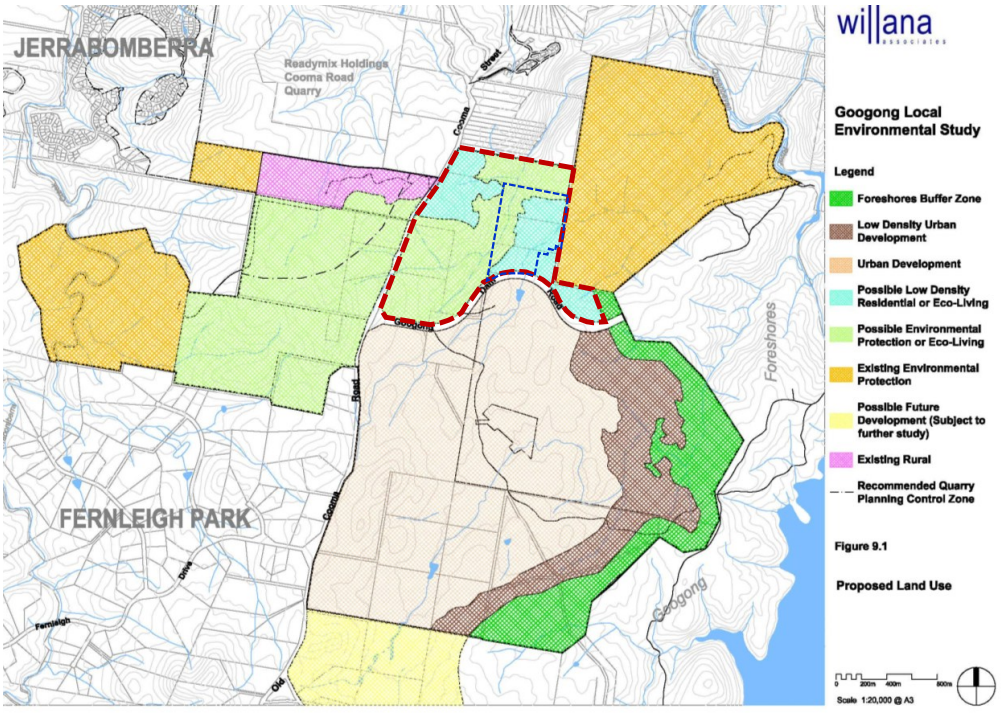


Figure 4 | LES Proposed Land Use

Source: LES 2007

and "lifestyle properties, adequately protect the environmental and heritage qualities of adjoining sensitive land and avoid significant scenic impacts."

The LES also established several key principles that informed its recommendations for the rezoning of land related to the site:

1. **Slope Consideration:** Areas with slopes greater than 20% were deemed unsuitable for development due to risks of instability and erosion. In locations where slopes exceed 15%, any development must be thoughtfully designed to enhance slope stability and mitigate long-term erosion risks.
2. **Exclusion Zones:** Specific areas, identified in the Johnston Centre Ecological Assessment, were excluded from development to preserve their ecological significance. This principle continues to guide appropriate land use planning and environmental conservation.
3. **Adjacent Land Considerations:** Although this site was not classified as an "excluded area" by the Johnston Centre Ecological Assessment, the neighboring property, Talpa, was designated as such. The LES emphasized the necessity of establishing buffer zones between urban development and these excluded areas to protect their ecological value and to facilitate essential bushfire management measures, such as the creation of Asset Protection Zones (APZs).

3.2 Existing Statutory Planning Context

This section summarizes the relevant clauses of the *QPRLEP* concerning the land and proposed amendments. Maps in table 2 are extracted from the NSW Planning Portal website.

3.2.1 Land Use Zoning

As outlined in Table 2, the site is currently zoned C2 - Environmental Conservation, R1 - General Residential, and part R5 - Large Lot Residential.

3.2.2 Height of Buildings

As shown in Table 2, the height of buildings map permits structures up to 8.5 meters on the portions of the site zoned R1 and R5.

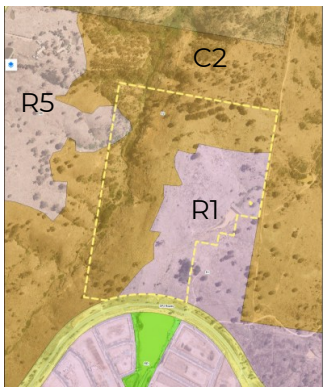
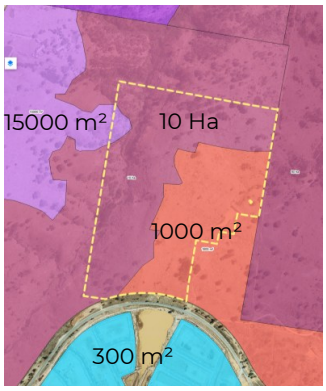
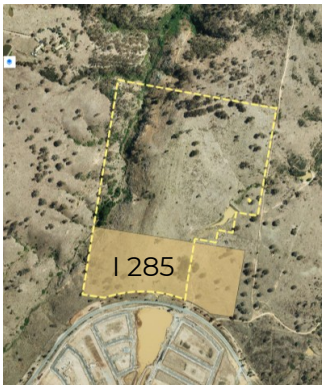
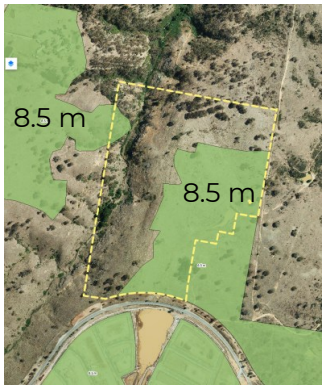
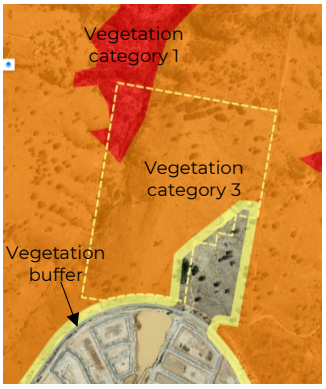
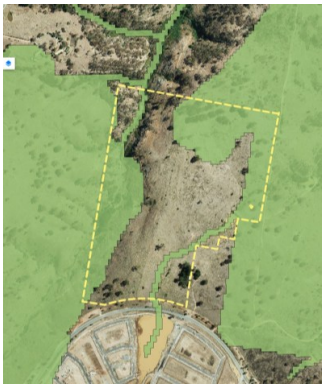
3.2.3 Heritage Conservation

As shown in Table 2, the southern part of the site is identified as a local heritage item, known as the McCawley "Sunset" homestead complex and is identified as item I 285 within the *QPRLEP*.

3.2.4 Minimum Lot size

As detailed in Table 2, the site has three minimum lot sizes: 10 hectares for land zoned C2, 1,000 m² for R1-zoned land, and 15,000 m² for R5-zoned land.

Table 2 | Existing Planning Controls Overview

QUEANBEYAN-PALERANG REGIONAL LOCAL ENVIRONMENTAL PLAN 2022			
Land Zoning	C2 - Environmental Conservation R1 - General Residential R5 - Large Lot Residential 	**Minimum Lot Size**	10 Ha 1000 m² 15000 m² 
Heritage	McCawley "Sunset" homestead complex Significance: Local 	**Height Of Building**	8.5 m 
Bushfire Prone Land (Non-EPI)	Vegetation Buffer 	**Terrestrial Biodiversity**	Biodiversity 
Floor Space Ratio		N/A	
Local Provisions		Secondary Dwelling or Dual Occupancy, 15 ha for R5 Secondary Dwelling or Dual Occupancy, 600 m² for R1	
Riparian Lands and Watercourses		2nd order stream	

4. SITE SPECIFIC ENVIROMENTAL CONSIDERATIONS

The Scoping Proposal included the required supporting documentation as requested by QPRC to initiate the process. These documents have been summarized here for completeness.

Engagement with key stakeholders during the pre-lodgment phase, along with a review of background studies, allowed the identification of key considerations that influenced the proposed rezoning and corresponding technical assessments. These considerations include:

Key site-specific considerations that informed the extent of proposed rezoning included:

- Ecological characteristics and values
- Geotechnical characteristics
- Visual Impact
- Bushfire
- Aboriginal and European Heritage
- Flood
- Traffic Impact Assessment

4.1 PRELIMINARY LAYOUT

A preliminary concept master plan (Attachment J) was developed to identify suitable areas for proposed rezoning and to establish reduced lot sizes. This layout was informed by several factors, including slope considerations, land suitability identified through a detailed geotechnical investigation, and a preliminary flora and fauna study. As discussed in section 3.1, these elements were also key in defining the residential boundaries established in the original LES.

This concept master plan served as the foundation for more detailed technical assessments requested by the Council, evolving through an iterative design process based on their recommendations and findings. The plans illustrate that the land can accommodate the proposed housing yield while providing a suitable interface between Stage 1 and the surrounding environment, ensuring alignment with both environmental and infrastructural considerations.

4.2 ENVIRONMENTALLY SENSITIVE LANDS – SLOPE AND STABILITY

As noted in Section 3.1, slope consideration was one of the principles that informed LES recommendations for the rezoning of land in the URA.

To address this, a detailed slope analysis was conducted to assess the extent of the proposed rezoning. As shown in Figure 5, the land proposed for the R1 General Residential zone generally flat and features slopes of less than 10%. This aligns with the LES recommendation that areas with slopes greater than 20% are unsuitable for development.

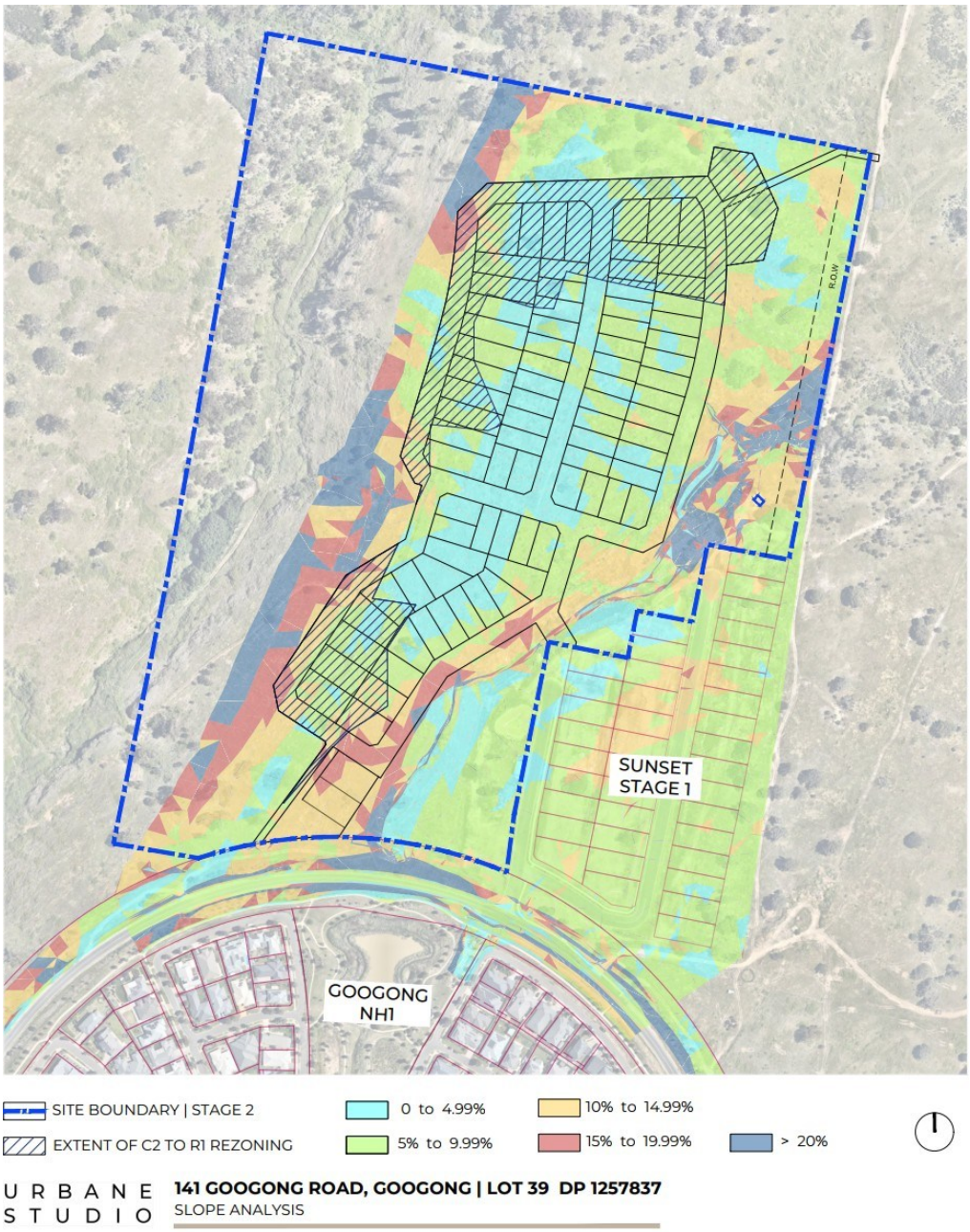


Figure 5 | Slope Analysis

In addition to slope, soil stability and erosion potential were also determining factors in defining the boundaries of the residential zones during the original LES for the Googong URA. The assessments at the time utilized the 1:100,000 Soil Landscapes Map to identify erosion risks, particularly along the western edge of the site.

To further investigate these issues, a detailed geotechnical assessment was conducted by Douglass Partners (See Attachment C), evaluating the urban capability of the proposed rezoning areas. The assessment concluded that these areas exhibit a very low to low risk of slope instability, making them suitable for residential development, provided that effective erosion control measures and appropriate dwelling designs are implemented. In areas with moderate slopes, standard hillside development practices should be employed to mitigate associated risks.

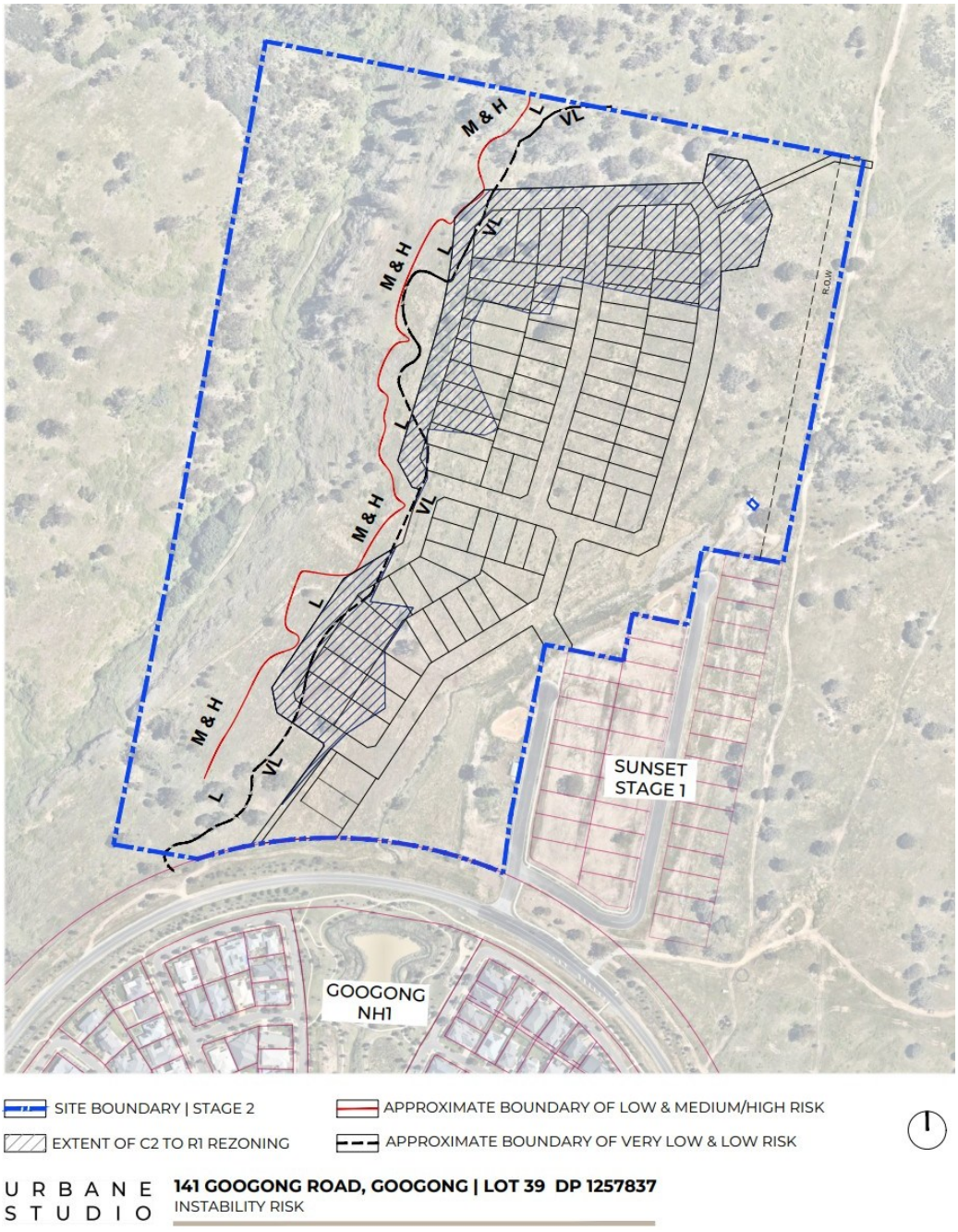


Figure 6 | Soil Instability Risk

Figure 6 illustrates the instability risks, showing that the proposed development footprint is situated outside the medium and high-risk areas, which is the western side of the red dashed line.

4.3 BIODIVERSITY

Biodiversity conservation has been the primary focus of this Planning Proposal. To assess the biodiversity values of the site, a Stage 1 Biodiversity Assessment Method (**BAM**) report was commissioned. This assessment guided the preliminary concept layout and helped determine the extent of the proposed rezoning.

Subsequently, vegetation and targeted species surveys were carried out as part of a Biodiversity Development Assessment Report (**BDAR**) prepared by Capital Ecology (see Attachment A). The report concluded that most of the subject land has undergone significant alteration due to historical and ongoing land use, particularly livestock grazing. This has resulted in extensive loss of native vegetation, especially in the central and southeastern areas, where only scattered paddock trees remain. Consequently, the groundstorey in these areas is highly disturbed and features a very low diversity of native grasses and forbs due to past pasture improvements and grazing practices.

Despite these alterations, certain sections of the land retain important biodiversity features, including Box-Gum Woodland identified for protection under the *Environment Protection and Biodiversity Conservation Act 1999* (***EPBC Act***) and the *Biodiversity Conservation Act 2016* (***BC Act***), relatively intact dry sclerophyll forest, and habitats for several threatened species. The proposed lot layout has been refined through multiple design iterations, guided by the BDAR findings and consultations with DPHI to avoid impact on these areas.

The BDAR also highlights that the proposed development footprint is strategically located in areas largely devoid of significant biodiversity values, with 94% of the anticipated impact occurring in disturbed areas. Importantly, the development footprint has been designed to avoid any impacts on valuable areas, ensuring no harm to EPBC Act Box-Gum Woodland or critical habitats for identified threatened flora and fauna. This careful planning has led to significant reductions in the clearance footprint, allowing the proposed development to avoid:

- 95% (13.23 ha) of the BC Act native vegetation that occurs in the subject land;
- 90% (29) of the mature hollow-bearing remnant trees that occur in the subject land;
- 100% of the identified threatened flora / fauna species credit species habitat (i.e. Pink-tailed Legless Lizard and Hoary Sunray);
- 87% (3.47 ha) of the BC Act Box-Gum Woodland that occurs in the subject land; and
- 100% (1.99 ha) of the EPBC Act Box-Gum Woodland that occurs in the subject land.

As a result, the overall impacts to native vegetation, including EPBC Act and BC Act-listed Box-Gum Woodland and remnant hollow-bearing trees, have been significantly minimized. Future development, including land subdivision, will necessitate a final BDAR and may trigger an offset liability; however, no significant impacts on threatened species or ecological communities are anticipated from the proposed development.

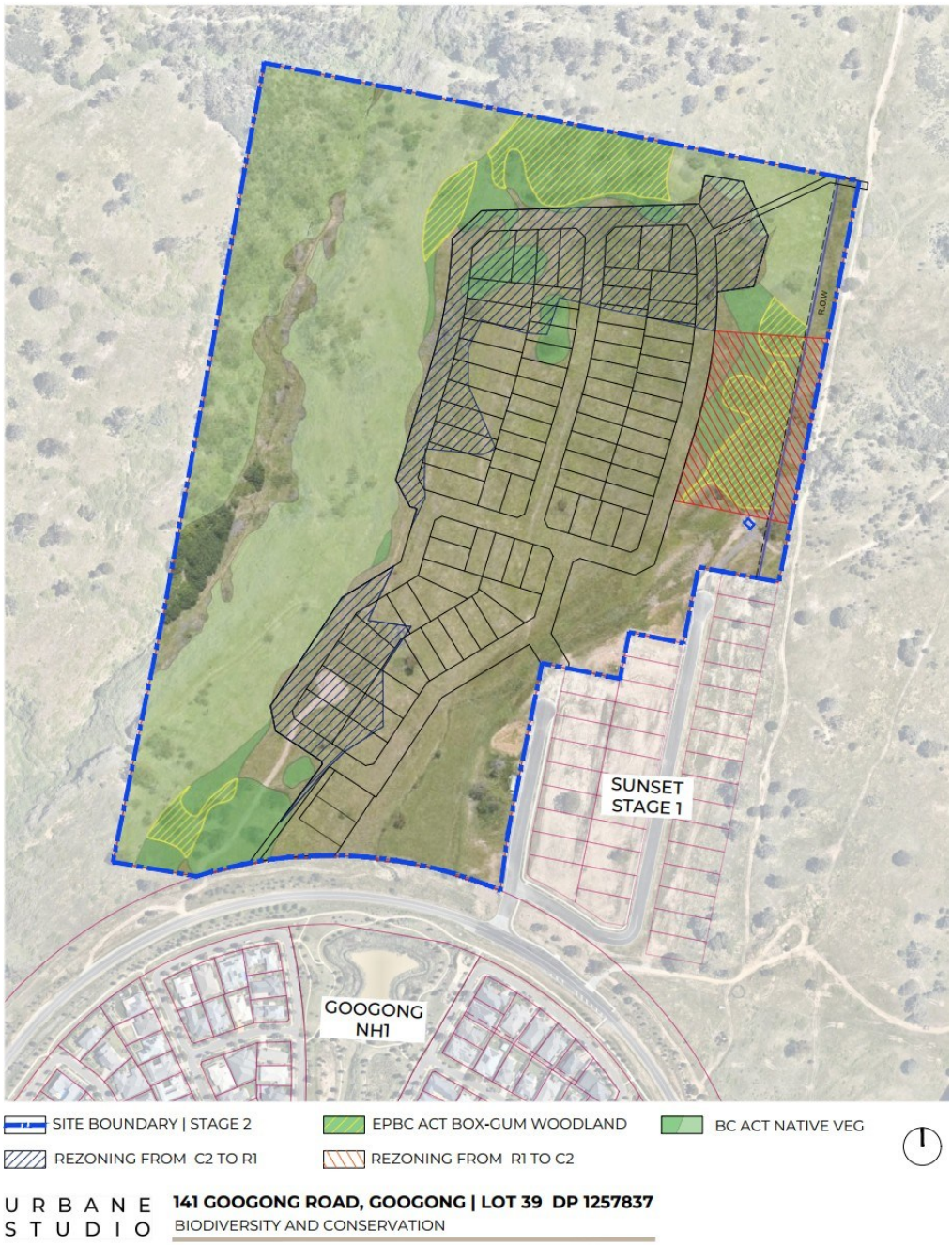


Figure 7 | Biodiversity and Conservation

Vegetation Mapping Source: Capital Ecology

4.4 VISUAL IMPACT

In accordance with the considerations outlined in the original LES, a comprehensive Visual Impact Assessment has been conducted by Urbaine Design Group and is included in Attachment G. The assessment involved modeling views from various vantage points along roads and pedestrian pathways, as well as from critical observation points throughout the area.

The findings of the visual impact assessment indicate that the existing extent of R1 zoning integrates well with the broader context of the locality and that the proposed additional lots are not expected to significantly disrupt this integration. The visual modeling demonstrates that the new housing lots will primarily be visible in the gaps between the existing R1 zoned lots. Furthermore, longer-distance views are largely obscured by the natural topography of the land and existing mature trees and landscaping, which collectively minimize the visual impact of the proposed development.

4.5 BUSHFIRE

A comprehensive Bushfire Report has been prepared by Ember Bushfire Consultants for the Preliminary Concept Master Plan (see Attachment E). This assessment follows the methodology specified in *Section 100B* of the *Rural Fires Act 1997* and the *Rural Fire Regulations 2013*, ensuring adherence to the standards set forth in Planning for Bushfire Protection 2019 (**PBP 2019**).

The report evaluates the bushfire threat level specific to the subject site and examines various protective measures that align with PBP 2019 objectives. These measures encompass considerations for asset protection zones, landscaping, access routes, water supply, utilities, and construction standards.

The report outlines that the site's topography and existing and anticipated vegetation indicate a moderate to high bushfire threat in the surrounding environment. However, this risk can be effectively mitigated through the implementation of standard protective measures outlined in PBP 2019. The design includes proposed edge roads and Asset Protection Zones (APZs) that will ensure adequate separation from hazardous vegetation, thereby reducing exposure to radiant heat.

Furthermore, the site has been planned to ensure well-coordinated access, which largely complies with the acceptable solutions outlined in PBP 2019. Based on the findings of the bushfire assessment and the recommended measures, the Planning Proposal is deemed capable of fulfilling strategic planning principles and is recommended for support. The details of the APZs will be confirmed during the future subdivision and associated Development Application (DA).

4.6 ABORIGINAL CULTURAL HERITAGE ASSESSMENT REPORT

An Aboriginal Cultural Heritage Assessment (**ACHA**) was conducted by Past Traces Consultants in 2022 to support the scoping proposal for Stage 2 of the Sunset Development (See Attachment D). This assessment builds on a previous Aboriginal Cultural Heritage Assessment Report (**ACHAR**) completed for the entire Sunset estate in 2018. The current ACHA evaluates the potential impacts

on Aboriginal heritage due to the Stage 2 development and provides management recommendations to mitigate any identified impacts.

The assessment identified five heritage sites within Stage 2, including two areas of Potential Archaeological Deposits (**PAD**). Subsurface testing conducted in 2022 revealed a total of 37 artefacts: 18 from GPAD10/SD6 and 19 from GPAD11/SD4, indicating a low density across these areas. As a result of this low density and the scale of impact, the report concluded that conservation is deemed unnecessary, and no further action is required for GPAD10 and GPAD11 following the granting of an Aboriginal Heritage Impact Permit (AHIP), which permits their destruction during development.

The Aboriginal heritage field survey, subsurface testing, and consultations with the local Aboriginal community found no significant items that would prevent development in the project area, provided that the recommended heritage management practices are implemented.

4.7 EUROPEAN HERITAGE

Located on the southern side of the site along George Creek are the historic Sunset Ruins. In 2010, these ruins were listed in the *QPRLEP* as the McCawley "Sunset" Homestead Complex, Heritage Item I285. This listing encompasses the entirety of the southern portion of the site and extends to Stage 1, which, at the time of the listing, comprised the entirety of Lot 2 DP255492.

During the subdivision application for Stage 1 of Sunset, the ruins were thoroughly assessed and deemed to have local significance under several NSW significance criteria. The assessment recommended a curtilage of 30m x 30m around the ruins. While the development application for Stage 1 was granted, allowing for avoidance of the curtilage, the LEP listing was never updated to reflect this assessment. Consequently, the majority of dwelling approvals in Stage 1 require heritage consideration due to the continued heritage overlay on the larger pre-subdivision site. This requirement limits the use of the complying development pathway and necessitates Council's review of heritage impacts during Development Application assessment.

This concern was addressed with Council, leading to a site visit in 2022, where the Council's heritage adviser recommended:

- Finalizing and mapping the heritage curtilage in Council's planning documents.
- Including the site in an appropriate recreational area.
- Making planning approval for the western side of George Creek Drive contingent upon satisfactory conservation and on-site interpretation of the ruins.

See Attachment I for Council correspondence.

This proposed amendment primarily serves an administrative function, aimed at aligning the statutory planning framework with the existing land use. The impact on the heritage ruins has been thoroughly assessed as part of the development application process for sunset stage 1. This proposal is consistent with the recommendations outlined in the original heritage study and further advice from Council's Heritage Adviser. Consequently, this aspect of the proposal does not necessitate any additional technical supporting documentation.

4.8 PROPOSED CONSERVATION MEASURES

The primary objective of this PP is to achieve a site-specific planning outcome grounded in detailed studies while balancing development with environmental conservation. As noted in Section 4.3 a small area in the eastern part of the site contains remnant Box-Gum Woodland, currently zoned R1. Following extensive consultations with DPHI, it was determined to rezone this area to C2 Environmental Conservation. This change aims to avoid impacts on areas recognized for their high biodiversity value while providing a tailored planning solution.

This approach involves rezoning approximately 1.6 hectares of land from R1 General Residential to C2 Environmental Conservation. This area, along with the remaining C2-zoned land, will form part of a residual lot associated with one of the residential lots in the northeastern corner. By integrating one of the proposed residential lots into this residual lot, the impacts associated with the building entitlement will be confined within the R1-zoned area. It is proposed for the residual lot to remain in private ownership.

It is anticipated that a Biodiversity Management Plan will be required for the C2-zoned portion of the residual lot during the Development Application process. This plan will ensure the ecological integrity of the site is maintained while enabling responsible development. This approach underscores a commitment to balancing residential needs with environmental conservation, promoting sustainable land use practices that benefit both the community and the local ecosystem.

The proposed extent of the residual lots is illustrated in Figure 8. It is important to note that the creation of these lots is subject to Development Application approval. The intent of showing them in this proposal is to demonstrate that the planning proposal is capable of incorporating and implementing measures, in addition to rezoning, to protect native vegetation effectively.

4.9 TRAFFIC IMPACT ASSESSMENT

A comprehensive Traffic Impact Assessment conducted by SCT Consulting confirms that the proposed additional yield from the PP will not have any significant adverse effects on the surrounding area or the broader transport network. The assessment validates that the proposed road network is suitable for the PP and that traffic volumes comply with the maximum loading criteria for each street type.

SIDRA intersection modeling was performed, confirming that the Level of Service **(LOS)** remains unchanged for the intersections of Old Cooma Road/Googong Road and Gorge Creek Road/Googong Road. The variations in delay recorded are less than one second, indicating that there is no need for infrastructure changes. The LOS of A and low Degree of Saturation **(DoS)** at the intersection of Gorge Creek Road/Googong Road demonstrates significant remaining capacity.

Furthermore, a turning warrant assessment was conducted for the intersection of Gorge Creek Road/Googong Road, confirming that no additional turn bays are required on Googong Road.

The Transport Study concluded that the proposed subdivision can be adequately accommodated by the existing and planned transport infrastructure. From a transportation perspective, the site is deemed suitable for further residential development (See Attachment F).

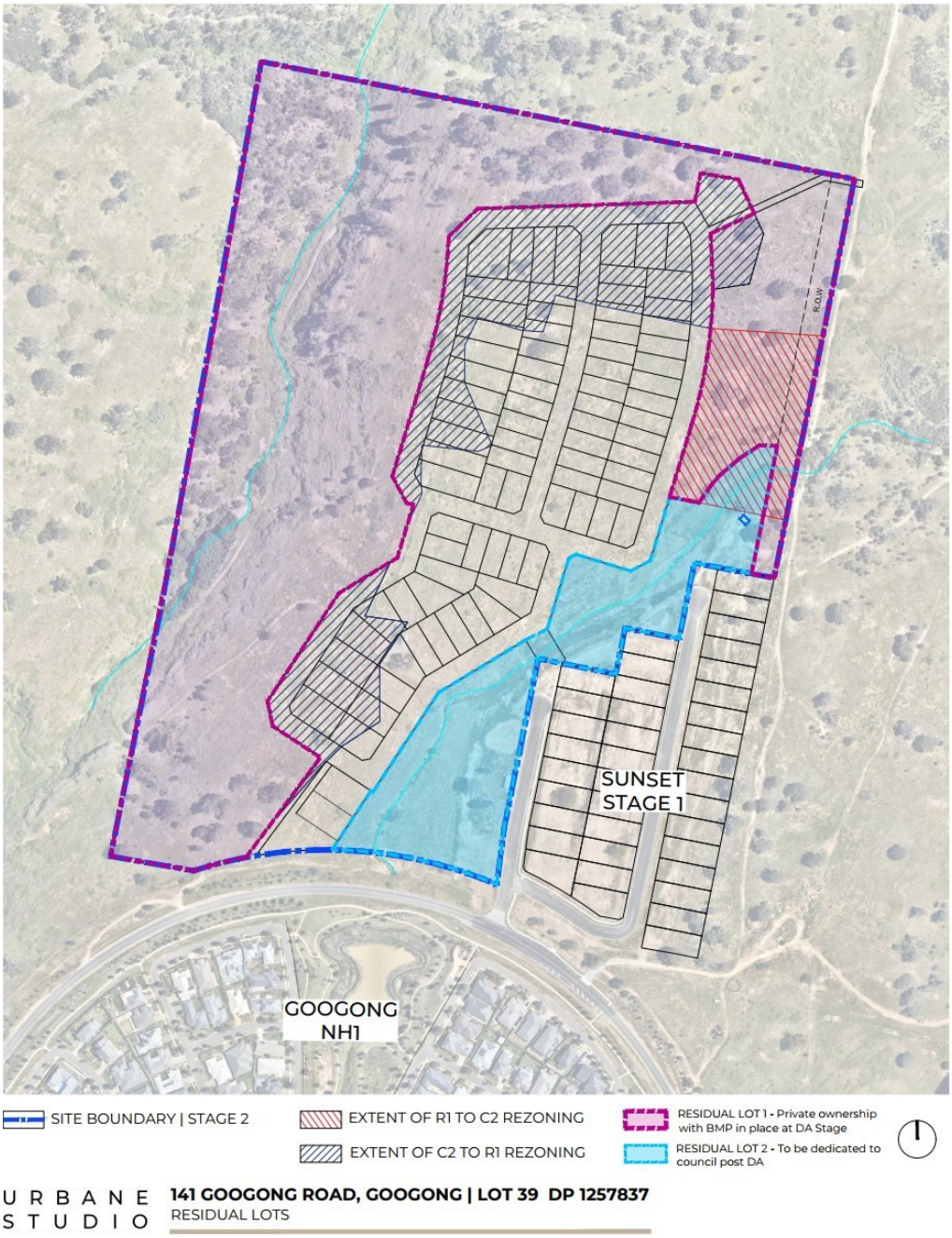


Figure 8 | Residual Lots

4.10 FLOOD IMPACT ASSESSMENT

The PP is supported by a comprehensive flood impact assessment study prepared by Spiire (see Attachment B) which analyzes the flood risks associated with the site. The key findings are as follows:

- The **1% Annual Exceedance Probability (AEP)** flood extent is confined to **Googong Creek**, with no impact on the Stage 2 development area. The assessment indicates a freeboard of **0.65 meters** between the 1% AEP flood water surface elevation and the proposed culvert crossing at Googong Creek.
- Flood extents for the **1% AEP + Climate Change (CC), 0.5% AEP,** and **0.2% AEP** scenarios are also contained within Googong Creek, confirming that these flood events do not affect the Stage 2 development area.
- The **Probable Maximum Flood (PMF)** extent does encroach on the road adjacent to Googong Creek and overtops the proposed road crossing between Stages 1 and 2. However, evacuation via Googong Road remains feasible even under this scenario.

These findings highlight the site's resilience to flood risks and the effectiveness of the proposed infrastructure in managing potential flood events.

4.11 SUMMARY OF PROPOSED CHANGES

This PP involves mapping amendments only, with no modifications to existing clauses or the introduction of new provisions.

An overview of the proposed changes is detailed below. Final maps will be prepared by Council prior to the exhibition of the Planning Proposal.

Key elements of the Planning Proposal include:

1. **Rezone Remnant Box-Gum Woodland**: The area containing EPBC Box-Gum Woodland in the eastern part of the site will be rezoned from R1 General Residential to C2 Environmental Conservation, ensuring the preservation of this significant ecological resource.
2. **Adjust Zone Boundaries**: The boundaries between C2 and R1 zones will be adjusted to align with anticipated future development areas.
3. **Minimum Lot Size (MLS) Amendments:**
    i. For proposed R1 zoned land, the MLS will change from 10 hectares to 1,000 square meters.
    ii. For proposed C2 zoned land, the MLS will be modified from 1,000 square meters to 10 hectares.
    iii. For a portion of existing R1 zoned land, the MLS will be reduced from 1,000 square meters to 600 square meters to allow for a more diverse range of lot sizes.

4. **Heritage Map Amendments**: The heritage ruins will be incorporated into the central open space, designated as Residual Lot 2, which will be developed and embellished by the developer following the approval of the Development Application (up to 30x30m curtilage as per heritage report recommendation). This embellishment will include interpretive design elements to integrate the heritage ruins into the open space, enhancing the area's historical significance. To formalize this commitment, the developer intends to enter into a planning agreement or provide a letter of offer during the Planning Proposal stage, ensuring that the heritage considerations are adequately addressed within the broader context of the development. It is noted that this amendment is largely administrative, designed to realign the statutory planning framework with the currently approved development application for Stage 1, as discussed in Section 4.7 above.

The proposed changes will alter the areas of residential and conservation land as follows. Notably, approximately **3.34 hectares** of land will be **dedicated to the council** (subject to future DA), of which **3.10 hectares** are zoned R1 (General Residential), and **0.24 hectares** are zoned C2 (Environmental Conservation). This area has been outlined in Figure 8 as Residual Lot 2.

Table 3 | Summary of Area Changes

	C2 (ha) Environmental Conservation	R1 (ha) General Residential	R5 (ha) Large Lot Residential	Total (ha)	Land to be Dedicated to Council (ha)
Current	18.39	11.79	0.53	30.71	Nill
Proposed	15.62	14.56	0.53	30.71	3.34

Additional Mapping Amendments

Alongside adjustments to the zone and lot size maps, a series of incidental amendments to other map sheets will be necessary to reflect the above changes, including:

1. **Additional Permissible Uses:** Amend the map to reflect land proposed for inclusion in the C2 Environmental Conservation zone.
2. **Height of Buildings**: Revise the map to align with the R1 zone, as current Height of Building restrictions do not apply to areas mapped as C2.
3. **Secondary Dwelling and Dual Occupancy Map**: Modify the map to ensure alignment with the Residential zoned land.

A summary of the proposed land use zones and planning controls is illustrated below, with mapping amendments (map sheet references) provided in Section 9, Part 4.

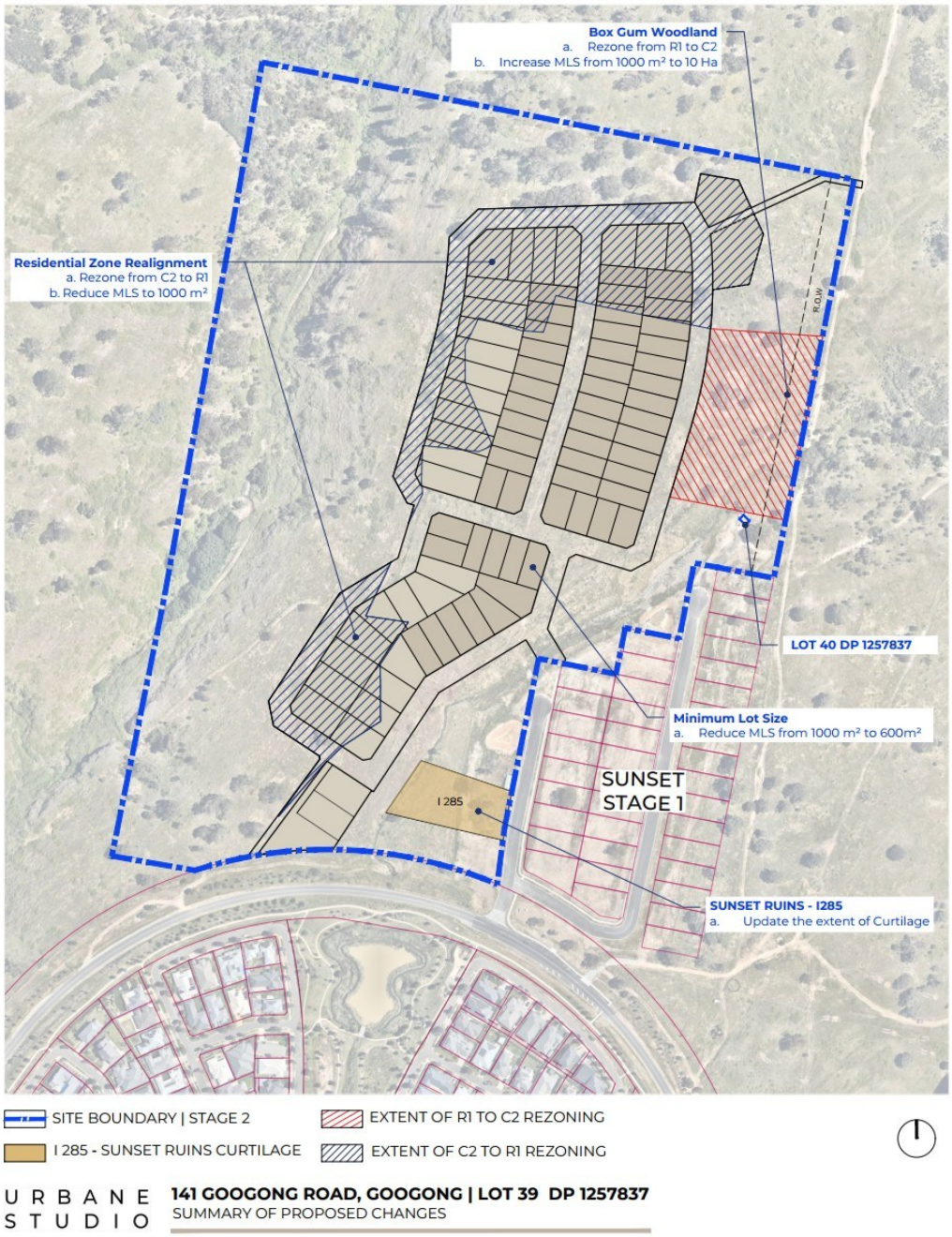


Figure 9 | Summary of Proposed Changes

5. PLANNING PROPOSAL ASSESSMENT

The PP has been prepared in accordance with *section 3.33* of the *EP&A Act* and the Local Environmental Plan Making Guideline (**LEP Making Guideline**) published by the DPHI in August 2023.

Accordingly, the PP is assessed in the following parts:

- **Part 1 |** A statement of the objectives and intended outcomes.
- **Part 2 |** An explanation of the provisions that are to be included in the proposed LEP.
- **Part 3 |** The justification of strategic and site-specific merit.
- **Part 4 |** Mapping.
- **Part 5 |** Details of community consultation that is to be undertaken for the Planning Proposal.
- **Part 6 |** Project timeline.

Discussion for each of the above parts is outlined in the following sections.

6. PART 1 | OBJECTIVES AND INTENDED OUTCOMES

6.1 OBJECTIVE

The primary objective of this Planning Proposal is to amend the *QPRLEP 2022* to make adjustments to the zone boundaries, minimum lot size and associated controls of part of the site at 141 Googong Road, Googong 2620. These changes aim to

- Deliver a suitable layout and structure that responds to the site's opportunities and constraints.
- Supporting the orderly and economic use of otherwise underutilized land and infrastructure.
- Increasing the potential lot yield and improving housing diversity to meet changing market needs and the emerging preference for more affordable lots, while ensuring an acceptable transition to the surrounding properties

6.2 INTENDED OUTCOME

The intended outcome is to concentrate urban development on the most appropriate land while protecting more sensitive areas. Key aspects include:

- Realigning the boundary between R1 General Residential and C2 Environmental Conservation zones, swapping the residentially zoned land containing EPBC Act Box Gum woodland with a less sensitive area more suitable for residential development. This ensures the zone boundaries efficiently align with future development areas.
- Amending the relevant development standard maps for the height of buildings and minimum lot size to reflect the new zone boundaries.
- Amending the Secondary Dwelling and Dual Occupancy Map and Additional Permitted Use Map to reflect the new zone boundaries for the purpose of consistency.
- Amending the heritage map to reflect the updated listing area of “Sunset” ruins as advised by Council’s heritage advisor.

7. PART 2 | EXPLANATION OF PROVISIONS

The PP results in mapping amendments only. There are no changes to any existing clauses and the proposal does not introduce any new provisions. The proposal seeks to achieve the intended outcomes outlined in Part 1 above by proposing amendments to the **QPRLEP** as follows:

1. Land Zoning Map (Sheet LZN_001D & Sheet LZN _001E)
2. Lot Size Map (Sheet LSZ_001D & Sheet LSZ_001E)
3. Height of Buildings Map (Sheet HOB_001D & Sheet HOB_001E)
4. Secondary Dwelling and Dual Occupancy Map (Sheet SDO_001D & Sheet SDO_001D)
5. Additional Permitted Use Map (Digital map applicable to the site)
6. Heritage Map (Sheet HER_001D & Sheet HER_001E)

8. PART 3 | JUSTIFICATION OF STRATEGIC AND SITE-SPECIFIC MERIT

8.1 SECTION A – NEED FOR THE PLANNING PROPOSAL

Q1. Is the Planning Proposal a result of an endorsed local strategic planning statement, strategic study, or report?

This Planning Proposal is not directly derived from any specific strategic study or report. None of the current strategic studies or reports designate the site as a priority or preliminary investigation area. However, these broader policy frameworks prioritize the protection of significant environmental land and recognize its value within the Queanbeyan-Palerang Regional Council region. In particular, this Planning Proposal aligns with the goals and priorities set forth in the following Council-endorsed strategic plans

- *Local Strategic Planning Statement – Towards 2040; and*
- *Queanbeyan-Palerang Community Strategic Plan – 2042*

These documents emphasize environmental protection, which is a key consideration in this proposal.

Towards 2040 QPRC Local Strategic Planning Statement

The *Towards 2040 QPRC Local Strategic Planning Statement* outlines how growth and change will be managed within the Queanbeyan-Palerang LGA. The following key priorities and actions demonstrate how this Planning Proposal aligns with the statement's objectives:

Planning Priority 2, Action 4.2.4:

- **Objective:** Investigate the potential for higher density development in areas adjacent to open spaces, where increased amenity and recreational opportunities are available.
- **Proposal Impact:** This proposal supports this priority by reducing the minimum lot size of a portion of the R1 zoned land to 600m² in proximity to open space and recreation areas. The larger 1,000 m² lot sizes are maintained at the interface of the C2 and R1 zones, ensuring a smooth transition between residential and conservation areas.

Planning Priority 4, Action 4.4.9:

- **Objective:** Provide diverse housing options at varying costs to meet the evolving needs of the community and explore partnerships with community housing providers to offer affordable housing. Additionally, enhance residential accessibility and availability compared to the ACT.

- **Proposal Impact:** This proposal supports this priority by introducing 600 m² min lot size, which diversify housing options and help address the anticipated population growth. The range of lot sizes contributes to meeting the demand for affordable and accessible housing, ensuring the region can accommodate a variety of community needs

Planning Priority 5, Action 4.5.1:

- **Objective:** Protect important environmental land from inappropriate development under respective Local Environmental Plans (LEPs).
- **Proposal Impact:** This proposal reinforces this priority by rezoning a portion of the site currently classified as R1 General Residential to C2 Environmental Conservation. This extension will safeguard land containing EPBC Act-listed Box Gum woodland, ensuring its protection from development.

Planning Priority 6, Action 4.6.3

- **Objective:** Review opportunities for high quality environmental vegetation in QPRC to be proactively conserved as part of recent biodiversity reforms, including potential for income generation.
- **Proposal Impact:** The proposal supports this objective by contributing to the proactive conservation of ecologically significant vegetation, aligning with broader biodiversity conservation goals.

Planning Priority 8, Action 4.8.1

- **Objective:** Focus settlement in planned locations with access to higher-level services such as employment, education, and health.
- **Proposal Impact:** The proposal aligns with this priority by providing increased housing supply and choice in a location that is well-serviced by existing infrastructure, ensuring access to essential services for future residents.

Community Strategic Plan

The *Queanbeyan-Palerang Community Strategic Plan (**CSP**)* outlines the Council's long-term vision and priorities for the region, addressing social, environmental, and economic goals. While the CSP has a broader focus compared to the Local Strategic Planning Statement (**LSPS**), the proposal aligns with the objectives of both, promoting balanced development that supports the community's long-term aspirations.

Q2. Is the Planning Proposal the best means of achieving the objectives or intended outcomes, or is there a better way?

Yes, the Planning Proposal to amend the LEP is the most effective way to achieve the objectives and outcomes outlined in Part 1 of this Planning Proposal. It provides certainty for the Council, local community, and landowner by formalizing zoning and associated changes that align with strategic objectives.

8.2 SECTION B – RELATIONSHIP TO STRATEGIC PLANNING FRAMEWORK

Q3. Will the planning proposal give effect to the objectives and actions of the applicable regional or district plan or strategy (including any exhibited draft plans or strategies)?

Yes, the Planning Proposal aligns with and supports the objectives of the following regional plans:

- *South-East and Tablelands Regional Plan 2036*
- *Draft South-East and Tablelands Regional Plan 2041*

South-East and Tablelands Regional Plan 2036:

This plan provides a 20-year framework for the region's growth, with four key goals:

1. A connected and prosperous economy.
2. A diverse environment interconnected by biodiversity corridors.
3. Healthy and connected communities.
4. Environmentally sustainable housing choices.

Relevant directions include:

Direction 22: Build socially inclusive, safe, and healthy communities:
The proposal promotes inclusive housing by offering diverse, affordable housing choices and balancing development with environmental conservation. It protects farmland from unnecessary rezoning and safeguards the ecological value of key lands.

Direction 25: Focus housing growth in locations that maximize infrastructure and services:
The proposal supports efficient housing growth by increasing supply and providing varied housing options in areas with established infrastructure and services, ensuring sustainable community expansion.

Draft Southeast and Tablelands Regional Plan 2041

This plan provides a regional framework for strategic land use planning, including for the Queanbeyan-Palerang LGA.

Theme 2, Objective 5: Protect important environmental assets.

emphasizes the need to safeguard key environmental features. This Planning Proposal directly supports this objective by conserving additional *Box Gum Woodland* within the proposed C2 Environmental Conservation zone, thereby protecting one of the region's significant environmental assets.

Theme 4, Objective 17: Plan for a supply of housing in appropriate locations

recognizes the projected population growth in the Queanbeyan-Palerang area, alongside a decline in average household sizes, necessitating a mix of smaller, low-maintenance dwellings. This proposal aligns with these goals by enabling a range of housing sizes in an area close to services and infrastructure. It ensures sustainable development, balancing increased housing supply with

environmental protection, and contributes to expanding the housing pipeline to meet future demand.

Q4. Is the planning proposal consistent with a council LSPS that has been endorsed by the Planning Secretary or GCC, or another endorsed local strategy or strategic plan?

Yes, the Planning Proposal is consistent with the endorsed *Local Strategic Planning Statement (LSPS) Towards 2040* and the *Queanbeyan-Palerang Community Strategic Plan – Towards 2042*. As mentioned previously, this proposal will give effect to the objectives and priorities outlined in these strategic documents, ensuring alignment with long-term planning goals for sustainable development and community growth.

Q5. Is the planning proposal consistent with any other applicable State and regional studies or strategies?

Other relevant State and regional studies or strategies applicable to the proposal include:

NSW Housing Strategy 2041

This strategy emphasizes creating more housing supply, diversity, and affordability across the state while ensuring it aligns with infrastructure capabilities. By rezoning land to accommodate additional residential development, the proposal directly supports this strategy's goals of meeting housing demand and providing more housing choices.

Future Transport Strategy 2056

The Planning Proposal aligns well with the objectives of the Future Transport Strategy 2056, which focuses on creating sustainable, connected, and resilient transport networks across NSW.

1. **Efficient Land Use:** The proposal to increase housing density near existing infrastructure supports the strategy's goal of focusing development in areas with established transport networks, ensuring that new developments are easily accessible by public transport and other modes of transit. This aligns with the strategy's direction to concentrate housing growth in areas that maximize infrastructure and service access.
2. **Sustainability:** By balancing environmental conservation with residential development, the proposal contributes to the strategy's overarching goal of integrating sustainable transport solutions with land use planning. The strategy emphasizes reducing emissions and encouraging developments that reduce dependency on cars, which could be achieved by placing housing near accessible transport services.

Net Zero Plan (NSW):

The proposal aligns with the NSW Net Zero Plan (2020-2030) in several key areas:

1. **Environmental Protection and Land Use**: The proposal to rezone land to C2 Environmental Conservation aligns with the *Net Zero Plan's* goals to preserve critical biodiversity and natural assets, such as the Box-Gum Woodland. This is consistent with the plan's focus on enhancing green infrastructure and protecting vital ecosystems to support emissions reduction and biodiversity conservation.

2. **Sustainable Development**: The proposal supports sustainable land use by facilitating residential development in areas that have limited ecological value. This promotes efficient land use, in line with the *Net Zero Plan's* objectives of managing urban growth while reducing environmental impact. It ensures a balance between housing needs and environmental sustainability, a key principle of the *Net Zero Plan*.
3. **Infrastructure and Energy Efficiency**: The plan also highlights the importance of using existing infrastructure efficiently, aligning with the *Net Zero* Plan's drive to reduce emissions from sectors like construction and infrastructure. By focusing on intensification without requiring substantial infrastructure upgrades, the proposal helps reduce the carbon footprint associated with new developments, contributing to the state's emission reduction targets.

Overall, the Sunset Planning Proposal supports the broader goals of the *NSW Net Zero Plan* by balancing development with environmental conservation, reducing emissions through sustainable land use, and efficiently utilizing existing infrastructure.

***NSW* State Infrastructure Strategy 2022-2042**

The Planning Proposal aligns well with the objectives of the NSW *State Infrastructure Strategy 2022-2042*, which emphasizes strategic infrastructure development to support population growth and sustainable land use. The proposal is consistent with the strategic goals of maintaining efficient infrastructure, protecting environmental assets, and supporting sustainable growth in the region.

A 20-Year Economic Vision for Regional NSW

The Planning Proposal is consistent with the objectives outlined in *A 20-Year Economic Vision for Regional NSW* in several key areas:

1. **Housing Growth and Diversification:** The proposal contributes to the plan's goal of driving sustainable, long-term economic growth by providing diversified housing options. This aligns with the vision's objective to support regional areas like Queanbeyan, where population growth is significant, and to ensure that infrastructure is used efficiently to meet housing demands. By focusing on areas with established infrastructure and services, the proposal supports sustainable development, which is a key focus of the economic vision.
2. **Environmental and Economic Balance:** The plan emphasizes economic growth while maintaining environmental sustainability, and the proposal's rezoning of certain areas for environmental conservation aligns well with this. It balances the development of housing with the protection of ecological assets, reinforcing the strategic importance of leveraging natural resources responsibly for regional development.
3. **Local Economic Strengthening:** The proposal's emphasis on intensifying residential use without significant infrastructure upgrades fosters local economic activity and meets the vision's aim to bolster regional economies by optimizing land use.

Overall, the proposal supports the key objectives of the *20-Year Economic Vision* by promoting sustainable growth, conserving environmental assets, and utilizing existing infrastructure to enhance regional economic development

Q6. Is the planning proposal consistent with applicable SEPPs?

Yes. The planning proposal is generally consistent with all relevant SEPPs. Applicable SEPPs are discussed as follows:

Table 4 | Relevant State Environmental Planning Policies

SEPP	Assessment
SEPP (Biodiversity and Conservation) 2021	
Chapter 2 Vegetation in non-rural areas This chapter aims to protect the biodiversity values of trees and other vegetation in non-rural areas of the State, and to preserve the amenity of non-rural areas of the State through the preservation of trees and other vegetation.	Consistent – The proposal involves rezoning a portion of R1 General Residential land to C2 Environmental Conservation to protect the EPBC-listed Box-Gum Woodland. In return, a section of land currently zoned C2, assessed by Capital Ecology to have limited conservation value, is proposed to be rezoned to R1 General Residential. Any future DA will require to address the objectives of the SEPP and obtain council approval.
Chapter 4 Koala habitat protection 2021 This Chapter aims to encourage the conservation and management of areas of natural vegetation that provide habitat for koalas to support a permanent free-living population over their present range and reverse the current trend of koala population decline	Consistent – An ecological assessment was undertaken for the site and confirms that the site does not support Kola habitat.
SEPP (Exempt & Complying Development Codes) 2008	
This Policy aims to provide streamlined assessment processes for development that complies with specified development standards by a. providing exempt and complying development codes that have State-wide application, and b. identifying, in the exempt development codes, types of development that are of minimal environmental impact that may be carried out without the need for development consent, and c. identifying, in the complying development codes, types of complying development that may be carried out in accordance with a complying development certificate as defined in the Act, and d. enabling the progressive extension of the types of development in this Policy, and e. providing transitional arrangements for the introduction of the State-wide codes, including the amendment of other environmental planning instruments	Consistent – The intention to update the Sunset Homestead heritage curtilage aligns with the objectives of this policy. By ensuring that the heritage curtilage is properly defined, the PP will facilitate the application of exempt and complying development codes for lots that are of minimal environmental impact, thus supporting the efficient progression of development while maintaining heritage protections.
SEPP (Housing) 2021	
The principles of this Policy are as follows: a. enabling the development of diverse housing types, including purpose-built rental housing, b. encouraging the development of housing that will meet the needs of more vulnerable members of the	Consistent – The PP enables diverse housing in well-served areas with existing infrastructure, ensuring resident amenity, and protecting the site's biodiversity values. It aligns with the goal of sustainable development, minimizing environmental impacts

	community, including very low to moderate income households, seniors and people with a disability, c. ensuring new housing development provides residents with a reasonable level of amenity, d. promoting the planning and delivery of housing in locations where it will make good use of existing and planned infrastructure and services, e. minimising adverse climate and environmental impacts of new housing development, f. reinforcing the importance of designing housing in a way that reflects and enhances its locality, g. supporting short-term rental accommodation as a home-sharing activity and contributor to local economies, while managing the social and environmental impacts from this use, h. mitigating the loss of existing affordable rental housing.	while meeting community housing needs**.**
SEPP Resilience and Hazards 2021		
(1) The object of this Policy is to provide for a Statewide planning approach to the remediation of contaminated land.(2) In particular, this Policy aims to promote the remediation of contaminated land for the purpose of reducing the risk of harm to human health or any other aspect of the environment—(a) by specifying when consent is required, and when it is not required, for a remediation work, and(b) by specifying certain considerations that are relevant in rezoning land and in determining development applications in general and development applications for consent to carry out a remediation work in particular, and(c) by requiring that a remediation work meet certain standards and notification requirements.	Consistent - The proposed rezoning does not interfere with or alter the previous site suitability assessments conducted as part of the Sunset Stage 1 development, which encompassed the entire site. Therefore, no further assessment is required under Chapter 4 for land remediation.

Other applicable SEPPs have been reviewed and were found not to be relevant to this Planning Proposal.

Q7. Is the Planning Proposal consistent with applicable Ministerial Directions?

The Ministerial Directions under section 9.1 of the *EP&A Act* requires planning proposals to be consistent with the terms of the relevant direction. The relevant directions are considered below.

Table 5 | Section 9.1 Directions

Direction	Consistency and Implications
Focus Area 1 - Planning Systems	
1.1 Implementation of Regional Plans The objective of this direction is to give legal effect to the vision, land use strategy, goals, direction and actions contained in regional plans	Consistent
1.3 Approval and Referral Requirements The objective of this direction is to ensure that the LEP provisions encourage efficient and appropriate assessment of development.	Consistent
Focus Area 3 – Biodiversity and Conservation	
3.1 Conservation zones The objective of this direction is to protect and conserve environmentally sensitive areas. A	Inconsistency has been addressed, as detailed in Section 4.3 and within the provided BDAR report.

Planning Proposal must include provisions that facilitate the protection and conservation of environmentally sensitive areas. That a Planning Proposal does not reduce the conservation standards that apply to the land. Consistency A Planning Proposal may be inconsistent with the terms of this direction in circumstances where the proposal is justified by a study prepared in support of the proposal that gives consideration to the objective of the direction.	The proposal involves rezoning a portion of R1 General Residential land to C2 Environmental Conservation to protect the EPBC-listed Box-Gum Woodland. In return, a section of land currently zoned C2, assessed by Capital Ecology to have limited conservation value, is proposed to be rezoned to R1 General Residential. This balanced approach offsets the loss of developable land being set aside for conservation and promotes sustainable land use by aligning environmental protection with development objectives.
3.2 Heritage Conservation The objective of this direction is to conserve items, areas, objects and places of environmental heritage significance and Indigenous heritage significance.	Consistent An Aboriginal Cultural Heritage Assessment (ACHA) was conducted by Past Traces Consultants in 2022 (Attachment D) to support the scoping proposal for Stage 2 of the Sunset Development. This assessment builds on a previous Aboriginal Cultural Heritage Assessment Report (ACHAR) completed for the entire sunset estate in 2018. The report evaluates the potential impacts on both Aboriginal and historical heritage resulting from the Stage 2 development and provides management recommendations to mitigate any identified impacts. The report concludes that "As a result of the Aboriginal heritage field survey, subsurface testing and consultation with the local Aboriginal community, there are no items of significance that would preclude development of the project. The PP also aligns with the direction by incorporating the Sunset Homestead into the open space design and entering into a planning agreement with the Council to ensure its ongoing protection.
Focus Area 4 — Resilience and Hazards	
4.1 Flooding The objectives of this direction are to: (a) ensure that development of flood prone land is consistent with the NSW Government's Flood Prone Land Policy and the principles of the Floodplain Development Manual 2005, and (b) ensure that the provisions of an LEP that apply to flood prone land are commensurate with flood behaviour and includes consideration of the potential flood impacts both on and off the subject land. Consistency A planning proposal may be inconsistent with this direction only if the planning proposal authority can satisfy the Planning Secretary (or their nominee) that: (a) the planning proposal is in accordance with a floodplain risk management study or plan adopted by the relevant council in accordance with the principles and guidelines of the Floodplain Development Manual 2005, or (b) where there is no council adopted floodplain risk management study or plan, the planning proposal is consistent with the flood study adopted by the council prepared in accordance with the principles of the Floodplain Development Manual 2005 or (c)	Consistent. The proposal has been supported by a flood impact assessment study prepared by Spiire for stage 2 of the sunset that provides a comprehensive analysis of the flood risks associated with the site, with the following key findings: – The 1% Annual Exceedance Probability (AEP) flood extent is confined to Googong Creek and does not affect the Stage 2 development area. There is a sufficient freeboard of 0.65m between the 1% AEP flood water surface elevation and the proposed culvert crossing at Googong Creek. – The flood extents for the 1% AEP + Climate Change (CC), 0.5% AEP, and 0.2% AEP are also contained within Googong Creek and do not impact the Stage 2 development area. – The Probable Maximum Flood (PMF) extent encroaches on the road adjacent to Googong Creek and overtops the proposed road crossing between Stages 1 and 2. However, evacuation via Googong Road remains feasible in this scenario. – The PMF hazard classification is rated high (H5 to H6) within Googong Creek and near the road crossing between Stages 1 and 2, as well

the planning proposal is supported by a flood and risk impact assessment accepted by the relevant planning authority and is prepared in accordance with the principles of the Floodplain Development Manual 2005 and consistent with the relevant planning authorities' requirements, or (d) the provisions of the planning proposal that are inconsistent are of minor significance as determined by the relevant planning authority.	as in the surrounding road reserves. However, this classification does not apply to the lot areas within Stages 1 and 2. – PMF velocities exceeding 2m/s are largely confined to the Googong Creek corridor, except in the area surrounding the proposed road crossing between Stages 1 and 2. The report confirms that the Planning Proposal adheres to floodplain management principles and does not present significant risks to the development area. It is noted that the part of the land proposed for rezoning from C2 to R1 is not within the flood prone land.
4.3 Planning for Bushfire Protection The objectives of this direction are to: (a) protect life, property and the environment from bush fire hazards, by discouraging the establishment of incompatible land uses in bush fire prone areas, and (b) encourage sound management of bush fire prone areas.	Consistent: The proposal is supported by a preliminary bushfire strategic study prepared by Ember Bushfire Consulting. The study concludes that future development on the site can achieve adequate protection in accordance with the guidelines set out in Planning for Bushfire Protection. This ensures that the proposal complies with bushfire safety standards and mitigation strategies, supporting the development's alignment with necessary risk management protocols.
Focus Area 5 — Transport and Infrastructure	
5.1 Integrating Land Use and Transport The objective of this direction is to ensure that urban structures, building forms, land use locations, development designs, subdivision and street layouts achieve the following planning objectives: a) improving access to housing, jobs, and services by walking, cycling and public transport, and b) increasing the choice of available transport and reducing dependence on cars, and c) reducing travel demand including the number of trips generated by development and the distances travelled, especially by car, and d) supporting the efficient and viable operation of public transport services, and e) providing for the efficient movement of freight.	Consistent: The traffic impact of the additional lots resulting from this Planning Proposal has been assessed in a Traffic Impact Assessment prepared by SCT (See attachment F). The report concludes that the surrounding road network is capable of accommodating the increased yield, ensuring that the proposed development will not negatively affect traffic flow or capacity in the area.
Focus Area 6 — Housing	
6.1 Residential zones The objectives of this direction area to: a) encourage a variety of housing types to provides for existing and future housing needs, b) make efficient use of existing infrastructure and services and ensure that new housing has appropriate access to infrastructure and services, and c) minimise the impacts of residential development on the environment and resources land.	Consistent The proposal aligns with the Local Housing Strategy by providing diverse housing options, accommodating population growth, and leveraging existing infrastructure and services. Technical assessments, including flood, bushfire, and traffic studies, confirm the site's capacity for development, ensuring that all necessary protections and access to services are maintained. Overall, the proposal supports sustainable development, efficiently utilizing infrastructure while preserving key environmental areas
Focus area 9 — Primary Production	

9.2 Rural Land The main objective of this Direction is to protect the agricultural production value of rural land and facilitate the orderly and economic development of rural lands for rural and related purposes. This Direction applies when a relevant planning authority prepares a Planning Proposal that will affect land within an existing or proposed rural or conservation zone or that changes the existing minimum lot size on land within a rural or conservation zone.	Consistent The proposal is consistent with these directions in the following ways: – **Consistency with Planning Frameworks:** It is consistent with all relevant regional and local planning frameworks, as detailed in questions 3-5 above. – **Agricultural Significance:** The site holds minimal agricultural value and is no longer used for farming. The rezoning will not impact agricultural production, as the land is fragmented and isolated from active agricultural areas. – **Environmental Protection:** The proposal avoids the clearing of protected native vegetation and ensures the protection of significant ecological resources. It rezones key areas, including Box-Gum Woodland, to C2 Environmental Conservation and integrates the Sunset Homestead Ruins into open space, addressing both environmental and heritage concerns. – **Natural and Physical Constraints**: The natural and physical characteristics of the land have been considered, with no significant constraints that would prevent the proposed development. – **Fostering Investment:** Although no longer used for agriculture, the rezoning promotes investment in residential development, supporting sustainable urban growth in a region with existing infrastructure, which contributes to long-term community development. – I**mpact on Rural Land Uses:** The rezoning will not adversely affect the operation or viability of nearby rural land uses or enterprises. The site has been removed from agricultural activity, and the proposed change will not affect farming on adjacent lands. – **Minimising Rural Land Fragmentation:** The rezoning of this isolated site avoids further fragmentation of rural land and is in line with existing growth plans, minimizing conflicts between rural and urban uses. – **State Significant Agricultural Land:** The land is not classified as State Significant Agricultural Land, and its rezoning will not impact agricultural viability or nearby farming operations. – **Balancing Community Interests:** The proposal strikes a balance between social, economic, and environmental interests by providing housing in a well-planned area, protecting biodiversity, and enhancing the community with open space and heritage preservation, contributing to both cultural and recreational amenities.

8.3 SECTION C – ENVIRONMENTAL, SOCIAL AND ECONOMIC IMPACTS

Q8. Is there any likelihood that critical habitat or threatened species, populations or ecological communities or their habitats will be adversely affected as a result of the proposal?

No. Biodiversity Assessment has been the fundamental initial study conducted prior to the proposed rezoning, forming the foundation of this proposal. The areas of the site suggested for rezoning from C2 to R1 are not identified as having significant biodiversity value. Conversely, in instances where high-value biodiversity areas have been recognized within the R1 zoned land, it is proposed that these areas be upzoned to C2 and integrated into a residual lot. This strategy ensures the protection of critical habitats and threatened species, thereby maintaining the ecological integrity of the site (See attachment A).

Q9. Are there any other likely environmental effects as a result of the planning proposal and how are they proposed to be managed?

No. Section 4 provides an overview of the technical and supporting documentation referenced in the Scoping Proposal addressing biodiversity, geotechnical considerations, bushfire and flood risk management. This documentation demonstrates the suitability of the land identified for R1 General Residential zoning and the rationale for rezoning a portion of R1 land to C2 Environmental Conservation. The Planning Proposal primarily rationalizes boundaries and involves only minor amendments at the periphery of the existing zones. Any potential impacts from future development can be mitigated and will be addressed in detail through the Development Application (DA) process.

Q10. Has the planning proposal adequately addressed any social and economic effects?

Yes. While the proposal is minor in nature and does not trigger significant social or economic impacts, it is expected to make a positive contribution to the immediate area by increasing the number of dwellings and diversifying housing types. This will enhance housing choice and support local housing needs, contributing to the social and economic development of the locality

8.4 SECTION D – INFRASTRUCTURE

Q11. Is there adequate public infrastructure for the Planning Proposal?

Yes. The proposal does not impact the delivery of or demand for infrastructure.

8.5 SECTION E – STATE AND COMMONWEALTH INTERESTS

Q12. What are the views of state and Commonwealth public authorities consulted in accordance with the Gateway determination?

Appropriate consultation with relevant government agencies will be undertaken by Council following a Gateway Determination. Extensive consultation has been conducted with relevant State Government agencies, and all issues raised have been satisfactorily addressed in the initial Scoping Proposal and the Planning Proposal documentation.

9. PART 4 | MAPS

The proposal will amend various zone and lot size maps, and incidental adjustments to other maps will be required to align with these changes. The following Map Sheets will need to be amended:

1. Land Zoning Map - Sheet LZN_001D and Sheet LZN _001E:
   - **Proposed change:** Amend the relevant zones; R1 and C2 as they relate to the alignment of the new boundaries.
2. Lot Size Map: Sheet LSZ_001D and Sheet LSZ_001E
   - **Proposed change:** Apply the Minimum Lot Size (MLS) that corresponds with the revised zoning boundaries.
3. Height of Buildings Map: Sheet HOB_001D and Sheet HOB_001D
   - **Proposed change:** Update the Height of Buildings (HOB) Map to align with revised R1 General Residential zone.
4. Secondary Dwelling and Dual Occupancy Map: Sheet SDO_001D and Sheet SDO_001E
   - **Proposed change:** Amend to align with the Land Zoning Map
5. Additional Permitted Uses Map: Digital map applicable to the site.
   - **Proposed change:** Amend to align with the Land Zoning Map
6. Heritage map Sheet HER_001D and sheet HER_001E
   - **Proposed change:** Amend to align with the council recommendation and the approved subdivision for Sunset stage 1.

