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CIVIL ENGINEERING REPORT

A new primary school in Greater Flagstone

Prepared for Group GSA

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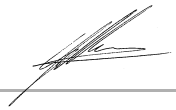
A	Issue for Approval	L.Blackwell	S.Killoran RPEQ: 25874	25 March 2026	

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Executive Summary

Northrop Consulting Engineers Pty Ltd (Northrop) have been engaged by Group GSA to prepare a Civil Engineering Report (CER) on behalf of the State of Queensland, represented by the Department of Education (applicant), in support of a Priority Development Area (PDA) development application over part of land at New Beith Road, Silverbark Ridge QLD 4124 and described as part of Lot 911 on SP356636 (site). This PDA development application seeks approval from the MEDQ for a development permit for a material change of use for educational establishment, child care centre, community facility and health care services.

This CER provides advice on engineering services strategy for the proposed school and the engineering planning issues associated with the PDA application. This report demonstrates that the proposed development can connect to local stormwater, potable water, sewerage reticulation, electricity, gas, telecommunications and transport infrastructure. The servicing strategy for the development is summarised below:

- **Site Context –** The site is being created as part of a broader subdivision project delivered by Peet Flagstone City Pty Ltd under PDA development approvals DEV2024/1491 and DEV2023/1414. Proposed civil site services are discussed below.
- **Site Access –** Four vehicular access points are proposed via a Trunk Connector Road (southern boundary) and Neighbourhood Connector Roads (western and northern boundaries), to be delivered under Flagstone City CA3 South (DEV2024/1491) by late 2027. A temporary construction access easement has been designed if required.
- **Earthworks –** Bulk earthworks cut/fill operations will be required on the site to achieve desired surface levels and interface with future external road levels. The proposed external bulk earthworks design is documented within development approval DEV2023/1414 & DEV2024/1491.
- **Flooding –** Flood modelling completed for the precinct indicates the site is well above design flood levels. As a result, the development is not expected to encounter any significant flood-related constraints.
- **Stormwater Infrastructure –** The proposed development will connect to the future external stormwater infrastructure on the southern Trunk Connector Road at the south-western corner of the site and is documented within development approval DEV2023/1414 & DEV2024/1491.
- **Stormwater Quality Management –** As detailed in the Flagstone City CA3 South Site Based Stormwater Management Plan prepared by Engeny, the developed school site catchment has been accounted for in the stormwater quality assessment for the broader CA3 South development. Stormwater quality is addressed through a downstream bio-retention basin, with MUSIC modelling confirming the SPP's reduction targets are achieved.
- **Stormwater Quantity Management –** As detailed in Engeny's Flagstone City CA3 South Site Based Stormwater Management Plan, the developed school site catchment has been accounted for in the stormwater quantity assessment for the broader CA3 South development. Stormwater quantity is addressed through the Flagstone City Masterplan FMS, with modelling confirming mitigated developed scenario peak flows do not exceed existing scenario flows. Therefore, no on-site stormwater quantity management infrastructure is proposed for the school.
- **Water Supply –** In accordance with the endorsed Flagstone Water Supply and Sewer Networks Infrastructure Master Plan (May, 2023), a water connection will be constructed to service the school site.
- **Sewer Reticulation –** In accordance with the endorsed Flagstone Water Supply and Sewer Networks Infrastructure Master Plan (May, 2023), a sewer connection will be constructed to service the school site.
- **Telecommunications, Electrical & Gas Supply** – Connections are subject to infrastructure to be delivered as part of Flagstone City CA3 South (DEV2024/1491).

1. Introduction

Northrop Consulting Engineers Pty Ltd (Northrop) have been engaged by Group GSA to prepare a Civil Engineering Report (CER) on behalf of the State of Queensland, represented by the Department of Education (applicant), in support of a Priority Development Area (PDA) development application over part of land at New Beith Road, Silverbark Ridge QLD 4124 and described as part of Lot 911 on SP356636 (The School Site). The School Site details are shown in Table 1 below. The proposed development comprises construction of Greater Flagstone State School, a new primary school and kindergarten facility including buildings, sports areas, car parking, and associated services.

The purpose of this CER is to provide advice on the engineering servicing strategy for the proposed development regarding earthworks, roadworks, stormwater management (quality, quantity and flooding), sewerage, water supply, electricity, communications and gas. The required infrastructure will be subject to the conditions attached to the Development Approval to be provided by Council and any nominated referral agencies.

Table 1 - Property Details

Category	A new primary school for Greater Flagstone
Site Address	New Beith Road, Flagstone, QLD , 4124
Lot Title	Lot 911 on SP356636
Total Site Area	Approx. 70,000m^2
Proposed Land Use	Future Primary School

1.1. Related Reports and Documents

This report is to be read in conjunction with the following supporting and reference documents:

- Concept Civil Drawings by Colliers. Drawing No. 20-0211-SK120-122 Rev A, dated 21st August 2025 (Sewer and Water)
- Concept Civil Drawings by Colliers. Drawing No. 20-0211-SK120-122 Rev C, dated 16th March 2026 (Stormwater)
- Group GSA's Overall 90% Concept Masterplan prepared for DoE, dated 20th March 2026
- Technical Memorandum by Colliers. Report Ref. 20-0211.TM2.DC.dc, dated 28th November 2023
- Flagstone City CA3 South SBSMP by Engeny. Report Ref. QC4012_002-REP-004-4, dated 18th February 2026
- Geotechnical Investigation by Soil Surveys. Report Ref. 1-29174 BR1.1, dated 20th November 2025
- Flood Assessment Memorandum by Engeny. Report Ref. QC4012_002-MEM-004-0, dated 26th November 2025
- Lodgment of PDA Development Application for ROL by RPS. Report Ref. AU213004414.004

2. Site Context and Existing Characteristics

The site is being created as part of a broader subdivision project delivered by Peet Flagstone City Pty Ltd under PDA development approvals DEV2024/1491 and DEV2023/1414. Works undertaken under these PDA development approvals provide the foundational infrastructure required to make the site 'fit for purpose' (including vegetation clearing, roadworks, sewerage, water supply, earthworks, telecommunications, and electrical infrastructure). The proposed school site (Lot 30015) is positioned approximately 500m from the existing Flagstonian Drive road reserve. Following ROL works as part of DEV2023/1414, Flagstone City CA3 South (DEV2024/1491) will deliver all external infrastructure.

The site currently features undeveloped land consisting of dense vegetation and open grassland. All existing vegetation will be cleared under PDA development application DEV2023/1414.

The site is bound by:

- Lot 989 on SP854074 and Lot 911 on SP311193 to the North
- Lot 989 on SP854074 to the East
- Lot 908 on SP316978 to the South
- Lot 911 on SP331193 to the West

Figure 1 below illustrates the site location and characteristics post-ROL as part of DEV2023/1414.

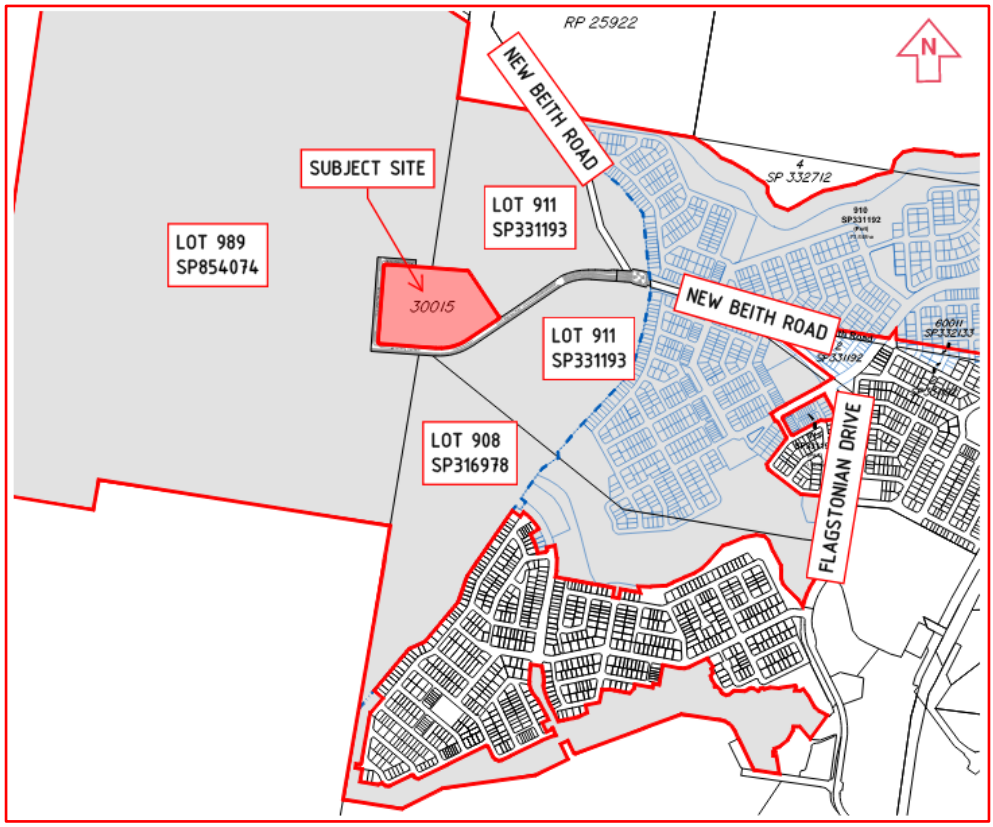

Figure 1 - Site Locality (RPS, 2022)

3. Proposed Development

The development proposes a new state school for Greater Flagstone, including all associated educational infrastructure (e.g., kindergarten, community hub, canteen, learning precincts etc.), carparking, sports facilities, and a bioretention basin for stormwater quality treatment. The proposed architectural layout of the development prepared by Group GSA is shown below in Figure 2. Architectural drawings are included in Appendix D.

The Applicant proposes a State primary school for Prep to Year 6, delivered in stages:

- Stage 1 opening in 2029 with capacity for approx. 712 enrolments.
- Stage 2 opening in 2031 with a cumulative enrolment capacity for approx. 1,092.
- Further undefined stage to provide a cumulative enrolment capacity of approx. 1,185.

The Applicant also proposes a child care centre (kindergarten) and community facility/health care services (hub) to be delivered at Stage 1 of the State primary school. The:

- child care centre is intended to be a two-unit kindergarten providing for up to 44 children per day, and up to 88 children across the week, and 15 hours care per week per child.
- community facility/health care services is intended to provide a range of services, supporting children and their families with early years programs and support, onsite health and wellbeing services, and family programs and activities.

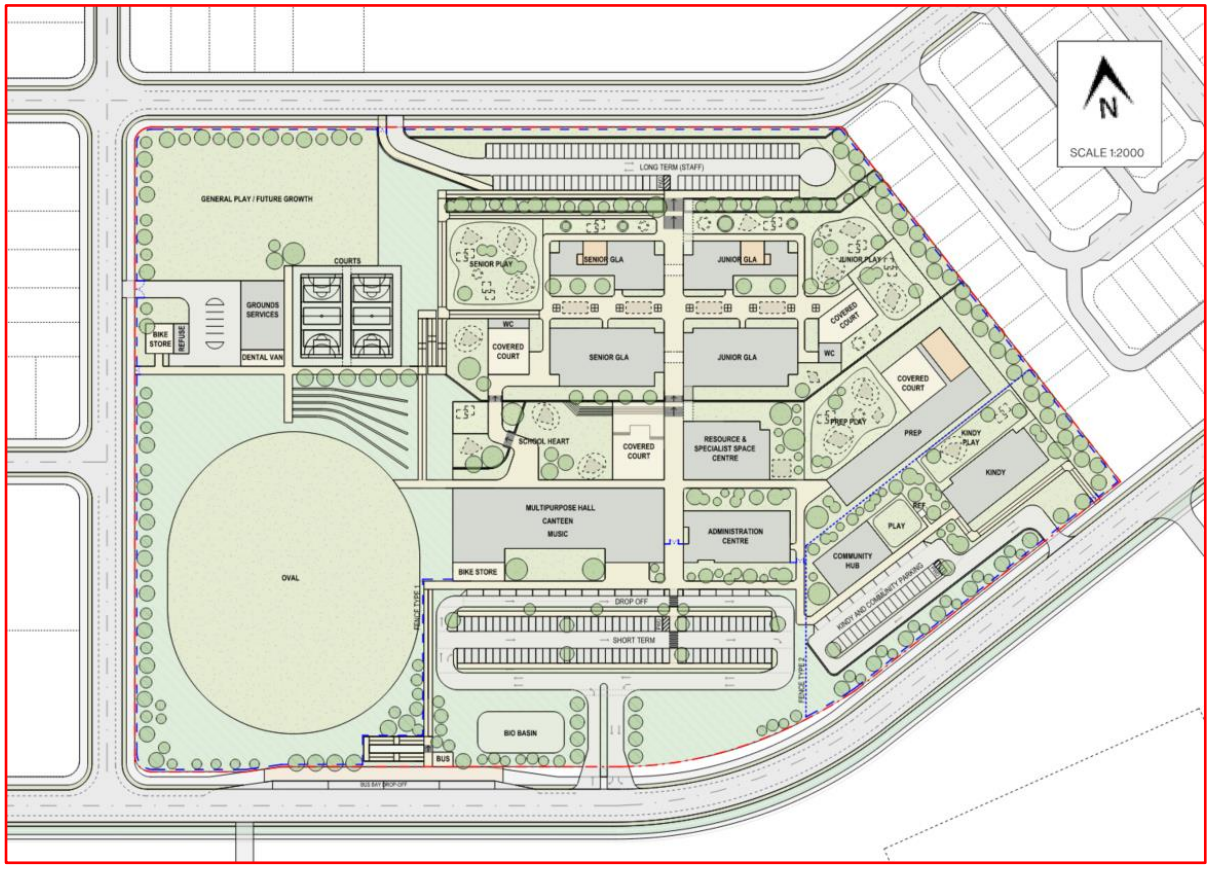

Figure 2 - Proposed Development (Group GSA, 2026)

4. Earthworks

4.1. Bulk Earthworks

The development will require bulk earthworks cut/fill operations to achieve the desired surface levels to accommodate for the development and ensure it interfaces with proposed future road levels. The proposed external road design is documented within development approval DEV2023/1414 & DEV2024/1491. As part of the overarching development, a portion of the existing site will be filled in to accommodate the overarching precinct grading. Preliminary Bulk Earthworks plans showing the extent of fill proposed as part of the ultimate precinct are included in Appendix C.

4.2. Acid Sulfate Soil Assessment

The Acid Sulfate Soil (ASS) overlay accessed from the LCC's PD Hub Interactive Mapping did not identify any ASS affecting the subject site. Furthermore, a Geotechnical Investigation undertaken by Soil Surveys, included in Appendix G, did not identify any evidence of ASS contamination.

LCC and the Department of Education and Heritage Protection may require an Acid Sulfate Soils Investigation Report to formally assess the presence of ASS on site. Should ASS be identified, a comprehensive Acid Sulfate Soil Management Plan will need to be prepared in accordance with the State Planning Policy.

5. Roads and Access

5.1. Proposed Site Access

In the ultimate precinct development, the proposed school site will be serviced by a Trunk Connector Road along the southern boundary and Neighbourhood Connector Roads along the western and northern boundaries, to be delivered as part of Flagstone City CA3 South (DEV2024/1491). The developed road network will provide vehicular access to on-site car parking via four access points: two along the southern boundary, one on the western boundary, and one on the northern boundary. A bus bay is also proposed along the southern boundary, as shown in Figure 3. It should be noted that all external infrastructure is planned to be delivered by late 2027, prior to the construction of the new school.

In the event that the Flagstonian Drive roadworks cannot be completed in time, a temporary construction access easement from Flagstonian Drive has been approved. Draft detailed designs for the construction access track (Colliers Plans 22-0450-100-102, 110-114, 120-124 & 130-136) are enclosed within Appendix I.

Site access points following the completion of all external works are shown below in Figure 3.

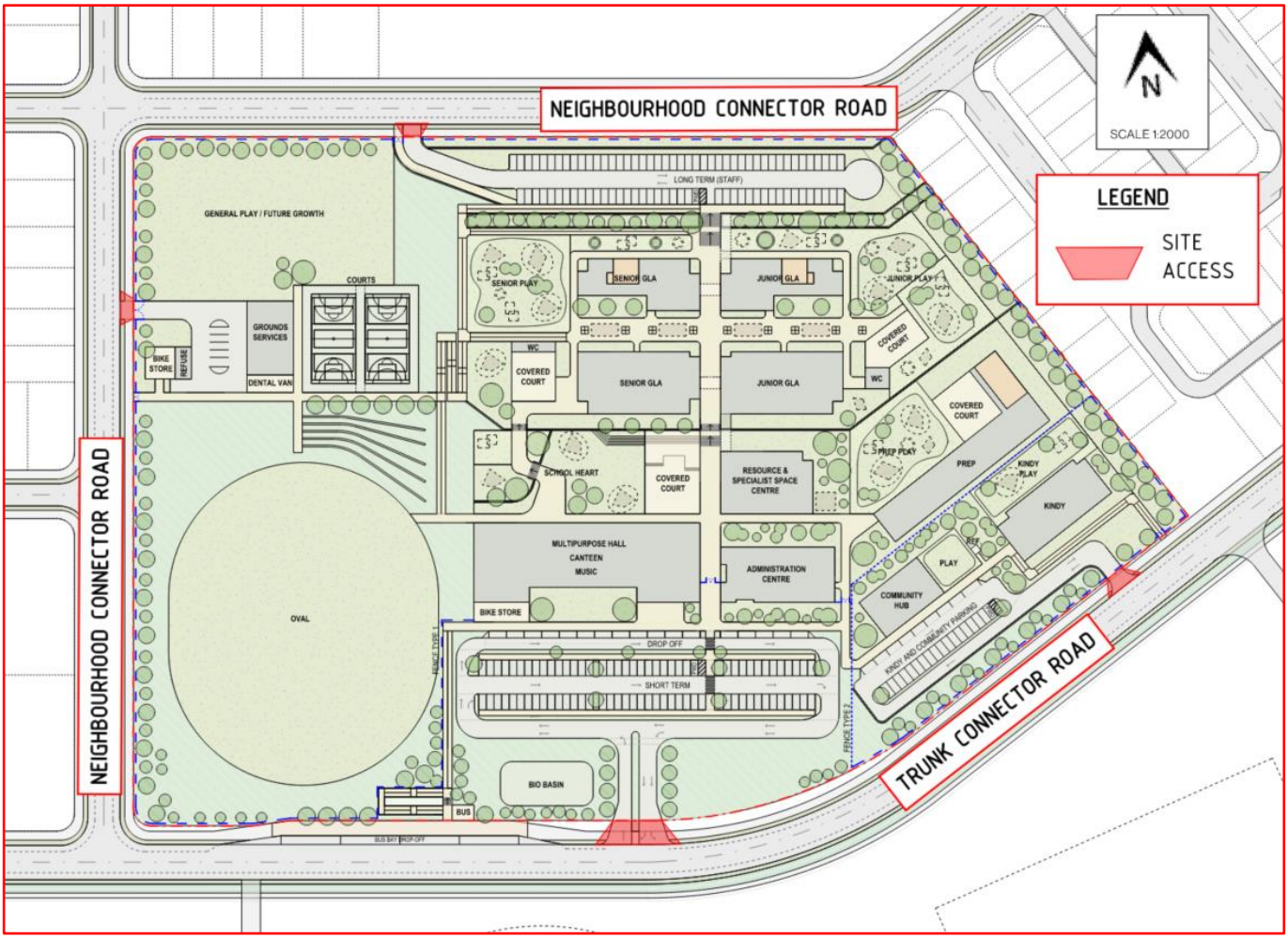

Figure 3 - Proposed Site Access (Group GSA, 2026)

6. Stormwater Drainage

This section addresses the stormwater quality and quantity management scheme for the proposed development and should be referred to for full details of the stormwater management strategy. A summary of the proposed stormwater strategy is provided below:

6.1. Proposed Stormwater Management Objectives

Stormwater management for the proposed development has been designed in accordance with the following documents:

- Design standards for Queensland Government Education Facilities, V6.0, December 2025
- Logan City Council Planning Scheme
- State Planning Policy (SPP), 2017
- Environmental Protection (Water) Policy, 2009
- Queensland Urban Drainage Manual (QUDM) Fourth Edition, 2016
- Water By Design MUSIC Modelling Guidelines, Version 3.0, 2018
- Water by Design - Construction and Establishment Guidelines: Swales, Bioretention Systems and Wetlands V1.1, 2010
- Plumbing and Drainage Code AS3500.3
- Australian Rainfall and Runoff Guideline (ARR)
- International Erosion Control Association – Best Practice Erosion and Sediment Control, 2008

The stormwater management objectives for the development are summarised below:

- Development should not result in water being diverted onto land that is not normally subject to overland flow,
- Protect the quality of surface and ground waters during construction and operation of new development,
- Maintain the natural hydrologic behavior of catchments,
- Integrate stormwater management infrastructure carefully in the urban and natural landscape,
- Define a lawful point of discharge that will not cause an actional nuisance in accordance with QUDM,
- Ensure that the development does not create adverse flood impacts to upstream or adjacent properties,
- No increase in post development flows for all rainfall events up to and including the 100-year event,
- Stormwater quality to achieve the minimum design requirements of the State Planning Policy (2017) and achieve water quality objectives in accordance with Environmental Protection (Water) Policy (2009), as follows in Table 2 below.

Table 2 - Stormwater Quality Requirements

POLLUTANT	PERCENT REDUCTION
Gross Pollutants (>5mm), GP	90%
Total Suspended Solids, TSS	80%
Total Phosphorous, TP	60%
Total Nitrogen, TN	45%

The achievement of these objectives is summarised in the following section of this report.

6.2. Existing Stormwater Drainage Scheme

In its current state, the subject site generally grades south at approximately 11%. There is no stormwater infrastructure located within the site. All site flows discharge south and are captured by a tributary of Sandy Creek.

The future external stormwater infrastructure will be constructed as part of Flagstone City CA3 South (DEV2024/1491). The future external stormwater main will be sized to cater for the fully developed school site. The school site is proposed to connect into the external stormwater infrastructure via a stormwater stub located in the south-west corner of the site (lawful point of discharge).

Figure 4 illustrates the proposed external concept roadworks and drainage layout plans, prepared by Colliers attached in Appendix C.

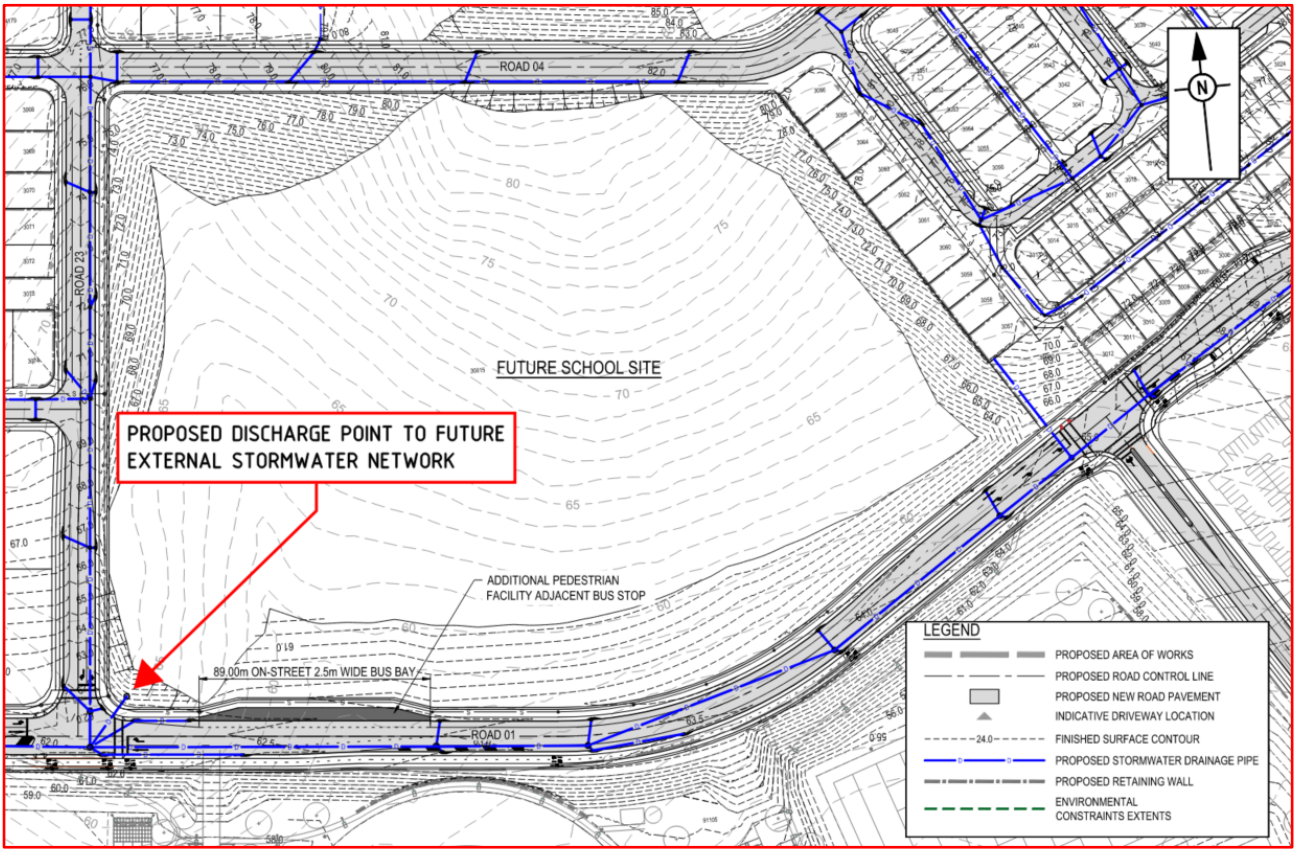

Figure 4 – Concept Roadworks and Drainage Layout (Colliers, 2026)

6.3. Proposed Stormwater Drainage Infrastructure

The proposed development will introduce a new internal pit and pipe system sized to capture all events up to and including the 5% AEP event as per the Design Standards for Queensland Government Education Facilities V6. It is proposed to connect into the future stormwater stub connection provided as part of the external development works. Major flows within the site will be safely conveyed through the school site and discharge over the southern boundary.

6.4. Flood Management

A Flood Assessment Memorandum has been prepared by Engeny (refer to Appendix F). The assessment confirmed the site remains flood-free in all modelled events, with 1% AEP and PMF flood levels in Sandy Creek reaching approximately 47.86m AHD and 50.02m AHD respectively. The proposed road crest at the site frontage facing Sandy Creek is designed at approximately 62m AHD or higher, ensuring the site is well above both design flood levels. Accordingly, the development is not expected to face any significant flood-related constraints.

Figure 5 - 1% AEP Flood Depth Map (Engeny, 2025)

6.5. Stormwater Quantity Management

Stormwater quantity management for the site is addressed through a masterplan solution as outlined in the Flagstone City Masterplan Flood Management Strategy. As detailed in Engeny's Flagstone City CA3 South Site Based Stormwater Management Plan (SBSMP), the school site falls within Catchment 10, which has been included in the WBNM modelling of the developed scenario. The relevant mitigation structures are to be constructed in accordance with the Masterplan FMS to achieve the stormwater quantity objectives. WBNM modelling confirms that mitigated developed scenario peak flows do not exceed existing scenario flows. Full details of the catchment delineation, WBNM modelling methodology, and detention basin sizing are provided in Engeny's Flagstone City CA3 South SBSMP, included in Appendix G.

6.6. Stormwater Quality Management

The State Planning Policy (SPP) proposes criteria which apply to 'high-risk' development for stormwater. The criteria includes one or more of the following:

- A Material Change of Use (MCU) for an urban purpose which involves greater than 2,500m^2 of land that:
  - Will result in an impervious area greater than 25% of the net developable area; or
  - Will result in six (6) or more dwellings
- A Reconfiguration of a Lot (ROL) for urban purposes that involves a land size greater than 2,500m^2 and will result in six (6) or more lots; or
- Operational works for urban purposes that involve disturbing more than 2,500m^2 of land.

As the site is greater than 2,500m^2, the stormwater quality targets from the State Planning Policy are triggered. Stormwater quantity management is addressed through a downstream precinct bio-retention basin, with the fully developed school site catchment accounted for in the assessment. The school site falls within Catchment 10, which has been included in the MUSIC modelling of the developed scenario. MUSIC modelling results confirm that the proposed treatment train achieves the required reduction targets outlined in Table 2. Full details of the catchment delineation, MUSIC modelling methodology and treatment train sizing are provided in Engeny's Flagstone City CA3 SBSMP (Appendix G)which should be referred to for further detail.

7. Water & Sewer Infrastructure

7.1. Existing Water Supply Infrastructure

Figure 6 illustrates the proposed water and sewer layout to be constructed as part of Flagstone City CA3 South (DEV2024/1491), with indicative civil drawings by Colliers attached in Appendix C. Water mains are to be located on the verge of the northern boundary and on the opposite side of the road reserve along the southern boundary.

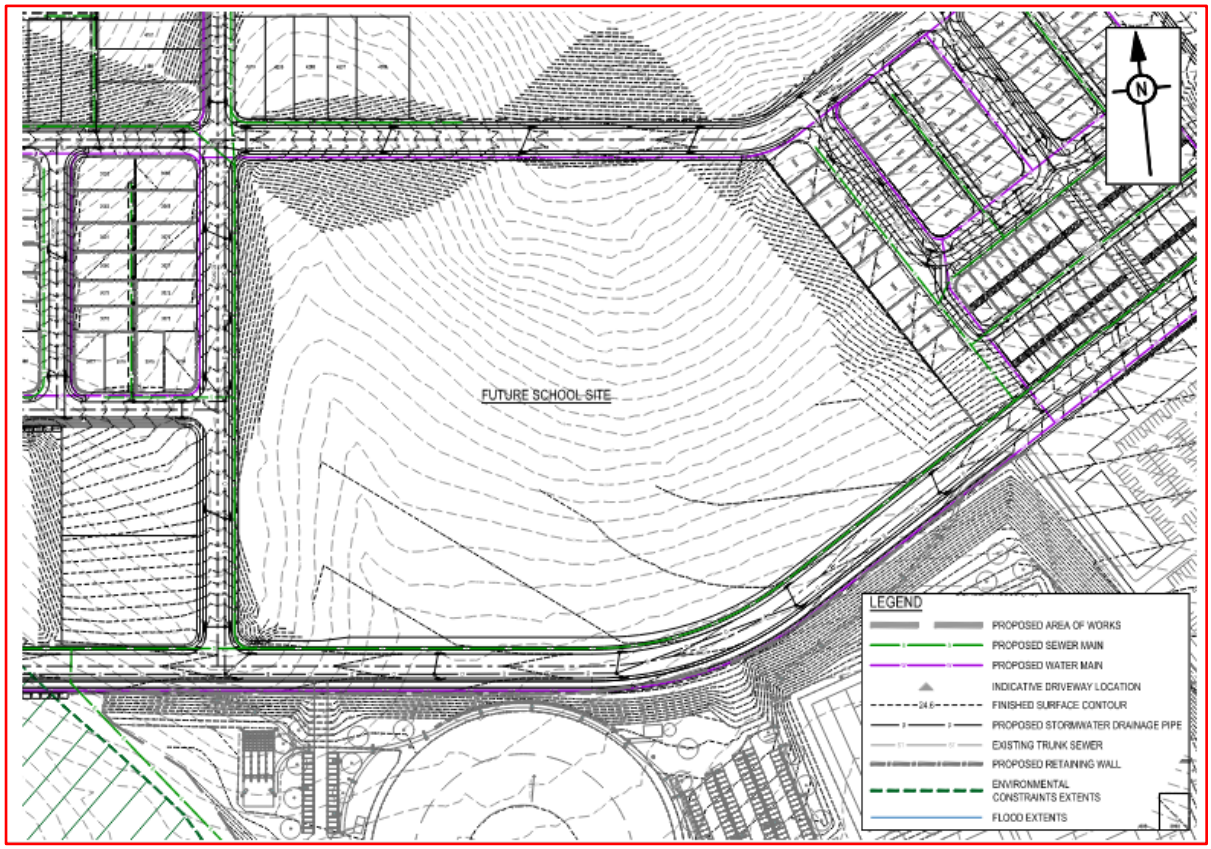

Figure 6 - Concept Water and Sewer Services Layout (Colliers, 2025)

7.2. Proposed Water Supply Infrastructure

PROPOSED CONNECTION

The site will be serviced by a connection to a proposed watermain along Flagstonian Drive, which will be designed to cater for the school site as part of Flagstone City CA3 South (PDA Development Approval DEV2024/1491). The proposed main will run along the trunk connector road adjacent to the southern boundary of the school site, as outlined in the Preliminary Services Layout prepared by Colliers (refer to Appendix C). Connection to the reticulation main will be undertaken in accordance with Flagstone's endorsed Water Supply and Sewer Networks Infrastructure Master Plan (May, 2023).

INTERNAL WATER NETWORK

As part of the building works, internal water reticulation service will be provided throughout the site. This will require a full water network design to be prepared by a qualified hydraulic engineer, designed to service all internal firefighting flows and services demands.

FIRE SYSTEM

In accordance with the SEQ WS&S D&C Code, the site is permitted to draw the following fire flows:

- Commercial/ Industrial – 30L/sec for 4 hours
- Residential – 15L/sec for 2 hours

The water connection and internal water reticulation network for the development will be designed as part of future Operational Works applications for the site.

8. Sewerage Reticulation

8.1. Existing Sewer Reticulation

As per the concept water and services layout in Figure 6 provided by Colliers (refer to Appendix C), a sewer main is proposed to run along the western and southern boundaries of the school site. This sewer infrastructure will be delivered as part of Flagstone City CA3 South (DEV2024/1491).

8.2. Proposed Sewer Reticulation

PROPOSED CONNECTION

As detailed in the Technical Memorandum prepared by Colliers (Ref. 20-0211.TM2.DC.dc), a gravity sewer connection will be established at the south-western corner of the site to the future external sewer infrastructure, which will be designed to cater for the school site. Site connection to be undertaken in accordance with Flagstone City CA3 South's endorsed Water Supply and Sewer Networks Infrastructure Master Plan (May, 2023). The approximate connection location is shown in Figure 7 below.

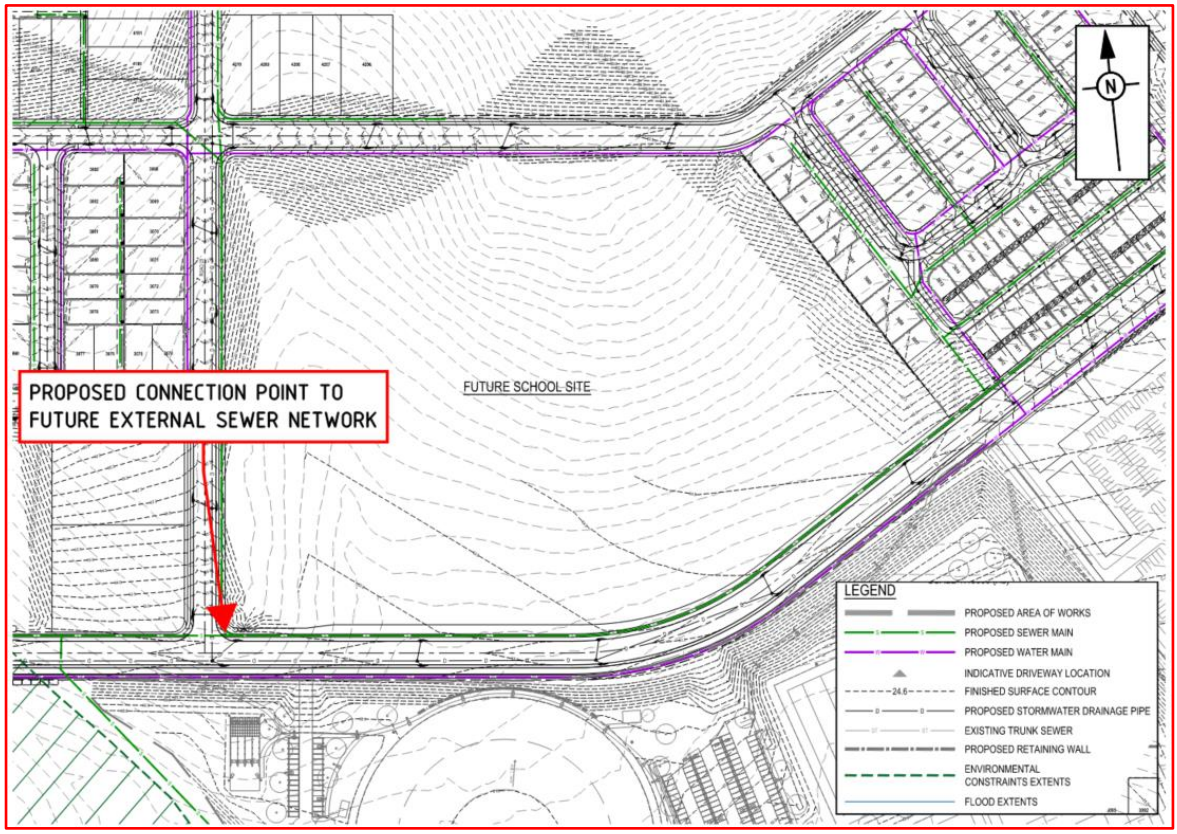

Figure 7 - Proposed Sewer Connection Location (Colliers, 2025)

INTERNAL NETWORK

The internal wastewater network will form part of the design required for the Building Application approval.

9. Electrical Supply

Connection to electrical services is subject to the infrastructure to be constructed as part of Flagstone City CA3 South (DEV2024/1491). The proposed development is required to incorporate low-voltage electricity supply to all facilities within the development to comply with LCC and Energex legislation.

The need for a pad mount transformer to be located within the development site is subject to further design discussion with Energex; however sufficient provisions have been made within the proposed plan of development to accommodate one if required.

10. Gas Supply

Connection to gas services is subject to the infrastructure to be constructed as part of Flagstone City CA3 South (DEV2024/1491). Should gas services be required for the development, connection and extension requirements shall be undertaken by a specialist consultant and will form part of the future building works applications to both APA and LCC.

11. Telecommunications

Connection to telecommunication services is subject to the infrastructure to be constructed as part of Flagstone City CA3 South (DEV2024/1491). Connection from the proposed development to the above-mentioned services will be undertaken by a specialist consultant and will form part of the future building works applications to both appropriate telecommunications entity and LCC.

12. Conclusion

Northrop Consulting Engineers Pty Ltd (Northrop) have been engaged by Group GSA to prepare a Civil Engineering Report (CER) in support of a Detailed Business Case (DBC) for submission to the Department of Education (DoE) and any nominated referral agency for the proposed new state school for Greater Flagstone. This report demonstrates that the proposed development can connect to local stormwater, potable water, sewerage reticulation, electrical, telecommunications and transport infrastructure. The proposed servicing strategy is summarised below:

- **Site Access** – Four vehicular access points are proposed via a Trunk Connector Road (southern boundary) and Neighbourhood Connector Roads (western and northern boundaries), to be delivered under Flagstone City CA3 South (DEV2024/1491) by late 2027. A temporary construction access easement has been designed if required.

- **Earthworks** – Bulk earthworks cut/fill operations will be required on the site to achieve desired surface levels and interface with future external road levels. The proposed external road design is documented within development approval DEV2023/1414 & DEV2024/1491.

- **Flooding** – Engeny's Flood Memorandum indicates the site is well above design flood levels, with the proposed road crest at the site frontage designed at approximately 62m AHD or higher. As a result, the development is not expected to encounter any significant flood-related constraints.

- **Stormwater Infrastructure** – The proposed development will connect to the future external stormwater infrastructure on the southern Trunk Connector Road at the south-western corner of the site as per Colliers' Technical Memorandum and PEET's Concept Civil Drawings.

- **Stormwater Quality** – As detailed in the Flagstone City CA3 South SBSMP prepared by Engeny, the developed school site catchment has been accounted for in the stormwater quality assessment for the broader CA3 South development. Stormwater quality is addressed through a downstream bio-retention basin, with MUSIC modelling confirming the SPP's reduction targets are achieved.

  Stormwater Quantity – As detailed in Engeny's Flagstone City CA3 South SBSMP, the developed school site catchment has been accounted for in the stormwater quantity assessment for the broader CA3 South development. Stormwater quantity is addressed through the Flagstone City Masterplan FMS, with WBNM modelling confirming mitigated developed scenario peak flows do not exceed existing scenario flows. Therefore, no on-site stormwater quantity management infrastructure is proposed for the school.
- **Water Supply** – The development's internal network will connect to external infrastructure delivered under Flagstone City CA3 South (DEV2024/1491), in accordance with the endorsed Flagstone Water Supply and Sewer Networks Infrastructure Master Plan (May, 2023).

- **Sewer Reticulation** – The development's internal sewer network to external infrastructure delivered under Flagstone City CA3 South (DEV2024/1491), in accordance with the endorsed Flagstone Water Supply and Sewer Networks Infrastructure Master Plan (May, 2023).

- **Telecommunications, Electrical & Gas Supply** – Connections are subject to infrastructure to be delivered as part of Flagstone City CA3 South (DEV2024/1491).