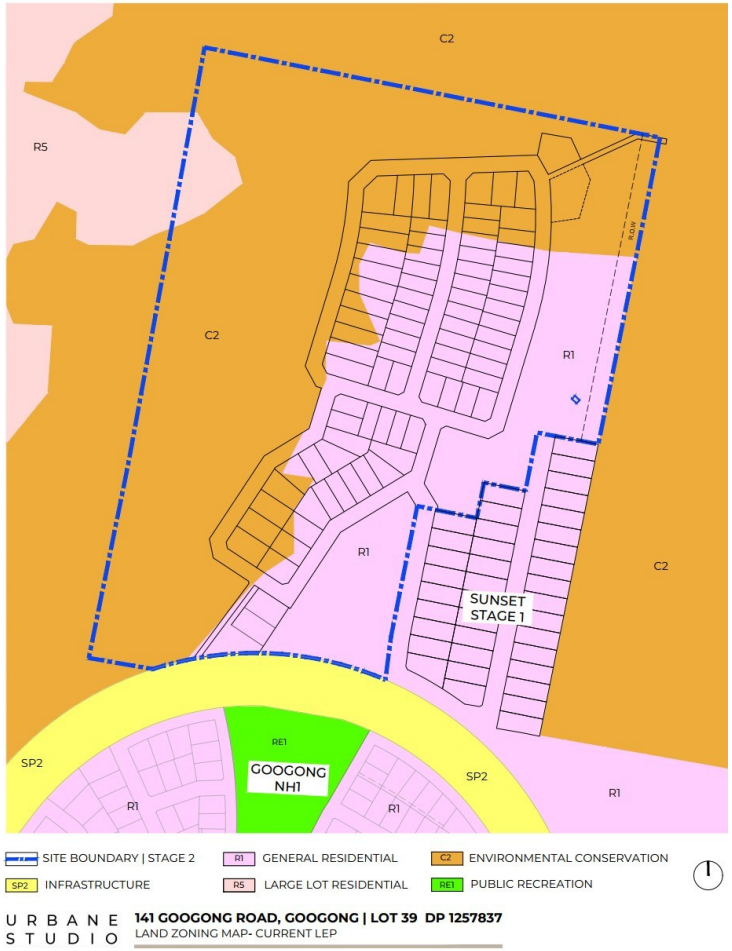


Figure 10 | Land Zoning Map - Existing

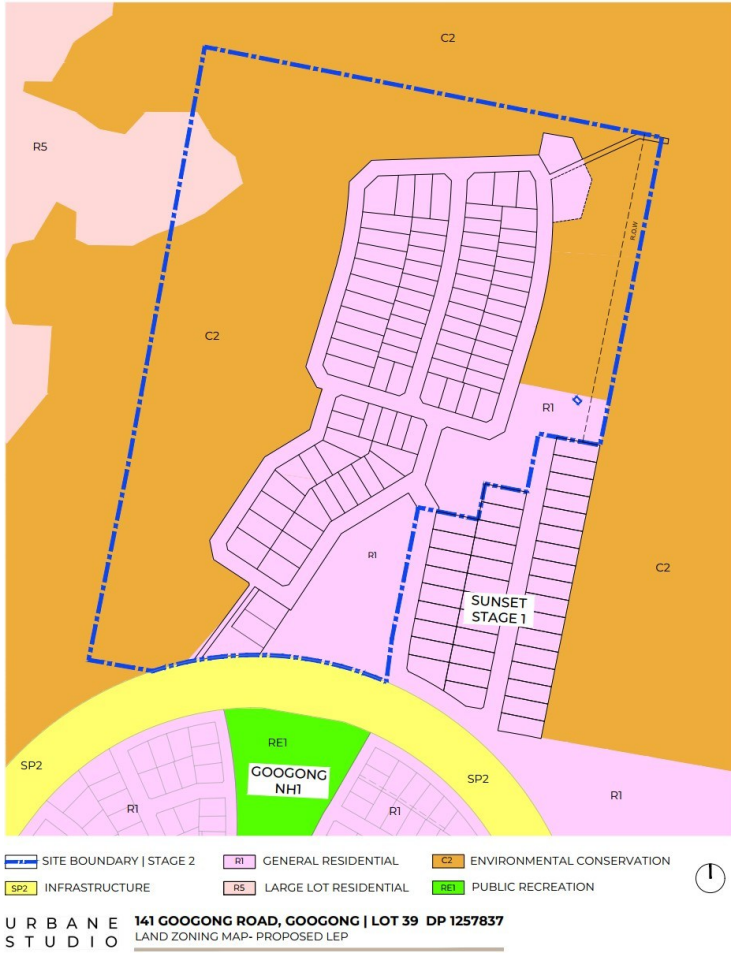


Figure 11 | Land Zoning Map - Proposed

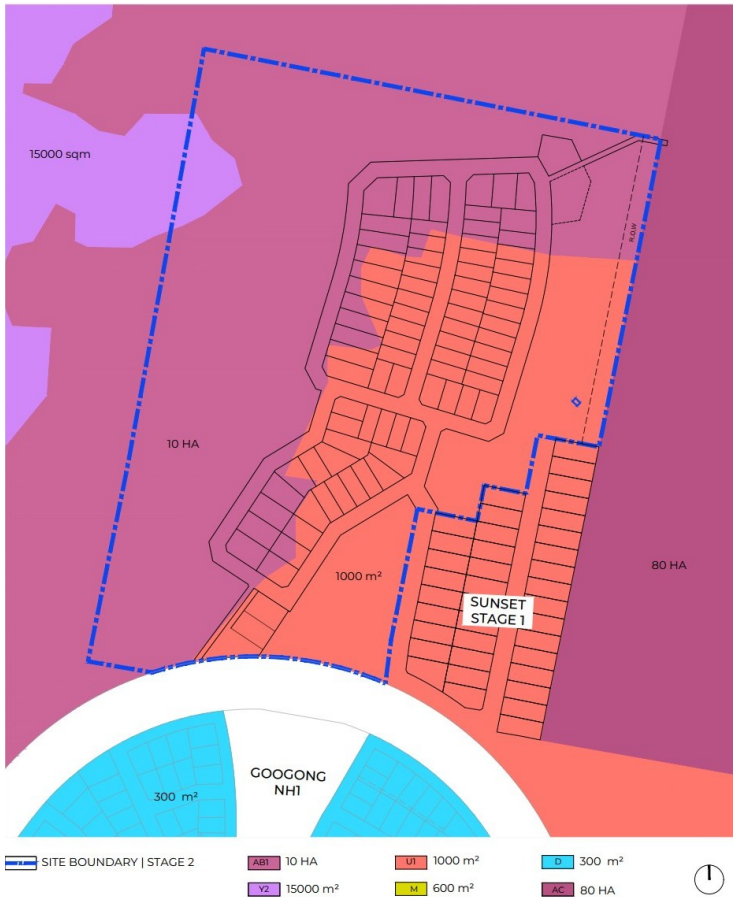


Figure 12 | Lot Size Map - Existing

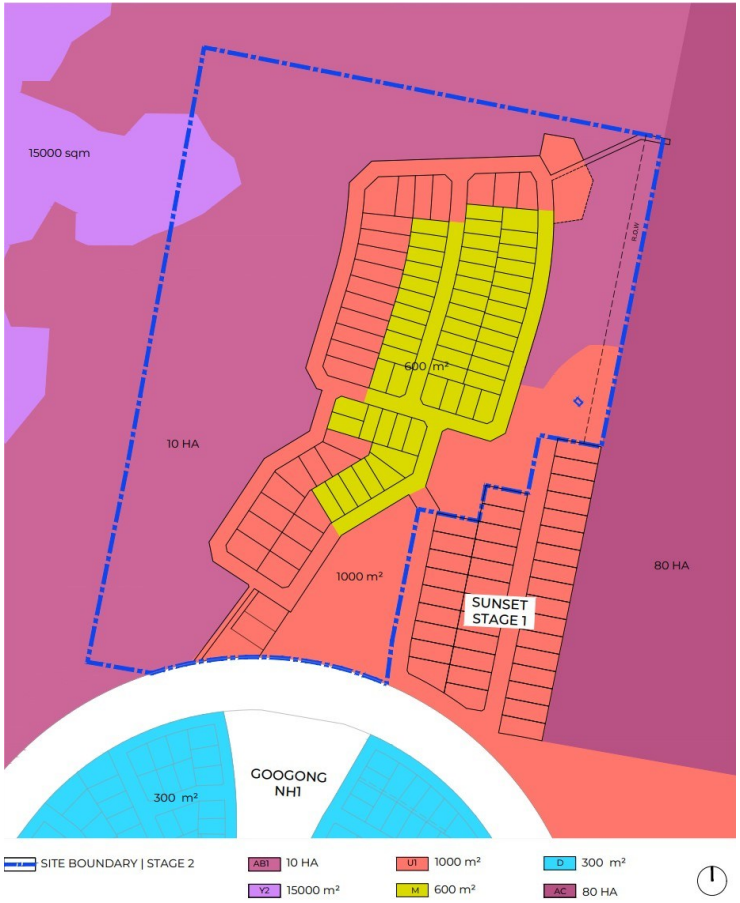


Figure 13 | Lot Size Map - Proposed

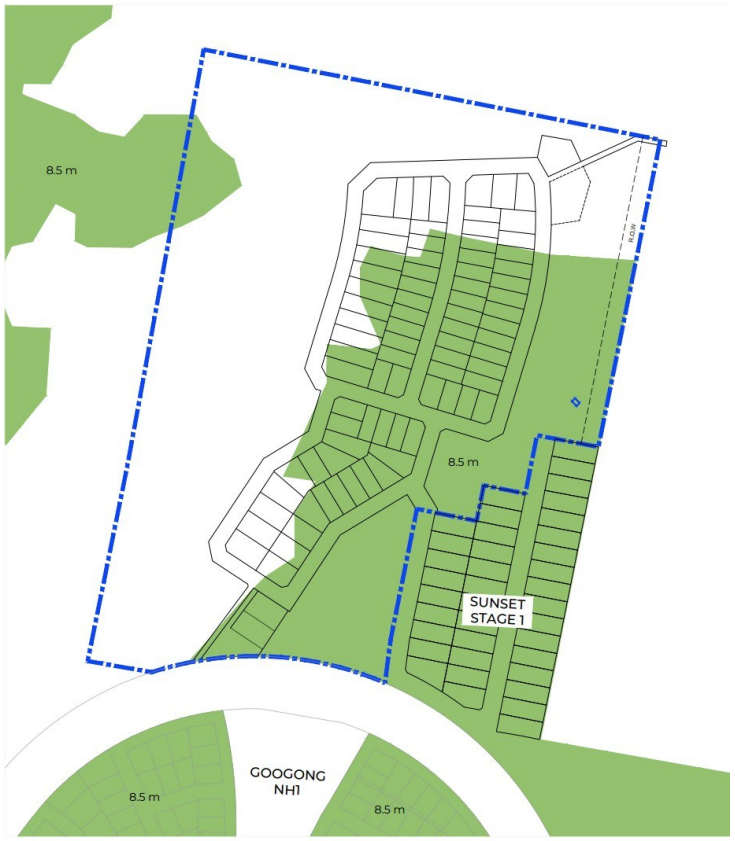


Figure 14 | Height of Buildings Map - Existing

Figure 15 | Height of Buildings Map - Proposed

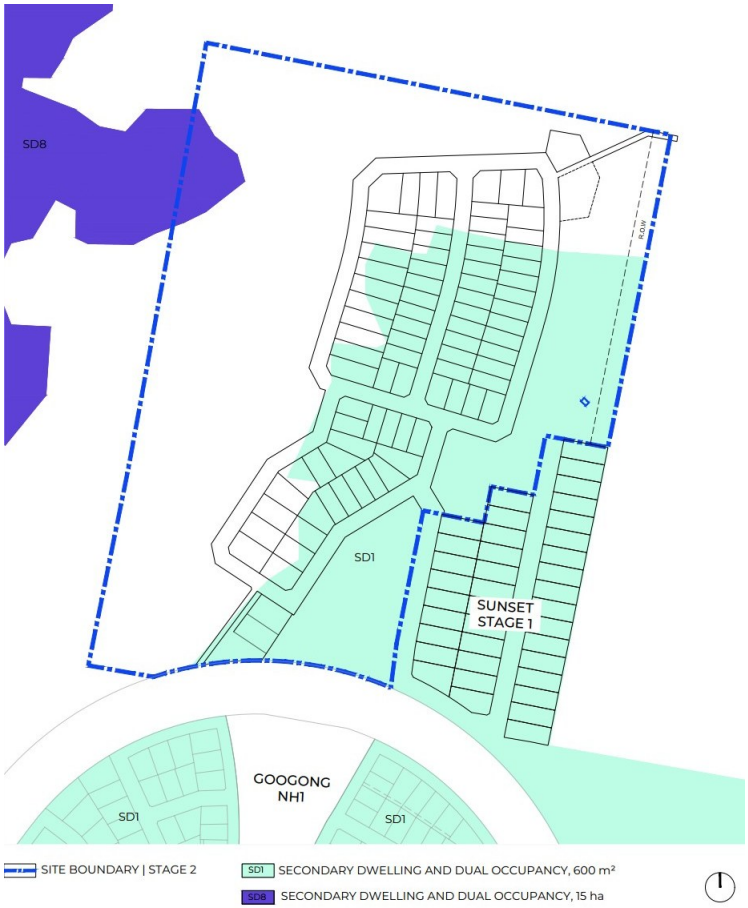


Figure 16 | Secondary Dwelling and Dual Occupancy - Existing

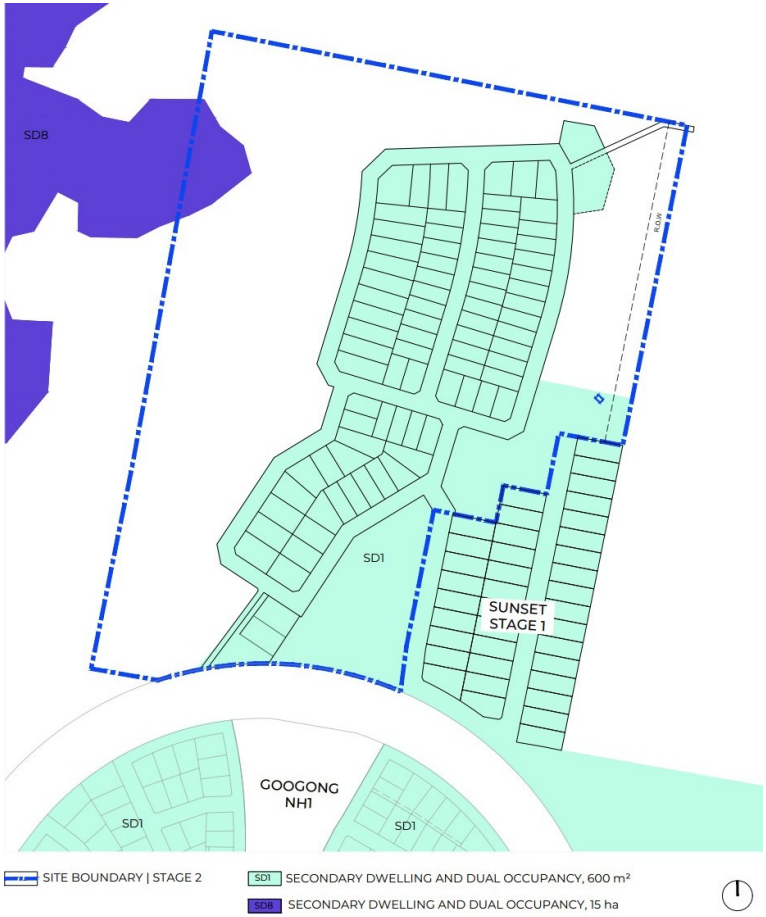
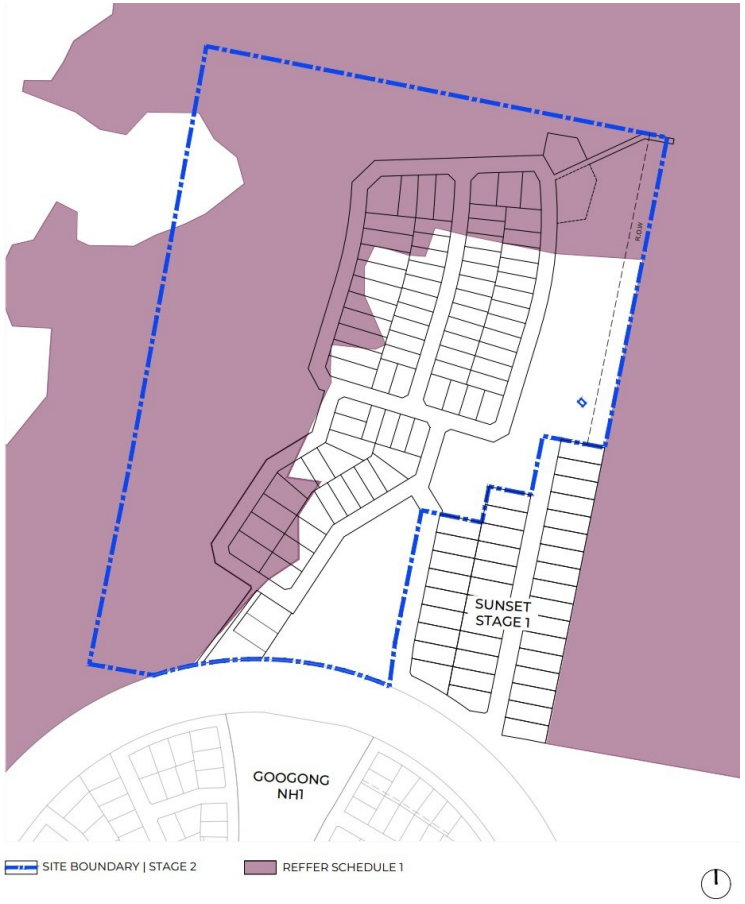
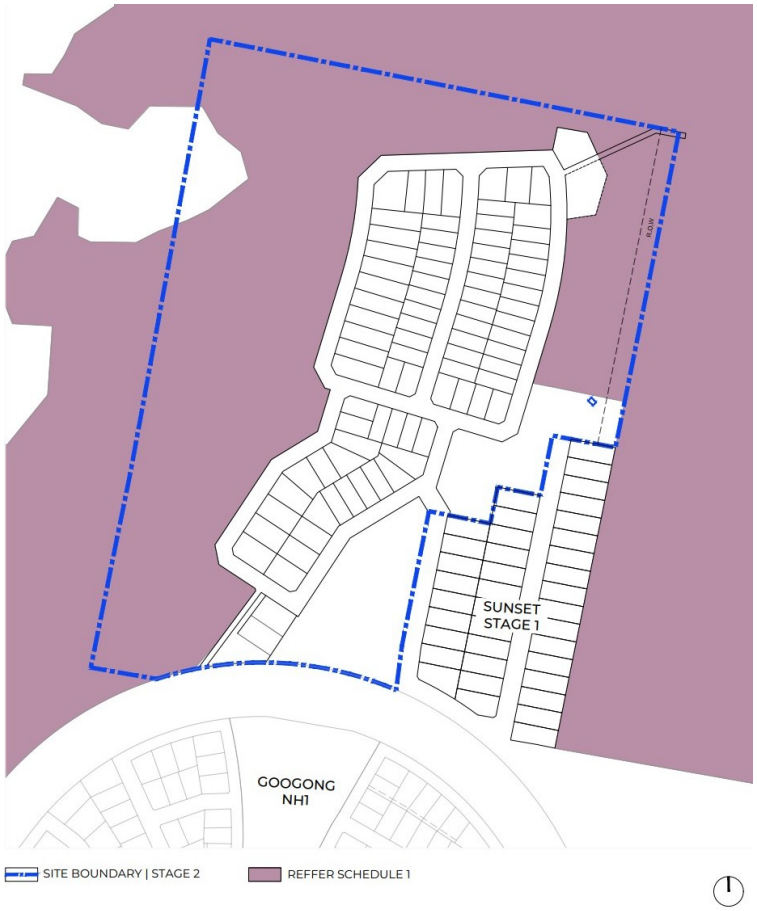


Figure 17 | Secondary Dwelling and Dual Occupancy Map - Proposed



URBANE STUDIO **141 GOOGONG ROAD, GOOGONG | LOT 39 DP 1257837**
ADDITIONAL PERMITTED USE MAP - CURRENT LEP

Figure 18 | Additional Permitted Use Map - Existing



URBANE STUDIO **141 GOOGONG ROAD, GOOGONG | LOT 39 DP 1257837**
ADDITIONAL PERMITTED USE MAP - PROPOSED LEP

Figure 19 | Additional Permitted Use Map - Proposed

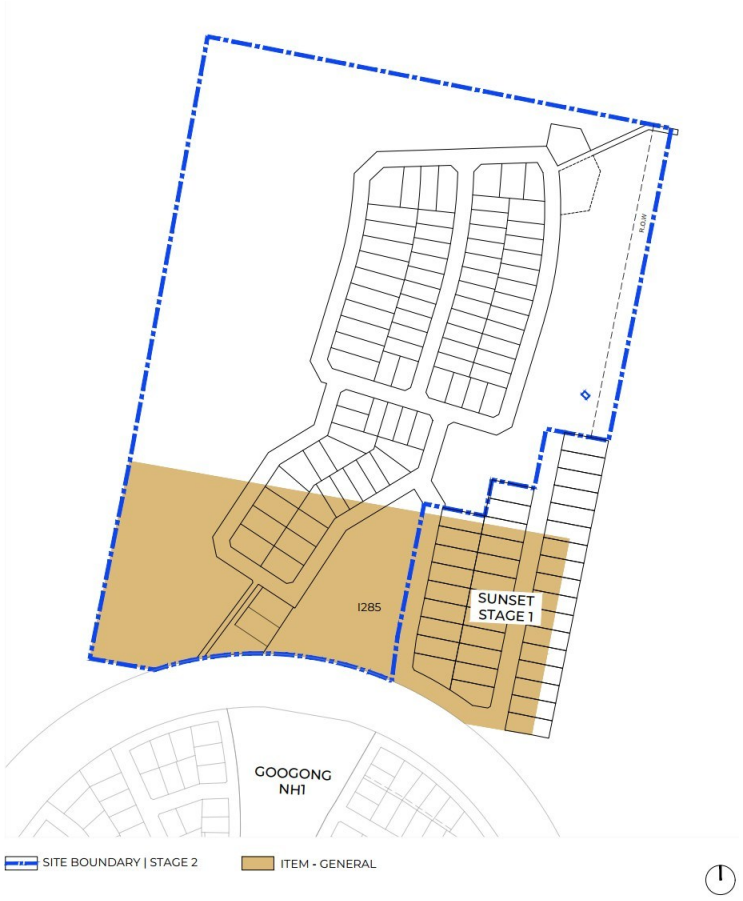


Figure 20 | Heritage Map - Existing

Figure 21 | Heritage Map - Proposed

10. PART 5 | COMMUNITY CONSULTATION

Public consultation will be conducted in accordance with the requirements of the *Environmental Planning and Assessment (EP&A) Act* and Council's community consultation policies.

The Planning Proposal will be publicly exhibited for 20 working days, following the timeframes outlined in the *LEP Making Guidelines* for standard Planning Proposals. All exhibition materials will be made available on Council's website and at its administration centre for public access and review.

11. PART 6 | PROJECT TIMELINE

It is anticipated that the LEP amendment will be completed within 9 months which is consistent with timeframes recommended by the *LEP Plan Making Guidelines (August 2023)* for Standard Planning proposals.

Table 6 | Project Timeline

Stage	Anticipated time frame
Stage 1 – Pre-lodgment	**Finalized**
Stage 2 – Planning Proposal	**Oct 2024**
Stage 3 - Gateway Determination	**Feb-March 2025**
Stage 4 – Post-Gateway	**March-April 2025**
Stage 5 – Public Exhibition & Assessment	**May-Aug 2025**
Stage 6 - Finalisation	**Sep-Oct 2025**

12. CONCLUSION

The Planning Proposal demonstrates both strategic and site-specific merit, aligning with key state and regional strategies that address housing demand, environmental conservation, and infrastructure efficiency. It directly supports the *NSW Housing Strategy 2041* by offering a diverse range of housing options, particularly smaller, more affordable lots, which are critical for meeting the growing population needs in Queanbeyan-Palerang.

By focusing development near existing infrastructure and transport networks, the proposal aligns with the *Future Transport Strategy 2056*, reducing reliance on private vehicles and ensuring connectivity to essential services. The rezoning of R1 General Residential land to C2 Environmental Conservation is consistent with the *Net Zero Plan (NSW*), protecting biodiversity assets such as the Box-Gum Woodland and contributing to carbon reduction.

The proposal also supports the *State Infrastructure Strategy 2022-2042* by utilizing existing infrastructure efficiently without the need for major upgrades. Additionally, it aligns with the *South-East and Tablelands Regional Plan 2036* and the *Draft Southeast and Tablelands Regional Plan 2041*, ensuring housing development occurs in areas with sufficient infrastructure and minimal environmental impact.

Table 7 | Assessment Summary

Criteria	Assessment
Strategic merit test criteria	
Consistent with the relevant regional plan outside of the Greater Sydney Region, the relevant district plan within the Greater Sydney Region, or corridor/precinct plans applying to the site, including any draft regional, district or corridor/precinct plans released for public comment; or	**Consistent |** The PP is consistent with the South-East and Tablelands Regional Plan.
Consistent with a relevant local strategy that has been endorsed by the Department; or	**Consistent |** The PP is consistent with the Community Strategic Plan (CSP) and the recent Local Strategic Planning Statement (LSPS)
Responding to a change in circumstances, such as the investment in new infrastructure or changing demographic trends that have not been recognized by existing planning controls.	**Consistent |** The PP is consistent with current market and demographic changes, which require smaller lots at various price ranges
Site-specific merit test criteria	
The natural environment (including known significant environmental values, resources or hazards)	**Consistent |** The PP is a result of detailed site-specific studies that will protect the site's ecological values by back zoning from R1 to C2.
The existing uses, approved uses and likely future uses of land in the vicinity of the land subject to a proposal	**Consistent |** An appropriate level of buffer and transition from R1 to C2 has been provided to ensure minimal land use conflict.
The services and infrastructure that are or will be available to meet the demands arising from the proposal and any proposed financial arrangements for infrastructure provision	**Consistent**

Specific public benefits will be outlined within an offer to enter into a Voluntary Planning Agreement with the Council upon gazettal of the proposed amendments to the QPRLEP, including the protection and management of the residual lot containing all native vegetation within one parcel over C2 zoned land.

It is requested that Council endorse the Planning Proposal and request the DPHI to issue a Gateway determination to commence the process of amending the relevant planning maps of the QPRLEP, thereby permitting the logical use of the land for residential subdivision.

13. ATTACHMENTS

U R B A N E

DESIGN PLANNING ADVISORY

Melbourne

Suite 2, 11 Wilson Street,
South Yarra VIC 3141 03 7067 5282

Canberra

Level 1, 33 Allara Street,
Canberra ACT 2601 02 5119 3047

QUEANBEYAN-PALERANG REGIONAL COUNCIL

Council Meeting Attachment

12 NOVEMBER 2025

ITEM 9.4 FINALISATION OF PLANNING PROPOSAL TO REZONE SUNSET ESTATE - STAGE 2 - 141 GOOGONG ROAD, GOOGONG

ATTACHMENT 2 SUBMISSIONS REPORT - PP SUNSET ESTATE - 141 GOOGONG ROAD

Community Submissions for the Planning Proposal to Rezone Sunset Estate – Stage 2 141 Googong Road Googong PP-2024-2398

Ref: Doc Set ID 3371405

qprc.nsw.gov.au

Community Submissions for the Planning Proposal
To Rezone Sunset Estate – Stage 2 – 141 Googong Road Googong

Executive Summary of engagement report:

The planning proposal was publicly exhibited in accordance with the *Environmental Planning and Assessment Act 1979* and the Environmental Planning and Assessment Regulations 2021. It had regard to other relevant plans and guidelines, including QPRC's Community Engagement and Participation Plan, the Local Environmental Plan Making Guidelines 2023, and any other conditions of the Gateway determination.

The Gateway determination recommends the planning proposal to be exhibited for a minimum of 28 days. The planning proposal was placed on public exhibition from 28 April 2025 until 26 May 2025.

Council sent out 65 emails to adjoining landowners with a further 25 letters by mail to adjoining landowners living in Googong, informing the landowners about the planning proposal.

The public notification of the exhibition comprised a notification and request for feedback on Council's website and an email or letter to landowners in the vicinity of the subject site.

Participation in engagement:

There were 426 visits to Council's Your Voice page of the planning proposal (including photographs).

Downloads with Associated Documents:

Planning Proposal	101
Gateway determination	28
Traffic Impact Statement	27
Council Report & Minutes of Meeting 18 Dec 2024	16
Visual Impact Assessment	13
QPRC Heriatge Advisors Report – Sunset Homestead	13
Infrastructure Capacity Statement	13
Bushfire Strategic Study	10
Biodiversity Development Assessment Report	8
Flood Impact Assessment	6
Geotechnical Investigation	5
Aboriginal Cultural Heritage Assessment	3

Community Submissions for the Planning Proposal
To Rezone Sunset Estate – Stage 2 – 141 Googong Road Googong

Comments received:

Comments made in a written submission on QPRC's Your Voice regarding the planning proposal for the rezoning of Sunset Estate – 141 Googong Road, Googong, from community land to operational land (thirteen written submissions were received).

Submitter:	Submission:	Council response	Recommendation
1	Dear Council Team I am writing in response to the public exhibition of the Sunset Planning Proposal – Amendment to QPRLEP 2022. My husband and I are residents and property owners in the original Sunset estate and wish to formally raise our concerns regarding the proposed rezoning of land directly opposite our block. When we purchased our 1,000 m² block several years ago, we were advised that the land in front of us was heritage-listed and could not be built on. This assurance played a significant role in our decision to invest in the estate, as the rural setting, low density, and uninterrupted views were key features that set Sunset apart from the broader Googong development. We now understand that this land is being considered for rezoning from C2 Environmental Conservation to R1 General Residential, and the minimum lot size for parts of this land is proposed to be reduced to 600 m². This proposal fundamentally changes the character of the area and risks undermining the distinctive identity and value of the Sunset estate. **Key concerns:** 1. Impact on Property Value and Character The proposed development will directly obstruct views that have been a key selling point of our estate. The value of our home will likely be negatively impacted, and the low-	Noted. Currently, part of the vacant land on the Stage 2 plan is zoned R1 – General Residential. The planning proposal is to allow additional adjoining land on the western side to be rezoned from C2 Environmental Conservation to R1 General Residential. It will also rezone part of the land on the eastern side, currently zoned R1 General Residential containing EPBC BoxGum Woodland to C2 Environmental Conservation. The current planning proposal contains indicative subdivision drawings. The proponent will be providing Council with amended drawings which will be assessed at the development application stage. Under the Googong Development Control Plan (DCP) – Part 3 – The Master Plan will accommodate a diversity of housing types including single dwelling, multi dwelling, attached and detached homes (3.22 Housing Diversity). The **Towards 2040 QPRC Local Strategic Planning Statement** outlines how growth and change will be managed within the Queanbeyan-Palerang LGA. The following key priorities and actions demonstrate how this planning proposal aligns with the statement's objectives: **Planning Priority 2, Action 4.2.4** • **Objective:** Investigate the potential for higher density development in areas adjacent to open	No action is required.

Community Submissions for the Planning Proposal
To Rezone Sunset Estate – Stage 2 – 141 Googong Road Googong

Submitter:	Submission:	Council response	Recommendation
	density, semi-rural feel will be replaced with a suburban landscape inconsistent with the estate's current design. 2. Consistency with Sunset Estate's Identity Sunset is defined by large block sizes (minimum 1,000 m²), high-quality builds, and a demographic seeking a quieter, more spacious lifestyle. In contrast, the Googong estate across the road comprises smaller lots, higher density housing, and a very different feel. To preserve the point of difference, any extension to Sunset should reflect these existing characteristics. 3. Minimum Lot Sizes Must Be Maintained The introduction of 600 m² blocks is completely out of step with the 1,000 m² minimum that defines Sunset. Maintaining a 1,000 m² minimum for any new blocks within or adjacent to the Sunset estate is essential to protect the estate's integrity and appeal. 4. Preservation of Environmental and Visual Amenity If development must proceed, we strongly urge Council to preserve as much of the surrounding land as possible in its natural form. Buffer zones and conservation areas should be retained or enhanced to minimise the visual and environmental impacts on existing residents. 5. Heritage Significance of the Sunset Homestead Directly in front of our property sits the old Sunset Homestead, which is heritage listed. While we acknowledge the proposal includes a curtilage around this site, we believe the development footprint should be further reduced to ensure the homestead remains surrounded by greenery and is clearly visible from the road. This would preserve its historical context and further	spaces, where increased amenity and recreational opportunities are available. • **Proposal Impact:** This proposal supports this priority by reducing the minimum lot size of a portion of the R1 zoned land to 600m² in proximity to open space and recreation areas. The larger 1,000 m² lot sizes are maintained at the interface of the C2 and R1 zones, ensuring a smooth transition between residential and conservation areas. **Planning Priority 4, Action 4.4.9:** • **Objective:** Provide diverse housing options at varying costs to meet the evolving needs of the community and explore partnerships with community housing providers to offer affordable housing. Additionally, enhance residential accessibility and availability compared to the ACT. • **Proposal Impact:** This proposal supports this priority by introducing 600 m² min lot size, which diversify housing options and help address the anticipated population growth. The range of lot sizes contributes to meeting the demand for affordable and accessible housing, ensuring the region can accommodate a variety of community needs **Planning Priority 6, Action 4.6.3:** • **Objective:** Review opportunities for high quality environmental vegetation in QPRC to be proactively conserved as part of recent biodiversity reforms, including potential incoming generations. • **Proposed Impact:** The proposal supports this objective by contributing to the proactive conservation of ecological significant vegetation, aligning with broader biodiversity conservation goals.	

Community Submissions for the Planning Proposal
To Rezone Sunset Estate – Stage 2 – 141 Googong Road Googong

Submitter:	Submission:	Council response	Recommendation
	distinguish the Sunset estate as a unique and meaningful part of the region, benefiting both residents and the broader community. 6. Increased Traffic and Change of Road Function We also hold serious concerns regarding the proposed access arrangement. Our street was originally sold to us on the understanding that it would contain only nine homes, maintaining a quiet, low-traffic environment. The proposed changes would turn this street into a primary entrance and thoroughfare for the extended estate, significantly increasing traffic and changing the nature and safety of our neighbourhood. We urge Council to investigate alternative access options further up the road, where there appears to be ample space for a more suitable entrance that does not disrupt the integrity of the existing Sunset community. We understand the need for growth and housing, but this should not come at the cost of breaking commitments that attracted buyers to this estate in the first place. We respectfully request that Council ensure the Sunset estate is extended in a way that preserves its unique characteristics, and that any planning decisions reflect the expectations of those who have already invested in this area in good faith. Thank you for considering our submission.	**Planning Priority 8, Action 4.8.1** • **Objective:** Focus settlement in planned locations with access to higher-level services such a employment, education and health. • **Proposed Impact:** The proposal aligns with this priority by providing increased supply and choice in a location that is well-serviced by existing infrastructure, ensuring access to essential services for future residents. The future development application will also assess in greater detail the road access to the Stage 2 subdivision development. As per Gateway determination the planning proposal was forwarded to NSW Rural Fire Service (RFS). The RFS recommend that 'the future subdivision should provide two road/egress points from Googong Road that can be used by both residents and emergency services.' Council agrees with the RFS. Council has been provided by SCT Consulting – Googong Sunset Estate Stage 2 – Traffic Impact Statement – 28 October 2024. This can be accessed on QPRC Your Voiced website: **Document 09-Traffic Impact Statement** https://yourvoice.qprc.nsw.gov.au/sunset-planning-proposal The current planning proposal contains indicative subdivision drawings. The proponent will be providing Council with amended drawings which will be assessed at the development application stage. An important aspect of the planning proposal is the proposed curtilage of 30m x 30m for McCawley "Sunset" Homestead Complex Item I285. Currently the heritage listing encompasses the southern portion of the site and extends to many in Stage 1 dwellings. Consequently,	

Community Submissions for the Planning Proposal
To Rezone Sunset Estate – Stage 2 – 141 Googong Road Googong

Submitter:	Submission:	Council response	Recommendation
		many dwelling approvals in Stage 1 require heritage consideration due to the heritage overlay. This requirement limits the use of the complying development pathway and requires Council to review heritage impact during development application assessments.	
2	1.The extra traffic this will create will require better road surface 2. At least 1 if not 2 pedestrian crossings. As the people from Sunset walk across to the Googong North shops, crossing the Googong Road, they are currently unsafe and with further development to the west an additional crossing will also be on unsighted corners. 3. The visual impact t of housing in the magenta coloured area will cut across the north running valley impacting current long range views we all enjoy.	Noted. The development application (DA) will assess the legislative requirements for the road surface and together with pedestrian safety for existing Stage 1 residents and new Stage 2 residents. Council has been provided by SCT Consulting – Googong Sunset Estate Stage 2 – Traffic Impact Statement – 28 October 2024. This can be access on QPRC Your Voiced website: **Document 09-Traffic Impact Statement** https://yourvoice.qprc.nsw.gov.au/sunset-planning-proposal	No action is required.
3	Subject: Safety of pedestrian traffic traversing Googong Rd. References: 1. 02-Council Report and Minutes of Meeting 18Dec2024 2. 03-Planning Proposal - TRAFFIC IMPACT ASSESSMENT 3. 09-Traffic Impact Statement 4. Googong_Rd_Sidewalk.png Concern: The Sunset Planning Proposal has evidently undertaken a throrough review of vehicle traffic implications whilst inadequately identifying the safety concerns introduced to pedestrian traffic destined to or origionating from the subdivision. The Council Report at Reference 1 concurs	Noted. The development application (DA) will assess the legislative requirements for the road surface and together with pedestrian safety for existing Stage 1 residents and new Stage 2 residents. The future development application will also assess in greater detail the road access to the Stage 2 subdivision development. As per Gateway determination the planning proposal was forwarded to NSW Rural Fire Service (RFS). The RFS recommend that 'the future subdivision should provide two road/egress points from Googong Road that can be used by both residents and emergency services.' Council agrees with the RFS.	No action is required.

Community Submissions for the Planning Proposal
To Rezone Sunset Estate – Stage 2 – 141 Googong Road Googong

Submitter:	Submission:	Council response	Recommendation
	with the conclusion of the Traffic Impact Statement at Reference 3, stating the "existing and planned transport infrastructure can adequately be accommodated without any infrastructure changes", which I urge to be further considered with respect to the safety of pedestrian traffic. As identified in Reference 3, paragraph 2.4, "pedestrian facilities should be provided to link those within the Googong Neighbourhood". This footpath exists, and connects pedestrian traffic to Googong by traversing the 60km/h, two lane Googong Rd. As noted in Reference 3, paragraph 4.3 and 5.4, this pathway would be used to facilitate trips to bus stops, schools and the town centre. Given the aggregate number of lots within Sunset Googong (~123), it is reasonable expected for the quantity and frequency of pedestrian traffic traversing Googong Rd to significantly increase. Additionally, noting the average number of children per household in New South Wales is 0.7 (Reference Australian Bureau of Statistics 2024), it is not unreasonable to suggest that more that 170 transits of Googong Rd by school aged children may occur on any given weekday. There is currently insufficient infrastructure in place to accommodate the pedestrian traffic traversing Googong Rd, and the likelyhood of incident will increase with the frequency of transiting pedestrian traffic. **Recommendation:** A traffic management solution be investigated and implemented to allow pedestrian traffic to safely traverse Googong Rd.	Council has been provided by SCT Consulting – Googong Sunset Estate Stage 2 – Traffic Impact Statement – 28 October 2024. This can be access on QPRC Your Voiced website: **Document 09-Traffic Impact Statement** https://yourvoice.qprc.nsw.gov.au/sunset-planning-proposal	
4	Absolutely not QPRC has allowed and encouraged the development of sensitive land without thought to leaving green spaces and environmental sensitive areas. You should remove any and all climate change agendas from council as you have no intention of holding sensitive	Noted. Currently part of the vacant land on the Stage 2 plan is zoned R1 – General Residential. The planning proposal is to allow additional adjoining land on the western side to	No action is required.

Community Submissions for the Planning Proposal
To Rezone Sunset Estate – Stage 2 – 141 Googong Road Googong

Submitter:	Submission:	Council response	Recommendation
	habitat and trees for wildlife or to cool residential housing in summer. Is there mandatory solar power to ALL roofs mandatory water tanks mandatory grey water for toilets ?? Are there mandatory tree preservation of ALL the trees of significance. Be honest about your environmental policy which is that we can build and destroy endangered habitat just so long as someones pockets get lined and why seek feedback just to lie to the community and do what you want.	be rezoned from C2 Environmental Conservation to R1 General Residential. It will also rezone part of land on the eastern side currently zoned R1 General Residential containing EPBC BoxGum Woodland to C2 Environmental Conservation. The current planning proposal contains indicative subdivision drawings. The proponent will be providing Council with amended drawings which will be assessed at the development application stage. Mandatory energy efficiency: New homes in Googong are required to achieve a minimum 40% energy-saving rating under the NSW Building Sustainability Index (BASIX), which is higher than the standard southern region target. This incentivises solar installations to meet energy reduction targets. Recycled water system: Googong has an Integrated Water Cycle (IWC) management system that provides treated recycled water via a purple pipe network for non-potable uses like toilet flushing, watering gardens and lawns, and washing cars.	
5	It is impossible to comment on this matter when there are no actual maps provided of what areas are being rezoned. The photos provided with this request for comment are entirely unhelpful when it comes to actually determining what is being changed.	Noted. The maps can be found on QPRC Your Voice – Sunset Planning Proposal – Amendment to QPRLEP 2022 – **Document 03-Planning Proposal** https://yourvoice.qprc.nsw.gov.au/sunset-planning-proposal	No action is required.
6	Opposed to the rezoning. Enough houses already with only one access road out on this side of Googong.	Noted.	No action is required.

Community Submissions for the Planning Proposal
To Rezone Sunset Estate – Stage 2 – 141 Googong Road Googong

Submitter:	Submission:	Council response	Recommendation
		Currently part of the vacant land is zoned R1 – General Residential. Dwellings houses are permitted with consent under the QPRLEP 2022. The planning proposal is to allow additional adjoining land on the western side to be rezoned from C2 Environmental Conservation to R1 General Residential. It will also rezone part of land on the eastern side currently zoned R1 General Residential containing EPBC BoxGum Woodland to C2 Environmental Conservation. The current planning proposal contains indicative subdivision drawings. The proponent will be providing Council with amended drawings which will be assessed at the development application	
7	The proposal will impact biodiversity in the area and habitat.	Noted. Currently part of the vacant land is zoned R1 – General Residential. Dwellings houses are permitted with consent under the QPRLEP 2022. The planning proposal is to allow additional adjoining land on the western side to be rezoned from C2 Environmental Conservation to R1 General Residential. It will also rezone part of land on the eastern side currently zoned R1 General Residential containing EPBC BoxGum Woodland to C2 Environmental Conservation. As noted, Council Report and Minutes – 9.4 Sunset Planning Proposal – 141 Googong Road Googong – 18 December 2024 **(Resolution: 599/24)** that the Biodiversity Assessment Report (BDAR) mapped the ecological communities observed during the site surveys. The report noted that no threatened ecological community, threatened species habit or BC Act native vegetation were observed in the central and southeastern	No action is required.

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Submitter:	Submission:	Council response	Recommendation
		parts of the site. The report further advises that the extensive loss of native vegetation and threatened species habit is a result of significant land modification due to its current and past land uses, being primarily livestock grazing. The proposed development is located on the central and southern parts of the site that lack significant biodiversity values, therefore, the impact of proposed development on the biodiversity of the site is minimal.	
8	**RECEIVED VIA COUNCIL EMAIL ** I am writing to express my concerns regarding the Sunset Planning Proposal and the significant changes it would bring to our estate, particularly concerning traffic flow, infrastructure, and the overall character of our community. My wife and I specifically chose to purchase our home in Sunset Estate because of the promise of a peaceful, low-traffic environment. We were informed that the area would remain a small, premium development with only a limited number of homes. The current proposal, however, would drastically alter the character of the estate, turning our quiet street into a major thoroughfare for both construction and future traffic. The proposed development would see increased traffic, including large trucks and machinery, entering and exiting through our street, which simply isn't designed for such volumes. The infrastructure here was intended to serve a much smaller community, and the roads are already showing signs of wear. The additional strain from construction vehicles and later from residents' everyday traffic will not only damage the roads but will also significantly reduce the peaceful atmosphere that initially drew us to the estate. The constant disruption caused by heavy vehicles will affect not only the quality of life for current residents but also reduce the value of our properties.	Noted. Currently part of the vacant land on the Stage 2 plan is zoned R1 – General Residential. The planning proposal is to allow additional adjoining land on the western side to be rezoned from C2 Environmental Conservation to R1 General Residential. It will also rezone part of land on the eastern side currently zoned R1 General Residential containing EPBC BoxGum Woodland to C2 Environmental Conservation. The current planning proposal contains indicative subdivision drawings. The proponent will be providing Council with amended drawings which will be assessed at the development application stage. Under the Googong Development Control Plan (DCP) – Part 3 – The Master Plan will accommodate a diversity of housing types including single dwelling, multi dwelling, attached and detached homes (3.22 Housing Diversity). The **Towards 2040 QPRC Local Strategic Planning Statement** outlines how growth and change will be managed within the Queanbeyan-Palerang LGA. The following key priorities and actions demonstrate how this planning proposal aligns with the statement's objectives:	No action is required.

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	Moreover, the placement of the new development directly in front of our estate raises another concern—the view. One of the key features that makes Sunset Estate unique is the wide-open space we enjoy, particularly the scenic outlooks that are central to the quality of life here. The proposed rezoning and development would block those views, replacing them with rows of houses and reducing the open space that currently enhances the living experience for us. The homes on our street were purchased with the expectation that we would have this open, natural space directly in front of us, and this development would significantly diminish the appeal and future resale value of our properties. In addition to these concerns, the preservation of the heritage-listed McCawley "Sunset" Homestead Complex must be a priority. This historic site is an integral part of our community's identity and should be respected in the planning process. I believe the development should be directed to the side of the existing estate, not directly in front, to ensure that the heritage space surrounding the homestead remains intact. The homestead should have a clear, unobstructed view of its surroundings to maintain its rightful position within the estate and preserve its historical significance. This would also ensure that the new development complements rather than detracts from the character and charm of the existing estate. While I fully understand the need for growth and development, I strongly believe that the current proposal does not adequately consider the long-term impact on existing residents and the heritage value of the estate. I urge Council to reassess the proposed plans, taking into account the negative consequences for traffic, infrastructure, views, and the protection of historical landmarks. A solution that reroutes the development to	**Planning Priority 2, Action 4.2.4** • **Objective:** Investigate the potential for higher density development in areas adjacent to open spaces, where increased amenity and recreational opportunities are available. • **Proposal Impact:** This proposal supports this priority by reducing the minimum lot size of a portion of the R1 zoned land to 600m² in proximity to open space and recreation areas. The larger 1,000 m² lot sizes are maintained at the interface of the C2 and R1 zones, ensuring a smooth transition between residential and conservation areas. **Planning Priority 4, Action 4.4.9:** • **Objective:** Provide diverse housing options at varying costs to meet the evolving needs of the community and explore partnerships with community housing providers to offer affordable housing. Additionally, enhance residential accessibility and availability compared to the ACT. • **Proposal Impact:** This proposal supports this priority by introducing 600 m² min lot size, which diversify housing options and help address the anticipated population growth. The range of lot sizes contributes to meeting the demand for affordable and accessible housing, ensuring the region can accommodate a variety of community needs **Planning Priority 6, Action 4.6.3:** • **Objective:** Review opportunities for high quality environmental vegetation in QPRC to be proactively conserved as part of recent biodiversity reforms, including potential incoming generations. • **Proposed Impact:** The proposal supports this objective by contributing to the proactive	

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	the side of the estate would allow for growth without sacrificing the character that makes Sunset Estate unique. Thank you for considering my concerns. I look forward to seeing a development plan that balances the needs of new residents with the preservation of the current estate's qualities.	conservation of ecological significant vegetation, aligning with broader biodiversity conservation goals. **Planning Priority 8, Action 4.8.1** • **Objective:** Focus settlement in planned locations with access to higher-level services such a employment, education and health. • **Proposed Impact:** The proposal aligns with this priority by providing increased supply and choice in a location that is well-serviced by existing infrastructure, ensuring access to essential services for future residents. The future development application will also assess in greater detail the road access to the Stage 2 subdivision development. As per Gateway determination the planning proposal was forwarded to NSW Rural Fire Service (RFS). The RFS recommend that 'the future subdivision should provide two road/egress points from Googong Road that can be used by both residents and emergency services.' Council agrees with the RFS. Council has been provided by SCT Consulting – Googong Sunset Estate Stage 2 – Traffic Impact Statement – 28 October 2024. This can be access on QPRC Your Voiced website: **Document 09-Traffic Impact Statement** https://yourvoice.qprc.nsw.gov.au/sunset-planning-proposal	
9	**RECEIVED VIA COUNCIL EMAIL** I am writing in response to the public exhibition of the Sunset Planning Proposal – Amendment to QPRLEP 2022. My husband and I are residents and property owners in the original Sunset estate and wish to formally	Noted. Currently part of the vacant land on the Stage 2 plan is zoned R1 – General Residential. The planning proposal is to allow additional adjoining land on the western side to	No action is required.

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	raise our concerns regarding the proposed rezoning of land directly opposite our block. When we purchased our 1,000 m² block several years ago, we were advised that the land in front of us was heritage-listed and could not be built on. This assurance played a significant role in our decision to invest in the estate, as the rural setting, low density, and uninterrupted views were key features that set Sunset apart from the broader Googong development. We now understand that this land is being considered for rezoning from C2 Environmental Conservation to R1 General Residential, and the minimum lot size for parts of this land is proposed to be reduced to 600 m². This proposal fundamentally changes the character of the area and risks undermining the distinctive identity and value of the Sunset estate. **Key concerns:** 1. Impact on Property Value and Character The proposed development will directly obstruct views that have been a key selling point of our estate. The value of our home will likely be negatively impacted, and the low-density, semi-rural feel will be replaced with a suburban landscape inconsistent with the estate's current design. 2. Consistency with Sunset Estate's Identity Sunset is defined by large block sizes (minimum 1,000 m²), high-quality builds, and a demographic seeking a quieter, more spacious lifestyle. In contrast, the Googong estate across the road comprises smaller lots, higher density housing, and a very different feel. To preserve the point of difference, any extension to Sunset should reflect these existing characteristics.	be rezoned from C2 Environmental Conservation to R1 General Residential. It will also rezone part of land on the eastern side currently zoned R1 General Residential containing EPBC BoxGum Woodland to C2 Environmental Conservation. The current planning proposal contains indicative subdivision drawings. The proponent will be providing Council with amended drawings which will be assessed at the development application stage. Under the Googong Development Control Plan (DCP) – Part 3 – The Master Plan will accommodate a diversity of housing types including single dwelling, multi dwelling, attached and detached homes (3.22 Housing Diversity). The **Towards 2040 QPRC Local Strategic Planning Statement** outlines how growth and change will be managed within the Queanbeyan-Palerang LGA. The following key priorities and actions demonstrate how this planning proposal aligns with the statement's objectives: **Planning Priority 2, Action 4.2.4** • **Objective:** Investigate the potential for higher density development in areas adjacent to open spaces, where increased amenity and recreational opportunities are available. • **Proposal Impact:** This proposal supports this priority by reducing the minimum lot size of a portion of the R1 zoned land to 600m² in proximity to open space and recreation areas. The larger 1,000 m² lot sizes are maintained at the interface of the C2 and R1 zones, ensuring a smooth transition between residential and conservation areas. **Planning Priority 4, Action 4.4.9:**	

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	3. Minimum Lot Sizes Must Be Maintained The introduction of 600 m² blocks is completely out of step with the 1,000 m² minimum that defines Sunset. Maintaining a 1,000 m² minimum for any new blocks within or adjacent to the Sunset estate is essential to protect the estate's integrity and appeal. 4. Preservation of Environmental and Visual Amenity If development must proceed, we strongly urge Council to preserve as much of the surrounding land as possible in its natural form. Buffer zones and conservation areas should be retained or enhanced to minimise the visual and environmental impacts on existing residents. 5. Heritage Significance of the Sunset Homestead Directly in front of our property sits the old Sunset Homestead, which is heritage listed. While we acknowledge the proposal includes a curtilage around this site, we believe the development footprint should be further reduced to ensure the homestead remains surrounded by greenery and is clearly visible from the road. This would preserve its historical context and further distinguish the Sunset estate as a unique and meaningful part of the region, benefiting both residents and the broader community. 6. Increased Traffic and Change of Road Function We also hold serious concerns regarding the proposed access arrangement. Our street was originally sold to us on the understanding that it would contain only nine homes, maintaining a quiet, low-traffic environment. The proposed changes would turn this street into a primary entrance and thoroughfare for the extended estate, significantly increasing traffic and changing the nature and safety of our neighbourhood. We urge Council to	• **Objective:** Provide diverse housing options at varying costs to meet the evolving needs of the community and explore partnerships with community housing providers to offer affordable housing. Additionally, enhance residential accessibility and availability compared to the ACT. • **Proposal Impact:** This proposal supports this priority by introducing 600 m² min lot size, which diversify housing options and help address the anticipated population growth. The range of lot sizes contributes to meeting the demand for affordable and accessible housing, ensuring the region can accommodate a variety of community needs **Planning Priority 6, Action 4.6.3:** • **Objective:** Review opportunities for high quality environmental vegetation in QPRC to be proactively conserved as part of recent biodiversity reforms, including potential incoming generations. • **Proposed Impact:** The proposal supports this objective by contributing to the proactive conservation of ecological significant vegetation, aligning with broade3r biodiversity conservation goals. **Planning Priority 8, Action 4.8.1** • **Objective:** Focus settlement in planned locations with access to higher-level services such a employment, education and health. • **Proposed Impact:** The proposal aligns with this priority by providing increased supply and choice in a location that is well-serviced by existing infrastructure, ensuring access to essential services for future residents.	

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	investigate alternative access options further up the road, where there appears to be ample space for a more suitable entrance that does not disrupt the integrity of the existing Sunset community. We understand the need for growth and housing, but this should not come at the cost of breaking commitments that attracted buyers to this estate in the first place. We respectfully request that Council ensure the Sunset estate is extended in a way that preserves its unique characteristics, and that any planning decisions reflect the expectations of those who have already invested in this area in good faith. Thank you for considering our submission.	The future development application will also assess in greater detail the road access to the Stage 2 subdivision development. As per Gateway determination the planning proposal was forwarded to NSW Rural Fire Service (RFS). The RFS recommend that 'the future subdivision should provide two road/egress points from Googong Road that can be used by both residents and emergency services.' Council agrees with the RFS. Council has been provided by SCT Consulting – Googong Sunset Estate Stage 2 – Traffic Impact Statement – 28 October 2024. This can be access on QPRC Your Voiced website: **Document 09-Traffic Impact Statement** https://yourvoice.qprc.nsw.gov.au/sunset-planning-proposal An important aspect of the planning proposal is the proposed curtilage of 30m x 30m for McCawley "Sunset" Homestead Complex Item I285. Currently the heritage listing encompasses the southern portion of the site and extends to many in Stage 1 dwellings. Consequently, many dwelling approvals in Stage 1 require heritage consideration due to the heritage overlay. This requirement limits the use of the complying development pathway and requires Council to review heritage impact during development application assessments.	
10	I think it's not a good idea to change heritage buildings or rezone to allow for the development of once heritage listed sites/structures	Noted. An important aspect of the planning proposal is the proposed curtilage of 30m x 30m for McCawley "Sunset" Homestead Complex Item I285. Currently the heritage listing encompasses the southern portion of the site and extends to many in Stage 1 dwellings. Consequently, many dwelling approvals in Stage 1 require heritage consideration due to the heritage overlay. This	No action is required.

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		requirement limits the use of the complying development pathway and requires Council to review heritage impact during development application assessments.	
11	These comments relate to the document entitled "Sunset Stage 2 Planning Proposal" as prepared by Urbane Studio and dated 26 November, 2024. There appears to be confusion as for whom the document was prepared in that the cover sheet cites Binowee Developments Pty Ltd whilst the first para of the Executive Summary (P6) refers to Bionowee Developments. Whilst this is not particularly significant it does not reflect positively on the QMS of the entity preparing and reviewing the document (Urbane Studio). Para 3 of the Executive Summary seems to infer that the 2009 rezoning supporting the development of Googong township was supported by broad-scale mapping which needed to be supported by site-specific investigations to more accurately define zoning boundaries. Does this mean that the development of Googong was based on these broad scale assumptions and may, therefore, not be particularly accurate. In the list of abbreviations used within the report, the BC Act is shown as a NSW act (P7), but the same approach has not been adopted with regard to the EP&A Act or the EPBC Act - which are NSW and Commonwealth acts respectively. Section 2.1 Subject Site - Figure 1: on this figure the Googong Town Centre and the Googong NH1 Centre are identified using American spelling. Surely it is not expecting too much for an Australian consulting company (or any company for that matter) to utilise the spelling conventions appropriate to the area which is the subject of its report. Again, this does not reflect positively on its	Noted. A Council records indicate that Sunset Estate – Stage 1 (141 Googong Road, Googong) was subdivided in 21 residential lots as per Development Application (DA) 67-2018 on 10 April 2019. Council Item 7.2 **(Resolution No: PLA034/19)** and the Applicant/Owner was Hugh Cooke/Tyban Pty Limited. The resolution was carried unanimously. Council records show that Lot 39 DP 1257837 – 141 Googong Road, Googong is Owned by Tyban Pty Limited. Errors have been noted.	No action is required.

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	QMS. This comment also relates to other instances throughout the report, e.g., dot point two of Section 2.2 but will not be identified in later cases - the report author should be required to review and amend for all such spelling errors. Figure 2 just "sits" in the report, not having been refenced in the text at all. Section 3.1 - the text in this section refers at P14 to a figure below whereas the figure is, in fact, above this reference and should be cited as Figure 3. Section 3.1 states, at P15, that "in locations where slopes exceed 15%, any development must be thoughtfully designed to enhance...". In spite of this, the planned developed as shown in Figure 5 (P19) does not appear to differentiate between those areas where the slope exceeds 15% and those where it is less than this - areas near to Googong Rd at the southern edge of the development.		
12	There should be no net loss of C2 Conservation zone land. Any rezoning of C2 zone land, should be 100% offset with alternative land rezoned from R1 to C2. The developer should be required to rehabilitate and improve all C2 land to high biodiversity value - especially along water courses.	Noted. Currently part of the vacant land on the Stage 2 plan is zoned R1 – General Residential. The planning proposal is to allow additional adjoining land on the western side to be rezoned from C2 Environmental Conservation to R1 General Residential. It will also rezone part of land on the eastern side currently zoned R1 General Residential containing EPBC BoxGum Woodland to C2 Environmental Conservation. The current planning proposal contains indicative subdivision drawings. The proponent will be providing Council with amended drawings which will be assessed at the development application stage.	No action is required.

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		Under the Googong Development Control Plan (DCP) – Part 3 – The Master Plan will accommodate a diversity of housing types including single dwelling, multi dwelling, attached and detached homes (3.22 Housing Diversity). The **Towards 2040 QPRC Local Strategic Planning Statement** outlines how growth and change will be managed within the Queanbeyan-Palerang LGA. The following key priorities and actions demonstrate how this planning proposal aligns with the statement's objectives: **Planning Priority 2, Action 4.2.4** • **Objective:** Investigate the potential for higher density development in areas adjacent to open spaces, where increased amenity and recreational opportunities are available. • **Proposal Impact:** This proposal supports this priority by reducing the minimum lot size of a portion of the R1 zoned land to 600m² in proximity to open space and recreation areas. The larger 1,000 m² lot sizes are maintained at the interface of the C2 and R1 zones, ensuring a smooth transition between residential and conservation areas. **Planning Priority 4, Action 4.4.9:** • **Objective:** Provide diverse housing options at varying costs to meet the evolving needs of the community and explore partnerships with community housing providers to offer affordable housing. Additionally, enhance residential accessibility and availability compared to the ACT. • **Proposal Impact:** This proposal supports this priority by introducing 600 m² min lot size, which diversify housing options and help address the anticipated population growth. The range of lot sizes contributes to meeting the demand for affordable and accessible housing, ensuring the	

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		region can accommodate a variety of community needs **Planning Priority 6, Action 4.6.3:** • **Objective:** Review opportunities for high quality environmental vegetation in QPRC to be proactively conserved as part of recent biodiversity reforms, including potential incoming generations. • **Proposed Impact:** The proposal supports this objective by contributing to the proactive conservation of ecological significant vegetation, aligning with broader biodiversity conservation goals. **Planning Priority 8, Action 4.8.1** • **Objective:** Focus settlement in planned locations with access to higher-level services such a employment, education and health. • **Proposed Impact:** The proposal aligns with this priority by providing increased supply and choice in a location that is well-serviced by existing infrastructure, ensuring access to essential services for future residents.	
13	RECEIVED VIA COUNCIL EMAIL I live in Gorge Creek Drive in Googong and this email contains my concerns, suggestions and recommendations in response to the Sunset Stage 2 Planning Proposal. Traffic Concerns According to our interpretation of the proposal, Gorge Creek Drive would be the only ingress / egress road for the Stage 2 development. Given the planned 86 new lots, my wife and I have serious concerns about the level of traffic on the road in terms of noise, safety and pollution.	Noted. Currently part of the vacant land on the Stage 2 plan is zoned R1 – General Residential. The planning proposal is to allow additional adjoining land on the western side to be rezoned from C2 Environmental Conservation to R1 General Residential. It will also rezone part of land on the eastern side currently zoned R1 General Residential containing EPBC BoxGum Woodland to C2 Environmental Conservation.	No action is required.

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	In the original plan (Figure 2-3, Page 6 of the Traffic Impact Statement) both Gorge Creek Drive and Chimney Rise were to be used as collector roads for Stage 2 and this change will now make our road a major thoroughfare with all the associated traffic impacts. When we bought our land and were told about Stage 2, we were informed about the dual road plan and were happy with this. Looking at the Stage 2 lay out, the use of Chimney Rise makes complete sense as a second collector road as it will service the northern part of Stage 2 and spread the traffic load between the two streets. Recommendation: We are unhappy with this change as it will significantly affect our lifestyle over the long term and disrupt our day-to-day living, including even simple things such as entering / departing our property due to the increased traffic flows. We request serious consideration be given to using Chimney Rise as a second collector road for Stage 2 as per the original plan. Speeding Given the length of Gorge Creek Drive from Googong Road to the planned entry into Stage 2, inevitably the road will become a 'drag strip' for all vehicles (tradies, residents etc) which will further impact us due to increased noise, reduced safety etc. I say this from personal experience having lived in Insley Street in Googong for 7 years where our road acted as a 'Local Street' under your definition, but on an increasing basis became dangerous due to drivers using it to move from the streets around Googong Pool up to Caragh Road at high speed - given Insley Street was a 50 kph zone, I saw cars driving past regularly at estimated speeds of 70-80 kph which was disconcerting to say the least and outright dangerous at times. Gorge Creek Drive is a much wider road than Insley Street and noting there will be few parked cars on the	The current planning proposal contains indicative subdivision drawings. The proponent will be providing Council with amended drawings which will be assessed at the development application stage. Under the Googong Development Control Plan (DCP) – Part 3 – The Master Plan will accommodate a diversity of housing types including single dwelling, multi dwelling, attached and detached homes (3.22 Housing Diversity). The **Towards 2040 QPRC Local Strategic Planning Statement** outlines how growth and change will be managed within the Queanbeyan-Palerang LGA. The following key priorities and actions demonstrate how this planning proposal aligns with the statement's objectives: **Planning Priority 2, Action 4.2.4** • **Objective:** Investigate the potential for higher density development in areas adjacent to open spaces, where increased amenity and recreational opportunities are available. • **Proposal Impact:** This proposal supports this priority by reducing the minimum lot size of a portion of the R1 zoned land to 600m² in proximity to open space and recreation areas. The larger 1,000 m² lot sizes are maintained at the interface of the C2 and R1 zones, ensuring a smooth transition between residential and conservation areas. **Planning Priority 4, Action 4.4.9:** • **Objective:** Provide diverse housing options at varying costs to meet the evolving needs of the community and explore partnerships with community housing providers to offer affordable housing. Additionally, enhance residential accessibility and availability compared to the ACT.	

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	road, and no houses on the southern side, I can see the road becoming a 'drag strip' with vehicles reaching high speeds and impacting us in terms of noise, safety and disruption to our lifestyle. Noting our recommendation to make Chimney Rise the second collector road, irrespective of the outcome, traffic calming methods (speed humps or a chicane) should be installed in Gorge Creek Drive, the road correctly marked (lane markings etc) and signposted with a recommendation that the road be sign posted at 40kph. This issue would be mitigated to a good degree by using Chimney Rise as the second collector road and also installing traffic calming measures on it as well. **Recommendation:** Irrespective of whether Gorge Creek Drive and/or Chimney Rise are used as collector road(s), traffic calming measures are a mandatory requirement to reduce traffic speed and reduce the impact of speeding and associated noise and safety issues. Given the impact that traffic will have on us, I view this as a requirement that can't be ignored by council due to the associated impacts on all residents on Gorge Creek Drive. This is particularly relevant given the presence of small children in houses on the street now and the dangers posed to them in time once Stage 2 is constructed and then occupied as houses are built. Stage 2 Land Development Construction Traffic Once work commences on Stage 2, we will be faced with Gorge Creek Drive becoming a heavy vehicle thoroughfare for an extended period which will almost certainly include early morning and late night movement of heavy vehicles (moving heavy engineering equipment), workers vehicles etc that will create significant noise and disruption to residents on the street. Looking at the proposed Stage 2 layout, it is highly recommended that a temporary dirt / gravel road be constructed to	• **Proposal Impact:** This proposal supports this priority by introducing 600 m² min lot size, which diversify housing options and help address the anticipated population growth. The range of lot sizes contributes to meeting the demand for affordable and accessible housing, ensuring the region can accommodate a variety of community needs **Planning Priority 6, Action 4.6.3:** • **Objective:** Review opportunities for high quality environmental vegetation in QPRC to be proactively conserved as part of recent biodiversity reforms, including potential incoming generations. • **Proposed Impact:** The proposal supports this objective by contributing to the proactive conservation of ecological significant vegetation, aligning with broader biodiversity conservation goals. **Planning Priority 8, Action 4.8.1** • **Objective:** Focus settlement in planned locations with access to higher-level services such a employment, education and health. • **Proposed Impact:** The proposal aligns with this priority by providing increased supply and choice in a location that is well-serviced by existing infrastructure, ensuring access to essential services for future residents. An important aspect of the planning proposal is the proposed curtilage of 30m x 30m for McCawley “Sunset” Homestead Complex Item I285. Currently the heritage listing encompasses the southern portion of the site and extends to many in Stage 1 dwellings. Consequently, many dwelling approvals in Stage 1 require heritage consideration due to the heritage overlay. This	

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	accommodate movement of heavy vehicles and keep them off Gorge Creek Drive. Looking at Googong Road, back up from Gorge Creek Drive there is an existing dirt section that leads to the Sunset farm through a gate with 'Sunset' signed on it. This would be a logical location for the dirt / gravel temporary road for vehicles to ingress / egress from the Stage 2 development. Recommendation: Create a temporary dirt / gravel road using the existing Sunset Farm entrance gate as an alternative ingress/egress road for the land development component of the development. This will keep heavy vehicles off Gorge Creek Drive and significantly reduce the impact on residents in Gorge Creek Drive. Stage 2 House Building Construction Traffic Once house construction commences in Stage 2, Gorge Creek Drive will become the thoroughfare for all types of construction traffic including cement trucks, concrete pump trucks, trucks delivering frames / trusses, tradesmen and all other required builder traffic. Noting the 86 proposed blocks, this could amount to years of heavy traffic down Gorge Creek Road that will severely disrupt our lifestyle in terms of noise, pollution and safety. This issue links directly to the points above about speeding and the need to use Chimney Rise as a second collector road to mitigate this issue. It also points to the need for traffic calming measures and correct lane marking and sign posting in the street. Recommendation: Irrespective of whether Gorge Creek Drive and/or Chimney Rise are used as collector road(s), traffic calming measures are a mandatory requirement to reduce traffic speed and reduce the impact of speeding and associated noise and safety issues. Given the impact that traffic will have on us, I view this as a requirement that can't be ignored by council due to the associated	requirement limits the use of the complying development pathway and requires Council to review heritage impact during development application assessments. The future development application will also assess in greater detail the road access to the Stage 2 subdivision development. As per Gateway determination the planning proposal was forwarded to NSW Rural Fire Service (RFS). The RFS recommend that 'the future subdivision should provide two road/egress points from Googong Road that can be used by both residents and emergency services.' Council agrees with the RFS. The development application (DA) will assess the legislative requirements for the road surface and together with pedestrian safety for existing Stage 1 residents and new Stage 2 residents. Council has been provided by SCT Consulting – Googong Sunset Estate Stage 2 – Traffic Impact Statement – 28 October 2024. This can be access on QPRC Your Voiced website: **Document 09-Traffic Impact Statement** https://yourvoice.qprc.nsw.gov.au/sunset-planning-proposal	

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To Rezone Sunset Estate – Stage 2 – 141 Googong Road Googong

Submitter:	Submission:	Council response	Recommendation
	impacts on all residents on Gorge Creek Drive. This is particularly relevant given the presence of small children in houses on the street now and the dangers posed to them in time once Stage 2 is constructed and then occupied as houses are built. Peak Hour Movement Googong Road / Gorge Creek Drive Despite the reports and assessments, I disagree that Gorge Creek Drive on it's own will manage to handle the traffic flowing in and out of Sunset Stages 1 and 2. Having lived in Gorge Creek Drive now for almost a year, there are mornings when you can get stuck turning into Googong Road for 1-2 minutes due to traffic flow at peak hour. Once the 86 blocks of Stage 2 are occupied, there will be a large bank up of vehicles as standard each morning trying to get onto Googong Road, resulting in delays and also potential accidents, as people try to jump into the traffic flow. The same will apply in the evening as traffic slows to turn into Gorge Creek Drive, causing bank ups and potential accidents. **Recommendation:** As Stage 2 fills, strongly recommend a second entrance road to Sunset or a re-development of the existing intersection to include multi lanes / median strips to allow traffic on Googong Road to pass through unimpeded, but let traffic coming out of Sunset to flow onto Googong Road. A good example of a similar intersection proposal is the intersection at Pialligo Avenue and Scherger Drive near the Airport which allows traffic to flow and merge out of Scherger Drive with the traffic already on Pialligo Avenue. Change in Block Size from 1000 to 600 Square Metres When we purchased our block in 2020, we were informed under Stage 2, that block size would be (like ours in		

Community Submissions for the Planning Proposal
To Rezone Sunset Estate – Stage 2 – 141 Googong Road Googong

Submitter:	Submission:	Council response	Recommendation
	Gorge Creek Drive) 1000 square metres to limit the number of dwellings and keep an exclusive nature to the Sunset development. The change to 600 square metres will simply increase the number of dwellings, reduce the exclusive nature of the development and increase traffic on Gorge Creek Drive (compared to the lessor number of blocks and reduced number of houses if block size was kept at 1000 square metres). Yet again, compared to when we bought, aspects of the development have been changed to our detriment and that of the area. **Summary** The plan to use Gorge Creek Drive as the only collector road for Stage 1 and Stage 2 of Sunset is a major change to what we were originally told when we bought our property, and represents a significant, long term detriment to my family's lifestyle, safety and general well being. I disagree that Gorge Creek Drive can handle the traffic flows required over the comings years as Stage 2 is developed and then built on. Even after building is completed, we will then be subjected to our street becoming a drag strip as evidenced from previous personal experience. To summarise my recommendations, I ask council that the following recommendations are seriously considered and implemented to provide for a more moderate level of disruption to both my, and the other families lifestyle on Gorge Creek Drive, improve safety and otherwise limit the impact to our existing lifestyle: 1.Gorge Creek Drive and Chimney Rise to both act as collector roads for Stage 2 to limit the level of noise, pollution and safety issues compared to only if Gorge Creek Drive was used. I reference your own report as noted above where the original plan was to use both Gorge Creek Drive and Chimney Rise as collector roads and influenced our decision to buy our block.		