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Glossary

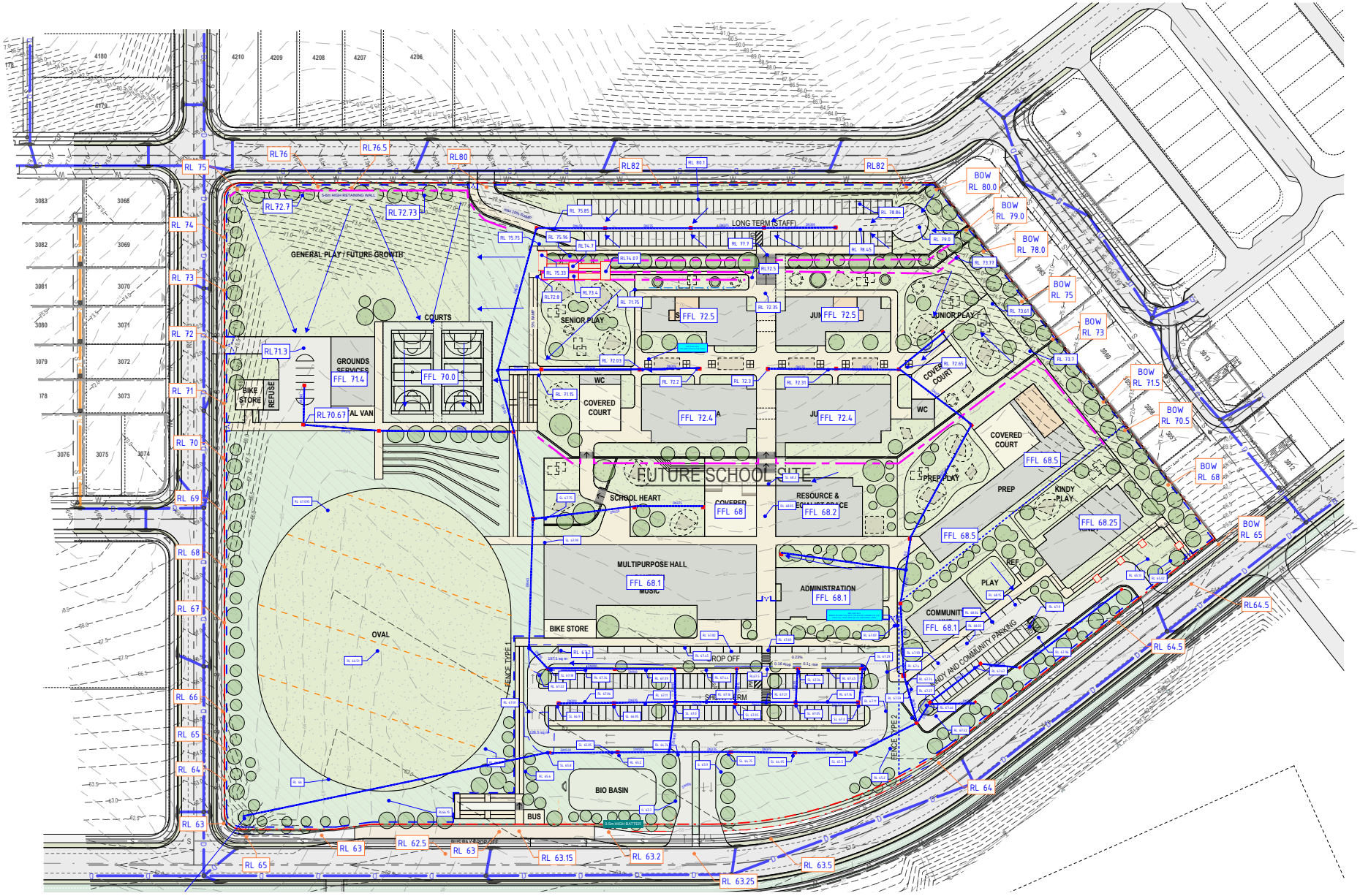
GLOSSARY

Term	Definition
AEP	Annual Exceedance Probability
LCC	Logan City Council
DoE	Department of Education
CER	Civil Engineering Report
QUDM	Queensland Urban Drainage Manual
SQID	Stormwater Quality Improvement Device
PMF	Probable Maximum Flood
ROL	Reconfiguration of a Lot
PDA	Priority Development Area
ASS	Acid Sulfate Soils
LPoD	Lawful Point of Discharge
WQO	Water Quality Objective
WBD	Water by Design
CA3	Context Area 3
WBNM	Watershed Bounded Network Model

LCC CODE RESPONSE TABLES

Code Ref.	Name
8.2.1	Acid Sulfate Soils Overlay Code
9.4.2	Filling and Excavation Code
9.4.3	Infrastructure Code

Appendix A – Concept Civil Design



REV	DESCRIPTION	ISSUED	VER'D	APP'D	DATE
A	ISSUED FOR INFORMATION	AT	SK	AT	23.02.2026
B	ISSUED FOR INFORMATION	AT	SK	AT	25.03.2026

DRAWN: A.Tatham
DESIGNED: A.Tatham
JOB MANAGER: A.Tatham
VERIFIER: S.Killoran

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Brisbane
Level 25, 12 Creek Street, Brisbane QLD 4000
GPO BOX 423 Brisbane QLD 4001
(07) 3365 0400 brisbane@northrop.com.au
ABN 81 094 433 100

PROJECT
GREATER FLAGSTONE SS

DRAWING TITLE
CIVIL CONCEPT SKETCH

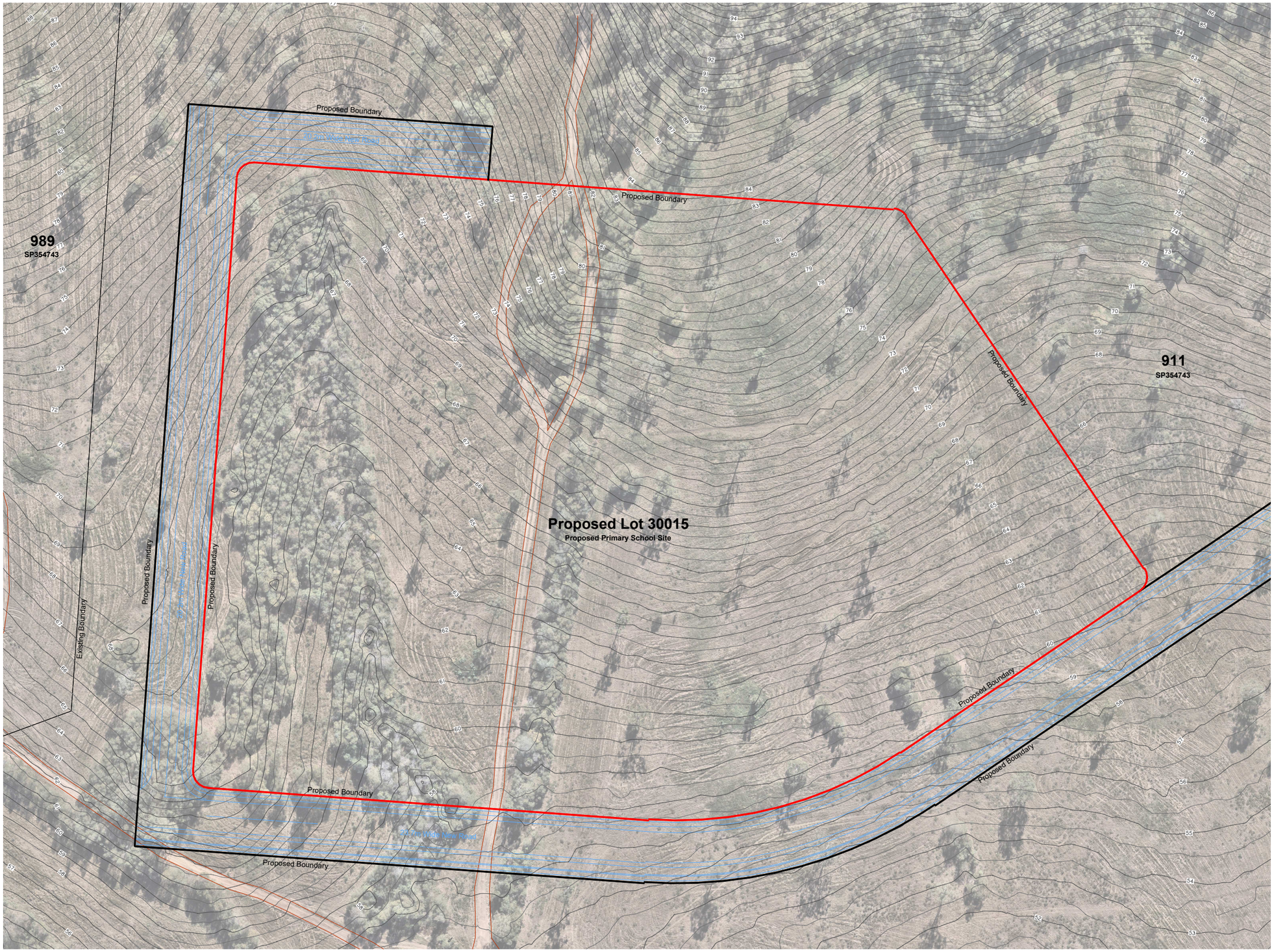
JOB NUMBER
251257

DRAWING NUMBER
SK01

REVISION
B

DRAWING SHEET SIZE = A1

Appendix B – Existing Site Survey



0 15 30 45 60 75m

SCALE 1:750 @A1

Linework
- Existing Lot Boundary
- Major Contour
- Minor Contour
- Proposed Lot Boundary
- Proposed Road
- Road Track

NOTES

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(2) Datum for all provided information is Plane Scale MGA2020. For true MGA coordinates and distances scale all information by 0.9996005. Datum point PSM 196248

(3) The contours and levels shown on this plan are derived from a 5m grid digital elevation model extracted from LiDAR captured by the Department of Resources over Logan LGA between 12/08/2023 and 13/08/2023. Quoted Vertical Accuracy: +/- 0.2m @ 95% CI (2 Sigma)

(4) Property Boundaries
The lot boundaries and descriptions shown on this plan are extracted from the Queenland Digital Cadastre and are a general representation of the boundaries only. General accuracies of each parcel of land are included in the digital data. Data extracted on 23-09-2025

A Cadastral Survey as defined by the Surveying and Mapping Infrastructure Act 2003 and Surveyors Act 2003 is required for accurate boundary positions and dimensions.

(5) Site Boundaries and Layout have been derived from provided plan "Att DCA3 School ROL Phase 2" and aligned to project datum using common points on the Queensland Digital Cadastre.

(6) All other site features have been digitised from Nearmap imagery captured on 19 July 2025. Digitised features and Nearmap imagery provided for site layout and context.

(7) Provided utility locations are generated from BYDA Responses - Enquiry 51243187. This plan generally complies with Australian Standard 5488: Classification of Subsurface Utility Information (SUI).

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CLIENT
GroupGSA (Brisbane)

PROJECT
Proposed Phase 2 Subdivision
Flagstone Primary School Site

PROJECT NO.
25-0325S

DRAWING NAME
Site Plan

Local Authority: Logan City
Datum: PM196248
Co-ord System: Plane Scale MGA2020
Description: Part of Lot 911 on SP354743
Origin: Supplied

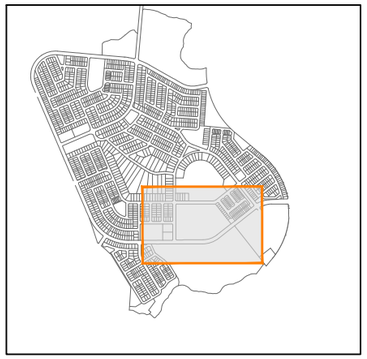
REVISION TABLE

REV	DESCRIPTION	DRAWN	APPROVED	DATE
A	Original Issue	KB	NM	09-10-2025

DRAWING NO.
25-0325S-01
SHEET NO.
1 of 1
REVISION
A

NORTH

Appendix C – PEET Concept Civil Drawings



KEY PLAN

SCALE 1:20000 (A1)
SCALE 1:40000 (A3)

LEGEND

- PROPOSED AREA OF WORKS
- PROPOSED RETAINING WALL 0.5 - 1.0m HIGH
- PROPOSED RETAINING WALL 1.0 - 1.5m HIGH
- PROPOSED RETAINING WALL 1.5 - 2.5m HIGH
- PROPOSED BOULDER WALL
- 24.60 PROPOSED FINISHED SURFACE LEVEL (FSL)
- 40.0 PROPOSED SURFACE CONTOUR
- 40.0 EXISTING SURFACE CONTOUR
- PROPOSED AREA OF CUT
- PROPOSED AREA OF FILL
- ENVIRONMENTAL CONSTRAINTS EXTENTS
- FLOOD EXTENTS

FUTURE SCHOOL SITE

REV	DATE	DESIGN	DRAWN	REVISION DETAILS
A	21.08.25	TR	TR	ORIGINAL ISSUE

DRAWN

DESIGN

STATUS
FOR DEVELOPMENT APPLICATION
NOT FOR CONSTRUCTION

APPROVED
DANIEL COLLINS RPEQ 18631

FOR AND ON BEHALF OF COLLIERS INTERNATIONAL ENGINEERING & DESIGN PTY LTD

Colliers

SCALE
1:1000 10 0 10 20 30 40 50 A1
1:2000 A3

CLIENT
PEET FLAGSTONE CITY Pty. Ltd.

ASSOCIATED CONSULTANT
VERIS
(07) 3666 4700

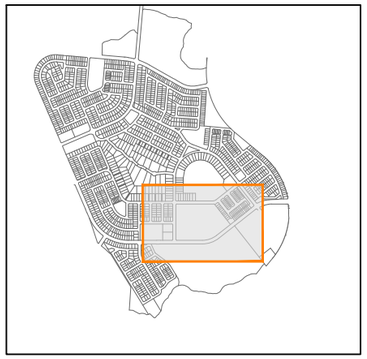
PROJECT NAME
CONTEXT AREA 3

NEW BEITH ROAD
FLAGSTONE

DRAWING TITLE
SCHOOL SITE - SURROUNDING CONCEPT BULK EARTHWORKS LAYOUT PLAN

PROJECT No.	DRAWING No.	REVISION
20-0211	SK-121	A

PLOT - 21 Aug 2025 12:13 PM LOCATION - H:\20\20-0211 Flagstone - Context Area 3\Design\Acad\Sketch\20-0211-SK120 - SCHOOL SITE - BULK EW.dwg



KEY PLAN
SCALE 1:20000 (A1)
SCALE 1:40000 (A3)

LEGEND

- PROPOSED AREA OF WORKS
- PROPOSED SEWER MAIN
- PROPOSED WATER MAIN
- INDICATIVE DRIVEWAY LOCATION
- 24.6 FINISHED SURFACE CONTOUR
- PROPOSED STORMWATER DRAINAGE PIPE
- EXISTING TRUNK SEWER
- PROPOSED RETAINING WALL
- ENVIRONMENTAL CONSTRAINTS EXTENTS
- FLOOD EXTENTS

FUTURE SCHOOL SITE

REV	DATE	DESIGN	DRAWN	REVISION DETAILS
A	21.08.25	TR	TR	ORIGINAL ISSUE

DRAWN

DESIGN

STATUS
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SCALE
1:1000 10 0 10 20 30 40 50 A1
1:2000 A3

CLIENT
PEET FLAGSTONE CITY Pty. Ltd.

ASSOCIATED CONSULTANT
VERIS
(07) 3666 4700

PROJECT NAME
CONTEXT AREA 3

NEW BEITH ROAD
FLAGSTONE

DRAWING TITLE
SCHOOL SITE - SURROUNDING CONCEPT SEWERAGE AND WATER RETICULATION LAYOUT

PROJECT No.	DRAWING No.	REVISION
20-0211	SK-122	A

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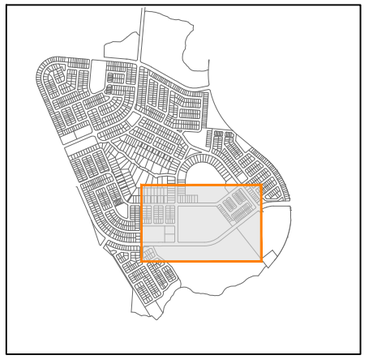

KEY PLAN
SCALE 1:20000 (A1)
SCALE 1:40000 (A3)

LEGEND

- PROPOSED AREA OF WORKS
- PROPOSED ROAD CONTROL LINE
- PROPOSED NEW ROAD PAVEMENT
- INDICATIVE DRIVEWAY LOCATION
- 24.0 FINISHED SURFACE CONTOUR
- PROPOSED STORMWATER DRAINAGE PIPE
- PROPOSED RETAINING WALL
- ENVIRONMENTAL CONSTRAINTS EXTENTS

ROAD 04
ROAD 23
ROAD 32
ROAD 01
FUTURE SCHOOL SITE
ADDITIONAL PEDESTRIAN FACILITY ADJACENT BUS STOP
89.00m ON-STREET 2.5m WIDE BUS BAY

REV	DATE	DESIGN	DRAWN	REVISION DETAILS
A	21.08.25	TR	TR	ORIGINAL ISSUE
B	18.12.25	BC	BC	REVISED ISSUE
C	16.03.26	KH	KH	ROAD PROFILES UPDATED

DRAWN
DESIGN

STATUS
FOR DEVELOPMENT APPLICATION
NOT FOR CONSTRUCTION

APPROVED
DANIEL COLLINS RPEQ 18631

FOR AND ON BEHALF OF COLLIERS INTERNATIONAL ENGINEERING & DESIGN PTY LTD

Colliers

SCALE
1:1000 10 0 10 20 30 40 50 A1
1:2000 A3

CLIENT
PEET FLAGSTONE CITY Pty. Ltd.

ASSOCIATED CONSULTANT
RPS CONSULTING
(07) 3539 9500

PROJECT NAME
CONTEXT AREA 3

NEW BEITH ROAD
FLAGSTONE

DRAWING TITLE
SCHOOL SITE - SURROUNDING CONCEPT ROADWORKS AND DRAINAGE LAYOUT PLAN

PROJECT No.	DRAWING No.	REVISION
20-0211	SK-120	C

PLOT - 16 Mar 2026 03:44 PM LOCATION - H:\2020\0211 Flagstone - Context Area 3\Design\Acad\Sketch\20-0211-SK-120 - SCHOOL SITE - RWD.dwg

Appendix D – Architectural Concept Layout

1 OVERALL 90% MASTERPLAN
1 : 1000

Amendments

Issue	Description	Date

PRELIMINARY

Consultant
Consultant Company
Consultant Details

Consultant
Consultant Company
Consultant Details

Consultant
Consultant Company
Consultant Details

Consultant
Consultant Company
Consultant Details

Client
PC BUNDLE - GREATER FLAGSTONE SS
Client Details

GROUP GSA
Group GSA Pty Ltd ABN 76 002 113 779
Level 07, 260 Queen St Brisbane QLD
Australia 4000
www.groupgsa.com

T +617 3112 3079

architecture interior design urban design landscape
nom architect Lisa-Maree Carrigan 5696

Project Title
GREATER FLAGSTONE STATE SCHOOL

Drawing Title
MASTERPLAN 90%

Scale 1 : 1000
Drawing Created (date)
Drawing Created (by)
Plotted and checked by Designer
Verified Checker
Approved Approver
Project No Drawing No Issue
A252250 2001

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20/03/2026 11:07:13 AM

1 OVERALL 90% MASTERPLAN STAGE 1
1 : 1000

Amendments

Issue	Description	Date

PRELIMINARY

Consultant
Consultant Company
Consultant Details

Consultant
Consultant Company
Consultant Details

Consultant
Consultant Company
Consultant Details

Consultant
Consultant Company
Consultant Details

Client
PC BUNDLE - GREATER FLAGSTONE SS
Client Details

GROUP GSA
Group GSA Pty Ltd ABN 76 002 113 779
Level 07, 260 Queen St Brisbane QLD
Australia 4000
www.groupgsa.com

T +617 3112 3079

architecture interior design urban design landscape
nom architect Lisa-Maree Carrigan 5696

Project Title
GREATER FLAGSTONE STATE SCHOOL

Drawing Title
MASTERPLAN - STAGE 1
90%

Scale 1 : 1000

Drawing Created (date)

Drawing Created (by)

Plotted and checked by Designer

Verified Checker

Approved Approver

Project No | Drawing No | Issue
A252250 | 2002

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1 OVERALL 90% MASTERPLAN STAGE 2
1 : 1000

Amendments

Issue	Description	Date

PRELIMINARY

Consultant
Consultant Company
Consultant Details

Consultant
Consultant Company
Consultant Details

Consultant
Consultant Company
Consultant Details

Consultant
Consultant Company
Consultant Details

Client
PC BUNDLE - GREATER FLAGSTONE SS
Client Details

Group GSA Pty Ltd ABN 76 002 113 779
Level 07, 260 Queen St Brisbane QLD
Australia 4000
www.groupgsa.com

T +617 3112 3079

architecture interior design urban design landscape
nom architect Lisa-Maree Carrigan 5696

Project Title
GREATER FLAGSTONE STATE SCHOOL

Drawing Title
MASTERPLAN - STAGE 2 90%

Scale 1 : 1000

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Drawing Created (by)

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Approved Approver

Project No | Drawing No | Issue
A252250 2003

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20/03/2026 11:07:22 AM

1 OVERALL 90% MASTERPLAN STAGE 3

1 : 1000

Amendments

Issue	Description	Date

PRELIMINARY

Consultant

Consultant Company
Consultant Details

Consultant

Consultant Company
Consultant Details

Consultant

Consultant Company
Consultant Details

Consultant

Consultant Company
Consultant Details

Client

PC BUNDLE - GREATER FLAGSTONE SS
Client Details

GROUPGSA

Group GSA Pty Ltd ABN 76 002 113 779
Level 07, 260 Queen St Brisbane QLD
Australia 4000
www.groupgsa.com

T +617 3112 3079

architecture interior design urban design landscape
nom architect Lisa-Maree Carrigan 5696

Project Title

GREATER FLAGSTONE STATE SCHOOL

Drawing Title

MASTERPLAN - STAGE 3 90%

Scale	1 : 1000
Drawing Created (date)	
Drawing Created (by)	
Plotted and checked by	Designer
Verified	Checker
Approved	Approver

Project No	Drawing No	Issue
A252250	2004	

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20/03/2026 11:07:29 AM

Appendix E – Geotechnical Report

SOIL SURVEYS
Geotechnical Specialists

Report for Geotechnical Investigation
Proposed Greater Flagstone State School

1-45 Poinciana Drive, Flagstone

Group GSA Pty Ltd

Project No: 1-29174
Ref: 1-29174 BR 1.1
Date: 20 November 2025

Soil Surveys Engineering Pty Limited
ABN 70 054 043 631
soilsurveys.com.au
Brisbane, Level 1, 87 Schneider Road, Eagle Farm, QLD, 4009
Gold Coast, Unit 8, 140 Millaroo Drive, Helensvale, QLD, 4212
07 3369 6000

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Site Plan

Distribution List

Ver	Organisation	Contact	Email	Date
1.1	Group GSA Pty Ltd	Giuseppe Mangini	GMangini@groupgsa.com	20/11/2025

1.0 Introduction

1.1 General

This report presents the results of the geotechnical investigation carried out by Soil Surveys Engineering Pty. Limited for the Proposed Greater Flagstone State School at Greater Flagstone State School, 1-45 Poinciana Drive, Flagstone.

The investigation was carried out in accordance with Soil Surveys Engineering Pty Limited proposal 1-29174 PR 1.1 as requested by Group GSA Pty Ltd. Confirmation to proceed with the investigation was received from Group GSA Pty Ltd on the 25th September 2025.

1.2 Proposed Development

It is understood that the proposed development will comprise the construction of Greater Flagstone State School, 1-45 Poinciana Drive, Flagstone.

The site covers an area of 7 hectares and it is understood the school will consist of a number of two to three story buildings, that may include:

- GLA Buildings
- Administration and Support Services
- Resource Information Centre
- Sports/Play Facilities including Multi-Purpose Hall
- Covered Area
- Stem & Amenities Building
- Visitor & Staff Parking
- Green Space

A general layout plan is presented within Figure 1 below.

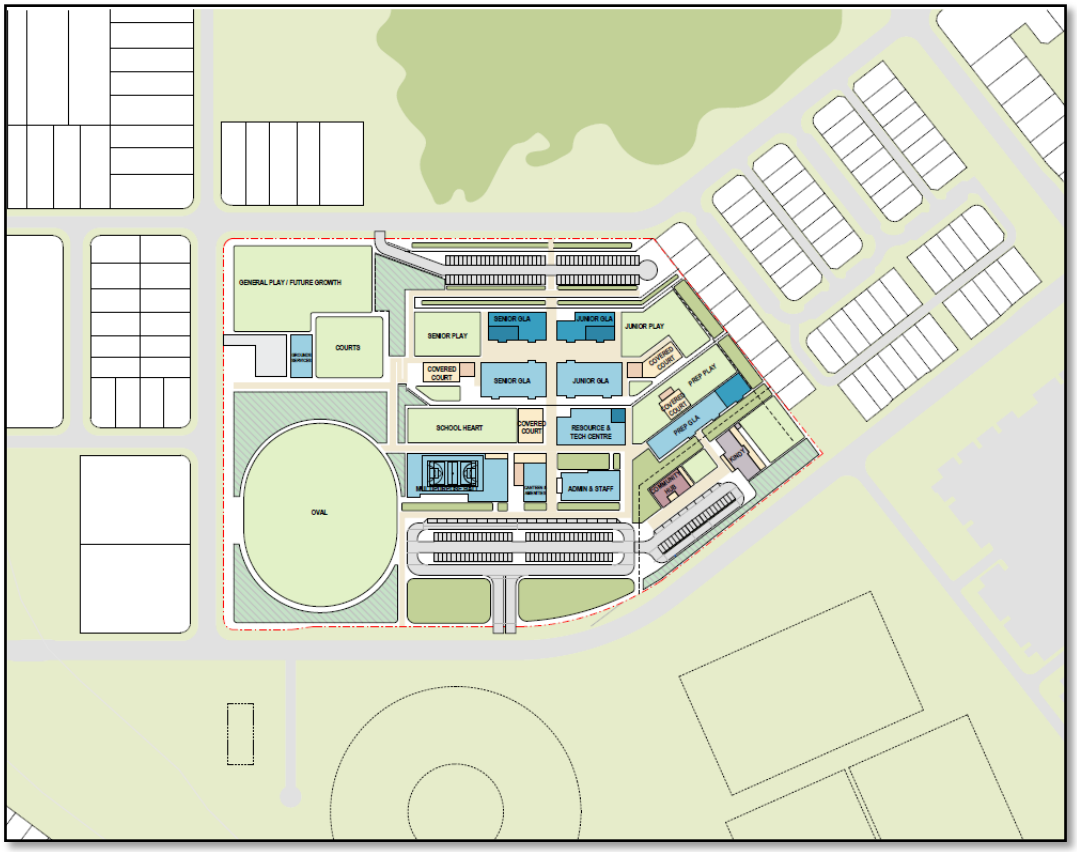

Figure 1 - Site Layout

1.3 Scope of Geotechnical Services

The objective of this study was to identify materials and material properties and groundwater conditions to enable geotechnical assessment of the following: -

- Earthworks recommendations
  - trafficability
  - subgrade preparation
  - compaction standards
  - excavatability
  - suitability of cut for use as fill
  - temporary safe batter angles for cuts
  - fill batter slopes
  - erosion potential
- Foundation recommendations
  - recommended foundation type (high and deep support)
  - bearing capacity
  - skin friction
  - site classification (AS 2870)
  - site subsoil class (AS 1170.4-20)
  - predicted ground surface movement

- Retaining wall design parameters
- Pavement recommendations
- Construction recommendations (where applicable)
- Site management recommendations

2.0 Site Description

The site is located at Greater Flagstone State School, 1-45 Poinciana Drive, Flagstone (refer Figure 2).

Figure 2 - Site Location Imagery, Dated 30th August 2025 on Nearmap

At the time of the investigation, the majority of the site was covered with various sized bushes and grasses, with large trees scattered across the area.

The Queensland Globe Contours Overlay indicates that the ground elevation rises from approximately R.L. 60m in the southern section of the site to approximately R.L. 80m in the northern section of the site.

Site observations indicate that the terrain exhibits steep gradients across different areas of the site.

Figures 2, 3, 4, and 5 indicate existing site conditions.

Figure 3 - BH01 Location, located in the northwest of the site.

Figure 4 - BH14 Location, located in the southwest of the site.

Figure 5 - BH10 Location, located at the centre of the site.

Figure 6 - BH16 Location, located at the southeast of the site.

3.0 Field Investigation

Subsurface conditions at the site were investigated by drilling and sampling twenty (20) boreholes to depths of between 0.30m and 6.00m within the proposed structure areas, using a 4WD mounted drilling rig.

All Boreholes except BH15 and BH19 terminated at 'TC' bit refusal depths of between 0.25m and 4.60m.

In addition, dynamic cone penetrometer (DCP) tests were carried out adjacent to each borehole.

The field work was carried out on the 22nd and 23rd of October 2025.

The soil classification descriptions, field and laboratory testing were carried out in general accordance with the following Australian Standards: -

- AS 1726-2017 - Geotechnical Site Investigations
- AS 1289 - Methods of Testing Soils for Engineering Purposes

A description of the investigation method, borehole records and a site plan showing the location of the boreholes are included in the Appendices.

Borehole coordinates were recorded using a handheld GPS device, with accuracy consistent with such devices.

4.0 Geotechnical Model

4.1 Local Geology

Reference to the Geological Survey of Queensland 1:100 000 series Geological Map (Ipswich 100K) indicate that the site is underlain by Marburg Formation (Jbm) typically comprising 'Lithic or feldspathic, labile to sublabile sandstone, siltstone, shale, and coal'.

4.2 Subsurface Profile

The subsurface profile intersected during the drilling program consisted of: -

- Fill - Encountered in each borehole (not encountered at BH01) to depths of between 0.05m and 0.30m. The fill encountered predominantly consisted of Loose, Medium Dense Silty Sand and Medium Dense Sand.

  The filling is considered to be 'uncontrolled'.
- Natural Soils - The natural soil profile was variable comprising:-
  - Silty Sand (SM) - medium dense
  - Sand (SP) - medium dense to dense
  - Clayey Sand (SC) - medium dense to dense
  - Sandy Clay (CH, CI, CL) - low to highly plastic and very stiff or hard
- Weathered Rock - Weathered Sandstone was encountered in all borehole locations with the exception of BH15 and BH19. Assessed as extremely weathered (XW), and distinctly weathered (DW), low strength. As the majority of the boreholes refused (drill rig refusal) within the DW stratum, stronger rock is expected to be encountered below the refusal depth.

A summary of the subsurface profile is presented in Table 1 with detailed borehole records included in Appendix B.

Table 1 Summary of Subsurface Profile

Location	Fill (m)	Silty Sand / Sand / Clayey Sand (m)	Clay (m)	Weathered Rock (m)		Termination Depth (m)
				XW[4]	DW	
BH01	NE	0.00-2.20	NE	2.20-2.40	2.40-TD	2.50[3]
BH02	0.00-0.20	NE	NE	NE	0.20-TD	0.25[3]
BH03	0.00-0.20	NE	NE	0.20-0.40	0.40-TD	0.50[3]
BH04	0.00-0.20	0.20-0.80	NE	NE	0.80-TD	0.90[3]
BH05	0.00-0.30	0.30-3.90	NE	NE	3.90-TD	4.00[3]
BH06	0.00-0.20	0.20-0.45	NE	NE	0.45-TD	0.70[3]
BH07	0.00-0.20	0.20-0.50	NE	NE	0.50-TD	0.55[3]
BH08	0.00-0.05	0.05-0.50	0.50-2.30	NE	2.30-TD	2.50[3]
BH09	0.00-0.30	NE	0.30-0.75	NE	0.75-TD	0.85[3]
BH10	0.00-0.20	0.20-0.50	0.50-1.00	NE	1.00-TD	1.10[3]
BH11	0.00-0.30	NE	0.30-0.60	0.60-0.80	0.80-TD	0.90[3]
BH12	0.00-0.05	NE	0.05-0.20	NE	0.20-TD	0.30[3]
BH13	0.00-0.30	3.80-4.20	0.30-3.80	NE	4.20-TD	4.40[3]
BH14	0.00-0.20	0.20-1.00	NE	NE	1.00-TD	1.10[3]
BH15	0.00-0.20	0.20-0.60 1.30-4.80	0.60-1.30 4.80-TD	NE	NE	6.00
BH16	0.00-0.20	0.20-1.00	NE	NE	1.00-TD	1.10[3]
BH17	0.00-0.20	0.20-0.50 2.60-3.90	0.50-2.60 3.90-4.50	NE	4.50-TD	4.60[3]
BH18	0.00-0.20	0.20-0.60	NE	NE	0.60-TD	0.70[3]
BH19	0.00-0.20	0.20-0.80 1.20-TD	0.80-1.20	NE	NE	6.00
BH20	0.00-0.20	0.20-0.50	0.50-1.20	1.20-1.60	1.60-TD	1.70[3]

Notes:-
1. NE = Not Encountered; TD = Termination Depth.
2. All depths below existing ground level at date of drilling.
3. 'TC' bit refusal.
4. AS 1726-2017 'Geotechnical Site Investigations' requires that XW rock be described using soil terms

4.3 Groundwater

Groundwater was not encountered at borehole locations at the time of the investigation. Whilst groundwater was not encountered in the boreholes, it should be noted that groundwater may be present; please note that the period of time available (during the drilling of boreholes) is relatively short, and hence, the opportunity to observe the presence (or otherwise) of groundwater is limited.

However seepage may be encountered, particularly within the sand layers, following rain. It should also be noted that groundwater levels can vary both seasonally and with prevailing weather conditions and, if construction is to be undertaken at a “significant” time following this investigation, or following ‘wet’ weather, then it would be prudent to confirm groundwater levels prior to construction.

4.4 Laboratory Testing

4.4.1 General

Laboratory testing was carried out on selected samples retrieved from the field investigation programs and was directed towards assessing the following:-

- Emerson Class
- pH
- Conductivity
- Moisture Content
- Soaked CBR
- Shrink Swell Index
- Unit Weight

Laboratory testing was carried out in accordance with AS 1289 Methods of Testing Soils for Engineering Purposes.

Laboratory test certificates are contained in Appendix C.

4.4.2 Emerson Class Number, pH, and Conductivity

Selected samples retrieved from the field investigation program were tested for dispersiveness using the Emerson Class Number test method, i.e. AS 1289.3.8.1.

The test method AS1289.3.8.1 divides soils into seven classes on the basis of their coherence in water, with one further class being distinguished by the presence of calcium - rich minerals, i.e.:-

Table 2 Emerson Classification

Class	Description
Class 1	- slaking and complete dispersion of natural soil crumbs in still water - very high potential for erosion
Class 2	- slaking and some dispersion of natural soil crumbs in still water - very high potential for erosion
Class 3	- slaking but no dispersion of natural soil crumbs in still water - dispersion of moistened, remoulded soil crumbs in still water - high potential for erosion
Class 4	- slaking but no dispersion of natural soil crumbs in still water - no dispersion of moistened, remoulded soil crumbs in still water - calcite or gypsum present - medium potential for erosion -
Class 5	- slaking but no dispersion of natural soil crumbs in still water - no dispersion of moistened, remoulded soil crumbs in still water - no calcite or gypsum present - dispersion of soil/water suspension after shaking - medium potential for erosion
Class 6	- slaking but no dispersion of natural soil crumbs in still water - no dispersion of moistened, remoulded soil crumbs in still water - no calcite or gypsum present - flocculation of soil/water suspension after shaking - medium potential for erosion
Class 7	- no slaking and swelling of natural soil crumbs in still water - low potential for erosion
Class 8	- no slaking and no swelling of natural soil crumbs in still water - low potential for erosion

The results of the Emerson Class Number testing are contained in Table 3.

Table 3 Emerson Class Number

Location	Sample Depth (m)	Emerson Class Number	pH	Conductivity (mS/cm)
BH01	0.00-0.20	4	6.5	0.04
BH01	0.30-0.50	4	7.0	0.02
BH03	0.00-0.20	4	6.2	0.05
BH03	0.30-0.50	3	6.7	0.03
BH09	0.00-0.20	4	6.6	0.05
BH09	0.30-0.50	3	6.8	0.03
BH13	0.00-0.20	3	6.2	0.03
BH13	0.30-0.50	3	6.7	0.03
BH15	0.00-0.20	3	6.5	0.04
BH15	0.30-0.50	3	6.9	0.02
BH18	0.00-0.20	4	6.5	0.03
BH18	0.30-0.50	4	6.2	0.03

4.4.3 California Bearing Ratio

Selected samples retrieved from the field investigation program were submitted for testing to determine the Soaked CBR values of the subgrade material (AS 1289 6.1.1).

The results of this testing are presented in Table 4.

Table 4 California Bearing Ratio

Location	Sample Depth (m)	Soaked CBR Value (%)	Swell (%)
BH08	0.50-1.00	2.5	3.5
BH13	0.30-0.80	9	1.0
BH15	0.60-1.00	8	0.0
BH17	0.50-1.00	7	0.0

4.4.4 Shrink Swell Index

Selected samples retrieved from the field investigation were submitted for shrink swell index testing (AS 1289.7.1.1).

The results for the above laboratory testing are summarised in Table 5.

Table 5 Shrink Swell Index

Location	Sample Depth (m)	Unit Weight (t/m^3)	Shrink Swell Index (%)	Swell Pressure (kPa)
BH09	0.60-0.74	1.95	1.9	20
BH11	0.60-0.70	1.92	1.1	60
BH15	0.80-1.00	2.26	0.2	30
BH17	1.00-1.45	2.03	1.8	20

5.0 Engineering Assessment

5.1 Trafficability

Trafficability conditions were considered to be fair during the investigation however, some problems may be anticipated during wet weather for even light weight 4WD vehicles.

The silty sands on site are sensitive to repetitive vehicle loading and water (i.e. they will lose strength through repetitive vehicle loading or if they become overly moist or wet). Further, seepage may also result in a subsequent loss of strength. This may limit trafficability and create difficulties for earthworks operations. This situation would be more pronounced if rainfall followed initial clearing, stripping and grubbing.

Problems may also arise from disturbance of the upper level soil fabric with removal of vegetation. Depressions could be formed resulting in water traps and potential softening of adjacent and underlying soils.

Removal of the upper level soils, i.e. the silty/clayey sand, and placement of a bridging layer, may be required to allow access for light weight construction vehicles should these soils become saturated and weakened at the time of construction. We recommend that the earthworks contract includes a PC item to account for the removal.

It is recommended that after stripping, clearing and grubbing, the exposed surface in the construction area be proof rolled (where appropriate) to assist in identifying weak areas and to improve trafficability. In areas of cut, proof rolling may be deferred until after the cut operation.

An important aspect of maintaining trafficability is seepage/drainage control.

It is recommended that subsurface drains be installed to intercept seepage as early as possible in the construction phase; drains may take a number of weeks before any positive affect is achieved. The location, depth and spacing of drains is dependent on prevailing weather conditions, subsurface conditions, proposed earthworks and the degree of risk willing to be accepted by the earthworks contractor.

Use of dedicated construction tracks to control site traffic is recommended.

Maintaining adequate drainage conditions is essential. It should be ensured that runoff is diverted away from the construction area to prevent ponding of water. In addition, the construction area should be "sealed" at the completion of each day and in the event of rain.

Potential trafficability problems with this site should not be underestimated. The site will very quickly become untrafficable if appropriate seepage and drainage control measures, along with construction practices appropriate for site conditions, are not maintained.

Nevertheless, the contractor should fully inform themselves of the ground conditions on site prior to commencement of earthworks. This requirement should be explicit in any earthworks specifications or contract.

Working Platforms For Tracked Plant and Heavy Construction Vehicles

The scope of Soil Surveys Engineering's study DOES NOT include the design of a working platform for heavy construction vehicles or heavy tracked plant.

Detailed design of a working platform should be carried out considering the operation of actual machinery proposed to be used. This is particularly important when considering the use of heavy piling rigs and heavy cranes - the piling/crane contractor should be consulted regarding their requirements.

Demolition and Clearing Activities

Extreme care should be exercised during the demolition/clearing phase to ensure that excessive subgrade disturbance is not caused during removal of existing structures, trees, services, etc.

5.2 Earthworks

5.2.1 General

Earthworks are unknown at the time of the investigation. The following provides general recommendations with respect to earthworks and should be reviewed once the earthworks extent has been established.

Earthwork procedures should be carried out in a responsible manner in accordance with AS 3798-2007 "Guidelines on Earthworks for Commercial and Residential Developments" and include the following:-

Note: The surface silty sands will cause problems with trafficability/workability should this material be wet/become wet prior to or during construction.

Should the Silty Sand material be wet/saturated the material will need to be either:-

- Allowed to dry (significant time and favourable weather conditions may be required).
- Excavated and replaced with imported fill material.

In our opinion, the area of major risk from a Geotechnical Engineering perspective associated with site development/construction are the earthworks operations. Site conditions leading up to and at the time of construction will need to be favourable, i.e. fine/dry conditions, weather conditions are unfavourable, the complete or near complete removal and replacement of the silty sands may be required.

5.2.2 Erosion & Sediment Control

Emerson Class Number

Selected samples retrieved from the field investigation program were tested for dispersiveness using the Emerson Class Number test method, i.e. AS 1289.3.8.1 and are summarised in Table 6.

The test method AS1289.3.8.1 divides soils into seven classes on the basis of their coherence in water, with one further class being distinguished by the presence of calcium - rich minerals, i.e.:-

Table 6 Emerson Classification

Class	Description	Erosion Potential	Dispersibility[1]	Soil Usage[2]
Class 1	slaking and complete dispersion of natural soil crumbs in still water	Very High	Very High	High susceptible to tunnelling
Class 2	slaking and some dispersion of natural soil crumbs in still water	Very High	High to Very High	Susceptible to tunnelling
Class 3	slaking but no dispersion of natural soil crumbs in still water, dispersion of moistened, remoulded soil crumbs in still water	High	Moderate to High	Generally stable
Class 4	slaking but no dispersion of natural soil crumbs in still water, no dispersion of moistened, remoulded soil crumbs in still water, calcite or gypsum present	Medium	Moderate	Soil may not hold water
Class 5	slaking but no dispersion of natural soil crumbs in still water, no dispersion of moistened, remoulded soil crumbs in still water, no calcite or gypsum present, dispersion of soil/water suspension after shaking	Medium	Slight	Soil may not hold water
Class 6	slaking but no dispersion of natural soil crumbs in still water, no dispersion of moistened, remoulded soil crumbs in still water, no calcite or gypsum present flocculation of soil/water suspension after shaking	Medium	Negligible	Soil unlikely to hold water
Class 7	no slaking and swelling of natural soil crumbs in still water	Low	Negligible	-
Class 8	no slaking and no swelling of natural soil crumbs in still water	Low	Negligible	-

[1] BPESC Table C12
[2] BPESC Table C13 - provides an idea of usage of soils in soil conservation earthworks.

The samples tested returned a value of 3 and 4 were recorded for the samples tested and as Table 6 indicates the samples would be deemed to have a **high to medium** erosion potential and **moderate to high** dispersibility.

Construction activities and erosion/sediment control measures should be implemented in a manner consistent with good building practices and Authority requirements.

Erosion & Sediment Control Recommendations

An erosion control program should include but not be limited to the following general recommendations:-

- Minimise disturbance - where possible the development should utilise existing topography and avoid extreme land shaping and surface modifications. Minimise the removal or disturbance of trees and ground cover to reduce erosion potential.
- Slope runoff should be diverted around the development site.
- Drainage controls should be installed early in the site development.
- Install sediment barriers as required; barriers to also be positioned around soil stockpiles.
- Entry and exit points are to be minimal and stabilised with coarse gravel and stone. Limit site entry and on-site traffic movement.
- All drainage, erosion and sediment control measures should be regularly checked and maintained throughout the construction period.
- Re-vegetation is to be carried out promptly and progressively during construction.
- It is essential that batters be suitably protected from erosion and scour by the establishment of ground cover and shrubs, installation of surface drains, placement of rock protection, placement of gravel capping, etc. Runoff should not be allowed to discharge directly across unprotected batters.
- Clearly define flow/drainage paths on development drawings. Establishment of vegetation along flow/drainage paths is recommended - vegetation will reduce flow velocity.
- Avoid concentration of flow from multiple drainage paths.
- Where soils/final platform are not protected from erosion by the establishment of vegetation or pavements, placement of “gravel capping” or working platform is recommended.
- Use of dedicated tracks (during and post construction) is recommended to control site traffic; vehicle tracks may trigger erosion.

5.2.3 Subgrade Preparation

Subgrade preparation procedures should include the following:-

- Clearing, stripping and grubbing should be carried out in areas subject to earthworks (as trafficability conditions allow). Also all soils containing organic matter (up to 0.4m thick) should be stripped from the construction area; this material is not considered suitable for use as structural fill.

- Depressions formed by the removal of vegetation, etc. should have all disturbed weakened soil cleaned out and be backfilled with compacted select material.
- Any fill material encountered should be considered uncontrolled and requiring treatment (i.e. excavate/condition/replace/compact as required).
- The subgrade should be proof rolled (where appropriate) under the supervision of Soil Surveys Engineering in accordance with methods and equipment as per Clause 5.5 of AS 3798-2007. In areas of cut, proof rolling may be deferred until after the cut operation. Areas demonstrating excessive movement should be treated (dried and recompacted) or removed and replaced with compacted fill. Treatment should be to a standard sufficient so that the subgrade passes proof rolling and that compaction can be achieved in the first layer of fill.
- Please note that the on site silty sands are very sensitive to water and will lose strength if they become wet. Should these soils be wet at time of construction, significant works to treat these soils would be required.
- Sloping ground, etc. should be benched to “key in” fill material and optimise compaction. The benches should slope back at 1V:10H and be at least 0.5m wide. Wider benches to accommodate the width of the roller may need to be adopted in some situations (Figure 7).

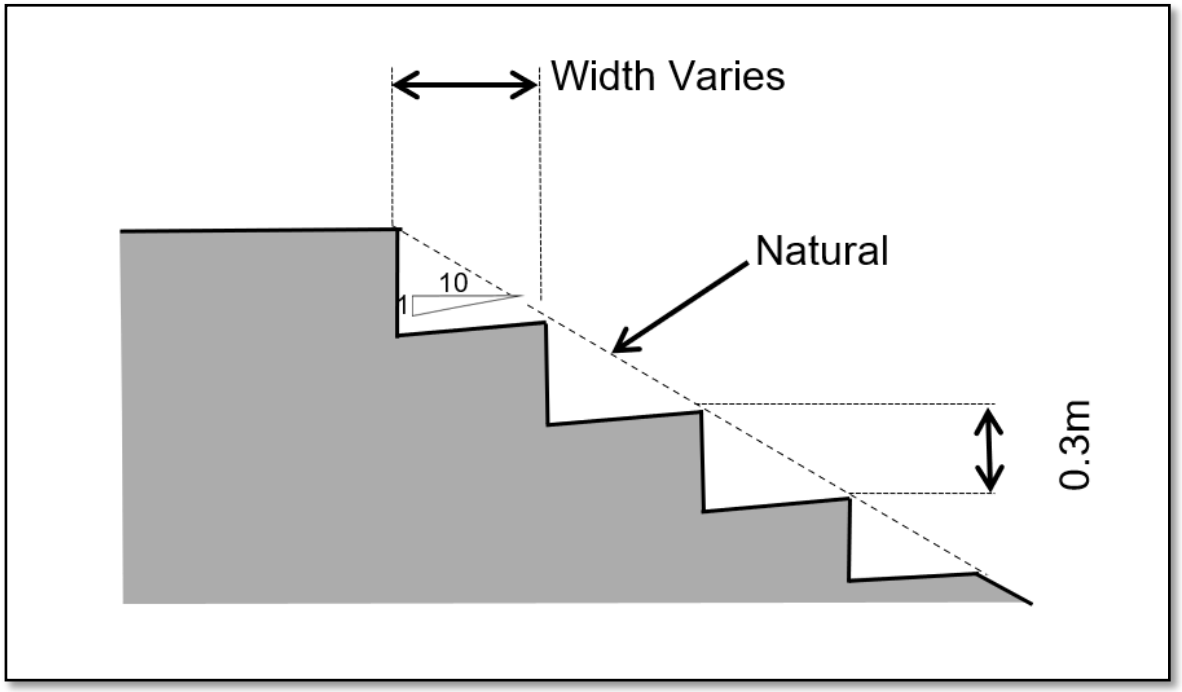

Figure 7

5.2.4 Material Usage

- Due to the water sensitive nature of the silty sand soils, **it is recommended that insitu silty sand/clayey sand NOT be used as structural fill**.
- Blending of the silty sands with the clay soils could be considered to produce appropriate fill material.

- The insitu clay soils, where free of organic and deleterious material, may be used for structural fill provided the moisture content of the soils on placement approximates the optimum moisture content required for compaction. This will require conditioning to bring the soils to optimum. However, it should be noted that the on site soils could be expected to present difficulties in handling, placement and compaction if the appropriate moisture content could not be achieved, particularly if the soils were overly moist.
- With use of reactive clay soils, close control of moisture content during placement and compaction is required so as to minimise the potential for swelling and shrinkage movement. A moisture content within the range of OMC (Standard Optimum Moisture Content) -1% to OMC +2% is recommended.
- The weathered sandstone may constitute the bulk of the borrow material won from the site excavations. It is considered that the extremely and distinctly weathered material will break down sufficiently during the earthworks operations using large compactors.

  The weathered rock, where broken down on extraction, may be used in areas of structural fill provided no rock over 75mm greatest dimension is included above a plane 300mm below the final subgrade/platform. Below this plane, rocks up to 150mm greatest dimension may be used. These rocks should however not represent more than 20% of the fill make-up. Rocks over 150mm greatest dimension, which cannot be broken down, should be removed.
- Imported general fill material (if required) should be cohesive in nature and be a good quality low plasticity (Liquid Limit of less than 45%, Plasticity Index of less than 15%, Shrink/Swell Index of less than 1.0%) select fill material with a Soaked CBR >10% and a maximum particle size of 75mm.
- Quality testing to confirm imported fill quality should be carried out prior to delivery to site; frequency of testing is subject to assessment by Soil Surveys Engineering, however, a sufficient number of tests should be carried out so that all parties are confident of material characteristics. Quality test results should be reviewed by Soil Surveys Engineering. Contractors should submit details of their proposed fill source (with quality certificates) with their tender submission. The proposed fill source should be reviewed by Soil Surveys Engineering prior to awarding the earthworks contract.
- Pavements gravels should comply with appropriate local council quality specifications for base, sub-base and blanket materials.

5.2.5 Compaction Procedures & Specifications

- Provided the placement moisture content of the imported fill or select insitu material approximates the optimum moisture content for compaction, suitable compaction should be achievable using typical compaction machinery. The fill material should be compacted in layers not exceeding 250mm, loose thickness. However, layer thicknesses will be dependent on the compaction plant type and size, use of vibration, material type and condition. Final maximum placement layer thicknesses will need to be determined when compaction plant as well as material type and conditions are known. Fill batters should be overfilled and cut-back to design batter angles.
- Guidelines for minimum relative compaction values for insitu soils and imported general fill for the building and pavements are presented in Table 7.

Table 7 Minimum Relative Compaction

Location	Minimum Dry Density Ratio
General Fill/Subgrade	98 (1)
Base Course	98 (2)
Subbase	98 (2)

Notes:
1. The recommended compactions are percentages of the maximum dry density determined by Australian Standard 1289 (Standard Compaction).
2. For processed pavement gravels, minimum density requirements should be a percentage of maximum dry density in accordance with AS 1289 5.2.1, Modified Compaction.

- Field density testing should be carried out to check the standard of compaction achieved and the placement moisture content. The frequency and extent of testing should be as per guidelines in AS 3798-2007, Section 8.0.
- Backfilling for service trenches, etc. should use good quality material. The backfill should be placed in uniform layers over the full width of the excavations with the layers not exceeding 200mm thickness, loosely placed using wheeled plant and 100mm loose thickness using hand held vibrating plates. The backfill material should be compacted to the specifications outlined above for insitu or imported cohesive material.

5.2.6 Trenching

Shoring of deep trench excavations is recommended. Suitable precautions to satisfy Health & Safety requirements must be adopted. Construction procedures (i.e. operation of plant, storage of materials, etc.) should also consider the nature of the site soils.

5.2.7 Earthworks Supervision

Engineering supervision of the earthworks operations by Soil Surveys Engineering Pty Limited is recommended.

It is recommended that the following objectives (as a minimum) be incorporated into the earthworks specification:-

- Engineering certification that all general earthworks operations (i.e. stripping, proof rolling of subgrade, subgrade treatment, etc.) have been carried out in accordance with the earthworks specification.
- Engineering certification that the quality of any imported fill complies with the earthworks specification requirements.
- Engineering certification that fill has been placed and compacted to the required minimum density in accordance with the earthworks specification.
- If required, engineering certification that the controlled fill material is suitable to support a conventional slab on ground floor.
- Engineering certification that the stability of cut/fill batters and trenches is adequate.

Engineering certification should be provided by a Registered Professional Engineer of Queensland.

Compaction testing (alone) by a testing authority which does not include inhouse RPEQ certification (supported with adequate Professional Indemnity insurance coverage) that geotechnical engineering requirements associated with earthworks operations have been met, is considered inadequate and unacceptable.

5.3 Excavation Characteristics

5.3.1 General

It is anticipated that excavations will consist of the following:-

- Bulk Cuts - for site stripping and excavation to create building platforms and carpark/driveway areas.
- Trenching - for high level footings and underground services.
- Drilling - for bored pier foundations.

The assessment of excavation characteristics of soil and weathered rock is normally based on the depth of penetration of the drilling rig using the ‘TC’ bit attachment. These depths are recorded on the Borehole Record Sheets.

When augering, the bits are attached to the flight auger.

The limit of the ‘TC’ bit is indicative of the limit of excavations using a small dozer in bulk excavations (Cat D 6) or a medium sized backhoe in trenches (Case 580 or M.F. 50).

Generally, below the ‘TC’ bit limit, large excavators (say 30 tonne) possibly with hydraulic rock breakers are required for excavation.

Ripping depths can be significantly increased when the rock is bedded, laminated and highly jointed. The nature of the rock and inherent planes of weakness therefore play an important part in rock excavation assessment.

It is considered that excavations could be carried out to the depths of the 'TC' bit limit using the appropriate plant as indicated above. Below the depth of the 'TC' bit limit, larger plant with specialised attachments, e.g. rock breakers, may be required for the proposed construction. Some budgeting should be allocated for the possibility of encountering zones of stronger rock.

It should be noted that the ability to drill piers in the weathered rock material is not only dependent on material characteristics but also the type (power and size) of the bored pier drilling rig, drilling teeth, size of pier, etc. It is recommended that the drilling contractors are consulted on this matter.

5.3.2 Excavatability - Summary

Considering the findings of the geotechnical investigation, the following comments can be made on excavation characteristics:-

- Soils - soils will be within the excavation limits of a medium sized backhoe.
- Weathered Rock - we recommend that planning considers that rock excavation will require the use of large excavators (say 30 tonne) with use of rock breakers and/or single tyne for efficient excavation.

Bored Piers - the ability to drill piers in the rock is not only dependent on material characteristics but also the type (power and size) of the bored pier drilling rig, drilling teeth, size of pier, etc. **It is recommended that the drilling contractors be consulted on this matter**. However, we recommend that planning considers that the use of large tracked mounted bored pier machines (say 30 tonne machines) will be required for piers extending into the weathered rock stratum.

5.3.3 Rock Excavatability

Please note that the above rock excavatability assessment should be considered preliminary only - rock coring is required to allow accurate assessment of rock excavatability. Should rock excavatability be considered a “high cost” or “critical” item, then further geotechnical assessment is required. Regardless, it is recommended that very careful drafting of contracts be carried out with respect to site excavation works, taking into account the following recommendations:-

5.3.4 Contractual Matters

It is recommended that very careful drafting of the building contract be carried out with respect to site excavation works, taking into account the following recommendations:-

1. The contract should not contain a definition of rock.
2. The contract should not contain different rates for rock and non-rock excavation.
3. The contract should require the Builder to inspect (subject to availability) retrieved rock core held by Soil Surveys Engineering (if further investigations are undertaken) so that they and their subcontractors can make their own assessment and judgement on excavatability conditions with respect to pricing and rate of excavation.
4. The contract should require the Builder to confirm that provided geotechnical data is sufficient for them to make their own assessment and judgement on excavatability conditions (excavation costing, rate of excavation, etc.). Should the Builder advise that provided geotechnical data is insufficient for their purposes, then the Builder should be requested to provide a brief of works for additional geotechnical investigation (to satisfy their needs).
5. The contract should require the Builder to confirm that they have not relied upon general excavatability comments contained in this report to formulate their excavation costings, and that they have made their own assessment and judgement with respect to excavation costing, rate of excavation, etc..
6. The contract should require the Builder to confirm that their assessment and judgement on excavatability conditions has taken into account that natural geological variations are such that “stronger” rock than that encountered at borehole locations may be present on site within the excavation zone.
7. The contract should include a lump sum for all excavation works associated with the project.

5.4 Batters

5.4.1 General

Earthworks requirements are unknown at the time of the investigation, however given the variation in surface level across the site, it is expected that cut/fill batters of varying heights will be required.

Where surcharges (e.g., footings, live loads, etc.) are located within H (height of batter) of the top of the batter, then some reduction in design angle will occur.

Steeper batters are possible with suitable surface protection such as stone pitching, etc. or by use of retaining structures (temporary and permanent).

Table 8 Batter Angles

Material	Temporary Batter Angle		Permanent Batter Slope	
	<3m in height	>3 <6m in height	<3m in height	>3 <6m in height
Controlled Fill	30° (1V:1.75H)	NR	26° (1V:2H)	NR
Clayey Soils	45° (1V:1H)	26° (1V:2H)	26° (1V:2H)	15° (1V:3.75H)
Sandy Soils	30° (1V:1.75H)	NR	20° (1V:2.75H)	NR
Weathered Rock XW[2]	60° (1V:0.6H)	40° (1V:1.2H)	40° (1V:1.2H)	35° (1V:1.4H)
Weathered Rock DW or Better[2]	70° (1V:0.35H)	45° (1V:1H)	60° (1V:0.6H)	45° (1V:1H)

Notes:
1. These values assume no seepage. If seepage is present the recommended angles would need to be significantly reduced or the use of dewatering considered.
2. Subject to inspection by Soil Surveys Engineering.
3. NR - Not Recommended

Note values above are maximum values in the case of fill and soils. Flatter angles may be considered for ease of maintenance.

In the case of weathered rock steeper angles may be possible but would require mapping during excavation and even then, some artificial support may still be required.

Where cuts are either greater than 6.00m, adjacent existing structures/services, or if steeper batter angles than that indicated in Table 8 are required, some form of cut batter retention system may be required.

Where batters are high (say > 4.0m to 6.0m) the use of benches as part of the design could be considered. Generally lower height batters can be cut at steeper angles than higher batters. Therefore, by adjusting the size and location of the benches the actual horizontal width of batter may not vary between a benched system and a single batter system.

The advantage of the use of benches is that benches can provide "control" points where seepage and minor fall-down can be collected and controlled. The width of the benches should be sufficient

to allow maintenance access. The benches should preferably slope back into the slope to minimise the potential for over topping of the crest.

Regardless of the design, it is important that all cuts be inspected (progressively as construction proceeds) by an experienced Geotechnical Engineer/Engineering Geologist.

5.4.2 Fill Batters

Fill batter slopes are dependent on suitable compaction being achieved. It is recommended that all fill batters are formed by overfilling past the line of the final face and then the batter cut back (Figure 8) refer to AS 3798-2007 Section 6.2.4. This allows compaction equipment to adequately compact the entire fill batter. All fill batters should consider the possible effects of scour and water runoff.

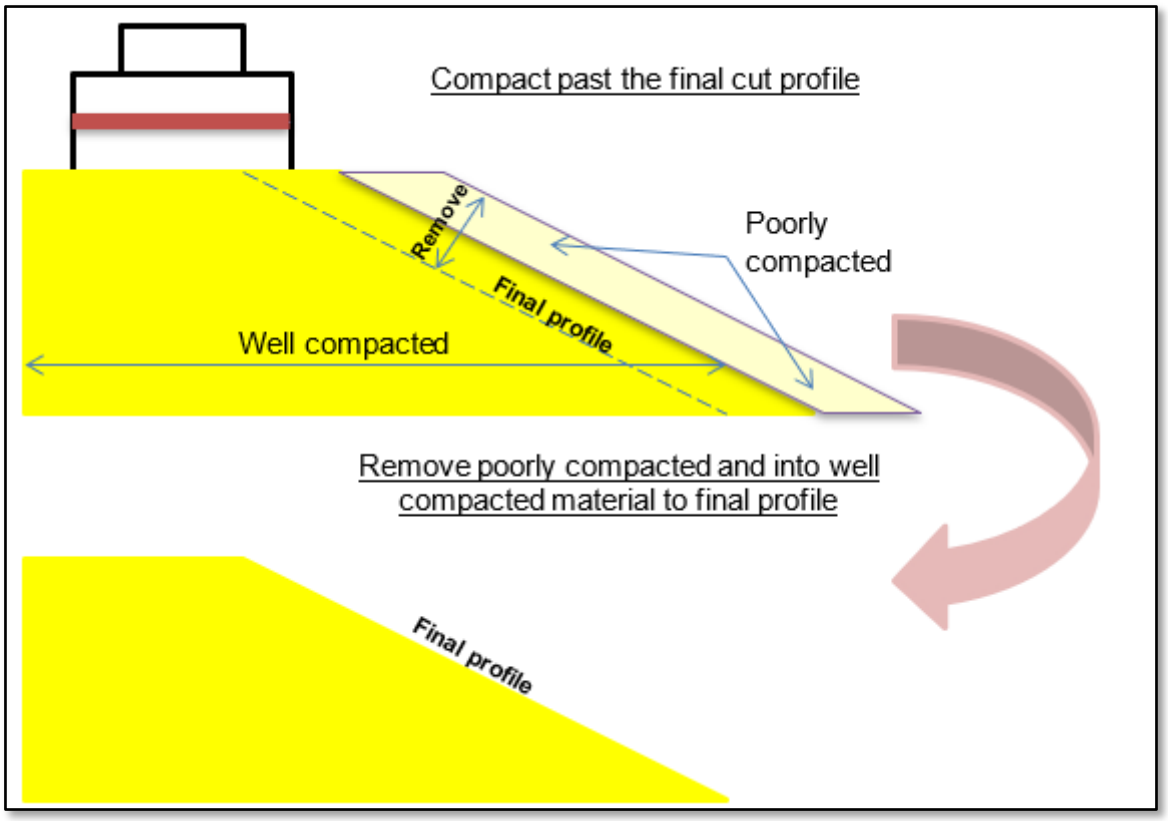

Figure 8

5.4.3 Scour Protection and Erosion Control

It is essential that permanent batters be suitably protected from erosion and scour by appropriate drainage and the establishment of ground cover and shrubs, etc. Pavement runoff should not be allowed to discharge directly across the batters without suitable scour protection.

If runoff velocities are sufficiently high, following cutting and construction of batters, erosion of the exposed soil and fractured rock could occur. In the case of the more competent rock cuts, erosion is expected to be limited to minor rutting and "funnelling" along more weathered zones and defect planes.

Top soiling and seeding or hydromulching on cut areas steeper than 1:5 (11 degrees) is suggested so that protection could be provided until such time as the grass cover is established.

Drain outlets would also need to consider the effects of scouring runoff water. These will need to be concrete lined near each entry and exit, with grassing further out.

The construction of asphalt surfaced roads with kerb and channelling and appropriate underground drainage will limit erosion on fill batters to the effects of localised surface runoff. Rutting, scouring and erosion is therefore possible.

It is suggested that top soiling and seeding or hydromulching also be used on all fill batters, regardless of slope, to provide protection to the slopes until permanent grass cover is established. The seed selection for the hydromulch will depend on the season when placed, but in any case, should include a rapid growing seasonal variety that could rapidly establish itself until such time as the regular grass variety is established.

It is recommended that where possible all batters have surface and subsurface drains installed above and below the slope so that water is collected and directed away from structures. This is particularly important when lots are located below the road level.

5.5 Site Classification - AS 2870 ‘Residential Slabs and Footings’

While a site classification in accordance with AS 2870 'Residential Slabs and Footings' relates to residential type construction and is not directly applicable for this development, it is, however, a valuable method of classification.

In assessing the site classification, the following has been considered:-

- The subsurface profile (as per borehole records).
- Laboratory test results.
- Geotechnical data held by Soil Surveys Engineering.
- That the site is considered to be a reactive site (as per AS 2870-2011).
- That the site is subject to abnormal moisture conditions due to the presence of trees (on the building site and adjacent sites) and or proposed removal of trees (as per Clause 1.3.3 of AS 2870-2011).
- Proposed earthworks, i.e. controlled fill greater than 0.4m is proposed.
- Likely future development.

Considering the above, and other factors, the site is classified Class ‘P’.

5.6 Site Classification Based on Site Reactivity

If this reactive site is assessed to be subject to ground surface movement predominantly due to soil reactivity **under normal moisture conditions**, a characteristic surface movement (ys) within the Class 'S' (slightly reactive) to Class 'M' range (moderately reactive) could be calculated (considering the proposed development, existing subsurface profile as per boreholes records, laboratory test results, and considering other relevant geotechnical data held by Soil Surveys Engineering); please note that tree induced movement would be additional to this value.

The above assessment may change following earthworks comprising filling in excess of 0.40m or cuts in excess of 0.45m occur. For building platforms where natural clays are used as fill to depths that exceed 1.50m, Class 'H1' condition may occur.

The above ground surface movement (ys) estimates would be reduced where clay thicknesses are limited, i.e. if weathered rock exists within 0.5m of platform level, Class 'S' conditions exist even where natural clays are used as fill.

However, it is imperative that the site classification be re-assessed by Soil Surveys Engineering following completion of earthworks. The above site classification should be considered preliminary only and subject to further assessment (post earthworks) by Soil Surveys Engineering.

The foundation system for the proposed buildings should be designed and constructed to accommodate the potential ground movement resulting from the volume instability of the reactive clay soils.

Trees

Trees can greatly affect ground surface movement (greater movements than what would be expected may occur), and subsequently negatively impact structures.

The footing system should be designed for the effect of trees, with the Designer (Soil Surveys Engineering are not the Designer) considering the following cases (as appropriate):-

- Existing trees are left in place.
- Existing trees are removed prior to construction/development.
- New trees are subsequently planted.

AS 2870-2011 includes an informative section (refer Appendix H) on the design of footings for tree, and particularly the calculations of the maximum potential surface movement due to the tree-induced suction change (that is in addition to the normal design suction profile). The Designer should refer to AS 2870-2011 for detailed discussion on this matter.

Regardless, it is recommended that the site be maintained at "stable moisture conditions", with "extremes of wetting and drying prevented" - refer AS 2870-2011, Appendix B. This includes attention to such matters including limitations on gardens and restrictions on trees and shrubs.

5.7 Building Foundations

5.7.1 Foundation Options

Given the subsurface profile encountered, it is considered that a shallow footing system would be suitable for typical sized school buildings of between one and three levels.

Foundation conditions are expected to be variable across the site. For all structures, it is recommended that all footings are founded on similar materials to provide uniform bearing conditions. Where the structure is partially on fill, natural soils or weathered rock, it is recommended that all footings are deepened to found into the natural soils or weathered rock.

Foundation and slab on ground systems that could be considered include:-

- Foundation systems
    - high level footings
    - deep foundations (piers)
- Slab on ground floors
    - stiffened raft
    - conventional floating slab on ground floor

5.7.2 High Level Footings

High level strip/pad footings should found a minimum of 300mm into controlled and certified fill or natural stiff (or stronger) soils; footings will need to be deepened in areas of uncontrolled fill material (if any). Deepened footings, backhoe excavated pedestals (bulk piers) or bored piers may also be considered.

Table 9 outlines recommended allowable bearing capacities for high level footings.

Table 9 Allowable Bearing Capacities

Material		Allowable Bearing Capacity (kPa)	
		Strip Footing	Pad Footing
Fill	- Uncertified - Certified	NR 150	NR 150
Silty Sand		NR	NR
Clays	- Very Stiff - Hard	150 250	200 300
Weathered Rock	- XW - DW	350 600	400 600

Notes:-
1. All capacities subject to inspection by Soil Surveys Engineering.
2. NR = Not Recommended.

5.7.3 Deep Foundations

Bored or screw piers could be considered.

The design of a deep foundation system should consider the following:-

- Capacity
- Tensional effects due to swell
- Construction considerations

It is recommended that the deep foundation system on this project be designed in accordance with AS 2159-2009 'Piling - Design and Installation'. This code uses the limit state design method.

Compressional Capacity

The design of a single pile or a pile group must be such that both the geotechnical design strength $R_{d,g}$ and the structural design strength $R_{d,s}$ are greater than or equal to the design action effect E_d*, i.e.

$$R_{d,g} \geq E_d \text{ and } R_{d,s} \geq E_d$$

The design geotechnical strength ($R_{d,g}$) can be calculated as the ultimate geotechnical design strength ($R_{d,ug}$) multiplied by the geotechnical strength reduction factor $Ø_g$. Ultimate design geotechnical strength ($R_{d,ug}$) parameters for the materials encountered on the site are outlined in Table 10.

Table 10 Ultimate Geotechnical Strength (R_{ug}) Parameters

Material		fb - Base Bearing (kPa)		fm,s - Skin Friction (kPa)
		D/B<4	D/B>4	
Fill Material / Silty Sand		NR	NR	NC
Natural Clay	- Very Stiff - Hard	NR NR	900 1350	30 45
Weathered Rock	- XW - DW	1200 3000	1800 4500	60 120

Notes:
1. NR = Not Recommended; NC = Not Considered in skin friction calculations.
2. Ultimate geotechnical strength for compression can be determined from Rd,ug = fbAb + Asfm,s.
3. Recommended geotechnical strength reduction factor (Øg) - Refer Table 4.3.2(c) AS 2159.
4. Considering limit state analysis (AS 2159-2009), the design geotechnical strength R*g is calculated by multiplying the ultimate design geotechnical strength $R_{d,ug}$ by the geotechnical strength reduction factor Øg, i.e. $R_{d,g} = R_{d,ug}$ x Øg.
5. Should a "working stress" approach be adopted, a minimum factor of safety of 3.0 on base and 2.0 on skin friction is recommended.
6. Skin friction contribution from clays in the upper 1.80m of the profile should be ignored.
7. The above parameters are for single piers. If piers are spaced at closer than three diameters, a reduction factor (Group Efficiency Ratio) may apply.
8. Base bearing and skin friction parameters to be confirmed by inspection by Soil Surveys Engineering.

Construction Considerations

Some difficulty with fall-in may occur with bored piers, particularly when drilling through fill material and silty/clayey. It should be ensured that all loose material is removed from the base of piers prior to pouring of concrete. The use of a 'clean-out' bucket should be explicit in instructions to the drilling contractor. The practice of 'using water and spinning the augers' to remove loose material from the pier base is generally unacceptable.

Groundwater was not encountered in boreholes (refer Section 4.3) at the time of the investigation. However should a bored pier foundation system be adopted, an allowance for dewatering and the use of liners should be made.

If screw piles are envisioned, it should be noted that the use of screw piles on this site may have issues with achieving typical installation torques (assuming this is the installation criteria adopted) particularly at the design foundation depths. It is therefore recommended that they be appropriately designed for the actual soil conditions using the parameters provided in this report. This may require an increased helix size or other structural design optimisation.

5.7.4 Slab on Ground

Field and laboratory test results indicate that the existing natural soils, along with any controlled fill, are suitable for slab on ground construction provided that earthworks are carried out in accordance with Section 5.2 and that appropriate engineering certification is provided (refer Section 5.2.5).

Should earthworks operations not result in a subgrade suitable for slab support, the slab on ground floor should be supported on pedestals/piers founding in competent natural soils.

Slab on ground floor options include:-

- Stiffened raft
- Conventional slab on ground floor

Stiffened Raft

A stiffened raft comprises perimeter and internal beams and is designed to accommodate potential ground surface movements is recommended for fill sites.

Conventional Slab On Ground Floor

It is considered that a floating slab would be suitable for cut zones where weathered rock is exposed at or near subgrade level.

5.7.5 Adjacent Feature/Excavation Considerations

Where proposed footings/piers are located adjacent to proposed or existing feature/excavations (e.g. retaining walls, underground service trenches, unsupported batters, etc.), the effect of the feature/excavation on proposed or existing footings/piers must be carefully considered. Deepening of proposed footings/piers is expected to be required in such circumstances.

Soil Surveys Engineering and the Structural Engineer should be consulted on this matter prior to construction.

For underground service trenches (as a general guide) proposed footings and piers should extend to base a minimum of 500mm and 1.0m respectively below the feature/excavation base level for a distance of 1.0m out from the feature/excavation. Beyond 1.0m the footings and piers should be taken a minimum of 500mm and 1.0m respectively below an imaginary line (influence line) drawn up at 45° (1H:1V) from the feature/excavation base level. Note that actual depths (Soil Surveys Engineering should be consulted on this matter prior to construction) below the influence line will depend on footing/pier capacity and possible uplift considerations. Figure 9 refers.

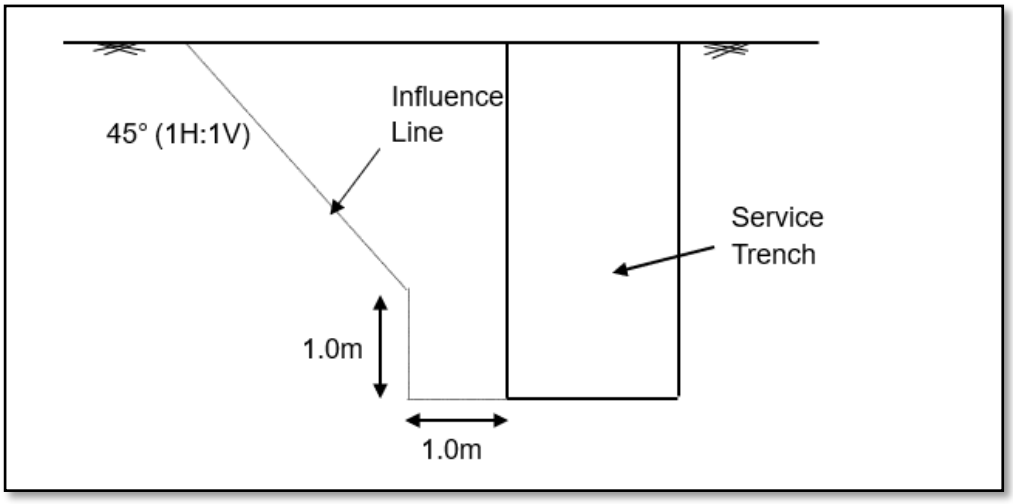

Figure 9

For all other feature types, Soil Surveys Engineering and the Structural Engineer should be consulted prior to construction.

5.7.6 Inspections

It is recommended that inspections be undertaken by an experienced and qualified geotechnical engineer from Soil Surveys Engineering following footing and during pier excavations to confirm the adequacy of the founding soils. Inspections should be carried out prior to placement of reinforcing steel and ordering of concrete.

5.8 Earthquake Design

With respect to structure design, the following would apply in accordance with AS 1170.4-2007:-

- Earthquake Hazard Factor - 0.08 (refer Figure 3.2 [F] of AS 1170.4-2007).
- Site Subsoil Class - Class ‘Ce’, Shallow Soil Site (refer Section 4.2 of AS 1170.4-2007).
- Site Subsoil Class - Class ‘Be’, Rock Soil Site (refer Section 4.2 of AS 1170.4-2007).

Class ‘Be’ sites will apply for any areas of the site with the DW rock encountered at depths of less than 3.00m.

5.9 Site Management

It is important that proper site management methods be observed for the existing soil conditions by both the builder at the time of the construction and the owner(s) throughout the life of the proposed development.

Particular reference to site management matters is set out in AS 2870-2011. It should be noted that where proper site management, particularly with respect to change in moisture conditions, is not followed, the foundation recommendations contained in this report could be considered void.

The following are some specific comments with respect to site management and the reader is also directed to CSIRO publication, “Foundation Maintenance and Footing Performance: A Homeowners Guide” (Building Technology File 18) for further information:-

- It is important that the site be well drained. The ground around the structures should slope away at 1 in 50 for 3 metres and then fall to the stormwater system to prevent ponding of water adjacent to the structures.
- Roof downpipes and garden taps should not be allowed to saturate founding soils.
- It is recommended that service trenches under the building be minimised, as disruption or breakage of these service lines could lead to saturation of the under slab material resulting in an increase to moisture condition. If this were to occur, all footing recommendations contained within this report would be void.
- Footings should be placed with minimal delay after excavation to avoid desiccation or wetting of the founding soils. If footings cannot be poured on the same day as excavation, a blinding layer of 75mm thickness is recommended. Piers should be poured immediately.
- Do not let the slab subgrade "dry out" prior to casting.
- Future shrubs and trees should be planted at a distance at least equivalent to three quarter times their mature height away from the building to avoid shrinkage movement in the potentially expansive founding soils. Existing trees that may encroach this restriction should be removed as soon as possible prior to commencement of construction. Replenishment of soil moisture to equilibrium conditions after tree removal can result in soil heave.

5.10 Retaining Walls

Retaining walls should be designed in accordance with AS 4678-2002 “Earth Retaining Structures”.

For cantilever walls, or temporarily braced walls, which allow movement at the top, i.e. at least 0.005H in clays, the active case (Ka) applies with a triangular distribution. For walls which cannot tolerate this movement, the at rest (Ko) case applies with a triangular distribution.

Lateral pressure assessment must also consider hydrostatic pressure and surcharge loadings.

The following parameters (unfactored) may be adopted for wall design (Table 11).

Table 11 Parameters for use in Retaining Wall Design

Material		Density (kN/m^3)	Earth Pressure Coefficient Vertical Wall			Long Term Drained Ø
			Ka	Ko	Kp	
Uncontrolled Fill		18	0.41	0.58	NC	25°
Controlled Fill		19	0.33	0.50	3.00	30°
Clay		19	0.36	0.53	2.70	28°
Weathered Rock	- XW - DW	22 24	0.27 0.24	0.43 0.38	3.70 4.20	35° 38°

Notes:
1. NR - Not Recommended.

Any backfill placed behind the wall should be loose granular material. The backfill should not be heavily compacted since research has shown that compaction can raise the earth pressure to above the 'at rest' pressure.

Adequate surface and subsoil drainage should be provided for all retaining walls on the site. Cut-off / interceptor drains should also be provided around the high side of the wall to ensure stormwater runoff from the area above the wall is suitably diverted.

The placement of a filter fabric between the retained soil and the drainage material (e.g. granular backfill) for protection against silting of the drainage material is recommended. The outlets to subsoil pipe drains must be located beyond the ends of the walls and connected to a proper drainage system. It is suggested the pipes be wrapped in filter fabric to minimise silting.

In weather exposed locations, to reduce infiltration by surface runoff, the surface of the backfill should be sealed. This can be achieved by either compacting a material of low permeability, i.e. on site clay, or concrete, with a slope towards an open drain.

Due to possible long term problems with blocking of gravel filters and drains and short term storm conditions that could flood the fill behind retaining walls, it is recommended that all retaining walls be designed for some water pressure distribution.

During installation of any retaining walls, the insitu soils should be battered back to minimise fall-in and subsequent disruption of works. Suitable precautions to satisfy Health & Safety requirements must also be adhered to.

5.11 Pavements

Laboratory testing was carried out on materials sampled from Boreholes BH08, BH13, BH15 & BH17 to determine these material's California Bearing Ratio (CBR); the CBR value represents the 'strength' of this material, compacted to 98% standard density ratio, under saturation.

The Soaked CBR test produced a values of:-

- Borehole BH08 - 2.5%

- Borehole BH13 - 9%
- Borehole BH15 - 8%
- Borehole BH17 - 7%

Given the above, a CBR value of 3.0% is recommended for preliminary design for a clay/sand subgrade, which could be increased to 10% in areas where the weathered Sandstone is exposed at subgrade level.

It is recommended that inspection and testing be carried out following general earthworks to fully assess subgrade conditions.

Along with recommendations contained in Sections 5.1 and 5.2, the following general earthworks recommendations are made:-

i) Incorporate a perimeter drain at the pavement edges to prevent possible deterioration under wet weather.

ii) Pavements should be well drained both during and upon completion of construction. Water should not be allowed to pond on or near pavement surfaces.

iii) Pavement gravel should comply with the local council quality specifications for sub base and base course material.

iv) Subgrades should be compacted to achieve the minimum density ratios as outlined in Section 5.2 'Earthworks'.

6.0 Construction Inspections

It is recommended that placement of all structural fill, footing excavations, and cut batter slopes in soil and rock together with pavement subgrades be inspected by Soil Surveys Engineering Pty Limited or a duly qualified Geotechnical Engineer. Should subsurface conditions other than those described in this report be encountered, Soil Surveys Engineering Pty Limited should be consulted immediately and appropriate modifications developed and implemented if necessary.

7.0 Additional Investigation

Additional investigation would need to be considered following completion of earthworks design and planning of the school.

8.0 Limitations

We have prepared this report for the use of **Group GSA Pty Ltd**, for design purposes in accordance with generally accepted geotechnical engineering practices. No other warranty, expressed or implied, is made as to the professional advice included in this report. This report has not been prepared for use by parties other than **Group GSA Pty Ltd**; it may not contain sufficient information for purposes of other parties or for other uses. Please note that any third party relying on the information contained in this report for any purpose whatsoever does so entirely at its own risk, and any duty of care to that third party is excluded.

Any interpretation or recommendation given by Soil Surveys Engineering shall be understood to be based on judgement and experience and not on greater knowledge of the facts than the reported investigations would imply. The interpretation and recommendations are therefore opinions provided for our client's sole use in accordance with the specific brief. As such they do not necessarily address all aspects of ground behaviour on the subject site. Information provided by others has been taken in good faith, but no liability can be accepted for information provided by others.

Your attention is drawn to 'Appendix A', 'Notes Relating to this Report'. Interpretation of factual data given in this report is based on judgement, not a greater knowledge of facts other than those reported.

Interpretation of the information shown on the logs, and its application to design and construction, should therefore consider the spacing and depth of test locations, the method of investigation, the frequency of sampling and testing and the possibility of other than "straight line" variations between the test locations. Subsurface conditions between and below test locations may vary significantly from conditions encountered at the test locations.

Please note that should, following detailed design, footings or piers/piles be required to extend within 3B (B = footing width/pier diameter) above the termination level of the boreholes/DCP or any excavations extend below borehole/DCP termination levels, Soil Surveys Engineering should be contacted immediately. In this case, geotechnical data in this report should be considered preliminary only; additional investigation is likely to be required.

If conditions encountered on site during construction appear to vary from those expected from the information contained in the report, the Company strongly recommends that it immediately be notified. Most problems are more readily resolved when conditions are exposed than at some later stage, after the event. Should Soil Surveys Engineering not be notified or if this notification is delayed, then Soil Surveys cannot be held responsible for the affect that any variation has on any aspect of the development.

Soil Surveys Engineering consider that a documentation review service (during the design phase and prior to construction) to verify that the intent of geotechnical recommendations is properly reflected in the design, along with construction inspections, forms a very important component of the geotechnical engineering design service/process.

The geotechnical review ensures geotechnical risks to our client and their project are minimised at the design and tender stage of the project. Further, with Soil Surveys Engineering being commissioned to carry out geotechnical construction inspections, an opportunity at the time of

construction to confirm any assumptions made in the preparation of the report and allow the effect of any normally occurring variation in ground conditions to be assessed with respect to construction becomes available.

The above statements are not intended to reduce the level of responsibility accepted by Soil Surveys Engineering in accordance with our commission, but rather to ensure that all parties who may rely on this report are aware of the responsibilities each assumes in doing so and the risks they accept should they decline to have Soil Surveys Engineering carry out a geotechnical documentation review and geotechnical construction inspections.

Cameron Johnson (RPEQ 7052)
Principal Geotechnical Engineer

For and on behalf of
Soil Surveys Engineering Pty Limited

Appendices

Appendix A
Notes Relating to this Report

INTRODUCTION

These notes are provided by Soil Surveys Engineering Pty Limited (the Company) to complement the geotechnical report in regard to classification methods and field procedures. Not all notes are necessarily relevant to all reports.

The ground is a product of continuing natural and man-made processes and therefore exhibits a variety of characteristics and properties which vary from place to place and can change with time. Geotechnical engineering involves gathering and assimilating limited information about these characteristics and properties in order to understand or predict the behaviour of the ground on a particular site under certain conditions. This report may contain such information obtained by inspection, excavation, probing, sampling, testing or other means of investigation. If so, they are directly relevant only to the ground at the place where and at the time when the investigation was carried out.

DESCRIPTION AND CLASSIFICATION METHODS

Soils - The methods of description and classification of soils and rocks used in this report are based on Australian Standard 1726-2017 (Geotechnical Site Investigations), where appropriate. In general, descriptions cover the following properties - soil or rock type, colour, structure, strength or density, and inclusions. Identification and classification of soil and rock involves judgement and the Company infers accuracy only to the extent that is common in current geotechnical practice.

Soil types are described according to the dominant particle size and behaviour as set out in AS 1726-2017.

Cohesive soils are classified on the basis of strength (consistency) either by use of hand penetrometer, shear vane, laboratory testing or engineering examination. The strength terms are defined in AS 1726-2017 Table 11.

Non-cohesive soils are classified on the basis of relative density usually based on insitu testing or engineering examination (see AS 1726-2017 Table 12).

Rocks - Rock types are classified by their geological names (AS 1726-2017 Tables 15 to 18), together with descriptive terms regarding weathering (AS 1726-2017 Table 20), strength (AS 1726-2017 Table 19), defects (AS 1726-2017 Table 22), etc.

SAMPLING

Sampling is carried out during drilling or from other excavations to allow engineering examination (and laboratory testing where required) of the soil or rock.

Disturbed samples taken during drilling provide information on plasticity, grain size, colour, moisture content, minor constituents and, depending upon sample disturbance, (information on strength and structure).

Undisturbed samples are taken by pushing a thin walled sample tube, usually 50mm diameter (U50), into the soil and withdrawing it with a sample of the soil contained in a relatively undisturbed state. Such samples yield information on structure and strength, and are necessary for laboratory determination of shear strength, volume change potential and compressibility. Undisturbed sampling is generally effective only in cohesive soils.

Details of the type and method of sampling used are given on the attached logs.

SAMPLE STORAGE – SOIL, ROCK AND WATER SAMPLES

Soil samples (not subject to testing) are not stored beyond a period of 90 days of taking or receiving said soil sample. Rock core (not subject to testing) is not stored beyond a period of six months of taking or receiving said rock core.

Should any party require that soil samples (not subject to testing) be stored beyond 90 days, or rock core (not subject to testing) be stored beyond six months, please contact Soil Surveys Engineering.

Water samples (not subject to testing) are not stored beyond a period of seven days of taking or receiving water samples.

TEST LOCATIONS

Test locations (e.g. boreholes, CPT's, test pits etc.) were based on available access at the time of testing. Test locations may have been shifted if access was not suitable.

Unless noted otherwise, accuracy of test locations are to the accuracy of hand held GPS equipment.

INVESTIGATION METHODS

The following is a brief summary of investigation methods currently adopted by the Company and some comments on their use and application.

Test Pits - These are normally excavated with a backhoe or a tracked excavator, allowing close examination of the insitu soils if it is safe to descend into the pit. The depth of penetration is limited to approximately 3.0m for a backhoe and up to 6.0m for an excavator. Limitations of test pits are the problems associated with disturbance and difficulty of reinstatement and the consequent effects on close-by structures. Care must be taken if construction is to be carried out near test pit locations to either properly recompact the backfill during construction or to design and construct the structure so as not to be adversely affected by poorly compacted backfill at the test pit location.

Hand Auger Drilling - A borehole of 50mm to 100mm diameter is advanced by manually operated equipment. Refusal of the augers can occur on a variety of materials such as hard clay, gravel or rock fragments and does not necessarily indicate rock level.

Continuous Spiral Flight Augers - The borehole is advanced using 75mm to 300 mm diameter continuous spiral flight augers, which are withdrawn at intervals to allow sampling or insitu testing. This is a relatively economical means of drilling in clays and in sands above the water table. Samples are returned to the surface by the flights or may be collected after withdrawal of the augers. Information from the drilling (as distinct from specific sampling) is of relatively lower reliability due to remoulding, inclusion of cuttings from above or softening of samples by groundwater, or

uncertainties as to the original depth of the samples. Augering below the groundwater table has a lower reliability than augering above the water table. Various drill bits are attached to the base of the augers during the drilling. The depth of refusal of the different bit types can provide information as to the strength of the material encountered. Generally the 'TC' bit (a tungsten carbide tipped screw type bit) is used.

Wash Boring - The borehole is usually advanced by a rotary bit with water or fluid pumped down the hollow drill rods and returned up in the space between the rods and the soil or casing, carrying the drill cuttings. Only major changes in stratification can be determined from the cuttings, together with some information from "feel" and rate of penetration. More accurate information on soil strata is gained by regular testing and sampling using the Standard Penetration Test (SPT) and undisturbed thin walled tube samples (U50).

Mud Stabilized Drilling - Either Wash Boring or Continuous Core Drilling can use drilling mud as a circulating fluid to stabilize the borehole. The term "mud" encompasses a range of products ranging from bentonite to polymers such as Revert or Biogel. The mud tends to mask the cuttings and reliable identification is only possible from regular intact sampling (e.g. from SPT and U50 samples) or from rock coring, etc.

Continuous Core Drilling - A continuous core sample is obtained using a diamond or tungsten carbide tipped core barrel. Provided full core recovery is achieved (which is not always possible in very weak rocks and granular soils), this technique provides a very reliable method of investigation. In rocks, NMLC coring (nominal 52 mm diameter) is usually used with water flush. The length of core recovered is compared to the length drilled and any length not recovered is shown as CORE LOSS. The location of losses is determined on site by the supervisor. If the location of the loss is uncertain, it is placed at the top end of the run, when the core is placed in a storage tray and recorded on the log.

Standard Penetration Tests - Standard Penetration Tests (SPT) are used mainly in non-cohesive soils, but can also be used in cohesive soils, as a means of indicating density or strength. The test procedure is described in Australian Standard 1289, "Methods of Testing Soils for Engineering Purposes" - Test 6.3.1.

The test is carried out in a borehole by driving a 50mm diameter split sample tube with a tapered shoe, under the impact of a 63 kg hammer with a free fall of 760 mm. It is normal for the tube to be driven in three successive 150 mm increments and the 'N' value is taken as the number of blows for the last 300 mm, the upper 150 mm being neglected due to possible disturbance from the drilling method. In dense sands, very hard clays or weak rock, the full 450 mm penetration may not be practicable and the test is discontinued at a reduced penetration.

In the case where full penetration is obtained with successive blow counts for each 150 mm of, say 4, 6 and 7 blows, the record shows,

4, 6, 7 N = 13

In a case where the test is discontinued short of full penetration, say after 15 blows for the first 150 mm and 30 blows for the next 40 mm, the record shows:

15, 30/40mm

The results of the test can be related empirically to the engineering properties of the soil.

Occasionally, the drop hammer is used to drive 50mm diameter thin walled sample tubes (U50) in clays. In such circumstances, it is noted on the borehole logs.

A modification to the SPT test is where the same driving system is used with a solid 600 tipped steel cone of the same diameter as the SPT hollow sampler. The solid cone can be continuously driven for some distance in soft clays or loose sands, or may be used where damage would otherwise occur to the SPT. The results of this Solid SPT are shown as "N_c" on the borehole logs, together with the number of blows per 150 mm penetration.

Cone Penetration Tests - Test Method - Cone Penetration Tests (CPT) are carried out in accordance with AS 1289 Test 6.5.1-1999, using an electrical friction-cone penetrometer.

The test essentially comprises the measurement of resistance to penetration of a cone of 35.7 mm diameter pushed into the soil at a rate of 10-20 mm per second by hydraulic force. The resistance to penetration is recorded in terms of pressure on the end area of the cone (cone resistance, q_c, in MPa) and friction on the side of the 135 mm long sleeve immediately above the top of the cone (friction resistance, f_s, in kPa). These forces are measured by electrical transducers (strain gauges) within the cone device. The ratio between friction resistance and cone resistance is also calculated as a percentage, i.e.-

$$\text{Friction Ratio (FR)} = \frac{\textit{Friction Resistance, } f_s\ (kPa)\ x\ 100}{\textit{cone resistance, } q_c\ (kPa)}$$

The friction ratio, FR, is generally low in sands (less than 1% or 2%) and generally higher in clays (say 3% or more). The interpretation of sandy clays, clayey sands and material with a high silt content is more difficult, but intermediate values (between 1% and 3%) would be expected. Highly organic clays and peats generally have a friction ratio in excess of 5%.

Static cone data is recorded in the field on disc for later presentation using computer aided drafting.

The equipment can be operated from any conventional drill rig. A total applied load in the range of 4 to 10 tonnes is required for practical purposes, although lighter loads may be used. The cone penetrometers are available with various capacities of cone resistance ranging up to 100 MPa for general purpose investigations, while a range of 0 to 10 MPa can be used where more sensitive investigations of soft clay are required.

The cone resistance value provides a continuous measure of soil strength or density, and together with the friction ratio, provide very useful indications of the presence of narrow bands of geotechnically significant layers such as thin, soft clay layers or lenses of sand which might otherwise be missed using conventional drilling methods.

The lithology of the encountered soils is interpreted from static cone data and is generally presented on the static cone log sheets.

It is important to note that the lithology is interpreted information and is based on research by Schmertmann (1970), Sanglerat (1972), Robinson and Campinalli (1986), modified to suit local conditions as indicated by borehole information and laboratory testing.

As soils generally change gradually it is sometimes difficult to accurately describe depths of strata changes, although greater accuracy is obtained with the static cone compared with conventional drilling. In addition, friction ratios decrease in accuracy with low cone resistance values, and in desiccated soils. As a result, some overlap and minor discrepancies may exist between static cone and nearby borehole information.

Portable Dynamic Cone Penetrometers - Portable Dynamic Cone Penetrometer (DCP) tests are carried out by driving a rod into the ground with a falling weight hammer and measuring the blows for successive 100mm increments of penetration.

The DCP comprises a Cone of 20 mm diameter with 30 degree taper attached to steel rods of smaller section.

The cone end is driven with a 9 kg hammer falling 510 mm (AS 1289 Test 6.3.2). The test was developed initially for pavement subgrade investigations, and empirical correlations of the test results with California Bearing Ratio have been published by various Road Authorities. The Company has developed their own correlations with Standard Penetration tests and Density Index tests in sands.

LOGS

The borehole or test pit logs presented herein are an engineering and/or geological interpretation of the subsurface conditions, and their reliability will depend to some extent on the frequency of sampling and the method of drilling or excavation. Ideally, continuous undisturbed sampling or core drilling will enable the most reliable assessment but is not always practicable or possible to justify on economic grounds. In any case, the boreholes or test pits represent only a very small sample of the total subsurface conditions.

The attached explanatory notes define the terms and symbols used in preparation of the logs.

Interpretation of the information shown on the logs, and its application to design and construction, should therefore take into account the spacing of boreholes or test pits, the method of drilling or excavation, the frequency of sampling and testing and the possibility of other than "straight line" variations between the boreholes or test pits. Subsurface conditions between boreholes or test pits may vary significantly from conditions encountered at the borehole or test pit locations.

GROUNDWATER

Where groundwater levels are measured in boreholes, there are several potential problems.

- Although groundwater may be present in lower permeability soils, it may enter the hole slowly or perhaps not at all during the time the hole is open.
- A localized perched water table may lead to an erroneous indication of the true water table.
- Water table levels will vary from time to time with seasons or recent weather changes and may not be the same at the time of construction.
- The use of water or mud as a drilling fluid will mask any groundwater inflow. Water has to be bailed out of the bore and mud must be washed out of the hole or "reverted" if water observations are to be made.

More reliable measurements can be made by use of standpipes which are read after stabilizing at periods ranging from several days to perhaps weeks for low permeability soils. Piezometers, sealed in a particular stratum, may be advisable in low permeability soils or where there may be interference from perched water tables or surface water.