Community Submissions for the Planning Proposal
To Rezone Sunset Estate – Stage 2 – 141 Googong Road Googong

Submitter:	Submission:	Council response	Recommendation
	2.To avoid Gorge Creek Drive and/or Chimney Rise becoming drag strips, traffic calming measures are an essential feature to manage safety as evidenced by personal experience from living in Insley Street in Googong for 7 years as previously mentioned. Given the length of time of the land development and construction phase, then the on-going movement of traffic into the future, this requirement is considered essentially mandatory to ensure safety on Gorge Creek Drive and/or Chimney Rise 3.Construct a temporary dirt / gravel road for heavy vehicle ingress / egress during land works for Stage 2 to keep the vehicles off Gorge Creek Drive. 4.Limit or eliminate the 600 square metre blocks in Stage 2 to maintain the exclusive nature of the area that we were promised when we bought our block. 5.Re-design the intersection at Googong Road in time to allow for free flow of traffic noting the delays already experienced that will only get worse in time. **Conclusion** I have submitted this feedback on the basis that elements of Stage 2 have changed from what we were previously told and from the new proposal, the resultant changes will affect us in some cases to a significant extent (traffic flows, safety, noise, pollution and disruption). Noting my submission and major concern with the proposal, I would appreciate a response from council or even a phone call so I can further expand on my concerns. My contact details are below.		

QUEANBEYAN-PALERANG REGIONAL COUNCIL

Council Meeting Attachment

12 NOVEMBER 2025

ITEM 9.4 FINALISATION OF PLANNING PROPOSAL TO REZONE SUNSET ESTATE - STAGE 2 - 141 GOOGONG ROAD, GOOGONG

ATTACHMENT 3 FINAL FLOOD IMPACT & RISK ASSESSMENT FIRA - SUNSET ESTATE - 10 OCTOBER 2025

SUNSET ESTATE STAGE 2 FLOOD IMPACT AND RISK ASSESSMENT

FOR BINOWEE PTY LTD
28TH JULY 2025

This report has been prepared by the office of Spiire
445 Townsend Street PO Box 3400 **Albury** New South Wales 2640

Issue Date	Rev No	Authors	Checked	Approved
03/09/2024	A	Sophie Cant	Thomas Cousland	Thomas Cousland
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Spiire Job Number: 310853

Citation: Spiire 2025, FLOOD IMPACT ASSESSMENT SUNSET ESTATE STAGE 2 Report for BINOWEE. Authors: J Gribble, S Cant Spiire Australia Pty Ltd. Project Number 310853

File Name: N:\31\310853\Water\Documents & Calculations\Reports\310853-REP-SW-01-Sunset Estate Flood Impact and Risk Assessment (FIRA) clean.docx

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SUMMARY

This Flood Impact and Risk Assessment (FIRA) has been prepared by Spiire on behalf of Binowee Pty Ltd for the proposed Sunset Estate Stage 2 residential development, located at 141 Googong Road, Googong, NSW. The site is situated within the Queanbeyan-Palerang Regional Council (QPRC) area and is traversed by Googong Creek, which flows from south to north-east through the site.

The purpose of this FIRA is to assess how the proposed development may affect or be affected by flooding, and to inform planning decisions by identifying flood-related constraints and opportunities. The assessment responds to feedback from the NSW Department of Environment, Climate Change and Water and QPRC, and includes consideration of climate change, flood hazard, and emergency response.

Hydrologic and hydraulic modelling was undertaken for a range of design flood events, including the 1% AEP, 1% AEP + Climate Change, 0.5% AEP, 0.2% AEP, and Probable Maximum Flood (PMF). The modelling indicates that:

- For all events up to the 0.2% AEP, floodwaters are contained within the Googong Creek corridor, with adequate freeboard to proposed infrastructure.
- Under PMF conditions, floodwaters extend into several proposed lots adjacent to Googong Creek. Inundation is generally limited to lower portions of these lots, with habitable areas located above the PMF level.
- Localised high flood hazard (H5–H6) is present within the creek corridor, road reserves, and some isolated areas within Stage 2 lots. The isolated areas within Stage 2 lots are not proposed for dwellings and can be managed through appropriate house design.
- While the proposed road crossing between Stages 1 and 2 is overtopped during the PMF, alternative egress via Googong Road is available, supported by formal secondary access routes and elevated lot arrangements.

The proposed development layout, subject to future Development Consent, demonstrates a strong alignment with flood-resilient planning principles. The findings of this FIRA will inform future design refinement, emergency planning, and stakeholder engagement to ensure that flood risks are appropriately managed as the project progresses.

1. INTRODUCTION

1.1 BACKGROUND

Spiire has been engaged by Binowee Pty Ltd. to undertake a Flood Impact and Risk Assessment (FIRA) for Sunset Estate Stage 2 ('the site')

This FIRA identifies how the proposed development may affect or be affected by flooding and outlines how these risks will be managed. It also supports the planning application by providing the consent authority with relevant flood-related information for informed decision-making.

The site is located north of the Googong Township, located in Southern NSW, 8km from Queanbeyan and 15km from Canberra. It is within Queanbeyan-Palerang Regional Council (QPRC) jurisdiction. Refer to site location in Figure 1 below.

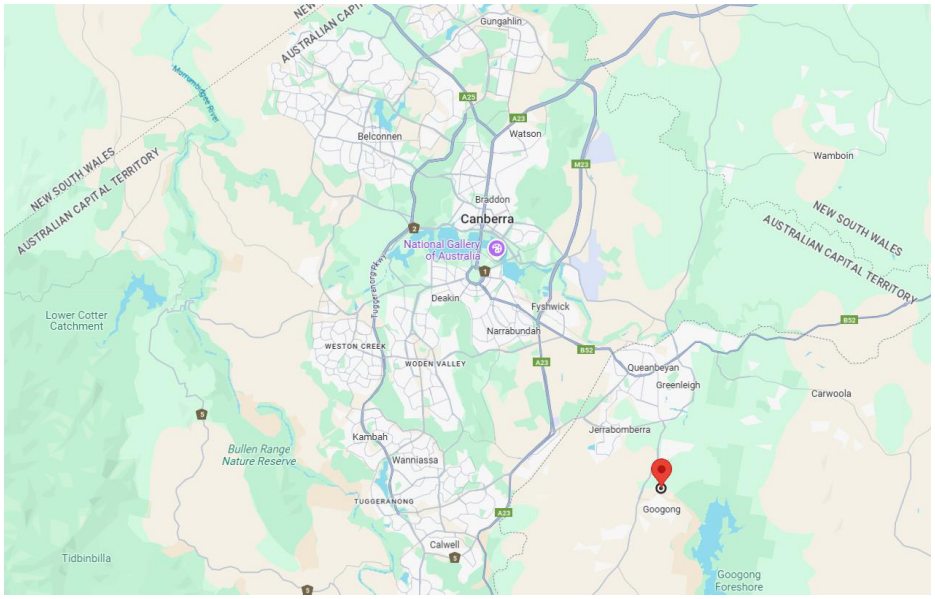

Figure 1: Site Location (ref Google Maps)

The site is located north of Googong Rd. The site address is 141 Googong Road, Googong, Lot 39 DP 1257837. The Googong Creek runs from south to north-east through the site. Stage 2 is north-west of Stage 1, on the opposite (western) side of Googong Creek. The site area is 30.7 ha and is a solely residential development.

A draft preliminary concept layout is shown in Figure 2 below. We note this is subject to future Development Consent and is therefore indicative only.

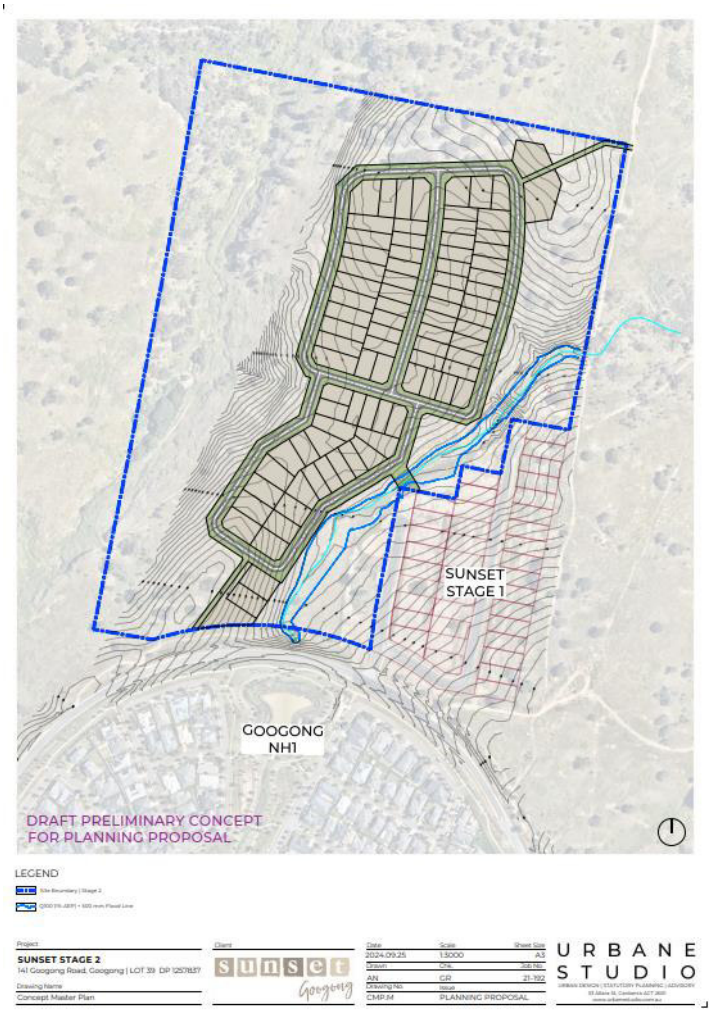

Figure 2: Draft Preliminary Concept Layout – Sunset Estate Stage 2

1.2 PROJECT CONTEXT

No previous FIRA's or Flood Risk Management (FRM) studies are understood to have been conducted relevant to the site. A Flood Impact Assessment (similar to a FIRA) was prepared by Spiire in October 2024 as part of the planning proposal process.

1.3 FIRA REQUIREMENTS

Feedback from the Department of Environment, Climate Change and Water (Biodiversity and Conservation) was received during the scoping proposal process and is to be addressed within the planning proposal and this FIRA.

To address the concerns regarding flooding, raised by the Department of Environment, Climate Change and Water (Biodiversity and Conservation) the planning proposal should include more detail regarding the flood analysis, such as:

- *other flood events (including Probable Maximum Flood (PMF)),*
- *the impact of the development on flood behaviour (including offsite impacts),*
- *rainfall data*
- *consideration of climate change*
- *how the flood model was developed.*

Based on the above, the general relevant assessment requirements addressed in the FIRA are summarised:

- Flood behaviour assessment of the 1% AEP, 1% AEP plus Climate Change (CC), 0.5% AEP, 0.2% AEP and PMF events for both developed and existing conditions
- Flow velocity, flood hazard and emergency response constraints for the 1% and PMF events
- Appropriateness of the development based on the flood constraint
- Adequacy of management measures and controls to address the constraints.
- ARR data version applied
- Climate Change Impacts

2. BACKGROUND

2.1 STUDY AREA

The study area is limited to the section of Googong Creek that flows though the site. The study extends approximately 140m downstream of the site boundary and extends back upstream past Googong Road.

The catchment is approximately ~196 hectares of predominantly residential developed catchment. The upstream catchment is bounded by Googong Road to the north, and to the west by a ridgeline located west of Old Cooma Road. The catchment slopes at a grade of approximately 1.1% towards Googong Road.

The catchment runoff is mainly conveyed via pit and pipe networks, swales and road corridors to a constructed waterway and basin located south of Googong Road. The basin outlets under Googong Road into the existing Googong Creek within the subject site.

The Googong Creek outlets into the Queanbeyan River approximately 1.7 km north-east of the site. The creek outlets approx. 2.5km downstream of the Googong dam.

Catchment and TUFLOW model extent is shown in Figure 3.

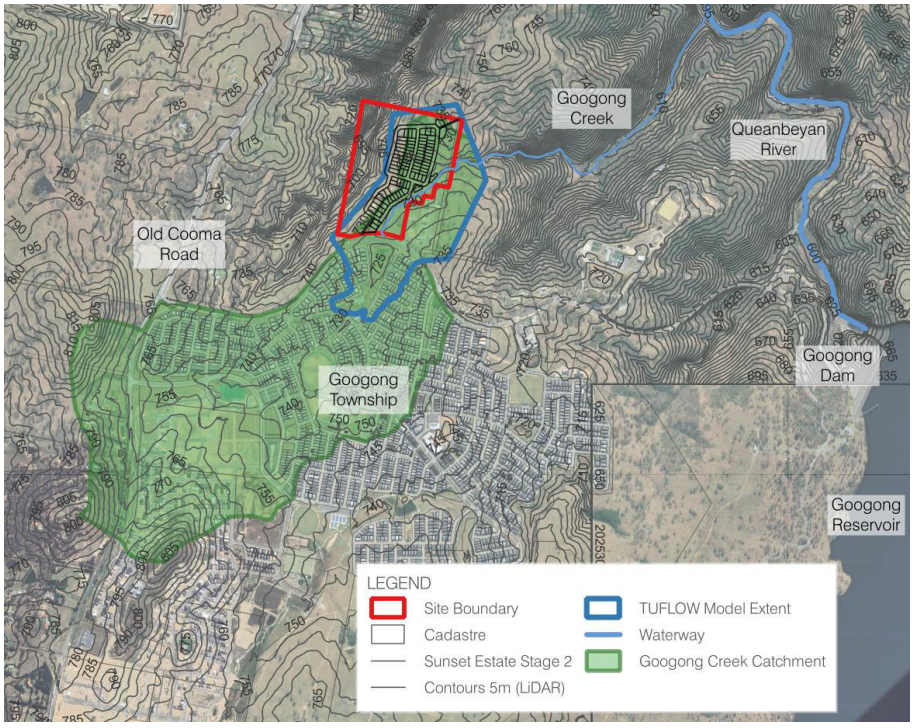

Figure 3: Catchment and TUFLOW Model Extent

2.2 KNOWN FLOOD BEHAVIOUR

Flood behaviour at the site is not well-documented; however, previous modelling undertaken for earlier assessments indicates that the site generally sheet flows towards the existing Googong creek, flowing north-east towards Queanbeyan River. Further flood modelling as part of this FIRA will refine the understanding of flood extents, depths, and behaviour across the site.

2.3 FLOOD HISTORY

There is no known records of historical flooding at the site or in the immediate surrounding area.

2.4 EMERGENCY MANAGEMENT

The emergency management strategy for the development aims to provide safe refuge areas above the PMF flood level and facilitate egress routes that remain passable during flood events, allowing evacuation toward higher ground.

Broader emergency management measures, including flood warning, communication, and integration with local emergency plans, are expected to follow standard council and emergency services procedures.

3. AVAILABLE INFORMATION

3.1 HYDROLOGICAL MODEL

Previous hydrological modelling using XP-RAFTS was completed as part of the *Stormwater Management and Drainage Analysis Design Report – Neighbourhood 1A Stages 1 and 2 Googong New Town (Brown Consulting 2010).* This report includes the best available comprehensive information in relation to the upstream catchment, including details of proposed upstream basins. Refer to Section 9 - Reference 2 for full report.

3.2 RAINFALL DATA

Rainfall Intensity-Frequency-Duration Data has been adopted from the Bureau of Meteorology (BoM) in accordance with ARR 4.2.

3.3 SURVEY DATA

The available surface data applied in the assessment are as follows:

- Survey of the existing surface within Stage 2 development area, Stage 1 development earthworks, Googong Creek and Googong Rd
- 1m LiDAR DEM for downstream section of Googong Creek (north-west of development) and basin upstream of the development (south of Googong Road).

3.4 DRAINAGE ASSET DATA

The existing drainage assets relevant to the assessment are the existing basin outlet south of Googong Road and associated culvert under Googong Road. The existing basin surface has been modelled based on the LiDAR surface data. Basin outlet and water level information have been based on the as-executed drainage drawings (Brown Consulting, 2014) – see Section 9 - Reference 3.

The existing culvert under Googong Road is understood to be 2x 1650 mm pipes based on the as-executed drainage drawings (Brown Consulting, 2014).

3.5 GIS DATA

Cadastral and Road data has been gathered from the online NSW Government Spatial Collaboration Portal.

Aerial Imagery shown in the assessment is from Google Maps data.

4. FLOOD RELATED REQUIREMENTS

The proposed development is located within the Queanbeyan-Palerang Regional Council (QPRC) area and includes land containing Googong Creek, with residential development proposed adjacent to the waterway. This Flood Impact Risk Assessment (FIRA) has been prepared to an appropriate level of detail based on the scale and nature of the development, which comprises approximately 11 hectares of residential development on a total site area of 30 ha.

The assessment focuses on identifying the extent of flooding associated with Googong Creek and demonstrating that future residential areas are located outside of significant flood extents. Key considerations include ensuring that proposed lots are protected from flood impacts and that safe, flood-free emergency egress, or appropriate shelter in place provisions can be provided under the Probable Maximum Flood (PMF) scenario. The assessment addresses flood risk broadly across the site to confirm that the proposed development layout avoids high hazard areas and maintains safety for future occupants.

5. PRE-DEVELOPED MODELLING AND ANALYSIS

5.1 EXISTING FLOOD MODELLING

5.1.1 HYDROLOGICAL MODEL

A hydrological model has been prepared using RORB to determine flows through Googong Creek, which runs through the Sunset Estate site from south to north-east.

This hydrological model has been based on the previous hydrological modelling completed as part of Googong New Town Report (Brown Consulting, 2010). Catchments and basin details from this report have been used as inputs into the RORB model.

The Sunset Estate catchments have been incorporated into the downstream extent of the RORB model, extending upon the upstream catchment inputs established in the Googong New Town Report (Brown Consulting, 2010)..

RORB flows have been determined for the 1% AEP, 1% AEP plus Climate Change, 0.5% AEP, 0.2% AEP and Probable Maximum Precipitation (PMP).

5.1.2 CATCHMENTS

The section of Googong Creek that runs through the Sunset Estate Site is downstream of a ~196 hectare developed catchment. The upstream catchment delineation is based on catchments outlined in the Googong New Town Report (Brown Consulting, 2010). Four basins have been modelled in the upstream catchment in line with the previous modelling. The Sunset Estate catchment along Googong Creek has been delineated based on LiDAR and survey data. Refer to Reference 2 for the report with basin locations and details.

A fraction impervious value of 0.7 has been assumed for developed residential catchments in accordance with *Queanbeyan Palerang Regional Council Development Design Specification D5 (QPRC 2019)*. Catchments with open space and/or other land uses have been adjusted accordingly.

Catchment delineation and RORB Model Setup is shown in Figure 4.

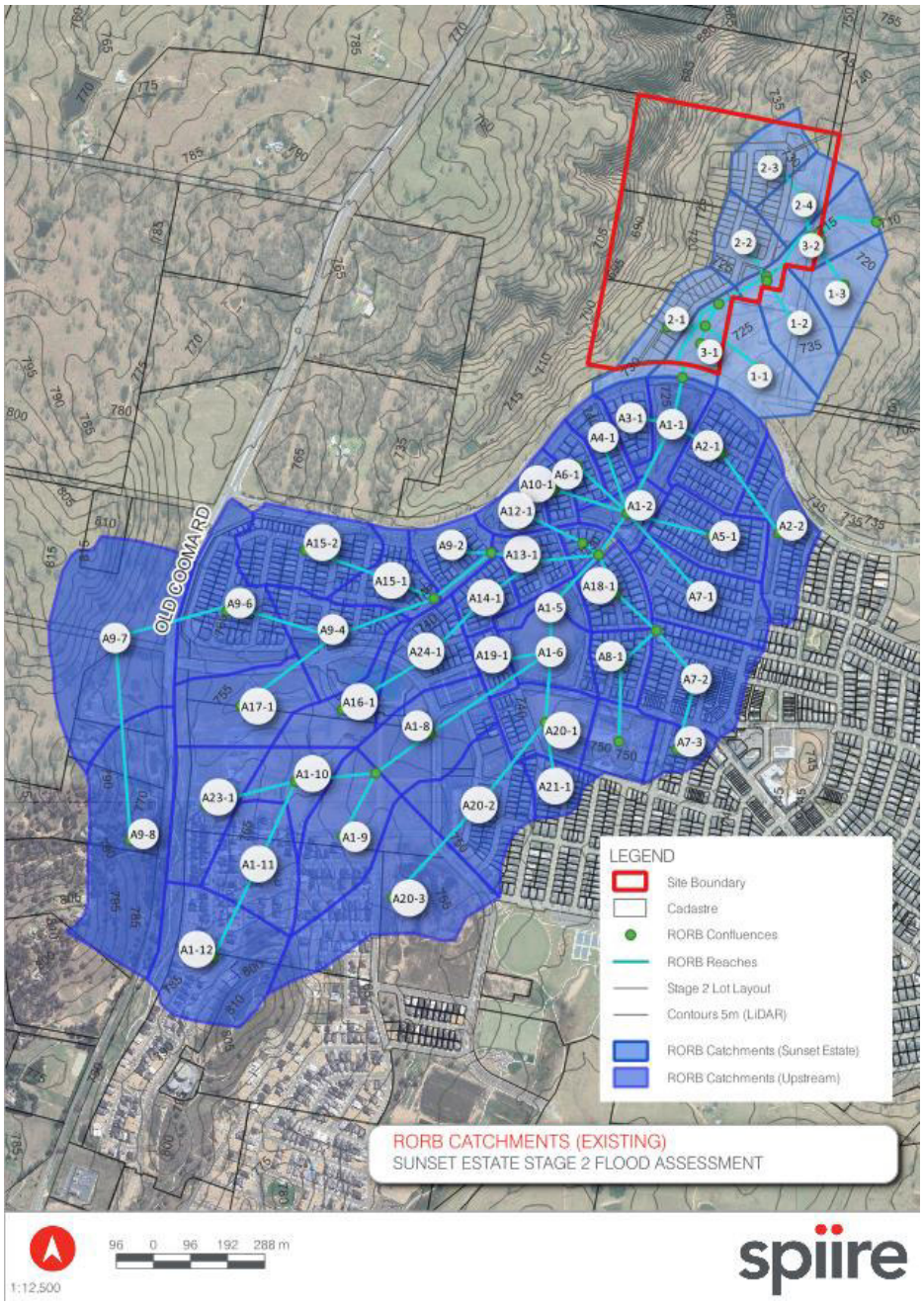

Figure 4: Predeveloped RORB Catchment Delineation

5.2 RORB MODELLING PARAMETERS

5.2.1 1% AEP RORB INITIAL AND CONTINUING LOSS

1% AEP RORB runoff routing parameters were used in line with Googong Drainage Design Criteria (QPRC, 2011). Standard ARR Datahub loss parameters (Initial Loss (IL) 22mm, Continuing Loss (CL) 5.2mm/hr) were not used in this model as they produced lower flows that were not sufficiently close to previous modelling results. The CL parameter of 5.2mm/hr was not considered accurate following review of ARR NSW Specific Data Information. IL and CL values were set to 10mm and 2mm/hr respectively to reflect the Googong Drainage Design Criteria (QPRC, 2011) guidelines. Initial losses have been factored for the median pre-burst depths and have been adjusted in RORB by applying variable loss factors for each duration.

5.2.2 0.5% AEP, 0.2% AEP AND PMP RORB INITIAL AND CONTINUING LOSS

IL and CL values adopted for 0.5% AEP, 0.2% AEP and PMP events have been determined using a log-log relationship method identified in AR&R, 4.2 (Bk 8, Ch 4). IL and CL values have been scaled for the 1% AEP+CC scenario in proportion to the rainfall increase.

RORB IL and CL values are outlined in Table 1.

Table 1: RORB IL and CL Values

Parameter	Initial Loss (IL)	Continuing Loss (CL)
1% AEP	10	2
1% AEP+CC	11.2	2.5
0.5% AEP	9.3	2
0.2% AEP	8.2	2
10^{-7} AEP (PMP)	0.1	1

5.2.2.1 Kc Value

The post development 1% AEP RORB model (excluding Sunset Estate catchments) was first run using ARR 1987 methodology and compared with previous ARR 1987 modelling (Brown Consulting, 2010) in order to determine an appropriate Kc value.

Flows determined using the following Kc equations were then checked against previous modelling flows:

- Default Kc (Eqn 2.5 RORB Manual) = 3.08
- Eastern NSW (Kleemola) = 1.61

Results are shown in Table 2 below. As shown, previous modelling results (Brown Consulting 2010) estimate a post development peak flow of 11.28m^3/s (with upstream basins) at the Googong Rd crossing. The Default Kc equation (Eqn 2.5 RORB Manual) produced a flow of 8.68 m^3/s, which is considered too low. The Eastern NSW Kc equation produced a flow of

13.12m^3/s which is relatively close to that produced in previous modelling. As such, a Kc of 1.61 has been adopted for modelling of all events up to the 0.2% AEP.

Note, ARR 1987 methodology has only been used for comparison purposes to determine an appropriate Kc value. RORB modelling results presented in Section 5.3 use ARR 4.2 methodology.

Table 2: Kc Flow Comparison

Method	Peak Flow Estimation	Comments
Previous results (ARR 1987) (Brown Consulting 2010) – Controlled Peak Flow with Basins	11.28 m^3/s	
RORB (ARR 1987) Default (Eqn 2.5 RORB Manual) (Kc = 3.08)	8.68 m^3/s	
RORB (ARR 1987) Eastern NSW (Kleemola) (Kc = 1.61)	13.12 m^3/s	Adopted

A Kc value of 0.67 was used for the Sunset Estate portion of catchment in the RORB model. This was calculated using the Eastern NSW (Kleemola) equation to remain consistent with the upstream catchment adopted Kc.

5.2.3 CLIMATE CHANGE FACTORS

Climate change (CC) factors have been applied to IFD data for the 1% AEP + CC and PMF events.

Climate change factors employed in this assessment follow the methodology in *Australian Rainfall and Runoff: A Guide to Flood Estimation Version 4.2 (Commonwealth of Australia, 2024)*, which includes the recent update to the climate change chapter.

A high emissions socioeconomic pathway (SSP3-7.0) has been adopted conservatively to understand the upper-end risks, for a long-term timeframe (2081-2100).

5.2.4 PMP

The GSDM analysis was used to identify the PMP to be 1 x 10^7 AEP. The GSDM method and ARR 4.2 tools were used to extract the rainfall data and intensity.

5.3 RORB RESULTS

Flows for each design storm event have been obtained from the RORB modelling and input into the post developed 2D hydraulic model as inflow hydrographs.

Peak flows at the upstream basin for each storm event are detailed in Table 3 below.

Table 3: RORB Peak Flow Results – Basin Inflow

Design Event	Duration	TP	Peak Flow (m3/s)
1% AEP	1 hour	TP23	13.58
1% AEP + CC	1.5 hour	TP28	25.90

Design Event	Duration	TP	Peak Flow (m3/s)
0.5% AEP	45 min	TP21	15.95
0.2% AEP	45 min	TP21	19.58
PMP	45 min	N/A	293.95

The upstream flow into the existing basin is unchanged from the pre-development scenario to the post-development scenario. The peak pre-development and post-development flows for each creek inflow location is shown in Table 4, Table 5 and Table 6. No detention assets have been included within the Sunset Estate in the current modelling. As such, the peak flows applied are conservative and likely overestimate actual post-development conditions, given that detention infrastructure would typically be implemented as part of the final development. Refer to Figure 5 for inflow locations.

Table 4: RORB Peak Flows – Creek Inflow Location 1

Design Event	Pre-development Peak Flow (m^3/s)	Post-development Peak Flow (m^3/s)
1% AEP	3.31 (15 min TP24)	3.64 (10 min TP22)
1% AEP + CC	5.87 (10 min TP22)	6.69 (10 min TP22)
0.5% AEP	3.85 (15 min TP24)	4.45 (10 min TP22)
0.2% AEP	4.95 (10 min TP22)	5.62 (10 min TP22)
PMP	33.62 (15 min)	34.28 (15 min)

Table 5: RORB Peak Flows – Creek Inflow Location 2

Design Event	Pre-development Peak Flow (m^3/s)	Post-development Peak Flow (m^3/s)
1% AEP	1.82 (15 min TP29)	2.36 (10 min TP22)
1% AEP + CC	3.24 (15 min TP24)	4.33 (10 min TP22)
0.5% AEP	2.18 (15 min TP29)	2.87 (10 min TP28)
0.2% AEP	2.69 (15 min TP24)	3.62 (10 min TP22)
PMP	18.73 (15 min)	22.88 (15 min)

Table 6: RORB Peak Flows – Creek Inflow Location 3

Design Event	Pre-development Peak Flow (m^3/s)	Post-development Peak Flow (m^3/s)
1% AEP	2.64 (15 min TP28)	4.13 (15 min TP29)
1% AEP + CC	4.94 (15 min TP29)	7.08 (15 min TP24)
0.5% AEP	3.23 (25 min TP22)	4.84 (15 min TP24)

Design Event	Pre-development Peak Flow (m^3/s)	Post-development Peak Flow (m^3/s)
0.2% AEP	4.09 (15 min TP29)	5.87 (15 min TP24)
PMP	30.43 (15 min)	40.68 (15 min)

The peak flows to the existing basin from the upstream catchment, which extends over approximately 196 hectares, represent the primary inflows entering the site and Googong Creek. In contrast, the internal site catchment is relatively small (approximately 30 hectares) and therefore contributes only a minor portion of the total flood flows within Googong Creek.

5.4 HYDRAULIC MODELLING

Pre-developed 2D hydraulic modelling has been undertaken using TUFLOW. The 2D hydraulic model has been used to determine the following:

- The Flood Extent within Googong Creek north of Googong Rd
- The Flood Hazard within Sunset Estate adjacent to Googong Creek

The following design events were assessed; 1% AEP, 1% AEP plus Climate Change (CC), 0.5% AEP, 0.2% AEP and PMF events.

5.4.1 MODEL SETUP

The pre-developed TUFLOW model has been set up with the following key elements:

The pre-developed TUFLOW model set up is shown in Figure 5.

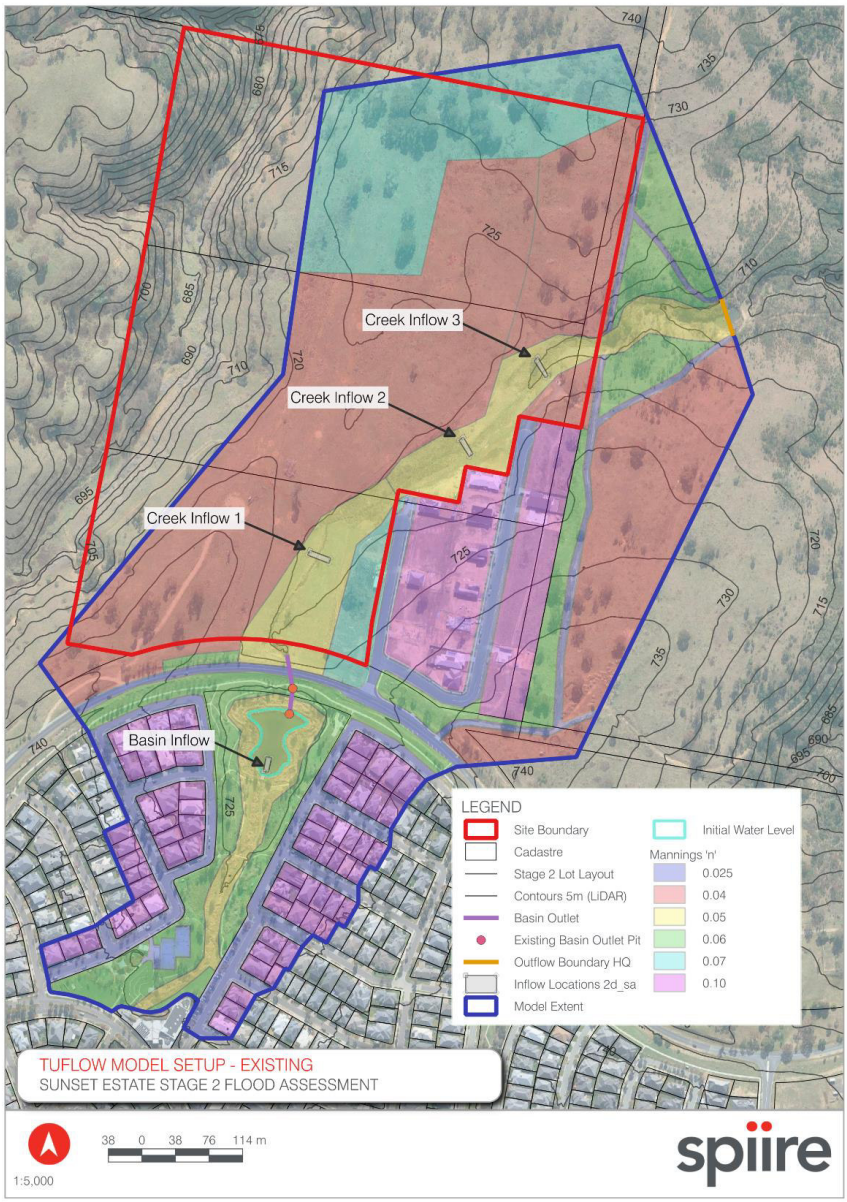

Figure 5: Pre-developed TUFLOW Model Setup

5.4.2 BOUNDARY CONDITIONS

5.4.2.1 Inflow Boundary

The model uses the following inflow boundaries:

- 2d Source Area (2d_sa) inflow hydrographs for each design event.
  - Inflow boundary located in the upstream basin (representing flows entering the basin from the upstream catchment)
  - 3 x Inflow boundaries located along Googong Creek (representing flows entering the creek from internal site catchments.

5.4.2.2 Downstream Boundary

The average slope of Googong Creek downstream of the site is ~4.5%. Given the relatively steep grade of the Creek, an HQ Slope downstream boundary has been used for the model.

5.4.3 TOPOGRAPHY

The topography data applied in the pre-developed model are as follows:

- Survey of the existing surface within Sunset Estate and Googong Road
- 1m LiDAR DEM for downstream section of Googong Creek and basin upstream of the development.

5.4.4 BED ROUGHNESS

Bed roughness has been defined using Manning's n values. The Manning's n values adopted for this assessment are based on the following:

- Existing aerial imagery where no development is proposed (including within the creek)
- The proposed development bed roughness

5.4.5 1D STRUCTURES

The following 1D structures have been included in the model to represent components of the outlet structure for the existing basin, which discharges to Googong Creek.

- Basin Outlet pit modelled based on a 3.3m x 0.9m grated pit with a cover level of 723.0 m AHD and 50% blockage factor applied.
- 2 x 525 mm pipes discharging to the Basin Overflow Outlet Pit
- Basin Overflow Outlet pit modelled based on a 6m x 3m grated pit with a cover level of 725.0 m AHD with 50% blockage factor applied.
- 2 x 1650 mm pipe culverts under Googong Road, discharging to Googong Creek

5.4.6 INITIAL WATER LEVEL

An initial water level was set in the model at the existing basin to represent permanent pooling water. This initial water level was set at 723.0 m AHD based on LiDAR data, with the extent determined by aerial imagery.

5.4.7 PMF SPECIFIC MODELLING INPUTS

The existing basin upstream of Googong Road has been excluded from the PMF hydraulic model by inserting an initial water level in the TUFLOW model set at the height of the Googong Road road crown level. The culverts under Googong Road have also been excluded from the PMF scenario to for additional conservatism.

5.5 EXISTING FLOOD IMPACTS

5.5.1 EXISTING 1% AEP RESULT

The existing 1% AEP flood extent and water surface elevation (WSE) is shown on Figure 6. The 1% AEP flood extent remains contained within the Googong Creek corridor and does not encroach upon the Stage 1 development. Additionally, there is approximately 1.1 metres of freeboard to the existing cul-de-sac (Gorge Creek Road) within the Stage 1 development area.

Refer to Section 9 – Reference 1 for all flood maps.

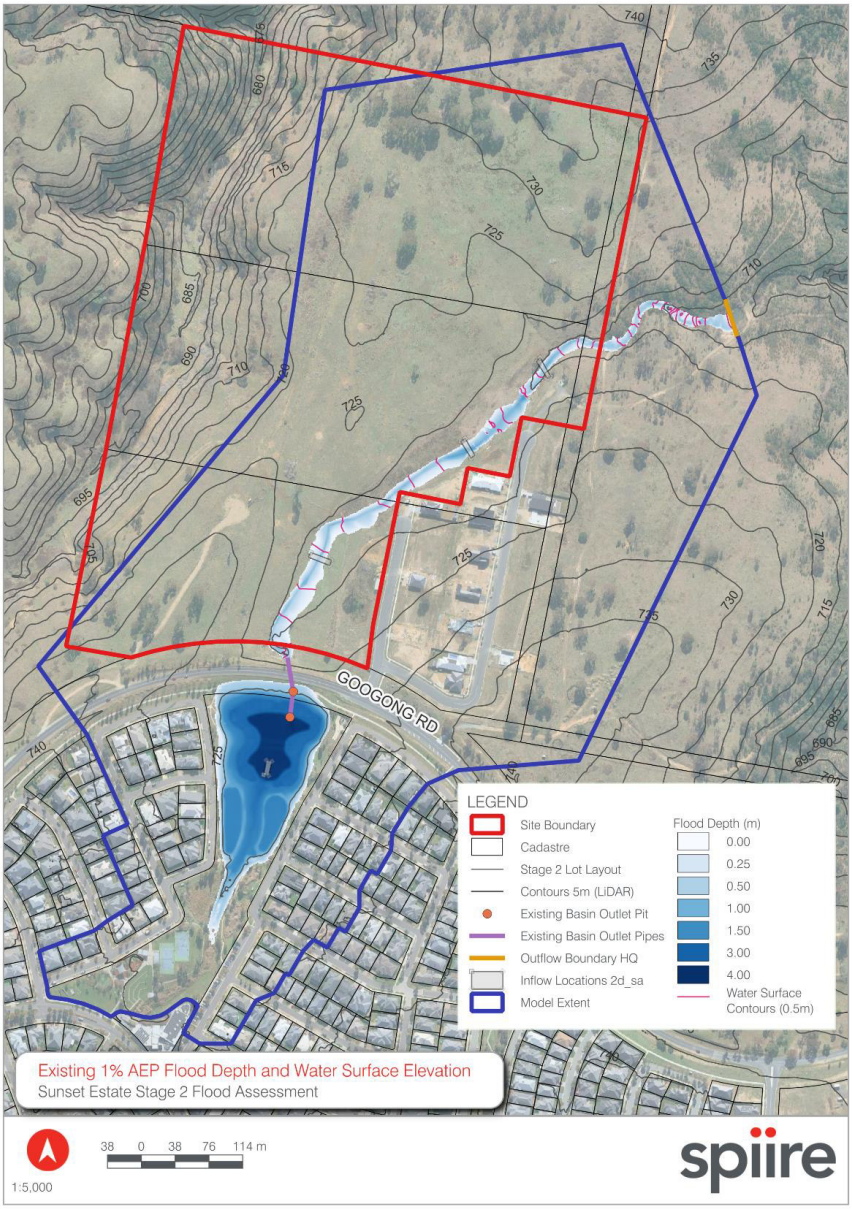

Figure 6: Existing 1% AEP Flood Depth and Water Surface Elevation

5.5.2 EXISTING 1% AEP + CLIMATE CHANGE RESULT

The existing 1% AEP plus Climate Change flood extent and WSE is shown in Figure 7. The 1% AEP plus Climate Change flood extent remains contained within the Googong Creek corridor and does not encroach upon the Stage 1 development. Additionally, there is approximately 0.8 metres of freeboard to Gorge Creek Road within the Stage 1 development area.

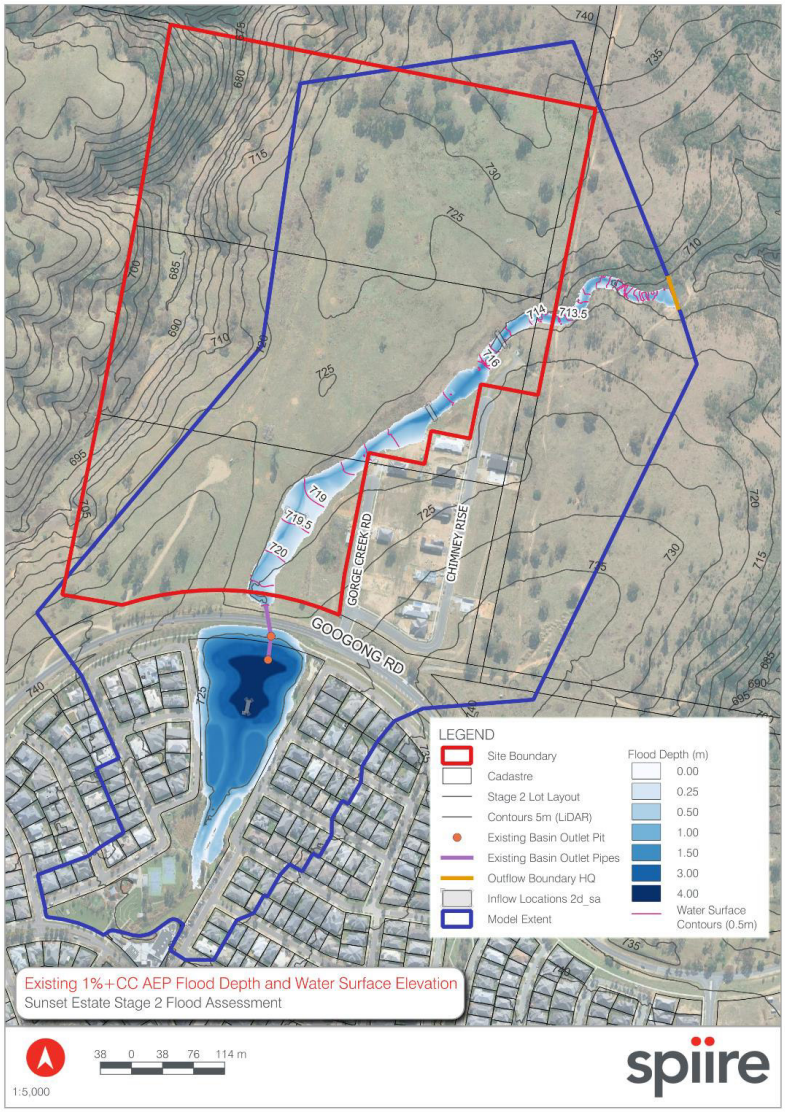

Figure 7: Existing 1% AEP + Climate Change Flood Depth and Water Surface Elevation

5.5.3 EXISTING 0.5% AEP RESULT

The existing 0.5% AEP flood extent and WSE is shown in Figure 8. The 0.5% AEP flood extent remains contained within the Googong Creek corridor and does not encroach upon the Stage 1 development area. Additionally, there is approximately 1.0 metres of freeboard to Gorge Creek Road within the Stage 1 development area.

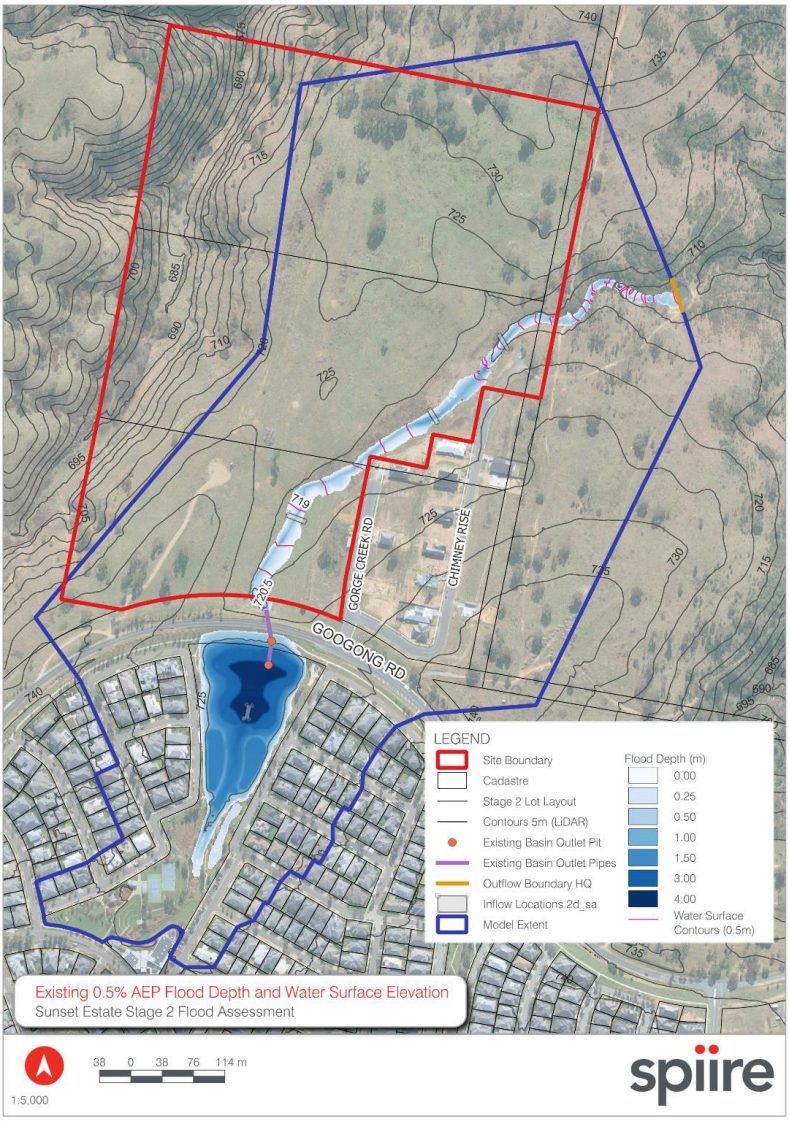

Figure 8: Existing 0.5% AEP Flood Depth and Water Surface Elevation

5.5.4 EXISTING 0.2% AEP RESULT

The existing 0.2% AEP flood extent and WSE is shown in Figure 9. The 0.2% AEP flood extent remains contained within the Googong Creek corridor and does not encroach upon the Stage 1 development area. Additionally, there is approximately 0.9 metres of freeboard at the existing cul-de-sac within the Stage 1 development.

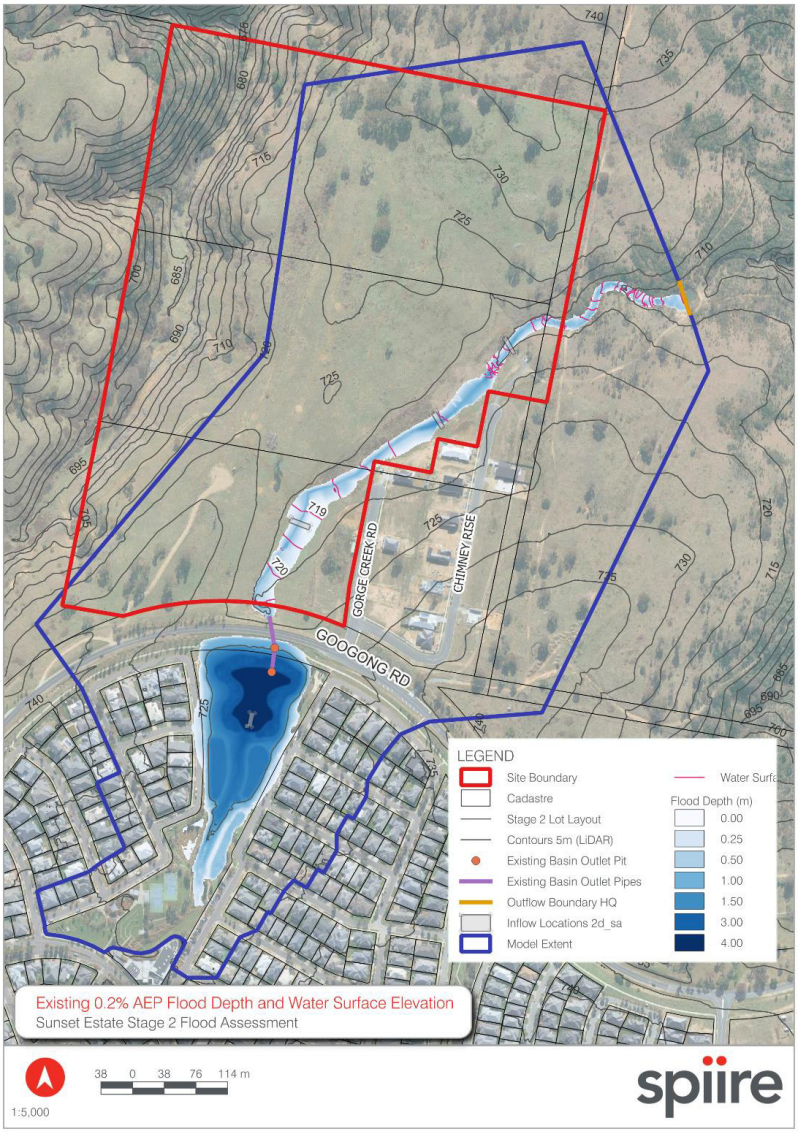

Figure 9: Existing 0.2% AEP Flood Depth and Water Surface Elevation

5.5.5 EXISTING PMF RESULTS

The existing PMF flood extent and WSE is shown in Figure 10. The PMF flood extent escapes the Googong Creek corridor and encroaches upon the Stage 1 development. Floodwater reaches a depth of approximately 0.6 m within the existing cul-de-sac within the Stage 1 development.

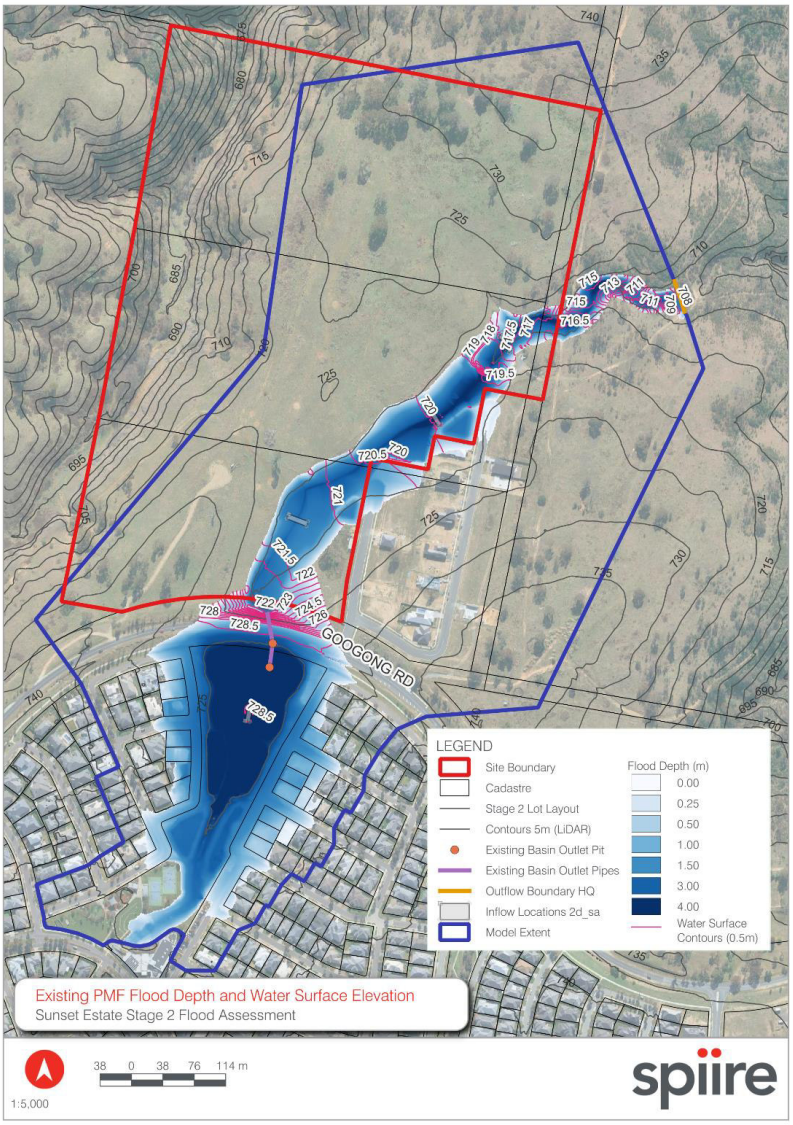

Figure 10: Existing PMF Flood Depth and Water Surface Elevation

The existing PMF flood hazard classification level is shown in Figure 11. The flood hazard category is high (H5 to H6) within Googong Creek and over Googong Road. The hazard category is low (H1 to H2) within lot areas and reaches a moderate hazard level (H3) within the existing cul-de-sac.

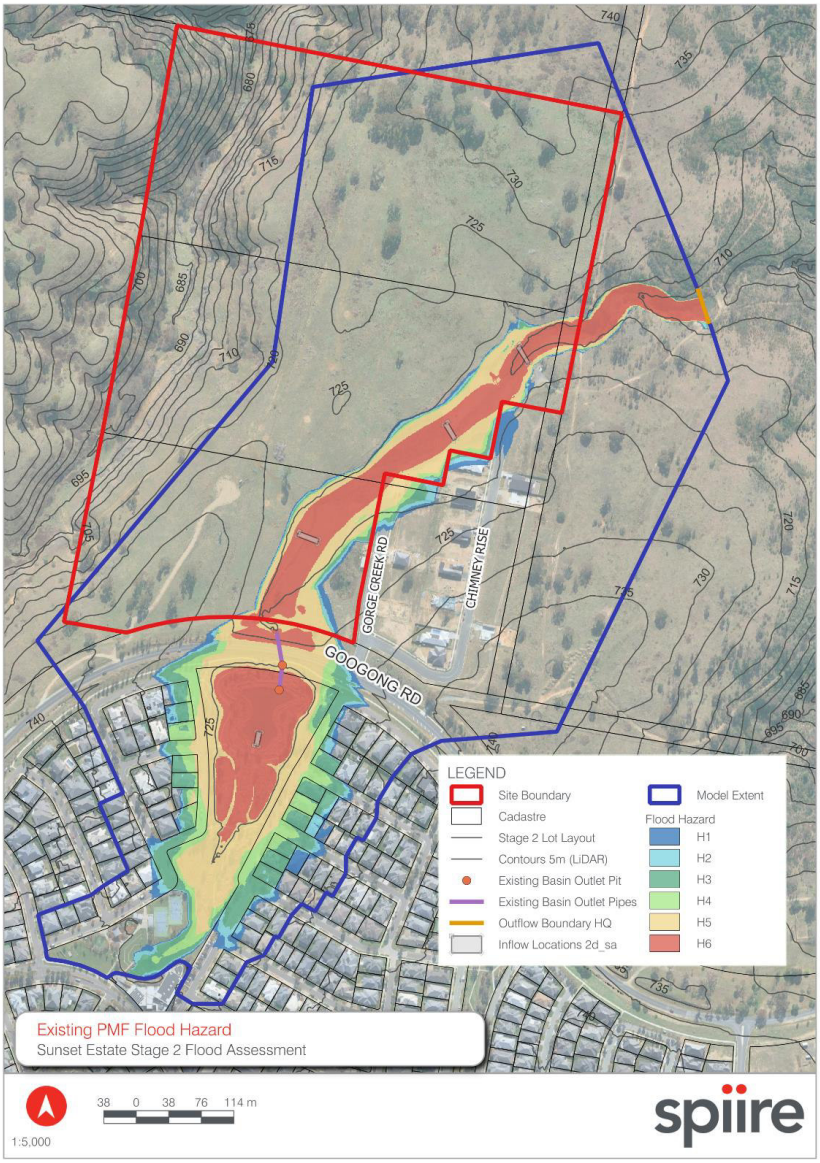

Figure 11: Existing PMF Flood Hazard

The existing PMF flow velocity is shown in Figure 12. Velocities above 2m/s are contained within the Creek Corridor. High velocities (> 4 m/s) occur on Googong Road as water overtops into the Creek.

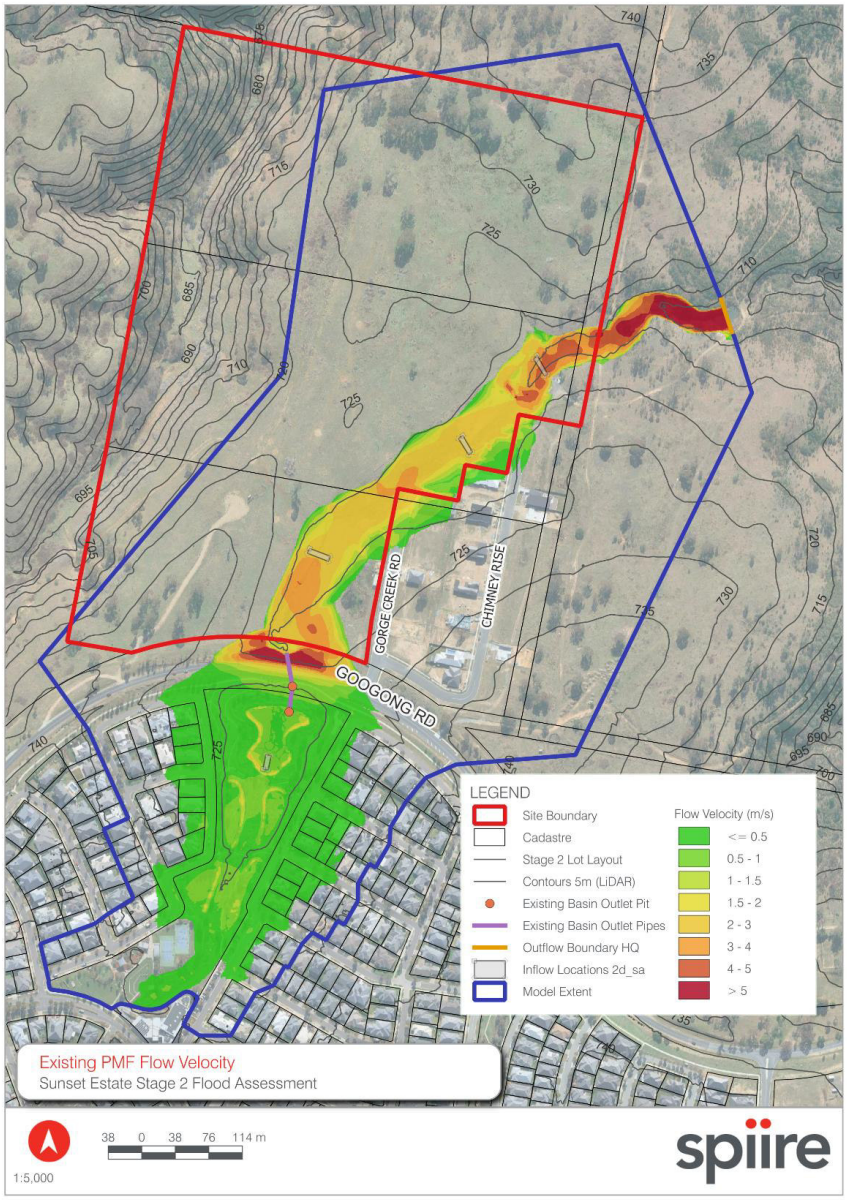

Figure 12: Existing PMF Flow Velocity

6. POST-DEVELOPMENT MODELLING AND ANALYSIS

6.1 PROPOSED DEVELOPMENT FLOOD MODELLING/ASSESSMENT

Developed 2D hydraulic modelling has been undertaken using TUFLOW. The 2D hydraulic model has been used to determine the following:

- The Flood Extent within Googong Creek north of Googong Rd
- The Flood Hazard within Sunset Estate adjacent to Googong Creek

6.1.1 MODEL SETUP

The post-development TUFLOW model has been configured to simulate the scenario in which Stage 2 is fully constructed. A summary of the model changes between the pre-development and post-development models are described below:

- A preliminary design surface including creek crossing and adjacent section of road and batter within the Stage 2 development has been applied to the topography.
- A 1D structure has been included in the model to represent the culverts beneath the road connecting Googong Stage 1 and Stage 2. This consists of 3 x 3mW x 1.8mH box culverts, with a 25% blockage allowance applied in accordance with the ARR 4.2 (Bk 6, Ch 6), Blockage Assessment Guideline.
- Inflow boundaries within the site extent have applied post-development RORB model outputs.

The post-development TUFLOW model set up is shown in Figure 13.

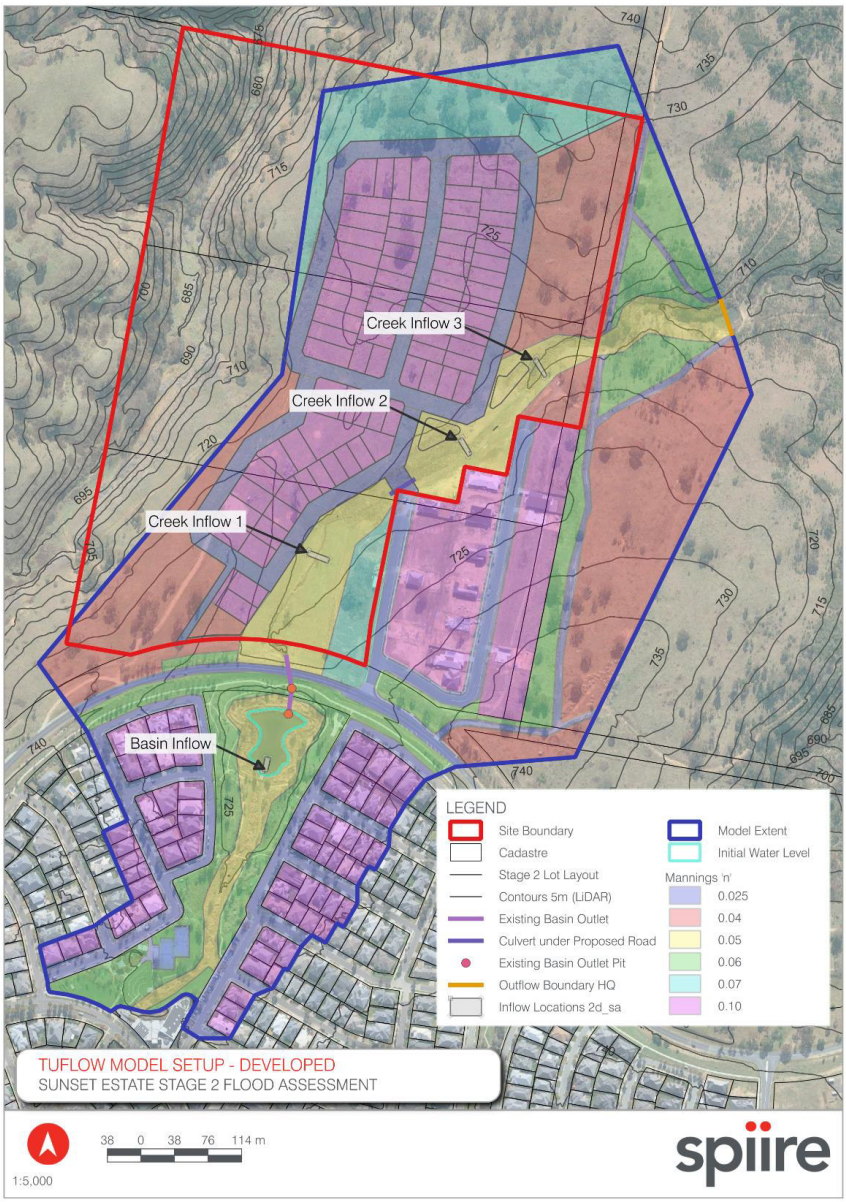

Figure 13: TUFLOW Model Setup

6.2 FLOOD IMPACTS OF PROPOSED DEVELOPMENT

6.2.1 POST-DEVELOPMENT 1% AEP RESULT

The 1% AEP post development flood extent and water surface elevation (WSE) is shown in Figure 14. As shown, the 1% AEP flood extent is contained within the Googong Creek Corridor, and does not encroach on the Stage 2 development area. In addition, there is 0.95m freeboard from the 1% AEP flood water surface elevation to the proposed road crossing between stages 1 and 2. Refer to Section 9 – Reference 1 for all flood maps.

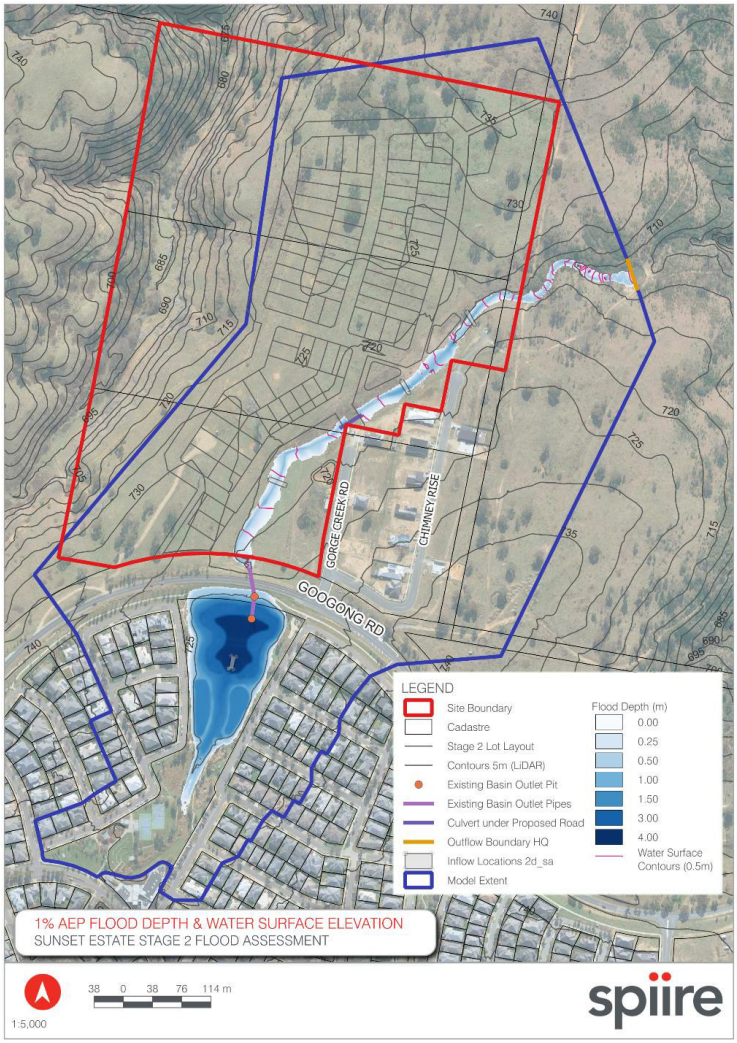

Figure 14: 1% AEP Flood Depth and Water Surface Elevation

The 1% AEP post-development less pre-development afflux map is shown on Figure 15. The afflux analysis indicates minimal changes to water surface elevations and inundation extents between pre- and post-development conditions. A localised increase in water level is observed at the location of the proposed road crossing, where culverts are introduced in the post-development scenario. At this location, the headwater elevation reaches approximately 0.30 metres above the pre-development water surface elevation. This increase is expected due to the introduction of hydraulic controls at the crossing. Elsewhere along the creek, no afflux is observed as a result of the development, indicating that the proposed works have a negligible impact on water surface elevations within Googong Creek.

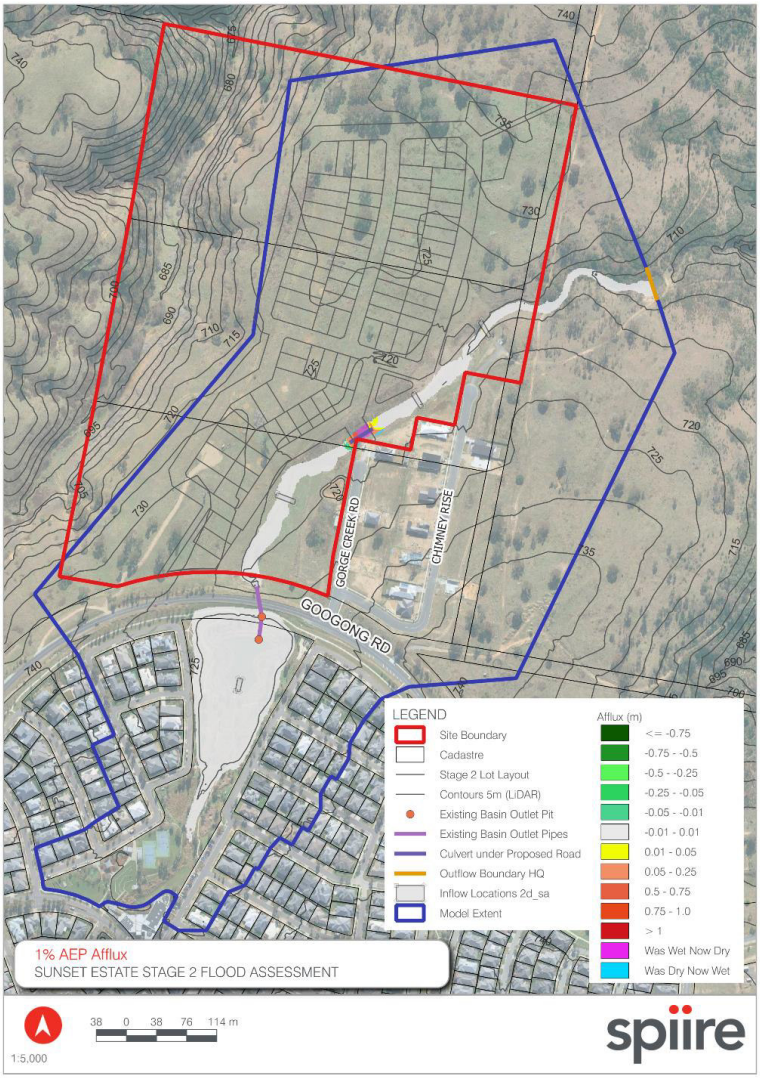

Figure 15: 1% AEP Post-development – Pre-development Afflux

6.2.2 POST-DEVELOPMENT 1% AEP + CLIMATE CHANGE RESULT

The 1% AEP plus Climate Change post development flood extent and water surface elevation (WSE) is shown in Figure 16. As shown, the 1% AEP plus Climate Change flood extent is contained within the Googong Creek Corridor, and does not encroach on the Stage 2 development area. Furthermore, there is approximately 0.30 metres of freeboard between the 1% AEP+ CC water surface elevation and the proposed road crossing.

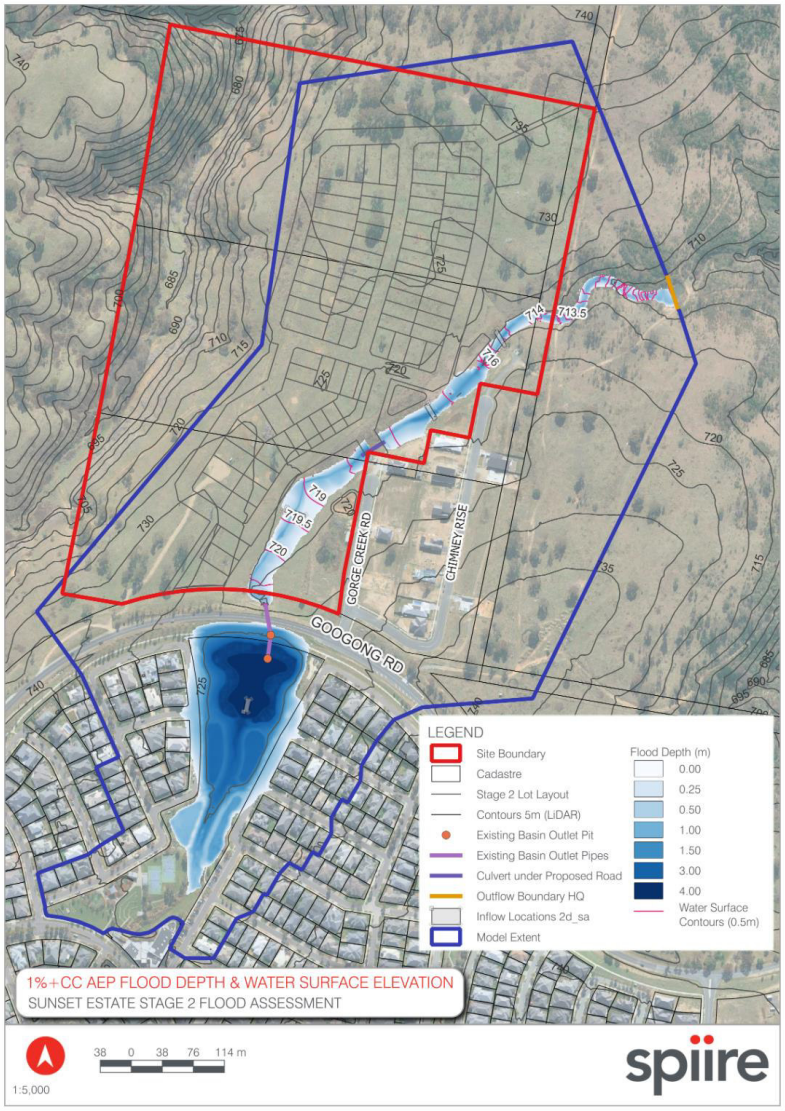

Figure 16: 1% AEP + Climate Change Flood Depth and Water Surface Elevation

The 1% AEP plus Climate Change post-development less pre-development afflux map is shown on Figure 17. Similarly to Figure 15 (1% AEP afflux), the afflux analysis for the 1% AEP plus Climate Change indicates minor changes to water surface elevations and inundation extents between pre- and post-development conditions. An increase in headwater elevation of approximately 0.55 metres above the pre-development water surface elevation is observed at the road crossing. No afflux is observed elsewhere along Googong Creek, indicating that the development has a negligible impact on water surface elevations outside the immediate vicinity of the road crossing.

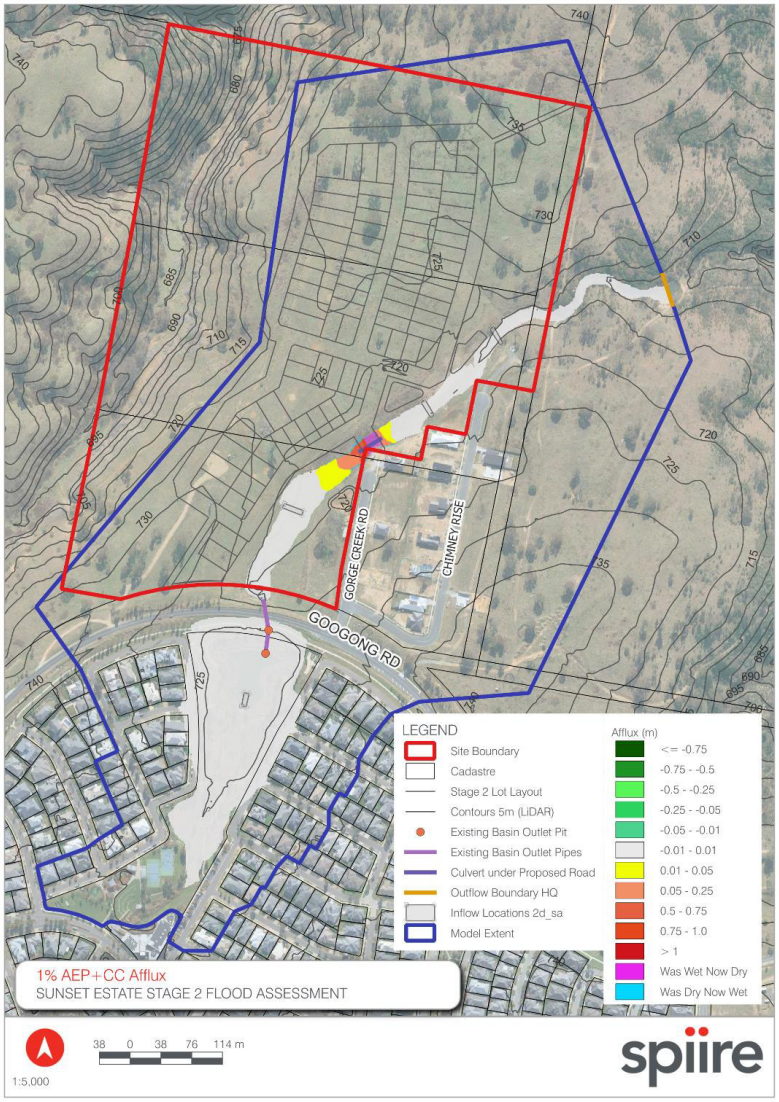

Figure 17: 1% AEP + Climate Change Post-development – Pre-development Afflux

6.2.3 POST-DEVELOPMENT 0.5% AEP RESULTS

The 0.5% AEP post development flood extent and water surface elevation (WSE) is shown in Figure 18. As shown, the 0.5% AEP flood extent remains contained within the Googong Creek corridor and does not encroach upon the Stage 2 development area. Furthermore, there is approximately 0.90 metres of freeboard between the 0.5% AEP water surface elevation and the proposed road crossing.

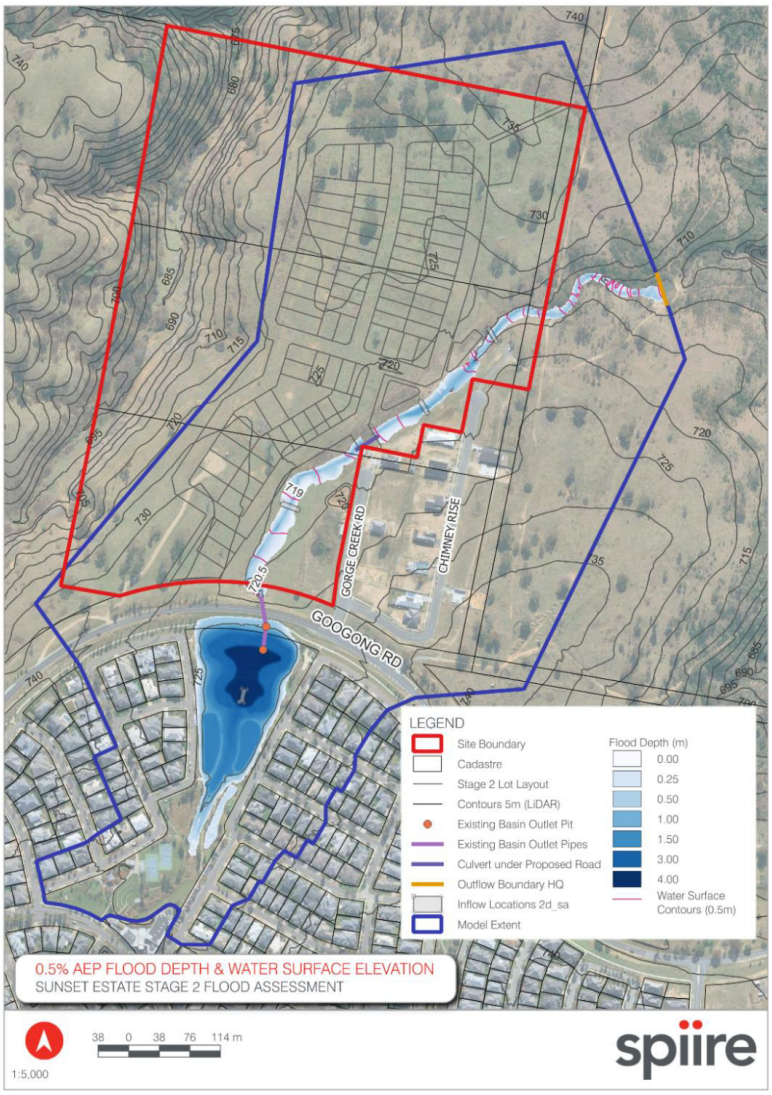

Figure 18: 0.5% AEP Flood Depth and Water Surface Elevation

6.2.4 POST-DEVELOPMENT 0.2% AEP RESULTS

The 0.2% AEP post development flood extent and water surface elevation (WSE) is shown in Figure 19. As shown, the 0.2% AEP flood extent remains contained within the Googong Creek corridor and does not encroach upon the Stage 2 development area. Furthermore, there is approximately 0.70 metres of freeboard between the 0.2% AEP water surface elevation and the proposed road crossing.

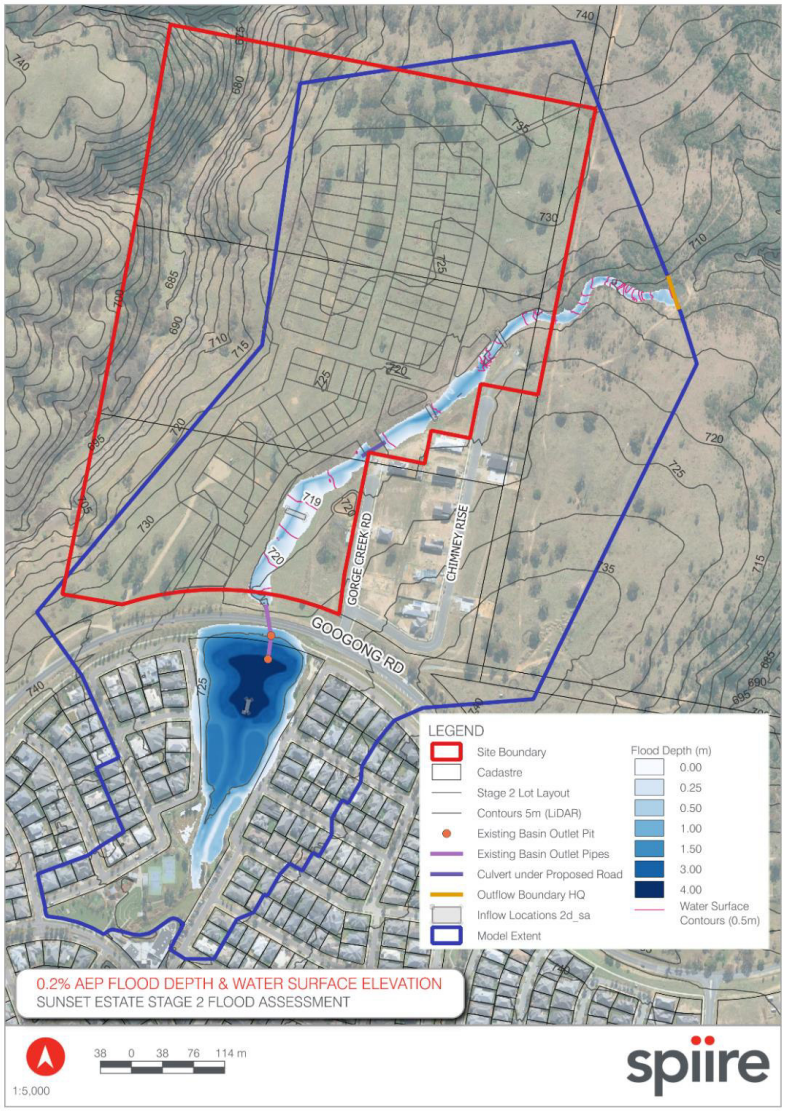

Figure 19: 0.2% AEP Flood Depth and Water Surface Elevation

6.2.5 PMF RESULTS

PMF flood modelling has been undertaken in relation flood egress to ensure safe evacuation routes, or appropriate shelter in place locations are available for the site. The post development PMF flood extent and water surface elevation (WSE) is shown in Figure 20. As shown, the PMF flood extent encroaches on the Stage 2 road directly adjacent to the Googong Creek, and overtops the proposed road crossing between Stages 1 and 2. Evacuation is, however available via Googong Rd.

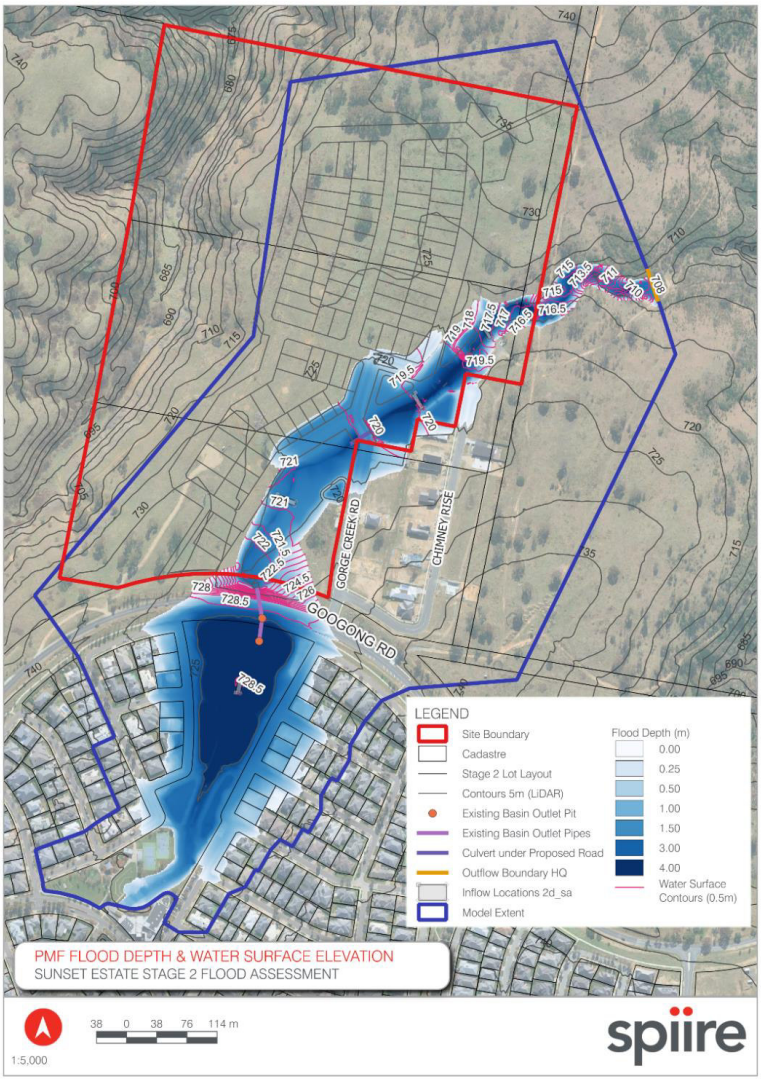

Figure 20: PMF Flood Depth and Water Surface Elevation

6.2.6 HAZARD AND VELOCITY

As the PMF flood extent inundates the development area surrounding the Googong Creek a Hazard and Velocity assessment has been undertaken. The PMF Hazard Classification level is shown in Figure 21.

As shown, the hazard classification is high (H5 to H6) within Googong Creek, over the proposed road crossing from Stage 1 to Stage 2, and within surrounding Stage 1 and 2 road reserves. Several Stage 2 lots have a high hazard classification (H5) at the front of the lots. The management of this risk is discussed in Section 7.

The PMF Flow Velocity is shown in Figure 22. As shown, velocities greater than 2m/s are generally contained within the Googong Creek Corridor, except around the proposed road crossing between Stages 1 and 2.

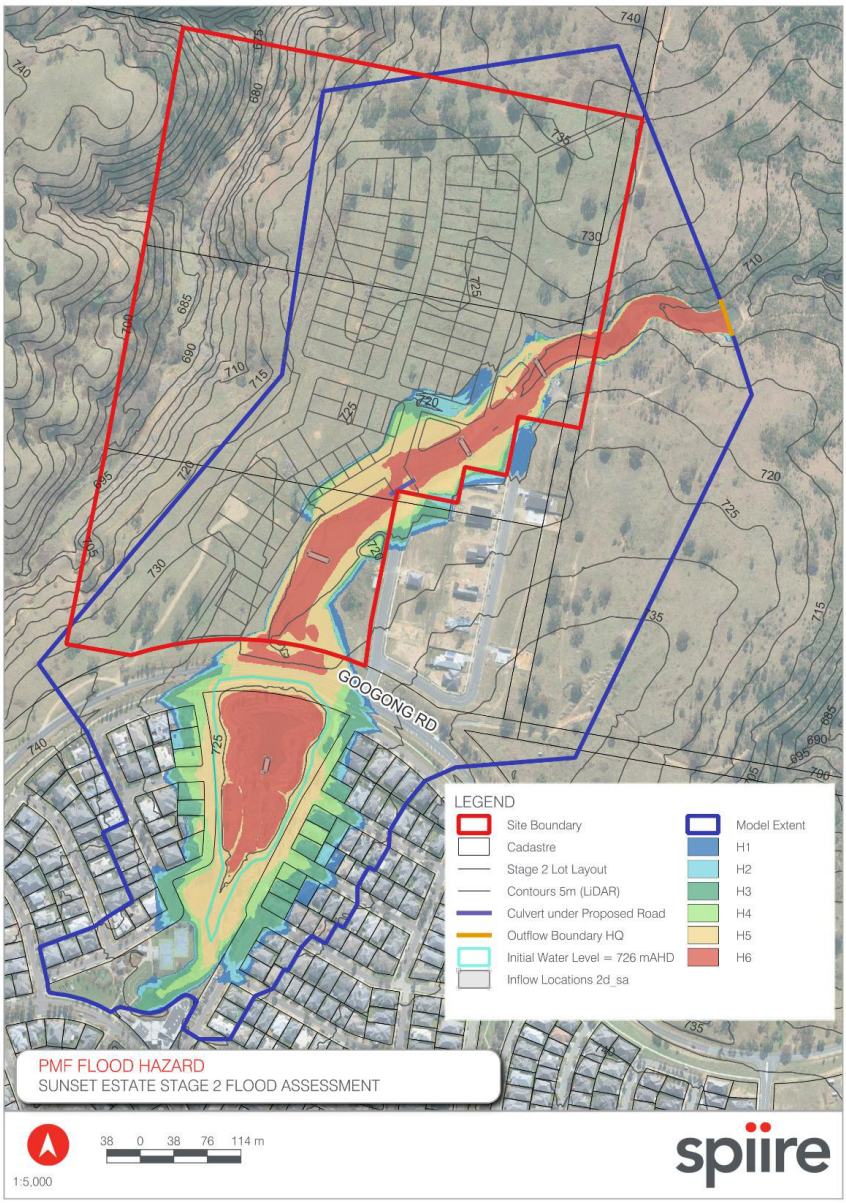

Figure 21: PMF Flood Hazard

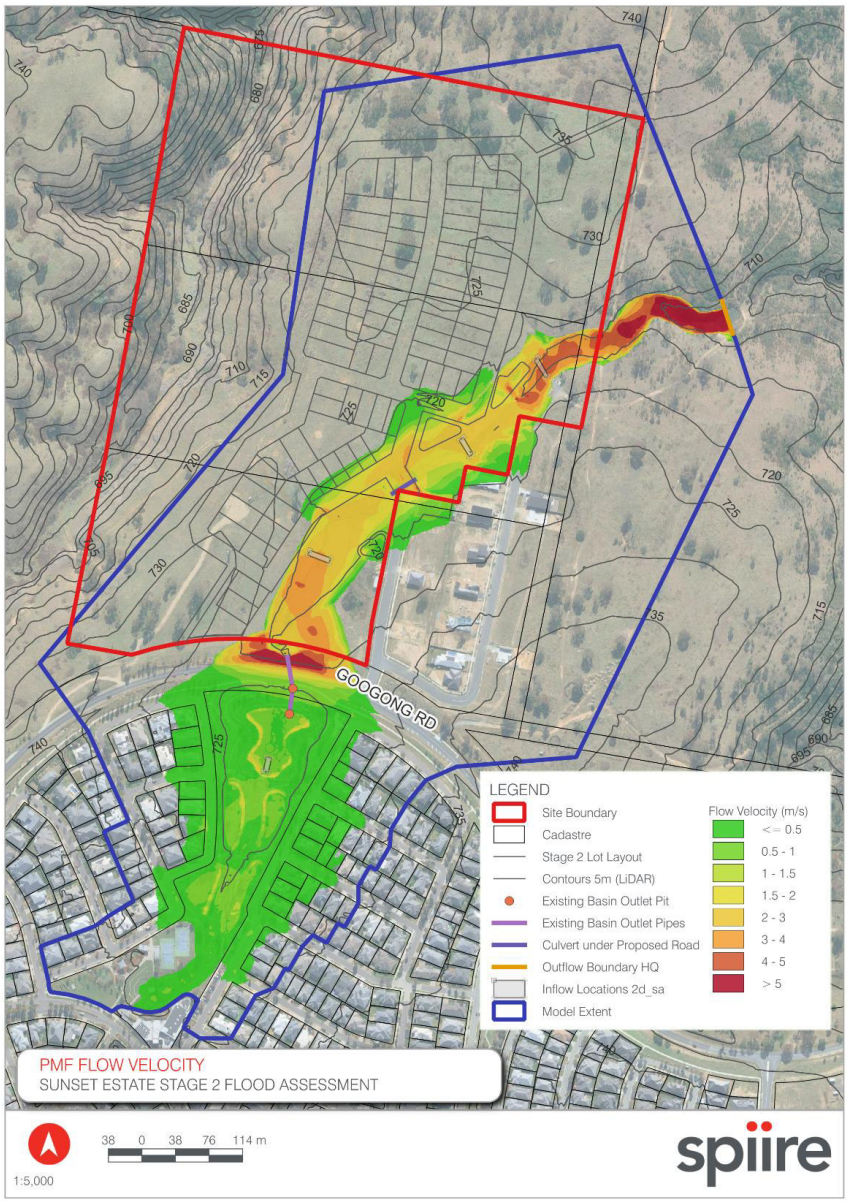

Figure 22: PMF Flow Velocity

7. KEY RISKS TO BE MANAGED

The key flood-related risk for the proposed development relates to the encroachment of Probable Maximum Flood (PMF) waters onto seven (subject to future Development Consent) proposed Stage 2 lots adjacent to Googong Creek. Under the PMF scenario, flooding results from overtopping of the upstream basin, which discharges to the creek and inundates parts of the lower site. Flood depths within the affected lots range from 0 m to approximately 1.7 m, with the deepest inundation occurring at the base of a steep batter at the front of each lot. This results in localised high flood hazard areas (H5), although these are limited to the lower portions of the lots and do not extend into areas proposed for dwellings.

Once the upstream basin overtops, floodwaters may rise relatively quickly. The proposed layout ensures that all dwellings and associated infrastructure will be situated above the PMF level, on the upper portion of each lot, with potential for future retaining walls to provide additional separation from inundated areas. Shelter in place for the affected lots will be required, with isolation periods on these lots approximately 1 hour (See Figure 24). Connections to higher ground and a formal track linking to Googong Road, enabling emergency egress even under PMF conditions is available for the other proposed lots. The Stage 1–2 road crossing will be inundated during the PMF and is not relied upon for emergency access, with isolation times for this crossing approximately 1 hour (See Figure 25). Refer to Figure 23 for proposed emergency egress in the PMF event.

These design measures ensure that habitable areas are not exposed to high flood hazard, and that safe, flood-free access is maintained for evacuation during extreme events. The development layout effectively manages residual PMF risk and aligns with principles of flood-resilient land use planning.

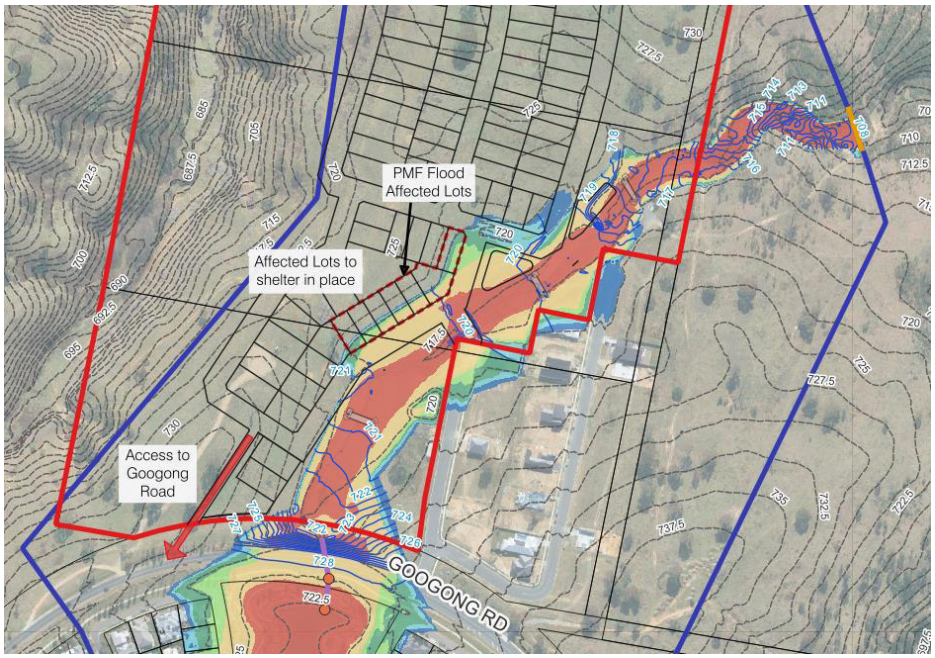

Figure 23: Post-development PMF Emergency Egress

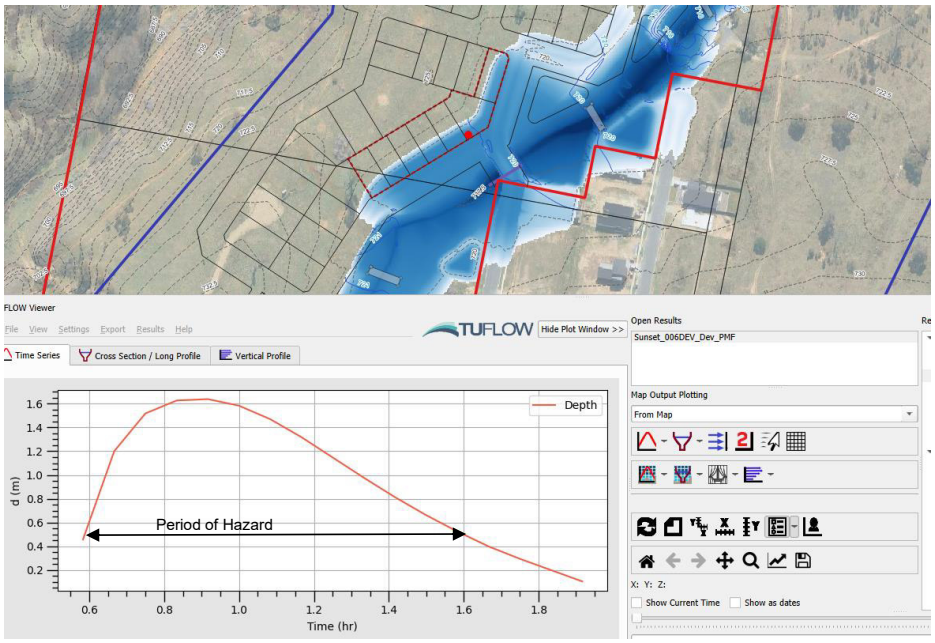

Figure 24: Isolation Time for Lots Affected by Flooding in the PMF Event

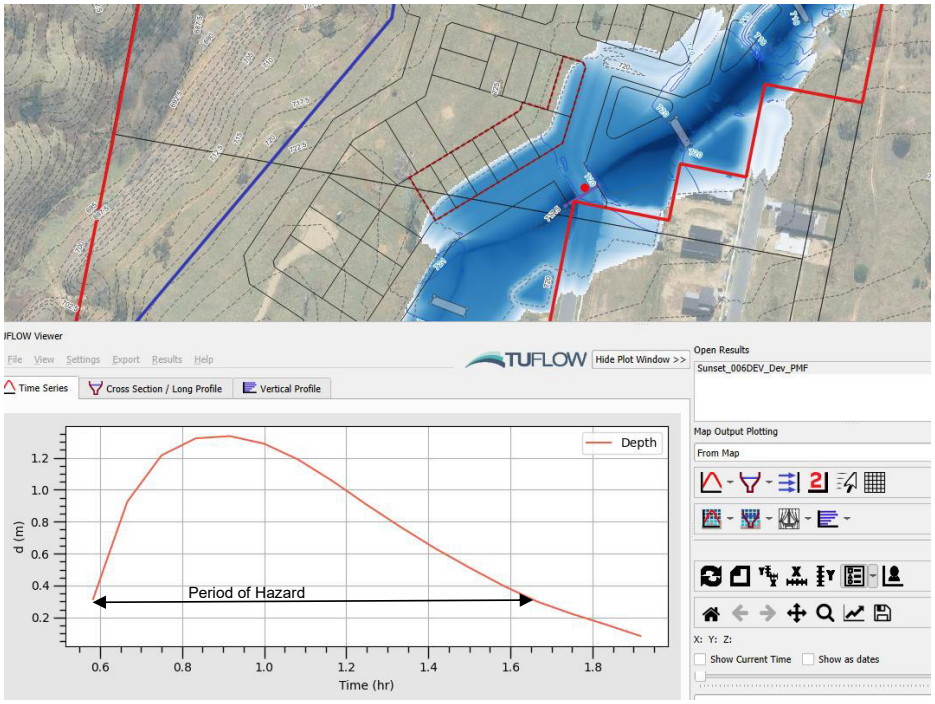

Figure 25: Isolation Time for Stage 1-2 Road Connection in the PMF Event

8. CONCLUSIONS AND RECOMMENDATIONS

8.1 CONCLUSIONS

The Flood Impact and Risk Assessment (FIRA) for Sunset Estate Stage 2 has evaluated the flood behaviour and associated risks under both existing and post-development conditions. The assessment incorporated hydrologic and hydraulic modelling for a range of design storm events, including 1% AEP, 1% AEP + Climate Change, 0.5% AEP, 0.2% AEP, and the Probable Maximum Flood (PMF).

Key conclusions include:

- **Flood Extents and Freeboard**: For all events up to the 0.2% AEP, floodwaters remain contained within the Googong Creek corridor, with sufficient freeboard to proposed infrastructure, including the Stage 2 road crossing.
- **PMF Impacts**: Under PMF conditions, floodwaters encroach upon several proposed lots adjacent to Googong Creek. Inundation is generally limited to lower portions of these lots, with habitable areas and infrastructure located above the PMF level to allow sheltering in place to occur.
- **Hazard Classification**: Under PMF conditions, high flood hazard (H5–H6) is predominantly observed within the Googong Creek corridor, road reserves, and some isolated areas within Stage 2 lots adjacent to the creek. Localised high hazard zones are present in lower portions of certain lots, particularly near steep batters. These areas are not proposed for habitable development and are effectively managed through elevated lot design and strategic placement of infrastructure.
- **Emergency Egress**: Despite PMF inundation of the Stage 1–2 road crossing, emergency access is maintained via Googong Road, supported by formal secondary access tracks and elevated lot design.
- **Climate Change Considerations**: The modelling incorporates high-emissions climate scenarios (SSP3-7.0) for long-term planning, ensuring robustness of flood resilience measures.

The proposed development layout (subject to future Development Consent) demonstrates a strong alignment with flood-resilient planning principles, ensuring safety and functionality under a range of flood scenarios.

8.2 RECOMMENDATIONS

To manage residual flood risks and ensure ongoing compliance with floodplain management objectives, the following recommendations are made:

- **Finalise Lot Design and Earthworks**
  Ensure that all dwellings are constructed above the PMF level, with retaining walls or other measures to separate habitable areas from potential inundation zones.
- **Emergency Management Planning**
  Develop a site-specific flood emergency response plan in consultation with QPRC and emergency services, including signage and public awareness measures for formal egress routes.

- **Drainage Infrastructure Maintenance**
  Implement regular inspection and maintenance of upstream basins and culverts to minimise blockage risk and ensure optimal performance during flood events.

- **Monitoring and Review**
  Periodically review flood modelling and assumptions, particularly in response to updated climate data or changes in upstream catchment development.

- **Stakeholder Engagement**
  Continue engagement with QPRC and relevant agencies to ensure transparency and alignment with broader floodplain management strategies.

- **Planning Controls and Compliance**
  Ensure that future development applications within the estate adhere to the flood-related controls outlined in QPRC's Development Control Plan and relevant state guidelines.

9. REFERENCES

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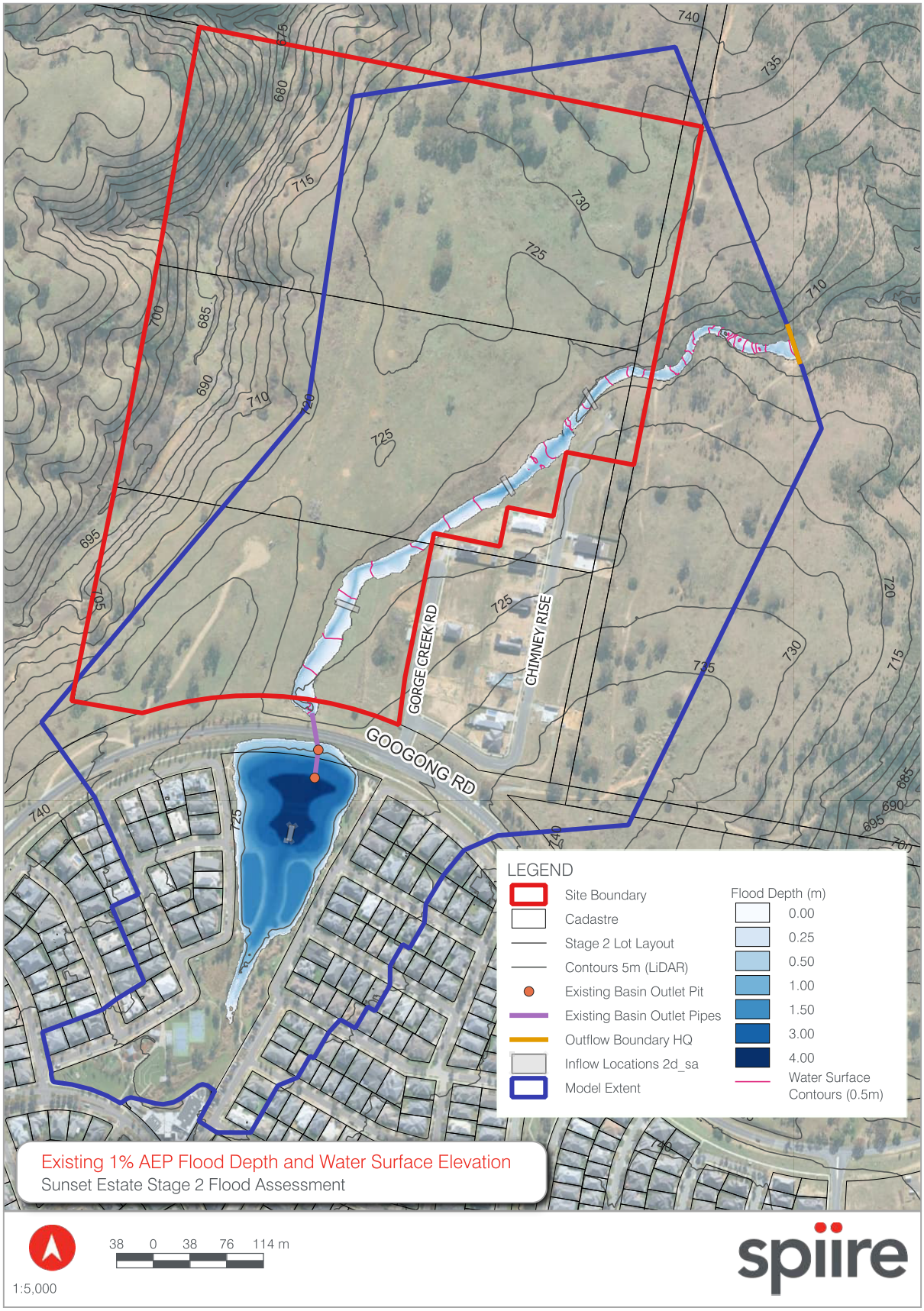
APPENDIX 1: FLOOD MAPS



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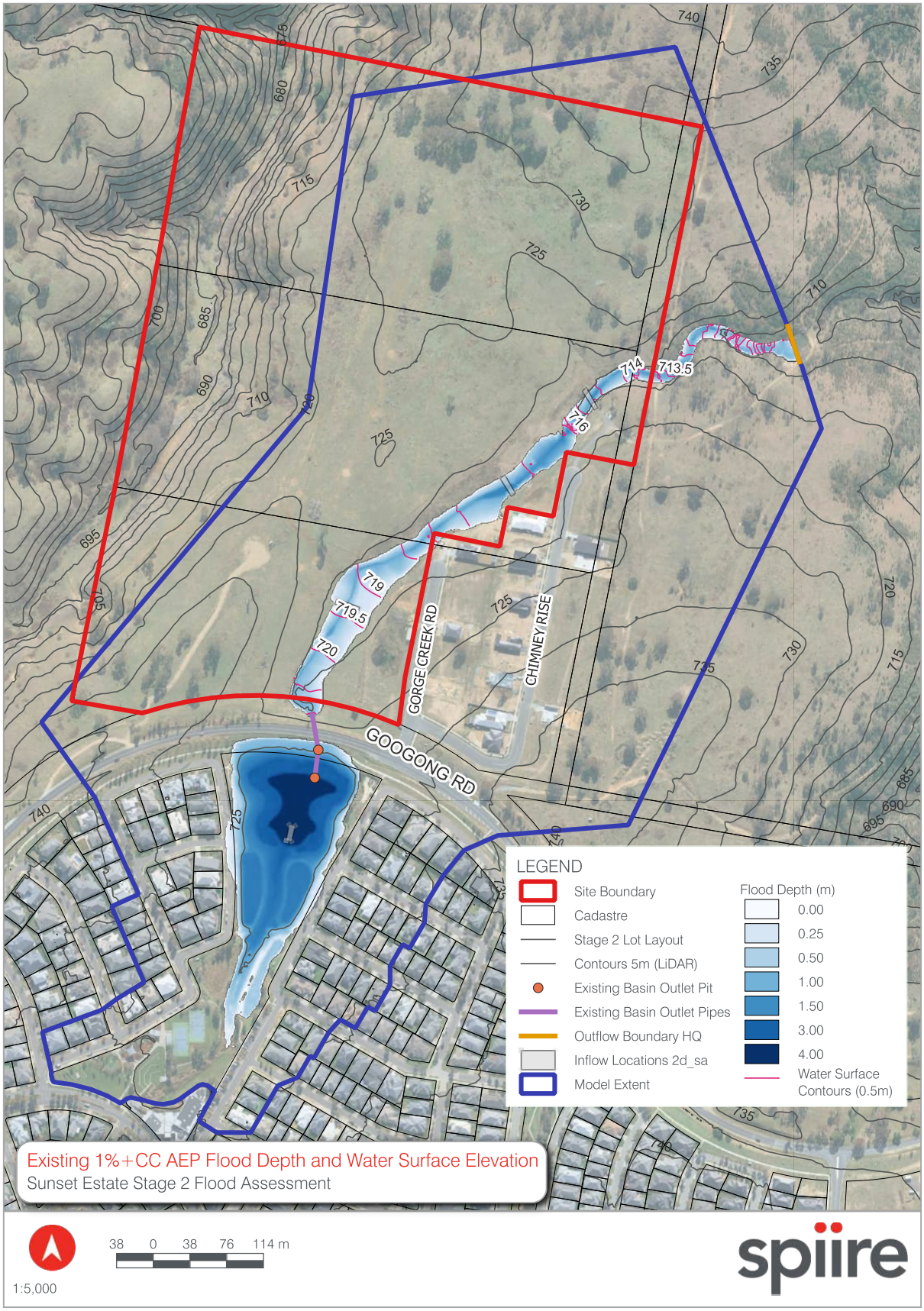

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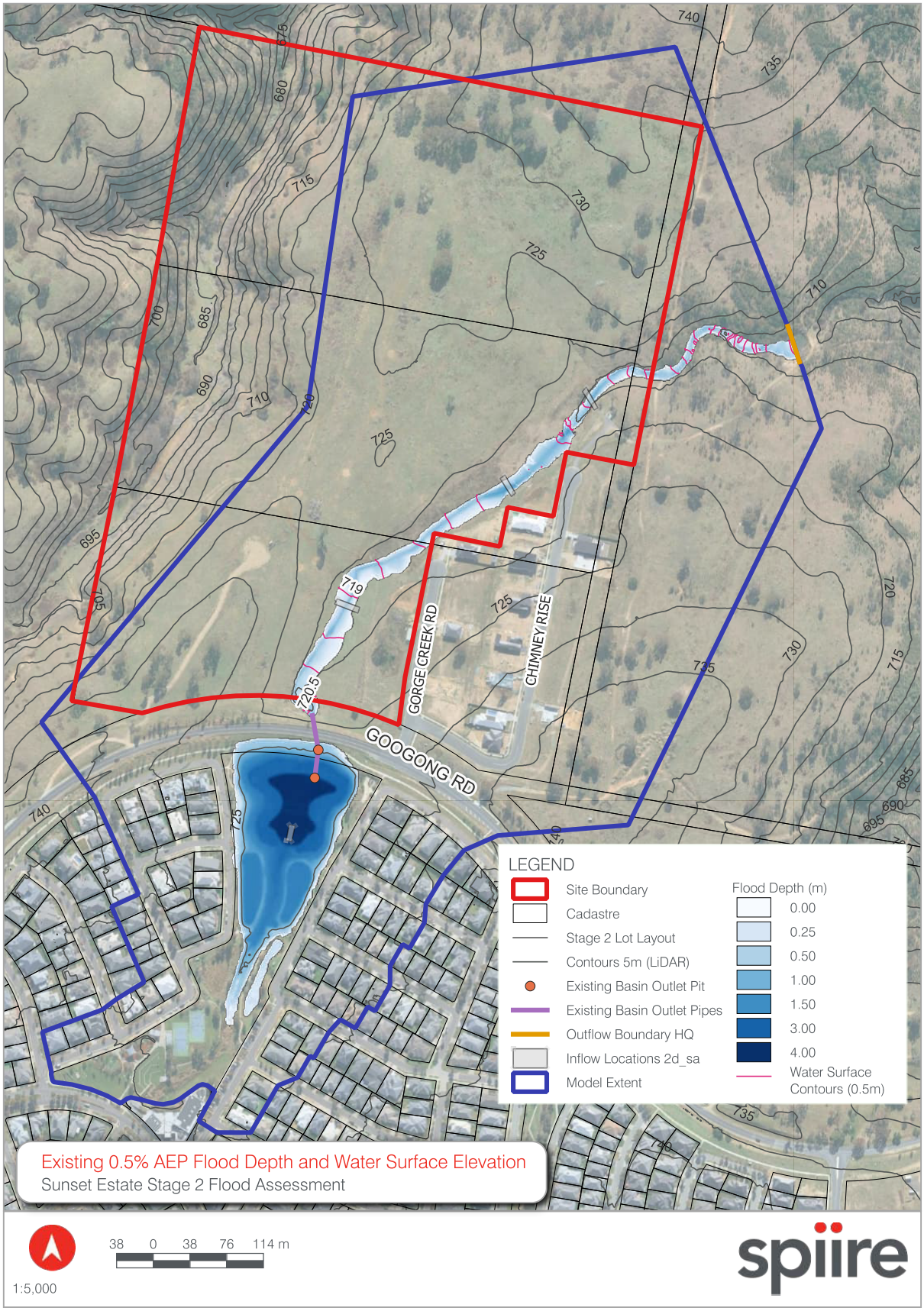

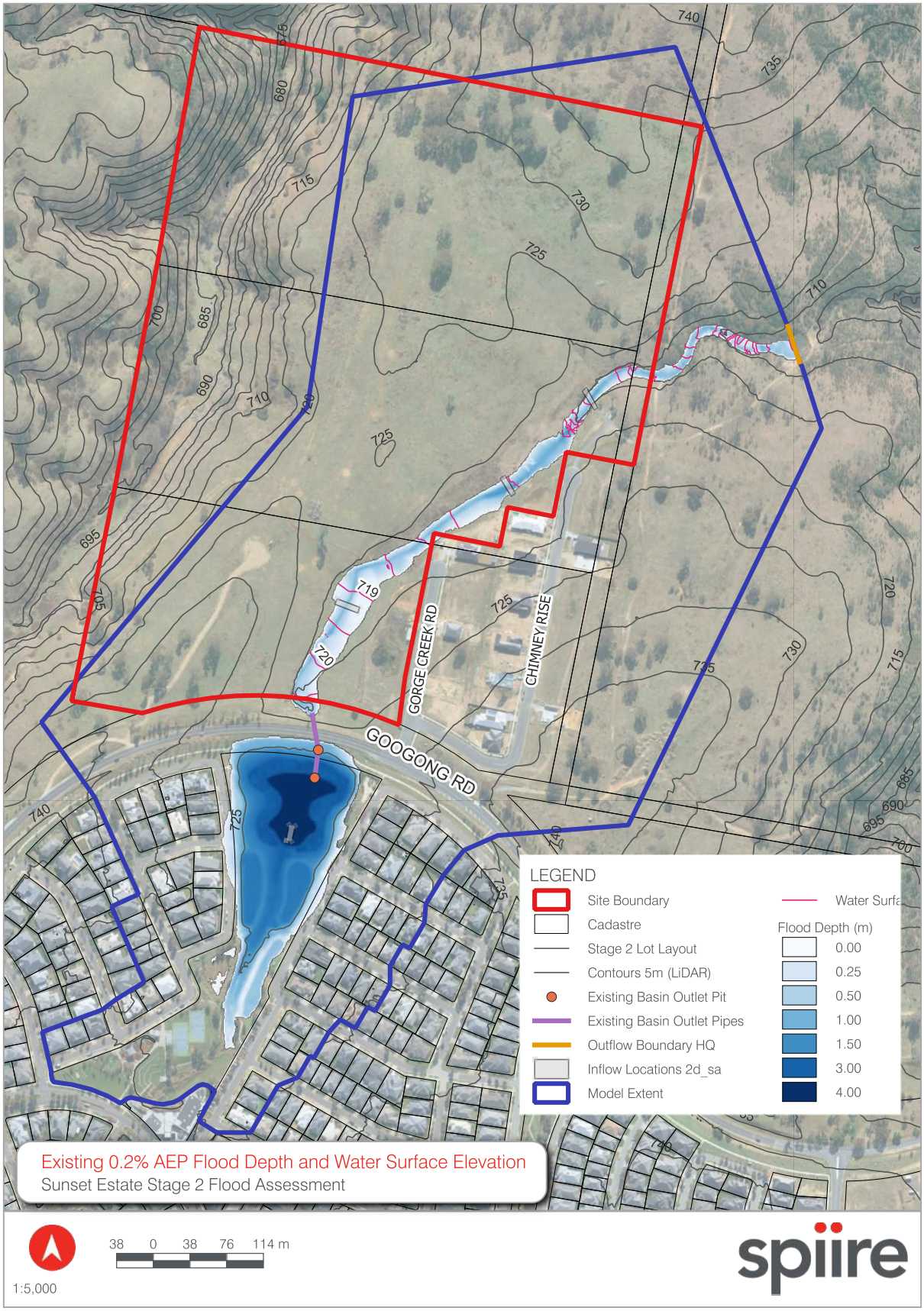

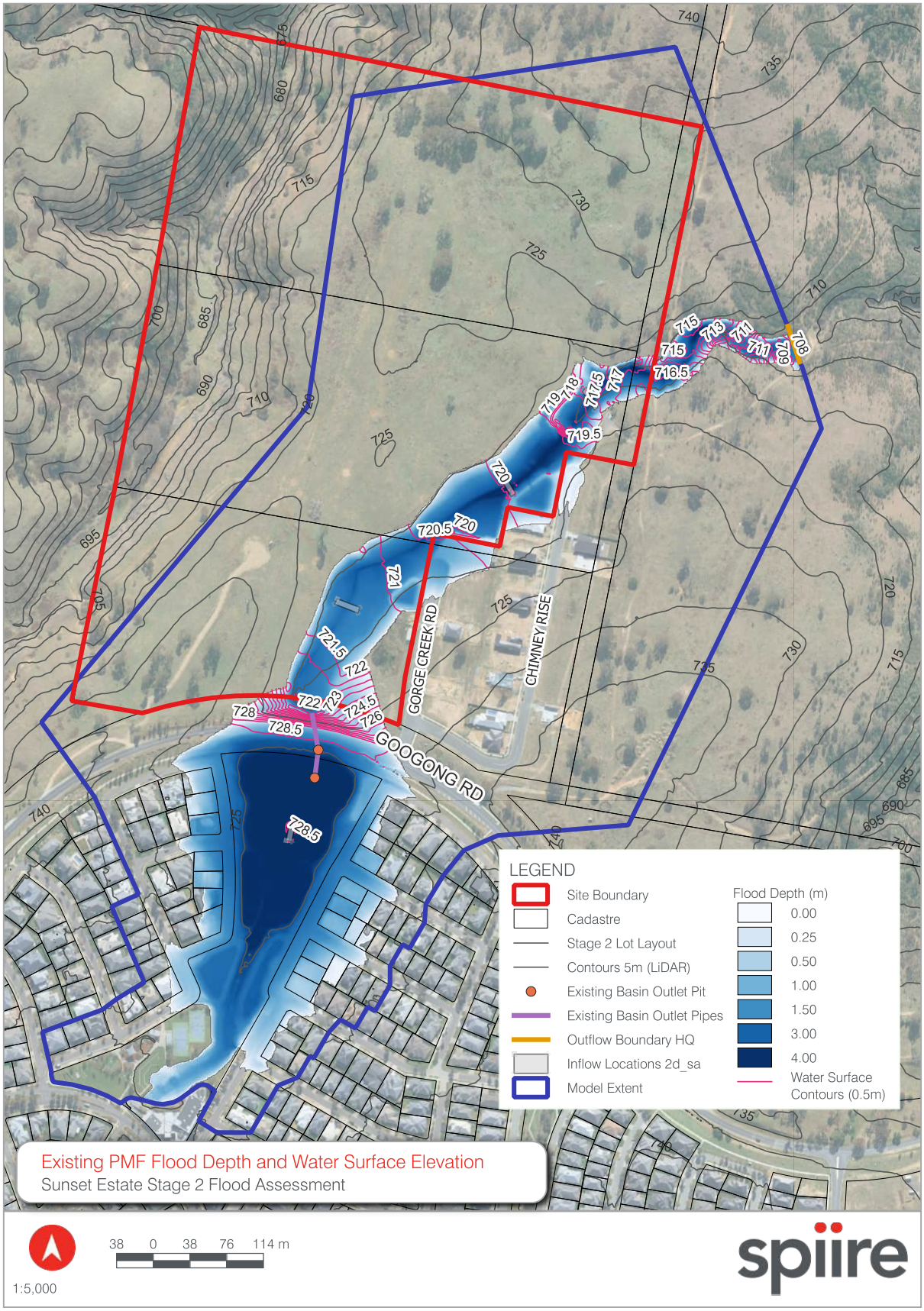

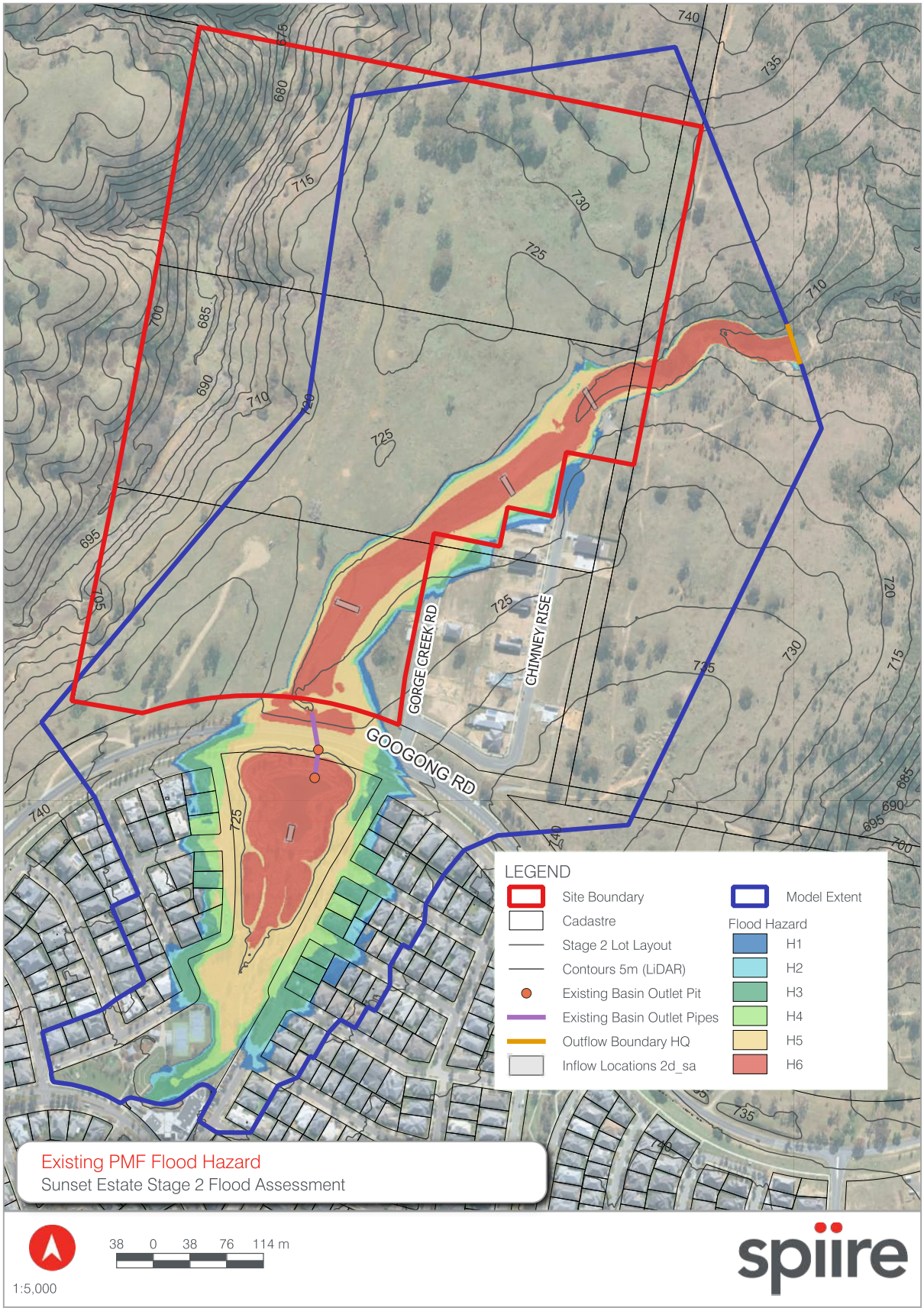

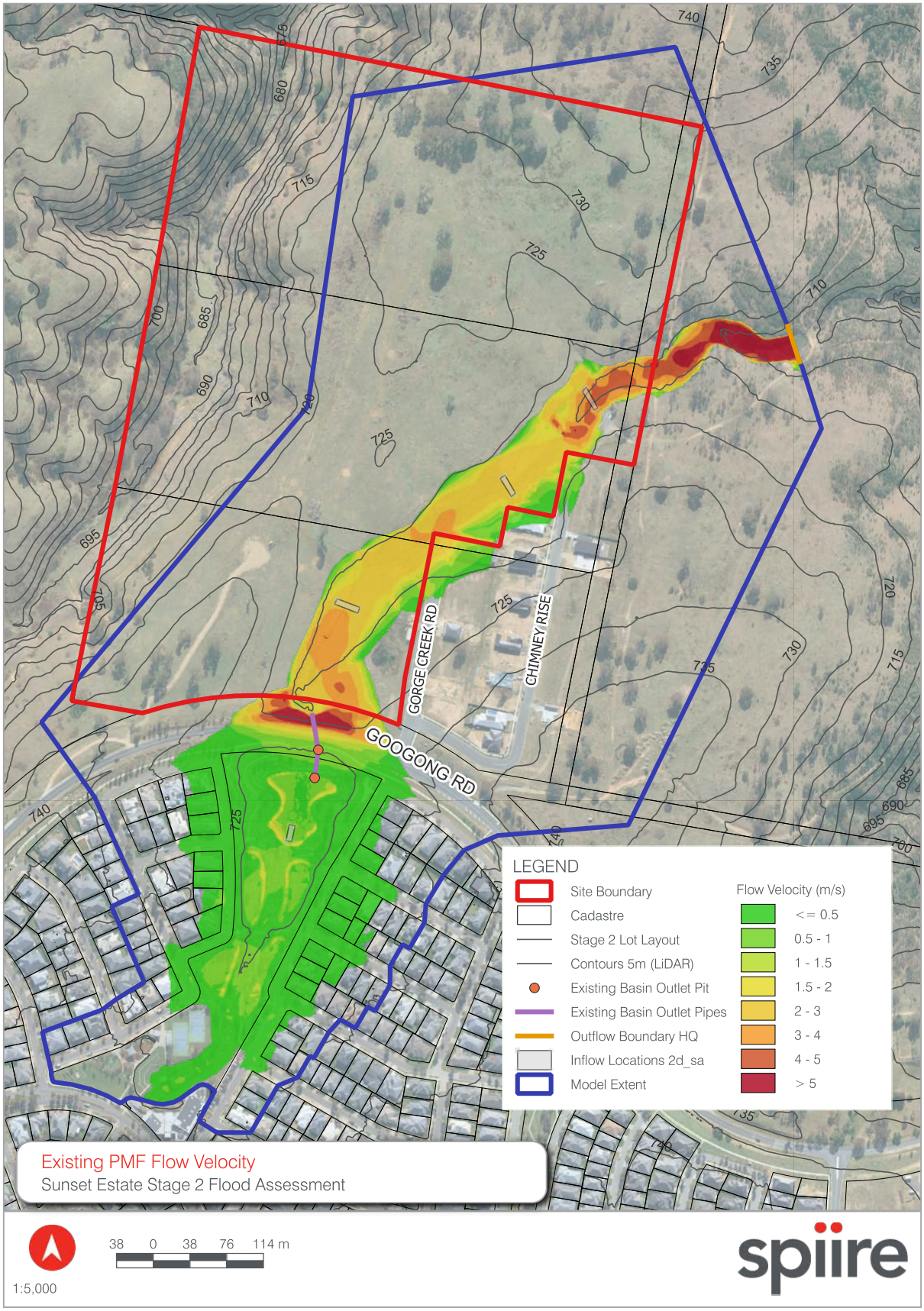

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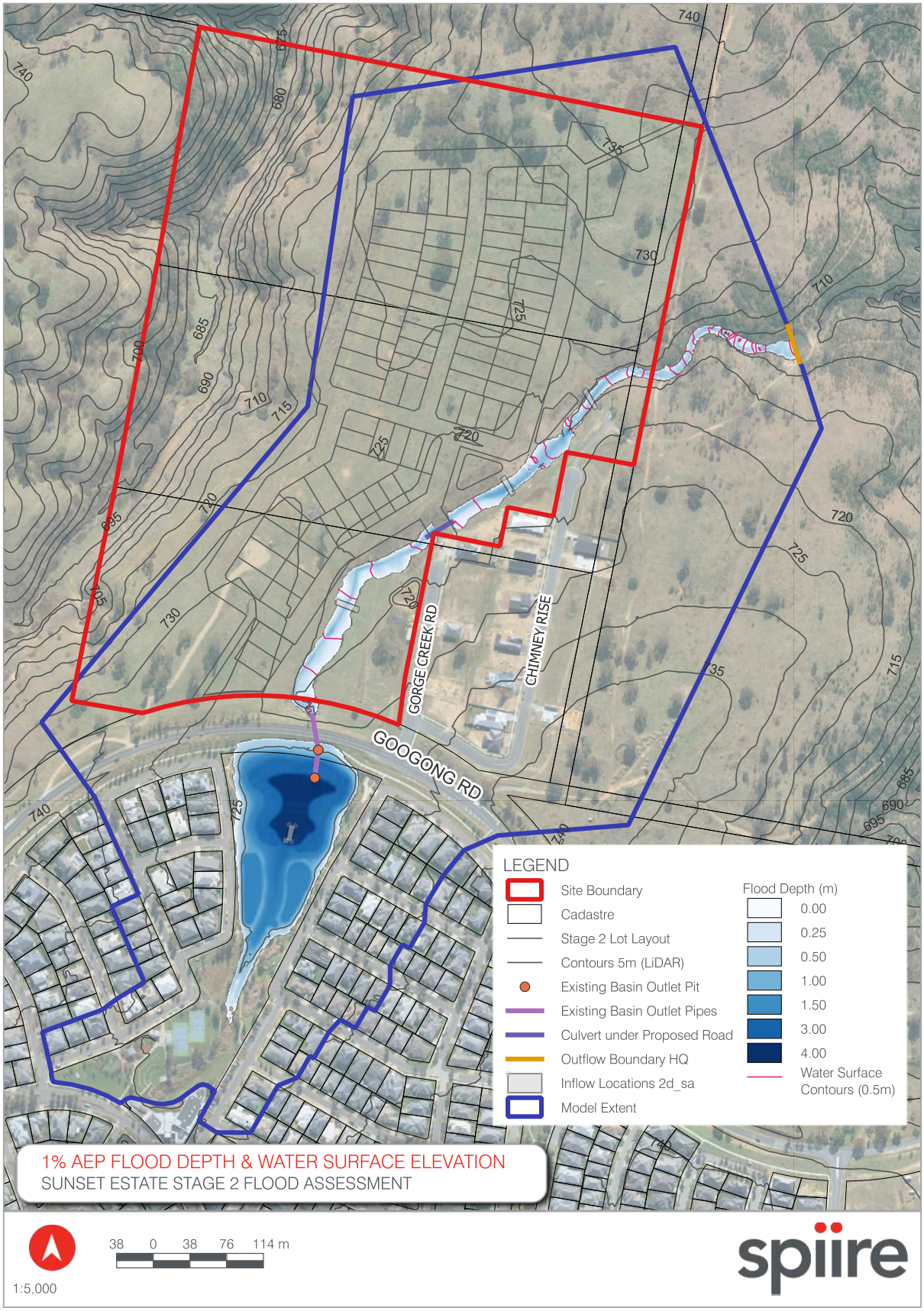

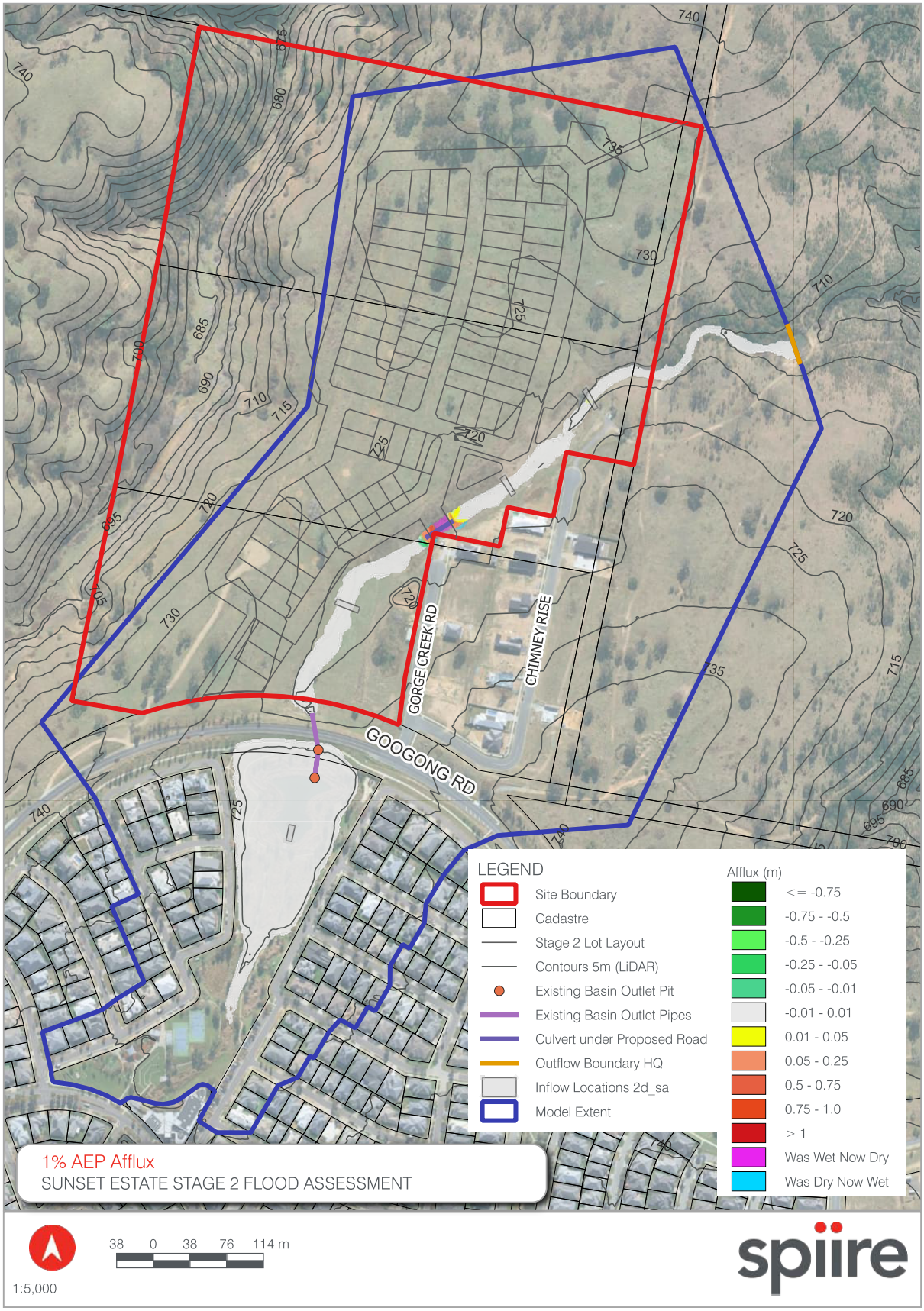

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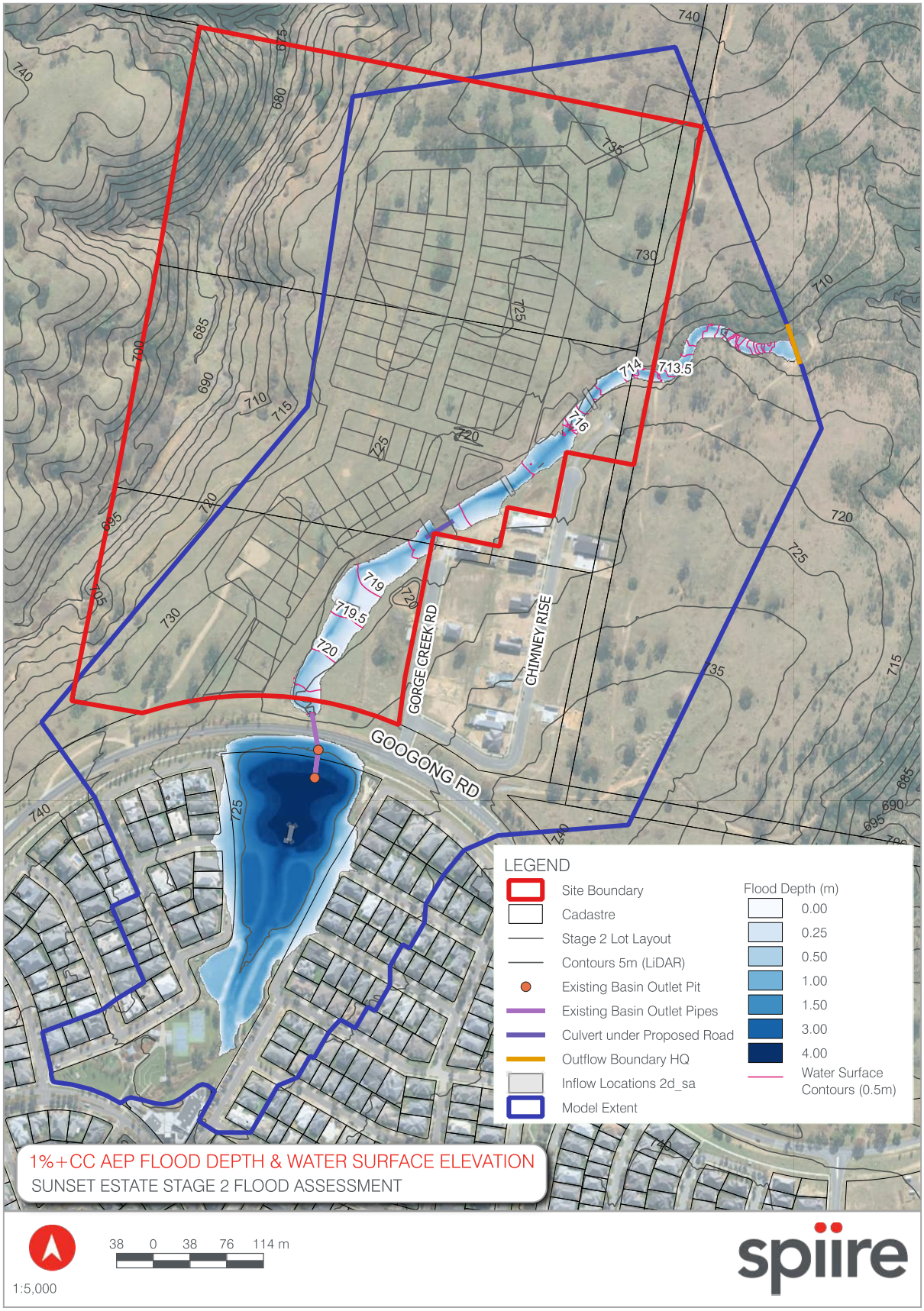