FILL

The presence of fill materials can often be determined only by the inclusion of foreign objects (e.g. bricks, steel, etc.) or by distinctly unusual colour, texture or fabric. Identification of the extent of fill materials will also depend on investigation methods and frequency. Where natural soils similar to those at the site are used for fill, it may be difficult with limited testing and sampling to reliably determine the extent of the fill.

The presence of fill materials is usually regarded with caution as the possible variation in density, strength and material type is much greater than with natural soil deposits. Consequently, there is an increased risk of adverse engineering characteristics or behaviour. If the volume and quality of fill is important to a project, then frequent test pit excavations are preferable to boreholes.

LABORATORY TESTING

Laboratory testing is normally carried out in accordance with Australian Standard 1289 "Methods of Testing Soil for Engineering Purposes". Details of the test procedure used are given on the individual report forms and the attached explanatory notes summarize important aspects of the Laboratory Test Procedures adopted.

ENGINEERING REPORTS

Engineering reports are prepared by qualified personnel and are based on the information obtained and on current engineering standards of interpretation and analysis. The information provided in Soil Surveys Engineering reports is opinion and interpretation and not factual. The client/contractor increases their risk by not retaining the person who authored the geotechnical report, to carry out site inspection and review (overseeing role) during construction, to confirm opinion and interpretation expressed in the report is accurate. Where the report has been prepared for a specific design proposal the information and interpretation may not be relevant if the design proposal is changed. If this happens, the Company will be pleased to

review the report and the sufficiency of the investigation work.

Every care is taken with the report as it relates to interpretation of subsurface conditions, discussion of geotechnical aspects and recommendations or suggestions for design and construction. Since the test sites in any exploration represent a very small proportion of the total site and since the exploration only identifies actual ground conditions at the test sites, even under the best circumstances actual conditions may vary from those inferred to exist. No responsibility is taken for:-

- Unexpected variations in ground and/or groundwater conditions.
- Changes in policy or interpretation of policy by statutory authorities.
- The actions of other persons.
- Any work where the company is not given the opportunity to supervise the construction using the Companies designs/recommendations.

If differences occur, the Company will be pleased to assist with investigation or advice to resolve any problems occurring.

SITE ANOMALIES

In the event that conditions encountered on site during construction appear to vary from those expected from the information contained in the report, the Company requests that it immediately be notified. Most problems are more readily resolved when conditions are exposed than at some later stage, well after the event.

Extreme events including but not limited to the results of climate change, e.g. flood levels above previously identified levels, beach scour or erosion beyond normal expectations (as identified by local authorities) extreme rainfall events, war, espionage, sabotage may result in different conditions between time of investigation and time of construction.

REPRODUCTION OF INFORMATION FOR CONTRACTUAL PURPOSES

Attention is drawn to the document “Guidelines for the Provision of Geotechnical Information in Construction Contracts (1987)”, published by the Institution of Engineers, Australia. Where information obtained from this investigation is provided for tendering purposes, it is recommended that all information, including the written report and discussion, be made available. In circumstances, where the discussion or comments section is not relevant to the contractual situation, it may be appropriate to prepare a specially edited document. The Company would be pleased to assist in this regard and/or to make additional report copies available for contract purposes at a nominal charge.

REVIEW OF DESIGN

Where major civil or structural developments are propose or where only a limited investigation has been completed or where the geotechnical conditions/ constraints are quite complex, it is prudent to have a joint design review which involves a senior geotechnical engineer. We would be happy to assist in this regard as an extension of our investigation commission. Construction drawings should be reviewed by Soil Surveys Engineering, with sufficient time to allow changes if required, prior to inspections. Otherwise Soil Surveys Engineering reserves the right to refuse to carry out inspections.

SITE INSPECTION

The Company will always be pleased to provide engineering inspection services for geotechnical aspects of work to which this report is related.

i. Site visits during construction to confirm reported ground conditions
ii. Site visits to assist the contractor or other site personnel in identifying various soil/rock types such as appropriate footing or pier founding depths, the stability of a filled or excavated slope; or
iii. Full-time engineering presence on site.

In the vast majority of cases it is advantageous to the principal for the geotechnical engineer who wrote the investigation report to be involved in the construction stage of the project.

The geotechnical engineer cannot take responsibility for variations in encountered conditions, where he is not given the opportunity to review plans for the proposed development with sufficient time to allow review and make changes to the proposed development if required, and where he is not given the opportunity to inspect the site and oversee construction methods with regard to site conditions with sufficient time to observe all relevant site conditions and operations.

RESPONSIBLE USE OF GEOTECHNICAL INFORMATION

Recommendations in our report are for design purposes only and provided on the basis that inspections are carried out to allow finalisation of opinions and recommendations contained in our report.

The geotechnical investigation consisting of field and laboratory testing has been carried out to indicate typical conditions by indicating conditions and parameters at the specific locations of boreholes/test pits. Subsurface conditions are indicated at these locations only and the inference of conditions between or away from these locations (interpolation and extrapolation) involves a certain degree of risk. Persons inferring such conditions or carrying out such inferences should do so with a degree of caution and conservatism which is commensurate with the consequences of the risk of error.

Estimates of volumes based on our findings require interpolation and extrapolation between test locations and as such may be significantly different from actual volumes.

Appendix B
Borehole Record Sheets

Soil Surveys Engineering Pty Ltd
Level 1, 87 Schneider Road, Eagle Farm Qld 4009
Phone: 3369 6000

Geotechnical Log - Borehole

BH01

Easting	: 493368.00	Location	: 1-45 Poinciana Dr, Flagstone	Job Number	: 1-29174
Northing	: 6925817.00	Logged By	: James Cachia Garrett	Client	: Group GSA Pty Ltd
Total Depth	: 2.5 m	Date	: 22/10/2025	Project	: Proposed Greater Flagstone State School

General comments: 1. Groundwater not encountered. 2. Borehole terminated at 'TC' bit refusal.

Drilling Method	Casing	Water	Depth (m)	Graphic Log	Material Description	Samples and Remarks
TC			0.3		TOPSOIL Silty SAND (SM): medium dense, fine grained, light grey, moist, trace of organics.	D 0 - 0.2
			0.5		NATURAL Silty SAND (SM): medium dense, fine to medium grained, pale brown, moist.	D 0.3 - 0.5
			1			D 0.6 - 1
			1.0		NATURAL SAND (SP): medium dense to dense, fine to medium grained, light brown mottled light grey, with clay, moist.	U50 1 - 1.1 pp>600
			1.5			
			2.0			
			2.2		Extremely weathered SANDSTONE (XW) recovered as Sand - dense, fine to medium grained, light brown.	D 2.2 - 2.4
			2.4		SANDSTONE (DW): distinctly weathered, low strength, light brown, fine to medium grained, moist.	
					BH01 Refusal at 2.5 m	

Comments

1. Groundwater not encountered.
2. Borehole terminated at 'TC' bit refusal.

Key

U - Undisturbed Tube
D - Disturbed (small)
B - Bulk Disturbed (large)
ASS - Acid Sulfate Soil
PP - Pocket Penetrometer
VS - Vane Shear
XW - Extremely Weathered
DW - Distinctly Weathered
Groundwater Observed
Standing Water

Approved By: CJ

Approval Date: 20/11/2025

Soil Surveys Engineering Pty Ltd
Level 1, 87 Schneider Road, Eagle Farm Qld 4009
Phone: 3369 6000

Geotechnical Log - Borehole

BH02

Easting	: 493462.00	Location	: 1-45 Poinciana Dr, Flagstone	Job Number	: 1-29174
Northing	: 6925817.00	Logged By	: James Cachia Garrett	Client	: Group GSA Pty Ltd
Total Depth	: 0.2 m	Date	: 22/10/2025	Project	: Proposed Greater Flagstone State School

General comments: 1. Groundwater not encountered. 2. Borehole terminated at 'TC' bit refusal.

Drilling Method	Water	Depth (m)	Graphic Log	Material Description	DCP (0 5 10 15 20 25)	Samples and Remarks
TC		0.15		TOPSOIL Silty SAND (SM): medium dense, fine to medium grained, grey brown, moist, trace of organics.		0.00-0.20, D
				SANDSTONE (DW): distinctly weathered, low strength, light brown, fine grained, moist.		
				BH02 Refusal at 0.2 m		

Comments

1. Groundwater not encountered.
2. Borehole terminated at 'TC' bit refusal.

Key

U - Undisturbed Tube	XW - Extremely Weathered
D - Disturbed (small)	DW - Distinctly Weathered
B - Bulk Disturbed (large)	Groundwater Observed
ASS - Acid Sulfate Soil	Standing Water
PP - Pocket Penetrometer	
VS - Vane Shear	

Approved By: CJ

Approval Date: 20/11/2025

Soil Surveys Engineering Pty Ltd
Level 1, 87 Schneider Road, Eagle Farm Qld 4009
Phone: 3369 6000

Geotechnical Log - Borehole

BH03

Easting	: 493535.00	Location	: 1-45 Poinciana Dr, Flagstone	Job Number	: 1-29174
Northing	: 6925813.00	Logged By	: James Cachia Garrett	Client	: Group GSA Pty Ltd
Total Depth	: 0.5 m	Date	: 23/10/2025	Project	: Proposed Greater Flagstone State School

General comments: 1. Groundwater not encountered. 2. Borehole terminated at 'TC' bit refusal.

Drilling Method	Water	Depth (m)	Graphic Log	Material Description	DCP (0 5 10 15 20 25)	Samples and Remarks
TC		0.2		TOPSOIL Silty SAND (SM): medium dense, fine grained, grey brown, moist, trace of organics.		0.00-0.20, D
		0.4		Extremely weathered SANDSTONE (XW): recovered as Silty Sand - dense, fine grained, pale brown.		0.20-0.50, D
				SANDSTONE (DW): distinctly weathered, low strength, light brown, fine grained, moist.		
				BH03 Refusal at 0.5 m		

Comments

1. Groundwater not encountered.
2. Borehole terminated at 'TC' bit refusal.

Key

U - Undisturbed Tube	XW - Extremely Weathered
D - Disturbed (small)	DW - Distinctly Weathered
B - Bulk Disturbed (large)	Groundwater Observed
ASS - Acid Sulfate Soil	Standing Water
PP - Pocket Penetrometer	
VS - Vane Shear	

Approved By: CJ

Approval Date: 20/11/2025

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Phone: 3369 6000

Geotechnical Log - Borehole

BH04

Easting	: 493602.00	Location	: 1-45 Poinciana Dr, Flagstone	Job Number	: 1-29174
Northing	: 6925808.00	Logged By	: James Cachia Garrett	Client	: Group GSA Pty Ltd
Total Depth	: 0.9 m	Date	: 23/10/2025	Project	: Proposed Greater Flagstone State School

General comments: 1. Groundwater not encountered. 2. Borehole terminated at 'TC' bit refusal.

Drilling Method	Water	Depth (m)	Graphic Log	Material Description	DCP (0 5 10 15 20 25)	Samples and Remarks
TC		0.2		TOPSOIL Silty SAND (SM): medium dense, fine grained, pale yellow, moist, trace of organics.		
		0.5		NATURAL Silty SAND (SM): medium dense, fine grained, pale brown, moist.		
		0.8		SANDSTONE (DW): distinctly weathered, low strength, light brown, fine grained, moist.		
				BH04 Refusal at 0.9 m		

Comments

1. Groundwater not encountered.
2. Borehole terminated at 'TC' bit refusal.

Key

U - Undisturbed Tube	XW - Extremely Weathered
D - Disturbed (small)	DW - Distinctly Weathered
B - Bulk Disturbed (large)	Groundwater Observed
ASS - Acid Sulfate Soil	Standing Water
PP - Pocket Penetrometer	
VS - Vane Shear	

Approved By: CJ

Approval Date: 20/11/2025

Soil Surveys Engineering Pty Ltd
Level 1, 87 Schneider Road, Eagle Farm Qld 4009
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Geotechnical Log - Borehole

BH05

Easting	: 493356.00	Location	: 1-45 Poinciana Dr, Flagstone	Job Number	: 1-29174
Northing	: 6925762.00	Logged By	: James Cachia Garrett	Client	: Group GSA Pty Ltd
Total Depth	: 4 m	Date	: 22/10/2025	Project	: Proposed Greater Flagstone State School

General comments: 1. Groundwater not encountered. 2. Borehole terminated at 'TC' bit refusal.

Drilling Method	Water	Depth (m)	Graphic Log	Material Description	DCP (0 5 10 15 20 25)	Samples and Remarks
		0.3		TOPSOIL Silty SAND (SM): medium dense, fine to medium grained, grey brown, moist, trace of organics.		0.00-0.20, D
		0.5		NATURAL Clayey SAND (SC): medium dense, fine to medium grained, light grey and light brown, low plasticity clay, trace fine to medium gravel, moist.		0.30-0.50, D
		1.0				0.50-1.00, D
		1.5				
		2.0				
		2.5				2.50-3.00, D
		3.0				
		3.3		NATURAL Clayey SAND (SC): dense, fine to medium grained, dark brown, low plasticity clay, moist.		
		3.5				3.50-4.00, D
		3.9		SANDSTONE (DW): distinctly weathered, low strength, dark grey grey, fine to medium grained, moist.		
				BH05 Refusal at 4 m		

Comments

1. Groundwater not encountered.
2. Borehole terminated at 'TC' bit refusal.

Key

U - Undisturbed Tube	XW - Extremely Weathered
D - Disturbed (small)	DW - Distinctly Weathered
B - Bulk Disturbed (large)	Groundwater Observed
ASS - Acid Sulfate Soil	Standing Water
PP - Pocket Penetrometer	
VS - Vane Shear	

Approved By: CJ

Approval Date: 20/11/2025

Soil Surveys Engineering Pty Ltd
Level 1, 87 Schneider Road, Eagle Farm Qld 4009
Phone: 3369 6000

Geotechnical Log - Borehole

BH06

Easting	: 493450.00	Location	: 1-45 Poinciana Dr, Flagstone	Job Number	: 1-29174
Northing	: 6925763.00	Logged By	: James Cachia Garrett	Client	: Group GSA Pty Ltd
Total Depth	: 0.7 m	Date	: 22/10/2025	Project	: Proposed Greater Flagstone State School

General comments: 1. Groundwater not encountered. 2. Borehole terminated at 'TC' bit refusal.

Drilling Method	Water	Depth (m)	Graphic Log	Material Description	DCP (0 5 10 15 20 25)	Samples and Remarks
TC		0.2		TOPSOIL Silty SAND (SM): medium dense, fine to medium grained, dark brown, moist, trace of organics.		0.00-0.20, D
		0.45		NATURAL Silty SAND (SM): dense, fine to medium grained, dark grey brown, trace fine to coarse gravel, moist.		0.20-0.45, D
		0.5		SANDSTONE (DW): distinctly weathered, low strength, dark brown, fine to medium grained, moist.		
				BH06 Refusal at 0.7 m		

Comments

1. Groundwater not encountered.
2. Borehole terminated at 'TC' bit refusal.

Key

U - Undisturbed Tube	XW - Extremely Weathered
D - Disturbed (small)	DW - Distinctly Weathered
B - Bulk Disturbed (large)	Groundwater Observed
ASS - Acid Sulfate Soil	Standing Water
PP - Pocket Penetrometer	
VS - Vane Shear	

Approved By: CJ

Approval Date: 20/11/2025

Soil Surveys Engineering Pty Ltd
Level 1, 87 Schneider Road, Eagle Farm Qld 4009
Phone: 3369 6000

Geotechnical Log - Borehole

BH07

Easting	: 493532.00	Location	: 1-45 Poinciana Dr, Flagstone	Job Number	: 1-29174
Northing	: 6925763.00	Logged By	: James Cachia Garrett	Client	: Group GSA Pty Ltd
Total Depth	: 0.55 m	Date	: 23/10/2025	Project	: Proposed Greater Flagstone State School

General comments: 1. Groundwater not encountered. 2. Borehole terminated at 'TC' bit refusal.

Drilling Method	Water	Depth (m)	Graphic Log	Material Description	DCP (0 5 10 15 20 25)	Samples and Remarks
TC		0.2		TOPSOIL Silty SAND (SM): medium dense, fine grained, dark brown, moist, trace of organics.		
		0.5		NATURAL Silty SAND (SM): dense, fine grained, light brown, moist.		
				SANDSTONE (DW): distinctly weathered, low strength, light brown, fine grained, moist.		
				BH07 Refusal at 0.55 m		

Comments

1. Groundwater not encountered.
2. Borehole terminated at 'TC' bit refusal.

Key

U - Undisturbed Tube	XW - Extremely Weathered
D - Disturbed (small)	DW - Distinctly Weathered
B - Bulk Disturbed (large)	Groundwater Observed
ASS - Acid Sulfate Soil	Standing Water
PP - Pocket Penetrometer	
VS - Vane Shear	

Approved By: CJ

Approval Date: 20/11/2025

Soil Surveys Engineering Pty Ltd
Level 1, 87 Schneider Road, Eagle Farm Qld 4009
Phone: 3369 6000

Geotechnical Log - Borehole

BH08

Easting	: 493630.00	Location	: 1-45 Poinciana Dr, Flagstone	Job Number	: 1-29174
Northing	: 6925776.00	Logged By	: James Cachia Garrett	Client	: Group GSA Pty Ltd
Total Depth	: 2.5 m	Date	: 23/10/2025	Project	: Proposed Greater Flagstone State School

General comments: 1. Groundwater not encountered. 2. Borehole terminated at 'TC' bit refusal.

Drilling Method	Water	Depth (m)	Graphic Log	Material Description	DCP (0 5 10 15 20 25)	Samples and Remarks
TC		0.05		TOPSOIL Silty SAND (SM): medium dense, fine grained, grey brown, moist, trace of organics.		
		0.5		NATURAL Silty SAND (SM): dense, fine grained, moist.		
		0.5		NATURAL Sandy CLAY (CH): hard, high plasticity, brown, fine to medium grained sand, moist.		0.50-1.00, B
		1.0				
		1.5				
		2.0				
		2.3		SANDSTONE (DW): distinctly weathered, low strength, light brown, fine to medium grained, moist.		2.30-2.50, D
				BH08 Refusal at 2.5 m		

Comments

1. Groundwater not encountered.
2. Borehole terminated at 'TC' bit refusal.

Key

U - Undisturbed Tube	XW - Extremely Weathered
D - Disturbed (small)	DW - Distinctly Weathered
B - Bulk Disturbed (large)	Groundwater Observed
ASS - Acid Sulfate Soil	Standing Water
PP - Pocket Penetrometer	
VS - Vane Shear	

Approved By: CJ

Approval Date: 20/11/2025

Soil Surveys Engineering Pty Ltd
Level 1, 87 Schneider Road, Eagle Farm Qld 4009
Phone: 3369 6000

Geotechnical Log - Borehole

BH09

Easting	: 493351.00	Location	: 1-45 Poinciana Dr, Flagstone	Job Number	: 1-29174
Northing	: 6925684.00	Logged By	: James Cachia Garrett	Client	: Group GSA Pty Ltd
Total Depth	: 0.85 m	Date	: 22/10/2025	Project	: Proposed Greater Flagstone State School

General comments: 1. Groundwater not encountered. 2. Borehole terminated at 'TC' bit refusal.

Drilling Method	Casing	Water	Depth (m)	Graphic Log	Material Description	Samples and Remarks
TC			0.3		TOPSOIL Silty SAND (SM): medium dense, fine to medium grained, light grey, moist, trace of organics.	D 0 - 0.2
			0.5			D 0.3 - 0.5
			0.75		NATURAL Sandy CLAY (CL): hard, low plasticity, light brown mottled light grey, fine to medium grained sand, moist.	U50 0.6 - 0.74 pp>600
					SANDSTONE (DW): distinctly weathered, low strength, light brown, fine to medium grained, moist.	D 0.75 - 0.85
					BH09 Refusal at 0.85 m	

Comments

1. Groundwater not encountered.
2. Borehole terminated at 'TC' bit refusal.

Key

U - Undisturbed Tube	XW - Extremely Weathered
D - Disturbed (small)	DW - Distinctly Weathered
B - Bulk Disturbed (large)	Groundwater Observed
ASS - Acid Sulfate Soil	Standing Water
PP - Pocket Penetrometer	
VS - Vane Shear	

Approved By: CJ

Approval Date: 20/11/2025

Soil Surveys Engineering Pty Ltd
Level 1, 87 Schneider Road, Eagle Farm Qld 4009
Phone: 3369 6000

Geotechnical Log - Borehole

BH10

Easting	: 493453.00	Location	: 1-45 Poinciana Dr, Flagstone	Job Number	: 1-29174
Northing	: 6925706.00	Logged By	: James Cachia Garrett	Client	: Group GSA Pty Ltd
Total Depth	: 1.1 m	Date	: 22/10/2025	Project	: Proposed Greater Flagstone State School

General comments: 1. Groundwater not encountered. 2. Borehole terminated at 'TC' bit refusal.

Drilling Method	Water	Depth (m)	Graphic Log	Material Description	DCP (0 5 10 15 20 25)	Samples and Remarks
TC		0.2		TOPSOIL Silty SAND (SM): loose, fine to medium grained, dark brown, moist, trace of organics.		0.00-0.20, D
		0.5		NATURAL SAND (SP): medium dense, fine to medium grained, pale brown, moist.		0.20-0.50, D
		1		NATURAL Sandy CLAY (CH): hard, high plasticity, light brown mottled light grey, fine to medium grained sand, moist.		0.50-1.00, D
		1.0		SANDSTONE (DW): distinctly weathered, low strength, light brown mottled light grey, fine grained, moist.		1.00-1.10, D
				BH10 Refusal at 1.1 m		

Comments

1. Groundwater not encountered.
2. Borehole terminated at 'TC' bit refusal.

Key

U - Undisturbed Tube	XW - Extremely Weathered
D - Disturbed (small)	DW - Distinctly Weathered
B - Bulk Disturbed (large)	Groundwater Observed
ASS - Acid Sulfate Soil	Standing Water
PP - Pocket Penetrometer	
VS - Vane Shear	

Approved By: CJ

Approval Date: 20/11/2025

Soil Surveys Engineering Pty Ltd
Level 1, 87 Schneider Road, Eagle Farm Qld 4009
Phone: 3369 6000

Geotechnical Log - Borehole

BH11

Easting	: 493542.00	Location	: 1-45 Poinciana Dr, Flagstone	Job Number	: 1-29174
Northing	: 6925690.00	Logged By	: James Cachia Garrett	Client	: Group GSA Pty Ltd
Total Depth	: 0.9 m	Date	: 23/10/2025	Project	: Proposed Greater Flagstone State School

General comments: 1. Groundwater not encountered. 2. Borehole terminated at 'TC' bit refusal.

Drilling Method	Water	Depth (m)	Graphic Log	Material Description	DCP (0 5 10 15 20 25)	Samples and Remarks
TC		0.3		TOPSOIL Silty SAND (SM): medium dense, fine grained, light grey, moist, trace of organics.		
		0.5		NATURAL Sandy CLAY (CI): hard, medium plasticity, light brown mottled dark grey, fine to medium grained sand, moist.		
		0.6		Extremely weathered SANDSTONE (XW) recovered as Sand - dense, fine to medium grained, light brown.		0.60-0.70, U50 pp>600
		0.8		SANDSTONE (DW): distinctly weathered, low strength, light brown, fine to medium grained, moist.		
				BH11 Refusal at 0.9 m		

Comments

1. Groundwater not encountered.
2. Borehole terminated at 'TC' bit refusal.

Key

U - Undisturbed Tube
D - Disturbed (small)
B - Bulk Disturbed (large)
ASS - Acid Sulfate Soil
PP - Pocket Penetrometer
VS - Vane Shear
XW - Extremely Weathered
DW - Distinctly Weathered
Groundwater Observed
Standing Water

Approved By: CJ

Approval Date: 20/11/2025

Soil Surveys Engineering Pty Ltd
Level 1, 87 Schneider Road, Eagle Farm Qld 4009
Phone: 3369 6000

Geotechnical Log - Borehole

BH12

Easting	: 493632.00	Location	: 1-45 Poinciana Dr, Flagstone	Job Number	: 1-29174
Northing	: 6925696.00	Logged By	: James Cachia Garrett	Client	: Group GSA Pty Ltd
Total Depth	: 0.3 m	Date	: 23/10/2025	Project	: Proposed Greater Flagstone State School

General comments: 1. Groundwater not encountered. 2. Borehole terminated at 'TC' bit refusal.

Drilling Method	Water	Depth (m)	Graphic Log	Material Description	DCP (0 5 10 15 20 25)	Samples and Remarks
		0.05				
TC		0.2		FILL Silty SAND (SM): medium dense, fine to medium grained, pale brown, moist.		0.05-0.20, D
				NATURAL Sandy CLAY (CI): hard, medium plasticity, light brown mottled pale brown and orange, fine to medium grained sand, moist.		0.20-0.30, D
				SANDSTONE (DW): distinctly weathered, low strength, light brown, fine to medium grained, moist.		
				BH12 Refusal at 0.3 m		

Comments

1. Groundwater not encountered.
2. Borehole terminated at 'TC' bit refusal.

Key

U - Undisturbed Tube	XW - Extremely Weathered
D - Disturbed (small)	DW - Distinctly Weathered
B - Bulk Disturbed (large)	Groundwater Observed
ASS - Acid Sulfate Soil	Standing Water
PP - Pocket Penetrometer	
VS - Vane Shear	

Approved By: CJ

Approval Date: 20/11/2025

Soil Surveys Engineering Pty Ltd
Level 1, 87 Schneider Road, Eagle Farm Qld 4009
Phone: 3369 6000

Geotechnical Log - Borehole

BH13

Easting	: 493700.00	Location	: 1-45 Poinciana Dr, Flagstone	Job Number	: 1-29174
Northing	: 6925692.00	Logged By	: James Cachia Garrett	Client	: Group GSA Pty Ltd
Total Depth	: 4.4 m	Date	: 23/10/2025	Project	: Proposed Greater Flagstone State School

General comments: 1. Groundwater not encountered. 2. Borehole terminated at 'TC' bit refusal.

Drilling Method	Water	Depth (m)	Graphic Log	Material Description	DCP (0 5 10 15 20 25)	Samples and Remarks
TC		0.3		TOPSOIL Silty SAND (SM): medium dense, fine grained, light grey, moist, trace of organics.		0.00-0.20, D
		0.5		NATURAL Sandy CLAY (CL-CI): hard, low to medium plasticity, light brown mottled light grey, fine to medium grained sand.		0.20-0.50, D
		1.0				0.30-0.80, B
		1.5				
		2.0				
		2.5				
		3.0				
		3.5				
		3.8				
		4.0		NATURAL Gravelly Clayey SAND (SC): dense, fine to coarse grained, fine to coarse sized gravel, medium to high plasticity clay, light brown mottled light grey, moist.		3.80-4.20, D
		4.2		SANDSTONE (DW): distinctly weathered, low strength, orange brown mottled light grey, fine grained, moist.		
				BH13 Refusal at 4.4 m		

Comments

1. Groundwater not encountered.
2. Borehole terminated at 'TC' bit refusal.

Key

U - Undisturbed Tube	XW - Extremely Weathered
D - Disturbed (small)	DW - Distinctly Weathered
B - Bulk Disturbed (large)	Groundwater Observed
ASS - Acid Sulfate Soil	Standing Water
PP - Pocket Penetrometer	
VS - Vane Shear	

Approved By: CJ

Approval Date: 20/11/2025

Soil Surveys Engineering Pty Ltd
Level 1, 87 Schneider Road, Eagle Farm Qld 4009
Phone: 3369 6000

Geotechnical Log - Borehole

BH14

Easting	: 493354.00	Location	: 1-45 Poinciana Dr, Flagstone	Job Number	: 1-29174
Northing	: 6925613.00	Logged By	: James Cachia Garrett	Client	: Group GSA Pty Ltd
Total Depth	: 1.1 m	Date	: 22/10/2025	Project	: Proposed Greater Flagstone State School

General comments: 1. Groundwater not encountered. 2. Borehole terminated at 'TC' bit refusal.

Drilling Method	Water	Depth (m)	Graphic Log	Material Description	DCP (0 5 10 15 20 25)	Samples and Remarks
TC		0.2		TOPSOIL Silty SAND (SM): medium dense, fine grained, light brown, moist, trace of organics.		
		0.5		NATURAL Silty SAND (SM): medium dense, fine grained, light brown, moist.		
		1.0	1	SANDSTONE (DW): distinctly weathered, low strength, pale brown, fine grained, moist.		
				BH14 Refusal at 1.1 m		

Comments

1. Groundwater not encountered.
2. Borehole terminated at 'TC' bit refusal.

Key

U - Undisturbed Tube	XW - Extremely Weathered
D - Disturbed (small)	DW - Distinctly Weathered
B - Bulk Disturbed (large)	Groundwater Observed
ASS - Acid Sulfate Soil	Standing Water
PP - Pocket Penetrometer	
VS - Vane Shear	

Approved By: CJ

Approval Date: 20/11/2025

Soil Surveys Engineering Pty Ltd
Level 1, 87 Schneider Road, Eagle Farm Qld 4009
Phone: 3369 6000

Geotechnical Log - Borehole

BH15

Easting	: 493455.00	Location	: 1-45 Poinciana Dr, Flagstone	Job Number	: 1-29174
Northing	: 6925601.00	Logged By	: James Cachia Garrett	Client	: Group GSA Pty Ltd
Total Depth	: 6 m	Date	: 22/10/2025	Project	: Proposed Greater Flagstone State School

General comments: 1. Groundwater not encountered.

Drilling Method	Water	Depth (m)	Graphic Log	Material Description	DCP (0 5 10 15 20 25)	Samples and Remarks
TC		0.2		TOPSOIL SAND (SP): medium dense, fine to medium grained, light brown, moist, trace of organics.		0.00-0.20, D
		0.5		NATURAL SAND (SP): medium dense, fine to medium grained, moist.		0.20-0.50, D
		0.6		NATURAL Sandy CLAY (CI-CH): hard, medium to high plasticity, light grey mottled orange, fine to medium grained sand, moist.		0.60-1.00, B
		1.0				0.80-1.00, U50 pp>600
		1.3		NATURAL Clayey SAND (SC): medium dense, fine to medium grained, low to medium plasticity clay, grey mottled light brown.		1.30-1.40, D
		1.5		NATURAL SAND (SP): dense, fine to medium grained, light brown, moist.		1.50-2.00, D
		2.0				
		2.5				
		3.0				
		3.5		NATURAL Clayey SAND (SC): dense, fine to medium grained, dark orange brown mottled light grey, low plasticity clay.		
		4.0				
		4.5				
		4.8		NATURAL Sandy CLAY (CI): hard, medium plasticity, light brown mottled light grey, fine to medium grained sand, moist.		
		5.0				
		5.5				5.00-6.00, D
				BH15 Target Depth Reached at 6 m		

Comments

1. Groundwater not encountered.

Key

U - Undisturbed Tube
D - Disturbed (small)
B - Bulk Disturbed (large)
ASS - Acid Sulfate Soil
PP - Pocket Penetrometer
VS - Vane Shear
XW - Extremely Weathered
DW - Distinctly Weathered
Groundwater Observed
Standing Water

Approved By: CJ

Approval Date: 20/11/2025

Soil Surveys Engineering Pty Ltd
Level 1, 87 Schneider Road, Eagle Farm Qld 4009
Phone: 3369 6000

Geotechnical Log - Borehole

BH16

Easting	: 493544.00	Location	: 1-45 Poinciana Dr, Flagstone	Job Number	: 1-29174
Northing	: 6925593.00	Logged By	: James Cachia Garrett	Client	: Group GSA Pty Ltd
Total Depth	: 1.1 m	Date	: 22/10/2025	Project	: Proposed Greater Flagstone State School

General comments: 1. Groundwater not encountered. 2. Borehole terminated at 'TC' bit refusal.

Drilling Method	Water	Depth (m)	Graphic Log	Material Description	DCP (0 5 10 15 20 25)	Samples and Remarks
TC		0.1 0.2		TOPSOIL Silty SAND (SM): medium dense, fine to medium grained, dark grey brown, moist, trace of organics.		
		0.5 0.5		NATURAL Silty SAND (SM): medium dense, fine grained, light grey, moist.		
				NATURAL SAND (SP): medium dense, fine to medium grained, light brown, moist.		
		1.0 1		NATURAL Clayey SAND (SC): medium dense, fine to medium grained, light brown mottled light grey, low plasticity clay, moist.		
				SANDSTONE (DW): distinctly weathered, low strength, light brown, fine grained, moist.		
				BH16 Refusal at 1.1 m		

Comments

1. Groundwater not encountered.
2. Borehole terminated at 'TC' bit refusal.

Key

U - Undisturbed Tube	XW - Extremely Weathered
D - Disturbed (small)	DW - Distinctly Weathered
B - Bulk Disturbed (large)	Groundwater Observed
ASS - Acid Sulfate Soil	Standing Water
PP - Pocket Penetrometer	
VS - Vane Shear	

Approved By: CJ

Approval Date: 20/11/2025

Soil Surveys Engineering Pty Ltd
Level 1, 87 Schneider Road, Eagle Farm Qld 4009
Phone: 3369 6000

Geotechnical Log - Borehole

BH17

Easting	: 493406.00	Location	: 1-45 Poinciana Dr, Flagstone	Job Number	: 1-29174
Northing	: 6925796.00	Logged By	: James Cachia Garrett	Client	: Group GSA Pty Ltd
Total Depth	: 4.6 m	Date	: 22/10/2025	Project	: Proposed Greater Flagstone State School

General comments: 1. Groundwater not encountered. 2. Borehole terminated at 'TC' bit refusal.

Drilling Method	Water	Depth (m)	Graphic Log	Material Description	DCP (0 5 10 15 20 25)	Samples and Remarks
TC		0.2		TOPSOIL Silty SAND (SM): medium dense, fine to medium grained, light grey brown, moist, trace of organics.		0.00-0.20, D
		0.5		NATURAL SAND (SP): medium dense, fine to medium grained, light brown, moist.		0.20-0.50, D
				NATURAL Sandy CLAY (CH): hard, high plasticity, orange mottled light grey, fine to medium grained sand, moist.		0.50-1.00, B
		1.0				0.50-1.00, D
						1.00-1.45, U50 pp>600
		1.5				
		2.0				
		2.5				
		2.6		NATURAL Clayey SAND (SC): medium dense, fine to medium grained, orange mottled light grey, low plasticity clay, moist.		2.60-3.00, D
		3				
		3.0		NATURAL SAND (SP): medium dense, fine to medium grained, light brown mottled light grey, trace clay, moist.		
		3.5				
		3.9				
		4.0		NATURAL Sandy CLAY (CH): hard, high plasticity, light brown, fine to medium grained sand, moist.		4.00-4.50, D
		4.5				
				SANDSTONE (DW): distinctly weathered, low strength, light brown mottled light grey, fine to medium grained, moist.		
				BH17 Refusal at 4.6 m		

Comments

1. Groundwater not encountered.
2. Borehole terminated at 'TC' bit refusal.

Key

U - Undisturbed Tube	XW - Extremely Weathered
D - Disturbed (small)	DW - Distinctly Weathered
B - Bulk Disturbed (large)	Groundwater Observed
ASS - Acid Sulfate Soil	Standing Water
PP - Pocket Penetrometer	
VS - Vane Shear	

Approved By: CJ

Approval Date: 20/11/2025

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Phone: 3369 6000

Geotechnical Log - Borehole

BH18

Easting	: 493507.00	Location	: 1-45 Poinciana Dr, Flagstone	Job Number	: 1-29174
Northing	: 6925720.00	Logged By	: James Cachia Garrett	Client	: Group GSA Pty Ltd
Total Depth	: 0.7 m	Date	: 23/10/2025	Project	: Proposed Greater Flagstone State School

General comments: 1. Groundwater not encountered. 2. Borehole terminated at 'TC' bit refusal.

Drilling Method	Water	Depth (m)	Graphic Log	Material Description	DCP (0 5 10 15 20 25)	Samples and Remarks
TC		0.2		TOPSOIL Silty SAND (SM): medium dense, fine grained, light grey pale brown, moist, trace of organics.		0.00-0.20, D
		0.5 0.6		NATURAL Silty SAND (SM): dense, fine grained, pale brown.		0.20-0.50, D
				SANDSTONE (DW): distinctly weathered, low strength, light brown, fine to medium grained, moist.		
				BH18 Refusal at 0.7 m		

Comments

1. Groundwater not encountered.
2. Borehole terminated at 'TC' bit refusal.

Key

U - Undisturbed Tube	XW - Extremely Weathered
D - Disturbed (small)	DW - Distinctly Weathered
B - Bulk Disturbed (large)	Groundwater Observed
ASS - Acid Sulfate Soil	Standing Water
PP - Pocket Penetrometer	
VS - Vane Shear	

Approved By: CJ

Approval Date: 20/11/2025

Soil Surveys Engineering Pty Ltd
Level 1, 87 Schneider Road, Eagle Farm Qld 4009
Phone: 3369 6000

Geotechnical Log - Borehole

BH19

Easting	: 493416.00	Location	: 1-45 Poinciana Dr, Flagstone	Job Number	: 1-29174
Northing	: 6925649.00	Logged By	: James Cachia Garrett	Client	: Group GSA Pty Ltd
Total Depth	: 6 m	Date	: 22/10/2025	Project	: Proposed Greater Flagstone State School

General comments: 1. Groundwater not encountered.

Drilling Method	Water	Depth (m)	Graphic Log	Material Description	DCP (0 5 10 15 20 25)	Samples and Remarks
TC		0.2		TOPSOIL Silty SAND (SM): medium dense, fine grained, light grey brown, moist.		0.00-0.20, D
		0.5		NATURAL SAND (SP): medium dense, fine to medium grained, pale brown, moist.		0.20-0.50, D
		0.8				
		1.0		NATURAL Sandy CLAY (CI): hard, medium plasticity, light brown mottled light grey, fine to medium grained sand, moist.		0.80-1.00, D
		1.2				
		1.5		NATURAL Clayey SAND (SC): dense, fine to medium grained, light brown mottled light grey, low plasticity clay, moist.		1.20-1.50, D
		2.0				
		2.5				2.50-3.00, D
		3.0				
		3.5		NATURAL SAND (SP): dense, fine to medium grained, dark orange brown mottled light grey, trace clay, moist.		
		4.0				
		4.5				
		5.0				
		5.5				5.00-6.00, D
				BH19 Target Depth Reached at 6 m		

Comments

1. Groundwater not encountered.

Key

U - Undisturbed Tube	XW - Extremely Weathered
D - Disturbed (small)	DW - Distinctly Weathered
B - Bulk Disturbed (large)	Groundwater Observed
ASS - Acid Sulfate Soil	Standing Water
PP - Pocket Penetrometer	
VS - Vane Shear	

Approved By: CJ

Approval Date: 20/11/2025

Soil Surveys Engineering Pty Ltd
Level 1, 87 Schneider Road, Eagle Farm Qld 4009
Phone: 3369 6000

Geotechnical Log - Borehole

BH20

Easting	: 493612.00	Location	: 1-45 Poinciana Dr, Flagstone	Job Number	: 1-29174
Northing	: 625648.00	Logged By	: James Cachia Garrett	Client	: Group GSA Pty Ltd
Total Depth	: 1.7 m	Date	: 22/10/2025	Project	: Proposed Greater Flagstone State School

General comments: 1. Groundwater not encountered. 2. Borehole terminated at 'TC' bit refusal.