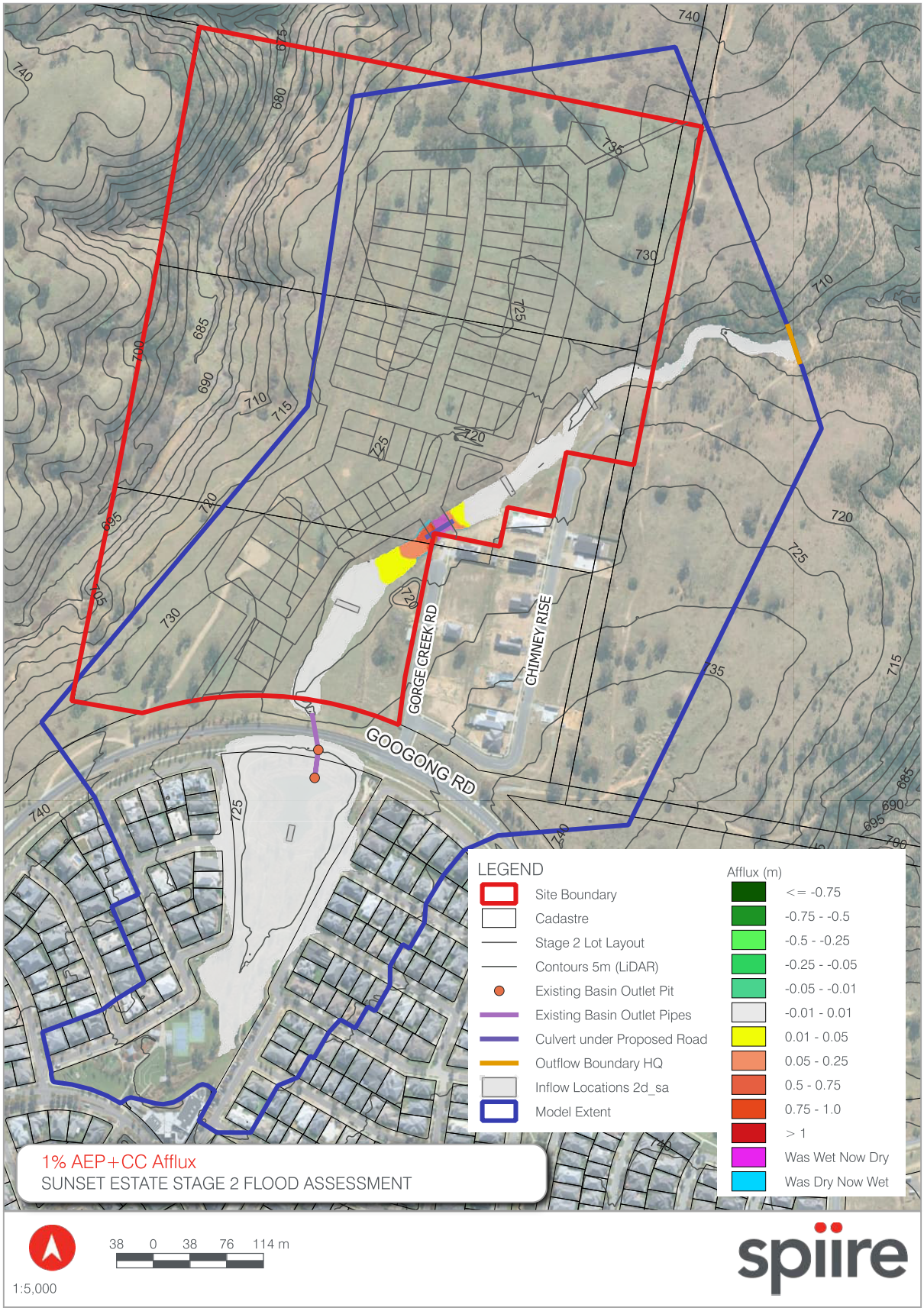

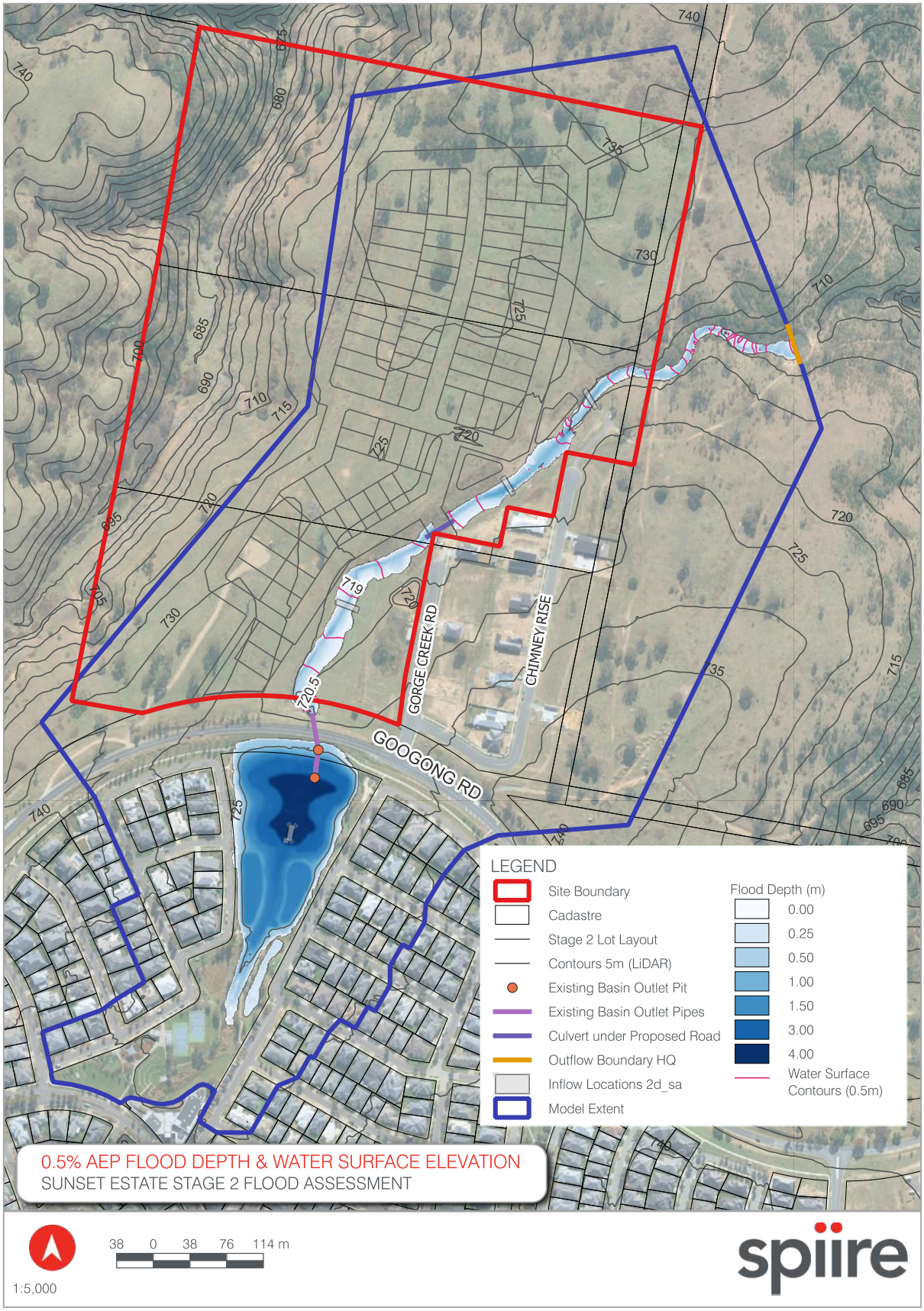

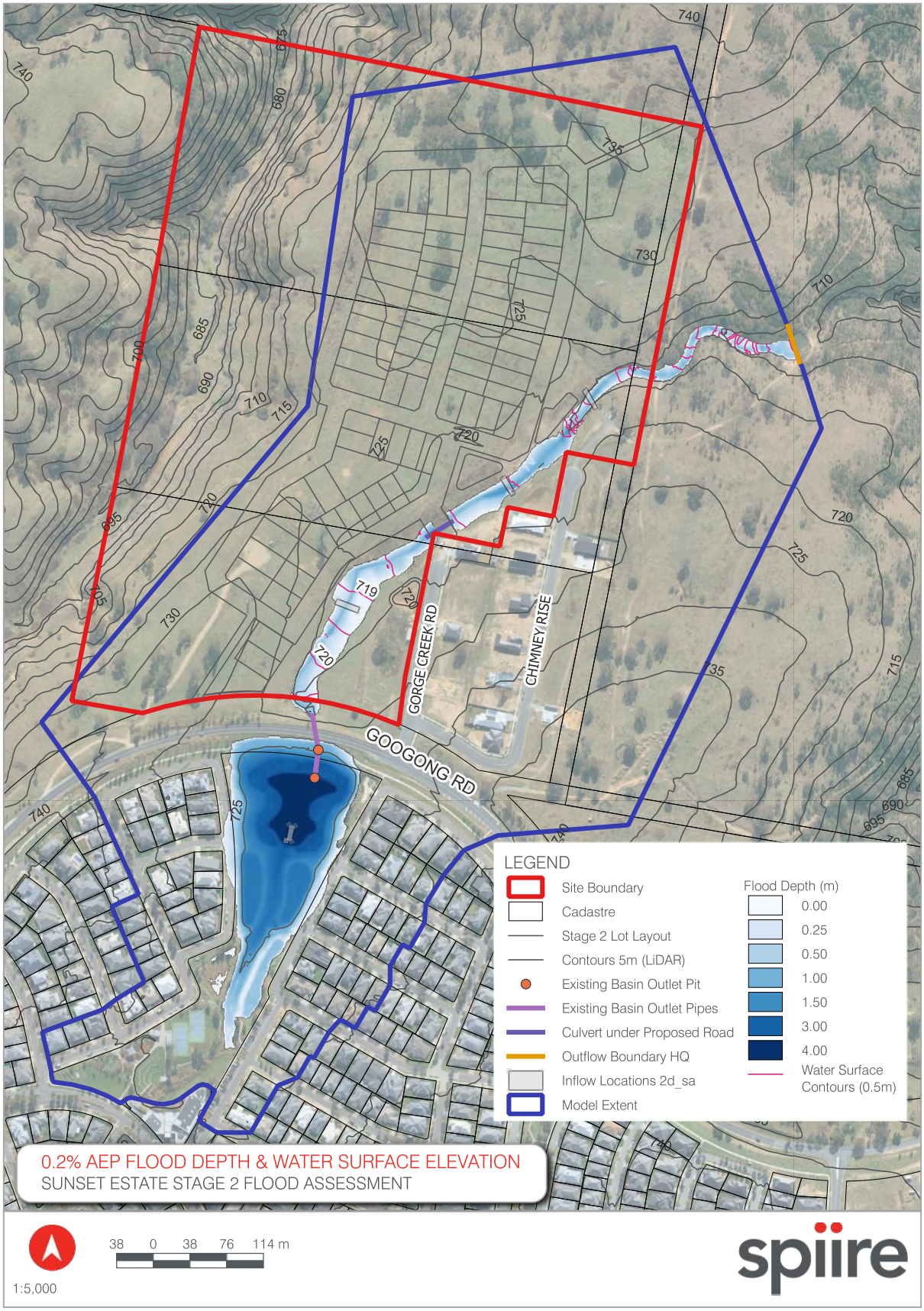

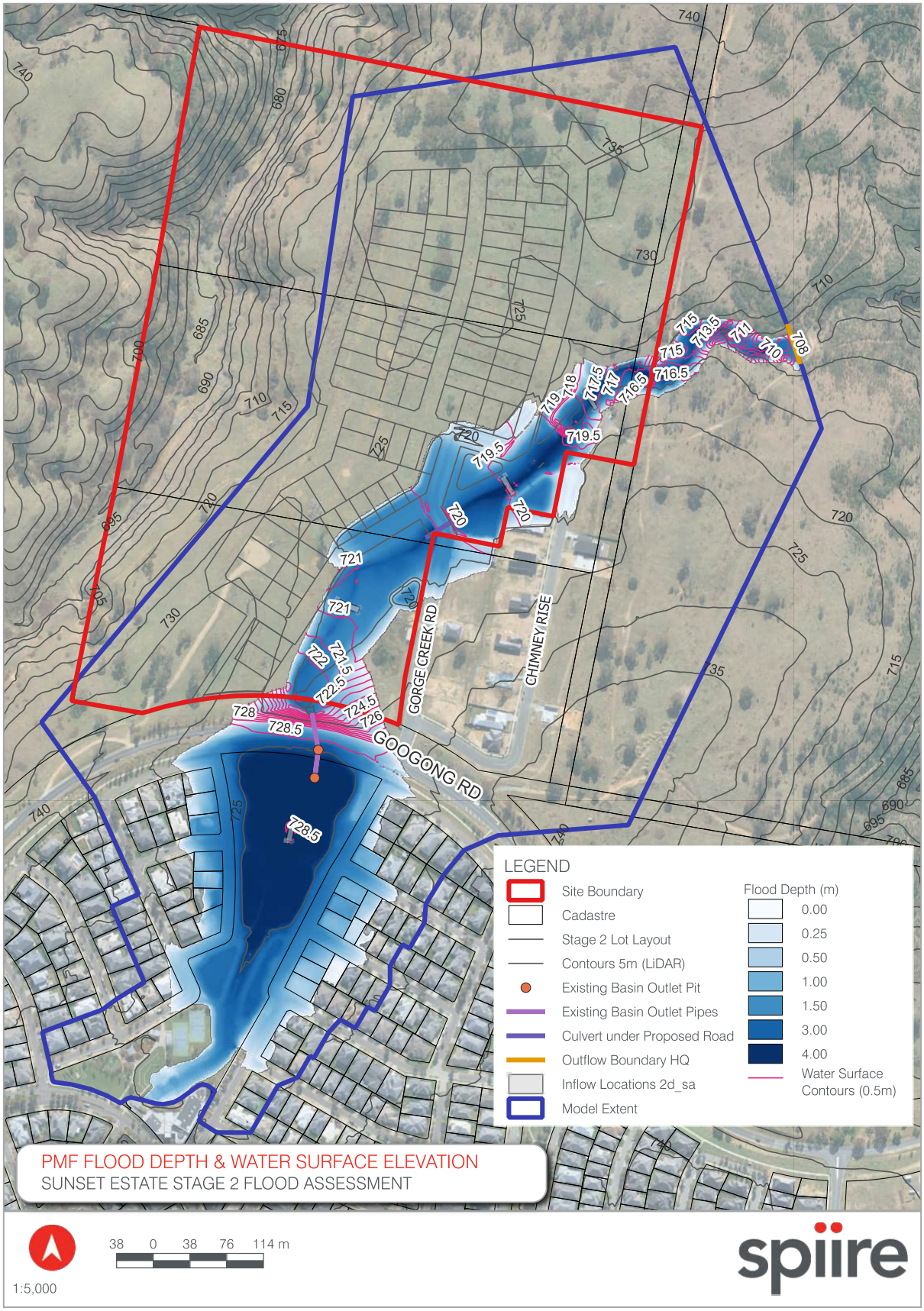

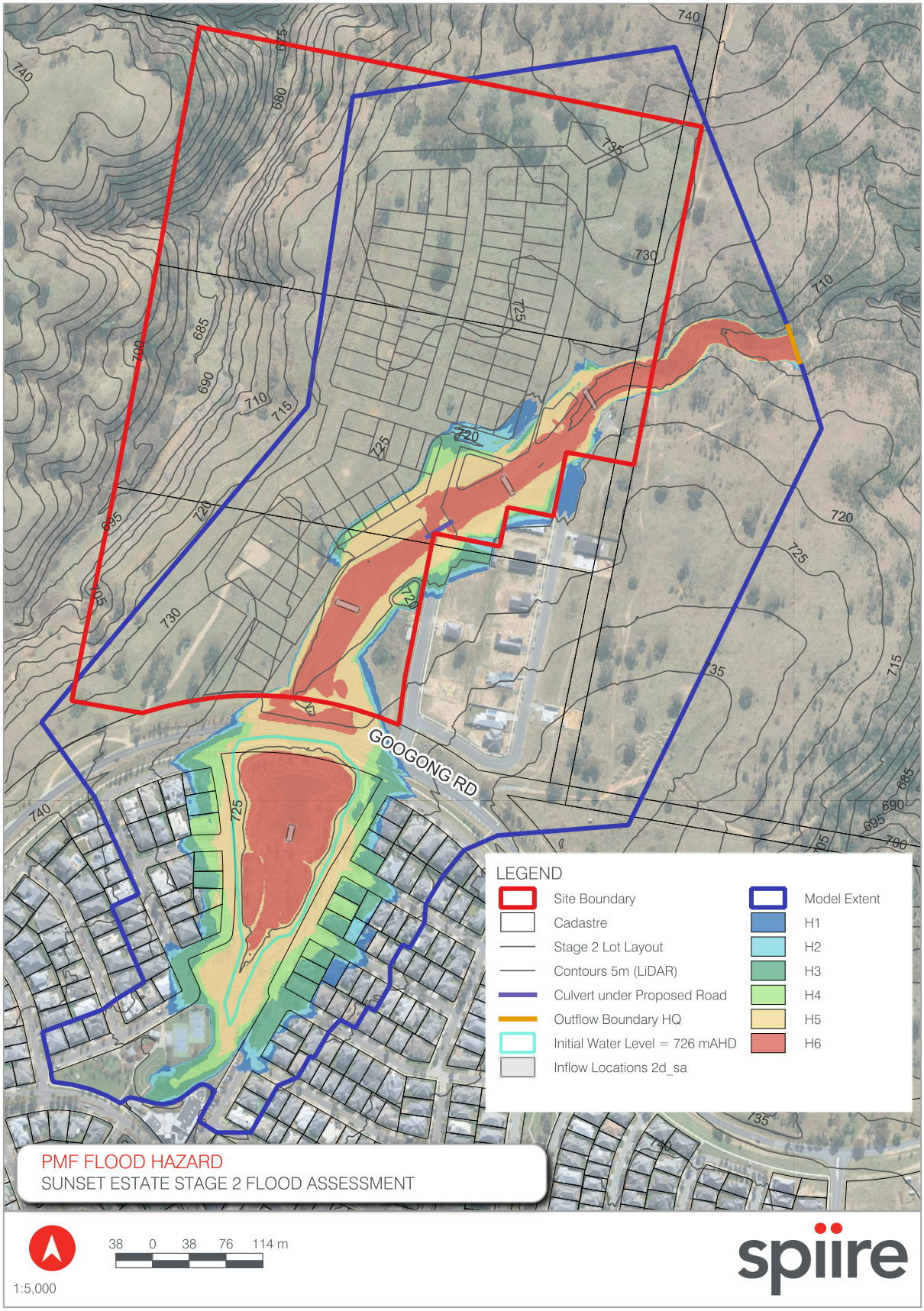

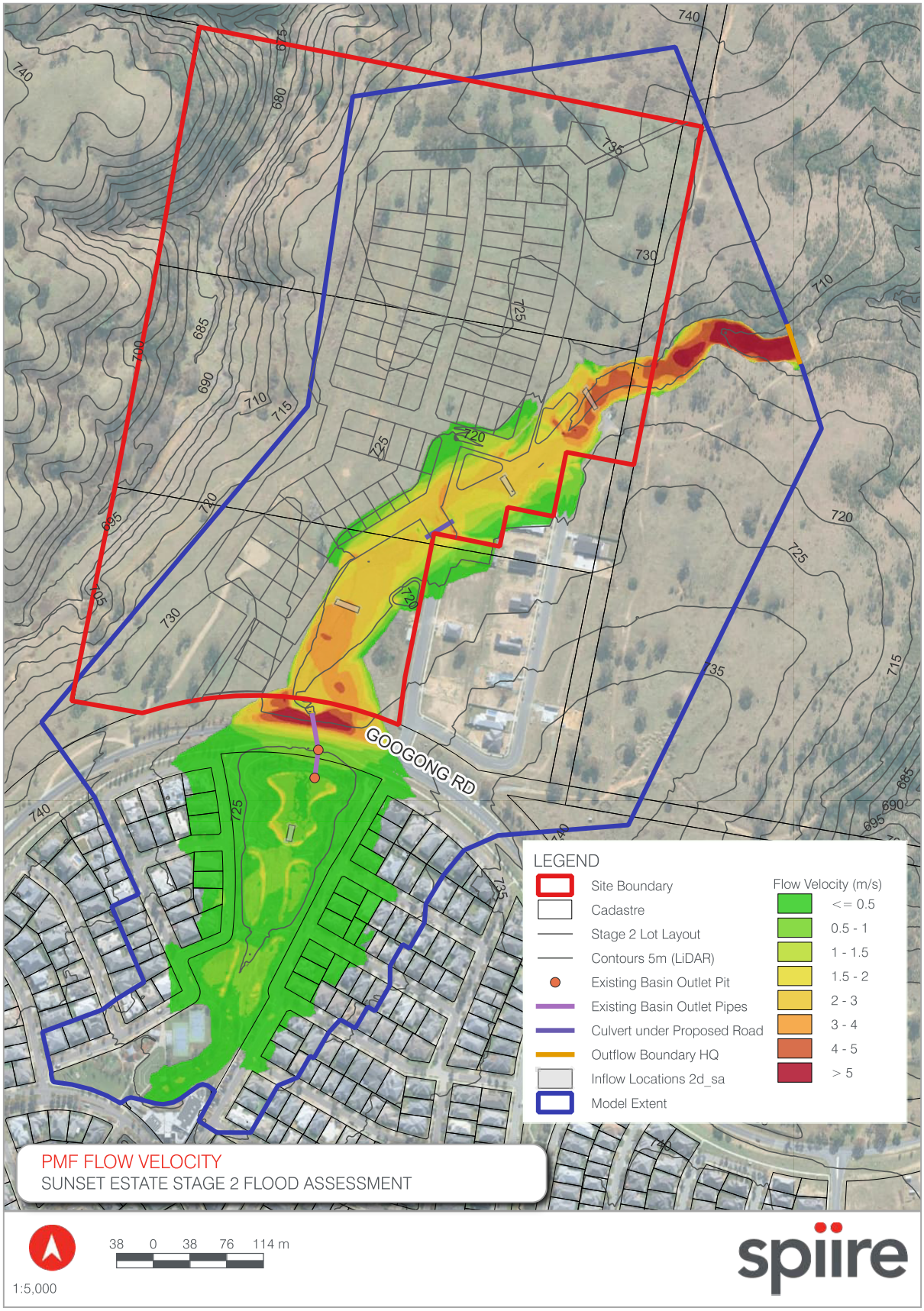

APPENDIX 2: GOOGONG NEW TOWN DRAINAGE REPORT (BROWN CONSULTING, 2010)

STORMWATER MANAGEMENT AND DRAINAGE ANALYSIS

DESIGN REPORT

NEIGHBOURHOOD 1A

STAGES 1 AND 2

GOOGONG NEW TOWN

March 2010
Prepared for CIC Australia






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STORMWATER MANAGEMENT AND DRAINAGE ANALYSIS

DESIGN REPORT

NEIGHBOURHOOD 1A :STAGES 1 AND 2

GOOGONG NEW TOWN

REVISION SCHEDULE

NO.	DATE	ISSUE	PREPARED BY	REVIEWED BY	AUTHORISED BY
0	16/03/2010	DRAFT	J Lepetit	T Connell	n/a
1	23/4/2010	FINAL	J Lepetit	T Connell	n/a
2	28/5/2010	FINAL FOR SUBMISSION	J Lepetit	T Connell	T Connell
3	1/6/2010	REVISION – ELTON COMMENTS	J Lepetit	T Connell	T Connell

Reference: H:\C09000\C09088\documents\de\Stormwater Management\C09088-StormwaterManagement&DrainageAnalysis_Rev3_20100601.docx

TABLE OF CONTENT

1 INTRODUCTION

This design report for the stormwater drainage and management of Neighbourhood 1A: Stages 1 and 2 of the proposed Googong New Town has been prepared by Brown Consulting (ACT) Pty Ltd for CIC Australia to support the Development Application (DA) for Neighbourhood 1A: Stages 1 and 2 of the future Googong New Town. This study specifically addresses the issues associated with stormwater drainage and peak flow attenuation, stormwater quality control and improvement using Water Sensitive Urban Design (WSUD) principles and is built upon collaborative work with Brown Consulting (NSW) Pty Ltd and EDAW|AECOM.

Googong New Town will at ultimate development extend over three catchments: Montgomery Creek catchment, Jerrabomberra Creek catchment and an unnamed creek referred to as Googong Creek catchment.

The DA for Neighbourhood 1A: Stages 1 and 2 focuses on Googong Creek catchment. It further develops the previous investigation undertaken and presented in the Googong Creek Catchment Stormwater Strategy (Brown Consulting, January 2010, see **Appendix A**)

This report should be read in conjunction with the Development Application Drawings (the Drawing Set).

1.1 PURPOSE OF THIS REPORT

This report has been prepared to demonstrate to Queanbeyan City Council and any other determining authority that the design features of the Neighbourhood 1A: Stages 1 and 2 of Googong New Town within Googong Creek catchment are appropriate for approval. The objectives of this report are to:

- Provide a summary of the existing drainage and hydrologic environment of Googong Creek.
- Outline the design criteria and codes that apply to the development.
- Describe the features of the stormwater management system for Googong Creek.
- Provide calculation and modelling outputs demonstrating how the project complies with the planning regulations.
- Describe the management of major and minor overland flows in Googong Creek.
- Outline how the stormwater quality measures included in the design will reduce the post developed pollutant loads.
- Outline the soil and water management strategies to be employed during construction.

1.2 STORMWATER OBJECTIVES OVERVIEW

The key objectives for stormwater management include:

- Meet stormwater targets identified within the Queanbeyan Development Control Plans (DCP) for both water quality and quantity.
- Linking water infrastructure effectively to minimise the impacts of development upon the water.
- Protecting downstream receiving waters (e.g. riparian corridors) from flooding and water quality degradation.
- Protect assets and the future subdivision from flooding.

A number of design criteria have been integrated into the design of the stormwater system for Neighbourhood 1A: Stages 1 and 2 including:

- Queanbeyan City Council – *Handbook of Drainage Design Criteria*;
- Queanbeyan City Council – *Development Control Plan No. 38 – Subdivision, Part B1 – Subdivision Design Criteria*;
- Queanbeyan City Council – *Development Control Plan No. 41 – Soil, Water and Vegetation Management Plans*;
- Queanbeyan City Council – *Development Design Specification D5 Stormwater Drainage Design*;
- Queanbeyan City Council – *Development Design Specification D7 – Erosion Control and Stormwater Management*;
- Queanbeyan Local Environment Plan (1997)
- ACT Planning and Land Authority *Waterways Water Sensitive Urban Design – General Code* (2008)
- ACT Planning and Land Authority *Industrial Zones Development Code* (2008)
- Suggested Googong Development Control Plan (by Elton)

1.3 EXISTING CONDITIONS

This section presents a summary of the detailed information contained in the Googong Creek Catchment Stormwater Strategy (Brown Consulting (NSW) Pty Ltd, January 2010) (provided in **Appendix A**).

Topography and Site Drainage

Googong Creek is the second largest catchment within the future Googong New Town. Representing roughly 164 ha within the site, it drains the northern area of the site from the western boundary at Old Cooma Road in a North Easterly direction to Queanbeyan River.
Twin culverts are located on Googong Creek at the Googong Dam Road embankment representing the downstream boundary of the development area.

Waterways and major drainage lines

There are a number of minor tributaries of Googong Creek within the site. The creek has two distinct characters; upstream and downstream of the Googong Dam Road culvert.

Upper section

The main channel and tributaries in the upper section of Googong Creek consist of grassy swales and remnant chain of ponds meadows draining to a number of farm dams. Minor modifications to the drainage lines in these sections have occurred, with diversion banks constructed to increase flows to several dams. Within this upper section there are limited lengths of stream bed and bank formations. There is a small part of Googong Creek on the western side of Old Cooma Road. This site is partially cleared and is generally steeper than the section of creek within the site. This catchment is drained under Old Cooma Road via a piped culvert (600 mm diameter). Flows in excess of the capacity of this culvert would pond behind the road embankment and flow over the roadway. The size of this catchment is 28.1 hectares. A culvert consisting of twin nominal 1650 mm diameter pipes is located on Googong Creek at the Googong Dam Road embankment. The culvert, embankment and the large dam immediately upstream form a de facto detention basin at this location, providing storage for flows above the culvert capacity. It is considered extremely unlikely that the roadway would be overtopped in any storm event.

Lower section

Preliminary investigations of the section of Googong Creek downstream of the twin culvert Googong Dam Road indicate that the creek is well formed with definable beds and banks. This section can be classified as having higher riparian values and development in this area, known as "Hamlet East" will incorporate different water design measures than the upstream sections. Neighbourhood 1A: Stages 1 and 2 does not extend downstream of the Googong Dam Road. This report therefore does not include any details of the development downstream of Googong Dam Road.

Googong Creek Classification

Brown Consulting completed in November 2008 a Riparian Corridor Assessment for all catchments located at Googong New Town site. The document was presented and discussed with DWE and DPI (now Department of Climate Change and Water).
The assessment of the classification of the various reaches of the creek system has been undertaken to provide guidance on the type of riparian corridor to be provided. There are two classification systems for the creeks; the first is DWE's creek categorisation system and the second is DPI's (NSW Fisheries) creek categorisation system for aquatic habitat.

The DWE classification was developed from the riparian corridor assessment project in the Illawarra region. This system provides natural recourse outcomes for a range of environmental objectives. This system has three categories:

- Category 1 – Environmental Corridor. This maximises the natural resource outcomes sought for a watercourse. These include protection and enhancement of aquatic and terrestrial vegetation and habitat. With an emphasis on improving connectivity between habitat zones.
- Category 2 – Terrestrial and Aquatic Habitat. This has similar objectives as Category 1, but is less stringent in terms of width of the core riparian zone and connectivity requirements.
- Category 3 – Bank Stability and Water Quality. This recognises the lower values of some streams with regard to environmental functions and because of site constraints it is unlikely that an ecologically satisfactory riparian outcome can be achieved.

The DPI classification system is based on the likelihood of fish habitat being present. This system has four categories:

- Class 1- Major Fish Habitat. Major permanently or intermittently flowing waterway (e.g. river or major creek), habitat of a threatened fish species.
- Class 2 – Moderate Fish Habitat. Named permanent or intermittent stream, creek or waterway with clearly defined bed and banks with semi permanent waters in pools or in connect wetland areas. Marine or freshwater aquatic vegetation is present. Known fish habitat and/or fish observed inhabiting the area.
- Class 3 – Minimal Fish Habitat. Named or unnamed waterway with intermittent flow and potential refuge, breeding or feeding areas for some aquatic fauna. Semi-permanent pools form within the waterway or adjacent wetlands after a rain event. Otherwise, any minor waterway that interconnects with wetlands or recognised aquatic habitats.
- Class 4 – Unlikely Fish Habitat. Named or unnamed waterway with intermittent flow following rain events only, little or no defined drainage channel, little or no flow of free standing water or pools after rainfall events.

This document has identified the following creek categorisation for Googong Creek:

Table 1 Creek Classification

Creek	DWE Category	DPI Classification
Lower Montgomery Creek	1	2
Upper Montgomery Cree	2	3
Lower Googong Creek	2	2
Upper Googong Creek	3	4
Jerrabomberra Creek	3	4
Queanbeyan River (within Site)	3	4
Queanbeyan River (hamlet area)	2	2

Creek classification for Googong Creek identifies the limited environmental and habitat value of upper Googong Creek which is proposed for partial development and modification. The

lower Googong Creek possesses environmental values that need to be protected through careful management.

2 HYDROLOGY

It is important to note that while the DA is focused on Neighbourhood 1A: Stages 1 and 2 of the Googong New Town, the hydrological and stormwater analysis was carried out for the whole of Googong Creek Catchment which extends beyond Neighbourhood 1A: Stages 1 and 2 alone to the west.

2.1 OBJECTIVES

The specific objectives of the DA with regards to stormwater quantity management include:

- Attenuate all storm flows from 1 year ARI to the 100 year ARI to existing flow levels,
- Provide a high level of safety in terms of batter slopes and ponding depths,
- Protect assets from flooding.

2.2 METHODOLOGY

The *XP-RAFTS* model was used for hydrological analysis of the existing catchment to obtain pre-development flows (referred to as the Permissible Site Discharge) from Stage 1, and to model the proposed development scenario. The model integrates the various stormwater detention basins as well as the area known as the "mini-common" as initially discussed and presented in the Googong Creek Catchment Stormwater Strategy (Brown Consulting (NSW) Pty Ltd, January 2010) (provided in **Appendix A**).

2.2.1 Hydrological Model Parameters

The *RAFTS* hydrological model was used for existing conditions and analysis of developed conditions. The following parameters from QCC Handbook of Drainage Design Criteria supplemented with the ACT Planning and Land Authorities' Water Sensitive Urban Design General Code (March, 2008) were adopted:

ARBM Rainfall losses

The Australian Representative Basins Model (ARBM) approach was used to model rainfall losses. The values adopted in the ARBM model were as per Table 1.3 of the Handbook of Drainage Design Criteria and Table 1.6 ACT Design Standards for Urban Infrastructure – Stormwater.

Initial Continuing Losses

The IC losses method was used to estimate the impervious areas of the proposed development with the following assumptions:

- Impervious Initial Loss 0.5mm
- Impervious Continuing Loss 0 mm

Manning's values and Impervious Fraction

Manning's values were assigned in accordance with the QCC Handbook of Drainage Design Criteria and the ACT Planning and Land Authorities' Water Sensitive Urban Design General Code (March, 2008).

- Impervious Areas Roughness n=0.015
- Pervious Areas Roughness n=0.040

Impervious fraction was assigned based on:

- QCC Handbook of Drainage Design Criteria,
- ACT Design Standards for Urban Infrastructure – Stormwater (Table 1.3 p. 1-10)
- as well as relevant project experience modelling similar conditions.

Typical impervious fractions are provided below:

Table 2 Typical Impervious Fractions

Land Use	Impervious Fraction Used	QCC Values[1]
Town Centre	90%	n/a
Commercial Area/Shopping Centre	85%	85%
Roads	80%	n/a
Residential Area (Multi Unit)	70%	70%
Residential Area (Single Residential)	60%	60%
Open Spaces	5-10%	10%

While the typical values specified above are relevant and compliant with standards, it is recommended that these impervious fraction values are refined based on more actual land use at detailed design stage.

2.2.2 Calibration

The above RAFTS parameters were applied to the model to estimate flows from the catchment for the 100 year ARI storm. For the calibration, a Probabilistic Rational Method was used to estimate the flow and the RAFTS model Bx factor adjusted accordingly to achieve a similar flow. The Rational Method was considered suitable for calibration: the catchment is a large rural catchment, which can be well approximated by this method. This process determined that the RAFTS model Bx factor required adjusting to a value of 1.5 to approximate the peak flow from the rational method.

2.2.3 Rainfall Data

Design storms obtained from Chapter 3 of *Australian Rainfall and Runoff* (Institution of Engineers, Australia, 1987) using Intensity-Frequency-Duration (IFD) data, were used for

[1] Values taken from Handbook of Drainage Design Criteria (Table 1.1)

ARI's of 2 to 100 years, which were representative of the local climatic conditions in Googong. Storm durations from 10 minutes to 24 hours were analysed.
Googong IFD table is provided in **Appendix B**.

2.2.4 Hydrological Model Catchments

The calibrated XP-RAFTS model was used to assess both pre-development hydrological conditions as well as proposed post-development conditions including proposed stormwater detention and peak flow attenuation measures. Summary results are provided below.
Detailed results are provided in **Appendix C**.

A map of the XP-RAFTS model catchment is provided as drawing no. C09088-100+ in the drawing set.

The XP-RAFTS model catchments are summarised below:

Table 3 Googong Creek Catchment RAFTS Catchments (Developed)

Developed Catchments	Total Area [ha]	Percentage Impervious [%]
A1-1	3.20	10%
A1-2	2.18	50%
A1-3J	n/a	
A1-4 Swale	0.28	100%
A1-5	1.39	20%
A1-6	3.92	20%
A1-7J	n/a	
A1-8	6.03	70%
A1-9	6.84	70%
A1-10	3.47	70%
A1-11	5.71	70%
A1-12	9.24	50%
A2-1	4.73	70%
A2-2	5.95	70%
A3-1	2.09	70%
A4-1	2.12	70%
A5-1	4.51	70%
A6-1	1.86	70%
A7-1	5.64	70%
A7-2	6.49	70%
A7-3	1.81	70%
A8-1	2.63	70%
A9-1 swale	0.22	100%

Developed Catchments	Total Area [ha]	Percentage Impervious [%]
A9-2	2.94	60%
A9-3J	0.00	100%
A9-4	5.52	50%
A9-5J	n/a	
A9-6	8.24	50%
A9-7	15.11	5%
A9-8	13.02	5%
A10-1	1.41	70%
A11-1	1.00	70%
A12-1	1.84	70%
A13-1	2.48	70%
A14-1	2.10	70%
A15-1	3.26	60%
A15-2	6.46	70%
A16-1	3.66	70%
A17-1	6.16	70%
A18-1	3.03	70%
A19-1	1.34	70%
A20-1	4.40	70%
A20-2	7.11	70%
A20-3	10.58	70%
A21-1	1.85	70%
A22-1	3.12	70%
A23-1	5.66	70%
A24-1	4.40	60%
Total	*195.00*	*107.70*

2.2.5 Existing Hydrologic Conditions

An XP-RAFTS hydrologic model has been developed for Googong Creek in the pre-development state. This model uses the parameters specified in Queanbeyan City Council *Handbook of Drainage Design Criteria* and ACT Planning and Land Authorities' *Water Sensitive Urban Design General Code* (March, 2008).

Flows were calculated for storms ranging from 15 minutes to 6 hours for the 100 year, 50 year, 20 year, 10 year, 5 year, 2 year, 18 month, 1 year, 9 month, 6 month and 3 month average recurrence intervals (ARI).

Permissible Site Discharges and existing hydrological conditions modelling were assessed at the culvert under Googong Dam Road, which corresponds to the ultimate outlet from Stages 1 and 2.

The existing hydrologic conditions and Permissible Site Discharges (PSD) are summarised below:

Table 4 Googong New Town NH1A Permissible Site Discharges (pre-development flows)

Event ARI [years]	Peak Flow [m^3/s]
100	14.86
10	7.42
5	5.78
1	2.18

2.3 IMPACT ASSESSMENT OF THE PROPOSED DEVELOPMENT

XP-RAFTS was used to determine what the impact of the proposed development of Neighbourhood 1A: Stages 1 and 2 as well as future stages of the Googong New Town would be on the hydrology of the site if no tailored stormwater management was put in place.

The table below summarises at the outlet point the peak discharge that could be expected in absence of any management measures (such detention basins or WSUD).

Table 5 Googong New Town NH1A Unmanaged Developed Site Discharges

Event ARI [years]	Peak Flow [m^3/s]	%age variation
100	35.85	+141%
10	22.21	+199%
5	19.22	+233%
1	10.90	+400%

Given the increase in peak flow, erosion and scouring conditions would be likely to occur in the absence of any management strategy and infrastructure.

3 PROPOSED STORMWATER MANAGEMENT STRATEGY

This section details the proposed strategy to manage to otherwise detrimental impacts of the development on the local waterways, receiving environment as well as the flooding analysis demonstrating the careful protection of proposed future infrastructure and assets.

3.1 STORMWATER DETENTION AND PEAK FLOW ATTENUATION

In this section are presented the elements of the strategy primarily designed to attenuate peak flows to PSD levels.

3.1.1 Overview

The stormwater detention and peak flow attenuation strategy has been developed and detailed in the Googong Creek Catchment Stormwater Strategy (Brown Consulting (NSW) Pty Ltd, January 2010) (provided in **Appendix A**).
An overall view of the stormwater detention measures is given on drawing no. C09088-101+.

Key elements of the strategy include:

- Basin 1 (Local Park 1): a complex system of swale, bioretention basins, stormwater quality control pond with stormwater detention capacity located at the outlet of the system near the Googong Dam Road culvert.
- Basin 2 (Recreation Reserve): this sporting oval/recreational reserve also represents a major stormwater detention basin which attenuates flow from a large part of the Googong Creek catchment. A low flow bypass with a capacity of 2m³/s corresponding to approximately a 3 months ARI is provided.
- Basin 3 and 4 (subsequent development stage): located in Neighbourhood 2, basins 3 and 4 will be designed to provide significant attenuation of the peak flows generated by the northern part of the Googong Creek catchment. The conceptual design of basins 3 and 4 is included in f this report but the works are not part of the d Development Application for Stages 1 and 2 . They have however been integrated in the overall catchment analysis and stormwater strategy definition.
- A network of stormwater drainage swale providing some stormwater attenuation benefits. Key swales are located along Street 4, Street 2/3 and Street 20/21 (refer to drawing no. C09088-101+ and 102+.

The preliminary design of the proposed detention basins is detailed below:

Basin No. 1(Local Park 1)

Basin Type:	Bioretention, Stormwater Quality Control Pond and Detention Basin
Area (TWL):	14,300m²
Volume (TWL):	23,000m³

Outlet:	Subsoil drainage Ø150 @721.7m + spillway (8m) @ 723.45m (180mm throat)
NOL:	h=1.0m (722.9mAHD) (PWL) | A= 7,300m^2
EDD:	V=2500m^3 | h=0.52m (723.42mAHD)
Q1:	h=0.7m (723.6mAHD)
Q5:	h=1.08m (723.98mAHD)
Q20:	h=1.16m (724.06mAHD)
Q100:	h=1.39m (724.29mAHD)

Basin No: 2

Basin Type:	Detention Basin (Sports Oval)
Area (TWL):	25,700m^2
Volume (TWL):	20,363m^3
Outlet:	Low flow bypass (2m3/s)+ Ø225 @0m+Spillway (4m) @0.95m
NOL:	h=0m (738mAHD) | (A= 0m^2)
EDD:	V=0m^3 | h=0 m^3 (dry basin)
Q1:	h=0.28m (738.28mAHD)
Q5:	h=0.6m (738.6mAHD)
Q20:	h=0.85m (738.85mAHD)
Q100:	h=1.15m (739.15mAHD)

Basin No: 3

Basin Type:	Detention/Bioretention Basin
Area (TWL):	6,300m^2
Volume (TWL):	6,170m^3
Outlet:	Spillway 25m @ 0.6m
NOL:	h=0 (743.4mAHD) | A= 3,835m^2
EDD:	V=2,013m^3 | h=0.6m (744mAHD)
Q1:	h=1.22m (744.62mAHD)
Q5:	h=1.25m (744.65mAHD)
Q20:	h=1.27m (744.67mAHD)
Q100:	h=1.3m (744.7mAHD)

Basin No: 4

Basin Type:	Detention Basin
Area (TWL):	12,260m^2
Volume (TWL):	19,516m^3
Outlet:	Ø750 RCP @ 0.65m + spillway 15m @ 1.3m
NOL:	h= 0m (749mAHD) | (A=7,410m^2)
EDD:	V=5,300m^3 | h= 0.65m
Q1:	h= 1.05m (750.05mAHD)
Q5:	h=1.34m (750.34mAHD)
Q20:	h=1.69m (750.69mAHD) (1.04m above EDD)

Q100:	h=2.0m (751mAHD)

It is important to note that the design of the detention basins will need to be progressed as the project progresses to detailed design. Basin design and outlet configuration is preliminary and solely intended to demonstrate that a functional design outcome will be achievable.

Preliminary design was completed in 12D model using the following criteria:

- Maximum batter slope: 1 in 6
- Q100 Freeboard: 300mm except for key infrastructures (600mm)
- Maximum water depth (Q20) 1.2m above EDD level

3.1.2 Stormwater Attenuation Results

Stormwater attenuation performance criteria include:

- the provision of adequate extended detention storage capacity to detain and release in a controlled manner a nominal 3 month ARI storm event
- the demonstration of attenuation of peak flows for 1 year to 100 year ARI events.

These requirements are addressed below:

Extended Detention Requirements

The extended detention (EDD) requirement represents the necessary storage capacity required to capture a nominal 3 months ARI event for a controlled release over 24 to 72 hours.

Two methods were used to assess the required EDD volume for Googong Creek catchment:

- XP-RAFTS modelling of 3 months ARI storm runoff volume generated by the developed catchment
- Using the empirical approach described in the ACT Planning and Land Authorities' *Water Sensitive Urban Design General Code* (March, 2008) (1.4kL of storage per 100m^2 of impervious catchment.

The estimated EDD requirement is summarised below:

Table 6 Estimation of Extended Detention (EDD) Requirements

Estimation Method	EDD Volume Requirement (m^3)
XP-RAFTS	15,100
ACT Waterways Code	15,081
Adopted EDD Requirement	**15,100**

Proposed EDD storage measures

EDD storage measures typically include dedicated EDD storage volumes in detention basins, storage achieved in WSUD measures in the streetscape (eg, tree pits, raingardens, etc.) and rainwater tanks on properties.

For the Googong Creek catchment, the following measures are proposed:

EDD storage in basins: for most stormwater detention basins, EDD storage is proposed, except for the recreation reserve that features a low flow bypass of 2m³/s.

Decentralised WSUD measures are also proposed which will contribute to the EDD storage for the site. These include:

(i) Rainwater tanks: at this stage in the design process, it is difficult to estimate with certainty the number and capacities of future rainwater tanks on site. It is expected that rainwater tanks would be a mandatory feature of future blocks in Googong. It is also understood that compulsory tank capacity would be in the order of 4kL to 6kL per block. Based on recent development projects in the ACT where rainwater tanks are compulsory (4kL for block sizes between 500m² and 800 m² in accordance with ACT Planning and Land Authorities' Water Sensitive Urban Design General Code (March, 2008), it is expected that 25% of EDD storage may be met using rainwater tanks. This figure will need to be refined as project progresses.

(ii) Raingardens in the streets. A number of raingardens are proposed within Stage 1 (refer to DWG no. C09088-140+)

(iii) Tree pits: a number of tree pits have been proposed by landscape architects AECOM|EDAW. At this stage in the design developed, it is not possible to confirm number and location of tree pits. Nominally, each tree pit represents an EDD storage of 1.5m³ which would be added to the EDD storage for the site.

The table below demonstrates how the EDD storage requirement is met for the Googong Creek catchment:

Table 7 Proposed Extended Detention (EDD) Storage

Location	Measure	Area at EDD (m^2)	EDD height (m)	Volume (m^3)
Basin 1	Bioretention Pod 1	1,035	0.4	488
	Bioretention Pod 2	911	0.4	440
	Bioretention Pod 3	1,046	0.4	488
	Bioretention Pod 4	278	0.4	170
	Bioretention Pod 5	366	0.4	189
	Central Swale	234	0.6	141
	Pond/Wetland	5,322	0.4	2,129
Total Local Park 1 (Basin 1)				**4,044**
Basin 2	No measure			0
Basin 3	EDD Pond	3,355	0.6	**2,013**
Basin 4	EDD Pond	8,850	0.65	**5,300**
Decentralised WSUD Measures				

	Rainwater tanks	*25% of EDD requirement*		3775
	Stage 1 Raingarden Type flat grade	340	0.15	51
	Stage 1 Raingarden Type moderate grade	165	0.15	24.75
Total EDD Storage				**15,208**

While the figures estimated in the table above are preliminary and would require confirmation as design progresses, they demonstrate that meeting the EDD requirements for the site will be possible.

Modelling of Peak Discharge at Googong Dam Road Outlet

A XP-RAFTS hydrologic model was used to model the measures proposed. Detailed results are provided in **Appendix C**.

A summary table is presented below, which shows the attenuation performance of the proposed strategy and demonstrates that comes detailed design, a suitable design outcome will be possible to ensure the protection of the downstream waterways.

Table 8 Stormwater Peak Flow Attenuation Performance Assessment

Event ARI [years]	Developed Peak Flow [m^3/s]	Controlled Peak Flow [m^3/s]	%age Attenuation	Permissible Site Discharge [m^3/s]	Flow Attenuation Target Met?
100	35.85	11.28	-69%	14.86	Yes
10	22.21	4.91	-78%	7.42	Yes
5	19.22	3.82	-80%	5.78	Yes
1	10.90	1.07	-90%	2.18	Yes

3.2 STORMWATER QUALITY CONTROL AND IMPROVEMENT

3.2.1 Typical Stormwater Quality Deterioration Associated with Urbanisation of Rural Catchments

Typical impact of urban development in rural catchments water quality is a net deterioration of stormwater quality due to the introduction of a number of pollutant sources.

Stormwater pollutants originate from a number of sources including atmosphere, motor vehicles, construction activities, erosion and surface degradation, spills and leachates and miscellaneous surface deposits.

Typical stormwater quality pollutants include:

- Gross pollutants and litter
- Sediments and suspended solids
- Nutrients (particularly nitrogen and phosphorus)
- BOD and COD
- Micro-organisms
- Toxic organics and trace metals (including heavy metals)
- Oils and surfactants.

While suspended solids, gross pollutants, nutrients and BOD/COD are considered the most important factors of stormwater quality, specific design criteria for the purpose of the Development Application are :

- Gross pollutants (90% removal requirement)
- Suspended Solids (85% removal requirement)
- Total Phosphorus (65% removal requirement), and
- Total Nitrogen (65% removal requirement).

3.2.2 Management of Salinity Hazard

The project proposes to direct treated recycled water in excess of the volumes to be reused to be directed to the stormwater drainage system. The treated recycled water will be of relatively high salinity level (modelling indicates TDS of 1,100mg/L max.). Investigations have been carried confirming the suitability of soil types for application of recycled water and manageable risk that represent directing recycled water to the stormwater drainage system. These risks would likely include salt accumulation in the waterways potentially leading to detrimental impact on vegetation and soil stability.

Given the highly urbanised character of the future Googong New Town, even the smallest rainfall events (in excess of a 2mm rainfall depth) will generate stormwater runoff that will effectively flush the stormwater drainage system. It is therefore considered that recycled water while representing a non negligible salt load for the receiving environment will only have a limited impact on the environment of Googong.

It is worth noting that more detailed investigation and modelling is currently being undertaken as part of the project Environmental Assessment report for the Water Cycle under Part 3A application, to determine more precisely the likely levels of salinity and any salt accumulation on site.

3.2.3 Assessment Methodology

MUSIC Modelling
Stormwater quality control measures and overall strategy have been modelled using MUSIC.

Model Parameters
The following key MUSIC model parameters have been used:

- Rainfall – Queanbeyan Bowling Club (BOM Station no. 070072) for the period 1967 - 2007
- Evaporation – default Canberra monthly averages within MUSIC (from the Bureau of Meteorology)
- Runoff parameters and pollutant concentrations – ACT Planning and Land Authorities *Water Sensitive Urban Design General Code* Appendix B.
- Time series data on the discharge of recycled water from the WRP

3.2.4 Proposed Strategy and Measures

Minor Flow Management

The design criteria for open channels are outlined in Section D5.13 of Queanbeyan City Council – Development Design Specification D5 Stormwater Drainage Design. Runoff from the development area for storms up to the 5 year ARI will be directed to a pipe system from the lots, in accordance with Section D5.04.5 of Queanbeyan City Council – Development Design Specification D5 Stormwater Drainage Design. The pipe system will discharge into the community detention system within Googong Creek, discussed below.

The road drainage system will also be connected to the central trunk drainage system with the combined flow discharging in the stormwater control basins. Flow from these basins will discharge from the site into Googong Creek to the north via the existing culvert under Googong Dam Road.

Major Flow Management

Major flows are considered those flows in excess of the 5 year ARI for residential lots and the 10 year ARI peak flow for commercial lots. Major flows from the development will be directed by overland flow paths using the roads and swales.

A series of swales, following existing natural drainage lines will direct flow from lots and roads to detention basins and eventually to the outlet at Googong Dam Road. The base of the swales will be excavated to the design level or to underlying rock where appropriate. In accordance with Section D5.13 of Queanbeyan City Council – Development Design Specification D5 Stormwater Drainage Design, the channel is to have minimum batters of 1 in 4 and the base of the channel to have a minimum cross slope of 1 in 20. The batters will be protected by freeform rock armouring where required.

Stability of the rock armouring will be accordance with the methodology in Section D5.06.9 of Design Specification D5 and on Hydraulic Design of Flood Control Channels, Engineer Manual published by the US Army Corps of Engineers.

Gross Pollutant Traps

Gross pollutant traps are typically placed in-line with the drainage system prior to discharge into a bioretention basin to capture litter, debris, coarse sediment, oils and greases. While the pollutant capture efficiency of various traps may vary, as a conservative measure for modelling purposes the GPT is assumed that the GPT will be capable of removing of the annual load:

- Gross Pollutants 90%
- Suspended Sediments 0%
- Total Phosphorous 0%
- Total Nitrogen 0%

It is proposed to install three GPTs upstream of the Googong Local Park 1 for litter control. .Please refer to drawings C09088-145+,146+ and 147+ for locations.

Swales

A series of swales, following existing natural drainage lines will direct flow from lots and roads to detention basins and eventually to the outlet at Googong Dam Road.

Swales will be planted with Monaro grasslands wherever appropriate for hydrology and scour protection. Depending upon the longitudinal grade of the swale, it may be required to plant more robust/sturdy plants such as sedges and rushes to provide additional friction losses and velocity control.

Planting will focus on re-establishing the grassland species of the Monaro landscape within broad waterway corridor, with some trees planted beyond the waterway channel.

The design criteria used in the design of the swales are listed below:

Batter Slope:	1 in 6
Preferred Q100 Flow Velocity	1m/s
Preferred Max Q100 Flow Velocity	2m/s
Preferred Q1 Flow Velocity	0.5m/s

Where required, it is expected that small check dams could be used to control flow velocities.

Table 9 Typical Swale Detail

						Discharge		Velocity	
Street	Type	Typical Cross Section	Width	Depth[2]	Slope	Q1	Q100	Q1	Q100
			m	*m*	*%*	*m3/s*	*m3/s*	*m/s*	*m/s*
Street 2 (top)	IV-A	DWG C009088-015+	Min 9.6	1.50	1%	0.83	2.54	0.89	1.21
Street 2 (bottom)	IV-A	DWG C009088-015+	Min 9.6	1.50	1%	2.53	7.86	1.21	1.53
Street 4 (top)	IV-B	DWG C09088-016	7.6	1	2%	2.53	7.86	0	0
Street 4 (bottom)	IV-B	DWG C09088-016	7.6	1	2%	2.99	9.49	0.9	1.2
Street 21 (top)	IV-A	DWG C009088-015+	Min 9.6	1.50	1.50%	2.06	2.75	1.34	1.44
Street21 (bottom)	IV-A	DWG C009088-015+	Min 9.6	1.50	1.50%	2.38	3.23	1.39	1.4

Bioretention Basins

Bioretention basins will be utilised to perform the majority of the water treatment from the site. Bioretention basins consist of shallow areas over most of their surface area to incorporate macrophytes for nutrient uptake.

The bioretention basins have been conceptually designed on the basis of a 0.6m deep filter medium with a maximum depth of ponding of 0.4m and a 48-72 hour drawdown.

The total bioretention area provided for the whole of Googong Creek catchment is 3,870m^2.

[2] Depth from kerb to base of swale.

A typical cross section through one of the bioretention systems is given in drawing no. C09088-142+.

Raingardens

A number of raingardens have been designed to integrate the streetscape and provide stormwater quality improvement for the road runoff. In principle very similar to bioretention basins, the raingardens have been designed to fit within the street verge and the landscaping outcomes.

Typical detail of the raingardens is provided in drawing C09088-140+ and C09088-141+.

3.2.5 Stormwater Quality Management Strategy Performance Assessment

The stormwater treatment performance has been verified using MUSIC to assess the pollution reduction achieved by the various WSUD measures proposed for the Googong Creek catchment.

Modelling in MUSIC was undertaken using the MUSIC parameters specified above. Outputs of the MUSIC model are presented and interpreted below:

Table 10 MUSIC model outputs (no recycled water)

Pollutant	Googong Ck Untreated	Googong Ck with WSUD	Reduction	Target QCC DCP	Target Googong DCP	Targets Met
Total Suspended Solids (kg/yr)	174,000.00	4,260.00	97.5%	80%	80%	Yes
Total Phosphorus (kg/yr)	153.00	36.50	76.1%	45%	65%	Yes
Total Nitrogen (kg/yr)	2,070.00	873.00	57.7%	45%	45%	Yes
Gross Pollutant (kg/yr)	25,200.00	0.00	100%	100%	90%	Yes

Table 11 MUSIC model outputs (with recycled water discharge)

Pollutant	Googong Ck Untreated	Googong Ck with WSUD	Reduction	Target QCC DCP	Target Googong DCP	Target Met
Total Suspended Solids (kg/yr)	176,000.00	4,930.00	97.2%	80%	80%	Yes
Total Phosphorus (kg/yr)	239.00	53.40	77.7%	45%	65%	Yes

Pollutant	Googong Ck Untreated	Googong Ck with WSUD	Reduction	Target QCC DCP	Target Googong DCP	Target Met
Total Nitrogen (kg/yr)	6,380.00	1,330.00	79.1%	45%	45%	Yes
Gross Pollutant (kg/yr)	25,200.00	0.00	100%	100%	90%	Yes

4 SPECIFIC DESIGN ELEMENTS

4.1 Stormwater drainage culverts under Club Googong

Located at the intersection of Street 4, Street 20/21 and Street 33, the proposed Club Googong is located close to major flow path for Googong Creek.
As a result, stormwater management and drainage in this area is particularly important to this DA.
It is a design requirement that 100 year ARI flood immunity be provided to Club Googong.

Allowing for a blockage factor of 20%, the culvert under Street 4 comprises two 2.7m x 1.2m RCBC in order to convey the 100 year ARI storm event.

Flow velocity at the culvert outlet will be relatively high (in excess of 3m/s) and will require scouring protection and energy dissipaters to be designed to limit scour issues and manage risks to the population in the Local Park 1.

For more information on the drainage around/under Club Googong, please refer to drawing no. C09088-146+.

The design and ultimate integration of drainage culverts in the design of Club Googong and the local landscaping features is pending progress on Club Googong which is being undertaken by Allen Jack +Cottier at the time this report is produced. Full integration will be done at Detail Design Stage.

4.2 Local Park 1

The Local Park 1 area is central to Stages 1 and 2 of Googong New Town. Not only is the Local Park 1 located in the heart of this part of the future development but it also achieves a number of essential functions:

- Stormwater detention basin
- Stormwater quality control and improvement site
- Urban park
- Recreational functions for residents
- Environmental and biodiversity values conservation; and
- Significant amenity value for the whole area.

Significant time and efforts have been put in the design of the proposed Local Park 1 area.
Brown Consulting and AECOM have worked closely to develop and detail the initial concept design that had been prepared at the Master Planning stage of the project.

The current design meets the multiple design criteria and functional targets in terms of stormwater detention, peak flow attenuation, flood levels and flooding behaviour, terrain batters and provision of adequate community and recreational facilities.

The Local Park 1 design integrated a number of bio-retention systems that will guarantee the long term treatment of stormwater quality to high levels.

For more information on the Local Park 1 area, please refer to drawing no. C09088-145+ and C09088-146+.

4.3 Bioretention Systems and Raingardens

The proposed stormwater quality control measures suite includes a number of bioretention systems and raingardens.

These biofiltration systems achieve advantageous results in terms of water quality treatment and clogging prevention (Bratieres *et al.*, 2008; Read *et al.* ,2008). Biofiltration systems work using a combination of physical, chemical and biological treatment processes. Biofiltration systems offer a number of benefits (FAWB, 2010) including:

- Flexible designs
- Aesthetic and biodiversity values
- Contribute to restoration of more natural flow regimes

The proposed biofiltration systems have been developed in collaboration between AECOM and Brown Consulting, in accordance with the principles described in the ACT *Waterways Code* (ACTPLA, 2005), best practice guidelines (such as from Engineers Australia) and integrating the most recent development in research from the Faculty of Advanced Water Biofiltration, the international centre of expertise in this area.

More information on typical details proposed for the site is presented in drawing no. C09088-140+, C09088-141+, C09088-142+, C09088-145+, and C09088-146+.

5 FLOODING ANALYSIS

An analysis of flooding within the major floodways of Stage 1 was undertaken to assess the flood planning levels (FPL) and road levels within the subdivision.

5.1 METHODOLOGY

- HEC-RAS for the Local Park 1 (Basin 1):
- Manning's hydraulic calculations for Swales

5.1.1 Roughness

Roughness was described in the cross sections by Manning's values. The values used for the flood estimation were those for a fully established vegetation community in the riparian corridor, with a n value of 0.035 corresponding to a minor stream on plain clean, straight with no rift or deep pools but with stones and weeds (CRC Catchment Hydrology, 2000. *Rehabilitation Manual – Australian Streams Vol. 2*)

5.1.2 Culvert Blockages

A number of culverts are proposed throughout Stage 1, particularly to drain stormwater underneath the proposed Club Googong site. A blockage factor of 20% was applied to all culvert crossings in the HEC-RAS model for the assessment of the flood planning level.

5.2 HYDRAULIC ANALYSIS RESULTS

The flood extent is shown on drawing C09088-102+. Q100 flows are satisfactorily contained within the swales and the Local Park 1 area.
The only exception is for Street 4 which will locally be flooded under 100 year ARI event. A one lane carriage way will be maintained at all times. This is acceptable under the Queanbeyan DCP and Drainage Manual design criteria.

6 SOIL EROSION CONTROL MEASURES

6.1 SOIL CONTEXT

Soil typology was confirmed by Brown Consulting (NSW) Pty Ltd in the Googong Creek Catchment Stormwater Strategy (January 2010, see **Appendix A**).

Soils present within the Googong Creek catchment were taken from the Soil Landscapes of the 1:100,000 Canberra Sheet, and are presented in **Figure 3** of **Appendix A**.

Soil constraints and sediment type for the soil classification on Figure 3 are taken from Appendix C, Table C24 of the Blue Book (*Managing Urban Stormwater: Soils and Construction.* Landcom)

- Anembo (an) – widespread seasonal waterlogging, localised permanent waterlogging of low areas (Sediment Type F/D)
- Burra (ba) – high water and wind erosion hazards, high run-on to low areas, mass movement of steeper slopes, localised shallow soils (Sediment Type F)
- Campbell (ca) – rounded, steep stony hills with rock outcrops, terracettes and vertical tuffs, shallow soils are hardsetting, infertile and erodible, localised waterlogging associated with weak impermeable soils on lower slopes (Sediment Type F/D)
- Celeys Creek (cc) – low rolling hills, granite tors, shallow, infertile permeable, coarse grained topsoils, subsoils display poor water holding and seasonal waterlogging (Sediment Type F/D)
- Paddy's River (pd) – erodible, non-cohesive coarse soils, highly susceptible to gully erosion, localised wind erosion (Sediment Type C)
- Round Hill (rh) – shallow, infertile, stony soils with low water holding capacity, rock outcrop common with steep rocky slopes susceptible to mass movement and rockfall (Sediment Type C/F)

6.2 PROPOSED LAND USE EROSION SENSITIVITY

The proposed subdivision and landuse for the Neighbourhood 1A: Stages 1 and 2 of Googong New Town includes residential lots and a number of open spaces that will be adequately landscaped and vegetated. Therefore ultimate site conditions will be stable with only very limited soil erosion to be expected.
Soil erosion control measures are required during the construction and vegetation establishment period of Neighbourhood 1A: Stages 1 and 2 in order to ensure that soil material destabilised by earthworks and land areas where vegetation will be establishing do not erode away.

6.3 PREVENTION AND MITIGATION MEASURES

It is important to note that a dedicated Soil and Water Management Plan (SWMP) will be prepared during detailed design stage and implemented prior to construction commencing to ensure minimisation of potential impacts on hydrology and water quality during the construction period. This plan will incorporate the design and installation of erosion controls in accordance with the requirements of Queanbeyan City Council *Development Design Specification D7 – Erosion Control and Stormwater Management* and the *Managing Urban Stormwater: Soils and Construction published by Landcom* ("Blue Book").

Two types of measures are proposed: preventive measures to try and control the generation of eroded material from the site (eg, mulching) and mitigation measures designed at controlling, diverting and trapping sediments and suspended solids that would be mobilised. The key soil erosion control measures are presented below.

This section of the report is to be read with reference to drawing no. C09088-155+.

6.3.1 Prevention Measures

- At the vegetation clearing stage, cleared vegetation will be mulched and spread over disturbed area to provide a natural erosion barrier
- Construction of cut-off drains to prevent clean water from upstream of the corridor flowing onto and eroding disturbed areas
- Controls outside the specific work area would be put in place including:
    - Refuelling of plant and machinery within bunded areas or off site in appropriate locations
    - Minimisation of disturbed areas so that the potential export of sediment is minimised
    - The establishment and maintenance of stabilised construction compounds to reduce the overall disturbance area for the Project.

6.3.2 Mitigation Measures

- The diversion of site discharge points to erosion control measures such as silt fences and sedimentation basins in order to control dirty water areas
- The stabilisation of exposed areas as soon as practical following the construction of each section of works
- Temporary sediment basins will be constructed to capture water and sediment before it can leave the site or enter the receiving water bodies. Conceptual design of the temporary sediment basins will be included in the SWMP and follow the methodology outlined in the "Blue Book" with the following features :
    - Sediment basins are to be located at points near where dirty water would discharge to receiving waters or leave the site

- Basins are to be designed for Type F/D soils, as outlined in Section 6.3.4 of the Blue Book, in accordance with the soil type classification.
- The minimum depth of the basins will be 0.6 metres with an average depth of 1 metre (where achievable).

6.3.3 Monitoring Program

In addition the control measures aiming at preventing soil erosion or controlling the mobility of sediments on site, a stormwater quality monitoring program will be designed and implemented in order to record the performance of the Soil and Water Management Plan and adjust it where required.

A surface water quality monitoring program for the construction period will be developed to monitor water quality upstream and downstream of the construction areas. Construction period monitoring will be carried out periodically and after rainfall events as part of the assessment of the operation of water quality mitigation measures. Monitoring during the construction phase of the project would examine the following indicators:

- pH
- Electrical conductivity
- Turbidity
- Dissolved oxygen

7 DESIGN REPORT CONCLUSIONS

The hydrological and hydraulic modelling has shown that the proposed residential subdivision and supporting roads can be constructed while meeting Queanbeyan Council, and NSW Department of Climate Change and Water (former NSW DEC and NSW DWE) requirements for stormwater quantity and quality management.

The objectives and performance targets (quantity and quality) are achieved by using a mix of water sensitive urban design (WSUD) components throughout the subdivision, not limited to bio-retention basins, wetlands ponds and detention storage.

All road levels are shown to be >100 mm above the 100 year ARI flood level and all lots meet the FPL requirement.

The only exception is Street 4 where flood extends to part of the road. Modelling however shows that a one lane carriage way of 2.5m wide will be maintained at all times, making the proposal compliant with all relevant design guidelines and requirements.

8 REFERENCES

Australian and New Zealand Guidelines for Fresh and Marine Water Quality 2000;
Department of Environment and Conservation (now Department of Environment and Climate Change and Water) (2006c) Waste Avoidance and Resource Recovery Strategy 2006;
Department of Primary Industries (previously the Department of Natural Resources) 2005, Floodplain Development Manual – the management of flood liable land;
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Institute of Engineers (1997) Australian Rainfall and Runoff – A Guide to Flood Estimation
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Landcom (2006) Managing Urban Stormwater: Soils and Construction;
NSW Government (1998) Environmental Management Systems Guidelines;
NSW Roads and Traffic Authority Code of Practice for Water Management – Road Development and Management;
NSW Roads and Traffic Authority (1998) Roads and Traffic Design Guide, Section 7;
NSW Roads and Traffic Authority (1998) Stormwater Management and Drainage Design, Chapter 22 – Open Channels, Draft 5.0, January 1998;
Australian/New Zealand Standard – Plumbing and Drainage Part 3: Stormwater drainage (AS/NZS 3500.3:2003)

Queanbeyan City Council – Handbook of Drainage Design Criteria;
Queanbeyan City Council – Development Control Plan No. 38 – Subdivision, Part B1 – Subdivision Design Criteria;
Queanbeyan City Council – Development Control Plan No. 41 – Soil, Water and Vegetation Management Plans;
Queanbeyan City Council – Development Design Specification D5 Stormwater Drainage Design;
Queanbeyan City Council – Development Design Specification D7 – Erosion Control and Stormwater Management;
Queanbeyan Local Environment Plan (1997)
ACT Planning and Land Authority Waterways Water Sensitive Urban Design – General Code (2008)
ACT Planning and Land Authority Industrial Zones Development Code (2008)
Proposed Googong Development Control Plan (Elton, 2010)

Bratieres, K., Fletcher, T. D., Deletic, A., & Zinger, Y. (2008). Nutrient and sediment removal by stormwater biofilters; a large scale design optimisation study. *Water Research, 42(14), 3930-3940.*
Read, J., Wevill, T., Fletcher, T.D., & Deletic, A. (2008). Variation among plant species in pollutant removal from stormwater in biofiltration systems. *Water Research, 42 (4-5), 893-902.*

9 GLOSSARY OF TERMS

Afflux	The rise in water level upstream of a hydraulic structure such as a bridge or culvert, caused by losses incurred from the hydraulic structure.
Australian Height Datum	National survey datum corresponding approximately to mean sea level.
Annual Exceedance Probability	The chance of a flood of a given size or larger occurring in any one year, generally expressed as percentage probability. For example, a 100 year ARI flood is a 1% AEP flood. An important implication is that when a 1% AEP flood occurs, there is still a 1% probability that it could occur the following year.
Average Recurrence Interval	Is the long term average number of years between the occurrence of a flood as big as, or larger than the selected flood event.
Catchment	The catchment at a particular point is the area of land which drains to that point.
Design floor level	The minimum (lowest) floor level specified for a building.
Design flood	A hypothetical flood representing a specific likelihood of occurrence (for example the 100 year or 1% probability flood). The design flood may comprise two or more single source dominated floods.
Development	Existing or proposed works which may or may not impact upon flooding. Typical works are filling of land, and the construction of roads, floodways and buildings.
Discharge	The rate of flow of water measured in terms of volume over time. It is not the velocity of flow which is a measure of how fast the water is moving rather than how much is moving. Discharge and flow are interchangeable.
Digital Terrain Model	A three-dimensional model of the ground surface that can be represented as a series of grids with each cell representing an elevation (DEM) or a series of interconnected triangles with elevations (TIN).
Effective warning time	The available time that a community has from receiving a flood warning to when the flood reaches their location.
Flood	Above average river or creek flows which overtop banks and inundate floodplains.
Flood awareness	An appreciation of the likely threats and consequences of flooding and an understanding of any flood warning and evacuation procedures. Communities with a high degree of flood awareness respond to flood warnings promptly and efficiently, greatly reducing the potential for damage and loss of life and limb. Communities with a low degree of flood awareness may not fully appreciate the importance of flood warnings and flood preparedness and consequently suffer greater personal and economic losses.
Flood behaviour	The pattern / characteristics / nature of a flood.

Flooding	The State Emergency Service uses the following definitions in flood warnings: *Minor flooding:* causes inconvenience such as closing of minor roads and the submergence of low level bridges *Moderate flooding:* low-lying areas inundated requiring removal of stock and/or evacuation of some houses. Main traffic bridges may be covered. *Major flooding:* extensive rural areas are flooded with properties, villages and towns isolated and/or appreciable urban areas are flooded.
Flood frequency analysis	An analysis of historical flood records to determine estimates of design flood flows.
Flood fringe	Land which may be affected by flooding but is not designated as a floodway or flood storage.
Flood hazard	The potential threat to property or persons due to flooding.
Flood level	The height or elevation of flood waters relative to a datum (typically the Australian Height Datum). Also referred to as "stage".
Flood liable land	Land inundated up to the probable maximum flood – flood prone land.
Floodplain	Land adjacent to a river or creek which is inundated by floods up to the probable maximum flood that is designated as flood prone land.
Flood Planning Levels	Are the combinations of flood levels and freeboards selected for planning purposes to account for uncertainty in the estimate of the flood level.
Flood proofing	Measures taken to improve or modify the design, construction and alteration of buildings to minimise or eliminate flood damages and threats to life and limb.
Floodplain Management	The coordinated management of activities which occur on flood liable land.
Floodplain Management Manual	A document by the NSW Government (2001) that provides a guideline for the management of flood liable land. This document describes the process of a floodplain risk management study.
Flood source	The source of the flood waters.
Floodplain Management Standard	A set of conditions and policies which define the benchmark from which floodplain management options are compared and assessed.
Flood standard	The flood selected for planning and floodplain management activities. The flood may be an historical or design flood. It should be based on an understanding of the flood behaviour and the associated flood hazard. It should also take into account social, economic and ecological considerations.
Flood storages	Floodplain areas which are important for the temporary storage of flood waters during a flood.
Floodways	Those areas of the floodplain where a significant discharge of flow occurs during floods. They are often aligned with naturally defined channels. Floodways are areas that, even if they are

	partially blocked, would cause significant redistribution of flood flows, or a significant increase in flood levels.
Freeboard	A factor of safety usually expressed as a height above the flood standard. Freeboard tends to compensate for the factors such as wave action, localised hydraulic effects and uncertainties in the design flood levels.
Geographical Information System	A form of computer software developed for mapping applications and data storage. Useful for generating terrain models and processing data for input into flood estimation models.
High hazard	Danger to life and limb; evacuation difficult; potential for structural damage, high social disruption and economic losses. High hazard areas are those areas subject to a combination of flood depth and flow velocity that are deemed to cause the above issues to persons or property.
Historical flood	A flood which has actually occurred – Flood of Record.
Hydraulic	The term given to the study of water flow in rivers, estuaries with coastal systems.
Hydrograph	A graph showing how a river or creek's discharge changes with time.
Hydrology	The term given to the study of the rain-runoff process in catchments.
Low hazard	Flood depths and velocities are sufficiently low that people and their possessions can be evacuated.
Management plan	A clear and concise document, normally containing diagrams and maps, describing a series of actions that will allow an area to be managed in a coordinated manner to achieve defined objectives.
Peak flood level, flow or velocity	The maximum flood level, flow or velocity occurring during a flood event.
Probable Maximum Flood	An extreme flood deemed to be the maximum flood likely to occur at a particular location.
Probable Maximum Precipitation	The greatest depth of rainfall for a given duration meteorologically possible over a particular location. Used to estimate the probable maximum flood.
Probability	A statistical measure of the likely frequency or occurrence of flooding.
Riparian Zone	Areas that are located adjacent to watercourses. Their definition is vague and can be characterised by landform, vegetation, legislation or their function.
Runoff	The amount of rainfall from a catchment which actually ends up as flowing water in the river of creek.
Stage hydrograph	A graph of water level over time.
Velocity	The speed at which the flood waters are moving. Typically, modelled velocities in a river or creek are quoted as the depth and width averaged velocity, i.e. the average velocity across the whole river or creek section.

10 APPENDICES

Appendix A	Googong Creek Catchment Stormwater Strategy
Appendix B	Intensity Frequency Duration Table for Googong
Appendix C	XP-RAFTS Results

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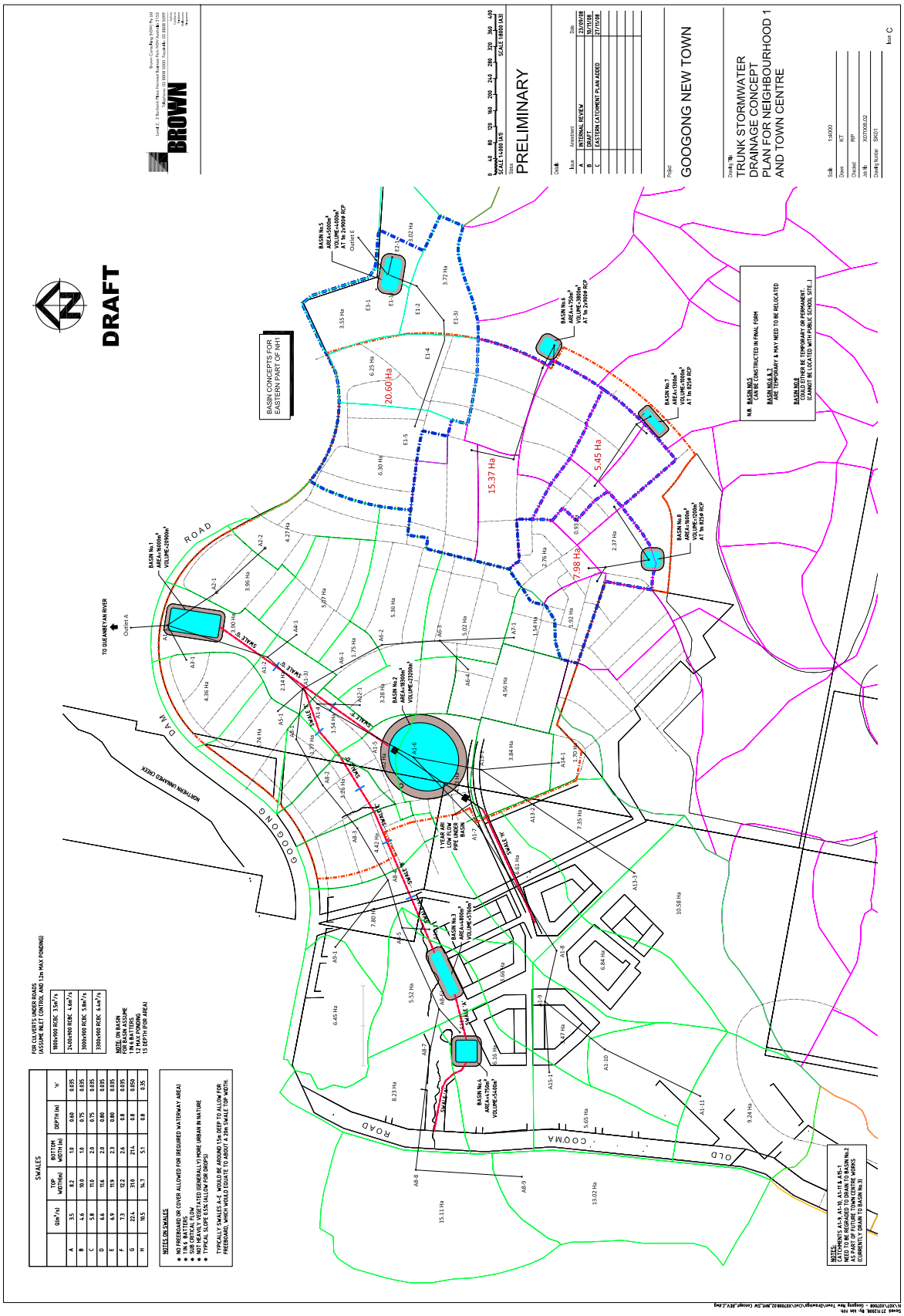
APPENDIX A

Googong Creek Catchment
Stormwater Strategy


DRAFT
BROWN
PRELIMINARY
GOOGONG NEW TOWN
TRUNK STORMWATER DRAINAGE CONCEPT PLAN FOR NEIGHBOURHOOD 1 AND TOWN CENTRE
BASIN CONCEPTS FOR EASTERN PART OF NH1
20.60 Ha
15.37 Ha
5.45 Ha
7.98 Ha
GOOGONG ROAD
OLD COOMA ROAD
DAM
NORTHERN UNNAMED CREEK
TO QUEANBEYAN RIVER
SWALE A
SWALE B
SWALE C
SWALE D
SWALE E
SWALE F
SWALE G
SWALE H
SWALE J
SWALE K
SWALE L
SWALE M
BASIN No.1 AREA=4300m² VOLUME=5300m³
BASIN No.2 AREA=8300m² VOLUME=23200m³
BASIN No.3 AREA=4800m² VOLUME=6000m³
BASIN No.4 AREA=1750m² VOLUME=5540m³
BASIN No.5 AREA=3500m² VOLUME=4300m³ AT 1in 2/4000 RCP Outlet E
BASIN No.6 AREA=1750m² VOLUME=2500m³ AT 1in 2/4000 RCP
BASIN No.7 AREA=1500m² VOLUME=3000m³ AT 1in 8250 RCP
BASIN No.8 AREA=1500m² VOLUME=3200m³ AT 1in 8250 RCP
Outlet A
N.B. BASIN NO.5 CAN BE CONSTRUCTED IN FINAL FORM
BASIN NO.6 & 7 ARE TEMPORARY & MAY NEED TO BE RELOCATED
BASIN NO.8 COULD EITHER BE TEMPORARY OR PERMANENT. (CANNOT BE LOCATED WITH PUBLIC SCHOOL SITE.)
1 YEAR ARI 100mm DIA PIPE UNDER BASIN
SWALES
Qm³/s
TOP WIDTH(m)
BOTTOM WIDTH(m)
DEPTH (m)
'n'
A 3.5 9.2 1.0 0.60 0.035
B 4.6 10.0 1.0 0.75 0.035
C 5.6 10.8 2.0 0.75 0.035
D 6.6 11.6 2.0 0.80 0.035
E 6.9 11.9 2.3 0.80 0.035
F 7.3 12.2 2.6 0.8 0.035
G 22.4 31.0 21.4 0.8 0.050
H 10.5 14.7 5.1 0.8 0.35
FOR CULVERTS UNDER ROADS (ASSUME INLET CONTROL AND 1m MAX PONDING)
1800x900 RCBC 3.5m³/s
2400x900 RCBC 4.6m³/s
3600x900 RCBC 5.8m³/s
3300x900 RCBC 6.6m³/s
NOTE: ON BASIN PERIMETER BANK 1 IN 4 BATTERS 1.2 MAX PONDING 1.5 DEPTH FOR AREA)
NOTES ON SWALES
• NO FREEBOARD OR COVER ALLOWED FOR (REQUIRED WATERWAY AREA)
• 1 IN 6 BATTERS
• SUB CRITICAL FLOW
• NOT NORMALLY USED (GENERALLY) MORE URBAN IN NATURE
• TYPICAL SLOPE 0.5% (ALLOW FOR DROPS)
TYPICALLY SWALES A-E WOULD BE AROUND 1.5m DEEP TO ALLOW FOR FREEBOARD, WHICH WOULD EQUATE TO ABOUT A 20m SWALE TOP WIDTH.
NOTES:
CATCHMENTS A1-5, A6-10, A1-11 & A9-1 ARE THE NEW CATCHMENTS ADDED TO BASIN No.2 AS PART OF FUTURE TOWN CENTRE WORKS (CURRENTLY DRAIN TO BASIN No.3)
Issue C
Scale 1:4000
Drawn KT
Checked RP
Job No. X070308.02
Drawing Number SK01

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GOOGONG CREEK CATCHMENT STORMWATER STRATEGY GOOGONG NEW TOWN






January 2010
Report No. X07008-03
Prepared for CANBERRA INVESTMENT CORPORATION

BROWN CONSULTING
Engineers & Managers

PEOPLE & PROJECTS

Googong Creek Catchment Stormwater Strategy
Googong New Town
Prepared for Canberra Investment Corporation

COMMERCIAL IN CONFIDENCE

January 2010

DOCUMENT CONTROL

X07008-03

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GOOGONG CREEK CATCHMENT STORMWATER STRATEGY

GOOGONG NEW TOWN

FOR CANBERRA INVESTMENT CORPORATION

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LIST OF ABBREVIATIONS

AEP	Annual Exceedance Probability
AHD	Australian Height Datum
ALS	Aerial Laser Scanned
ARBM	Australian Representative Basins Model
ARI	Average Recurrence Interval
ARR	Australian Rainfall and Runoff
DCP	Development Control Plan
DECC	Department of Environment and Climate Change
DECCW	Department of Environment and Climate Change and Water
DEM	Digital Elevation Model
DIPNR	Department of Infrastructure, Planning and Natural Resources
DLWC	Department of Land and Water Conservation NSW
DTM	Digital Terrain Model
DWE	Department of Water and Energy
ESD	Ecologically Sustainable Development
FPDM	Floodplain Development Manual
FPL	Flood Planning Level
FPMM	Floodplain Management Manual
FPRMS	Floodplain Risk Management Study
FSL	Flood Surface Level
GIS	Geographic Information System
ha	Hectare (Area = 10,000m^2)
HEC-RAS	Hydraulic Engineering Centre – River Analysis System
LEP	Local Environmental Plan
LGA	Local Government Area
MGA	Map Grid Australia
m^3/s	Cubic meters per second
PMF	Probable Maximum Flood
PMP	Probable Maximum Precipitation
QCC	Queanbeyan City Council
RCP	Reinforced Concrete Pipe
RCBC	Reinforced Concrete Box Culvert
RTA	Roads and Traffic Authority of NSW
SEPP	State Environmental Planning Policy
SES	State Emergency Services
SMP	Stormwater Management Plan
TIN	Triangular Irregular Network
WSUD	Water Sensitive Urban Design

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GOOGONG CREEK CATCHMENT STORMWATER STRATEGY

GOOGONG NEW TOWN

FOR CANBERRA INVESTMENT CORPORATION

1 INTRODUCTION

Brown Consulting has been commissioned to develop a catchment stormwater strategy for the unnamed tributary of the Queanbeyan River, referred to as "Googong Creek", as part of the Googong New Town urban development. The Googong New Town project is located on a 790 hectare site eight kilometres south east of Queanbeyan that is currently grazing land. The Canberra Investment Corporation (CIC) plans to establish five new suburbs to house 16,000 inhabitants as part of the Googong New Town, to be developed over the next twenty five years.

This stormwater strategy covers stormwater quality and quantity management issues to support the Development Plan for the site. This report outlines the management of stormwater for the catchment and watercourse of Googong Creek upstream of Googong Dam Road. This report is prepared for a technical audience including engineers at determining authorities. Details of calculations, design standards, codes and modelling results are presented in the stormwater strategy reports.

1.1 DESIGN OBJECTIVES

The objective of the design, as stated in the *Googong Landscape and Open Space Strategy Report* by AECOM EDAW, Inc., is to restore the indigenous drainage habitats, including the "chain of ponds" natural drainage system in Montgomery Creek. This will be achieved by the use of Water Sensitive Urban Design (WSUD) features that will manage the quantity and quality of post-development stormwater runoff for the protection and enhancement of receiving environments.

The objectives of the Googong Creek Catchment Stormwater Strategy are to demonstrate that the design of the new town takes into consideration the requirements of the:

- Queanbeyan City Council – *Handbook of Drainage Design Criteria*;
- Queanbeyan City Council – *Development Control Plan No. 38 – Subdivision, Part B1 – Subdivision Design Criteria;*
- Queanbeyan City Council – *Development Control Plan No. 41 – Soil, Water and Vegetation Management Plans*;
- Queanbeyan City Council – *Development Design Specification D5 Stormwater Drainage Design;*
- Queanbeyan City Council – *Development Design Specification D7 – Erosion Control and Stormwater Management;*
- Queanbeyan Local Environment Plan (1997)
- ACT Planning and Land Authority *Waterways Water Sensitive Urban Design – General Code* (2008)
- ACT Planning and Land Authority *Industrial Zones Development Code* (2008)
- Googong Development Control Plan (Dated 22 July 2008)

1.2 PURPOSE OF THIS REPORT

This report has been prepared to demonstrate to determining authorities that the design features of Googong New Town within Googong Creek catchment are appropriate for approval. The objectives of this report are to:

- Provide a summary of the existing drainage and hydrologic environment of Googong Creek.
- Summarise the regulations that apply to this development.
- Outline the design criteria and codes that apply to this development.
- Discuss the management of potential climate change.
- Describe the features of the stormwater management system for Googong Creek.
- Provide calculations demonstrating how the project complies with the planning regulations.
- Describe the management of major and minor overland flows in Googong Creek.
- Outline how the stormwater quality measures in this masterplan will reduce the post-developed pollutant loads.
- Explain how stormwater management of Googong Creek sits within the integrated water management strategy for the site.
- Outline the soil and water management strategies to be employed during construction.

1.2.1 Overall Reporting Framework

The Googong Creek Catchment Stormwater Strategy for Googong New Town forms part of a series of reports outlining the proposed drainage features for the proposal.

Googong New Town Stormwater Masterplan

The Stormwater Masterplan is to be used by planners and other non-technical readers and provides a broad description of the site, the planning context, general features of the stormwater management system and the overall site water management. The Masterplan will refer to more detailed catchment strategies that include calculations and specific features. Appendices of this report include:

Riparian zone reports

Concept plans for each Creek

Catchment Stormwater Strategy: Montgomery Creek
Googong Creek
Jerrabomberra Creek

This series of reports will outline the management of stormwater on a catchment/creek basis. These reports will be prepared for a technical audience including engineers at determining authorities. Details of calculations, design standards, codes and modelling results will be presented in these reports.

Neighbourhood Concept Stormwater Plans

Reports will be prepared for each release area of the Googong New Town. These reports will outline the concept stormwater plan for individual areas in terms of the implementation of specific measures for each release and in terms of the overall site context.

2 BACKGROUND INFORMATION

This chapter provides a brief description of the locality, topography and surface water environment of Googong Creek. This is followed by an introduction to proposed Googong New Town development and outline of the masterplan.

2.1 DESCRIPTION OF STUDY AREA

2.1.1 Locality

The Googong New Town site is located in the locality of Googong, approximately 5 kilometres south of Queanbeyan in New South Wales shown in Figure 1.

The site is wholly within the Queanbeyan City Council local government area, on the border with Palerang Council local government area. The Googong New Town site is approximately 790 hectares and is located between Old Cooma Road and Googong Reservoir.

Googong Creek Catchment Stormwater Strategy
Googong New Town
Prepared for Canberra Investment Corporation

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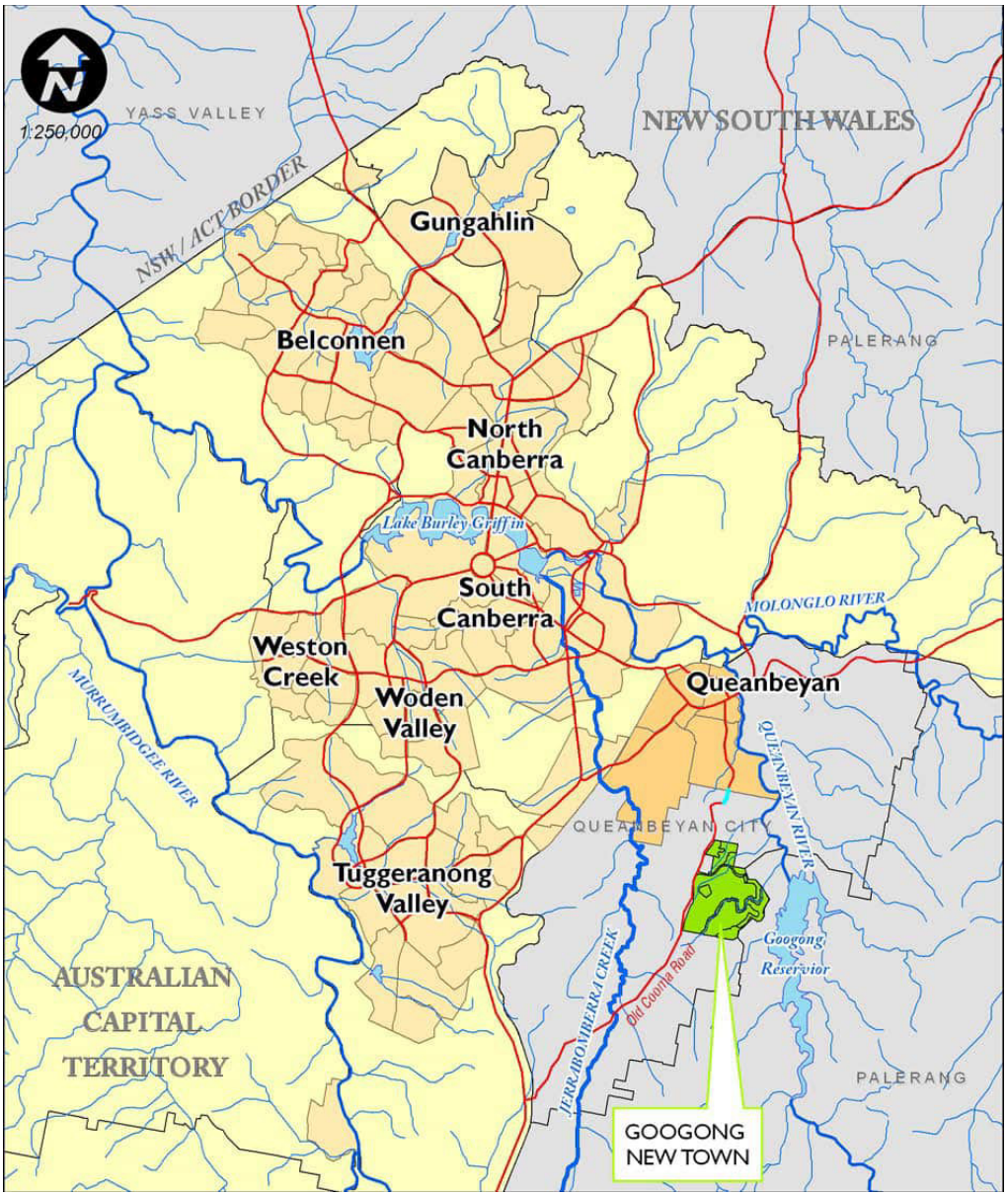


Figure 1 Locality Plan

2.1.2 Topography and Site Drainage

Googong Creek is the second largest catchment within the Googong New Town site. Googong Creek drains the northern area of the site from the western boundary at Old Cooma Road, in a north easterly direction to the Queanbeyan River, shown on Figure 2. Twin culverts are located on Googong Creek at the Googong Dam Road embankment, at the upstream and downstream boundaries of the development area. There are a number of minor tributaries of Googong Creek within the site. The creek has two distinct characters; upstream and downstream of the Googong Dam Road culvert. The area of this creek within the site is 164 hectares.

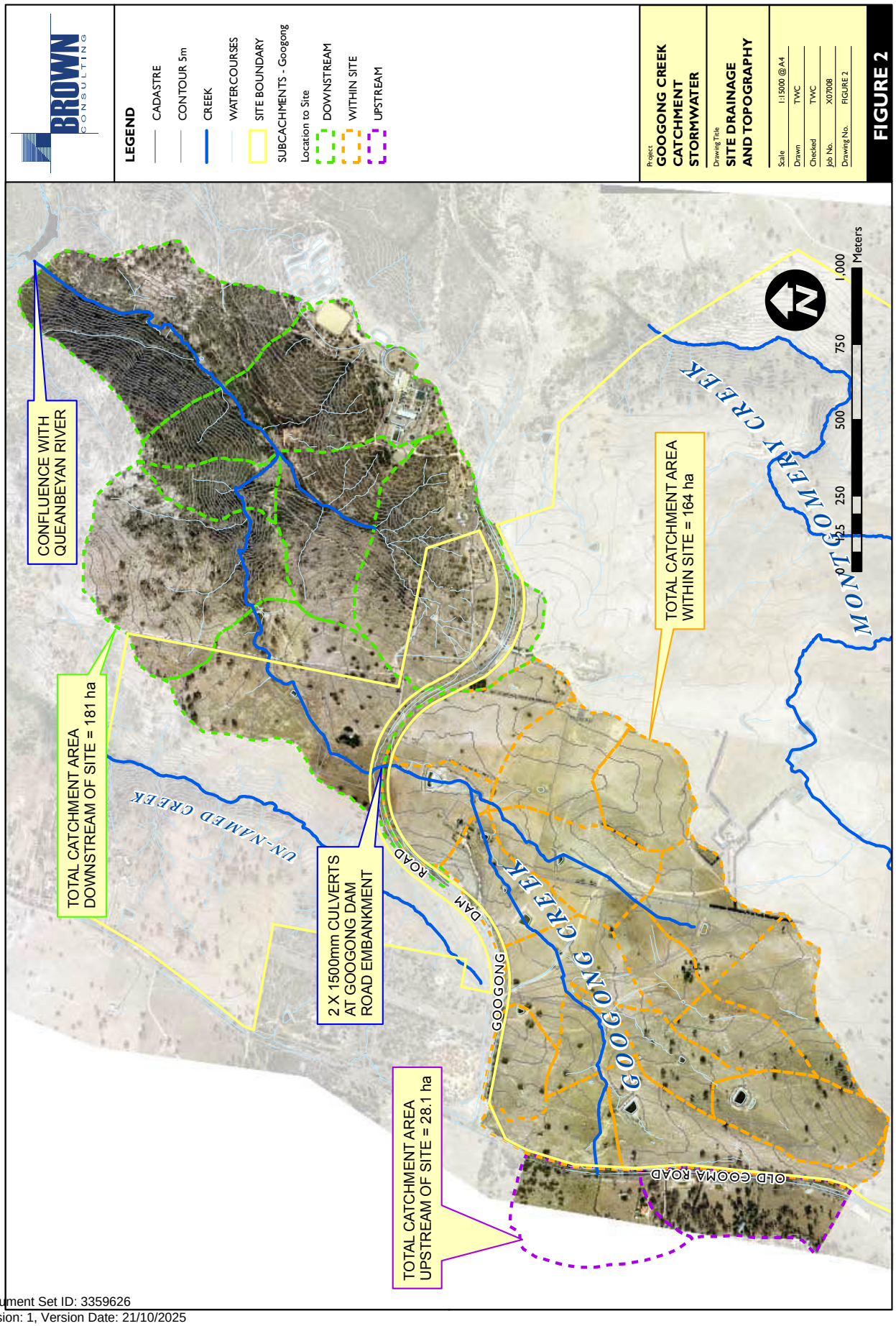
The main channel and tributaries in the upper section of Googong Creek consist of grassy swales and remnant chain of ponds meadows draining to a number of farm dams. Minor modifications to the drainage lines in these sections have occurred, with diversion banks constructed to increase flows to several dams. Within this upper section there are limited lengths of stream bed and bank formations.

There is a small part of Googong Creek on the western side of Old Cooma Road. This site is partially cleared and is generally steeper than the section of creek within the site. This catchment is drained under Old Cooma Road via a small piped culvert (approximately 375 – 450 mm diameter). Flows in excess of the capacity of this culvert would pond behind the road embankment and flow over the roadway. The size of this catchment is 28.1 hectares.

A culvert consisting of twin 1500 mm diameter pipes is located on Googong Creek at the Googong Dam Road embankment. The culvert, embankment and the large dam immediately upstream form a de facto detention basin at this location, providing storage for flows above the culvert capacity. It is considered extremely unlikely that the roadway would be overtopped in any storm event.

Preliminary investigations of the section of Googong Creek downstream of the twin culvert Googong Dam Road indicate that the creek is well formed with definable beds and banks. This section can be classified as having higher riparian values and development in this area, known as "Hamlet East" will incorporate different water design measures than the upstream sections. This report does not include details of the development downstream of Googong Dam Road.

Hydrologic and hydraulic modelling of Googong Creek and catchments is described in the Section 4. The riparian corridor of Googong Creek has been assessed in a separate report titled *Riparian Corridor Assessment Googong Township,* prepared by Brown Consulting in June 2007 (ref: X07008.01-01A).



2.1.3 Soil Type

Soils present within the Googong Creek catchment were taken from the Soil Landscapes of the 1:100,000 Canberra Sheet, and are presented in Figure 3.

Soil constraints and sediment type for the soil classifications on Figure 3 are taken from Appendix C, Table C24 of the Blue Book:

Anembo (an) – widespread seasonal waterlogging, localised permanent waterlogging of low areas (Sediment Type F/D)

Burra (ba) – high water and wind erosion hazards, high run-on to low areas, mass movement of steeper slopes, localised shallow soils (Sediment Type F)

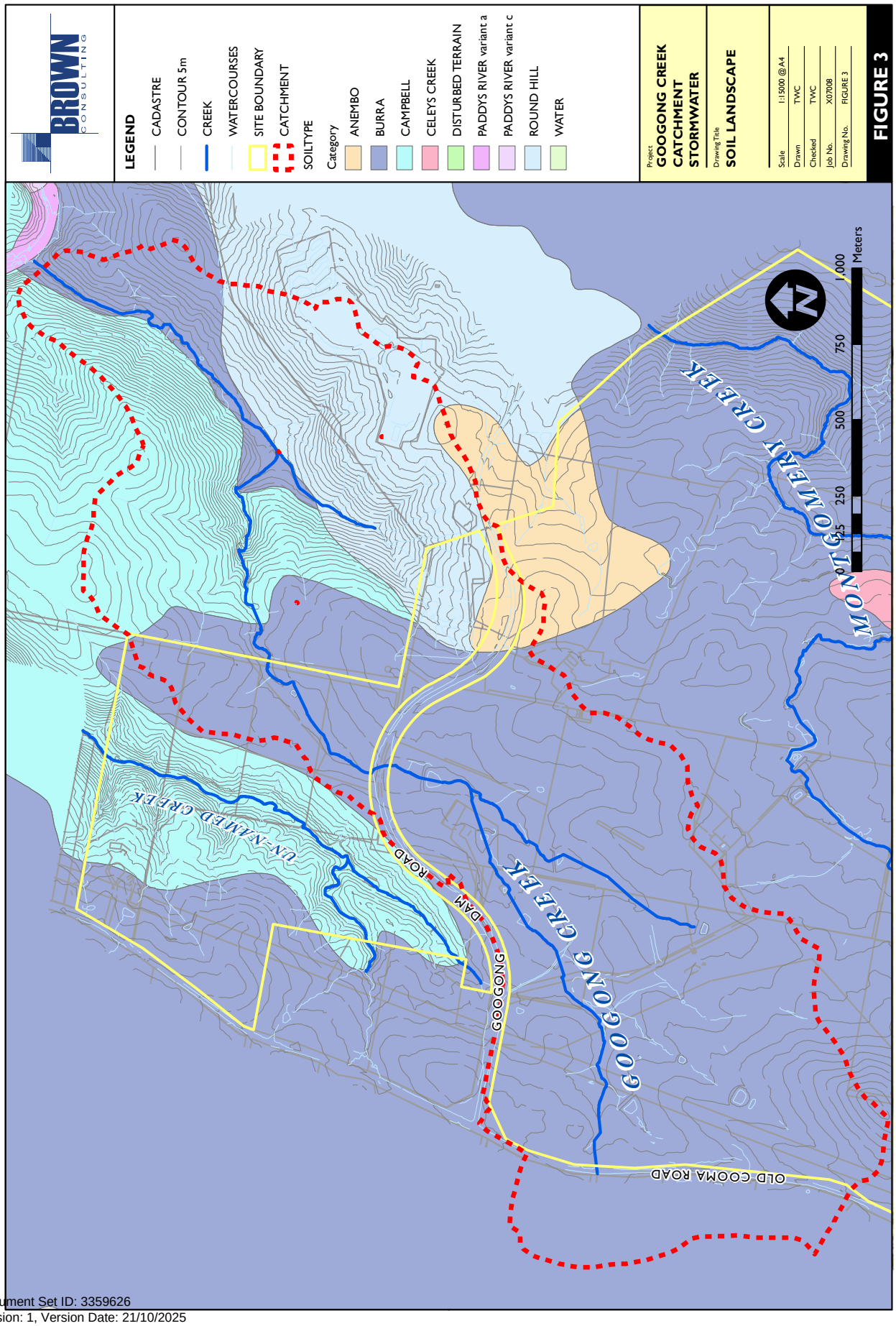
Campbell (ca) – rounded, steep stony hills with rock outcrops, terracettes and vertical tuffs, shallo soils are hardsetting, infertile and erodible, localised waterlogging associated with weak impermeable soils on lower slopes (Sediment Type F/D)

Celeys Creek (cc) – low rolling hills, granite tors, shallow, infertile permeable, coarse grained topsoils, subsoils display poor water holding and seasonal waterlogging (Sediment Type F/D)

Paddy's River (pd) – erodible, non-cohesive coarse soils, highly susceptible to gully erosion, localised wind erosion (Sediment Type C)

Round Hill (rh) – shallow, infertile, stony soils with low water holding capacity, rock outcrop common with steep rocky slopes susceptible to mass movement and rockfall (Sediment Type C/F)

Management of soils during construction is discussed in Section 9.



2.2 PROPOSED DEVELOPMENT

The Googong New Town project is located on a 790 hectare site eight kilometres south east of Queanbeyan that is currently used as grazing land. The Canberra Investment Corporation (CIC) plans to establish five new suburbs to house 16,000 inhabitants as part of the Googong New Town, to be developed over the next twenty five years.

The Googong New Town project will be developed in several stages shown on Figure 4. Googong Creek catchment contains the development areas known as Neighbourhood 2, incorporating the town centre, Neighbourhood 1A and the Hamlets East and West. Stages 1 and 2 of these developments incorporate works within the catchment of Googong Creek upstream of Googong Dam Road. These stages of the proposed development application include:

- The subdivision to create new lots and bulk earthworks on the site to facilitate future development.
- Provision of approximately 700 lots within the Googong Creek catchment
- Provision of utility services to facilitate future development (detailed separately to this report).
- Construction of site drainage works required to service the future development including detention basins and swales and Googong mini-common
- Construction of recreational features such as the sports oval and Googong mini-common

Copies of relevant drawings provided by other consultants involved in the masterplanning process of Googong New Town are provided in Appendix A.

GOOGONG CREEK CATCHMENT STORMWATER STRATEGY
GOOGONG NEW TOWN
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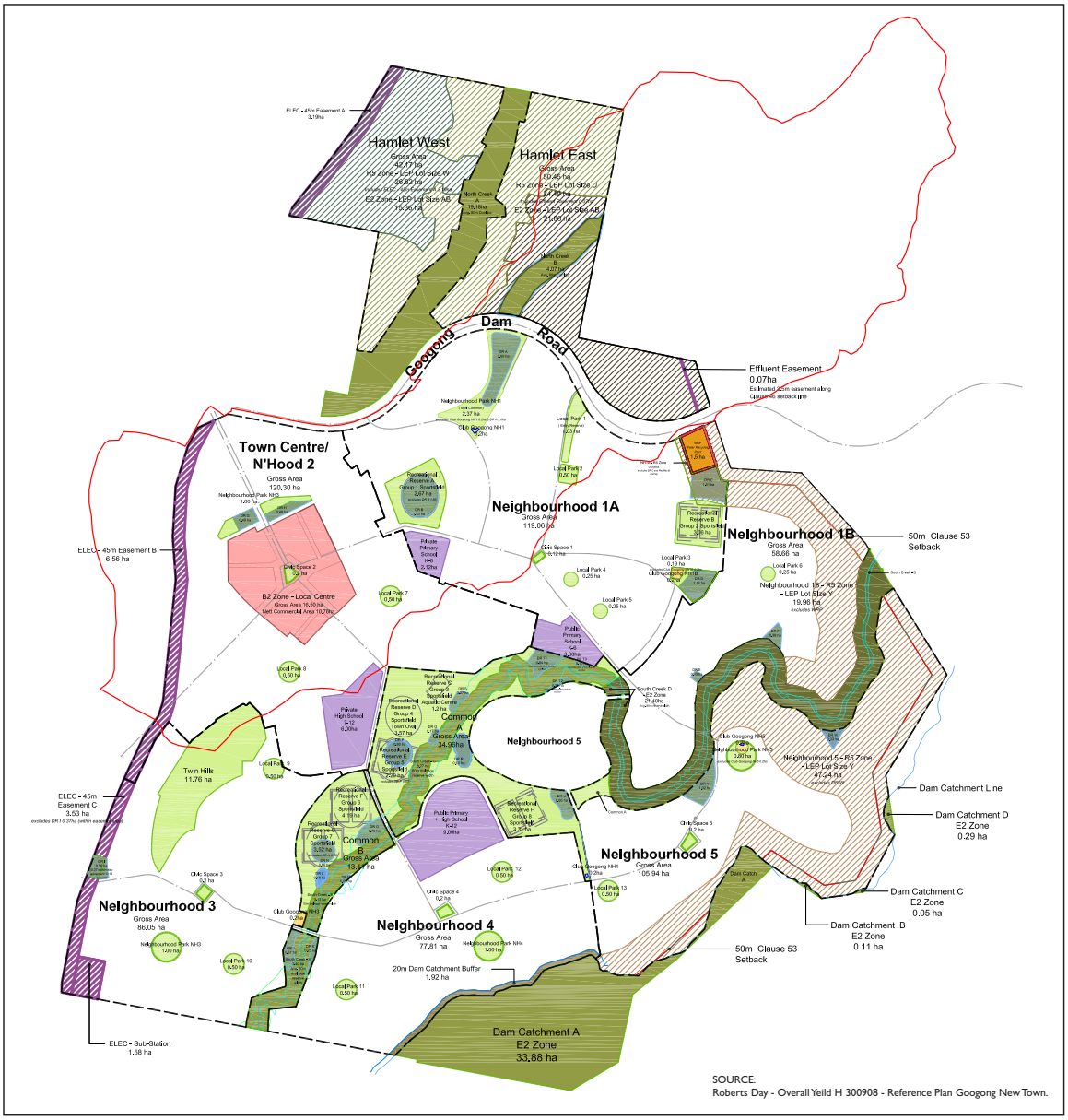

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FIGURE 4 - GOOGONG NEW TOWN LAYOUT PLAN

LEGEND

- NEIGHBOURHOOD BOUNDARY
- INDICATIVE ROAD LAYOUT
- UNENCUMBERED PUBLIC OPEN SPACE
- ENCUMBERED PUBLIC OPEN SPACE
- MIXED USE URBAN CORE
- 45 METRE POWERLINE EASEMENT
- E2 Zone - LEP LOT SIZE AB (10 HA MIN.)
- Club Googong (Private)
- R5 Zone - LEP LOT SIZE Y (1.5 HA MIN.)
- R5 Zone - LEP LOT SIZE U (1000m2 MIN.)
- R5 Zone - LEP LOT SIZE W (3000m2 MIN.)
- SCHOOLS
- STORMWATER DETENTION / WETLANDS
- 20 METRE DAM CATCHMENT BUFFER
- SEWERAGE TREATMENT PLANT
- CATCHMENT BOUNDARY

2.2.1 Stormwater Detention

Detention basins will be used to manage the changes to the natural hydrology of the catchment that result from urbanisation. The erosive effects of high flow events will be mitigated by attenuating peak flows. The design will incorporate stable design features of bed and banks of watercourses and associated vegetation in order to form a stable riparian landscape. The open space strategy incorporates areas that have both ecological and hydrologic function within the landscape whilst providing amenity and serving an aesthetic function.

2.2.2 Water Sensitive Urban Design

The WSUD elements proposed within Googong Creek Catchment are designed to improve stormwater quality, provide stabile waterways as well as supplying passive irrigation of vegetation. Bioretention systems will be used to treat stormwater. Detention areas and stormwater harvesting will be used to limit post-development changes in flow rate and flow duration for the protection of receiving environments. This is critical for the protection of the terrestrial and aquatic environments of the Googong Creek floodplain, particularly in limiting the impacts of urban development on channel bed and bank erosion.

WSUD elements are integrated into both the urban and landscape form within the streetscapes and within the open space areas. Development within the Googong Creek catchment will incorporate WSUD design features within roadways. The following streetscape WUSD features will be used:

- Flush or castellated kerbs on roads at open space to allow road runoff to remain as overland flow
- Road runoff directed to blisters at intersections set below road surface, planted with trees
- Rain gardens in centres of street
- Indented parking bays at urban centres
- Major roads such as Googong Ave to have castellated kerb

Stormwater quality will be addressed through bioretention systems at the urban/open space interface. Where grade, cost or available treatment area is limited, wetlands or bioretention systems can be integrated with end of catchment detention areas.

Landscaped areas will be configured to optimise passive irrigation (allowing for breaks in kerbs, appropriate set down of the planted surface, paths graded to drain to landscaped areas, scour protection at the edge of the landscaped bed).

The required bioretention treatment area is approximately 3% of the impervious catchment area. The required treatment area is reduced where rainwater tanks on individual houses and premises are used. Bioretention systems (configured as street trees or rain gardens) will treat road runoff and runoff from lots. The lot drainage will be directed to the kerb or to bioretention systems and not directly to the stormwater drainage.

Detention systems will be predominantly integrated within open space areas. Detention includes management of 1 year ARI peak flows and flow duration targets for waterway protection as well as providing 100 year ARI flood protection. A total of four, on-line detention basins are proposed for Googong Creek catchment.

3 REGULATORY FRAMEWORK

The objectives of the Stormwater Management Plan for Googong New Town take into consideration the legislative requirements and design criteria. This chapter outlines:

- the legislative framework within which the proposal has been developed;
- policies and guidelines applicable to the development; and
- design criteria that the development must comply with.

3.1 LEGISLATIVE FRAMEWORK

This section outlines the water resources legislation relevant to the development of Googong New Town.

Water Act 1912 / Water Management Act 2000

The objects of the Acts aim to provide for the sustainable and integrated management of the water sources and to apply the principles of ecologically sustainable development. The Acts set guides for the preparation of water management plans and direct the NSW Office of Water in decision making. The NSW Office of Water is a separate office within the NSW Department of Environment, Climate Change and Water. It is responsible for the management of the State's surface water and groundwater resources. The Office reports to the Minister for Water for water policy and the administration of key water management legislation, including the *Water Act 1912* and *Water Management Act 2000*.

Water Management Amendment (Controlled Activities) Regulation 2008

This Regulation of the *Water Management Act 2000* replaces the *Rivers and Foreshores Improvement Act 1948* from 4 Feb 2008. Under this Regulation a controlled activity permit is required from the NSW Office of Water for works within 40m of top of bank. This permit application will be developed at the detailed design stage of these proposals and needs to outline:

- A map of the area depicting the site to be affected by the works in relation to Googong Creek
- Plans indicating works to be undertaken including elevations
- Existing condition and values of the aquatic environment
- Recent photographs of the development area
- Details of excavations, earthworks and/or filling, including the type of materials to be affected, ie. soil, rock, etc
- The potential for disturbance of acid sulfate soils

- The potential for disturbance of contaminated material
- Stability assessment
- Location of existing drainage and any alteration to drainage
- A description of the construction methods to be used (including plant and equipment) and methods to be used to access the site
- Vegetation and landscape plans (including: details of vegetation to be retained, removed and/or planted; numbers of each species to be planted; general indication of the location of plantings)
- Methods to be employed to manage potential environmental impacts such as erosion and sediment control plans, remedial action plans, etc

NSW Seat of Government Acceptance Act 1909 / NSW Seat of Government Surrender Act 1909

Provides the Commonwealth with paramount rights to the use and control of waters of the Queanbeyan and Molonglo Rivers and their tributaries which lie in NSW, for the purposes of the ACT. The rights of NSW and it's residents to the waters of these rivers are subject to and secondary to this paramount right.

Fisheries Management Act 1994

Deals with matters related to the dredging of waterways and the reclamation of land and provides guidelines for assessing barriers to aquatic fauna movement.

Catchment Management Authorities Act 2003 / Catchment Management Act 1989

Established catchment management authorities and committees to achieve coordinated, sustainable management of natural resources on a water catchment basis.

Local Government Act 1993

Creates local governments and grants them the power necessary to perform their functions, among which are the management, development, protection, restoration, enhancement and conservation of the environment of the area the local government is responsible for, in a manner that is consistent with and promotes the principles of ecologically sustainable development. The *Local Government (Ecologically Sustainable Development) Act 1997* amended the *Local Government Act* so that ecologically sustainable development, including the sustainable use of resources, is now a guiding operational principle.

The NSW *Floodplain Development Manual: the management of flood liable land* relates to the management of flood liable land in accordance with Section 733 of the *Local Government Act.*

Queanbeyan Local Environmental Plan 1998

LEPs are prepared in accordance with the requirements of the Environmental Planning and Assessment Act 1979. The LEPs sets out zoning for land within the local government area and identifies planning objectives and development controls for each zone. A new LEP covering the whole of the Queanbeyan City Council area is being prepared.

NSW Environmental Planning and Assessment Act 1979

This Act is the primary piece of land use and planning legislation in New South Wales. It allows for the creation, at various levels of government, of environmental planning instruments to control land use and planning. State environmental planning policies, regional environmental plans, LEPs, development control plans (DCPs), and council codes and policies can all be established under the Act.

3.2 POLICIES AND GUIDELINES

An indicative list of Policies and Guidelines that will require review as part of the drainage design and water management is included below:

- Australian and New Zealand Guidelines for Fresh and Marine Water Quality 2000;
- Department of Environment and Conservation (now Department of Environment and Climate Change and Water) (2006c) *Waste Avoidance and Resource Recovery Strategy 2006;*
- Department of Primary Industries (previously the Department of Natural Resources) 2005, *Floodplain Development Manual – the management of flood liable land;*
- Department of Natural Resources (2005) *Floodplain Development Manual Glossary;*
- Department of Natural Resources (2005) *NSW Groundwater Database;*
- Ecologically Sustainable Development Steering Committee (1992) *National Strategy for Ecologically Sustainable Development;*
- Institute of Engineers (1997) *Australian Rainfall and Runoff – A Guide to Flood Estimation*
- Institute of Engineers (2006) *Australian Rainfall Quality – A Guide to Water Sensitive Urban Design*
- Landcom (2006) *Managing Urban Stormwater: Soils and Construction;*
- NSW Government (1998) *Environmental Management Systems Guidelines;*
- NSW Roads and Traffic Authority *Code of Practice for Water Management – Road Development and Management;*
- NSW Roads and Traffic Authority (1998) Roads and Traffic Design Guide, Section 7;
- NSW Roads and Traffic Authority (1998) Stormwater Management and Drainage Design, Chapter 22 – Open Channels, Draft 5.0, January 1998;
- Australian/New Zealand Standard – Plumbing and Drainage Part 3: Stormwater drainage (AS/NZS 3500.3:2003)

4 DESIGN CRITERIA

This section outlines the design criteria relevant to Googong New Town. The section provides a brief description of relevant Queanbeyan City Council publications and concludes with a table that summarises the applicable design criteria.

Queanbeyan City Council – Development Control Plan No. 38 – Subdivision, Part B1 – Subdivision Design Criteria

Section 5.4 of DCP 38, Part B1 deals with the management of soil, water and vegetation. The objectives of Section 5.4 are to manage soil erosion and minimise impacts on off-site water quality.

Section 5.5 concerns stormwater management and drainage. The objectives of Section 5.5 are to ensure that stormwater and drainage systems for subdivisions or new allotments have sufficient capacity to cater for peak demand and to ensure that subdivisions in new release areas have stormwater and drainage systems that maintain or improve predevelopment flows in terms of quality and volumes.

Queanbeyan City Council – Development Control Plan No. 41 – Soil, Water and Vegetation Management Plans

This plan sets out the legal requirements for the submission of Soil, Water and Vegetation Management Plans, along with checklists of details to be submitted with applications.

Queanbeyan City Council – Handbook of Drainage Design Criteria

This contains technical design data for the calculation of flows, flood elevations and velocities along with technical standards for the design of drainage structures. The hydrologic parameters include rainfall intensity charts and runoff parameters for flow estimation. The handbook also outlines hydraulic parameters and design requirements for pits, culverts and pipes.

The handbook is prepared to be read in conjunction with DCP 38 Part B1. Where further construction standards or specifications are required that are not provided, this handbook refers to the ACT Urban Services: Design Standards for Urban Infrastructure, Part 1 Stormwater.

Queanbeyan City Council – Development Design Specification D5 Stormwater Drainage Design;

This specification outlines requirements for hydrology, hydraulics, detention and documentation for subdivisions, buildings, structures and surrounds, along with roadworks, car parks, site works, landscaping, earthworks, damns and lakes.

In accordance with Section D5.04.5 of runoff from the development area for storms up to the 10 year ARI will be directed to a pipe system from the lots. The pipe system will discharge into Googong Creek, via a community detention system.

The design criteria for open channels are outlined in Section D5.13. Flows within Googong Creek up to and including the 2 year event will be contained within the banks of the channel, with flows above this level spilling into the riparian zone. In accordance with Section D5.13, the channel is to have minimum batters of 1 in 4 and the base of the channel to have a minimum cross slope of 1 in 20.

The design criteria for major flow structures are outlined in Section D5.14. All major structures in urban areas are to be designed for the 100 year ARI storm event without increasing flooding upstream or downstream. Stability of the rock armouring within the channel will be determined according to the methodology in Section D5.06.9 and from *Hydraulic Design of Flood Control Channels, Engineer Manual* published by the US Army Corps of Engineers.

Performance Targets as required for storm water quantity are as outlined in Table D5.3. The design objective for the site is to provide detention in addition to storm water quality treatment, such that flows can be attenuated to meet the objectives outlined in the code.

Queanbeyan City Council Development Design Specification D7 – Erosion Control and Stormwater Management

This specification is in two parts and covers erosion control and stormwater management during construction along with the design of stormwater treatment measures.

The Erosion Control section of Specification D7 outlines requirements for the management of erosion from construction sites. These measures are presented in detail, along with a concept plan in Section 9 of this report. This section also presents the along with the requirements for the preparation of a Soil and Water Management Plan.

The Stormwater Management section of Specification D7 introduces stormwater treatment device options and sets water quality objectives based on receiving environment characteristics and the risk development poses to the environment. Subdivision developments are classified as a high risk development according to D7.21.6. Reduction of pollutant export loads are subject to the requirements outlined in Table D7.2. These requirements are listed in this report in Table 1.

The Stormwater Quality Improvement Device section of Specification D7 provides a framework for the selection of water quality improvement devices and outlines design guidelines for treatment devices.

ACT Design Criteria

Where further construction standards or specifications are required that are not provided in Queanbeyan Council criteria, QCC documentation refers to the ACT criteria. Relevant codes and design standards for the ACT are:

- ACT Planning and Land Authority Waterways Water Sensitive Urban Design – General Code (2008)
- ACT Planning and Land Authority Industrial Zones Development Code (2008)
- ACT Urban Services: Design Standards for Urban Infrastructure, Part 1 Stormwater

Hydrologic parameters used in modelling, including Australian Representative Basins Model (ARBM) parameters are utilised from these ACT codes.

Table 1 summarises the design criteria applicable to development of Googong New Town, the source of the criteria and any comments or departures from the criteria.

Table 1 Stormwater Design Criteria for Googong New Town

Description	*Criteria*	*Source*	*Comments/Departures*
Rainfall Data		Queanbeyan Bowling Club 1967-2007	1967-2007 data set used for all modelling for project , including integrated water cycle management
Evaporation Data		Canberra monthly averages within MUSIC (from the Bureau of Meteorology)	
Design Rainfall	Methodology outlined in Volume 2 of ARR	D5.04.2	
Average Recurrence Interval (ARI)	Minor Urban: • 10 years for commercial/industrial • 5 years for residential • 1 year for parks and recreation areas Reduction of Peak flows to pre-development levels • 5 year and 100 year Major Structures: • 100 year, with 0.3 m freeboard	D5.04.5 Table D5.3 D5.14	
XP-RAFTS Roughness Parameters	Impervious areas 0.015 Pervious areas 0.04	ACT Planning and Land Authorities Water Sensitive Urban Design General Code (March, 2008)	

Description	*Criteria*			*Source*	*Comments/Departures*
XP-RAFTS ARBM loss parameters	Storage Capacities	Impervious (IMP)	0.50	ACT Planning and Land Authorities Water Sensitive Urban Design General Code (March, 2008)	
		Interception (ISC)	1.00		
		Depression (DSC)	1.00		
		Upper Soil (USC)	25.00		
		Lower Soil (LSC)	50.00		
	Infiltration	Dry soil sorptivity (SO)	3.00		
		Hydraulic conductivity (KO)	0.33		
		Lower soil drainage Factor (LDF)	0.05		
		Groundwater recession;			
		Constant rate (KG)	0.94		
		Variable rate (GN)	1.00		
		Dry soil sorptivity (SO)	3.00		
	Evapo-Transpiration	Proportion of rainfall intercepted by vegetation (IAR)	0.70		
		Max potential evapo-transpiration (EV):			
		Upper soil (UH)	10.00		
		Lower soil (LH)	10.00		
		Proportion of EV from upper soil zone (ER)	0.70		
		Ratio of potential evaporation to A class pan (ECOR)	0.90		

Description	*Criteria*		*Source*	*Comments/Departures*
Pollutant Removal targets	Suspended Solids (SS)	80% retention of average annual load	Table D7.2	Total Phosphorous (TP) and Total Nitrogen (TN) target set at 65% retention of average annual load
	Sediment	100% retention of sediment greater than 0.125 mm for flows up to the 3 month ARI peak flow		
	Oil and Grease	No visible oils for flows up to the 3 month ARI peak flow		
	Litter	100% retention of litter greater than 5 mm for flows up to the 3 month ARI peak flow		
	Total Phosphorous (TP)	45% retention of average annual load		
	Total Nitrogen (TN)	45% retention of average annual load		

Description	*Criteria*			*Source*	*Comments/Departures*
Channel Design Criteria	maximum batter slope		1 in 4	D5.13	
	base of the channel minimum cross slope		1 in 20		
Basin Design Criteria	Maximum batter slope		1 in 6	D5.15	
	Maximum water depth (20 year ARI)		1.2 m		
Vegetated Swale Design Criteria	1 year ARI velocity	< 0.5 m/s		D7.29	
	100 year ARI velocity	< 1.0 m/s			
	Longitudinal grade	> 1%			
		< 4%			
	Maximum base width	2.5 m (unless measures to ensure uniform spread of flow)			

5 SURFACE WATER ENVIRONMENT

This chapter describes in detail the:

- Existing surface water conditions within the development area and wider Googong Creek catchment, providing flows and flood extents;
- How the conditions within the catchment and Googong Creek will be affected by development of Googong New Town.; and
- How potential changes to extreme rainfall events brought about by climate change will impact on Googong Creek and the development of Googong New Town.

Modelling of the existing and developed conditions using the *XP-RAFTS* hydrological modelling package has been undertaken for Googong Creek, using the parameters outlined in Table 1. Flows were calculated at points along the creek relevant to both the existing site drainage and to the locations of developed features. This approach is appropriate for Googong Creek as design elements are proposed in the locations of existing features in order to restore the indigenous drainage habitats. The use of Water Sensitive Urban Design (WSUD) measures will manage the quantity and quality of post-development stormwater runoff for the protection and enhancement of receiving environments and is discussed in Section 6.

Hydraulic modelling using SOBEK software has been used to map flood extents for existing conditions. Models were developed from Digital Elevation Models (DEM) of the existing creek and from earthworks models of proposed drainage, landscape and development features generated in the 12D modelling package.

5.1 EXISTING CONDITIONS

A brief description of the existing layout and condition of Googong Creek is provided in Section 2.1. This section describes the existing flood conditions for Googong Creek in the location of Googong New Town, providing descriptions of the hydrologic and hydraulic calculations used to develop the flood extents maps.

5.1.1 Existing Conditions Hydrologic Modelling

An *XP-RAFTS* hydrologic model has been developed for Googong Creek in the pre-development state. This model uses the parameters specified in ACT Planning and Land Authorities' *Water Sensitive Urban Design General Code* (March, 2008) outlined in Table 1. The layout of the model is presented in Figure 5, with data input into the models and results provided in Appendix B.

Flows were calculated for storms ranging from 15 minutes to 6 hours for the 100 year, 50 year, 20 year, 10 year, 5 year, 2 year, 18 month, 1 year, 9 month, 6 month and 3 month average recurrence intervals (ARI). Peak flows for selected ARIs relevant to those in guidelines and criteria (from Table 1), are presented in Table 2.

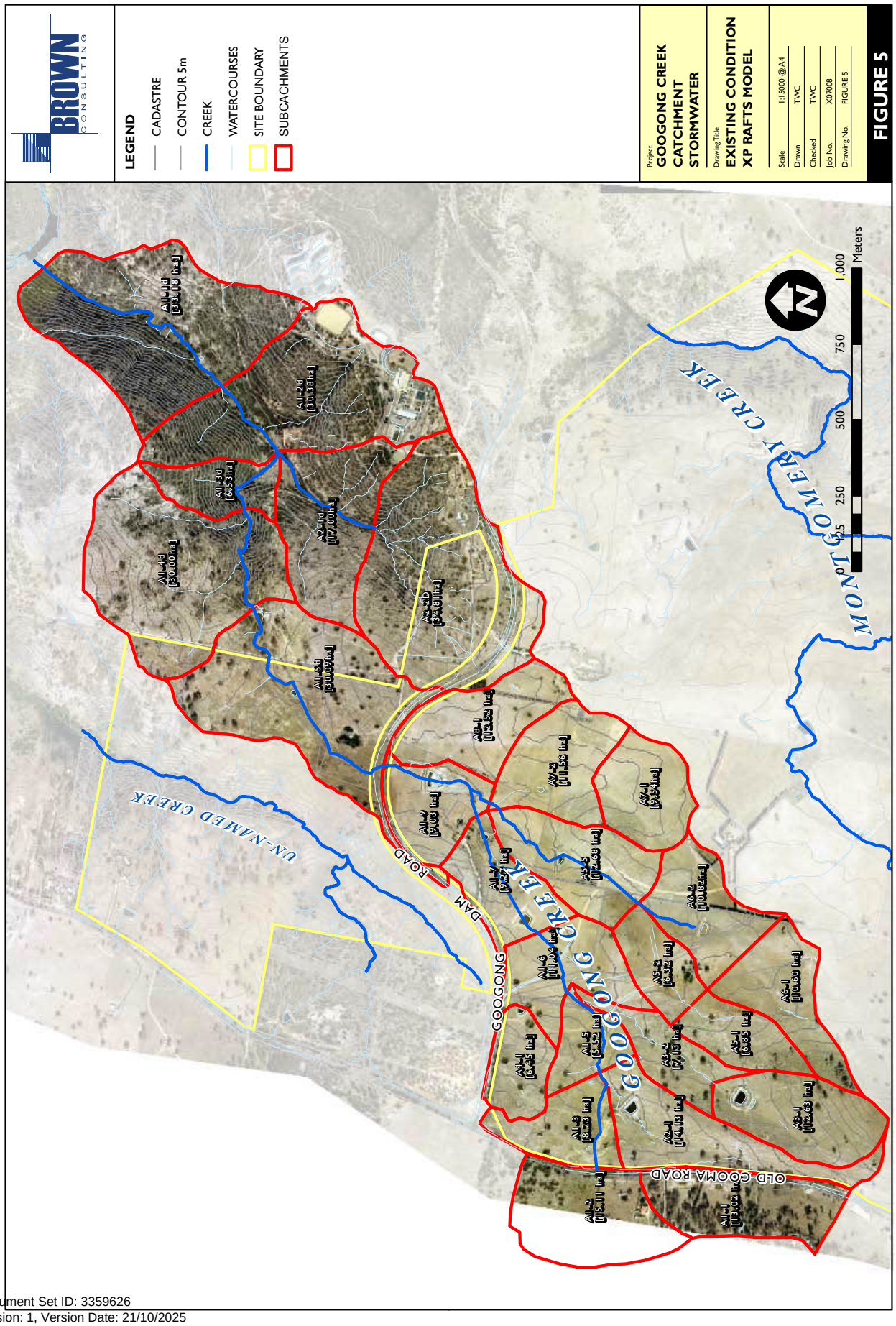
Table 2 Existing Condition Peak Flows

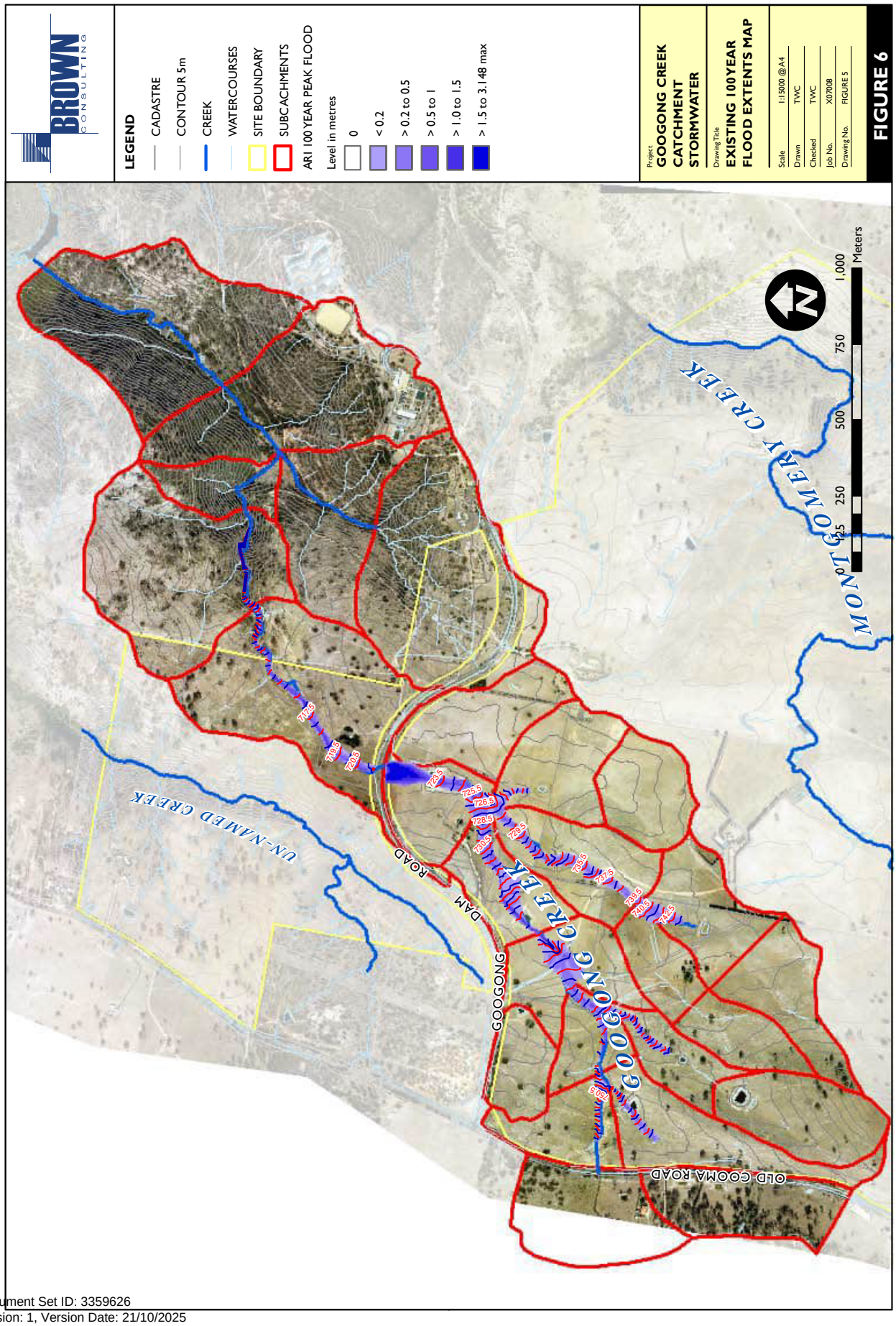
Node	*Peak Flow (m^3/s)*				
	100 year	*10 year*	*5 year*	*1 year*	*3 month*
Old Cooma Road (A1-2)	2.41	1.12	0.84	0.33	0.17
Basin 4 location (A1-5)	7.35	3.36	2.64	0.89	0.29
Mini Common (A1-8J)	14.18	6.85	5.35	1.96	0.52
Outlet	14.86	7.42	5.78	2.18	0.57

The results in Table 2 indicate that only a very small fraction of the flows at the Googong Road Dam are from upstream of the development site. The 3 month flows, used for development of treatment measures are three orders of magnitude smaller than the 100 year flows, used for major structural design.

5.1.2 Existing Conditions Flood Mapping

Hydraulic modelling using *SOBEK* software has been used to map flood extents for existing catchment conditions. Models were developed from Digital Elevation Models (DEM) of the existing creek from earthworks models in the *12D* modelling package. The flood extent for the 100 year peak storm for existing catchment conditions is presented in Figure 6.





APPENDIX 3: GOOGONG NEW TOWN AS-EXECUTED DRAINAGE DRAWINGS (BROWN CONSULTING, 2014)

GENERAL HYDRAULIC NOTES

1. REFER TO THE SPECIFICATION FOR DETAILS
2. SOME SERVICES SHOWN ON THE DRAWING AS EXISTING MAY BE UNDER CONSTRUCTION BY OTHER CONTRACTORS AND MAY NOT BE IN OPERATION AT THE TIME OF CONNECTION. WHERE NECESSARY THE CONTRACTOR SHALL LIAISE WITH THE OTHER CONTRACTORS CONCERNING CONNECTIONS.
3. FOR BACKFILLING OF ALL HYDRAULIC SERVICES, TELECOMMUNICATIONS OR SIMILAR, GAS AND CONDUITS REFER TO BACKFILL UNDER ROADS IN LAYERS NOT EXCEEDING 150mm AND BEHIND KERBS IN LAYERS NOT EXCEEDING 400mm
4. TRENCHING, BEDDING AND BACKFILLING REQUIREMENTS FOR CONDUITS REFER TO RELEVANT DETAILS PROVIDED BY SERVICE AUTHORITIES

STORMWATER NOTES

SW1 ALL DESIGN LEVELS SHOWN ON STORMWATER LINES ARE AT THE CENTRE OF THE MANHOLE OR SUMP UNLESS SHOWN OTHERWISE. NOTE THE SPECIFICATION REQUIREMENTS FOR THE CONSTRUCTION TOLERANCES FOR INVERT LEVELS.

SW2. STORMWATER HOUSE CONNECTION BRANCHES SHALL BE 100Φ UNLESS OTHERWISE SHOWN.

SW3 THE INVERTS GIVEN FOR HOUSE CONNECTIONS APPLY TO THE END OF THE BRANCH. IF INVERT LEVELS ARE NOT GIVEN, THE BRANCHES SHALL BE LAID AT A GRADE OF 1.0% FROM THE INVERT OF THE PROPOSED SLOPE JUNCTION OR BRANCH. WHERE THE TIE CONNECTS TO A STRUCTURE, THE TIE OBVERT SHALL MATCH THE OBVERT OF THE OUTGOING MAIN

SW4. 100mm STORMWATER TIES SHALL BE CLASS SN6, SOLID WALLED PVC WITH SOLVENT WELDED JOINTS. INSTALL 100mm/90mm REDUCER AT HOUSE CONNECTION TERMINATION.

SW5 ALL STORMWATER PIPELINES UP TO AND INCLUDING 675Φ LOCATED UNDER ROADWAYS SHALL HAVE RUBBER RING JOINTS

SW6 FOR STORMWATER PIPE GRADES EXCEEDING 7%, PLACE BULKHEADS AT 5m SPACINGS IN ACCORDANCE WITH THE SPECIFICATION

SW7. PIPES FOR SUBSOIL DRAINS SHALL BE 100Φ CORRUGATED PERFORATED PLASTIC DRAINAGE PIPE, CLASS 1000. SUBSOIL DRAIN ROAD CROSSINGS SHALL BE 100Φ PVC PIPE, CLASS SN6.

SW8 MINIMUM GRADE OF SUBSOIL DRAINS SHALL BE 1%

SW9 HEAVY DUTY STORMWATER MANHOLE COVERS SHALL BE "GATIC" CLASS D WITH CONCRETE INFILL

WATER NOTES

W1 ANGLES OF DICL BENDS SHALL BE THE NEAREST AVAILABLE. THE CONTRACTOR SHALL, WITHOUT EXTRA COST, EITHER ADAPT THE BEND TO PROVIDE THE REQUIRED ANGLE OR LAY THE ADJACENT SECTIONS OF THE MAIN SO THAT THEY INTERSECT AT THE BEND ANGLE.

W2 PROPERTY SERVICES SHALL BE 25mmΦ HDPE UNLESS OTHERWISE SHOWN. PROPERTY SERVICES SHOWN AS 32mmΦ SHALL BE 32mmΦ HDPE. PROPERTY SERVICES SHALL BE CONNECTED TO THE MAIN IN ACCORDANCE WITH WAT-1108

W3 WATER SERVICES SHALL BE HDPE CLASS PE100

W4 ALL CONNECTIONS TO LIVE WATER SUPPLY MAINS SHALL BE MADE BY CONTRACTOR UNDER THE SUPERVISION OF QCC.

W5 POTABLE WATER MAINS SHALL BE CLASS PN16 PVC-M WITH JOINTS COMPATIBLE WITH DUCTILE IRON PIPES AND FITTINGS. PLACE TRACING WIRE ON ALL PVC PIPES.

W6 WHERE WATER FITTINGS ARE IMMEDIATELY ADJACENT TO EACH OTHER THE FITTINGS SHALL BE BOLTED TOGETHER WITH FLANGED JOINTS

W7. SLUICE VALVES WHERE ADJACENT TO TEES, SHALL BE FLANGED TO THE TEE. SLUICE VALVES SHALL BE LOCATED BEHIND KERBS (AND NOT IN PAVEMENTS AS SOMETIMES NOTIONALLY INDICATED ON PLANS).

W8. FOR WATER PIPE GRADES 5%, CONSTRUCT TRENCH STOPS OR BULKHEADS IN ACCORDANCE WITH WSA03 5.10 AND DRAWINGS WAT-1209 AND WAT-1210.

W9 WATER MAINS AND SERVICES SHALL BE CONSTRUCTED IN ACCORDANCE WITH WSA 03-2011 VERSION 3.1 WATER SUPPLY CODE OF AUSTRALIA

W10. THE MINIMUM SEPARATION OF SEWER AND WATER TIES IS 600mm.

W11. RECYCELD WATER MAINS SHALL BE CLASS PN16 PVC-O PURPLE COLOURED WITH JOINTS COMPATIABLE WITH DUCTILE IRON PIPES AND FITTINGS. PLACE TRACING WIRE ON ALL PVC PIPES.

SEWER NOTES

S1. ALL DESIGN LEVELS SHOWN ON SEWER MAINS ARE AT THE CENTRE OF THE MANHOLE. NOTE THE SPECIFICATION REQUIREMENTS FOR THE CONSTRUCTION TOLERANCES FOR INVERT LEVELS.