Drilling Method	Water	Depth (m)	Graphic Log	Material Description	DCP (0 5 10 15 20 25)	Samples and Remarks
TC		0.2		TOPSOIL Silty SAND (SM): medium dense, fine to medium grained, light grey, moist, trace of organics.		
		0.5		NATURAL SAND (SP): medium dense, fine to medium grained, pale brown, trace silt, moist.		
		1.0		NATURAL Sandy CLAY (CL): hard, low plasticity, light brown mottled light grey, fine to medium grained sand, moist.		
		1.2		Extremely weathered SANDSTONE (XW): Sand - dense, fine to medium grained, light brown, moist.		
		1.5		SANDSTONE (DW): distinctly weathered, low strength, light brown, fine to medium grained, moist.		
		1.6		BH20 Refusal at 1.7 m		

Comments

1. Groundwater not encountered.
2. Borehole terminated at 'TC' bit refusal.

Key

U - Undisturbed Tube
D - Disturbed (small)
B - Bulk Disturbed (large)
ASS - Acid Sulfate Soil
PP - Pocket Penetrometer
VS - Vane Shear
XW - Extremely Weathered
DW - Distinctly Weathered
Groundwater Observed
Standing Water

Approved By: CJ

Approval Date: 20/11/2025

Appendix C
Laboratory Test Certificates

SOIL SURVEYS
Soil Surveys Engineering Pty Limited
Geotechnical Specialists
ABN: 70 054 043 631
www.soilsurveys.com.au

Helensvale Laboratory
Gold Coast
Unit 8, 140 Millaroo Drive
Helensvale
QLD, 4212
Tel: 07 3369 6000
info@soilsurveys.com.au

Soil pH & EMERSON CLASS NUMBER REPORT

Client :	**Group GSA Pty Ltd**	Report No:	1-29174 18.11.2025 ESC
Client Address :	**C/O 1/87 Schneider Road, Eagle Farm, QLD, 4009**	Report Date:	18/11/2025
Project Number :	**1-29174**	Issue Number:	1
Project :	**Proposed Greater Flagstone State School**	Page 1 of 3	
Location :	**1-45 Poinciana Drive, Flagstone**		

SAMPLE DETAILS:					
Sample ID:	1-29174-BH01-D00000	1-29174-BH01-D00030	1-29174-BH03-D00000	1-29174-BH03-D00020	1-29174-BH09-D00000
Date Sampled:	22/10/2025	22/10/2025	22/10/2025	22/10/2025	22/10/2025
Date Tested:	3/11/2025	3/11/2025	3/11/2025	3/11/2025	3/11/2025
Soil Description:	Silty Sand (SM) Grey	Silty Sand (SM) Grey	Silty Sand (SM) Dark Grey	Clayey Sand (SC)	Silty Sandy (SM) Dark Grey
Sampling Method:	AS1726:2017 Geotechnical Site Investigations	AS1726:2017 Geotechnical Site Investigations	AS1726:2017 Geotechnical Site Investigations	AS1726:2017 Geotechnical Site Investigations	AS1726:2017 Geotechnical Site Investigations
Sampled by:	SSE - Driller JCG	SSE - Driller JCG	SSE - Driller JCG	SSE - Driller JCG	SSE - Driller JCG
Sample Location:	**BH01**	**BH01**	**BH03**	**BH03**	**BH09**
Depth (m):	**0.00-0.20**	**0.30-0.50**	**0.00-0.20**	**0.20-0.50**	**0.00-0.20**
Source:	Borehole	Borehole	Borehole	Borehole	Borehole
Material:	Unknown	Unknown	Unknown	Unknown	Unknown
Moisture Condition:	Air Dried	Air Dried	Air Dried	Air Dried	Air Dried
TEST RESULTS:					
Emerson Class Number (AS1289.3.8.1)					
Emerson Class Number:	**4**	**4**	**4**	**3**	**4**
Type of Water:	Distilled	Distilled	Distilled	Distilled	Distilled
Water Temperature (°C)	21	21	21	21	21
Soil pH (AS1289.4.3.1)					
Soil pH:	6.5	7.0	6.2	6.7	6.6
Distilled Water pH:	6.9	6.9	6.9	6.9	6.9
*Conductivity(mS/cm):	0.04	0.02	0.05	0.03	0.05
Temperature (°C):	20	20	20	20	20

Remarks :

NATA
WORLD RECOGNISED ACCREDITATION

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APPROVED SIGNATORY
Mark Rutten

NATA Accred No:15301

END OF DOCUMENT

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Soil Surveys Engineering Pty Limited
Geotechnical Specialists
ABN: 70 054 043 631
www.soilsurveys.com.au

Helensvale Laboratory
Gold Coast
Unit 8, 140 Millaroo Drive
Helensvale
QLD, 4212
Tel: 07 3369 6000
info@soilsurveys.com.au

Soil pH & EMERSON CLASS NUMBER REPORT

Client :	**Group GSA Pty Ltd**	Report No:	1-29174 18.11.2025 ESC
Client Address :	**C/O 1/87 Schneider Road, Eagle Farm, QLD, 4009**	Report Date:	18/11/2025
Project Number :	**1-29174**	Issue Number:	1
Project :	**Proposed Greater Flagstone State School**	Page 2 of 3	
Location :	**1-45 Poinciana Drive, Flagstone**		

SAMPLE DETAILS:					
Sample ID:	1-29174-BH09-D00030	1-29174-BH13-D00000	1-29174-BH13-D00020	1-29174-BH15-D00000	1-29174-BH15-D00020
Date Sampled:	22/10/2025	22/10/2025	22/10/2025	22/10/2025	22/10/2025
Date Tested:	3/11/2025	3/11/2025	3/11/2025	3/11/2025	3/11/2025
Soil Description:	Sand Clay (CL) Grey & Brown Mottled	Silty Sand (SM) Grey	Sandy Clay (CL) Brown	Silty Sand (SM) Grey Brown	Silty Sandy (SM) Brown
Sampling Method:	AS1726:2017 Geotechnical Site Investigations	AS1726:2017 Geotechnical Site Investigations	AS1726:2017 Geotechnical Site Investigations	AS1726:2017 Geotechnical Site Investigations	AS1726:2017 Geotechnical Site Investigations
Sampled by:	SSE - Driller JCG	SSE - Driller JCG	SSE - Driller JCG	SSE - Driller JCG	SSE - Driller JCG
Sample Location:	**BH09**	**BH13**	**BH13**	**BH15**	**BH15**
Depth (m):	**0.30-0.50**	**0.00-0.20**	**0.20-0.50**	**0.00-0.20**	**0.20-0.50**
Source:	Borehole	Borehole	Borehole	Borehole	Borehole
Material:	Unknown	Unknown	Unknown	Unknown	Unknown
Moisture Condition:	Air Dried	Air Dried	Air Dried	Air Dried	Air Dried
TEST RESULTS:					
Emerson Class Number (AS1289.3.8.1)					
Emerson Class Number:	**3**	**3**	**3**	**3**	**3**
Type of Water:	Distilled	Distilled	Distilled	Distilled	Distilled
Water Temperature (°C)	21	21	21	21	21
Soil pH (AS1289.4.3.1)					
Soil pH:	6.8	6.2	6.7	6.5	6.9
Distilled Water pH:	6.9	6.9	6.9	6.9	6.9
*Conductivity(mS/cm):	0.03	0.03	0.03	0.04	0.02
Temperature (°C):	20	20	20	20	20

Remarks :

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APPROVED SIGNATORY
Mark Rutten

NATA Accred No:15301

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Geotechnical Specialists
ABN: 70 054 043 631
www.soilsurveys.com.au

Helensvale Laboratory
Gold Coast
Unit 8, 140 Millaroo Drive
Helensvale
QLD, 4212
Tel: 07 3369 6000
info@soilsurveys.com.au

Soil pH & EMERSON CLASS NUMBER REPORT

Client :	**Group GSA Pty Ltd**	Report No:	1-29174 18.11.2025 ESC
Client Address :	**C/O 1/87 Schneider Road, Eagle Farm, QLD, 4009**	Report Date:	18/11/2025
Project Number :	**1-29174**	Issue Number:	1
Project :	**Proposed Greater Flagstone State School**	Page 3 of 3	
Location :	**1-45 Poinciana Drive, Flagstone**		

SAMPLE DETAILS:					
Sample ID:	1-29174-BH18-D00000	1-29174-BH18-D00020			
Date Sampled:	23/10/2025	23/10/2025			
Date Tested:	3/11/2025	3/11/2025			
Soil Description:	Silty Sand (SM) Brown	Silty Sand (SM) Grey			
Sampling Method:	AS1726:2017 Geotechnical Site Investigations	AS1726:2017 Geotechnical Site Investigations			
Sampled by:	SSE - Driller JCG	SSE - Driller JCG			
Sample Location:	**BH18**	**BH18**			
Depth (m):	**0.00-0.20**	**0.20-0.50**			
Source:	Borehole	Borehole			
Material:	Unknown	Unknown			
Moisture Condition:	Air Dried	Air Dried			
TEST RESULTS:					
Emerson Class Number (AS1289.3.8.1)					
Emerson Class Number:	**4**	**4**			
Type of Water:	Distilled	Distilled			
Water Temperature (°C)	21	21			
Soil pH (AS1289.4.3.1)					
Soil pH:	6.5	6.2			
Distilled Water pH:	6.9	6.9			
*Conductivity(mS/cm):	0.03	0.03			
Temperature (°C):	20	20			

Remarks :

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www.soilsurveys.com.au

Helensvale Laboratory
Gold Coast
Unit 8, 140 Millaroo Drive
Helensvale
QLD, 4212
Tel: 07 3369 6000
info@soilsurveys.com.au

CALIFORNIA BEARING RATIO REPORT

Client :	**Group GSA Pty Ltd**	Report No:	1-29174-05.11.2025 CBR
Client Address :	**C/O 1/87 Schneider Road, Eagle Farm QLD 4009**	Report Date:	5/11/2025
Project Number :	**1-29174**	Issue Number:	1
Project :	**Proposed Greater Flagstone State School**	Page 1 of 1	
Location :	**1-45 Poinciana Drive, Flagstone**		

SAMPLE DETAILS:					
Sample ID:	1-29174-BH08-B00050	1-29174-BH13-B00030	1-29174-BH15-B00060	1-29174-BH17-B00050	
Field Sample ID:	-	-	-	-	
Date Sampled:	23/10/2025	22/10/2025	22/10/2025	22/10/2025	
Soil Description:	Silty Sandy Clay (CH) Red/Brown	Sandy Clay (CL-CI) Red/Brown with mottled Light Brown	Clayey Sand (SC) Brown	Sandy Clay (CL) Red/Brown	
Sampling Method:	AS1726:2017 Geotechnical Site Investigations	AS1726:2017 Geotechnical Site Investigations	AS1726:2017 Geotechnical Site Investigations	AS1726:2017 Geotechnical Site Investigations	
Sampled by:	SSE - Driller RH	SSE - Driller RH	SSE - Driller RH	SSE - Driller RH	
Sample Location:	**BH08**	**BH13**	**BH15**	**BH17**	
Depth (m):	**0.50 - 1.00**	**0.30 - 0.80**	**0.60 - 1.00**	**0.50 - 1.00**	
Source:	Borehole	Borehole	Borehole	Borehole	
Material:	Unknown	Unknown	Unknown	Unknown	
Specification:	100% STD	100% STD	100% STD	100% STD	
TEST RESULTS:					
Moisture Content (AS1289.2.1.1)					
Moisture Content (%)	15.6	15.8	9.8	16.6	
Date Tested:	30/10/2025	30/10/2025	30/10/2025	30/10/2025	
Maximum Dry Density - Standard (AS1289.5.1.1):					
Standard Maximum Dry Density (t/m3):	1.75	1.82	1.92	1.81	
Standard Optimum Moisture Content (%):	17.8	15.3	12.7	16.4	
Oversize Sieve (mm):	19	19	19	19	
Oversize Material (%):	0	0	0	0	
Date Tested:	30/10/2025	30/10/2025	30/10/2025	30/10/2025	
California Bearing Ratio (AS1289.6.1.1):					
CBR Value (%):	**2.5**	**9**	**8**	**7**	
CBR Penetration :	**2.5mm**	**2.5mm**	**5.0mm**	**2.5mm**	
Maximum Dry Density (t/m^3):	1.75	1.82	1.92	1.81	
Optimum Moisture Content (%):	17.8	15.3	12.7	16.4	
Dry Density Before Soaking (t/m^3):	1.75	1.81	1.91	1.80	
Density Ratio Before Soaking (%):	100.5	99.5	100.0	99.5	
Moisture Content before Soaking (%):	17.4	15.1	12.8	16.7	
Moisture Ratio before Soaking (%):	97.5	98.5	101.0	102.0	
Dry Density after Soaking (t/m^3):	1.70	1.80	1.91	1.80	
Density Ratio after Soaking (%):	97.0	98.5	100.0	99.5	
Swell (%):	3.5	1.0	0.0	0.0	
Moisture Content of Top 30mm (%):	24.5	18.3	13.2	18.9	
Moisture Content of Remaining Depth (%):	20.1	16.6	13.3	17.6	
Compactive Effort:	Standard	Standard	Standard	Standard	
Surcharge Mass (kg):	4.5	4.5	4.5	4.5	
Period of Soaking (Days):	4	4	4	4	
Oversize Material:	N/A	N/A	N/A	N/A	
Oversize Material (%):	0	0	0	0	
Date Tested:	4/11/2025	4/11/2025	4/11/2025	4/11/2025	
CBR Total Curing Time (hr):	32	26	4	6	
Plasticity Determination:	Tactile Assessment	Tactile Assessment	Tactile Assessment	Tactile Assessment	

Remarks :

NATA
WORLD RECOGNISED ACCREDITATION

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APPROVED SIGNATORY
Zane De Koster

NATA Accred No:15301

Soil Surveys Engineering Pty Limited
Geotechnical Specialists
ABN: 70 054 043 631
www.soilsurveys.com.au

Helensvale Laboratory
Gold Coast
Unit 8, 140 Millaroo Drive
Helensvale
QLD, 4212
Tel: 07 3369 6000
info@soilsurveys.com.au

SHRINK SWELL INDEX REPORT

Client :	**Group GSA Pty Ltd**	Report No:	1-29174 06.11.2025 ISS
Client Address :	**C/O 1/87 Schneider Road, Eagle Farm, QLD, 4009**	Report Date:	6/11/2025
Project Number :	**1-29174**	Issue Number:	1
Project :	**Proposed Greater Flagstone State School**	Page 1 of 1	
Location :	**1-45 Poinciana Drive, Flagstone 4280**		

SAMPLE DETAILS:					
Sample ID:	1-29174-BH09-U00060	1-29174-BH11-U00060	1-29174-BH15-U00080	1-29174-BH17-U00100	
Date Sampled:	22/10/2025	22/10/2025	22/10/2025	22/10/2025	
Date Tested:	29/10/2025	29/10/2025	30/10/2025	29/10/2025	
Soil Description:	Silty Sandy Clay (CH) Brown with Red & Grey Mottle	Sandy Clay (CI) Pale Brown	Silty Sandy Clay (CL) Grey, Brown & Red Mottled	Sandy Clay (CH) Brown with Grey Mottle	
Sampling Method:	AS1726:2017 Geotechnical Site Investigations	AS1726:2017 Geotechnical Site Investigations	AS1726:2017 Geotechnical Site Investigations	AS1726:2017 Geotechnical Site Investigations	
Sampled by:	SSE - Driller RH	SSE - Driller RH	SSE - Driller RH	SSE - Driller RH	
Sample Location:	**BH09**	**BH11**	**BH15**	**BH17**	
Depth (m):	**0.60-0.74**	**0.60-0.70**	**0.80-1.00**	**1.00-1.45**	
Source:	Borehole	Borehole	Borehole	Borehole	
Material:	Unknown	Unknown	Unknown	Unknown	
TEST RESULTS:					
Swell Test (AS1289.7.1.1)					
Swell on Saturation(%)	**0.0**	**1.2**	**0.1**	**0.0**	
Moisture Content Before(%)	23.1	16.0	10.7	15.2	
Moisture Content After(%)	23.3	22.8	15.1	19.1	
Shrink Test (AS1289.7.1.1)					
Shrink on Drying(%)	**3.5**	**1.3**	**0.3**	**3.3**	
Shrinkage Moisture Content(%)	16.3	13.0	11.9	21.6	
Est. Inert Material(%)	0	0	0	0	
Crumbling	None	None	None	None	
Cracking	None	Slight	Slight	Slight	
Results:					
Shrink Swell Index - Iss (%):	**1.9**	**1.1**	**0.2**	**1.8**	
*Swell Pressure (kPa):	20	60	30	20	
Unit Weight (t/m^3):	1.95	1.92	2.26	2.03	

Remarks :

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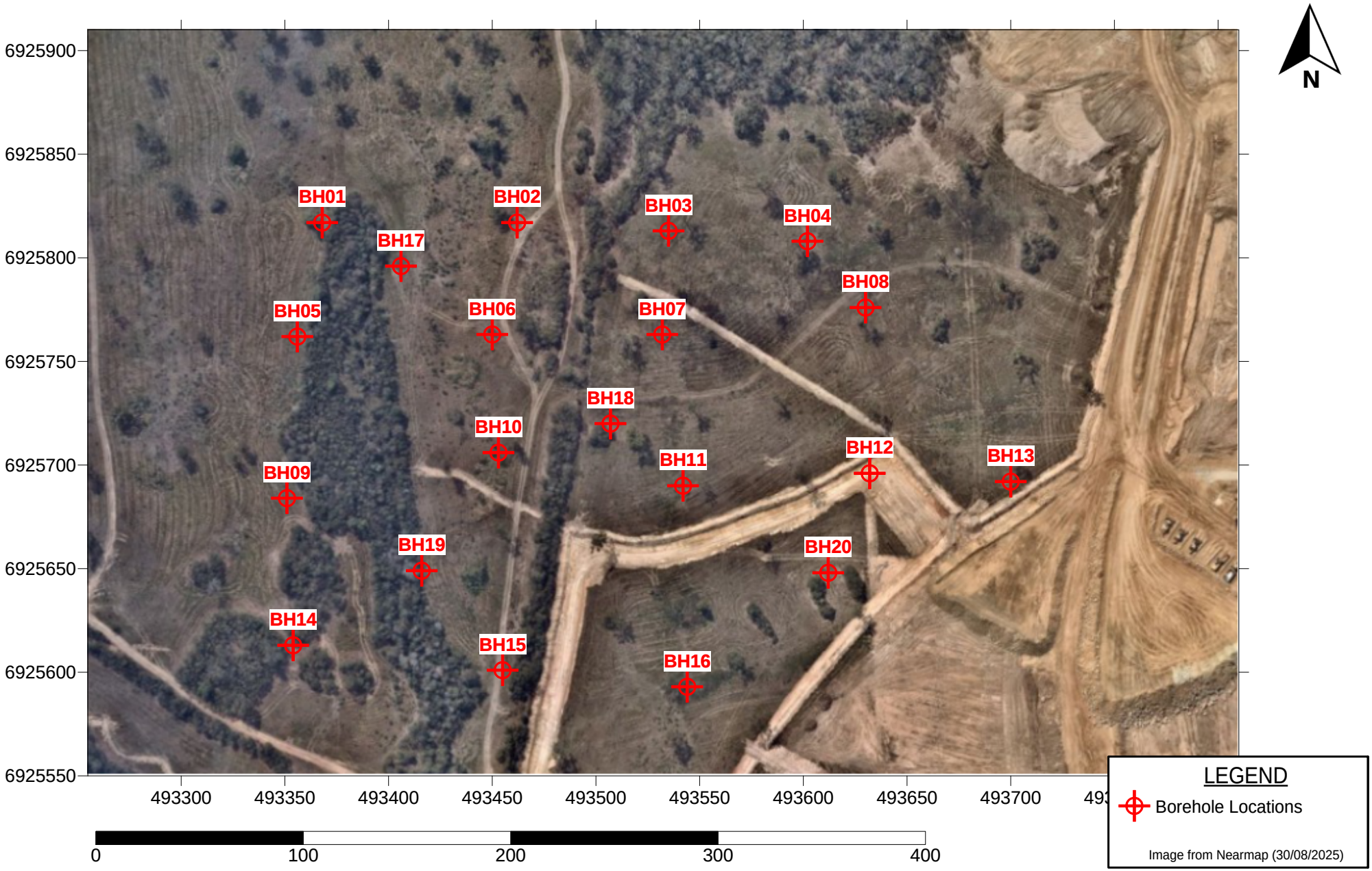
APPROVED SIGNATORY
Mark Rutten

Nata Accreditation number: 15301

END OF DOCUMENT

Appendix D
Site Plan



SCALE: 1:2500 at A4			DRAWING TITLE: **BOREHOLE LOCATION PLAN** Proposed Greater Flagstone State School	CLIENT: Group GSA Pty Ltd
DRAWING NUMBER: 1-29174-01	DATE: 22/10/2025	CHECKED: CJ		LOCATION: 1-45 Poinciana Drive, Flagstone

SOIL SURVEYS
Geotechnical Specialists

Appendix F – Flood Memo

MEMORANDUM

Project:	QC4012_002 Flagstone City Context Area 3	Date:	26 November 2025
To:	Peet Flagstone City Pty Ltd	From:	Jesse Hunter
ATT:	Jordan Pyne	CC:	Troy Thompson
Subject:	Flagstone Context Area 3 South – Stage 8 School Site Flood Assessment		

INTRODUCTION

Engeny Australia Pty Ltd (Engeny) was engaged by Peet Flagstone City Pty Ltd (Peet) to prepare a memorandum detailing the flood conditions and mapping relevant to the proposed Department of Education School Site (hereafter referred to as 'the Site') located within the Flagstone City Context Area 3 development.

Context Area 3 forms part of the overall Flagstone City development plan within the Greater Flagstone PDA. Flooding within the development is managed through a master-planned solution which utilises both online and offline devices to achieve the necessary peak flow mitigation prior to discharging from the Site. For further context and background information relating to the masterplan development and flood management strategy, this memorandum should be read in conjunction with the *Flagstone City Masterplan Flood Management Strategy (Engeny, 2025) (Ref. QC4012_002-REP-001-6)* which encompasses the entire Flagstone City development area.

The purpose of this memorandum is to provide an understanding of flood levels and extents at the School Site and the predicted level of flood immunity. The following sections outline the modelling methodology and results.

The Site locality is presented in Figure 1. The Flagstone CA3 South Stages 8-14 Overall Subdivision is provided in Appendix A.

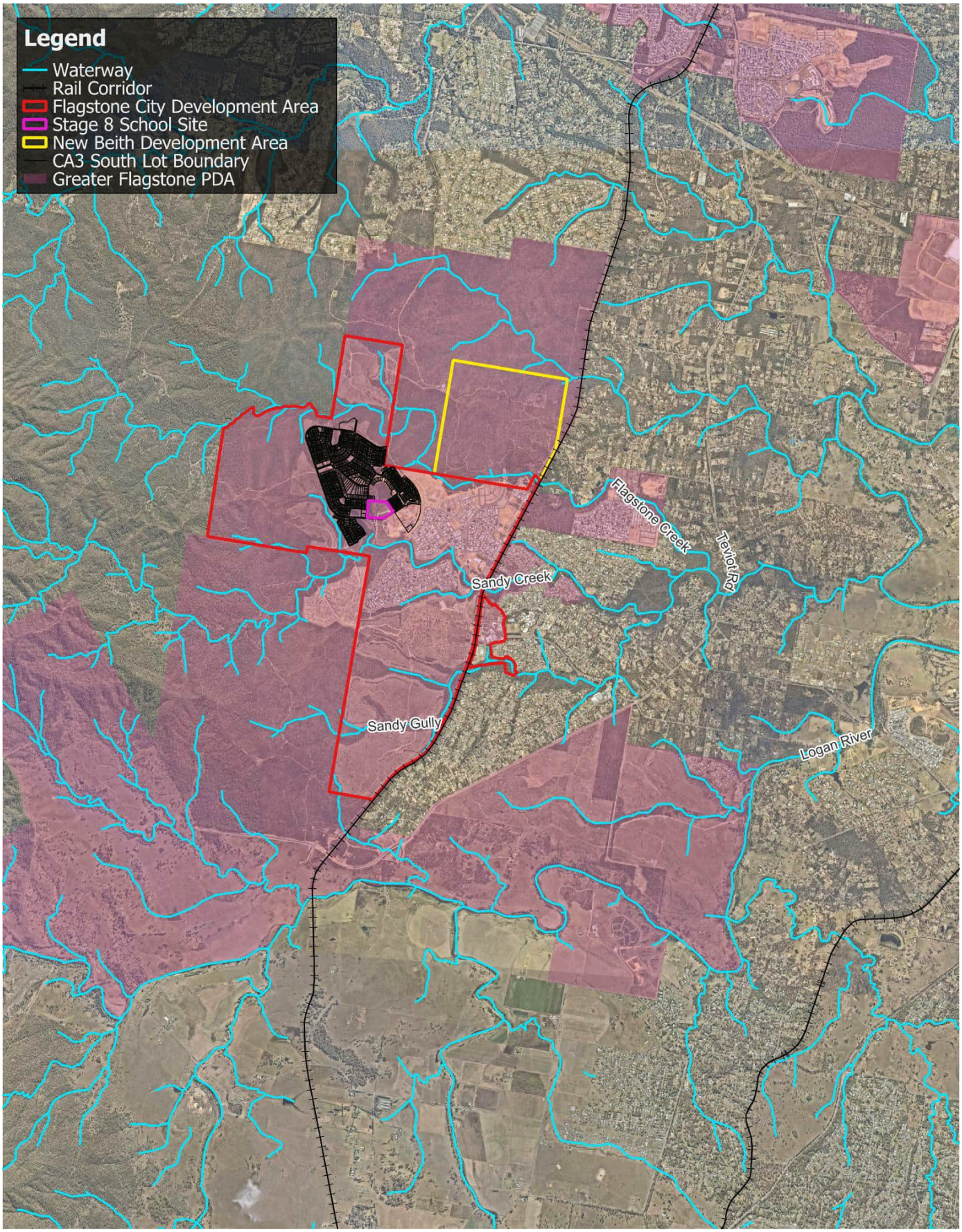


FIGURE 1: SITE LOCALITY

HYDROLOGIC MODELLING

Hydrology modelling was undertaken using the WBNM software package to determine the peak discharge and runoff hydrographs for a range of scenarios for the Flagstone Creek, Sandy Creek and Sandy Gully catchments. The scenarios used for this flood assessment of the Site were as follows:

- **Baseline Scenario (B01):** Pre-development case prior to development of Context Areas 1 – 5.
- **Masterplan Scenario (M01):** Development of all Context Areas 1 – 5 and construction of all required mitigation devices and detention basins.

Catchment delineation for the Baseline Scenario (B01) was undertaken using 2021 LiDAR for catchments external to the Flagstone City and New Beith development areas, and 2013 LiDAR within the development areas to represent the baseline scenario. For the Masterplan Scenario (M01), catchment delineation was undertaken using a combination of 2021 LiDAR and design information (supplied by the civil consultant) within the development areas.

Fraction impervious values for the catchment were determined using a combination of historical aerial imagery and LCC Planning Scheme zoning for the Baseline Scenario model. The Masterplan Scenario model included allowance for the overall Site development plan for both Flagstone City (Peet) and New Beith (Frasers). Fraction impervious values for each of the adopted land-uses are summarised below in Table 1. The sub-catchment delineation and adopted sub-catchment parameters can be found in the *Flagstone City Masterplan Flood Management Strategy* (Engeny, 2025).

TABLE 1: LAND-USE FRACTION IMPERVIOUS

Land Use	Fraction Impervious (%)
Centre	90
Community Facilities	70
Emerging Community	80
Environmental Management and Conservation	0
Industrial	90
Commercial	90
Low-Density Residential	55
Medium-Density Residential	80
High-Density Residential	90
Recreation and Open Space	10
Road	70
Rural	2
Rural Residential	10

Rainfall-Loss Parameters

The rainfall-loss parameters adopted in WBNM are summarised as follows:

- Application of storm initial loss of 24 mm, as per ARR v4.2 specifications, for all pervious surfaces.
- Application of storm continuing loss of 1.6 mm/h, as per ARR v4.2 specifications, for all pervious surfaces.
- Application of initial and continuing losses of 1 mm and 0 mm/h, respectively, for all impervious surfaces.
- Application of ARR 2019 rainfall depths (for historical climate conditions) sourced from the Bureau of Meteorology (BoM), as per ARR v4.2 specifications.
- Application of ARR 2019 median pre-burst rainfall depths, as per ARR v4.2 specifications, prior to the main burst.
- Simulation of the full ensemble of the 10 ensemble temporal patterns for the East Coast North region, as per ARR v4.2 specifications.
- No application of Areal Reduction Factors.
- WBNM default value of C = 1.6 was adopted.

Probably Maximum Precipitation

In accordance with the New Beith Stormwater IMP, the PMP design storm events were simulated in the hydrologic model. PMP rainfall estimates were determined using the BoM guidelines for The Estimation of Probably Maximum Precipitation in Australia: Generalised Short-Duration Method (BoM, 2003) for storm durations less than 6 hours.

A summary of the adopted parameters is provided in Table 2.

The adopted PMP IFD is provided in Table 3.

TABLE 2: PMP PARAMETERS

Parameters	Value
Catchment Area (km2)	55.7
Topography Adjustment Factor	1
Catchment Roughness	1 (fully rough)
Moisture Adjustment Factor	0.8
Elevation Adjustment Factor	1

TABLE 3: PMP IFD

Duration	PMP Rainfall Depth (mm)	PMP Rainfall Intensity (mm/h)	0.05% AEP Rainfall Depth (mm)	1% AEP Rainfall Intensity (mm/h)
1-hour	320	320	144	88
1.5-hour	410	273	164	101
2-hour	480	240	179	110
3-hour	580	193	201	124
6-hour	770	128	250	157

HYDRAULIC MODELLING

Hydraulic analysis of the Flagstone Creek, Sandy Creek and Sandy Gully catchments was undertaken using the TUFLOW software package to determine the peak discharge and runoff hydrographs for the range of scenarios as outlined in Section 3. TUFLOW has been widely used across Australia, and it is considered that TUFLOW is fit for purpose for this study.

Model Development

A hydrologic inflow model was developed to simulate the flooding behaviour of the Flagstone Creek, Sandy Creek and Sandy Gully catchments, the model utilised the TUFLOW HPC Solver which allows for an adaptive timestep to produce more accurate flood extents and characteristics. The 2025 TUFLOW engine (2025.2.1) was utilised for simulation of the storm events.

The model has been simulated for a range of critical storm durations within the catchment between the 10-minute and 24-hour.

All 10 ensemble temporal patterns were initially modelled in TUFLOW for the 63.2%, 50%, 20%, 10%, 5%, 2%, 1% AEP and 1% AEP Climate Change design storm events and PMF, the median storm temporal pattern was adopted for each storm duration to determine a measure for the average catchment response for each AEP. Detailed analysis of the median storm temporal patterns estimated by the hydraulic model was undertaken to select a single representative temporal pattern for each storm duration. These representative storm temporal patterns were adopted for analysis of all design events other than the 1% AEP. It is acknowledged that the 1% AEP is critical for determination of habitable floor levels, and it is therefore considered necessary to simulate all temporal patterns to most accurately define the 1% AEP flood extent. However, design events other than the 1% AEP are used for comparative assessments and risk analysis only, and therefore a single temporal pattern is considered appropriate for the purposes of this study.

Further details of the hydraulic model setup and inputs can be found in the *Flagstone City Masterplan Flood Management Strategy* (Engeny, 2025).

Hydraulic Model Results

Flood mapping including the following results is provided in Appendix B for the Masterplan Scenario:

- Depth.
- Level.
- Velocity.
- Depth-Velocity.
- Hazard.
- Critical Duration.

A summary of key observations of the flooding at the Site in the Masterplan Scenario is provided below:

- The Site is flood-free from regional flooding of Sandy Creek in all events up to and including the PMF event.
- 1% AEP flood levels in Sandy Creek adjacent to the Site are approximately 47.86 m AHD.
- PMF flood levels in Sandy Creek adjacent to the Site are approximately 50.02 m AHD.
- The design level of the proposed road crest at the front of the Site facing Sandy Creek is approximately 62.18 m AHD or higher, indicating that the Site is well above both the 1% AEP and PMF flood level.

SUMMARY

An assessment of flood conditions at the School Site (the Site) located within Stage 8 of CA3 within the Flagstone City development area was completed based on the flood modelling undertaken as part of the *Flagstone City Masterplan Flood Management Strategy* (Engeny, 2025). The results indicate that the Site is not subject to regional flooding from Sandy Creek in all events up to and including the PMF and therefore is not expected to face any significant flood-related constraints for development.

DISCLAIMER

This memorandum has been prepared on behalf of and for the exclusive use of Peet Flagstone City Pty Ltd and is subject to and issued in accordance with Peet Flagstone City Pty Ltd instruction to Engeny Australia Pty Ltd (Engeny). The content of this memorandum was based on previous information and studies supplied by Peet Flagstone City Pty Ltd

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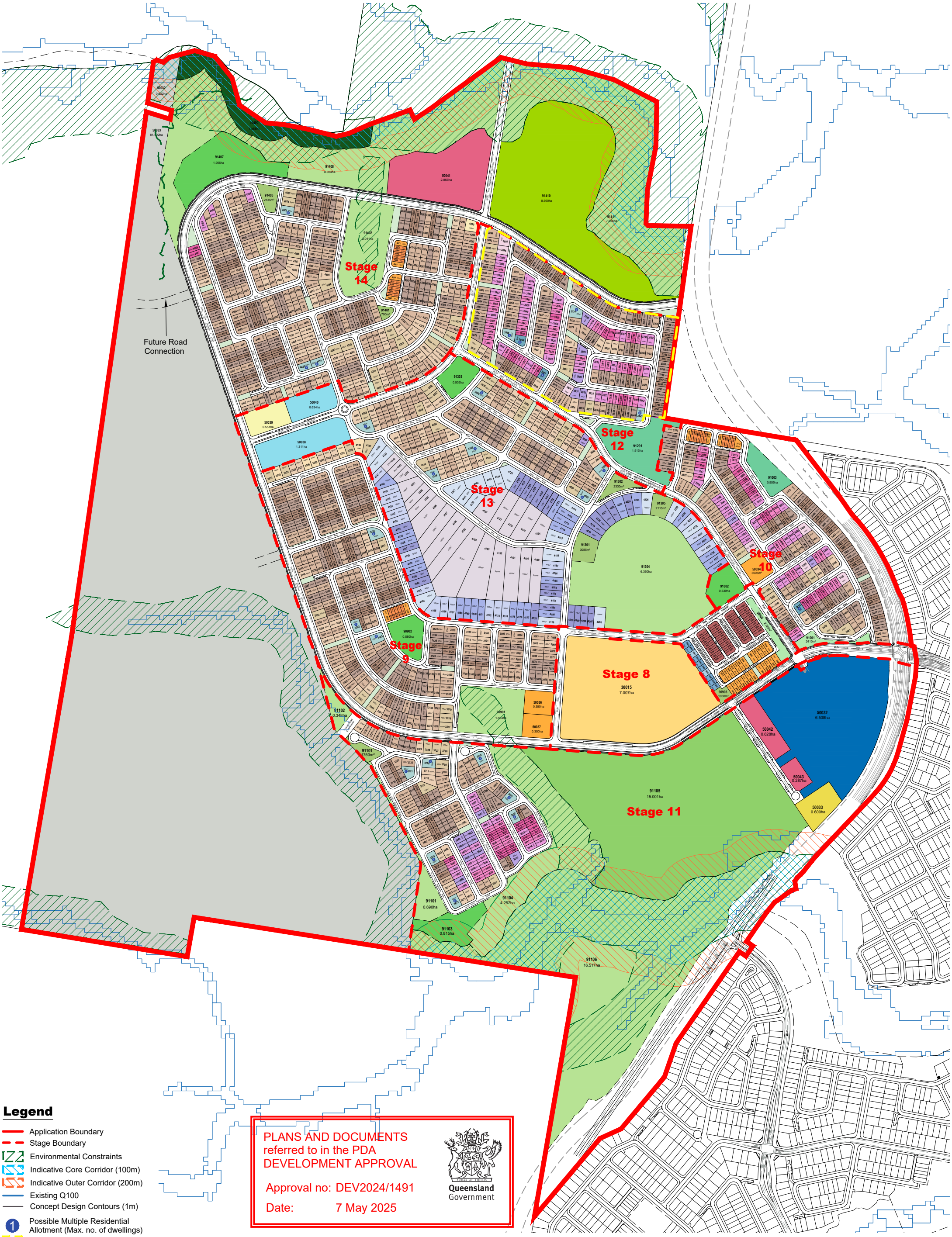
APPENDIX A: FLAGSTONE CA3 SOUTH STAGES 8-14 OVERALL SUBDIVISION PLAN



PLANS AND DOCUMENTS referred to in the PDA DEVELOPMENT APPROVAL

Approval no: DEV2024/1491

Date: 7 May 2025

Queensland Government

Legend

- Application Boundary
- Stage Boundary
- Environmental Constraints
- Indicative Core Corridor (100m)
- Indicative Outer Corridor (200m)
- Existing Q100
- Concept Design Contours (1m)
- 1 Possible Multiple Residential Allotment (Max. no. of dwellings)
- Potential School Site for Acquisition (12ha)

TO BE READ IN CONJUNCTION WITH 110056-640B STAGES 8-14 OVERALL STATISTICS

PLAN REF: 110056 – 639
Rev No: B
DATE: 12 DECEMBER 2024
CLIENT: PEET
DRAWN BY: JC / MM
CHECKED BY: MD

0 100 200 300 400 500 1 : 7,500 @ A3

FLAGSTONE CA3 SOUTH
STAGES 8 - 14
OVERALL PLAN OF SUBDIVISION

PEET

URBAN DESIGN
Level 8
31 Duncan Street
PO Box 1559
Fortitude Valley QLD 4006
T +61 7 3539 9500
W rpsgroup.com

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CA3 SOUTH - Stage 8 - 14 Yield Breakdown

Lot Type	Stage 8	Stage 9	Stage 10	Stage 11	Stage 12	Stage 13	Stage 14	Overall	
	Yield	Yield	Yield	Yield	Yield	Yield	Yield	Yield	%
25m Deep Product									
Premium Villa 12.5m Allotment	—	8	—	—	—	—	—	8	**0%**
Courtyard 14m Allotment	—	2	—	—	—	—	—	2	**0%**
Subtotal	**—**	**10**	**—**	**—**	**—**	**—**	**—**	**10**	**1%**
25m Deep Terrace Product									
Terrace 9.5m Allotment	—	32	—	—	—	—	—	32	**2%**
Subtotal	**—**	**32**	**—**	**—**	**—**	**—**	**—**	**32**	**2%**
25m Deep Product									
Villa 10m Allotment	—	—	13	16	11	—	—	40	**2%**
Premium Villa 12.5m Allotment	—	—	23	13	38	—	2	76	**5%**
Courtyard 14m Allotment	—	—	22	17	30	—	3	72	**4%**
Premium Courtyard 16m Allotment	—	—	2	9	5	1	—	17	**1%**
Premium Traditional 20m Allotment	—	—	4	—	4	—	—	8	**0%**
Possible Multiple Residential Allotment	—	—	1	—	2	—	—	3	**0%**
Subtotal	**—**	**—**	**65**	**55**	**90**	**1**	**5**	**216**	**13%**
28m Deep Terrace Product									
Terrace 7.5m Allotment	—	5	9	—	—	—	10	24	**1%**
Terrace 9.5m Allotment	—	26	4	—	—	—	4	34	**2%**
Subtotal	**—**	**31**	**13**	**—**	**—**	**—**	**14**	**58**	**4%**
30m Deep Product									
Villa 10m Allotment	—	58	30	13	27	—	50	178	**11%**
Premium Villa 12.5m Allotment	—	88	51	29	66	23	110	367	**23%**
Courtyard 14m Allotment	—	117	39	33	40	63	153	445	**27%**
Premium Courtyard 16m Allotment	—	25	6	10	8	35	45	129	**8%**
Traditional 18m Allotment	—	4	—	—	—	1	—	5	**0%**
Premium Traditional 20m Allotment	—	10	6	6	4	15	16	57	**4%**
Possible Multiple Residential Allotment	—	3	—	7	3	6	3	22	**1%**
Subtotal	**—**	**305**	**132**	**98**	**148**	**143**	**377**	**1203**	**74%**
50m+ Deep Product									
Courtyard 14m Allotment	—	—	—	—	—	25	—	25	**2%**
Premium Courtyard 16m Allotment	—	—	—	—	—	25	—	25	**2%**
Traditional 18m Allotment	—	—	—	—	—	20	—	20	**1%**
Premium Traditional 20m Allotment	—	—	—	—	—	18	—	18	**1%**
Ridgetop Allotment	—	—	—	—	—	21	—	21	**1%**
Subtotal	**—**	**—**	**—**	**—**	**—**	**109**	**—**	**109**	**7%**
Total Residential Allotments	**—**	**378**	**210**	**153**	**238**	**253**	**396**	**1628**	**100%**
Residential Net Density	**—**	**16.3 dw/ha**	**15.5 dw/ha**	**13.1 dw/ha**	**14.8 dw/ha**	**8.9 dw/ha**	**15.1 dw/ha**	**13.6 dw/ha**	
Super Lots									
Local Centre	—	—	—	—	—	2	—	2	
District Centre	—	—	—	1	—	—	—	1	
Ambulance	—	—	—	1	—	—	—	1	
Child Care	—	2	1	—	—	—	—	3	
Community Centre	—	—	—	—	—	1	—	1	
State Primary School	1	—	—	—	—	—	—	1	
Medium Density Allotment	—	—	—	2	—	—	1	3	
Balance Allotment	—	—	—	—	—	—	2	2	
Subtotal	**1**	**2**	**1**	**4**	**—**	**3**	**3**	**14**	
Total Allotments	**1**	**380**	**211**	**157**	**238**	**256**	**399**	**1642**	
Maximum Potential Residential Dwellings (Includes Multiple Residential Allotments)	**—**	**381**	**211**	**165**	**246**	**264**	**401**	**1668**	
Maximum Potential Net Residential Density	**—**	**16.4 dw/ha**	**15.5 dw/ha**	**14.1 dw/ha**	**15.3 dw/ha**	**9.3 dw/ha**	**15.3 dw/ha**	**13.9 dw/ha**	

CA3 SOUTH - Stage 8 - 14 Land Budget

Land Use	Stage 8	Stage 9	Stage 10	Stage 11	Stage 12	Stage 13	Stage 14	Overall	
	Area	Area	Area	Area	Area	Area	Area	Area	%
	10.176 ha	28.014 ha	16.967 ha	66.285 ha	16.056 ha	37.553 ha	144.025 ha	319.076 ha	100.0%
Saleable Area									
Residential Allotments	—	14.554 ha	7.934 ha	6.274 ha	9.374 ha	21.607 ha	16.542 ha	76.285 ha	23.9%
Medium Density	—	—	—	0.915 ha	—	—	2.863 ha	3.778 ha	1.2%
Local Centre	—	—	—	—	—	1.945 ha	—	1.945 ha	0.6%
District Centre	—	—	—	6.538 ha	—	—	—	6.538 ha	2.0%
Ambulance	—	—	—	0.600 ha	—	—	—	0.600 ha	0.2%
Child Care	—	0.700 ha	0.301 ha	—	—	—	—	1.001 ha	0.3%
Community Centre	—	—	—	—	—	0.551 ha	—	0.551 ha	0.2%
State Primary School	7.007 ha	—	—	—	—	—	—	7.007 ha	2.2%
Total Area of Allotments	**7.007 ha**	**15.254 ha**	**8.235 ha**	**14.327 ha**	**9.374 ha**	**24.103 ha**	**19.405 ha**	**97.705 ha**	30.6%
Road									
North South Arterial Dedication (incl. batters)	0.266 ha	—	3.079 ha	9.561 ha	—	—	0.132 ha	13.038 ha	4.1%
Trunk Connector 2 Lanes (23.7m)	2.195 ha	2.521 ha	—	0.144 ha	0.028 ha	0.327 ha	4.135 ha	9.350 ha	2.9%
Neighbourhood Connector (20.2m)	0.708 ha	1.746 ha	0.598 ha	1.224 ha	1.753 ha	1.016 ha	0.687 ha	7.732 ha	2.4%
Neighbourhood Access Street (16.5m)	—	5.229 ha	3.513 ha	3.143 ha	3.133 ha	4.373 ha	6.101 ha	25.492 ha	8.0%
Laneway (6.5m)	—	0.380 ha	0.075 ha	—	—	—	0.082 ha	0.537 ha	0.2%
Pedestrian Linkages	—	0.365 ha	0.132 ha	0.088 ha	0.255 ha	0.129 ha	0.642 ha	1.611 ha	0.5%
Total Area of New Road	**3.169 ha**	**10.241 ha**	**7.397 ha**	**14.160 ha**	**5.169 ha**	**5.845 ha**	**11.779 ha**	**57.760 ha**	18.1%
Open Space									
Conservation Buffer	—	—	—	—	—	—	1.988 ha	1.988 ha	0.6%
Corridor Park / Conservation	—	1.564 ha	—	21.807 ha	—	6.350 ha	18.061 ha	47.782 ha	15.0%
Stormwater Management	—	—	0.555 ha	—	1.513 ha	—	—	2.068 ha	0.6%
Regional Sports	—	—	—	15.001 ha	—	—	—	15.001 ha	4.7%
District Sports	—	—	—	—	—	—	8.560 ha	8.560 ha	2.7%
Neighbourhood Recreation Park	—	0.580 ha	0.539 ha	0.815 ha	—	0.502 ha	1.905 ha	4.341 ha	1.4%
Local Recreation Park	—	0.103 ha	—	0.175 ha	—	0.753 ha	0.293 ha	1.324 ha	0.4%
Local Linear Recreation Park	—	0.272 ha	0.241 ha	—	—	—	—	0.513 ha	0.2%
Total Open Space	**—**	**2.519 ha**	**1.335 ha**	**37.798 ha**	**1.513 ha**	**7.605 ha**	**30.807 ha**	**81.577 ha**	25.6%
Balance Allotments									
Balance Allotment	—	—	—	—	—	—	82.034 ha	82.034 ha	25.7%
Total Balance Allotments	**—**	**—**	**—**	**—**	**—**	**—**	**82.034 ha**	**82.034 ha**	25.7%

PLANS AND DOCUMENTS
relefred to in the PDA
DEVELOPMENT APPROVAL
Approval no: DEV2024/1491
Date: 7 May 2025

Queensland Government

PLAN REF: 110056 – 640
Rev No: B
DATE: 12 DECEMBER 2024
CLIENT: PEET
DRAWN BY: JC / MM
CHECKED BY: MD

Not to Scale @ A3

EDGESTONE CA3 SOUTH
STAGES 8 - 14
OVERALL PLAN OF SUBDIVISION STATISTICS

PEET

URBAN DESIGN
Level 8
31 Duncan Street
PO Box 1559
Fortitude Valley QLD 4006
T +61 7 3539 9500
W rpsgroup.com

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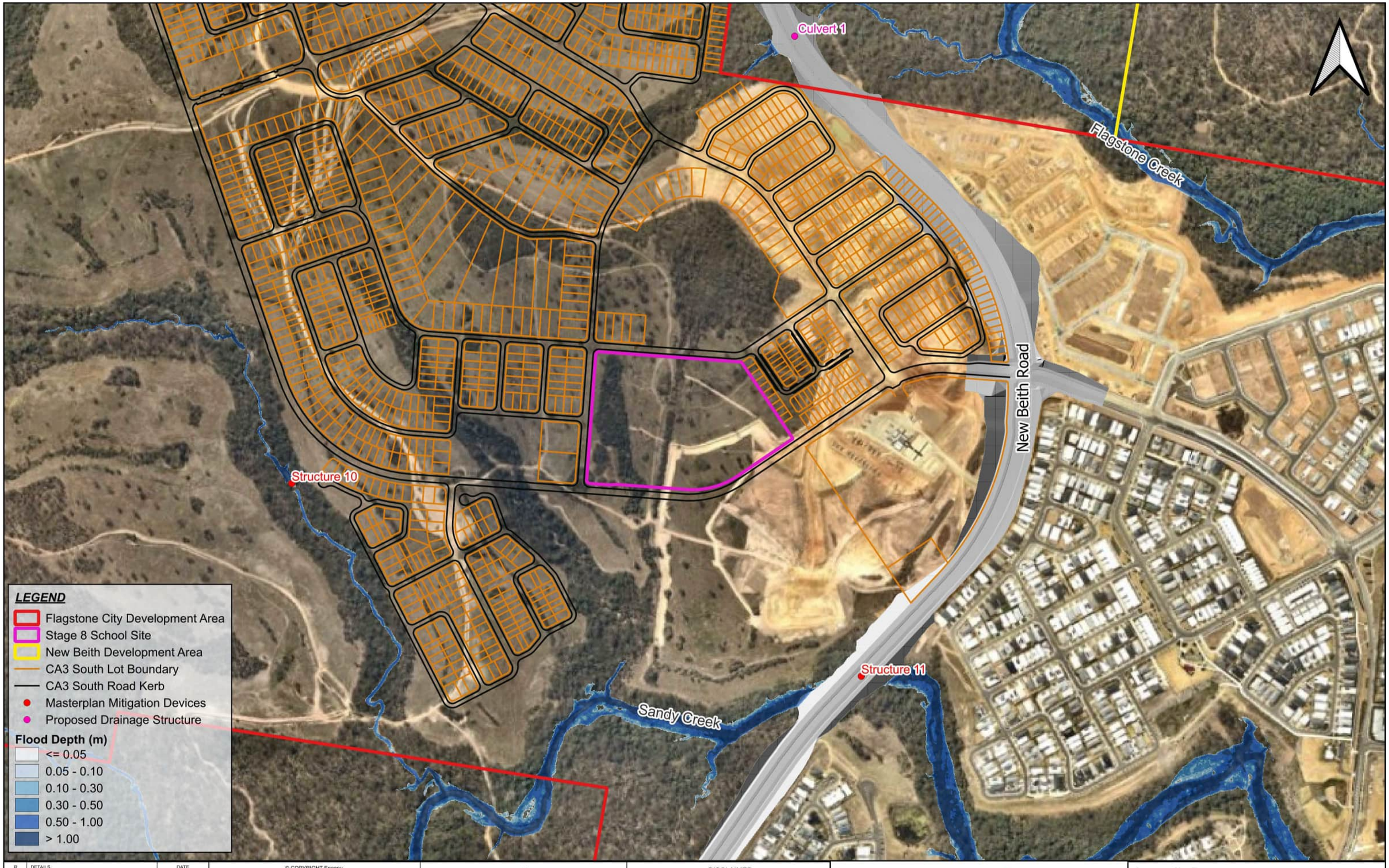
APPENDIX B: FLOOD MAPPING



R	DETAILS	DATE
0	Client Issue	26-11-2025

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DRAWN	AA	CHECKED	JH
APPROVED	JH	DATE	26-11-2025

NOTES:

N

0 100 200 m

SCALE @ A3 - 1:1
GDA 2020 / MGA 56

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DATA SOURCE
QLD Government Open Data Source

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Appendix B

Flagstone City Stage 8 School Site

Masterplan (M01) Scenario
63.2% AEP Flood Depth

Drg Ref
QC4021_002-SKE-01-001

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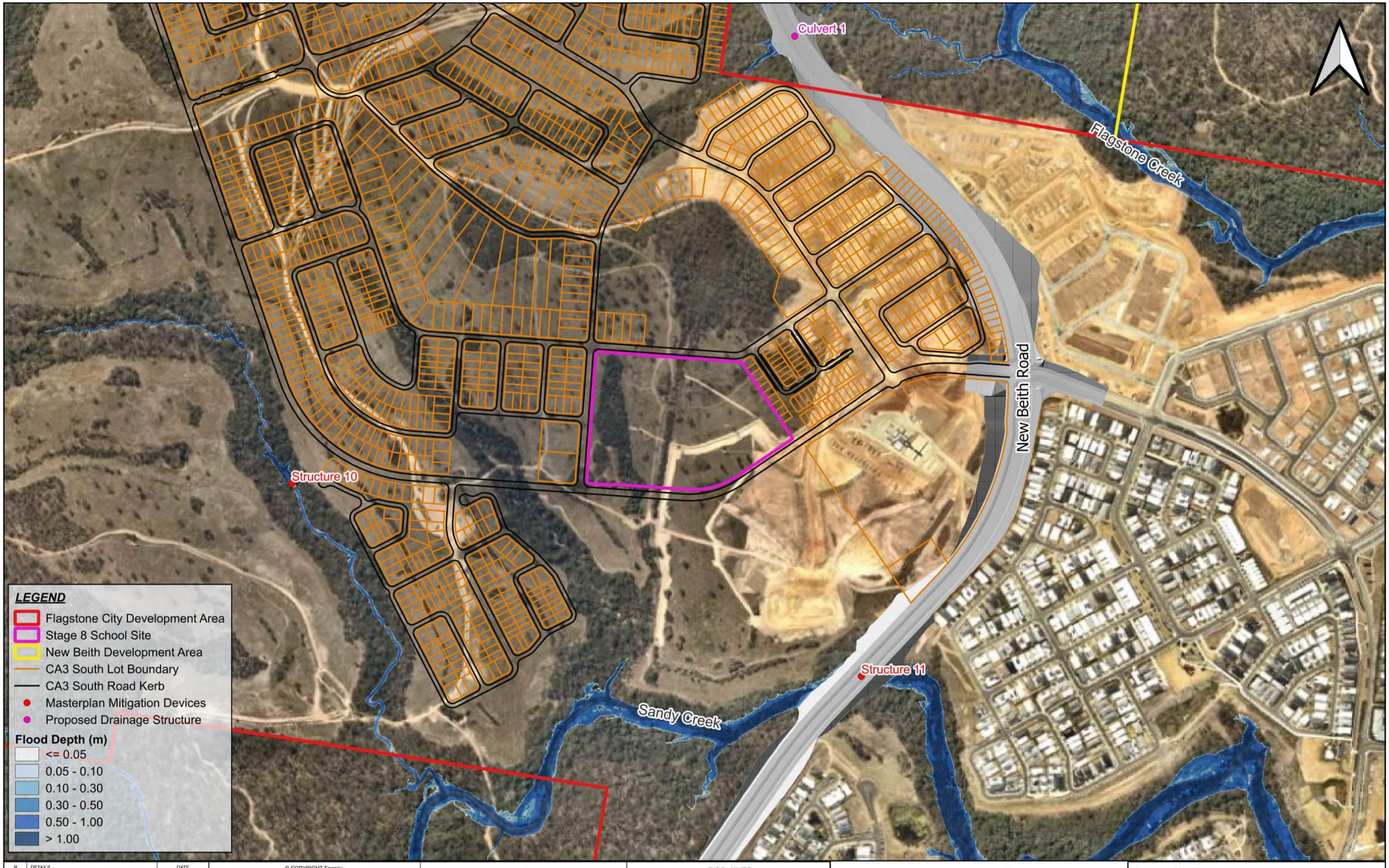

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NOTES:

N

0 100 200 m

SCALE @ A3 - 1:1
GDA 2020 / MGA 56

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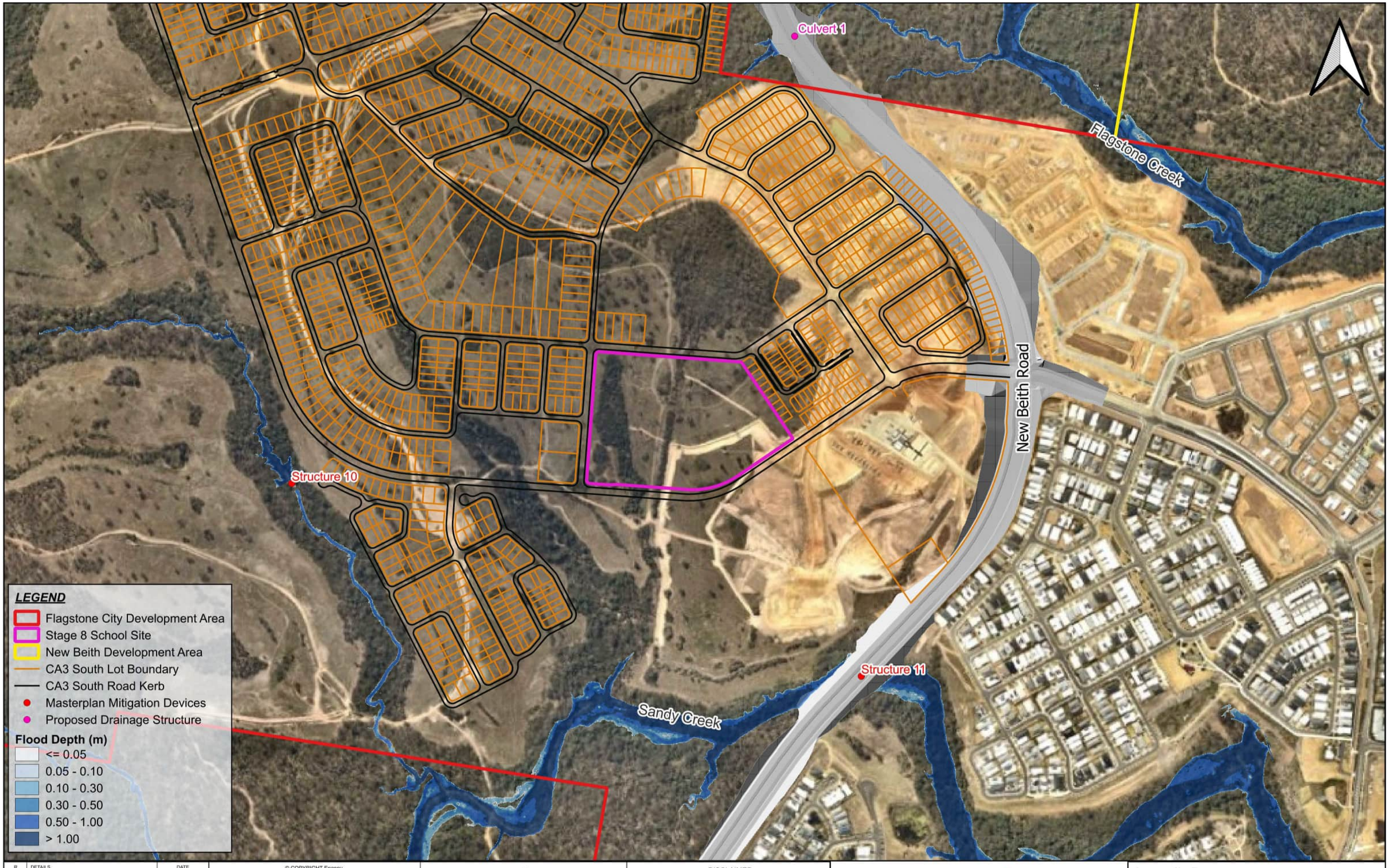
Appendix B

Flagstone City Stage 8 School Site

Masterplan (M01) Scenario
50% AEP Flood Depth

Drg Ref
QC4021_002-SKE-01-0002

Q:\Projects\QC4012 PEET Limited\QC4012_002 Flagstone Context Area 3\05 Design\QGIS\Workspaces\QC4012_002-WOR-007-C FMS Figures_School Site_AA.qgz



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NOTES:

N

0 100 200 m

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Appendix B

Flagstone City Stage 8 School Site

Masterplan (M01) Scenario
20% AEP Flood Depth

Drg Ref
QC4021_002-SKE-01-0003

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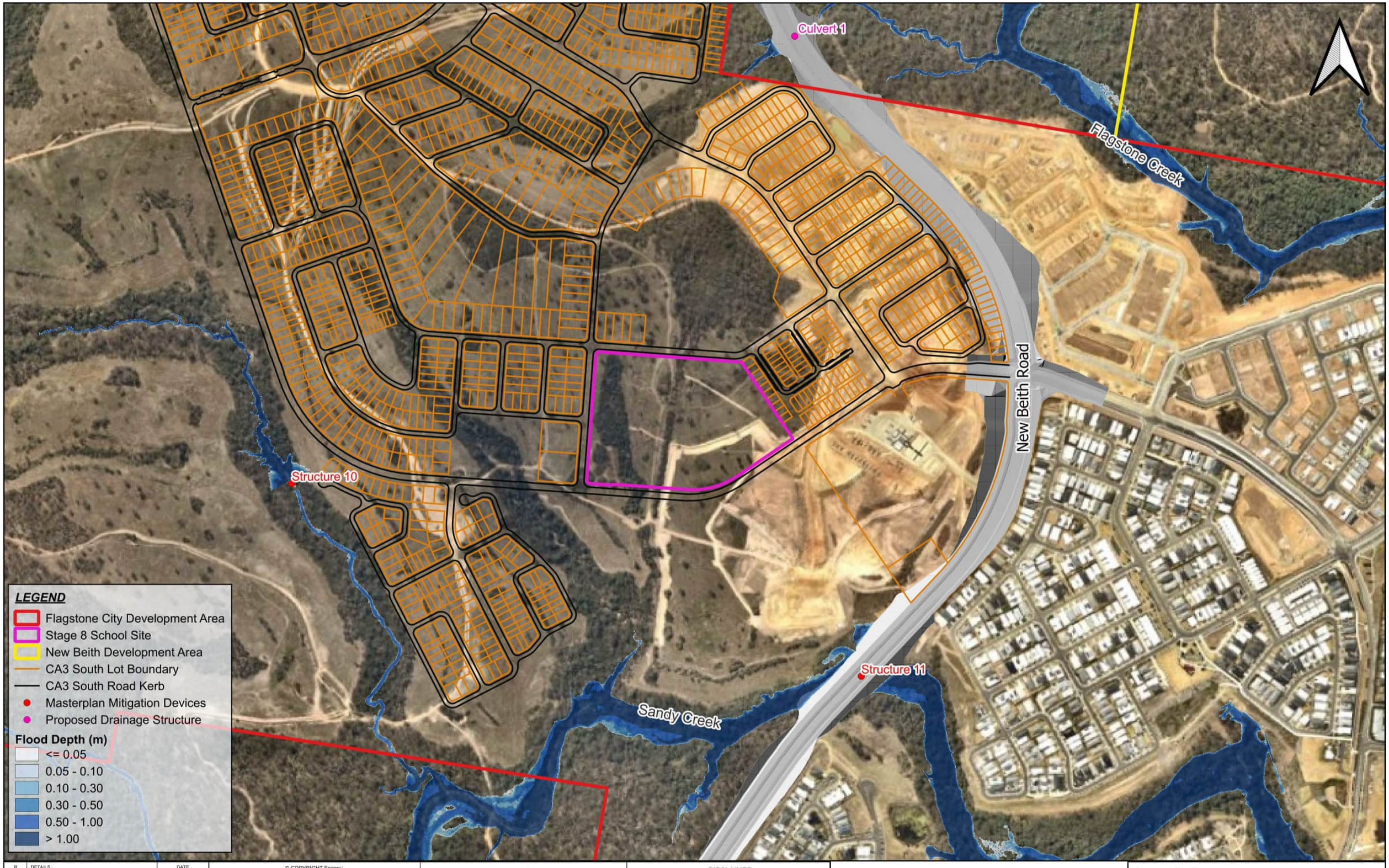

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N

0 100 200 m

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Appendix B

Flagstone City Stage 8 School Site

Masterplan (M01) Scenario
10% AEP Flood Depth

Drg Ref
QC4021_002-SKE-01-0004

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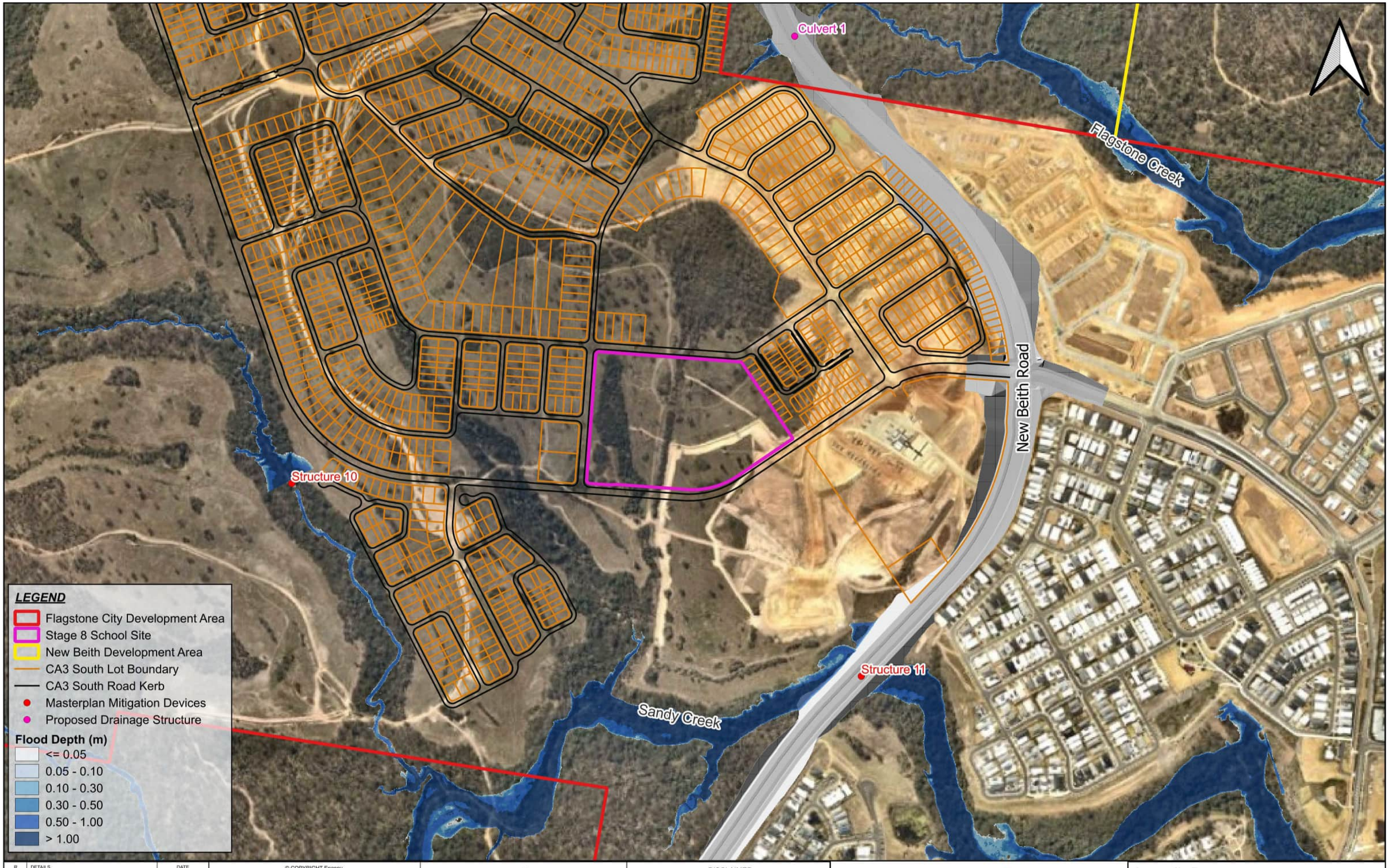

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N

0 100 200 m

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Appendix B

Flagstone City Stage 8 School Site

Masterplan (M01) Scenario
5% AEP Flood Depth

Drg Ref
QC4021_002-SKE-01-0005

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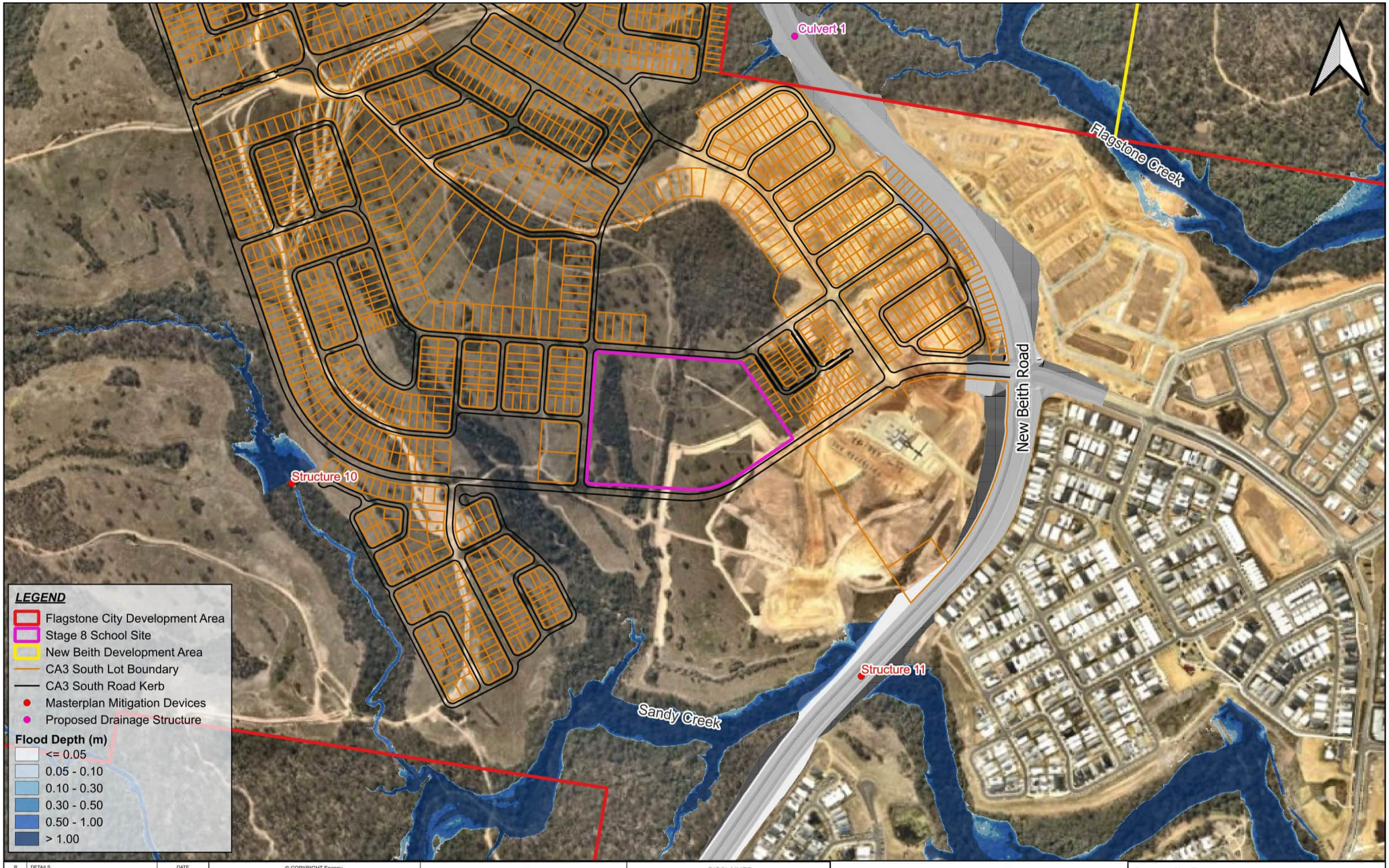

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0 100 200 m

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Appendix B

Flagstone City Stage 8 School Site

Masterplan (M01) Scenario
2% AEP Flood Depth

Drg Ref
QC4021_002-SKE-01-0006

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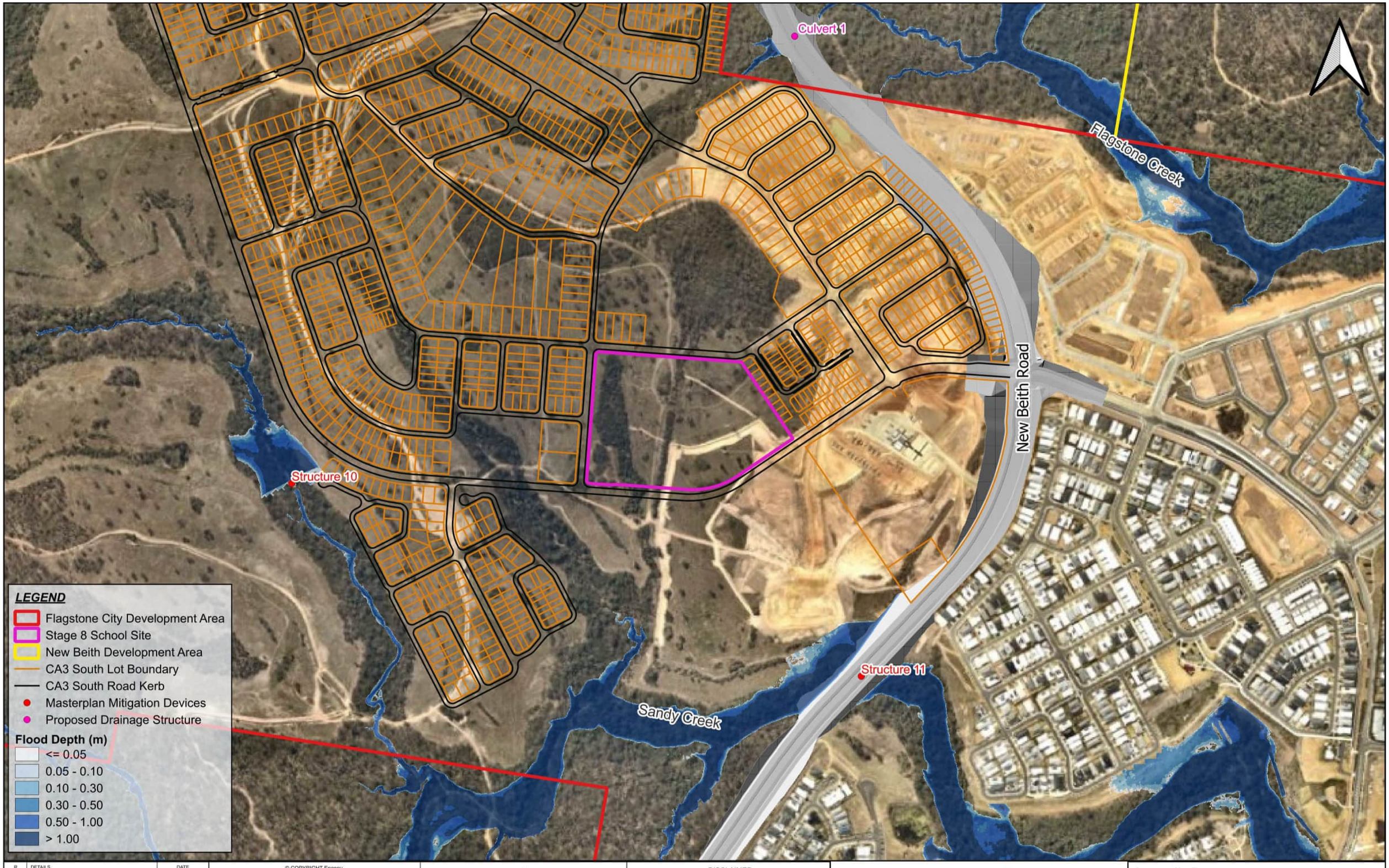

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NOTES:

N

0 100 200 m

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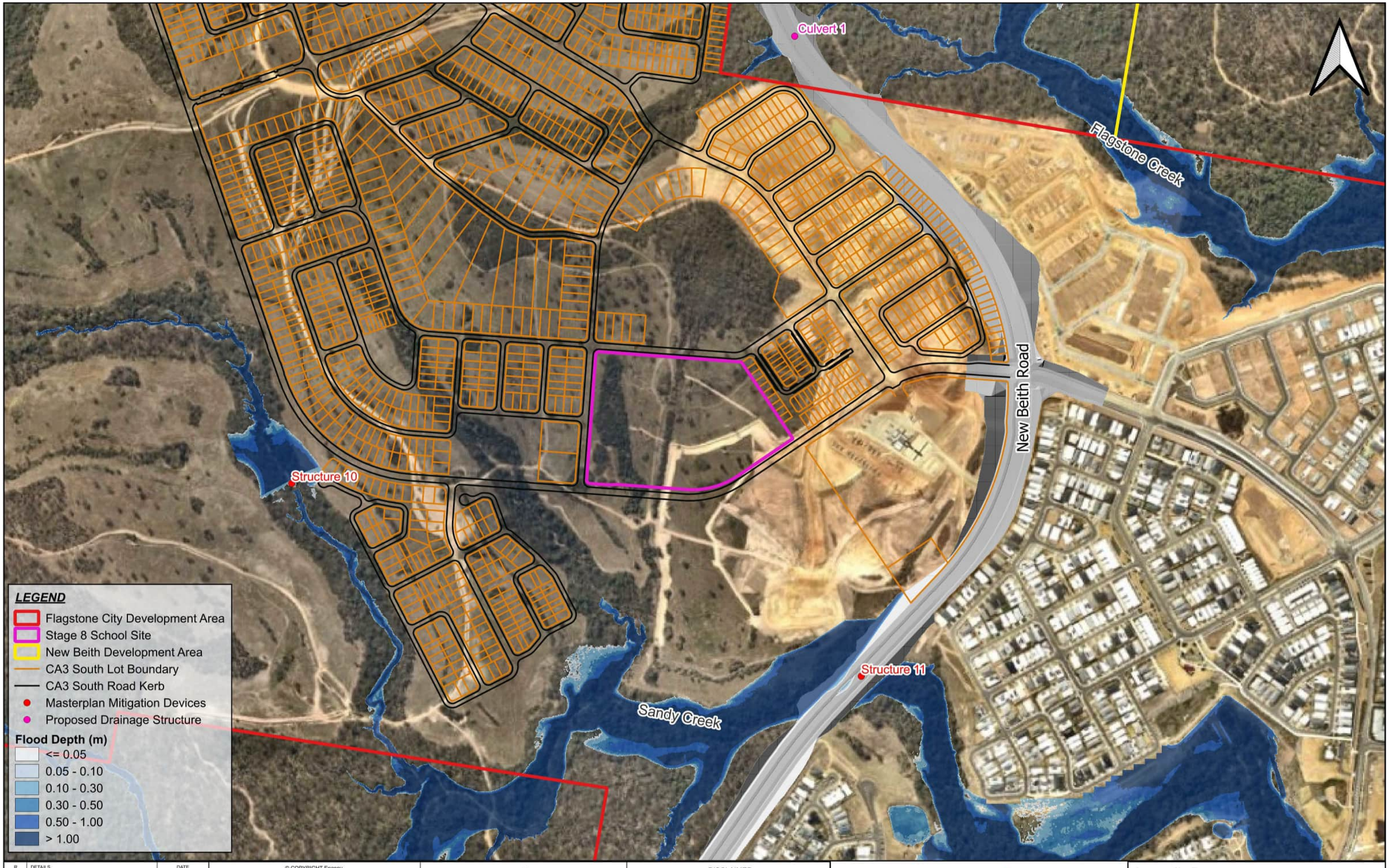
Appendix B

Flagstone City Stage 8 School Site

Masterplan (M01) Scenario
1% AEP Flood Depth

Drg Ref
QC4021_002-SKE-01-0007

Q:\Projects\QC4012 PEET Limited\QC4012_002 Flagstone Context Area 3\05 Design\QGIS\Workspaces\QC4012_002-WOR-007-C FMS Figures_School Site_AA.qgz



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N

0 100 200 m

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Appendix B

Flagstone City Stage 8 School Site

Masterplan (M01) Scenario
1% AEP Flood Depth (Climate Change)

Drg Ref.
QC4021_002-SKE-01-0008

Q:\Projects\QC4012 PEET Limited\QC4012_002 Flagstone Context Area 3\05 Design\QGIS\Workspaces\QC4012_002-WOR-007-C FMS Figures_School Site_AA.qgz

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N

0 100 200 m

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Flagstone City Stage 8 School Site

Masterplan (M01) Scenario
PMF Flood Depth

Drg Ref
QC4021_002-SKE-01-0009

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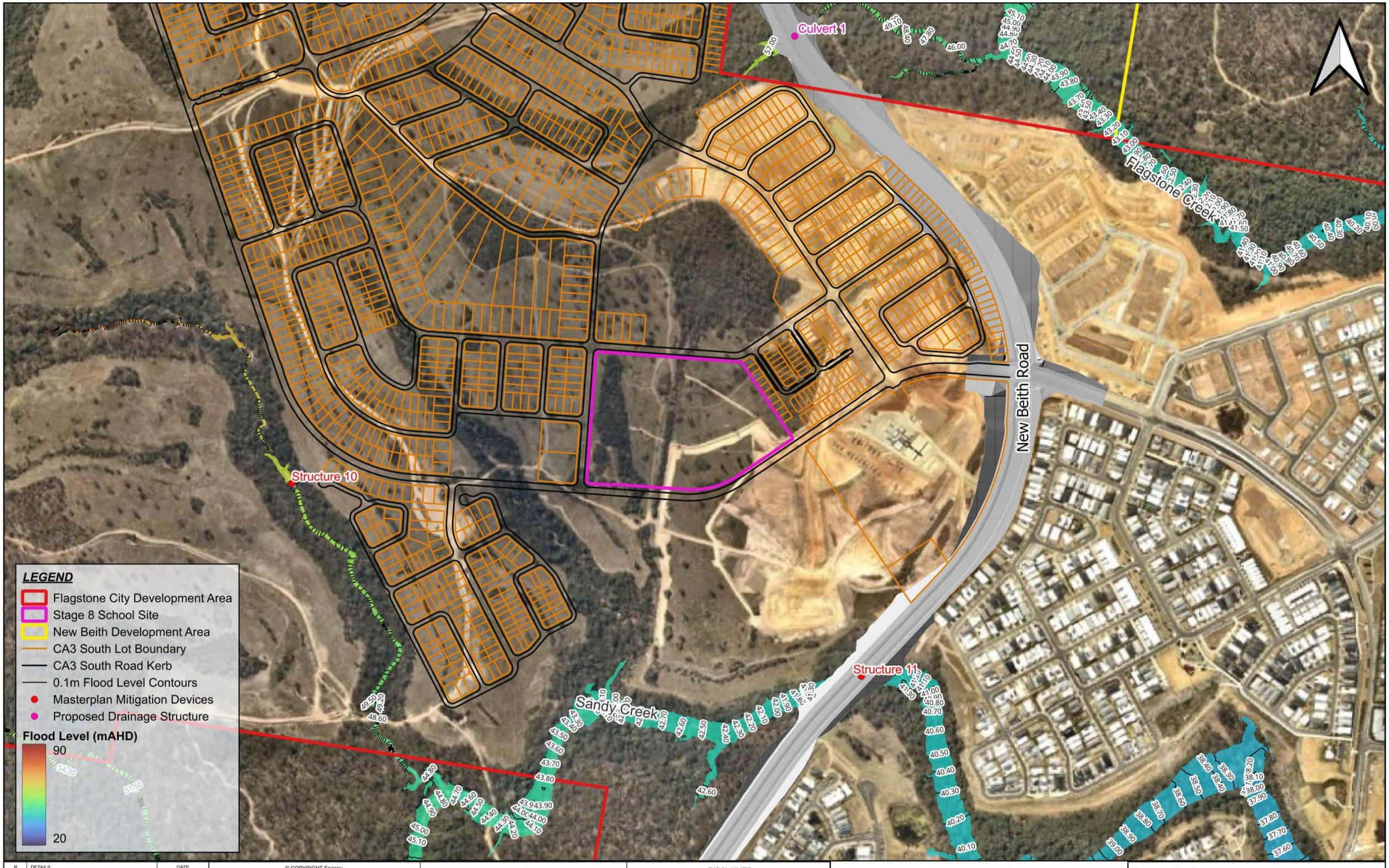

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Flagstone City Stage 8 School Site

Masterplan (M01) Scenario
63.2% AEP Flood Level

Drg Ref
QC4021_002-SKE-01-0010

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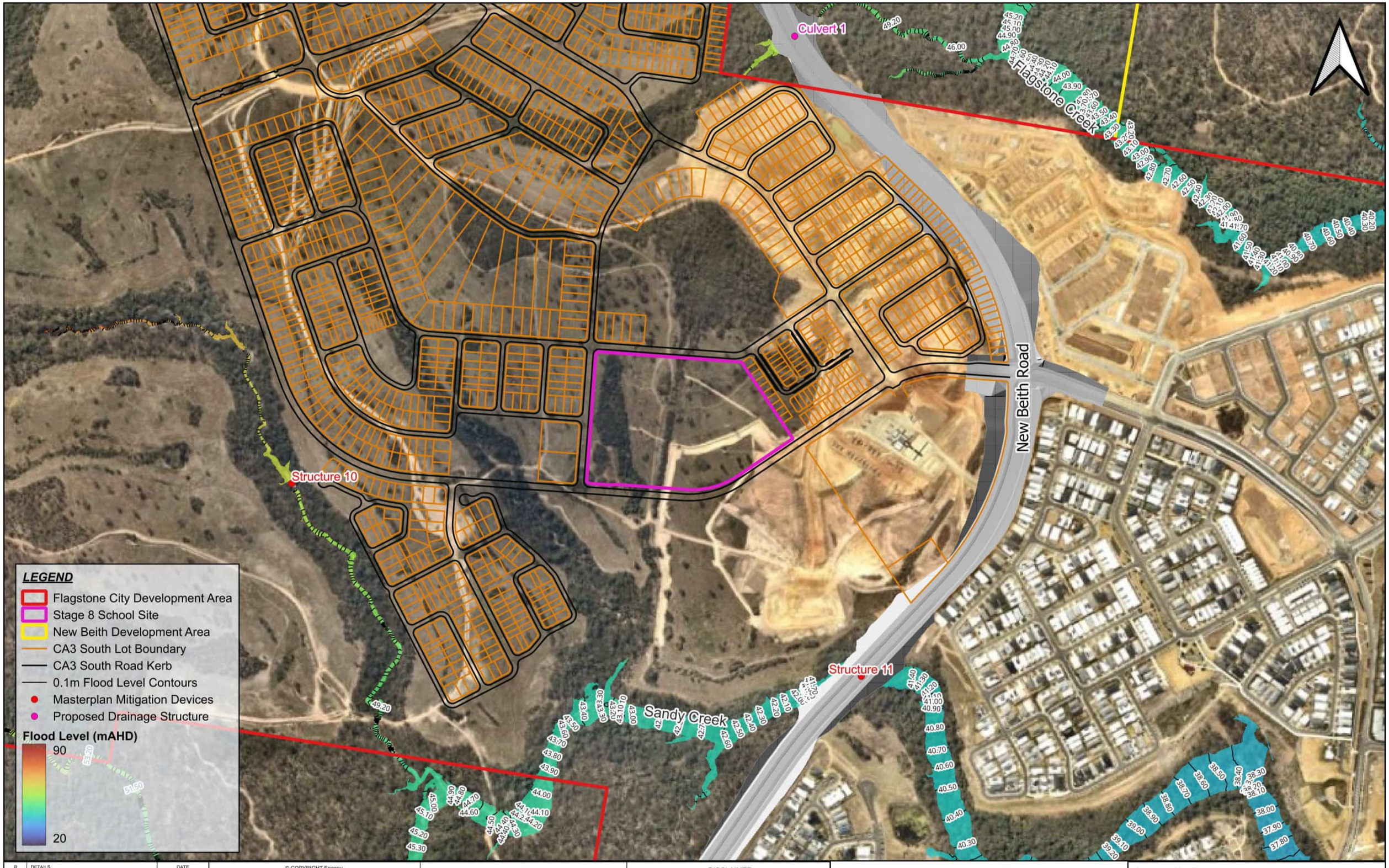

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0 100 200 m

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Flagstone City Stage 8 School Site

Masterplan (M01) Scenario
50% AEP Flood Level

Drg Ref
QC4021_002-SKE-01-0011

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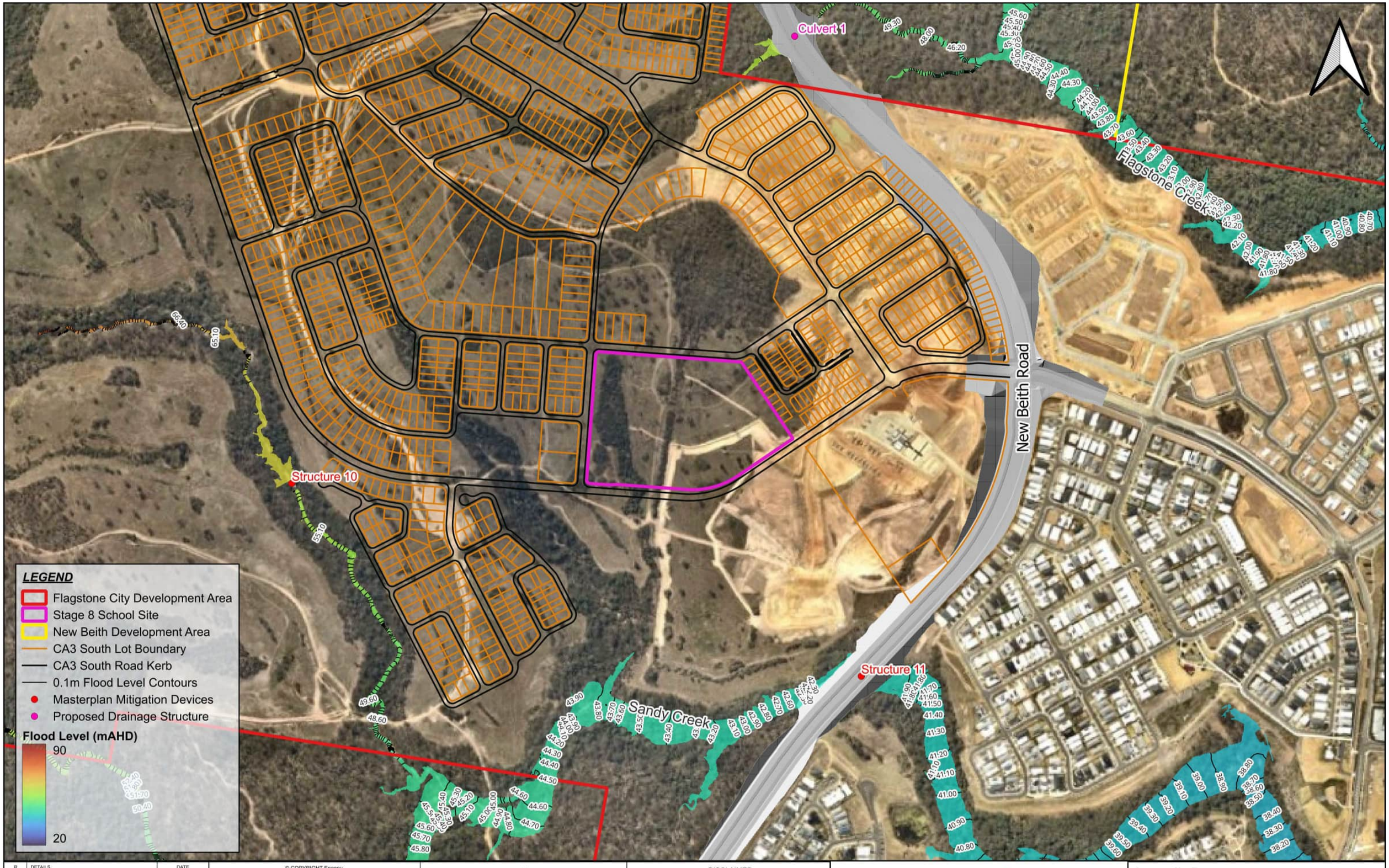

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0 100 200 m

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Flagstone City Stage 8 School Site

Masterplan (M01) Scenario
20% AEP Flood Level

Drg Ref.
QC4021_002-SKE-01-0012

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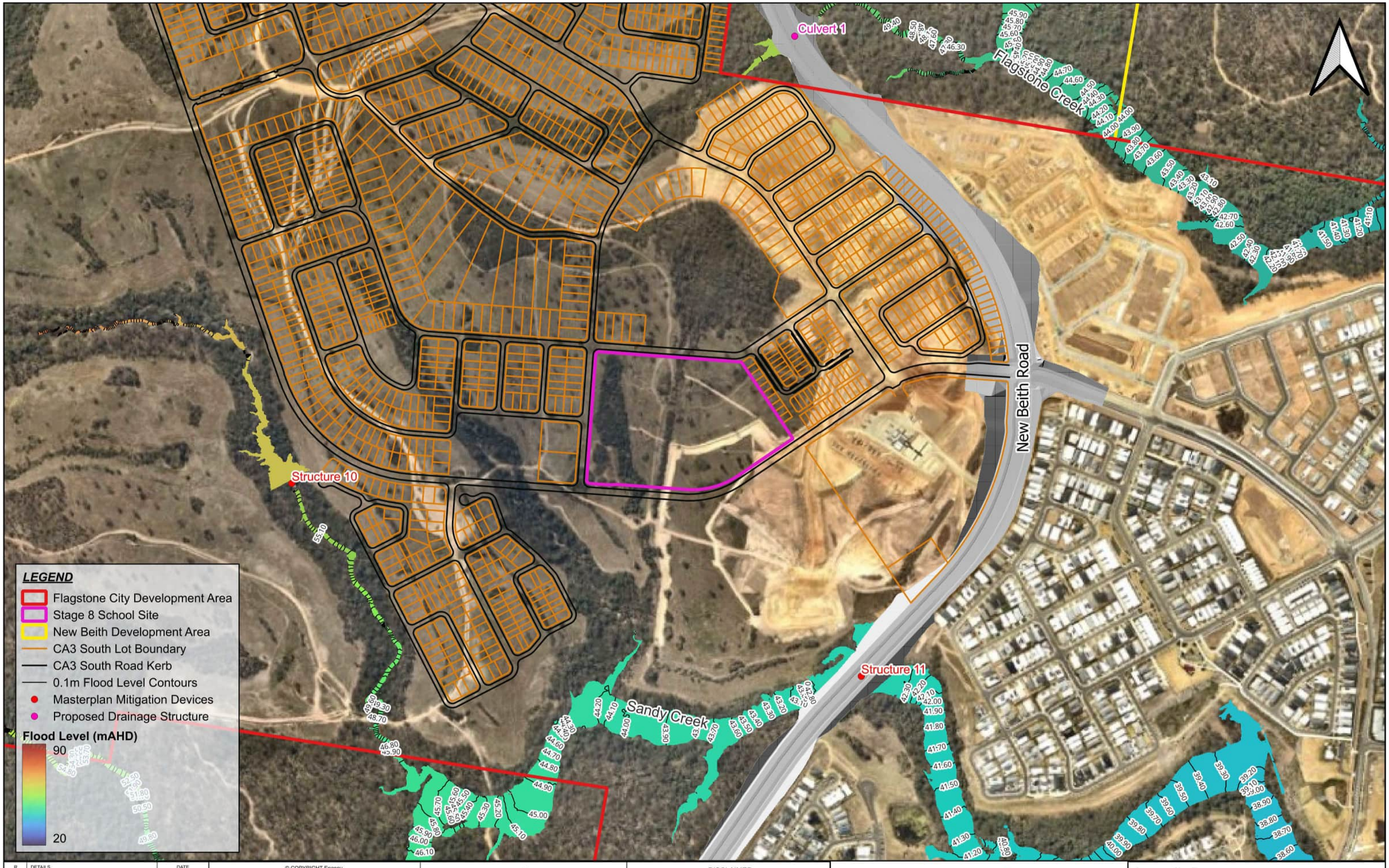

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N

0 100 200 m

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Flagstone City Stage 8 School Site

Masterplan (M01) Scenario
10% AEP Flood Level

Drg Ref
QC4021_002-SKE-01-0013

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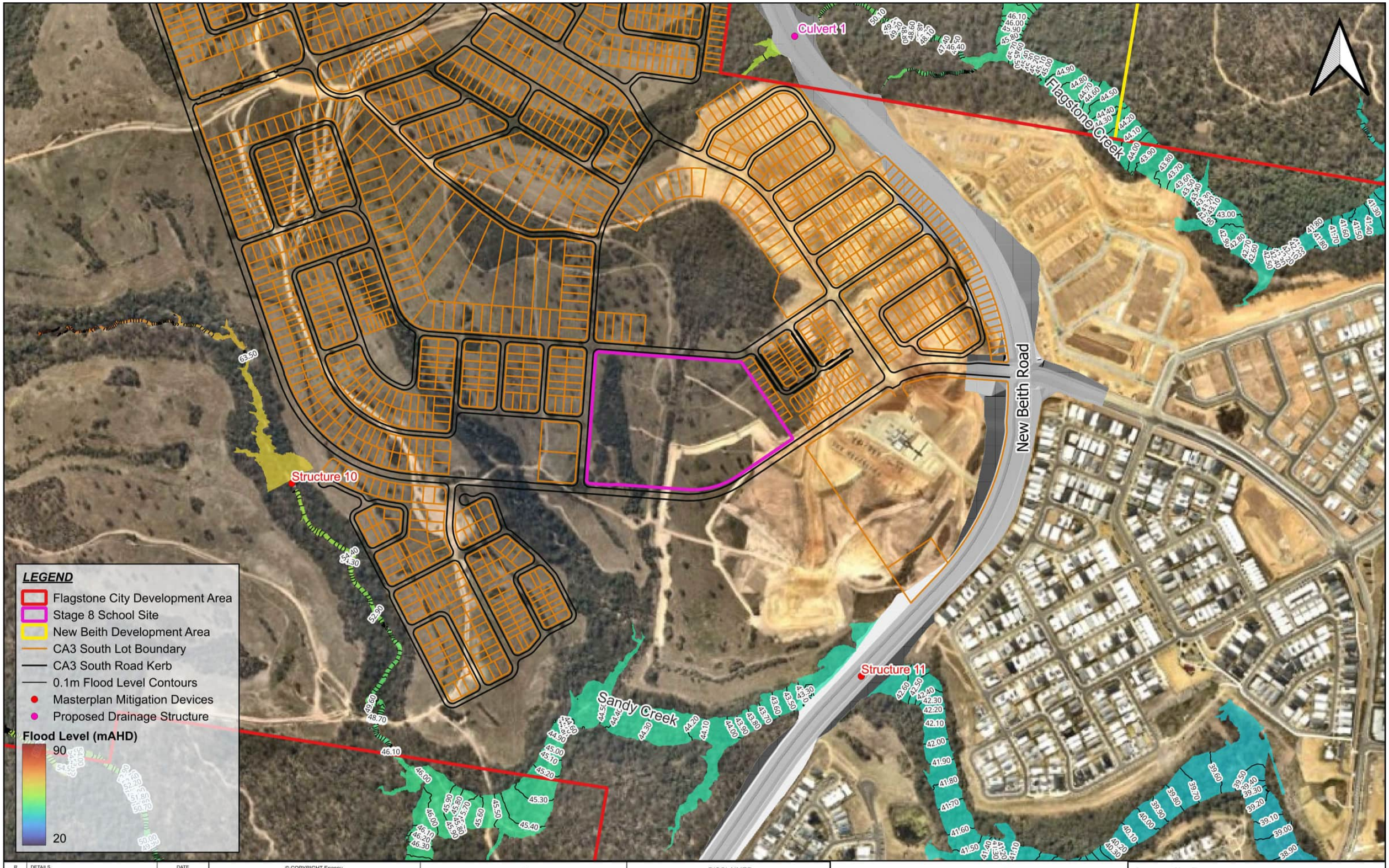