S2 SEWER PROPERTY CONNECTIONS (PC) SHALL BE 100Φ UNLESS OTHERWISE SHOWN OR AS REQUIRED BY CLAUSE D12.10.8 OF COUNCIL'S GOOGONG DESIGN SPECIFICATION

S3 THE INVERTS GIVEN FOR PROPERTY CONNECTIONS (PC) APPLY TO THE END OF THE BRANCH. IF INVERT LEVELS ARE NOT GIVEN, THE BRANCHES SHALL BE LAID AT A GRADE OF 2.0% FROM THE INVERT OF THE PROPOSED SLOPE JUNCTION OR BRANCH. WHERE THE SEWER PC CONNECTS TO A STRUCTURE, THE SEWER PC OBVERT SHALL MATCH THE OBVERT OF THE OUTGOING MAIN

S4 ALL CONNECTIONS TO LIVE SEWER MAINS SHALL BE MADE BY CONTRACTOR UNDER THE SUPERVISION OF QCC.

S5 SEWER PROPERTY CONNECTIONS (PC) SHALL BE CLASS SN8, SOLID WALLED PVC WITH SOLVENT WELDED JOINTS CONSTRUCTED IN ACCORDANCE WITH WSA SEW-1107. REFER TO AS 1260.

S6. SEWER PIPES SHALL BE CLASS SN8, SOLID WALLED PVC WITH RUBBER RING JOINTS REFER TO AS 1260. CURVED PVC SEWERS UP TO 225mm TO HAVE SOLVENT WELDED JOINTS, FOR RADII LESS THAN 250m.

S7 FOR SEWER PIPE GRADES EXCEEDING 5%, CONSTRUCT SCOUR STOPS IN ACCORDANCE WITH WSA02 8.10 AND DRAWINGS SEW-1206 AND SEW-1207

S8. SEWER MAINS AND SERVICES SHALL BE CONSTRUCTED IN ACCORDANCE WITH WSA 02-2002 VERSION 2.3 SEWERAGE CODE OF AUSTRALIA. UNLESS NOTED OTHERWISE.

S9 ALL MANHOLE COVERS SHALL BE CLASS B UNLESS NOTED AS "HD". HD DESIGNATED COVERS SHALL BE CLASS D. REFER TO WSA 02-2002 SEW-1308

S10 THE MINIMUM SEPARATION OF SEWER AND WATER TIES IS 600mm

STANDARD DRAWINGS - (COMPLETE LIST IN RFT)

STORMWATER - TAMS STANDARD DRAWINGS AS AMENDED BY QCC.

SEWER, POTABLE AND NON POTABLE WATER - WSAA

EXPLANATORY NOTES AND DEFINITIONS

SEWER	STORMWATER	
S10	C12	MANHOLE OR PIT NUMBER OR DEAD END
591.85	592.30	UPSTREAM INVERT LEVEL (AT CENTRE OF STRUCTURE)
150	300Φ2	PIPE NOMINAL DIAMETER & CLASS
45.5m	16.0m	PIPE LENGTH
1.01%	2.19%	PIPE GRADE
591.39	591.95	DOWNSTREAM INVERT LEVEL (AT CENTRE OF STRUCTURE)

2,3,4 - REINFORCED CONCRETE OR FIBRE CEMENT, AS1342
SP - SPLAYED FLUSH JOINTED PIPES
RRJ - RUBBER RING JOINTED PIPE
PVC - WATER MAINS CLASS 16, AS 2977
SEWER AND STORMWATER, AS 1260
ST - FIBRE REINFORCED CONCRETE, SUPERTITE JOINTS
DICL - DUCTILE IRON CEMENT LINED. CLASS DN35
SVD - SEWER VERTICAL DROP

LEGEND

SERVICES : **EXISTING** **PROPOSED**

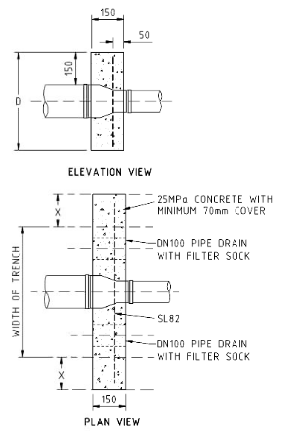
- MANDATORY DRIVEWAY LOCATION
- STAGE BOUNDARY
- TREE TO BE RETAINED
- FINISHED DESIGN CONTOURS (1.0m INTERVAL) — 616.0
- SERVICES EASEMENTS
- SERVICES EASEMENTS
- SCOUR STOPS
- STORMWATER MAIN (RADIUS/LENGTH RC RRJ PIPE) — SW — / R50.4 SW
- STORMWATER SUMP, MANHOLE
- STORMWATER SPECIAL STRUCTURE
- LARGE DIA STORMWATER MANHOLE WITH HEAVY DUTY MANHOLE COVER — HD / HD
- TEMPORARY SANDBAG HEADWALL
- PLANTATION SUMP
- GRATED PIT
- END CAP
- SWALE/FLOODWAY
- END WALL
- 100Φ SUBSOIL DRAIN WITH CONNECTION TO SUMP, HIGH END RISER AND INTERMEDIATE RISER — 100Φ PVC
- SUBSOIL DRAIN OUTLET
- SEWER MAIN (RADIUS) — S — / R50 S
- SEWER MAIN ABANDONED — S/A —
- SEWER RISING MAIN — SRM —
- SEWER MAINTENANCE HOLE, VERTICAL DROP — SVD / SVD
- TERMINAL MAINTENANCE SHAFT — TMS
- HEAVY DUTY COVER (REFER NOTE S10) — HD
- SEWER PUMP STATION
- POTABLE WATER MAIN (DIAMETER) (RADIUS) — W — / 150Φ W(P) R120
- RECYCLED WATER MAIN (DIAMETER) (RADIUS) — 150Φ W(R) R120
- FIRE HYDRANT, SLUICE VALVE, THRUST BLOCK, TAPER (POTABLE) — H / H
- FIRE HYDRANT, SLUICE VALVE, THRUST BLOCK, TAPER (RECYCLED) — H / H
- SLUICE VALVE AND IN LINE THRUST BLOCK (POT)
- SLUICE VALVE AND IN LINE THRUST BLOCK (REC)
- POTABLE WATER SERVICE (REFER NOTE W2) — W(P)
- RECYCLED WATER SERVICE (REFER NOTE W2) — W(R)
- POTABLE WATER END CAP — W(P)
- RECYCLED WATER END CAP — W(R)

SLUICE VALVE DIMENSIONS

SIZE DN	LOAD (kN)	MIN. BEARING AREA(m²)	LENGTH	DEPTH
100	16.0	0.36	1.2m	0.45m
150	34.6	0.69	1.2m	0.8m
225	73.8	1.48	1.2m	1.425m

TAPER BLOCK DIMENSIONS

TAPER	DEPTH (D)	WIDTH (X)	BEARING AREA(m²)
225-150	0.75	0.40	0.30
225-100	1.00	0.50	0.50
150-100	0.50	0.30	0.15



TAPER ANCHOR BLOCK DETAIL
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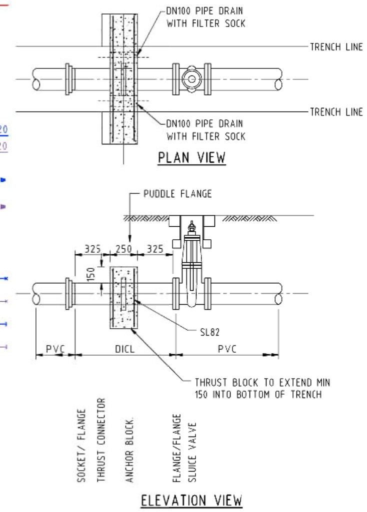

IN-LINE SLUICE VALVE ANCHOR BLOCK DETAIL
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B	PIB	JB			30/01/13	NOTE S5 WSA SEW-1107
C	PIB	DC			13/05/13	NOTES REVISED
D	AMK	VVB			31/01/14	WORK AS EXECUTED
E						
F						

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PROJECT No. ....

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CLIENT: GOOGONG

PROJECT: GOOGONG TOWNSHIP NEIGHBOURHOOD 1A STAGE 1

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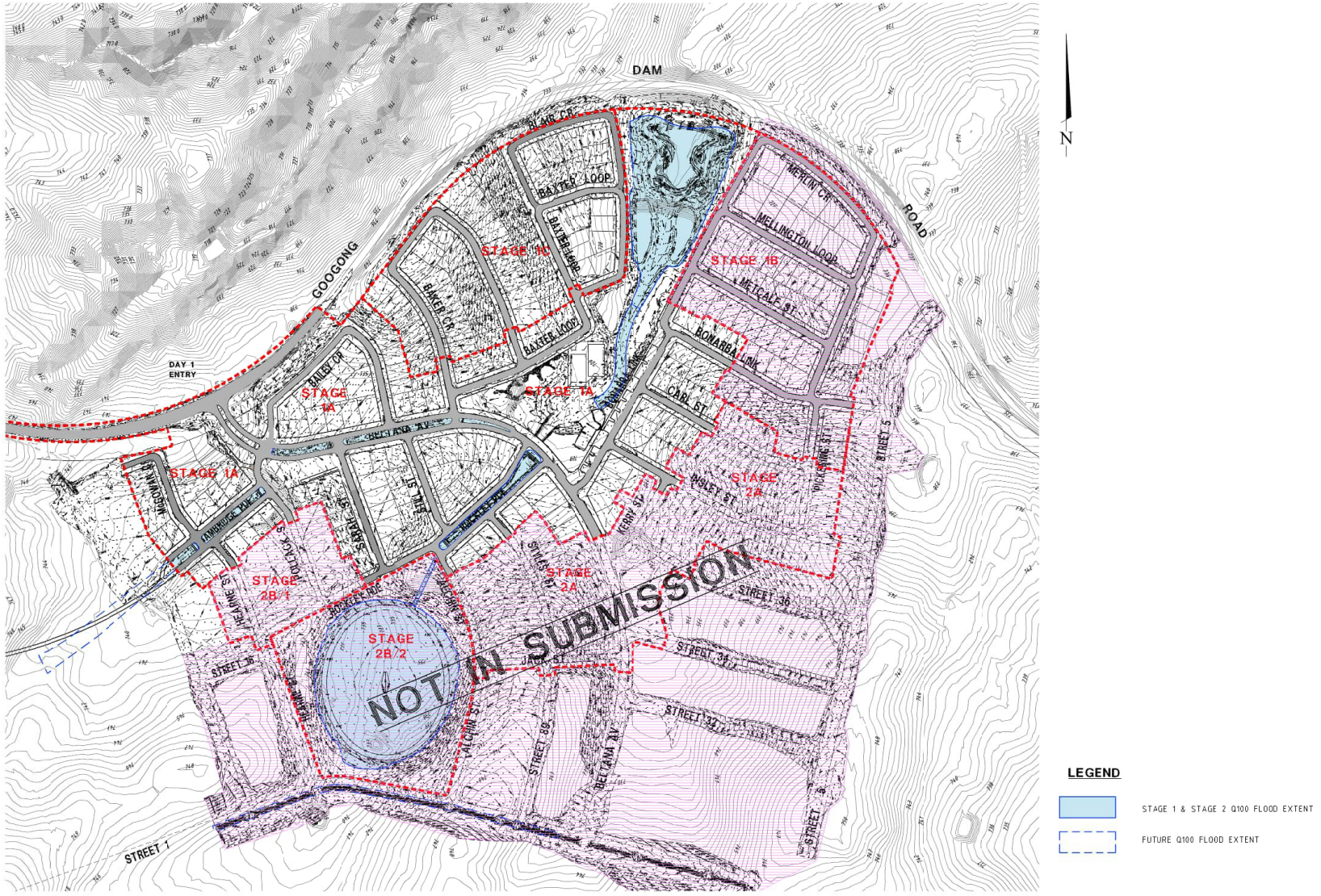

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B	C	AMF	VVB		31/01/14	WORK AS EXECUTED
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NEIGHBOURHOOD 1A
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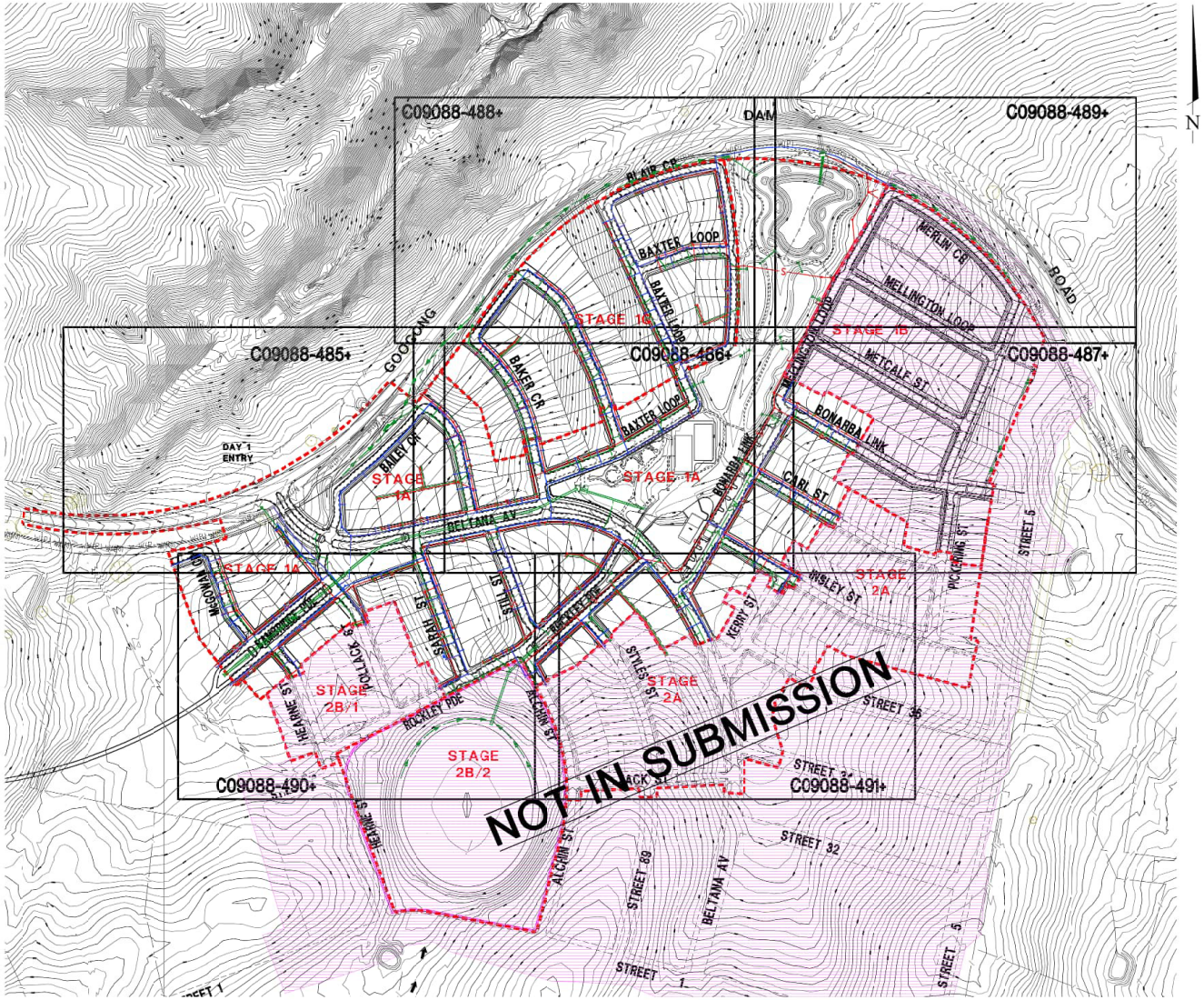
FLOOD EXTENT PLAN

C09088-483+ B



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B	APK	VVB			14/01/14	WORK AS EXECUTED
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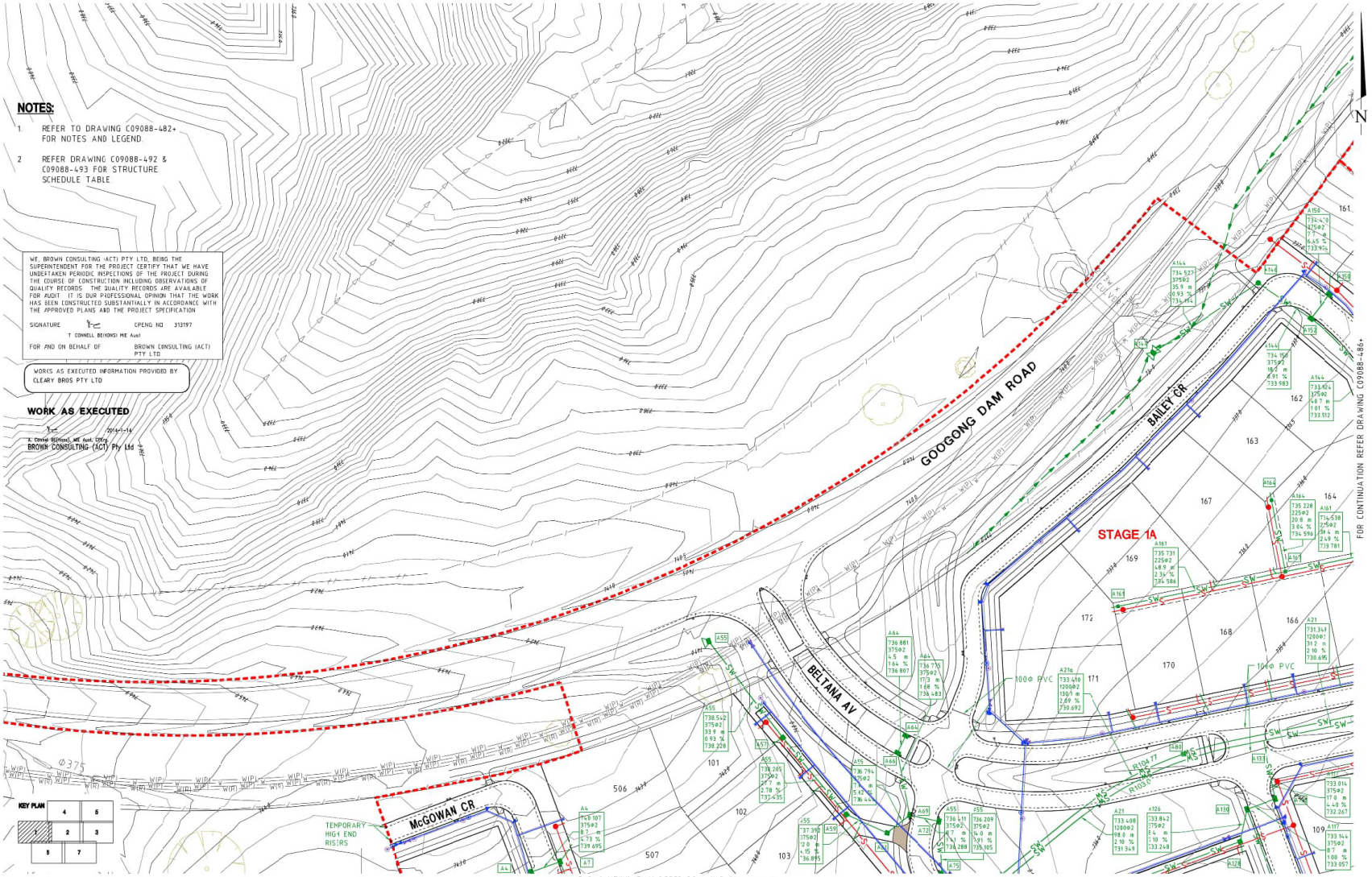
DRAWING TITLE: DRAINAGE KEY PLAN

DRAWING NUMBER: C09088-484+

APPVD: B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WORKS AS EXECUTED INFORMATION PROVIDED BY CLEARY BROS PTY LTD
WORK AS EXECUTED
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GOOGONG DAM ROAD
BAILEY CR
BELTANA AV
McGOWAN CR
STAGE 1A
TEMPORARY HIGH END RISERS
KEY PLAN
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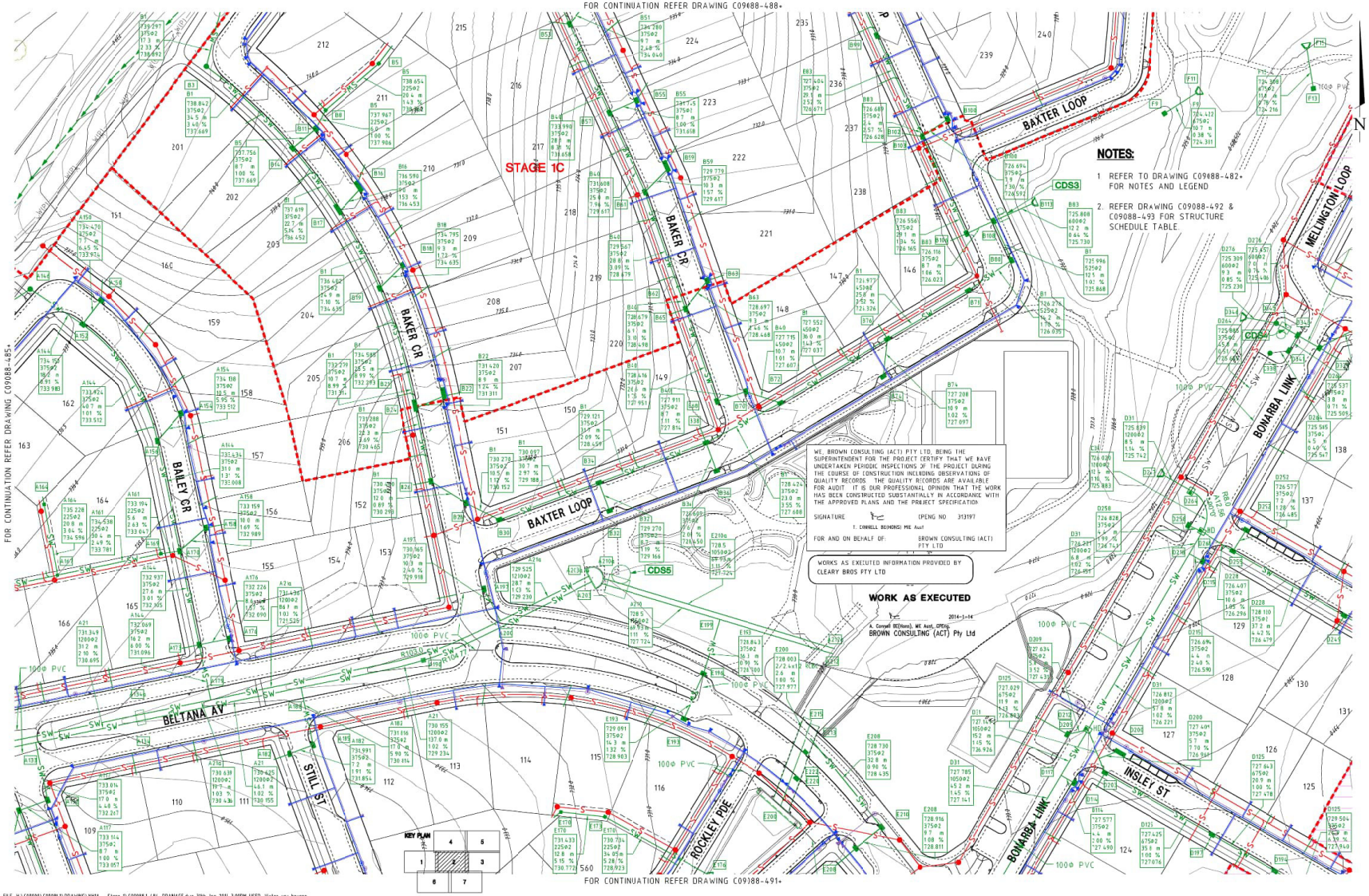

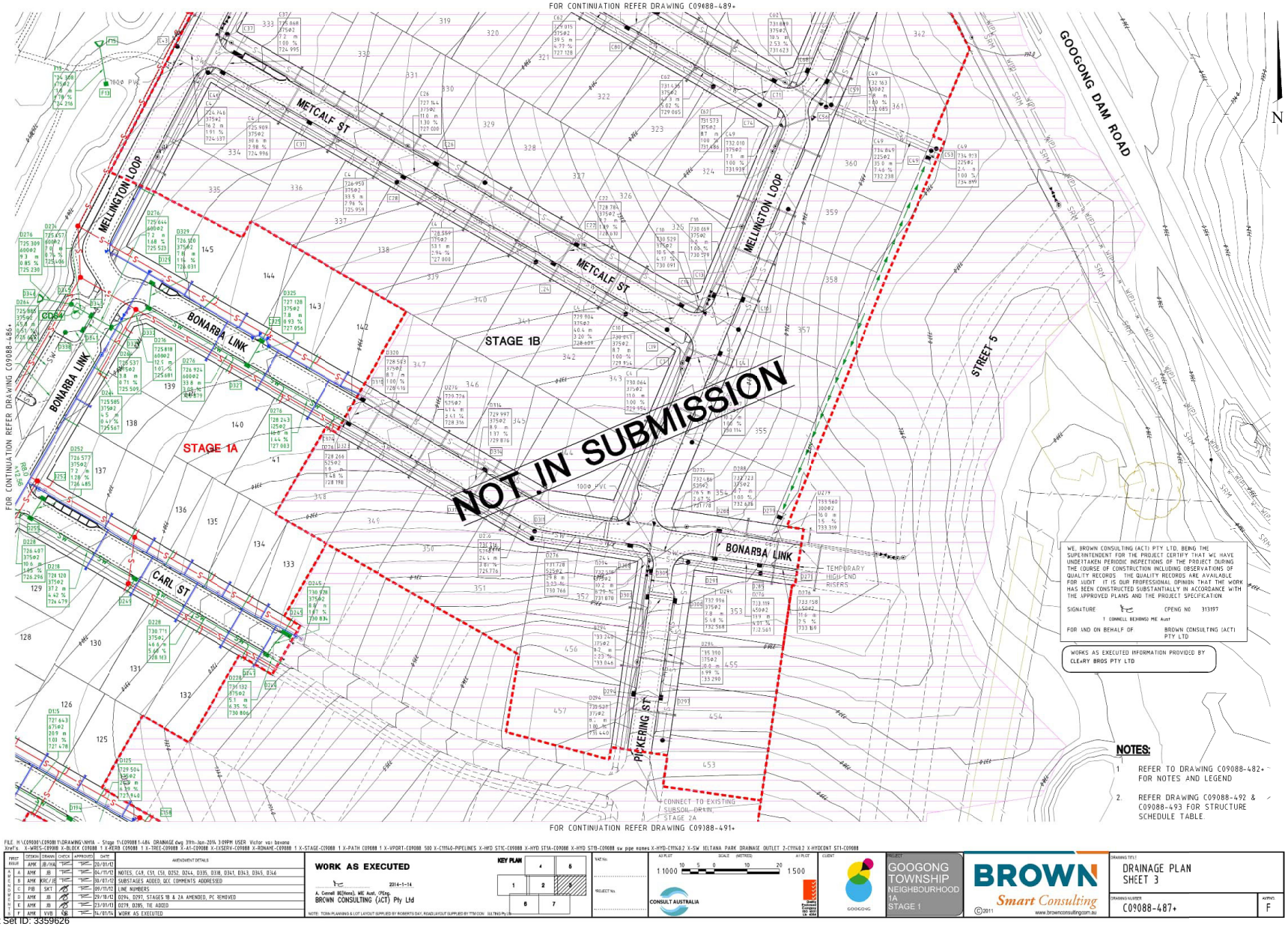

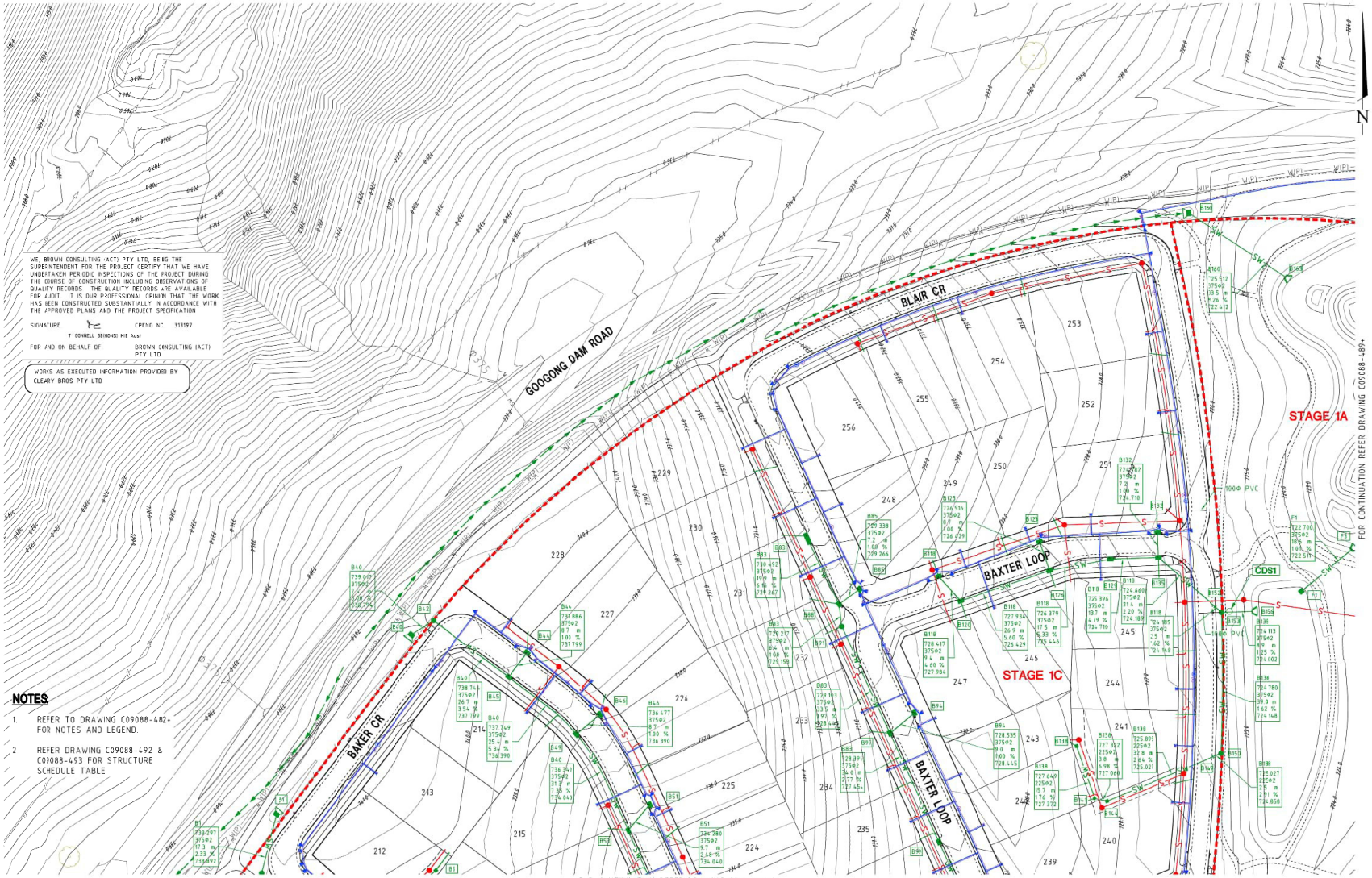

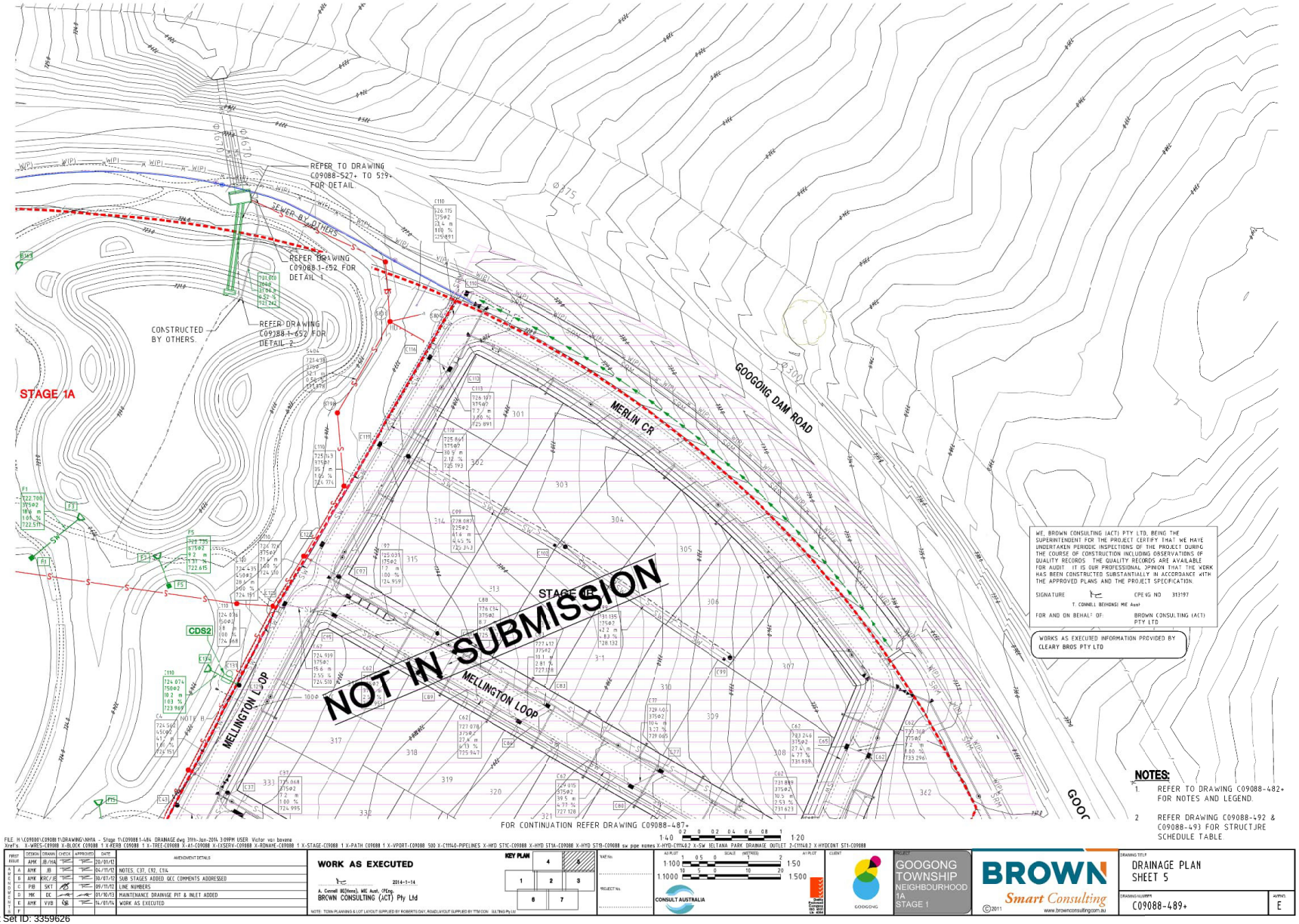

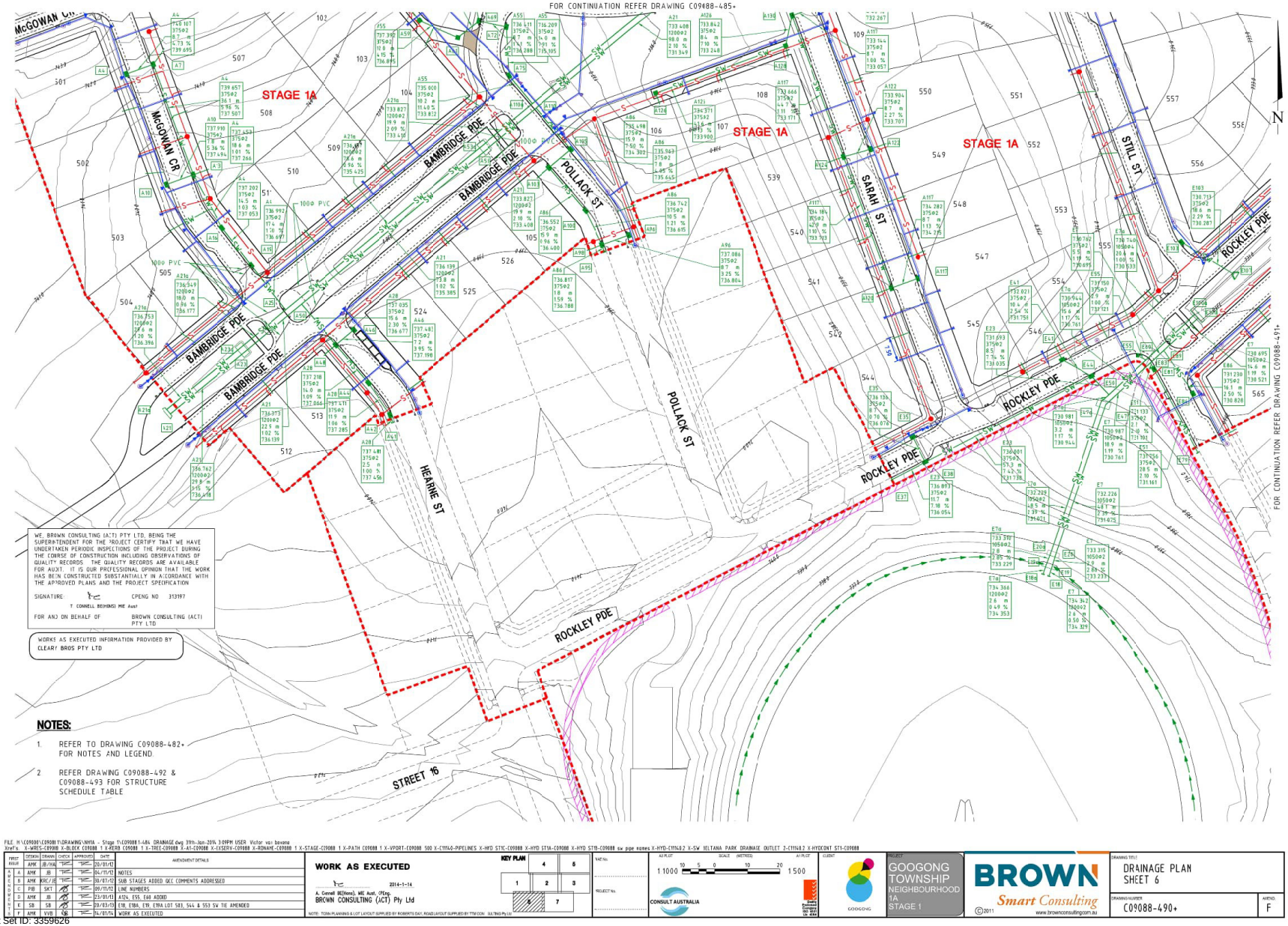
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ROCKLEY PDE
HEARNE ST
STREET 16
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DRAINAGE PLAN SHEET 6
C09088-490+
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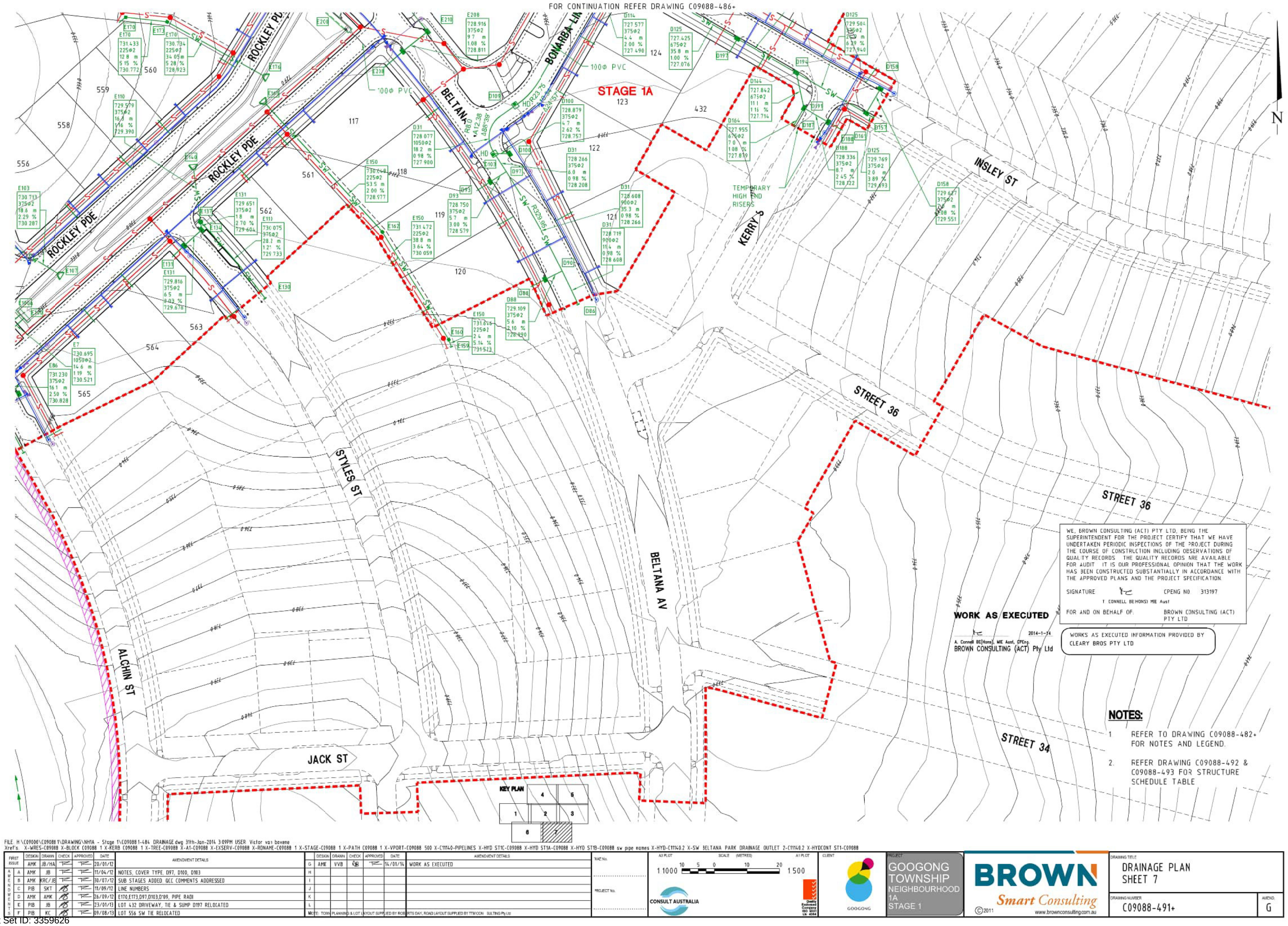

Document Set ID: 3359626
Version: 1, Version Date: 21/10/2025

STORMWATER STRUCTURE SCHEDULE - STAGE 1A

No	TYPE	EASTING	NORTHING	COVER TYPE	COVER RL
A4	R SUMP	702306.77	6078309.36		741.74
A7	R SUMP	702315.01	6078312.18		741.72
A10	R SUMP	702319.22	6078275.41		739.56
A13	R SUMP	702327.41	6078278.35		739.50
A16	R SUMP	702336.24	6078262.12		739.26
A19	R SUMP	702345.10	6078250.71		739.09
A21a	HW	702319.30	6078206.37		739.50
A21	HW	702320.24	6078204.89		739.50
A23a	SPECIAL	702342.07	6078225.29		738.29
A23	SPECIAL	702343.25	6078223.96		738.29
A25	SWBRANCH	702355.84	6078236.87		738.75
A41	DE	702388.806	6078202.307		739.44
A42	R SUMP	702387.91	6078204.77		739.24
A44	R SUMP	702381.16	6078214.53		739.36
A46	R SUMP	702376.85	6078230.91		739.00
A48	R SUMP	702371.28	6078226.15		739.10
A50	SWBRANCH	702360.72	6078238.63		738.70
A53	SWBRANCH	702417.19	6078286.09		737.28
A53a	SWBRANCH	702416.05	6078287.45		737.28
A55	R P.S.S.A.	702357.20	6078375.37		740.59
A57	GRATED P	702378.77	6078347.75		740.22
A59	GRATED P	702397.03	6078325.77		738.87
A61	GRATED P	702408.85	6078320.38		738.24
A64	R SUMP	702413.75	6078348.23		738.35
A66	R SUMP	702411.61	6078343.38		738.30
A69	R SUMP	702414.96	6078325.58		738.10
A72	R SUMP	702423.49	6078323.80		737.91
A75	R SUMP	702424.43	6078308.69		738.10
A80	GRATED P(S)	702493.31	6078342.90		734.54
A95	DE	702453.71	6078254.63		738.738
A96	R SUMP	702461.06	6078259.92		738.70
A98	R SUMP	702452.92	6078256.83		738.73
A100	R SUMP	702447.73	6078267.30		738.59
A103	R SUMP	702436.63	6078280.51		738.41
A105	R SUMP	702443.25	6078286.21		738.39
A110a	SWBRANCH	702432.50	6078298.85		738.24
A110	SWBRANCH	702431.35	6078300.23		738.22
A117	R SUMP	702550.00	6078246.66		735.92
A120	R SUMP	702541.91	6078243.54		736.00
A122	R SUMP	702535.47	6078286.47		735.52
A124	R SUMP	702527.17	6078283.96		735.51
A126	GRATED P	702469.42	6078303.53		735.77
A128	GRATED P	702509.34	6078318.05		735.39
A130	R SUMP	702511.33	6078327.27		735.24
A132	R SUMP	702519.47	6078330.22		735.02
A133	SWBRANCH	702516.03	6078346.85		734.63
A134	SWBRANCH	702546.58	6078353.09		733.34
A134a	SWBRANCH	702546.22	6078354.86		733.34
A144	R P.S.D.A.	702484.69	6078457.34		735.58
A146	MH	702514.55	6078477.47		736.75
A150	R SUMP	702534.88	6078474.15		736.70
A152	R SUMP	702529.56	6078467.31		736.87
A154	R SUMP	702557.96	6078441.47		735.76
A156	R SUMP	702551.18	6078433.72		735.58
A158	R SUMP	702565.14	6078408.76		734.76
A161	JUNCTION	702474.48	6078385.16		736.50
A164	JUNCTION	702518.36	6078415.44		736.12
A167	JUNCTION	702522.51	6078395.11		735.48
A169	MH	702552.24	6078401.18		734.80
A170	R SUMP	702557.74	6078402.04		734.65
A173	R SUMP	702563.33	6078374.97		734.95
A176	R SUMP	702571.76	6078376.88		733.79
A179	SWBRANCH	702566.58	6078359.12		733.01
A182	R SUMP	702589.46	6078343.67		733.68
A185	R SUMP	702596.19	6078346.03		733.49
A188	SWBRANCH	702592.74	6078362.73		732.47
A190	GRATED P(S)	702628.29	6078370.66		731.71
A197	R SUMP	702645.41	6078391.14		731.83
A200	SWBRANCH	702650.03	6078381.97		731.89
A203a	SWBRANCH	702675.733	6078394.827		731.32
A203	SWBRANCH	702676.568	6078393.267		731.32
A210	SPECIAL	702679.12	6078392.64		731.36
A210a	SPECIAL	702679.61	6078394.26		731.36
A212	SPECIAL	702746.051	6078372.376		731.32
A212a	SPECIAL	702746.508	6078373.882		731.32
B21	DE	702623.46	6078453.62		734.018
B22	RD SUMP	702633.80	6078447.34		733.30
B24	RD SUMP	702625.68	6078443.82		733.17
B26	R SUMP	702630.17	6078422.12		732.25
B28	R SUMP	702640.32	6078415.88		732.12

STORMWATER STRUCTURE SCHEDULE - STAGE 1A

No	TYPE	EASTING	NORTHING	COVER TYPE	COVER RL
B30	R SUMP	702649.74	6078411.01		731.77
B32	R SUMP	702681.52	6078413.64		730.90
B34	R SUMP	702678.53	6078421.72		730.90
B36	R SUMP	702712.56	6078425.06		730.20
B38	R SUMP	702709.52	6078433.26		730.16
B62	DE	702701.11	6078478.26		730.42
B63	R SUMP	702709.79	6078479.89		730.37
B65	R SUMP	702703.38	6078471.80		730.22
B68	R SUMP	702712.55	6078445.11		729.69
B70	R SUMP	702720.70	6078448.14		729.58
B72	R SUMP	702731.08	6078444.79		729.58
B74	R SUMP	702760.83	6078452.48		728.90
B76	R SUMP	702761.85	6078463.18		728.75
B78	R SUMP	702785.05	6078477.06		728.13
B80	R SUMP	702797.52	6078485.91		727.86
B100	R SUMP	702779.17	6078526.48		728.31
B102	DE	702770.78	6078524.06		728.357
B103	R SUMP	702771.91	6078521.47		728.27
B106	R SUMP	702784.54	6078493.56		727.81
B108	R SUMP	702792.53	6078496.98		727.80
B113	HW	702803.676	6078502.162		725.73
B149	DE	702836.78	6078574.98		726.39
B150	MH	702839.15	6078576.26		726.30
B152	DE	702837.26	6078617.58		725.774
B153	MH	702839.39	6078616.21		725.69
B156	HW	702848.036	6078616.344		724.47
B160	R SUMP	702829.87	6078729.66		726.30
B163	HW	702857.604	6078711.646		722.97
C131	DE	702925.57	6078583.34		725.868
C134	HW	702916.400	6078587.941		724.70
D86	DE	702806.14	6078238.94		731.435
D88	R SUMP	702796.47	6078246.10		731.305
D90	SWBRANCH	702801.59	6078248.55		731.330
D93	R SUMP	702779.40	6078276.36		730.950
D97	SWBRANCH	702784.30	6078279.31		730.976
D100	R SUMP	702785.33	6078285.08		730.96
D103	MH-L	702780.29	6078284.64	HD	730.89
D109	MH-L	702786.95	6078300.23	HD	730.48
D114	R SUMP	702815.52	6078335.20		729.76
D117	SWBRANCH	702811.87	6078337.32		729.754
D157	DE	702895.00	6078297.40		731.247
D158	R SUMP	702899.28	6078304.94		731.23
D161	R SUMP	702895.00	6078297.41		731.24
D187	DE	702872.74	6078293.57		730.636
D188	R SUMP	702883.27	6078294.56		730.708
D191	R SUMP	702875.73	6078299.04		730.547
D194	R SUMP	702873.39	6078309.86		730.479
D197	R SUMP	702855.35	6078320.28		730.205
D200	RD SUMP	702827.88	6078344.42		729.66
D203	R SUMP	702824.30	6078338.19		729.74
D209	R SUMP	702813.58	6078349.10		729.60
D212	MH-L	702819.19	6078351.26	HD	729.50
D215	R SUMP	702852.29	6078398.92		728.56
D218	SWBRANCH	702848.63	6078401.25		728.547
D244	DE	702938.00	6078357.63		732.809
D245	RD SUMP	702939.17	6078367.06		732.57
D247	R SUMP	702933.79	6078360.11		732.50
D249	R SUMP	702893.44	6078383.44		729.92
D252	R SUMP	702865.25	6078407.96		728.19
D255	R SUMP	702861.29	6078401.99		728.33
D258	R SUMP	702848.52	6078409.61		728.45
D261	MH-L	702851.97	6078408.20	HD	728.40
D264	MH-L	702848.99	6078419.07		728.31
D267	HW	702841.217	6078423.953		727.25
D324	DE	702957.51	6078431.90		730.06
D325	R SUMP	702932.32	6078456.42		730.066
D327	R SUMP	702927.97	6078448.98		728.86
D329	R SUMP	702898.59	6078474.17		728.87
D332	R SUMP	702897.57	6078466.50		727.73
D335	R SUMP	702886.13	6078460.52		727.94
D338	MH	702872.27	6078459.01		727.70
D341	R SUMP	702877.50	6078459.81		727.65
D343	R SUMP	702880.05	6078464.26		727.55
D345	MH	702873.60	6078467.79		727.53
D346	HW	702864.892	6078469.267		727.47
E35	R SUMP	702548.38	6078197.92		737.78
E37	DE	702542.01	6078184.81		738.76
E38	R SUMP	702552.46	6078190.33		738.03
E41	R SUMP	702594.19	6078221.69		733.74
E44	R SUMP	702603.37	6078216.65		733.36
E45	DE	702604.524	6078215.214		733.37

STORMWATER STRUCTURE SCHEDULE - STAGE 1A

No	TYPE	EASTING	NORTHING	COVER TYPE	COVER RL
E50	SWBRANCH	702608.55	6078210.89		733.767
E79	DE	702635.96	6078193.01		733.242
E81	R SUMP	702622.30	6078218.83		732.736
E82a	DE	702618.927	6078220.576		732.75
E82	DE	702620.011	6078219.434		732.75
E83	SWBRANCH	702621.36	6078220.72		732.726
E86	R SUMP	702634.55	6078211.33		732.704
E89	SWBRANCH	702625.40	6078224.50		732.445
E100a	HW	702635.071	6078235.631		731.82
E100	HW	702636.145	6078234.480		730.55
E103	R SUMP	702630.77	6078257.71		732.280
E107	HW	702646.731	6078248.044		730.78
E130	DE	702710.31	6078240.47		731.817
E131	R SUMP	702685.32	6078256.69		731.718
E134	R SUMP	702690.52	6078261.75		731.586
E137	MH	702690.15	6078264.49		731.561
E140	HW	702688.278	6078280.287		729.91
E159	DE	702767.530	6078225.598		732.55
E160	JUNCTION	702766.722	6078227.858		732.40
E162	JUNCTION	702766.71	6078227.84		732.288
E165	HW	702746.19	6078260.79		731.161
E170	JUNCTION	702667.64	6078327.03		732.07
E173	JUNCTION	702680.22	6078325.42		731.51
E176	HW	702709.820	6078308.877		729.32
E193	R SUMP	702702.84	6078353.65		730.71
E196	R SUMP	702708.79	6078366.65		730.69
E199	SWBRANCH	702713.425	6078382.279		730.21
E208	R SUMP	702752.55	6078316.42		730.52
E210	R SUMP	702760.04	6078322.50		730.47
E213	SWBRANCH	702739.602	6078348.013		730.43
E200	SPECIAL	SEE DRAWING C09088-522 FOR SETOUT DETAILS.			
E215	SPECIAL	SEE DRAWING C09088-522 FOR SETOUT DETAILS.			
E220	R SUMP	702735.34	6078336.48		730.33
E222	R SUMP	702738.15	6078344.12		730.31
E18	DE	702590.095	6078155.172		737.00
E18a	DE	702588.327	6078155.765		737.00
E19	SPECIAL	702591.080	6078158.112		737.00
E19a	SPECIAL	702589.311	6078158.704		737.00
E20	SPECIAL	702592.149	6078161.761		737.50
E20a	SPECIAL	702590.656	6078162.261		737.50
E47	SPECIAL	702607.583	6078207.843		733.67
E47a	SPECIAL	702606.217	6078208.722		733.67
E50	SWBRANCH	702608.550	6078210.897		733.45
F1	GRATED P	702861.92	6078622.03		724.23
F3	HW	702876.462	6078633.979		723.02
F5	GRATED P	702904.01	6078613.59		724.13
F7	HW	702900.666	6078622.050		723.42
F9	GRATED P	702841.34	6078528.24		725.52
F11	HW	702850.836	6078534.075		725.15
F13	GRATED P	702884.45	6078535.20		725.57
F15	HW	702882.536	6078547.032		724.94
E55	QS SUMP	702617.406	6078222.964		732.66
E60	SWBRANCH	702619.986	6078221.563		732.71

ROCLA CDS UNIT - GPT's

NODE	MODEL
CDS1	CDS 0708
CDS2	CDS 1012
CDS3	CDS 1012
CDS4	CDS 1518
CDS5	CDS 3030

NOTE. REFER DRAINAGE PLANS FOR LOCATIONS

WORKS AS EXECUTED INFORMATION PROVIDED BY CLEARY BROS PTY LTD

WORK AS EXECUTED

2014-1-14
A. Connell BE(Hons), MIE Aust, CPEng.
BROWN CONSULTING (ACT) Pty Ltd

WE, BROWN CONSULTING (ACT) PTY LTD, BEING THE SUPERINTENDENT FOR THE PROJECT CERTIFY THAT WE HAVE UNDERTAKEN PERIODIC INSPECTIONS OF THE PROJECT DURING THE COURSE OF CONSTRUCTION INCLUDING OBSERVATIONS OF QUALITY RECORDS. THE QUALITY RECORDS ARE AVAILABLE FOR AUDIT. IT IS OUR PROFESSIONAL OPINION THAT THE WORK HAS BEEN CONSTRUCTED SUBSTANTIALLY IN ACCORDANCE WITH THE APPROVED PLANS AND THE PROJECT SPECIFICATION.

SIGNATURE CPENG NO 313197
T. CONNELL BE(HONS) MIE Aust
FOR AND ON BEHALF OF: BROWN CONSULTING (ACT) PTY LTD

NOTE:

1. REFER TO DRAWING C09088-493 FOR NOTES

FILE H:\C09000\C09088.1\DRAWING\NH1A - Stage 1\C09088.1-484 DRAINAGE.dwg 31th-Jan-2014 3:09PM USER: Victor van bovene
Xref's: X-WRES-C09088 X-BLOCK C09088.1 X-KERB C09088.1 X-TREE-C09088 X-A1-C09088 X-EXSERV-C09088 X-RDNAME-C09088.1 X-STAGE-C09088.1 X-PATH C09088.1 X-VPORT-C09088 500 X-C11140-PIPELINES X-HYD ST1C-C09088 X-HYD ST1A-C09088 X-HYD ST1B-C09088 sw pipe names X-HYD-C11140.2 X-SW BELTANA PARK DRAINAGE OUTLET 2-C11140.2 X-HYDCONT ST1-C09088

AMENDMENTS	DESIGN	DRAWN	CHECK	APPROVED	DATE	AMENDMENT DETAILS
FIRST ISSUE	AMK	JB			20/01/12	
A	AMK	JB			11/04/12	C37, C92, C49, C51, C53, A53, A53A, B3, B5, A55, B156, C134
B	AMK	KRC/JB			30/07/12	SUB STAGES ADDED, QCC COMMENTS ADDRESSED
C	PIB	PIB			12/09/12	A80, A190, A210, A210A, A212, A212A MOVED, E50 ADDED
D	AMK	AMK			26/09/12	D103, D109, D261, D264, D267
E	AMK	JB			23/01/13	A182, E131, E134, E137, E55, E60, D197
F	SB	SB			20/03/13	E18, E18A, E19, E19A
G	AMK	AMK			22/05/13	A169 MH
H	AMK	VVB			14/01/14	WORK AS EXECUTED
I						
J						
K						
L						

NOTE: TOWN PLANNING & LOT LAYOUT SUPPLIED BY ROBERTS DAY, ROAD LAYOUT SUPPLIED BY TTM CONSULTING Pty Ltd

WAE No. .... PROJECT No. ....
A3 PLOT SCALE (METRES) A1 PLOT
CONSULT AUSTRALIA
CLIENT: GOOGONG
PROJECT: GOOGONG TOWNSHIP NEIGHBOURHOOD 1A STAGE 1
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DRAWING TITLE: DRAINAGE STRUCTURE SCHEDULES SHEET 1
DRAWING NUMBER: C09088-492
AMEND.: H

STORMWATER STRUCTURE SCHEDULE - STAGE 1B

No	TYPE	EASTING	NORTHING	COVER TYPE	COVER RL
C4	R SUMP	703073.413	6078452.441		731.94
C7	R SUMP	703063.300	6078450.772		731.95
C10	R SUMP	703080.312	6078469.067		732.31
C13	R SUMP	703071.446	6078470.403		732.23
C16	R SUMP	703061.389	6078467.389		731.79
C19	MH	703057.039	6078459.855		731.66
C22	R SUMP	703029.117	6078486.021		730.43
C24	R SUMP	703022.057	6078480.052		730.32
C26	R SUMP	702986.249	6078510.771		728.87
C28	R SUMP	702976.071	6078506.602		728.65
C31	R SUMP	702947.098	6078523.329		727.73
C37	RD SUMP	702925.111	6078544.337		726.71
C40	R SUMP	702920.567	6078538.647		726.82
C43	MH	702906.563	6078546.732		726.14
C49	R P.S.S.A.	703137.436	6078512.543		735.83
~~C51~~	~~DE~~	~~703139.276~~	~~6078516.977~~		~~735.87~~
C53	MH	703138.356	6078514.760		735.85
C56	MH	703106.006	6078528.184		733.81
C59	R SUMP	703106.316	6078535.982		733.89
C62	R SUMP	703117.192	6078561.859		735.00
C65	R SUMP	703110.542	6078564.618		735.00
C68	R SUMP	703100.051	6078539.336		733.81
C71	R SUMP	703089.994	6078536.322		733.29
C74	MH	703085.644	6078528.788		[illegible]
C77	R SUMP	703053.963	6078557.124		[illegible]
C80	R SUMP	703044.711	6078552.420		[illegible]
C83	R SUMP	703019.322	6078577.124		729.06
C86	R SUMP	703010.473	6078572.188		728.81
C88	R SUMP	702991.094	[illegible]		727.66
C89	R SUMP	702986.744	[illegible]		727.73
C92	R SUMP	702958.715	[illegible]		726.67
C95	R SUMP	[illegible]	6078604.483		726.83
C99	MH	[illegible]	6078591.233		732.79
C102	MH	[illegible]	6078625.907		729.90
C110	R P.S.S.A.	[illegible]	6078702.550		727.19
C113	R SUMP	702989.712	6078679.538		727.74
[illegible]	MH	702983.476	6078683.138		727.53
[illegible]	MH	702968.207	6078656.692		726.88
C122	R SUMP	702950.638	6078626.261		726.17
C125	R SUMP	702939.323	6078608.049		726.30
C129	MH	702925.421	6078583.286		725.89
C131	SWCONNEX	702924.710	6078583.653		725.85
D276	DE	703096.966	6078385.706		735.41
D279	R P.S.S.A.	703091.674	6078402.261		735.00
D285	R SUMP	703085.528	6078387.448		735.02
D288	R SUMP	703073.101	6078398.142		734.35
D291	R SUMP	703071.791	6078389.541		734.52
D294	R SUMP	703046.600	6078348.127		737.16
D297	R SUMP	703055.212	6078346.896		737.16
D299	SWCONNEX	703057.902	6078365.715		735.73
D300	R SUMP	703059.461	6078376.630		734.92
D302	R SUMP	703050.849	6078377.861		734.75
D305	R SUMP	703051.953	6078385.583		734.33
D308	R SUMP	703045.613	6078393.528		733.70
D311	MH	703016.144	6078398.017		732.59
D314	R SUMP	703000.864	6078416.885		731.63
D317	R SUMP	702995.050	6078410.196		731.61
D320	R SUMP	702963.538	6078438.435		730.13
D323	R SUMP	702959.188	6078430.901		730.13
D324	SWCONNEX	702957.500	6078431.876		730.06

NOT IN SUBMISSION

STORMWATER STRUCTURE SCHEDULE - 1C

No	TYPE	EASTING	NORTHING	COVER TYPE	COVER RL
B1	R P.S.S.A.	702569.56	6078558.58		740.31
B3	MH	702565.73	6078541.69		740.53
B5	JUNCTION	702614.94	6078542.47		739.72
B8	MH	702599.75	6078529.23		739.57
B11	R SUMP	702596.89	6078523.74		739.35
B14	R SUMP	702590.39	6078517.99		739.36
B16	RD SUMP	702609.40	6078507.07		738.28
B17	RD SUMP	702603.34	6078500.39		738.14
B18	R SUMP	702621.94	6078484.30		736.54
B19	R SUMP	702615.20	6078478.09		736.29
B21	SWCONNEX	702623.490	6078453.636		734.02
B40	R P.S.S.A.	702608.36	6078609.69		740.08
B42	MH	702614.76	6078613.52		740.43
B44	R SUMP	702640.84	6078604.60		739.52
B45	R SUMP	702635.89	6078597.56		739.50
B46	R SUMP	702661.76	6078586.90		738.09
B49	R SUMP	702655.22	6078581.22		738.09
B51	R SUMP	702676.11	6078561.22		736.07
B53	R SUMP	702669.93	6078553.85		735.71
B55	R SUMP	702689.44	6078531.79		733.35
B57	R SUMP	702681.56	6078528.17		733.37
B59	RD SUMP	702697.96	6078512.97		731.73
B61	R SUMP	702691.79	6078505.40		731.41
B62	SWCONNEX	702701.141	6078478.267		730.42
B83	RD SUMP	702721.23	6078636.90		732.30
B85	R SUMP	702735.93	6078622.58		730.99
B88	R SUMP	702730.08	6078618.30		731.05
B91	MH	702731.03	6078611.84		730.97
B94	R SUMP	702751.64	6078587.33		730.17
B97	R SUMP	702744.69	6078581.55		730.15
B99	R SUMP	702758.79	6078550.51		729.16
B102	SWCONNEX	702770.719	6078524.032		728.36
B118	R SUMP	702758.64	6078626.30		730.06
B120	R SUMP	702764.99	6078619.31		729.66
B123	R SUMP	702787.41	6078636.13		728.15
B126	R SUMP	702790.43	6078628.03		728.29
B129	R SUMP	702807.55	6078631.19		727.27
B132	R SUMP	702820.83	6078638.92		726.41
B135	R SUMP	702821.30	6078631.69		726.58
B138	JUNCTION	702797.82	6078577.85		728.89
B141	JUNCTION	702802.92	6078562.97		728.61
B144	MH	702806.46	6078562.27		728.38
B149	SWCONNEX	702836.811	6078574.895		726.40
B152	SWCONNEX	702837.364	6078617.700		725.77

WE, BROWN CONSULTING (ACT) PTY LTD, BEING THE SUPERINTENDENT FOR THE PROJECT CERTIFY THAT WE HAVE UNDERTAKEN PERIODIC INSPECTIONS OF THE PROJECT DURING THE COURSE OF CONSTRUCTION INCLUDING OBSERVATIONS OF QUALITY RECORDS. THE QUALITY RECORDS ARE AVAILABLE FOR AUDIT. IT IS OUR PROFESSIONAL OPINION THAT THE WORK HAS BEEN CONSTRUCTED SUBSTANTIALLY IN ACCORDANCE WITH THE APPROVED PLANS AND THE PROJECT SPECIFICATION.

SIGNATURE [signature] CPENG NO. 313197

T CONNELL BE(HONS) MIE Aust

FOR AND ON BEHALF OF: BROWN CONSULTING (ACT) PTY LTD

WORKS AS EXECUTED INFORMATION PROVIDED BY CLEARY BROS PTY LTD

THE SETOUT COORDINATES FOR EACH STRUCTURE ARE AS FOLLOWS.
1. R-SUMP & QS SUMP - 0.6m BEHIND KERB LINE AT CENTRE OF SUMP
2. MANHOLE - CENTRE OF MANHOLE
3. PLANTATION SUMP - CENTRE OF SUMP
4. DOUBLE R-SUMP - 0.6m BEHIND KERB AT INTERSECTION OF PIPES
5. SURCHARGE PITS - CENTRE OF PIT
6. DEAD END - END OF PIPE

NOTE

SWCONNEX = STORMWATER CONNECTION TO EXISTING
SWBRANCH = STORMWATER BRANCH CONNECTION
SPIT = SURCHARGE PIT
MH-L = LARGE MANHOLE CONSTRUCTED IN ACCORDANCE WITH STD DRAWING ST-0015 MARCH '98
DE = DEAD END
HW = HEADWALL
HWS = HEADWALL SPECIAL CHAMFER END OF PIPE TO SUIT DRY STONE BATTER AND MAKE GOOD
GRATED P = 900 x 900 GRATED PIT WITH SPECIAL GRATE SEE DETAIL C09088-315
R P.S.S.A. = R PLANTATION SUMP SINGLE APRON
R P.S.D.A. = R PLANTATION SUMP DOUBLE APRON
RD SUMP = LENGTH 2.4m DOUBLE R SUMP
JUNCTION = 600x600 JUNCTION SEE DETAIL C09088-315

SPECIAL REFER DRAWINGS C09088-515 TO 526 FOR DETAILS
GRATED P(S) = SEE DETAIL C09088-517

FILE H:\C09000\C09088 1\DRAWING\NH1A - Stage 1\C09088 1-484 DRAINAGE.dwg 31th-Jan-2014 3:10PM USER: Victor van bovene
Xref's. X-WRES-C09088 X-BLOCK C09088 1 X-KERB C09088 1 X-TREE-C09088 X-A1-C09088 X-EXSERV-C09088 X-RDNAME-C09088 1 X-STAGE-C09088 1 X-PATH C09088 1 X-VPORT-C09088 500 X-C11140-PIPELINES X-HYD ST1C-C09088 X-HYD ST1A-C09088 X-HYD ST1B-C09088 sw pipe names X-HYD-C11140.2 X-SW BELTANA PARK DRAINAGE OUTLET 2-C11140.2 X-HYDCONT ST1-C09088

	DESIGN	DRAWN	CHECK	APPROVED	DATE	AMENDMENT DETAILS
FIRST ISSUE	AMK	JB	[signature]	[signature]	20/01/12	
A	AMK	JB	[signature]	[signature]	11/04/12	COVER TYPE,D244,D252,D103,D264,D267,D338,E200,E215,E220,E222,D345,D346
B	AMK	KRC/JB	[signature]	[signature]	30/07/12	SUB STAGES ADDED, QCC COMMENTS ADDRESSED
C	AMK	JB	[signature]	[signature]	29/10/12	D294, D297
D	AMK	JB	[signature]	[signature]	23/01/13	C16, C19, C22, C24, C26, C28, C31, C37, C40, D279, D285
E	AMK	AMK	[signature]	[signature]	22/05/13	C99, C102, B8 & B144 MH'S
F	AMK	VVB	[signature]	[signature]	14/01/14	WORK AS EXECUTED

WORK AS EXECUTED

[signature] 2014-1-14

A. Connell BE(Hons), MIE Aust, CPEng.
BROWN CONSULTING (ACT) Pty Ltd

NOTE: TOWN PLANNING & LOT LAYOUT SUPPLIED BY ROBERTS DAY, ROAD LAYOUT SUPPLIED BY TTM CONSULTING Pty Ltd

WAE No. ....
PROJECT No. ....

A3 PLOT SCALE (METRES) A1 PLOT

CONSULT AUSTRALIA

Quality Endorsed Company ISO 9001 Lic 4084

CLIENT: GOOGONG

PROJECT: GOOGONG TOWNSHIP NEIGHBOURHOOD 1A STAGE 1

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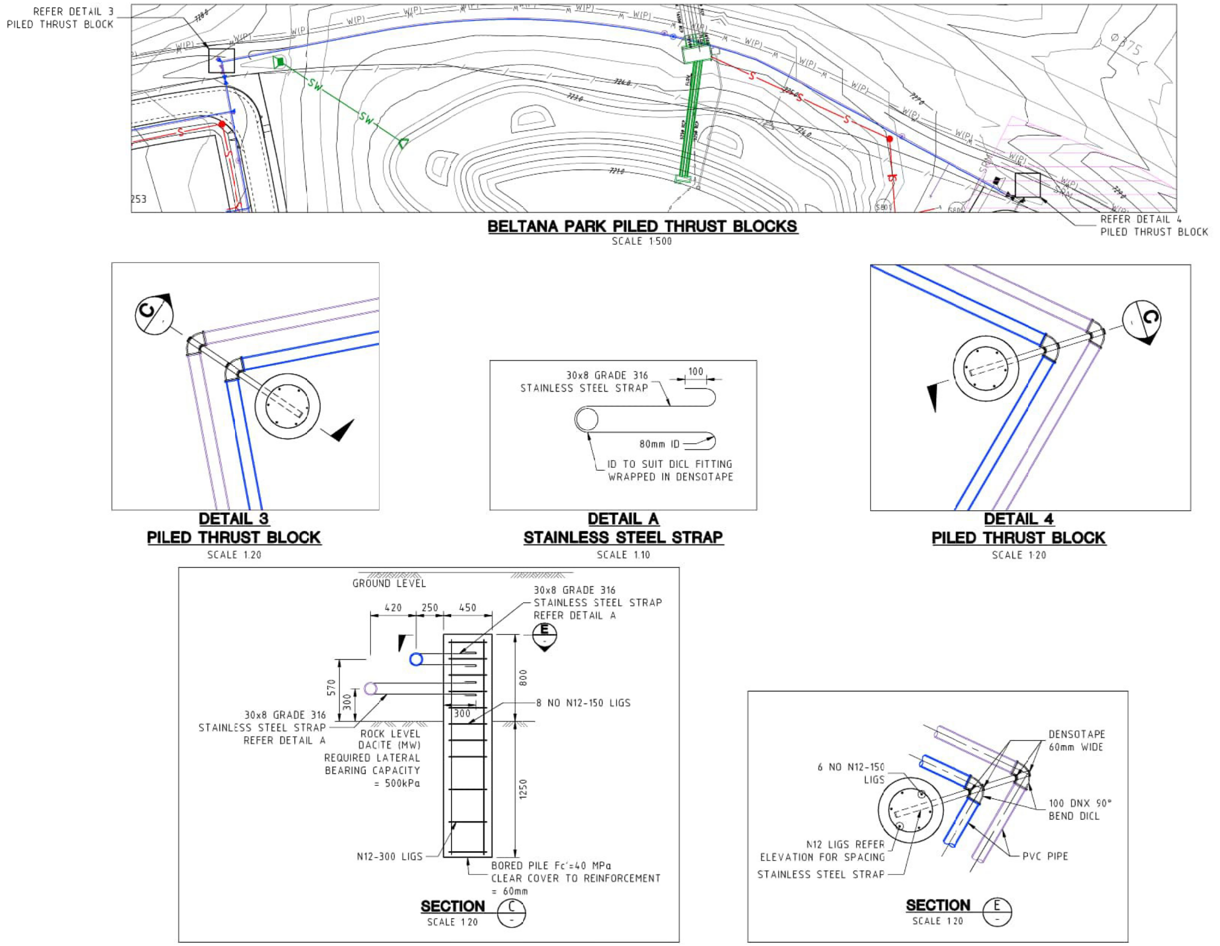
DRAWING TITLE: DRAINAGE STRUCTURE SCHEDULES SHEET 2

DRAWING NUMBER: C09088-493
AMEND. F


REFER DETAIL 3
PILED THRUST BLOCK
REFER DETAIL 4
PILED THRUST BLOCK
BELTANA PARK PILED THRUST BLOCKS
SCALE 1:500
DETAIL 3
PILED THRUST BLOCK
SCALE 1:20
30x8 GRADE 316
STAINLESS STEEL STRAP
100
80mm ID
ID TO SUIT DICL FITTING
WRAPPED IN DENSOTAPE
DETAIL A
STAINLESS STEEL STRAP
SCALE 1:10
DETAIL 4
PILED THRUST BLOCK
SCALE 1:20
GROUND LEVEL
420
250
450
30x8 GRADE 316
STAINLESS STEEL STRAP
REFER DETAIL A
800
570
300
8 NO N12-150 LIGS
30x8 GRADE 316
STAINLESS STEEL STRAP
REFER DETAIL A
ROCK LEVEL
DACITE (MW)
REQUIRED LATERAL
BEARING CAPACITY
= 500kPa
1250
N12-300 LIGS
BORED PILE Fc'=40 MPa
CLEAR COVER TO REINFORCEMENT
= 60mm
SECTION C
SCALE 1:20
DENSOTAPE
60mm WIDE
6 NO N12-150
LIGS
100 DNX 50°
BEND DICL
N12 LIGS REFER
ELEVATION FOR SPACING
PVC PIPE
STAINLESS STEEL STRAP
SECTION E
SCALE 1:20

NOTES

1. BORED PILE THRUST BLOCK HAVE BEEN DESIGNED FOR 1600kPa TEST PRESSURE
2. STAINLESS STEEL STRAP TO NOT CONTACT THE BORED PILE REINFORCEMENT

WORK AS EXECUTED

2014-1-14

A. Connell BE(Hons), MIE Aust, CPEng.
BROWN CONSULTING (ACT) Pty Ltd

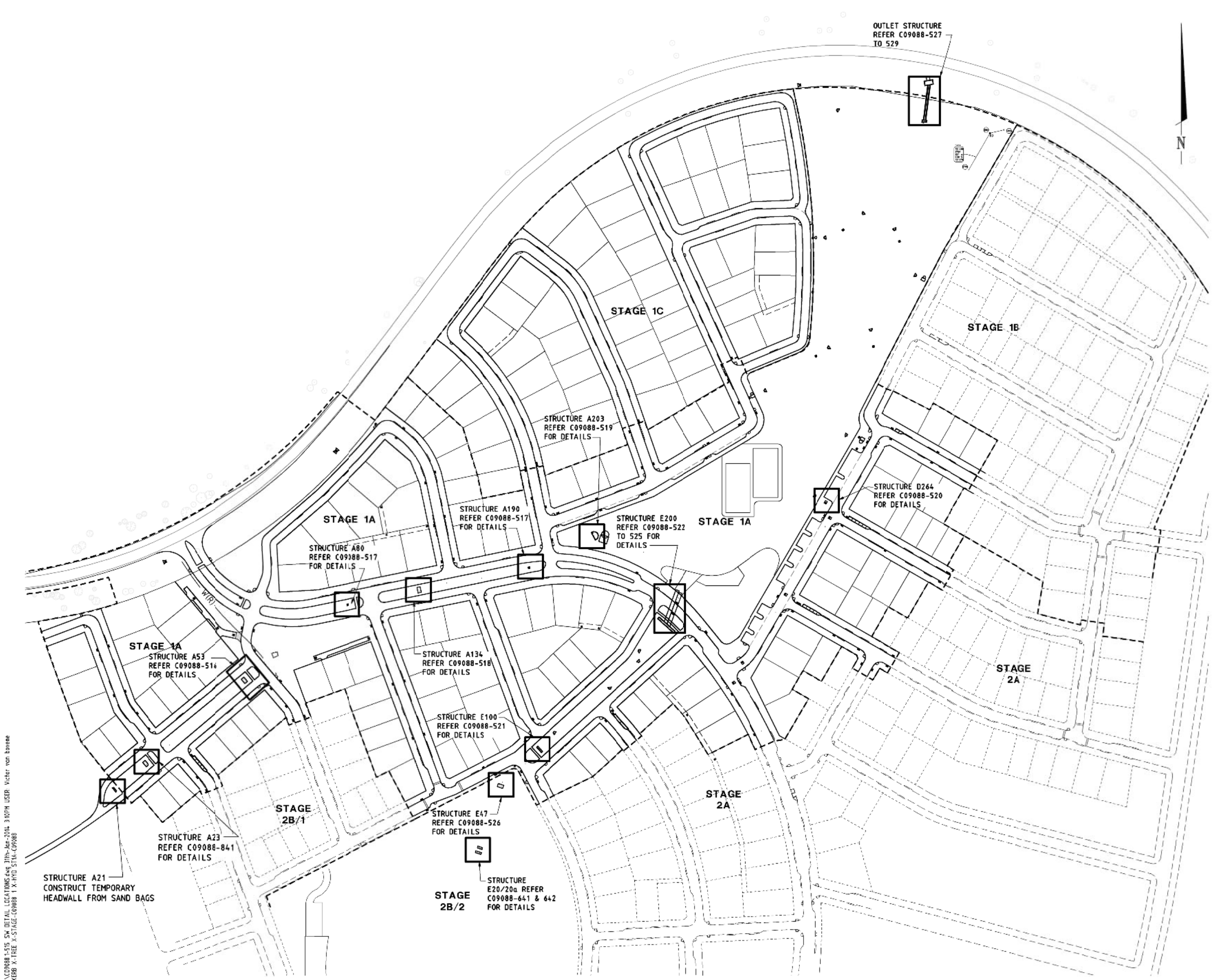
GOOGONG TOWNSHIP NEIGHBOURHOOD 1A STAGE 1

BROWN Smart Consulting

BELTANA PARK PILED THRUST BLOCKS DETAILS

C09088-494+

Document Set ID: 3359626
Version: 1, Version Date: 21/10/2025



CONCRETE

C1 ALL WORKMANSHIP AND MATERIALS SHALL BE IN ACCORDANCE WITH AS 3600, AND OTHER RELEVANT CODES

C2 CONCRETE AND COVER REQUIREMENTS

CONCRETE STRENGTH AND COVER			
MEMBER	EXPOSURE	STRENGTH MPa	COVER mm
IN SITU CONCRETE	CAST AGAINST BINDING LAYER	32	50
	CAST AGAINST FORMWORK	32	40
BLINDING LAYER	N/A	15	N/A

C3 ALL EXPOSED EDGES AND CORNERS ARE TO BE FINISHED WITH A 20×20 CHAMFER OR FILLET UNLESS NOTED OTHERWISE OR WHERE METAL PLATES FITTED.

C4 NO HOLES OR CHASES OTHER THAN THOSE ON THE STRUCTURAL DRAWINGS SHALL BE MADE IN CONCRETE STRUCTURES WITHOUT THE APPROVAL OF THE SUPERINTENDENT

C5 ALL CONCRETE EXCEPT CONCRETE IN BLINDING LAYERS SHALL BE COMPACTED USING HIGH FREQUENCY VIBRATORS.

C6 CONCRETE SURFACES SHALL BE PROTECTED AS SOON AS THE CONCRETE HAS GAINED ITS INITIAL SET AND THEREAFTER PROTECTED FROM DAMAGE UNTIL FULLY CURED. THE PREFERRED METHOD OF CURING FOR SLABS IS TO PLACE A CONTINUOUS LAYER OF PVC SHEETING TAPE-SEALED AT EDGES AND JOINTS. ALTERNATIVELY AN APPROVED CURING COMPOUND SUCH AS 'CALCURE-B' MAY BE USED. CURING SHALL BE IN PLACE FOR A MINIMUM PERIOD OF SEVEN DAYS.

C7 CONSTRUCTION JOINTS SHALL BE PROPERLY FORMED AND USED ONLY WHERE SHOWN OR SPECIFICALLY APPROVED BY THE SUPERINTENDENT. THE INTERFACE OF THE HARDENED CONCRETE SHALL BE THOROUGHLY SCABBLED TO REMOVE LAITANCE AT ALL CONSTRUCTION JOINTS.

C8 A 50mm MIN CONCRETE BLINDING LAYER SHALL BE PLACED, COMPACTED AND TRIMMED PRIOR TO PLACEMENT OF REINFORCEMENT AND CONCRETE IN FOOTINGS AND MANHOLE BASE SLABS

C9 FORMWORK SHALL BE IN ACCORDANCE WITH AS 3160 AND AS FOLLOWS: PERMANENTLY CONCEALED SURFACES - FINISH CLASS 4
ALL OTHER SURFACES - FINISH CLASS 3.

C10 UNFORMED SURFACE FINISH CLASSES SHALL BE AS FOLLOWS:
RAMP FLOOR SLABS - LIGHTLY RAKED HORIZONTALLY
ALL OTHER SURFACES - WOOD FLOAT FINISH

C11 COMPACT GRANULAR FILL BEHIND WALLS TO 95% MMDD USING SUITABLE LIGHT COMPACTION EQUIPMENT TO CONTROLLED BACKFILL REQUIREMENTS. REFER TO SPECIFICATION.
NOTE: BACKFILLING AROUND MANHOLES SHALL NOT COMMENCE UNTIL AT LEAST 3 DAYS AFTER CASTING THE TOP SLAB.

C12 FORMWORK SHALL BE DESIGNED AND CONSTRUCTED BY THE CONTRACTOR IN ACCORDANCE WITH AS3610 S.A.A. FORMWORK CODE.

C13 ___C.J.___ DENOTES CONSTRUCTION JOINT

C14 CONCRETE SIZES AS DRAWN DO NOT INCLUDE APPLIED FINISHES AND MUST NOT BE REDUCED OR HOLED IN ANY WAY WITHOUT APPROVAL OF THE SUPERINTENDENT.

REINFORCEMENT

R1 REINFORCEMENT IS REPRESENTED DIAGRAMMATICALLY AND NOT NECESSARILY SHOWN IN TRUE PROJECTION.

R2 ALL REINFORCEMENT SHALL BE SUPPORTED IN ITS CORRECT POSITION BY APPROVED BAR CHAIRS, SPACERS OR SUPPORT BARS PRIOR TO THE PLACING OF CONCRETE.

R3 SPLICES IN REINFORCEMENT SHALL BE MADE IN THE POSITION SHOWN. THE WRITTEN APPROVAL OF THE SUPERINTENDENT SHALL BE REQUIRED FOR ANY OTHER SPLICE.

R4 UNLESS NOTED OTHERWISE MINIMUM SPLICE LENGTHS FOR REINFORCEMENT SHALL BE :- 30 x DIAMETER OF SMALLER BAR FOR N16 BARS OR LESS
36 x DIAMETER OF SMALLER BAR FOR ALL BARS GREATER THAN N16
WHERE HORIZONTAL BARS HAVE MORE THAN 300mm OF CONCRETE BELOW THEM, THE MINIMUM SPLICE LENGTH SHALL BE INCREASED BY 25%.
WHERE MORE THAN HALF THE BARS ARE SPLICED AT ONE LOCATION, OR WHERE BARS MUST BE SPLICED AT POINTS OF MAXIMUM STRESS THE MINIMUM SPLICE LENGTH SHALL BE INCREASED BY AT LEAST 30%

AMENDMENT	DESIGN	DRAWN	CHECK	APPROVED	DATE	AMENDMENT DETAILS
FIRST ISSUE	PJB	VVB			20/01/12	
A	AMK	KRC			04/11/12	NOTES ADDED
B	AMK	KRC			30/07/12	SUB STAGES ADDED QCC COMMENTS ADDRESSED
C	AMK	KRC			13/02/13	STRUCTURE A23 & A21 ADDED
D	AMK	VVB			31/01/14	WORK AS EXECUTED
E						
F						

NOTE: TOWN PLANNING & LOT LAYOUT SUPPLIED BY ROBERTS DAY. ROAD LAYOUT SUPPLIED BY TTM CONSULTING Pty Ltd

A3 PLOT 1:3000 — SCALE (METRES) 25 0 25 50 75 — A1 PLOT 1:1500

CONSULT AUSTRALIA

CLIENT: GOOGONG

PROJECT: GOOGONG TOWNSHIP NEIGHBOURHOOD 1A STAGE 1

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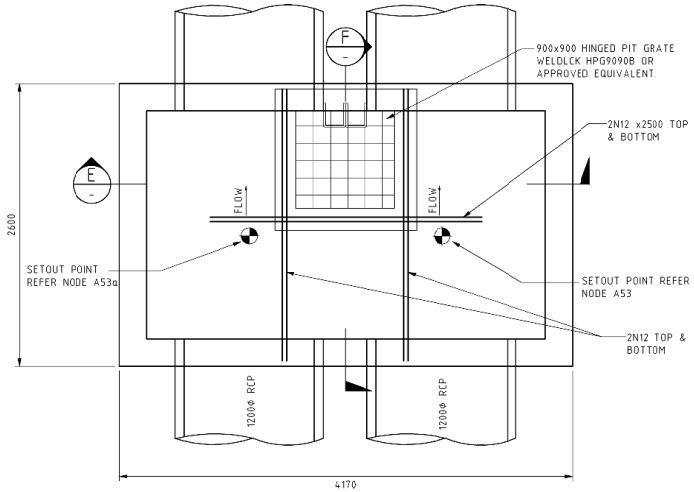
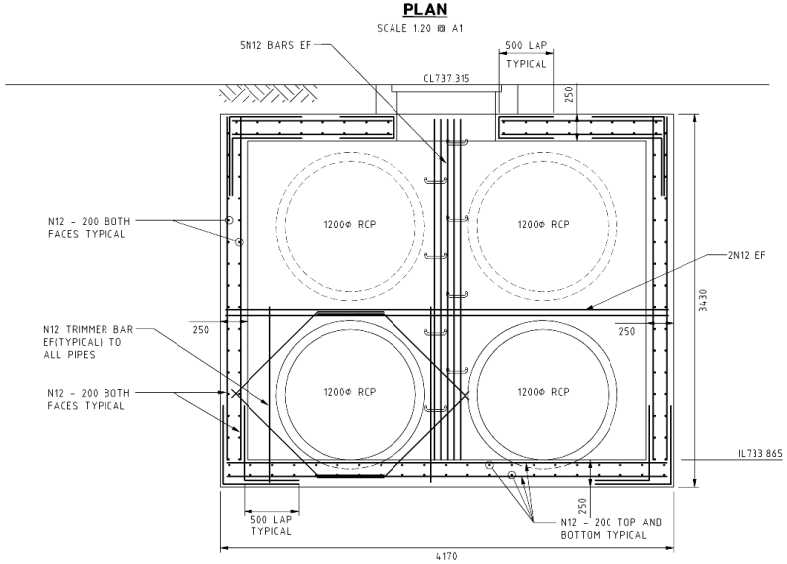
DRAWING TITLE: DRAINAGE STRUCTURES LOCATION PLAN

DRAWING NUMBER: C09088-515 — AMEND: D

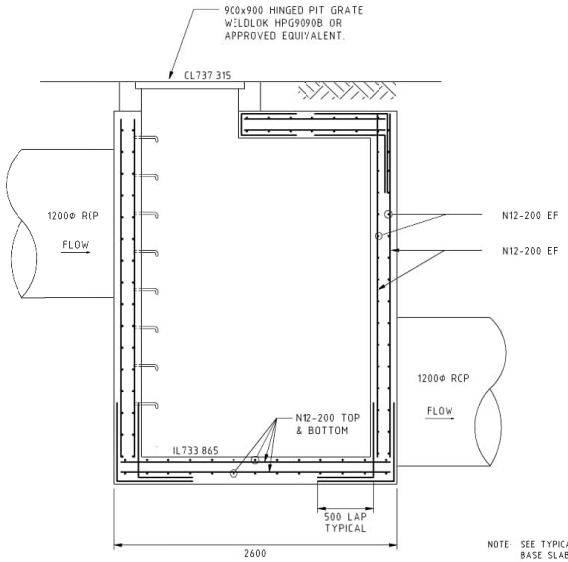
Document Set ID: 3359626
Version: 1, Version Date: 21/10/2025



PLAN
SCALE 1:20 @ A1



SECTION E
SCALE 1:20 @ A1



SECTION F
SCALE 1:20 @ A1

NOTE: SEE TYPICAL WALL CORNER, WALL TO BASE SLAB & WALL TO TOP SLAB DETAILS REFER DRAWING C09088-514

ISSUE	DESIGN	DRAWN	CHECK	APPROVED	DATE	AMENDMENT DETAILS
A	PJB	AH			20/09/12	
B	APK	KRC			28/07/13	SUB STAGES ADDED QCC COMMENTS ADDRESSED
C	APK	VVB			21/10/14	WORK AS EXECUTED
D						
E						
F						

NOTE: TOWN PLANNING & LOT LAYOUT SUPPLIED BY ROBERTS DAY, ROAD LAYOUT SUPPLIED BY TEMPLER. SURVEY PLAN

CONSULT AUSTRALIA

GOOGONG

GOOGONG TOWNSHIP
NEIGHBOURHOOD 1A
STAGE 1

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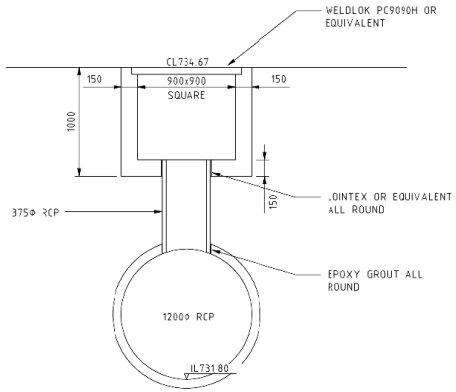
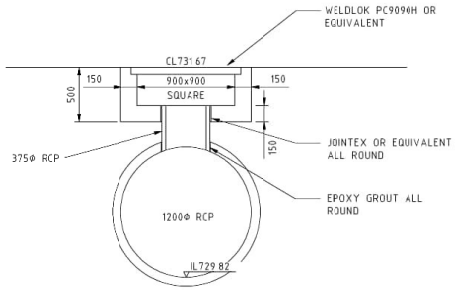
DRAINAGE STRUCTURE A53 DETAILS

C09088-516 B



STRUCTURE A80
SCALE 1:20 @ A1



STRUCTURE A190
SCALE 1:20 @ A1

PLAN

REV	DESIGN	DRAWN	CHECK	APPROVED	DATE	AMENDMENT DETAILS
ISSUE	PJB	AH			20/11/12	
A	APK	KRC			28/07/13	SUB STAGES ADDED QCC COMMENTS ADDRESSED
B	APK	VVB			21/10/14	WORK AS EXECUTED
C						
D						
E						
F						

NOTE: TOWN PLANNING & LOT LAYOUT SUPPLIED BY ROBERTS DAY, ROAD LAYOUT SUPPLIED BY TEMPLEN. EXISTING PLAN

MAP No.

PROJECT No.

AS PLOT: 1:40 | SCALE (METRES): 0.2 1 0.2 0.4 0.6 0.8 1 1.20 | AT PLOT: 1:20

CONSULT AUSTRALIA

CLIENT: GOOGONG

PROJECT: GOOGONG TOWNSHIP NEIGHBOURHOOD 1A STAGE 1

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DRAWING TITLE: DRAINAGE STRUCTURES A80 A190 DETAILS

DRAWING NUMBER: C09088-517

APPVD: B

FILE: n:\C09000\09088\DRAWING\09088-517 DW DETAILS.dwg 27th Jan 2014 3:02PM USER: Victor van Bavinc
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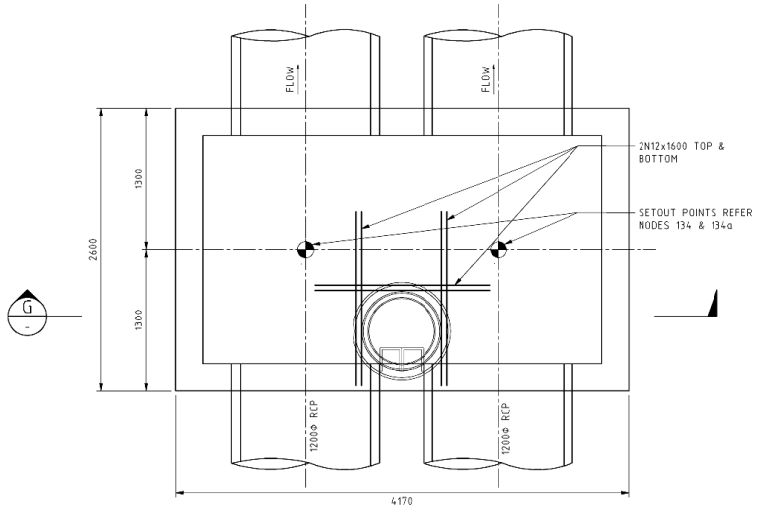
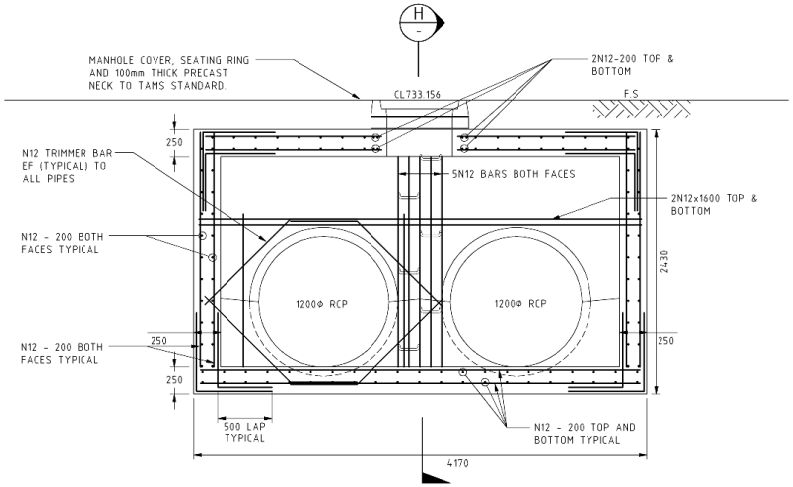
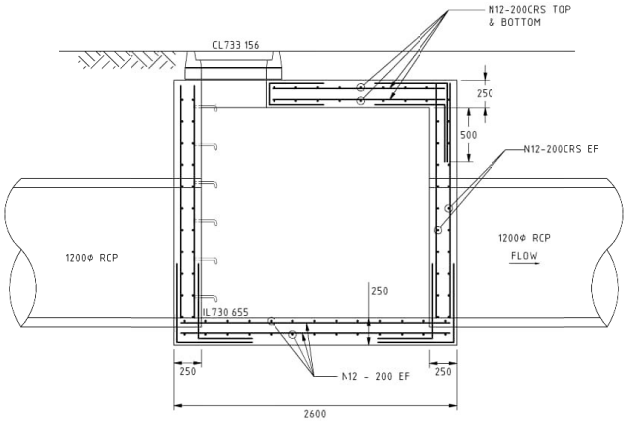


PLAN
SCALE 1:20 @ A1



SECTION G
SCALE 1:20 @ A1



SECTION H
SCALE 1:20 @ A1

NOTE: SEE TYPICAL WALL CORNER, WALL TO BASE SLAB & WALL TO TOP SLAB DETAILS REFER DRAWING C09088-514.

REV	DESIGN	DRAWN	CHECK	APPROVED	DATE	AMENDMENT DETAILS
A	PB	AH			20/01/12	
B	APK	KRC			30/07/12	SUB STAGES ADDED QCC COMMENTS ADDRESSED
C	APK	VVB			01/01/14	WORK AS EXECUTED
D						
E						
F						

NOTE: TOWN PLANNING & LOT LAYOUT SUPPLIED BY ROBERTS DAY, ROAD LAYOUT SUPPLIED BY TTM CON. SURVEY PLAN

SHEET No.
PROJECT No.

AS PLOT 1:40 | SCALE (METRES) 0.2 0.4 0.7 0.4 0.6 0.8 1 | AT PLOT 1:20

CONSULT AUSTRALIA

CLIENT: GOOGONG

PROJECT: GOOGONG TOWNSHIP NEIGHBOURHOOD 1A STAGE 1

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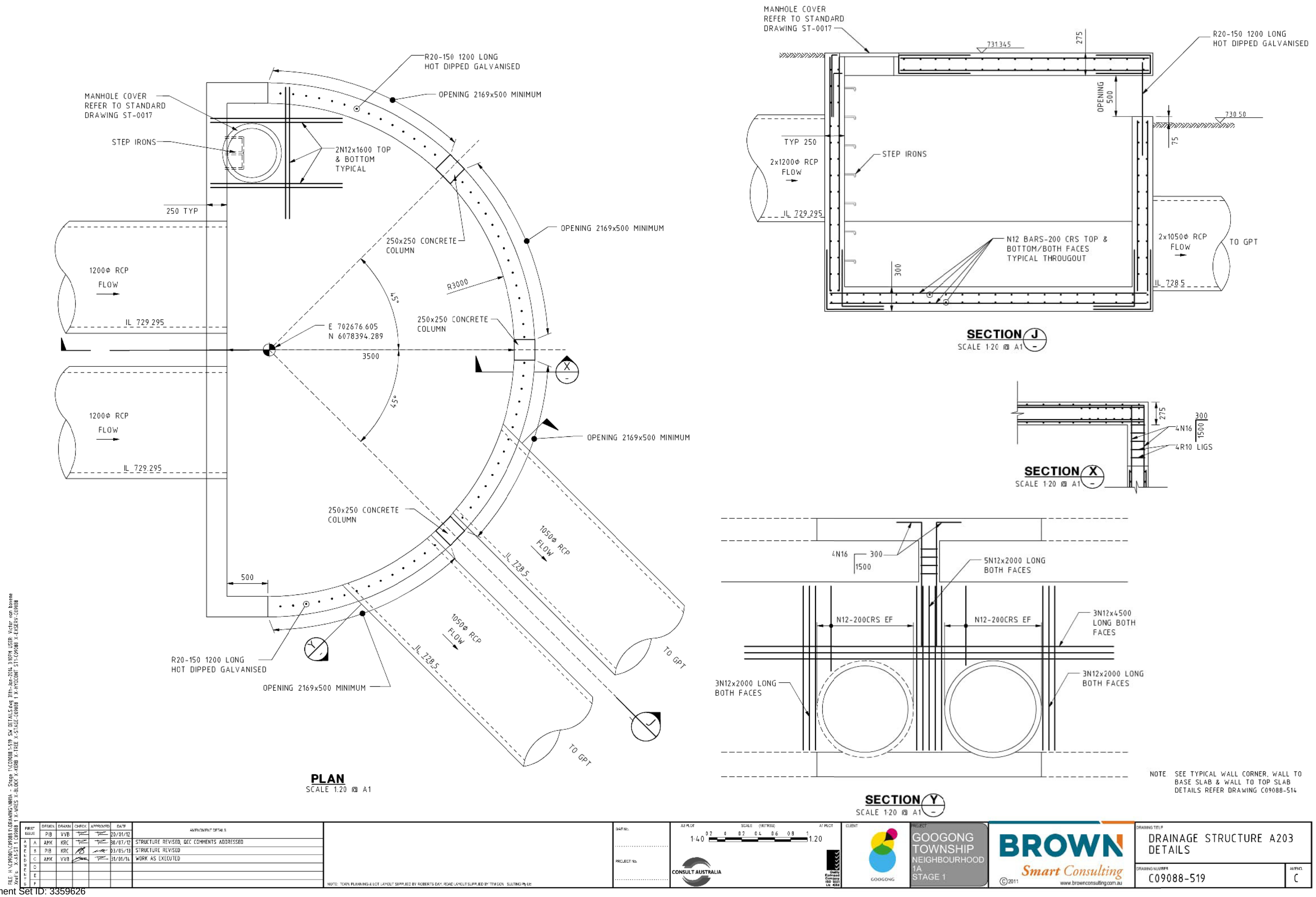
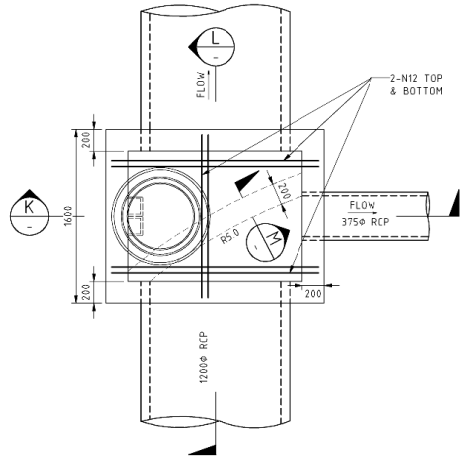
DRAWING TITLE: DRAINAGE STRUCTURE A134 DETAILS

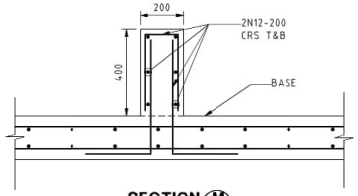
DRAWING NUMBER: C09088-518

APPVD: B

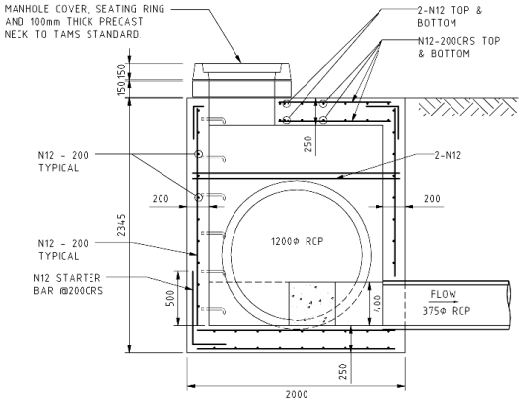

MANHOLE COVER REFER TO STANDARD DRAWING ST-0017
STEP IRONS
R20-150 1200 LONG HOT DIPPED GALVANISED
OPENING 2169x500 MINIMUM
2N12x1600 TOP & BOTTOM TYPICAL
250 TYP
250x250 CONCRETE COLUMN
1200Φ RCP FLOW
IL 729.295
R3000
45°
E 702676.605
N 6078394.289
3500
1050Φ RCP FLOW
IL 728.5
TO GPT
500
PLAN
SCALE 1:20 @ A1
731.345
275
OPENING 500
730.50
75
TYP 250
2x1200Φ RCP FLOW
2x1050Φ RCP FLOW
N12 BARS-200 CRS TOP & BOTTOM/BOTH FACES TYPICAL THROUGOUT
300
IL 728.5
SECTION J
SCALE 1:20 @ A1
4N16
4R10 LIGS
1500
SECTION X
4N16 300 1500
5N12x2000 LONG BOTH FACES
N12-200CRS EF
3N12x4500 LONG BOTH FACES
3N12x2000 LONG BOTH FACES
NOTE SEE TYPICAL WALL CORNER, WALL TO BASE SLAB & WALL TO TOP SLAB DETAILS REFER DRAWING C09088-514
SECTION Y
STRUCTURE REVISED, GCC COMMENTS ADDRESSED
STRUCTURE REVISED
WORK AS EXECUTED
GOOGONG TOWNSHIP NEIGHBOURHOOD 1A STAGE 1
BROWN Smart Consulting
DRAINAGE STRUCTURE A203 DETAILS
C09088-519
C



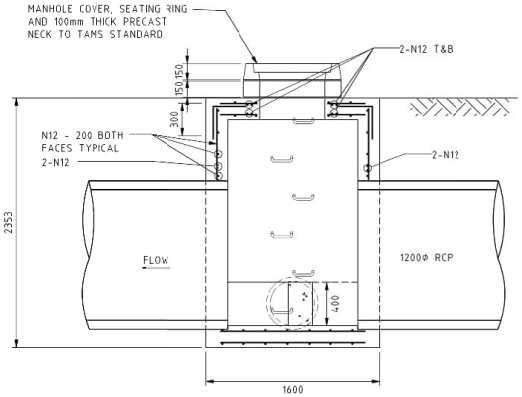
PLAN
SCALE 1:20 @ A1



SECTION M
SCALE 1:10 @ A1



SECTION K
SCALE 1:20 @ A1



SECTION L
SCALE 1:20 @ A1

NOTE SEE TYPICAL WALL CORNER, WALL TO BASE SLAB & WALL TO TOP SLAB DETAILS REFER DRAWING C09088-514

REV	DESIGN	DRAWN	CHECK	APPROVED	DATE	AMENDMENT DETAILS
ISSUE	PJB	AH			20/09/12	
A	APK	KRC			28/07/13	SUB STAGES ADDED QCC COMMENTS ADDRESSED
B	APK	VVB			21/10/14	WORK AS EXECUTED
C						
D						
E						
F						

NOTE: TOWN PLANNING & LOT LAYOUT SUPPLIED BY ROBERTS DAY, ROAD LAYOUT SUPPLIED BY TTM DCEN. SURVEY PLAN

SHEET No.
PROJECT No.

AS PLOT 1:40 | SCALE (METRES) 0 .2 .4 .6 .8 1 | AT PLOT 1:20

CONSULT AUSTRALIA

CLIENT: GOOGONG

PROJECT: GOOGONG TOWNSHIP NEIGHBOURHOOD 1A STAGE 1

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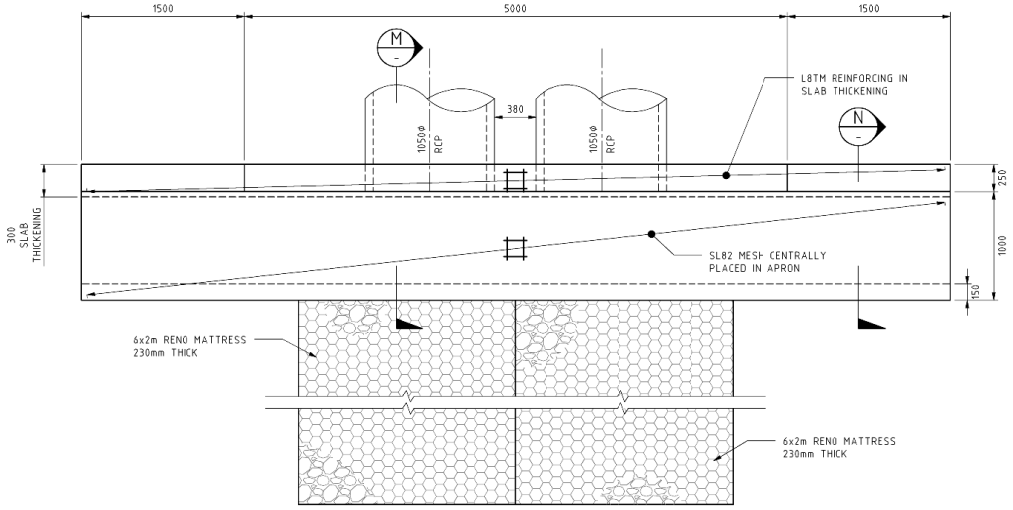
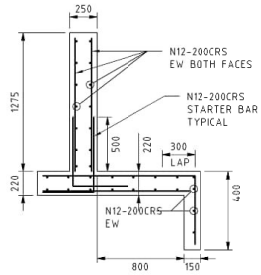
DRAWING TITLE: DRAINAGE STRUCTURE D264 DETAILS

DRAWING NUMBER: C09088-520

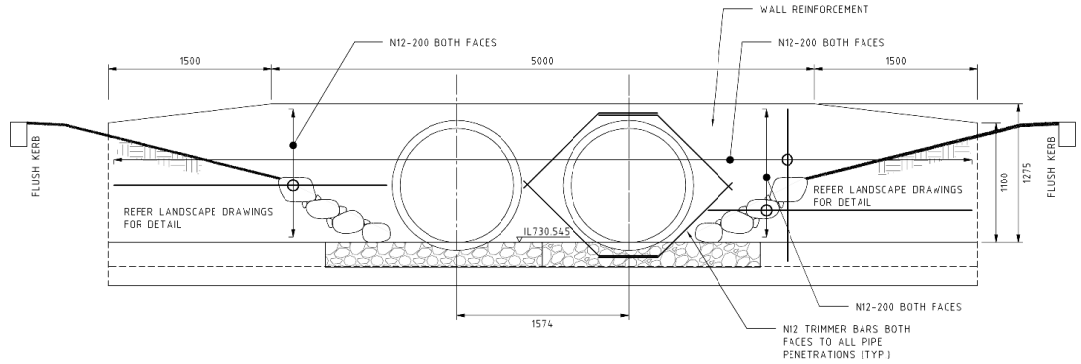
APPVD: B



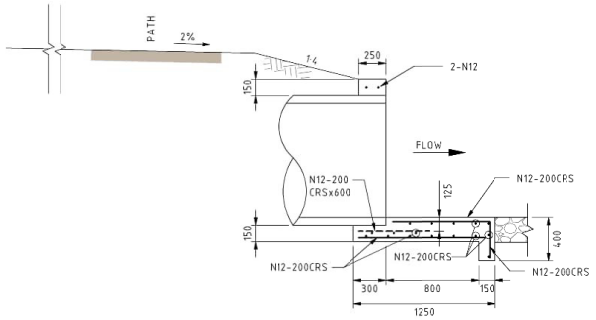
STRUCTURE E100 PLAN
SCALE 1:20 @ A1



SECTION N
SCALE 1:20 @ A1



ELEVATION
SCALE 1:20 @ A1



SECTION M
SCALE 1:20 @ A1

REV/ISSUE	DESIGN	DRAWN	CHECK	APPROVED	DATE	AMENDMENT DETAIL
A	AMK	IB			20/01/12	
B	AMK	KRC			28/07/17	SUB STAGES ADDED QCC COMMENTS ADDRESSED
C	AMK	VVB			31/01/24	WORK AS EXECUTED
D						
E						
F						

NOTE: TOWN PLANNING & LOT LAYOUT SUPPLIED BY ROBERTS DAY, ROAD LAYOUT SUPPLIED BY TEMPLEDS. SURVEY PLAN

CONSULT AUSTRALIA

GOOGONG

GOOGONG TOWNSHIP NEIGHBOURHOOD 1A STAGE 1

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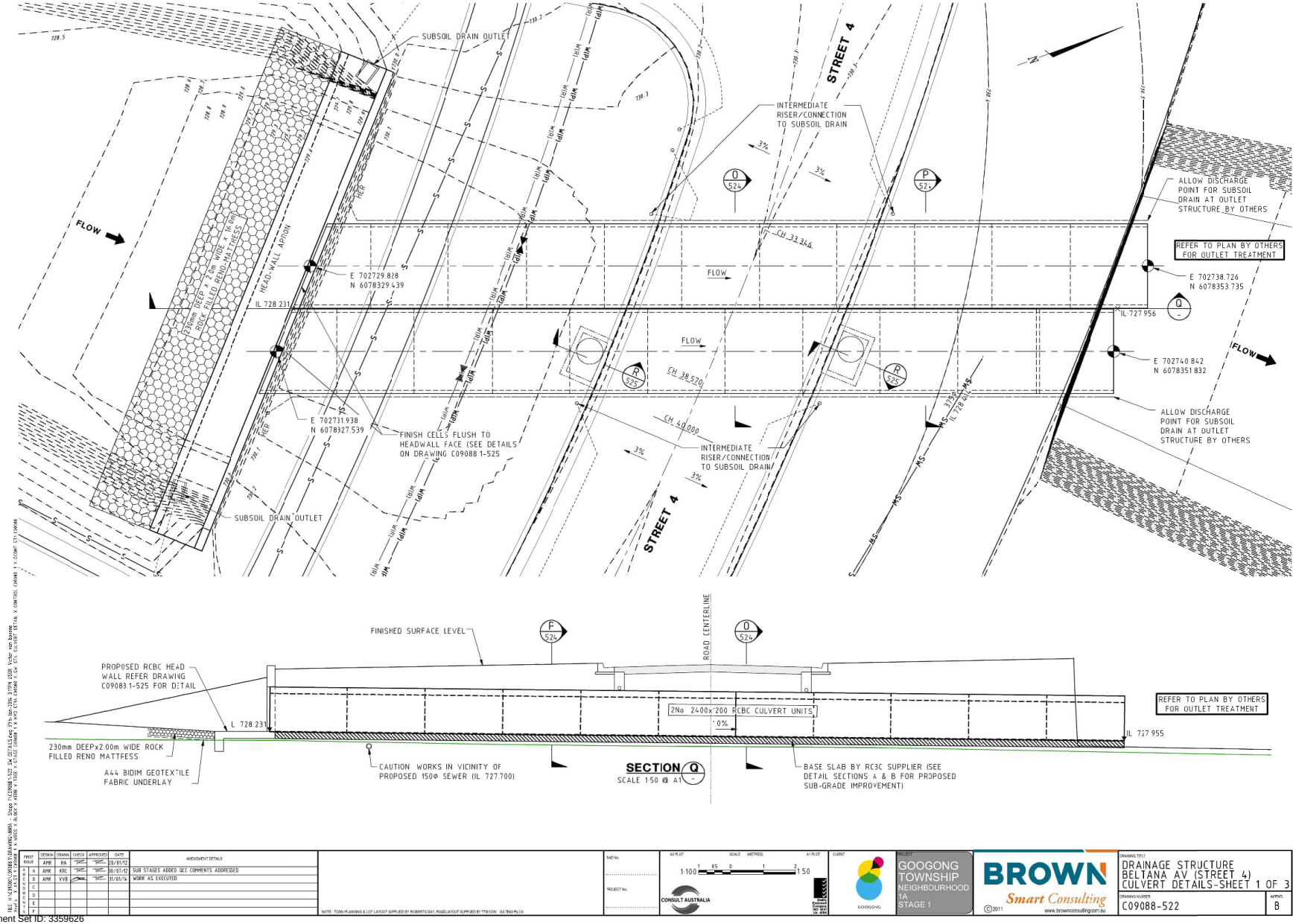
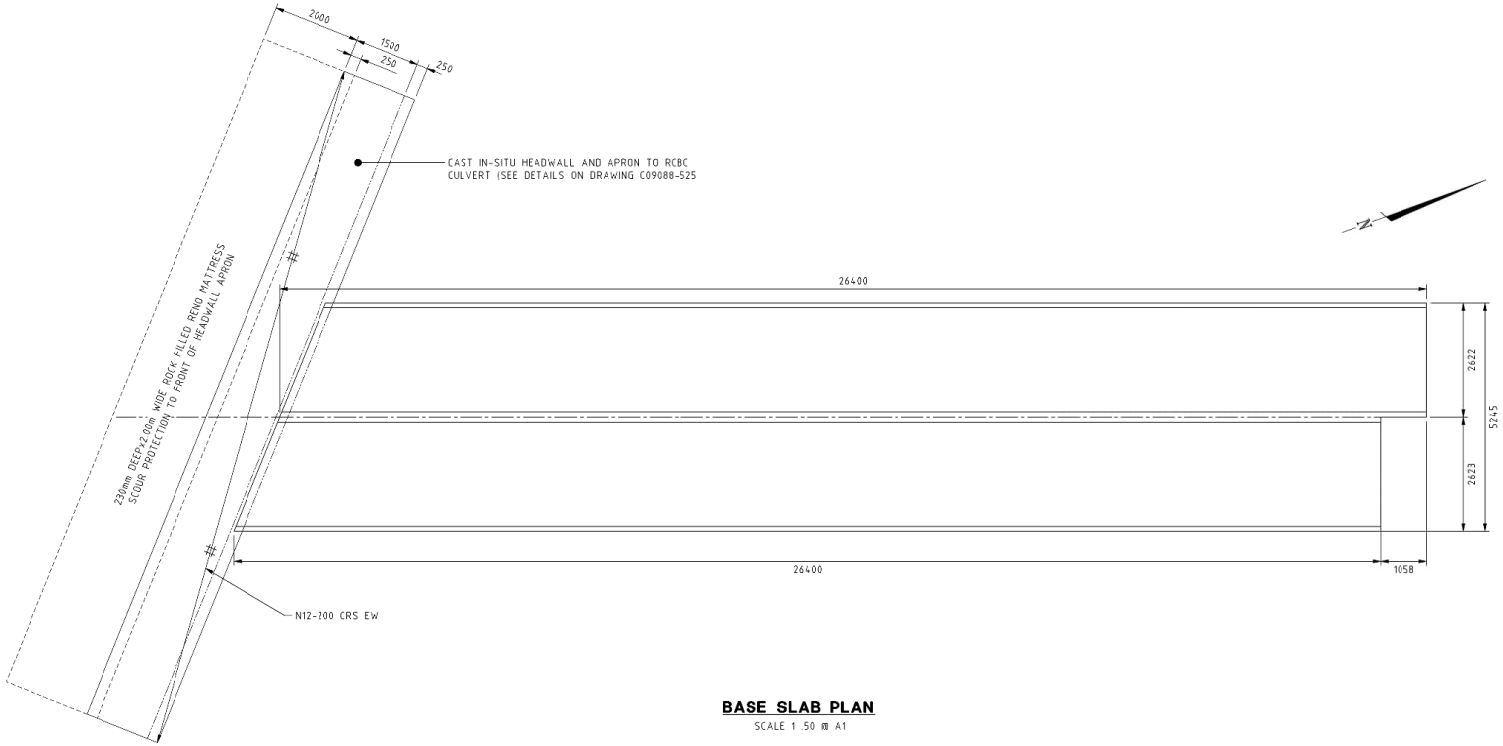
DRAWING TITLE: DRAINAGE STRUCTURE E100 DETAILS

DRAWING NUMBER: C09088-521

APPVD: B


SUBSOIL DRAIN OUTLET
STREET 4
INTERMEDIATE RISER/CONNECTION TO SUBSOIL DRAIN
ALLOW DISCHARGE POINT FOR SUBSOIL DRAIN AT OUTLET STRUCTURE BY OTHERS
REFER TO PLAN BY OTHERS FOR OUTLET TREATMENT
FLOW
E 702729.828
N 6078329.439
IL 728.231
E 702738.726
N 6078353.735
IL 727.956
E 702740.842
N 6078351.832
E 702731.938
N 6078327.539
FINISH CELLS FLUSH TO HEADWALL FACE (SEE DETAILS ON DRAWING C09088 1-525
SUBSOIL DRAIN OUTLET
FINISHED SURFACE LEVEL
ROAD CENTERLINE
PROPOSED RCBC HEAD WALL REFER DRAWING C09083.1-525 FOR DETAIL
2No 2400x200 RCBC CULVERT UNITS
230mm DEEPx2.00m WIDE ROCK FILLED RENO MATTRESS
A44 BIDIM GEOTEXTILE FABRIC UNDERLAY
CAUTION WORKS IN VICINITY OF PROPOSED 150Φ SEWER (IL 727.700)
SECTION Q
SCALE 1:50 @ A1
BASE SLAB BY RC3C SUPPLIER (SEE DETAIL SECTIONS A & B FOR PROPOSED SUB-GRADE IMPROVEMENT)
GOOGONG TOWNSHIP
NEIGHBOURHOOD 1A
STAGE 1
BROWN Smart Consulting
DRAINAGE STRUCTURE
BELTANA AV (STREET 4)
CULVERT DETAILS-SHEET 1 OF 3
C09088-522
B



BASE SLAB PLAN
SCALE 1:50 @ A1

REV	DESIGN	DRAWN	CHECK	APPROVED	DATE	AMENDMENT DETAILS
ISSUE	AMK	RA			20/01/12	
A	AMK	KRC			28/07/12	SUB STAGES ADDED QCC COMMENTS ADDRESSED
B	AMK	VVB			01/05/14	WORK AS EXECUTED
C						
D						
E						
F						

NOTE: TOWN PLANNING & LOT LAYOUT SUPPLIED BY ROBERTS DAY, ROAD LAYOUT SUPPLIED BY TTM CON. SURVEY PLAN

MAP No.
PROJECT No.

AS PLOT 1:100 SCALE (METRES) 1 0.5 0 1 2 AT PLOT 1:50

CONSULT AUSTRALIA

CLIENT: GOOGONG

PROJECT: GOOGONG TOWNSHIP NEIGHBOURHOOD 1A STAGE 1

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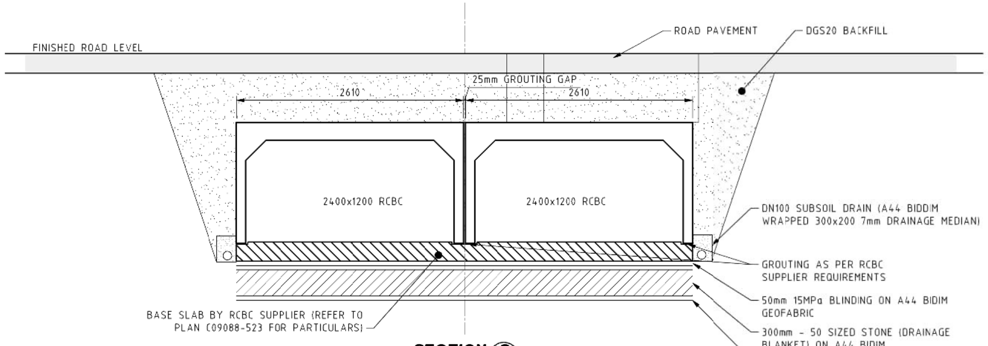
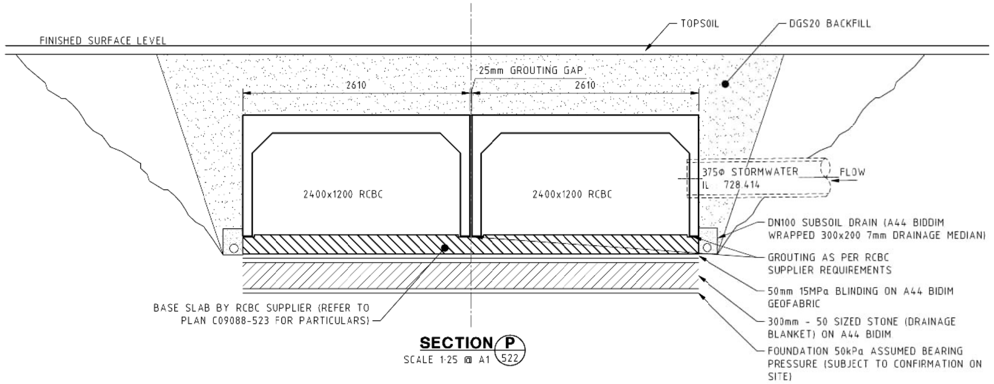
DRAWING TITLE: DRAINAGE STRUCTURE BELTANA AV (STREET 4) CULVERT DETAILS - SHEET 2

DRAWING NUMBER: C09088-523

APPVD: B



SECTION O
SCALE 1:25 @ A1 522



SECTION P
SCALE 1:25 @ A1 522

	DESIGN	DRAWN	CHECK	APPROVED	DATE	AMENDMENT DETAILS
FIRST ISSUE	AMK	HA			20/01/12	
A	AMK	KRC			30/07/12	SUB STAGES ADDED, QCC COMMENTS ADDRESSED
B	AMK	VVB			31/01/14	WORK AS EXECUTED
C						
D						
E						
F						

NOTE: TOWN PLANNING & LOT LAYOUT SUPPLIED BY ROBERTS DAY, ROAD LAYOUT SUPPLIED BY TTM CONSULTING Pty Ltd

WAE No.
PROJECT No.

A3 PLOT 1:50 — SCALE (METRES) — A1 PLOT 1:25

CONSULT AUSTRALIA

CLIENT: GOOGONG

PROJECT: GOOGONG TOWNSHIP NEIGHBOURHOOD 1A STAGE 1

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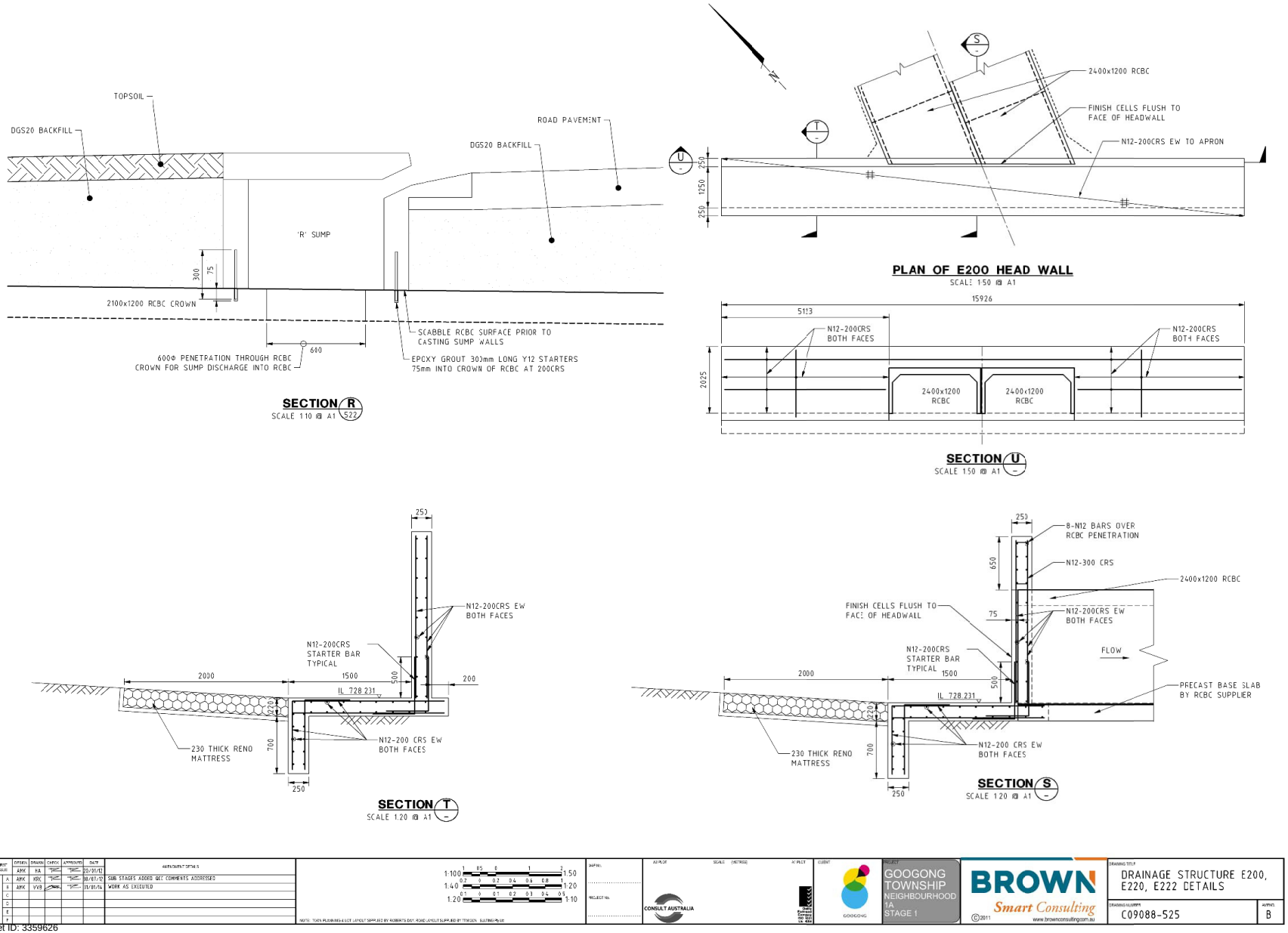
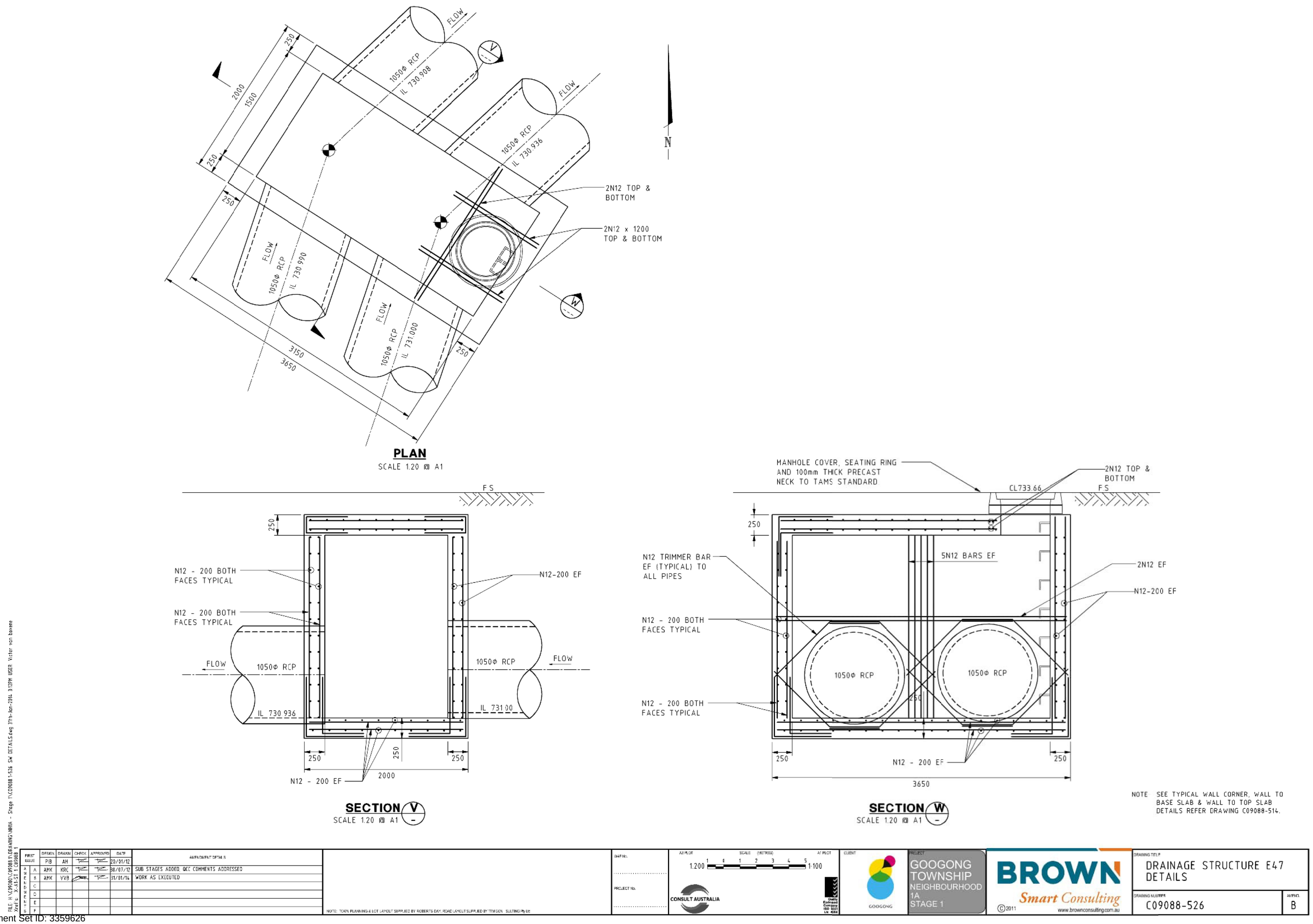
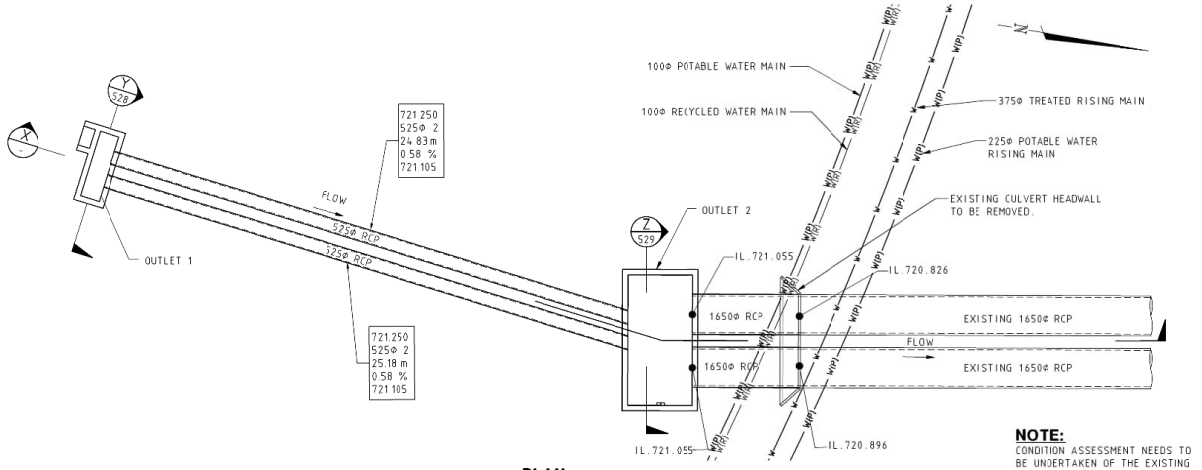
DRAWING TITLE: DRAINAGE STRUCTURE BELTANA AV (STREET 4) CULVERT DETAILS - SHEET 3

DRAWING NUMBER: C09088-524 AMEND. B

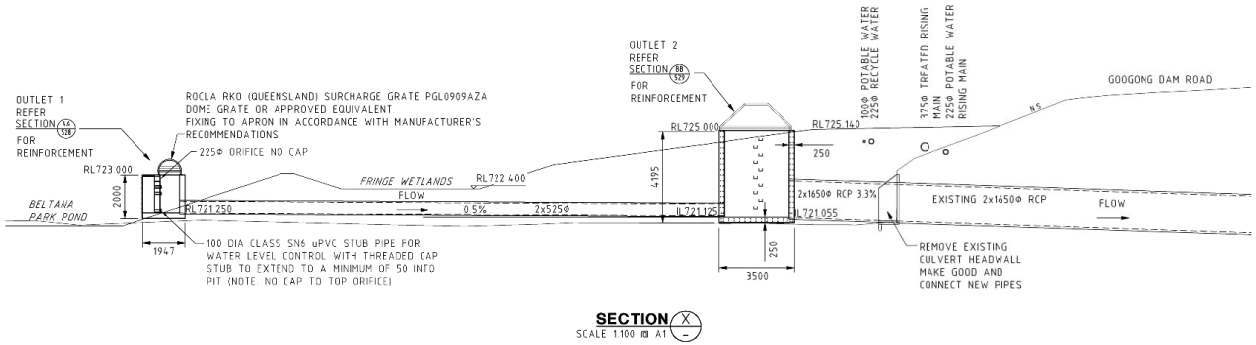
Document Set ID: 3359626
Version: 1, Version Date: 21/10/2025




PLAN
SCALE 1:20 @ A1
SECTION V
SCALE 1:20 @ A1
SECTION W
SCALE 1:20 @ A1
1050Ø RCP
IL 730.908
IL 730.936
IL 730.990
IL 731.000
FLOW
2N12 TOP & BOTTOM
2N12 x 1200 TOP & BOTTOM
MANHOLE COVER, SEATING RING AND 100mm THICK PRECAST NECK TO TAMS STANDARD
CL733.66
N12 - 200 BOTH FACES TYPICAL
N12-200 EF
N12 TRIMMER BAR EF (TYPICAL) TO ALL PIPES
5N12 BARS EF
2N12 EF
N12 - 200 EF
NOTE SEE TYPICAL WALL CORNER, WALL TO BASE SLAB & WALL TO TOP SLAB DETAILS REFER DRAWING C09088-514.
SUB STAGES ADDED, QCC COMMENTS ADDRESSED
WORK AS EXECUTED
GOOGONG TOWNSHIP NEIGHBOURHOOD 1A STAGE 1
BROWN Smart Consulting
DRAINAGE STRUCTURE E47 DETAILS
C09088-526
B



PLAN
SCALE 1:100 @ A1



SECTION X
SCALE 1:100 @ A1

REV	DESIGN	DRAWN	CHECK	APPROVED	DATE	AMENDMENT DETAIL
ISSUE	PJB	AH			11/04/12	
A	APK	KRC			28/07/17	SUB STAGES ADDED QLC COMMENTS ADDRESSED
B	MK	SC			18/12/17	ADDED LEVELS TO DETAIL
C	APK	YVB			31/10/24	WORK AS EXECUTED

NOTE: TOWN PLANNING 4 LOT LAYOUT SUPPLIED BY ROBERTS DAY, ROAD LAYOUT SUPPLIED BY TEMSON. SURVEY PLAN

SHEET No.
PROJECT No.

AS PLOT 1:200 | SCALE (METRES) 1 0 1 2 3 4 5 | AT PLOT 1:100

CONSULT AUSTRALIA

CLIENT: GOOGONG

PROJECT: GOOGONG TOWNSHIP NEIGHBOURHOOD 1A STAGE 1

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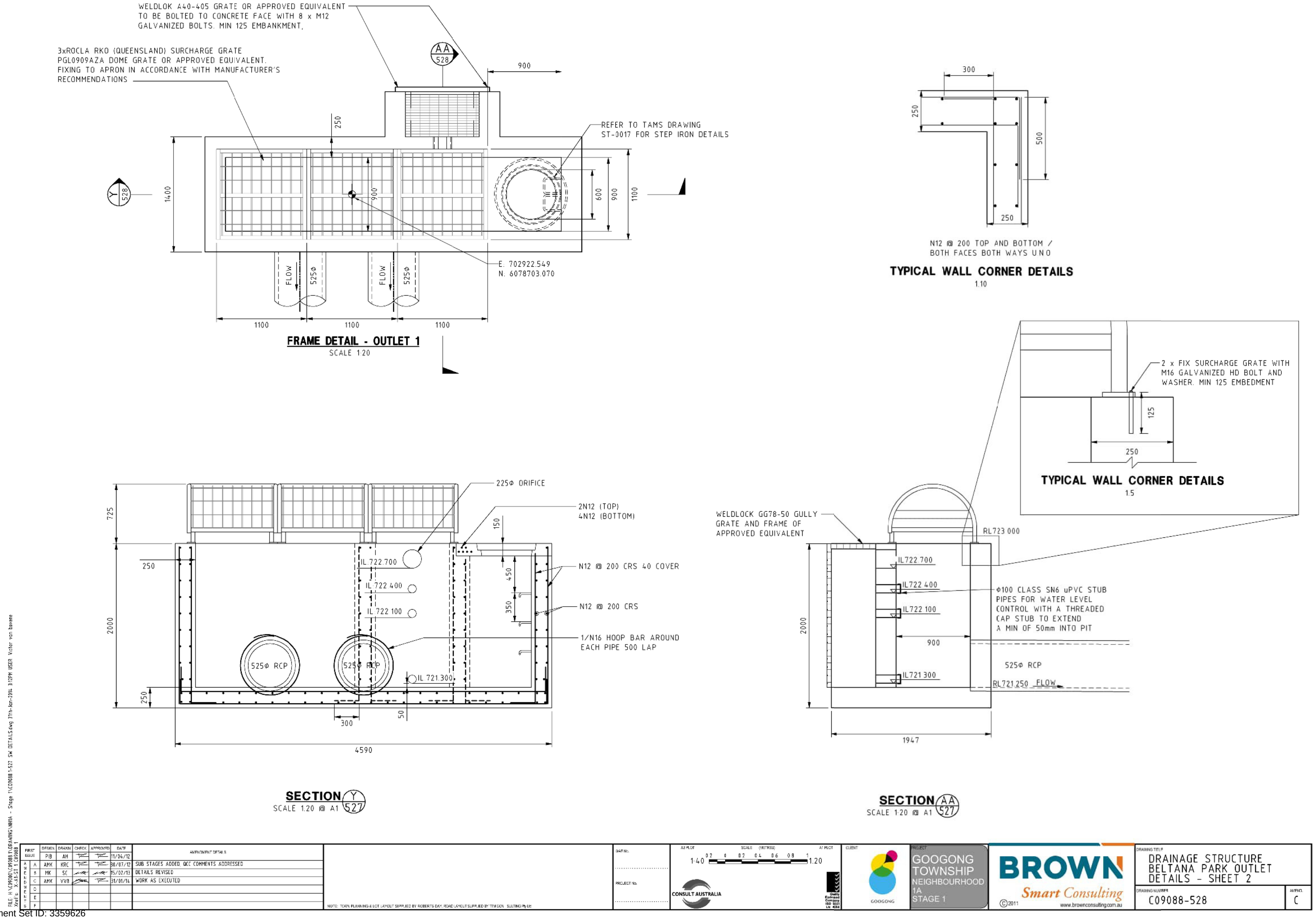
DRAWING TITLE: DRAINAGE STRUCTURE BELTANA PARK OUTLET DETAILS - SHEET 1

DRAWING NUMBER: C09088-527

APPVD: C


FRAME DETAIL - OUTLET 1
SCALE 1:20
TYPICAL WALL CORNER DETAILS
1:10
TYPICAL WALL CORNER DETAILS
1:5
SECTION Y 527
SCALE 1:20 @ A1
SECTION AA 527
SCALE 1:20 @ A1
GOOGONG TOWNSHIP
NEIGHBOURHOOD 1A
STAGE 1
BROWN
Smart Consulting
DRAINAGE STRUCTURE
BELTANA PARK OUTLET
DETAILS - SHEET 2
C09088-528