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NOTES:

N

0 100 200 m

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Appendix B

Flagstone City Stage 8 School Site

Masterplan (M01) Scenario
5% AEP Flood Level

Drg Ref
QC4021_002-SKE-01-0014

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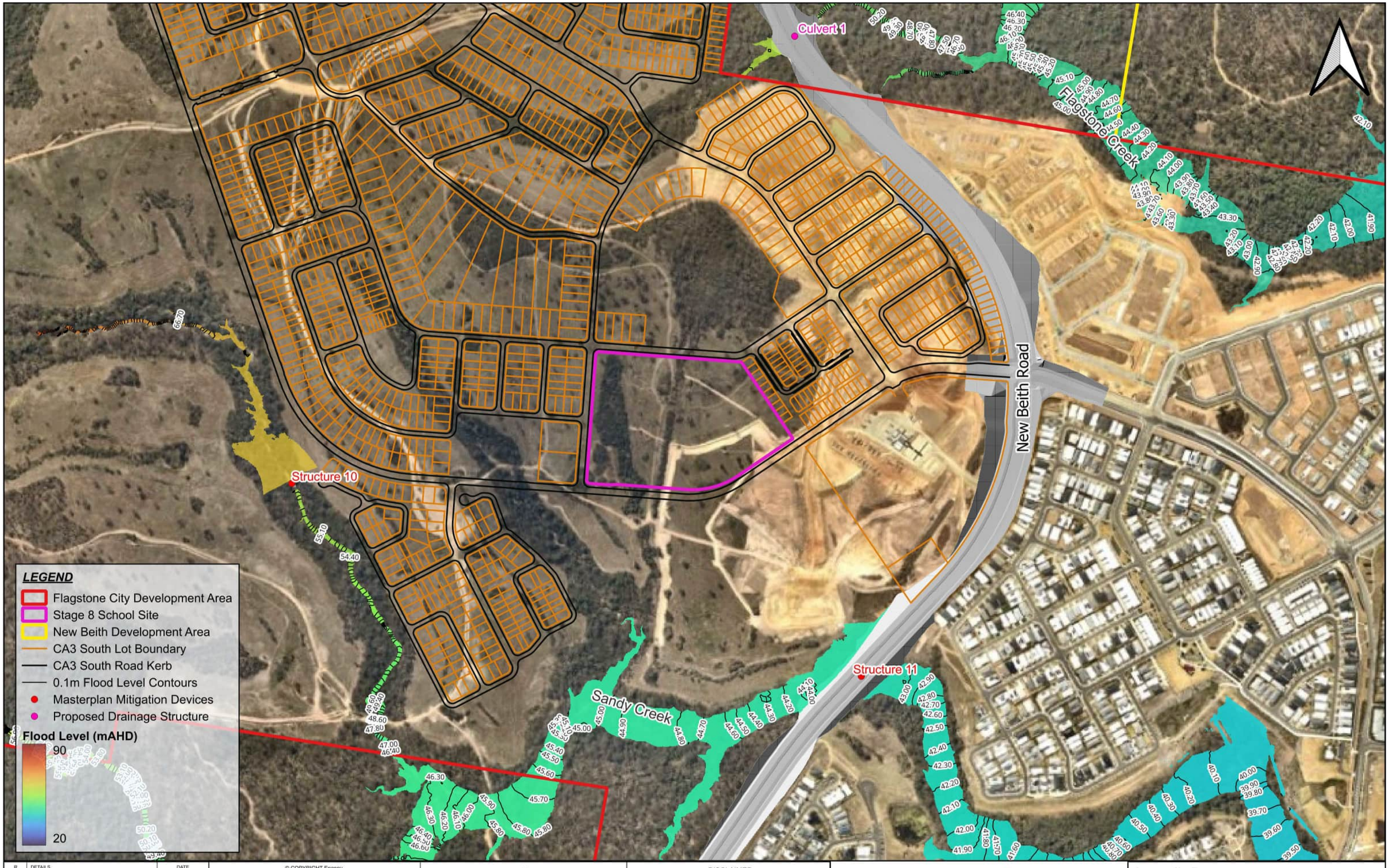

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NOTES:

N

0 100 200 m

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Appendix B

Flagstone City Stage 8 School Site

Masterplan (M01) Scenario
2% AEP Flood Level

Drg Ref.
QC4021_002-SKE-01-0015

Q:\Projects\QC4012 PEET Limited\QC4012_002 Flagstone Context Area 3\05 Design\QGIS\Workspaces\QC4012_002-WOR-007-C FMS Figures_School Site_AA.qgz

Culvert 1

Structure 10

Structure 11

Flagstone Creek

Sandy Creek

New Beith Road

LEGEND

- Flagstone City Development Area
- Stage 8 School Site
- New Beith Development Area
- CA3 South Lot Boundary
- CA3 South Road Kerb
- 0.1m Flood Level Contours
- Masterplan Mitigation Devices
- Proposed Drainage Structure

Flood Level (mAHD)

90

20

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NOTES:

N

0 100 200 m

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Flagstone City Stage 8 School Site

Masterplan (M01) Scenario
1% AEP Flood Level

Drg Ref
QC4021_002-SKE-01-0016

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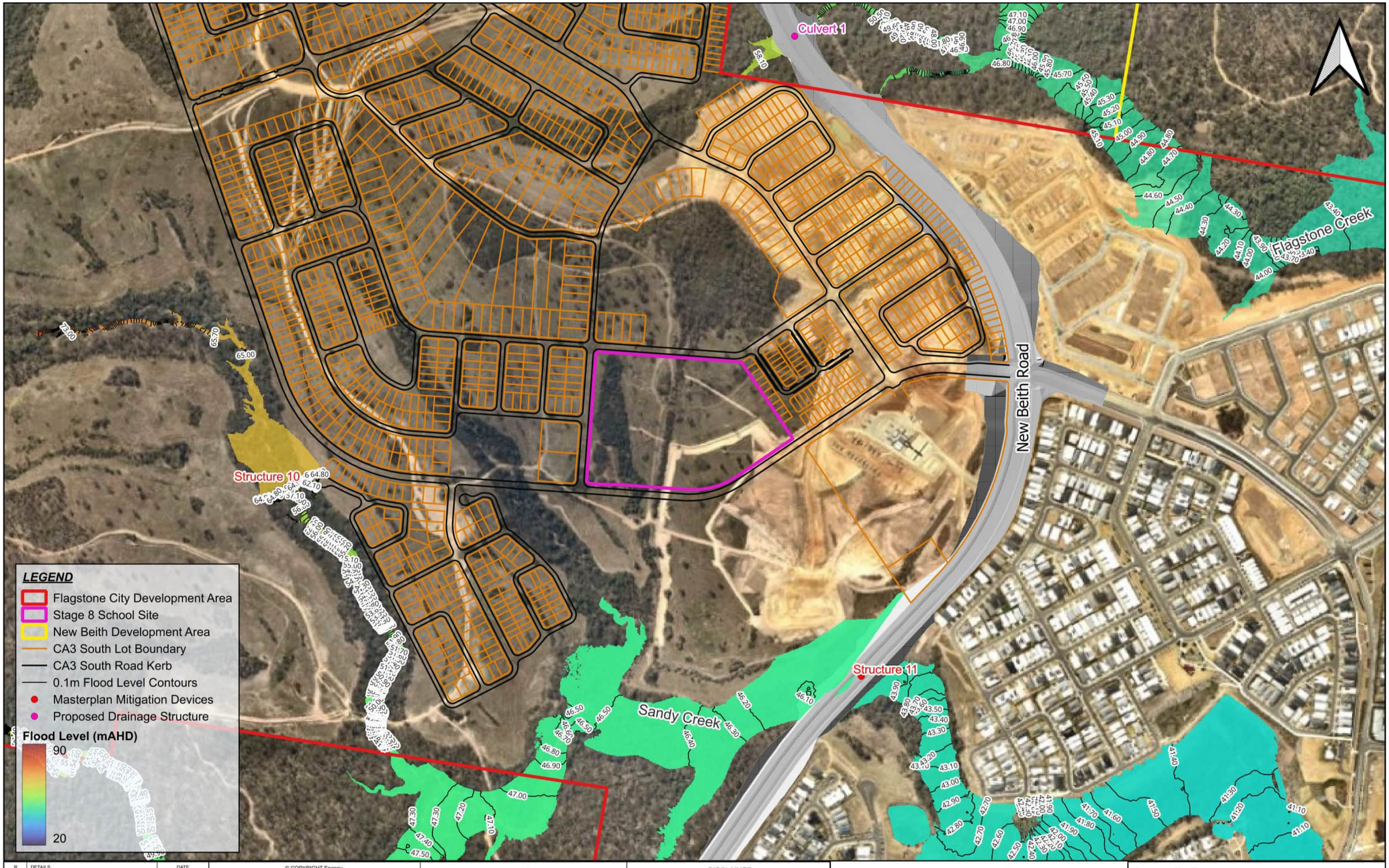

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Appendix B

Flagstone City Stage 8 School Site

Masterplan (M01) Scenario
1% AEP Flood Level (Climate Change)

Drg Ref: QC4021_002-SKE-01-0017

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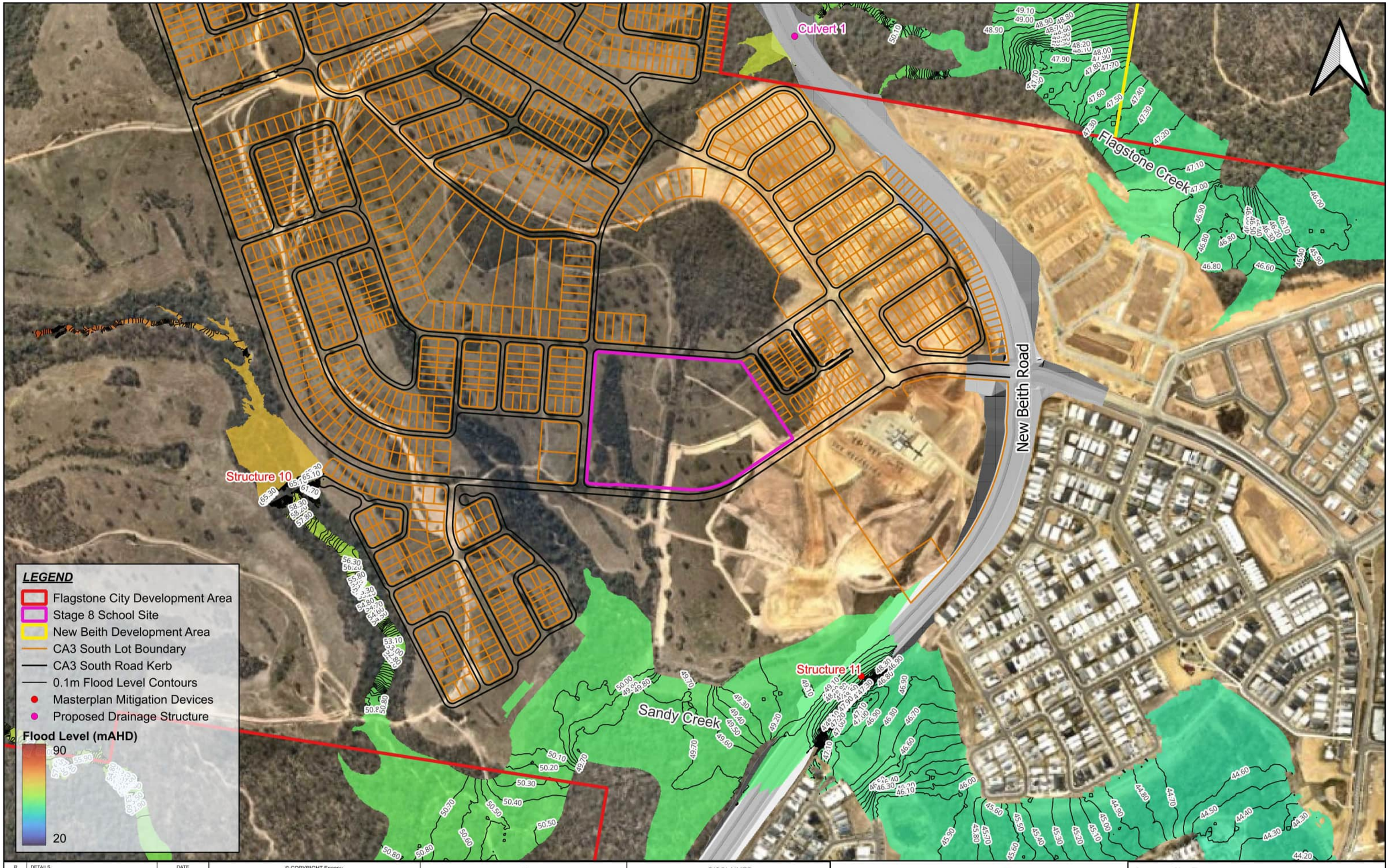

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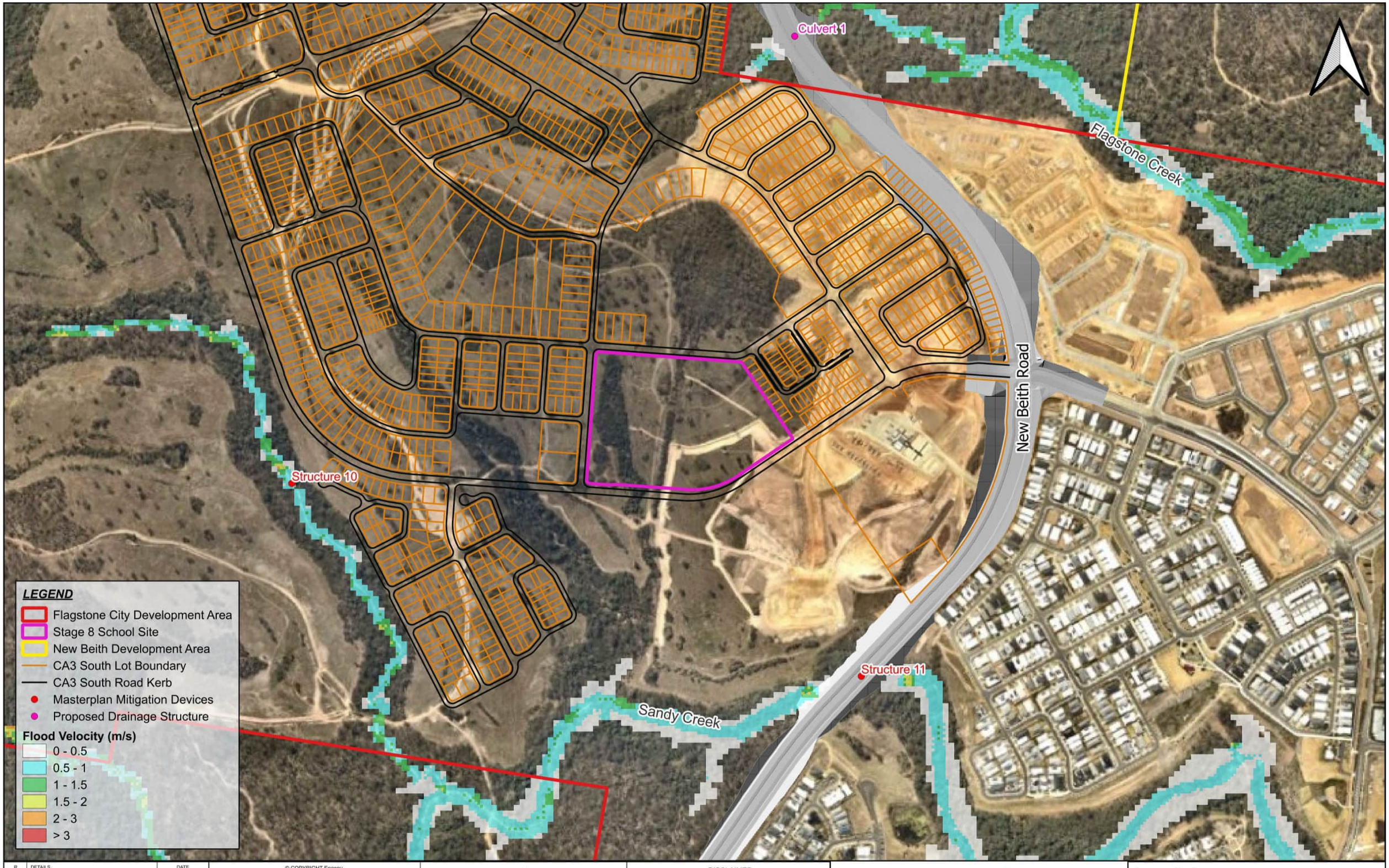
Flagstone City Stage 8 School Site

Masterplan (M01) Scenario
PMF Flood Level

Drg Ref
QC4021_002-SKE-01-0018

Q:\Projects\QC4012 PEET Limited\QC4012_002 Flagstone Context Area 3\05 Design\QGIS\Workspaces\QC4012_002-WOR-007-C FMS Figures_School Site_AA.qgz



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NOTES:

N

0 100 200 m

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Appendix B

Flagstone City Stage 8 School Site

Masterplan (M01) Scenario
63.2% AEP Flood Velocity

Drg Ref.
QC4021_002-SKE-01-0019

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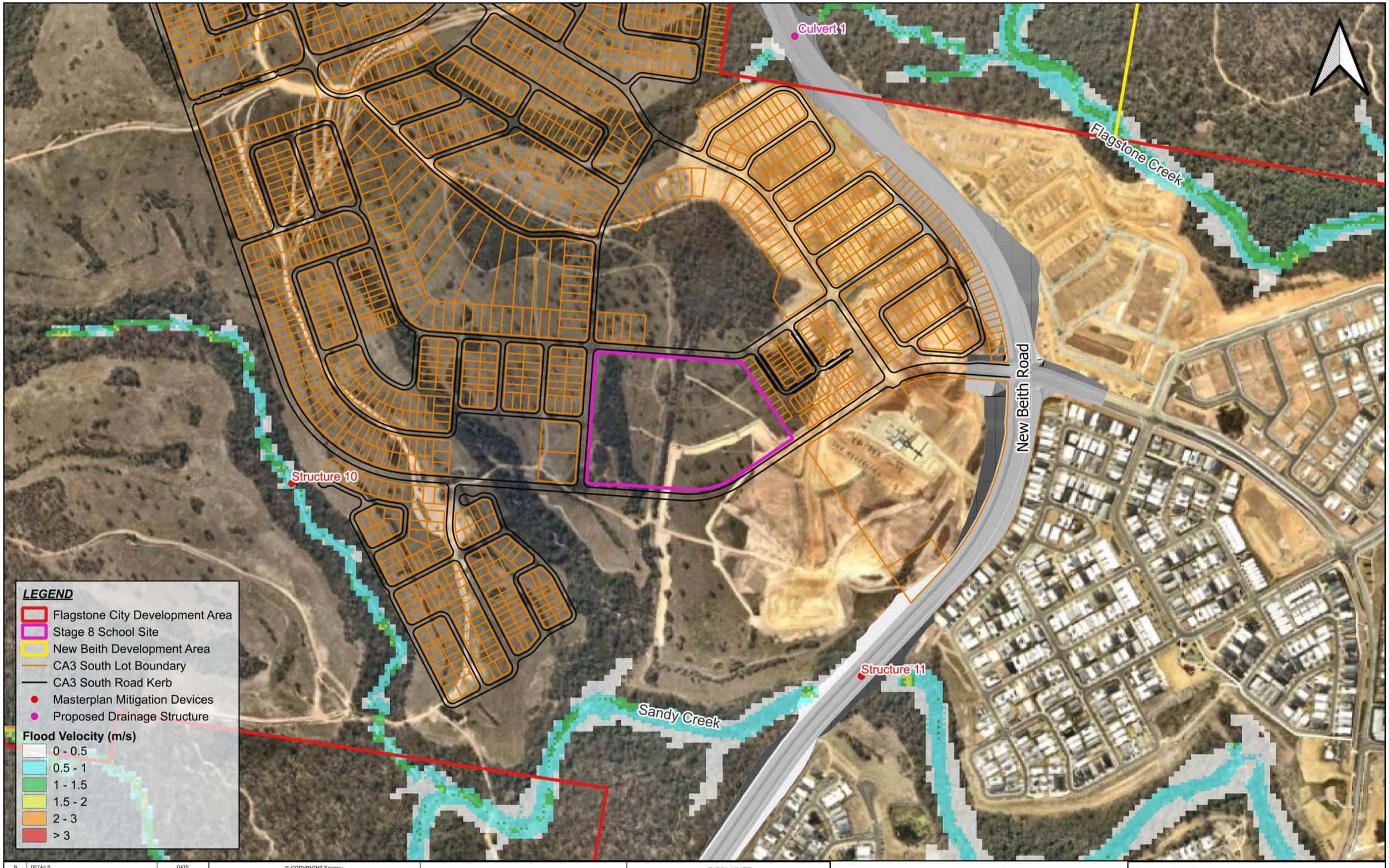

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NOTES:

N

0 100 200 m

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Flagstone City Stage 8 School Site

Masterplan (M01) Scenario
50% AEP Flood Velocity

Drg Ref.
QC4021_002-SKE-01-0020

Q:\Projects\QC4012 PEET Limited\QC4012_002 Flagstone Context Area 3\05 Design\QGIS\Workspaces\QC4012_002-WOR-007-C FMS Figures_School Site_AA.qgz

Culvert 1

Flagstone Creek

New Beith Road

Structure 10

Structure 11

Sandy Creek

LEGEND

- Flagstone City Development Area
- Stage 8 School Site
- New Beith Development Area
- CA3 South Lot Boundary
- CA3 South Road Kerb
- Masterplan Mitigation Devices
- Proposed Drainage Structure

Flood Velocity (m/s)

- 0 - 0.5
- 0.5 - 1
- 1 - 1.5
- 1.5 - 2
- 2 - 3
- > 3

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NOTES:

N

0 100 200 m

SCALE @ A3 - 1:1
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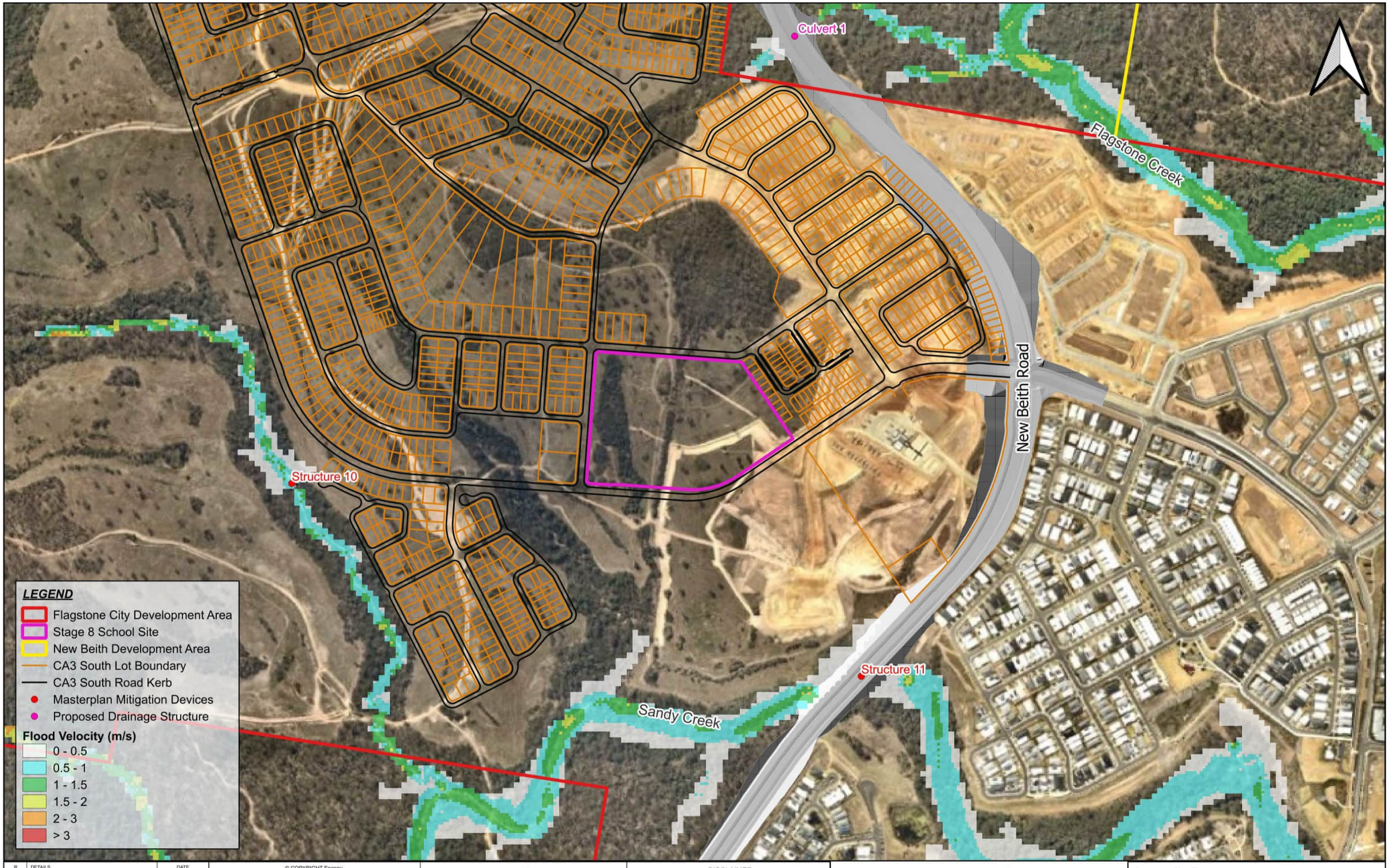
Appendix B

Flagstone City Stage 8 School Site

Masterplan (M01) Scenario
20% AEP Flood Velocity

Drg Ref.
QC4021_002-SKE-01-0021

Q:\Projects\QC4012 PEET Limited\QC4012_002 Flagstone Context Area 3\05 Design\QGIS\Workspaces\QC4012_002-WOR-007-C FMS Figures_School Site_AA.qgz



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APPROVED	JH	DATE	26-11-2025

NOTES:

N

0 100 200 m

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Appendix B

Flagstone City Stage 8 School Site

Masterplan (M01) Scenario
10% AEP Flood Velocity

Drg Ref.
QC4021_002-SKE-01-0022

Q:\Projects\QC4012 PEET Limited\QC4012_002 Flagstone Context Area 3\05 Design\QGIS\Workspaces\QC4012_002-WOR-007-C FMS Figures_School Site_AA.qgz

Culvert 1

Flagstone Creek

New Beith Road

Structure 10

Structure 11

Sandy Creek

LEGEND

- Flagstone City Development Area
- Stage 8 School Site
- New Beith Development Area
- CA3 South Lot Boundary
- CA3 South Road Kerb
- Masterplan Mitigation Devices
- Proposed Drainage Structure

Flood Velocity (m/s)

- 0 - 0.5
- 0.5 - 1
- 1 - 1.5
- 1.5 - 2
- 2 - 3
- > 3

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NOTES:

N

0 100 200 m

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Appendix B

Flagstone City Stage 8 School Site

Masterplan (M01) Scenario
5% AEP Flood Velocity

Drg Ref.
QC4021_002-SKE-01-0023

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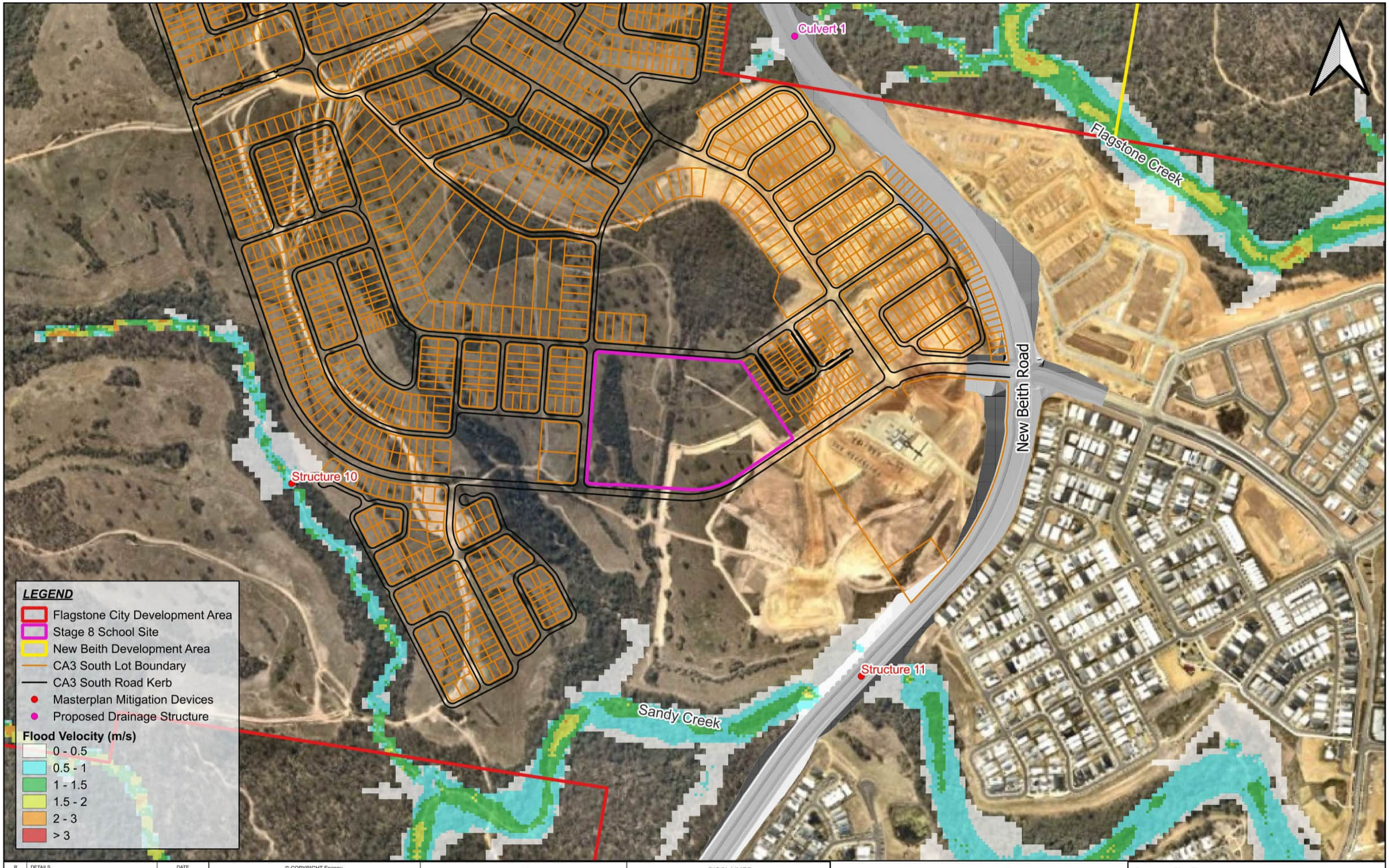

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N

0 100 200 m

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Appendix B

Flagstone City Stage 8 School Site

Masterplan (M01) Scenario
2% AEP Flood Velocity

Drg Ref.
QC4021_002-SKE-01-0024

Q:\Projects\QC4012 PEET Limited\QC4012_002 Flagstone Context Area 3\05 Design\QGIS\Workspaces\QC4012_002-WOR-007-C FMS Figures_School Site_AA.qgz

Culvert 1

Flagstone Creek

New Beith Road

Structure 10

Structure 11

Sandy Creek

LEGEND

- Flagstone City Development Area
- Stage 8 School Site
- New Beith Development Area
- CA3 South Lot Boundary
- CA3 South Road Kerb
- Masterplan Mitigation Devices
- Proposed Drainage Structure

Flood Velocity (m/s)

- 0 - 0.5
- 0.5 - 1
- 1 - 1.5
- 1.5 - 2
- 2 - 3
- > 3

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N

0 100 200 m

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Appendix B

Flagstone City Stage 8 School Site

Masterplan (M01) Scenario
1% AEP Flood Velocity

Drg Ref
QC4021_002-SKE-01-0025

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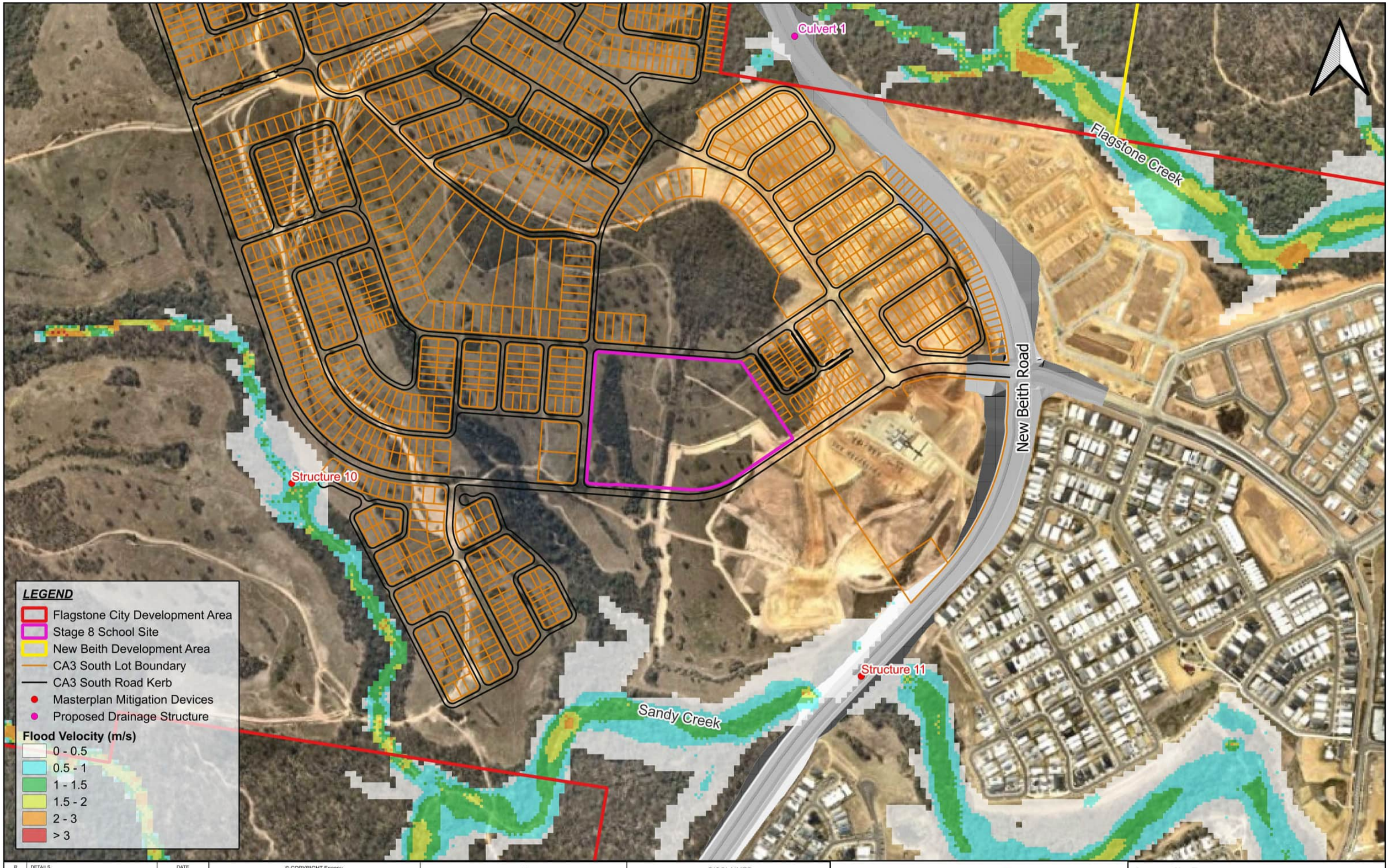

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NOTES:

N

0 100 200 m

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Flagstone City Stage 8 School Site

Masterplan (M01) Scenario
1% AEP Flood Velocity (Climate Change)

Drg Ref
QC4021_002-SKE-01-0026

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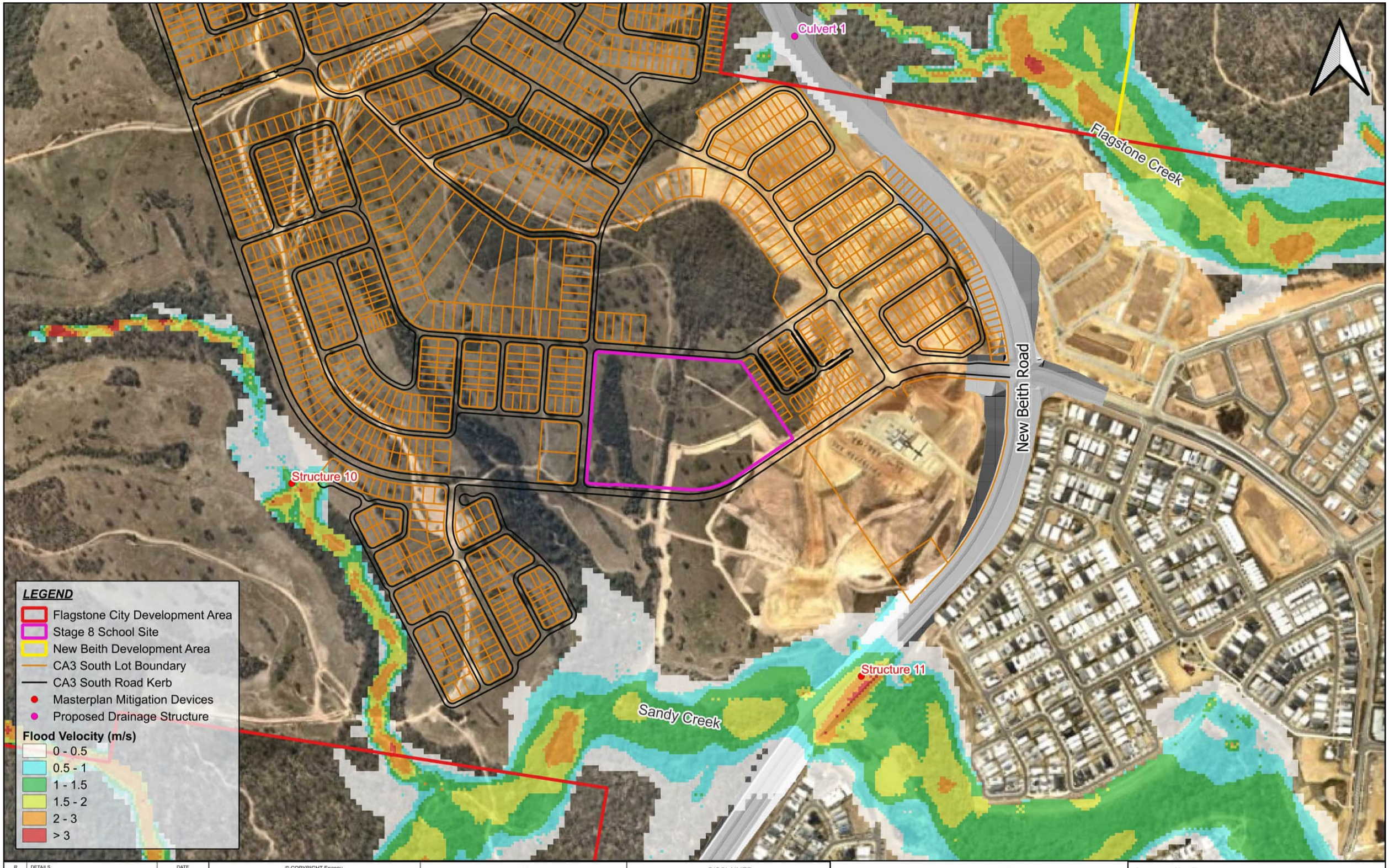

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NOTES:

N

0 100 200 m

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Appendix B

Flagstone City Stage 8 School Site

Masterplan (M01) Scenario
PMF Flood Velocity

Drg Ref
QC4021_002-SKE-01-0027

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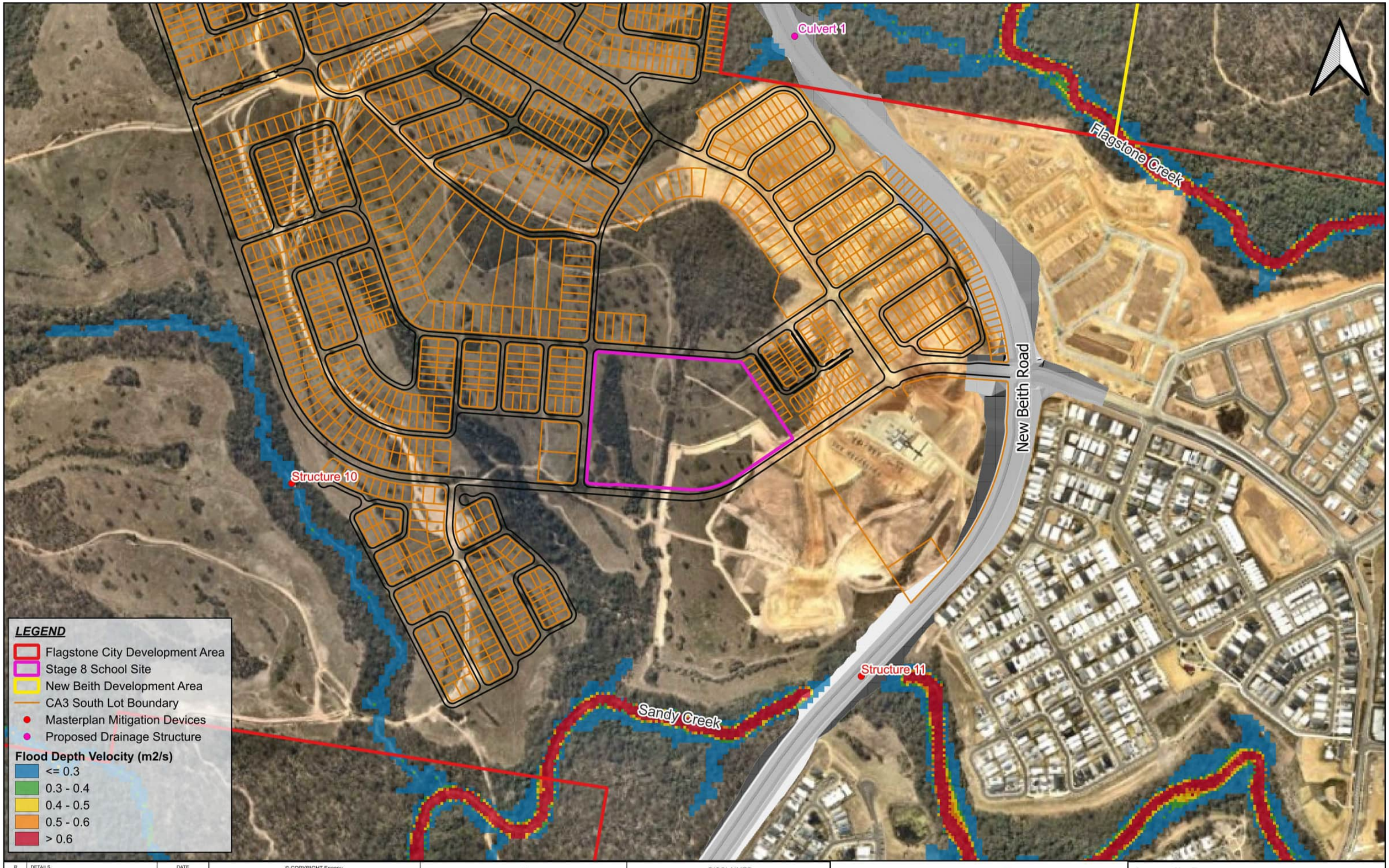

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NOTES:

N

0 100 200 m

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Appendix B

Flagstone City Stage 8 School Site

Masterplan (M01) Scenario
63.2% AEP Depth-Velocity

Drg Ref: QC4021_002-SKE-01-0028

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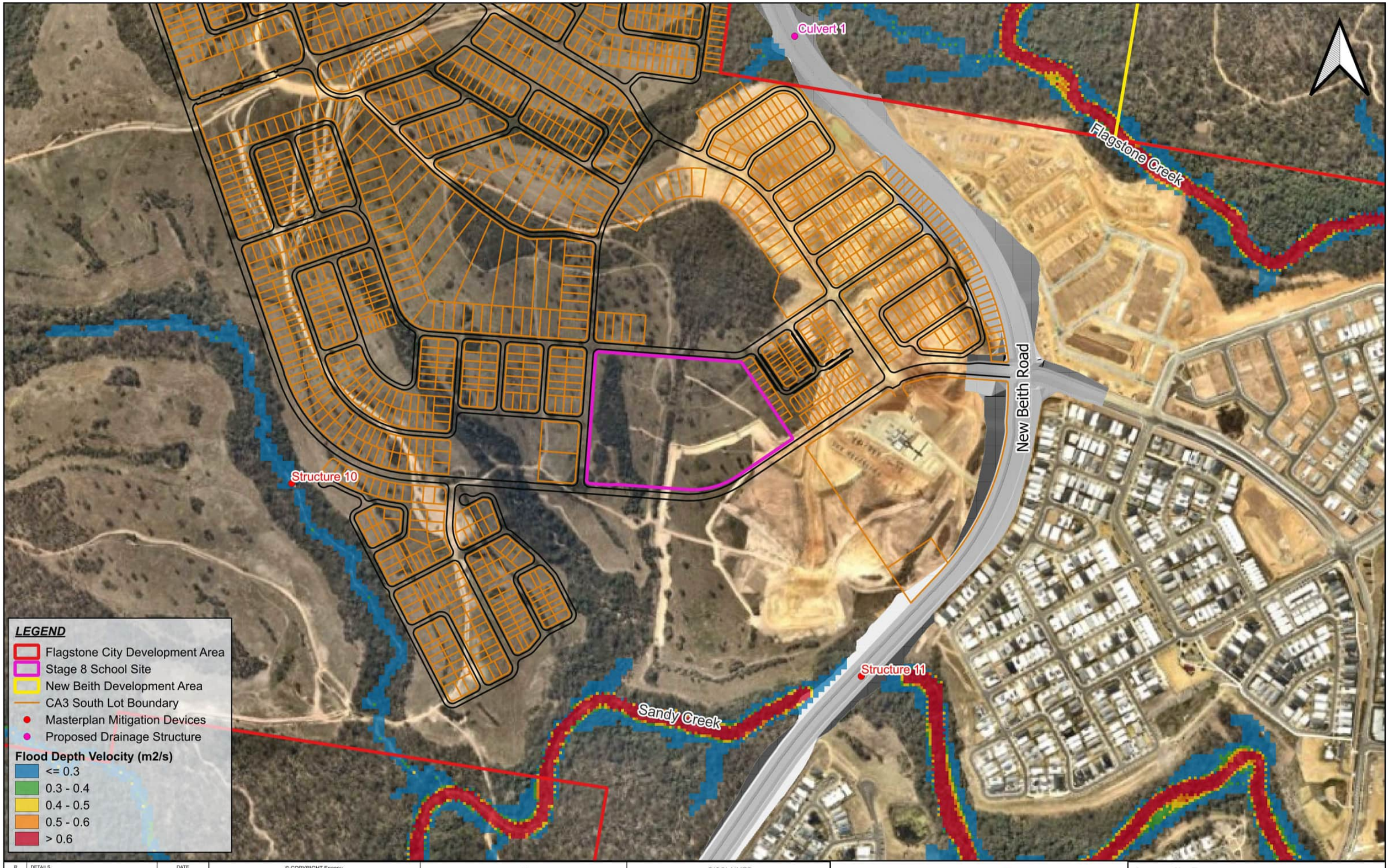

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0 100 200 m

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Flagstone City Stage 8 School Site

Masterplan (M01) Scenario
50% AEP Depth-Velocity

Drg Ref
QC4021_002-SKE-01-0029

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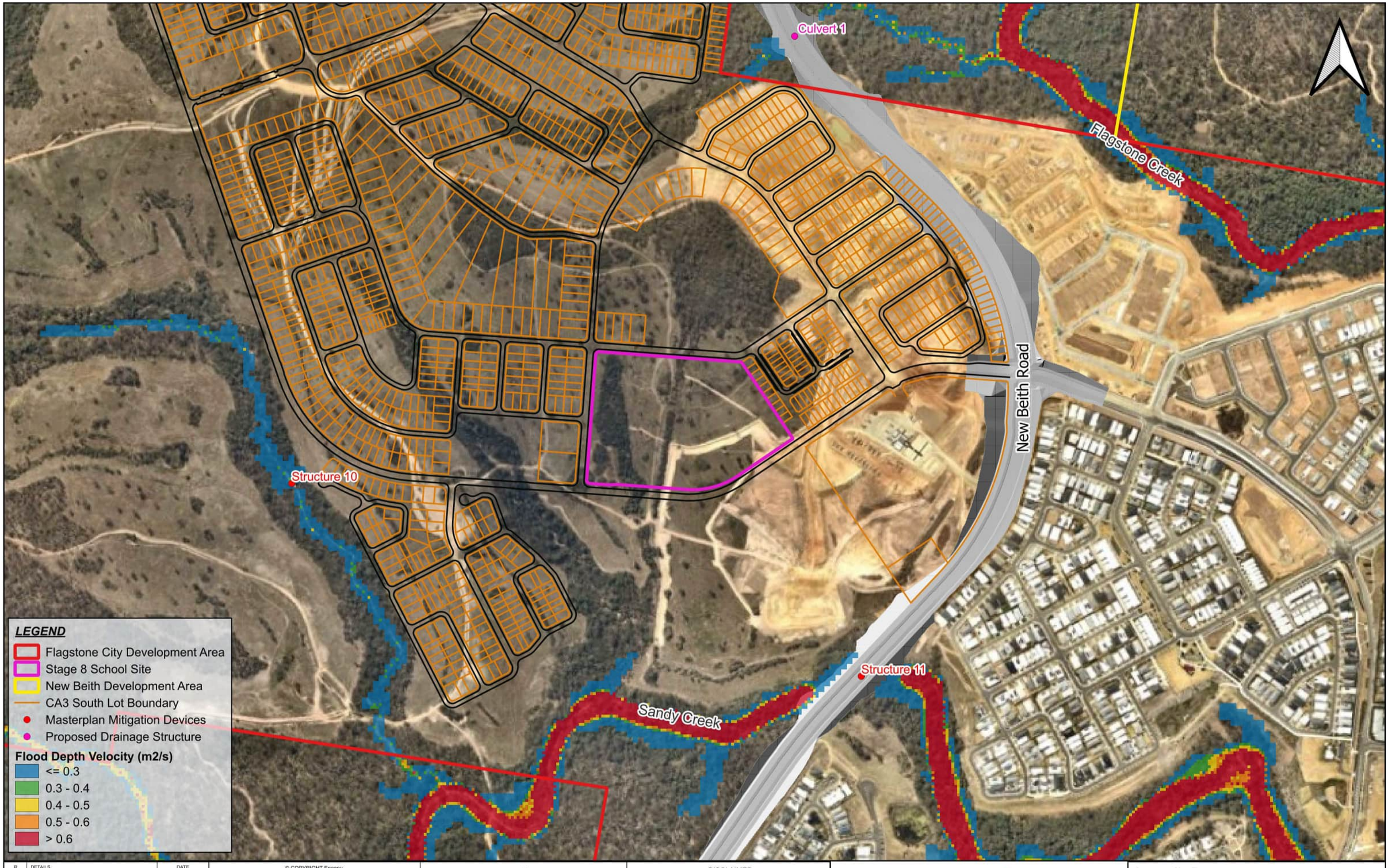

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0 100 200 m

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Appendix B

Flagstone City Stage 8 School Site

Masterplan (M01) Scenario
20% AEP Depth-Velocity

Drg Ref.
QC4021_002-SKE-01-0030

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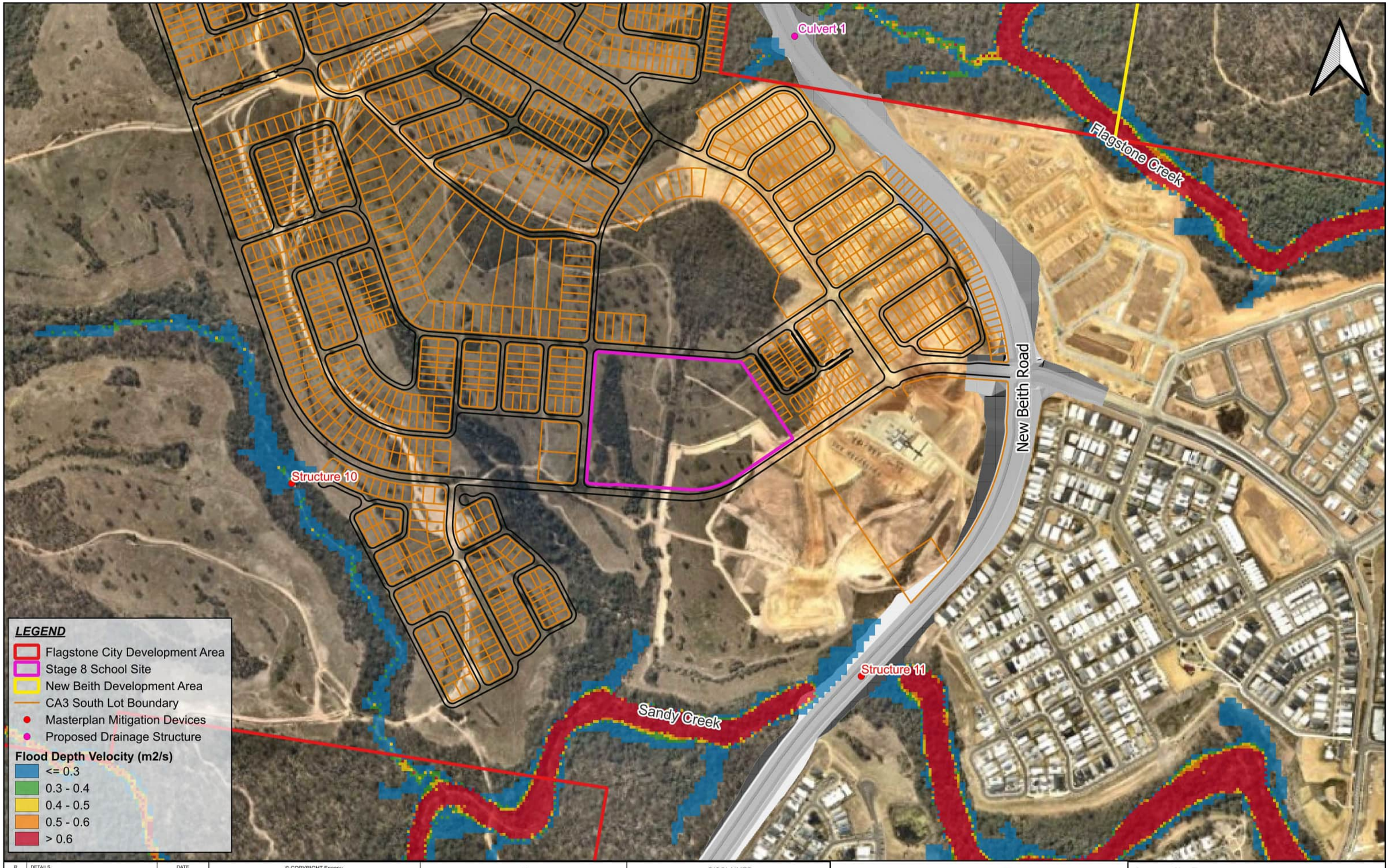

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0 100 200 m

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Appendix B

Flagstone City Stage 8 School Site

Masterplan (M01) Scenario
10% AEP Depth-Velocity

Drg Ref
QC4021_002-SKE-01-0031

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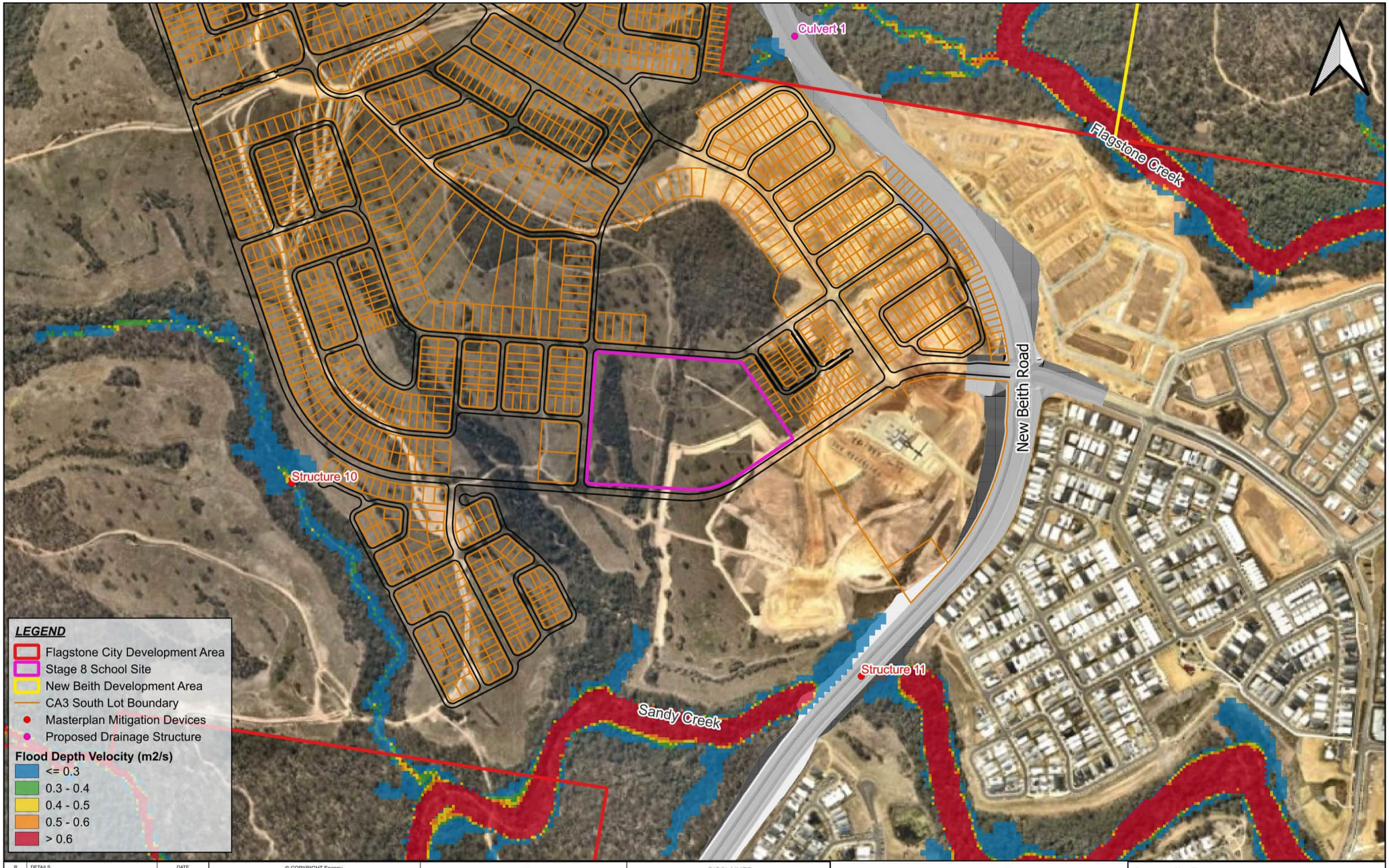

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0 100 200 m

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Appendix B

Flagstone City Stage 8 School Site

Masterplan (M01) Scenario
5% AEP Depth-Velocity

Drg Ref.
QC4021_002-SKE-01-0032

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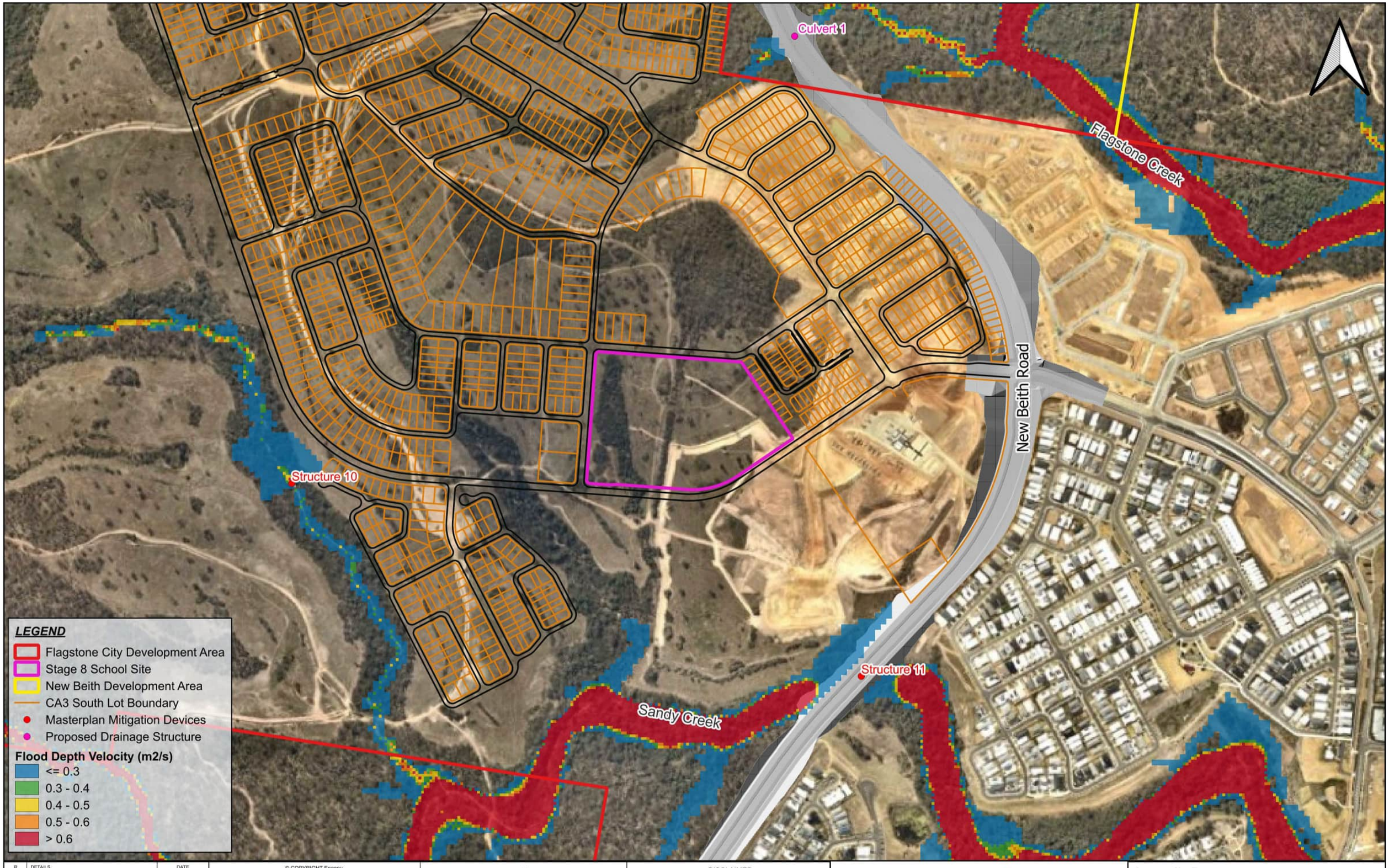

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N

0 100 200 m

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Appendix B

Flagstone City Stage 8 School Site

Masterplan (M01) Scenario
2% AEP Depth-Velocity

Drg Ref
QC4021_002-SKE-01-0033

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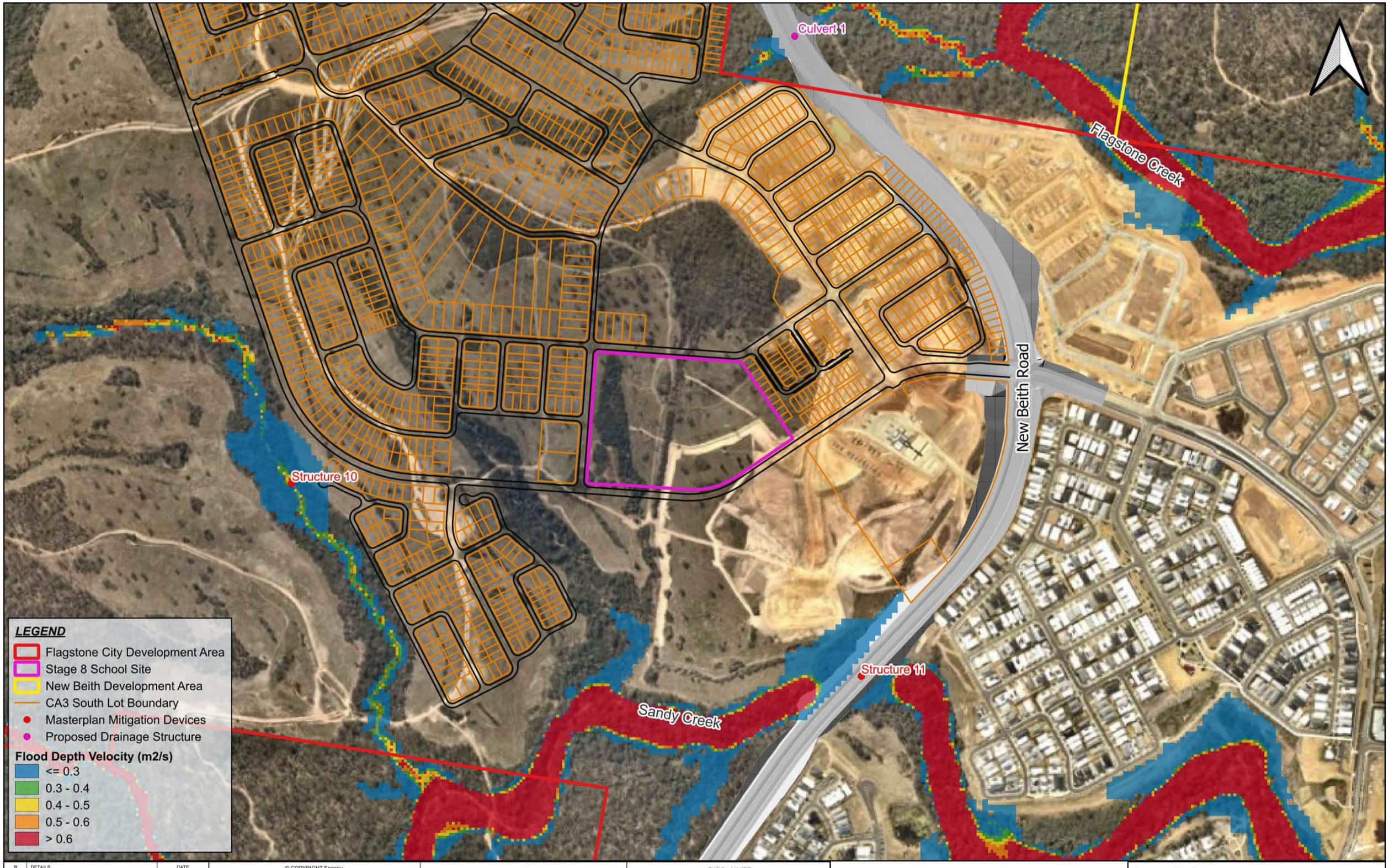

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NOTES:

N

0 100 200 m

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Appendix B

Flagstone City Stage 8 School Site

Masterplan (M01) Scenario
1% AEP Depth-Velocity

Drg Ref
QC4021_002-SKE-01-0034

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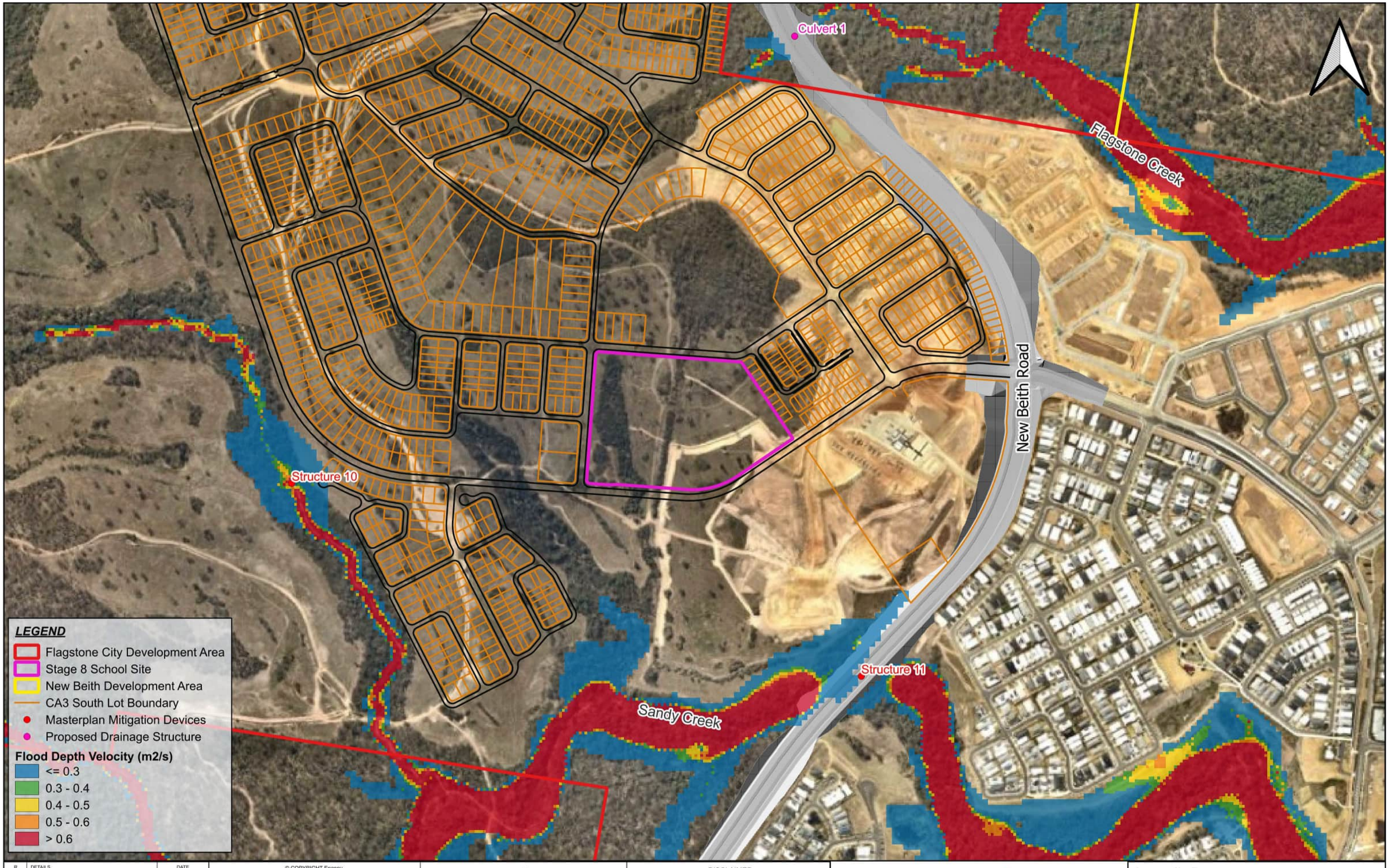

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NOTES:

N

0 100 200 m

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Appendix B

Flagstone City Stage 8 School Site

Masterplan (M01) Scenario
1% AEP Depth-Velocity (Climate Change)

Drg Ref: QC4021_002-SKE-01-0035

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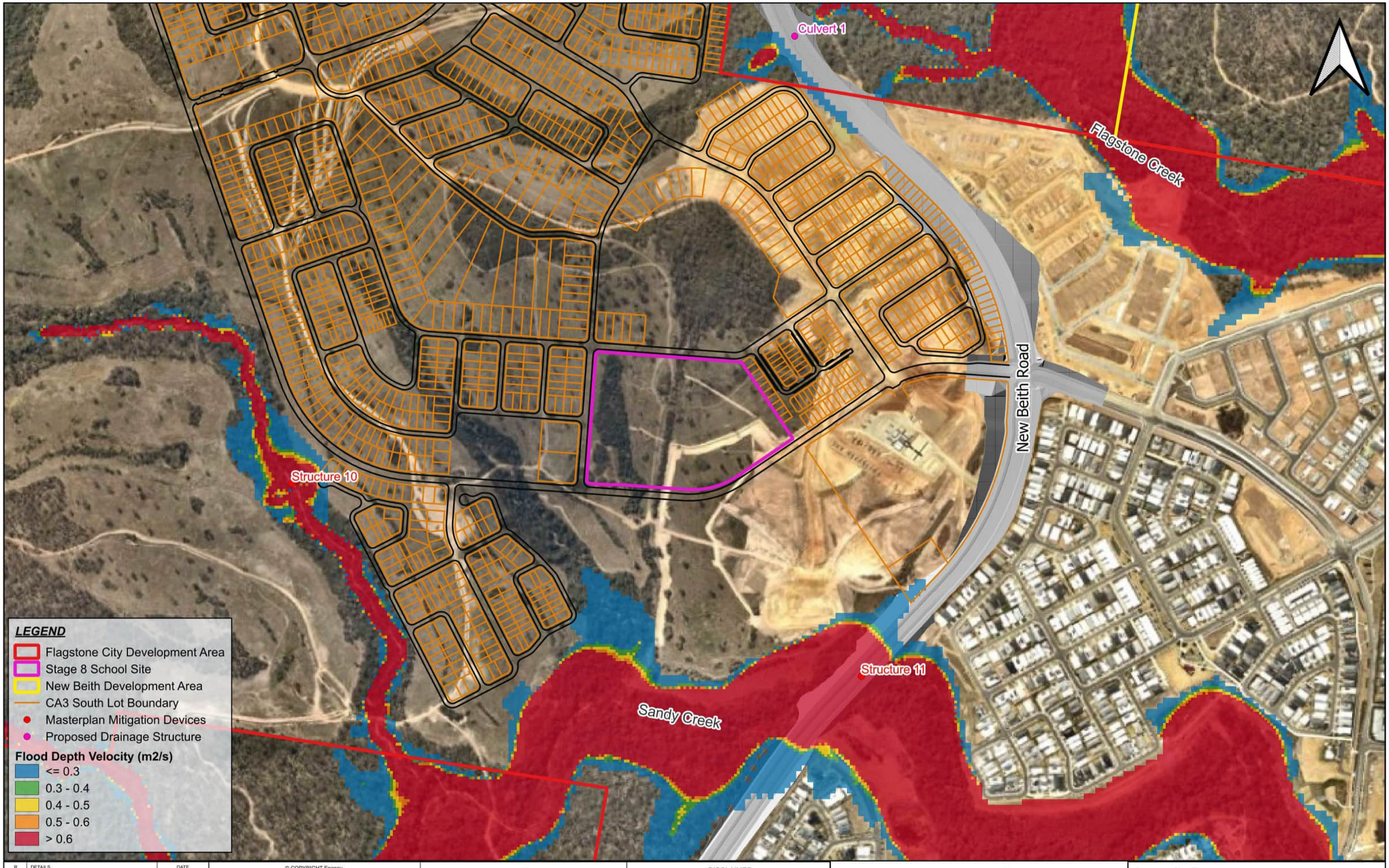

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NOTES:

N

0 100 200 m

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Appendix B

Flagstone City Stage 8 School Site

Masterplan (M01) Scenario
PMF Depth-Velocity

Drg Ref
QC4021_002-SKE-01-0036

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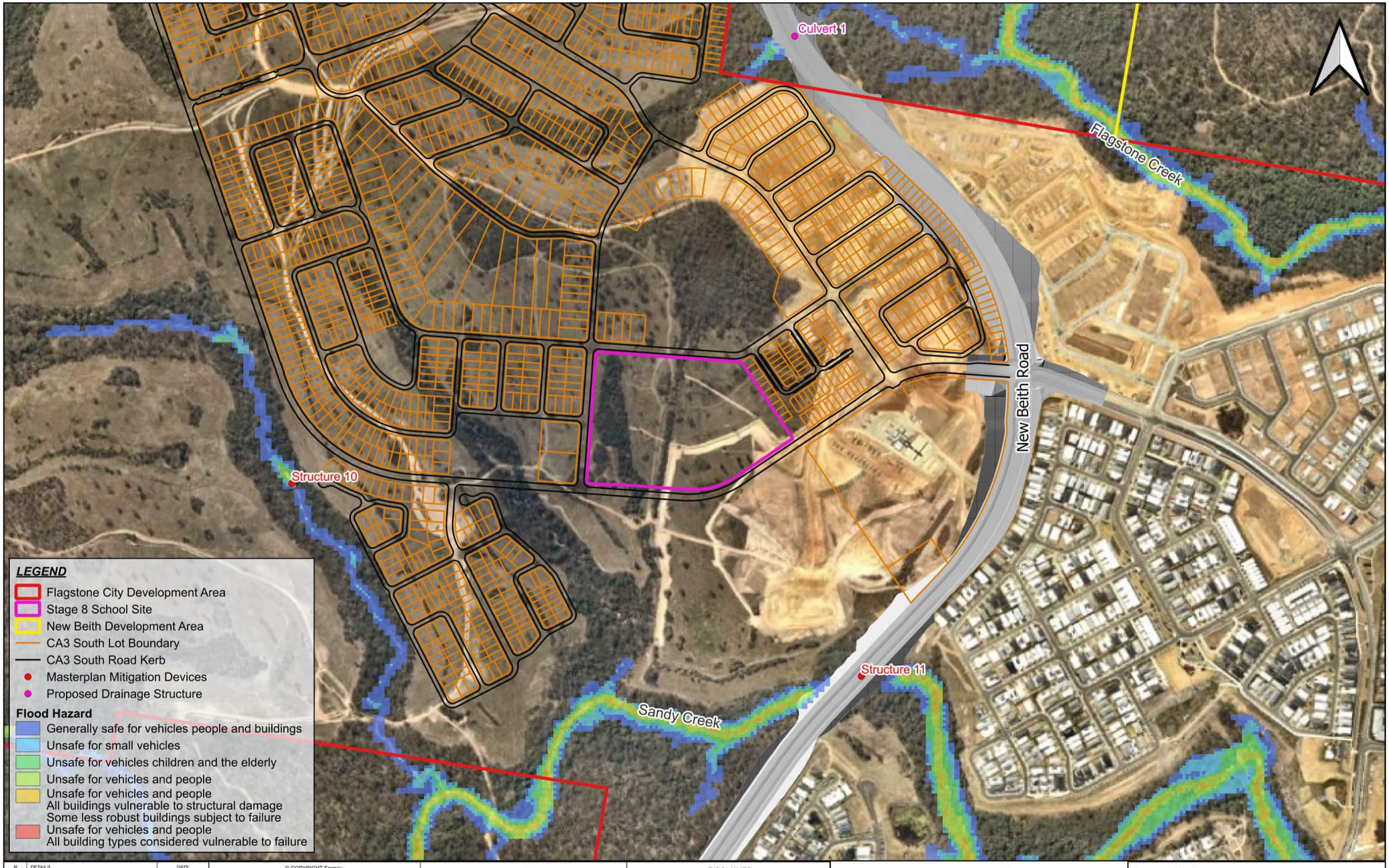

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N

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Appendix B

Flagstone City Stage 8 School Site

Masterplan (M01) Scenario
63.2% AEP Flood Hazard

Drg Ref
QC4021_002-SKE-01-0037

Q:\Projects\QC4012 PEET Limited\QC4012_002 Flagstone Context Area 3\05 Design\QGIS\Workspaces\QC4012_002-WOR-007-C FMS Figures_School Site_AA.qgz

Culvert 1

Flagstone Creek

New Beith Road

Structure 10

Structure 11

Sandy Creek

LEGEND

- Flagstone City Development Area
- Stage 8 School Site
- New Beith Development Area
- CA3 South Lot Boundary
- CA3 South Road Kerb
- Masterplan Mitigation Devices
- Proposed Drainage Structure

Flood Hazard

- Generally safe for vehicles people and buildings
- Unsafe for small vehicles
- Unsafe for vehicles children and the elderly
- Unsafe for vehicles and people
- Unsafe for vehicles and people
  All buildings vulnerable to structural damage
  Some less robust buildings subject to failure
- Unsafe for vehicles and people
  All building types considered vulnerable to failure

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NOTES:

N

0 100 200 m

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Appendix B

Flagstone City Stage 8 School Site

Masterplan (M01) Scenario
50% AEP Flood Hazard

Drg Ref
QC4021_002-SKE-01-0038

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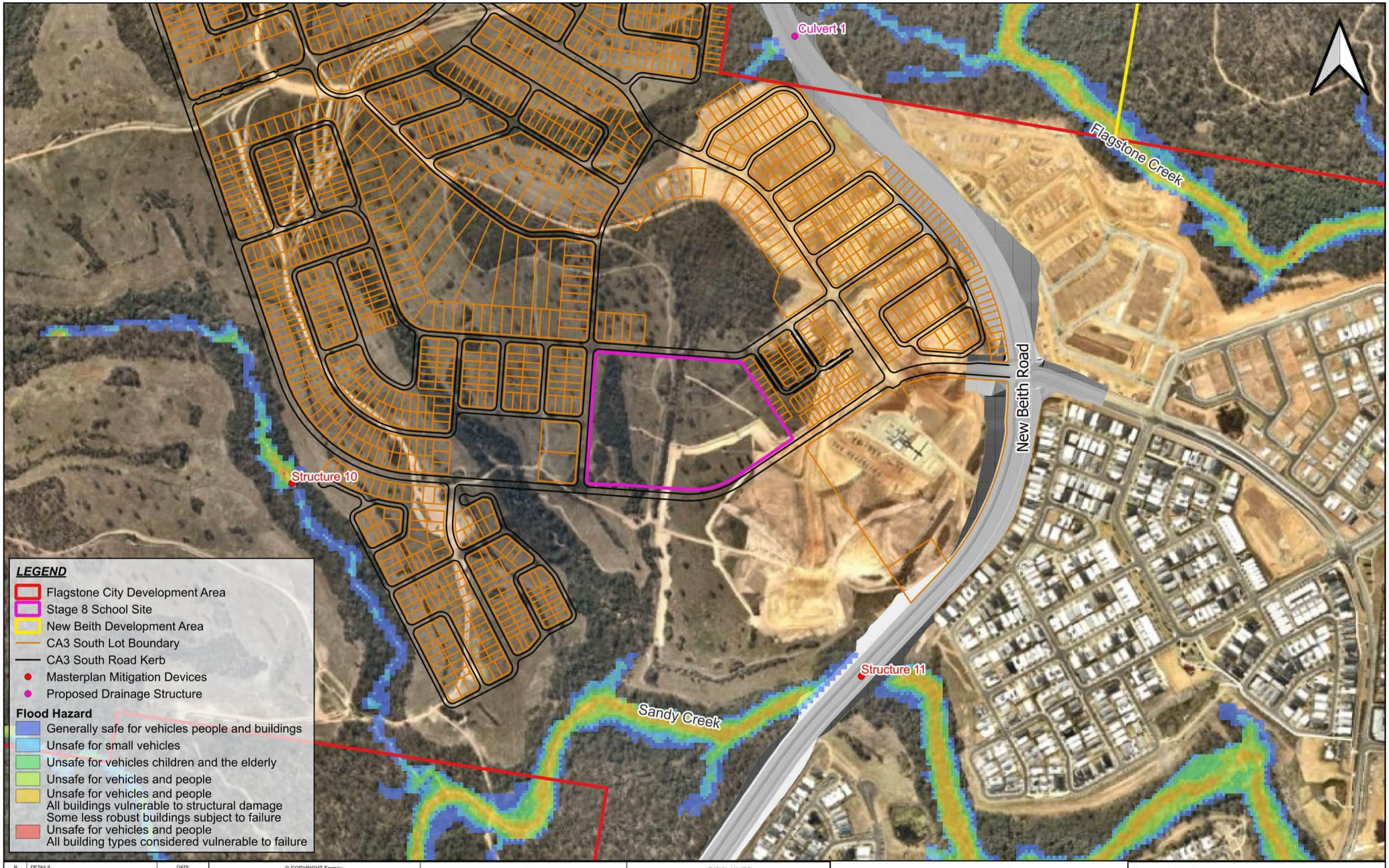

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APPROVED	JH	DATE	26-11-2025

NOTES:

N

0 100 200 m

SCALE @ A3 - 1:1
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Flagstone City Stage 8 School Site

Masterplan (M01) Scenario
20% AEP Flood Hazard

Drg Ref
QC4021_002-SKE-01-0039

Q:\Projects\QC4012 PEET Limited\QC4012_002 Flagstone Context Area 3\05 Design\QGIS\Workspaces\QC4012_002-WOR-007-C FMS Figures_School Site_AA.qgz

Culvert 1

Flagstone Creek

New Beith Road

Structure 10

Structure 11

Sandy Creek

LEGEND

- Flagstone City Development Area
- Stage 8 School Site
- New Beith Development Area
- CA3 South Lot Boundary
- CA3 South Road Kerb
- Masterplan Mitigation Devices
- Proposed Drainage Structure

Flood Hazard

- Generally safe for vehicles people and buildings
- Unsafe for small vehicles
- Unsafe for vehicles children and the elderly
- Unsafe for vehicles and people
- Unsafe for vehicles and people
  All buildings vulnerable to structural damage
  Some less robust buildings subject to failure
- Unsafe for vehicles and people
  All building types considered vulnerable to failure

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NOTES:

N

0 100 200 m

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Appendix B

Flagstone City Stage 8 School Site

Masterplan (M01) Scenario
10% AEP Flood Hazard

Drg Ref
QC4021_002-SKE-01-0040

Q:\Projects\QC4012 PEET Limited\QC4012_002 Flagstone Context Area 3\05 Design\QGIS\Workspaces\QC4012_002-WOR-007-C FMS Figures_School Site_AA.qgz

Culvert 1

Flagstone Creek

New Beith Road

Structure 10

Structure 11

Sandy Creek

LEGEND

- Flagstone City Development Area
- Stage 8 School Site
- New Beith Development Area
- CA3 South Lot Boundary
- CA3 South Road Kerb
- Masterplan Mitigation Devices
- Proposed Drainage Structure

Flood Hazard

- Generally safe for vehicles people and buildings
- Unsafe for small vehicles
- Unsafe for vehicles children and the elderly
- Unsafe for vehicles and people
- Unsafe for vehicles and people
  All buildings vulnerable to structural damage
  Some less robust buildings subject to failure
- Unsafe for vehicles and people
  All building types considered vulnerable to failure

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Flagstone City Stage 8 School Site

Masterplan (M01) Scenario
5% AEP Flood Hazard

Drg Ref.
QC4021_002-SKE-01-0041

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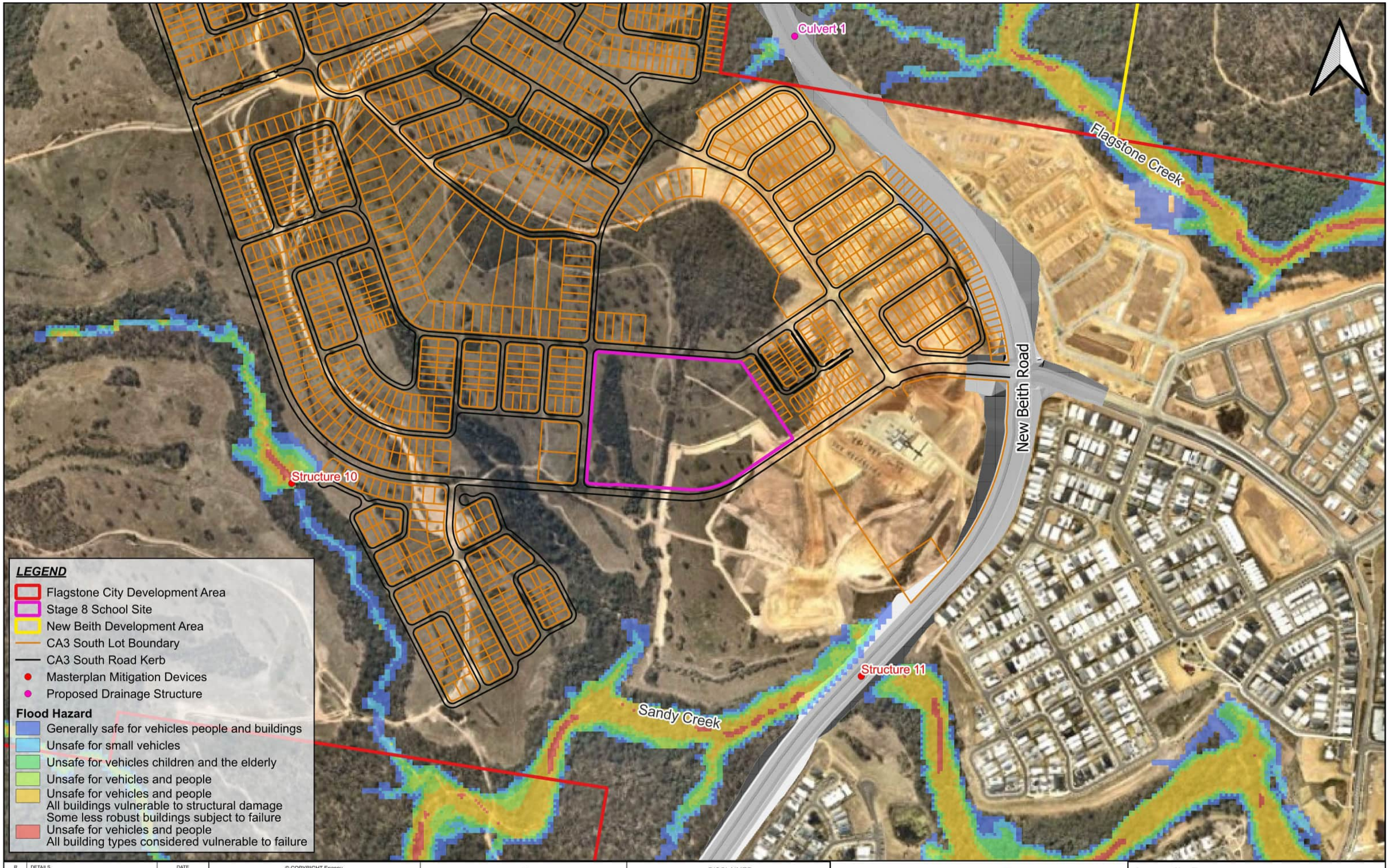

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Appendix B

Flagstone City Stage 8 School Site

Masterplan (M01) Scenario
2% AEP Flood Hazard

Drg Ref.
QC4021_002-SKE-01-0042

Q:\Projects\QC4012 PEET Limited\QC4012_002 Flagstone Context Area 3\05 Design\QGIS\Workspaces\QC4012_002-WOR-007-C FMS Figures_School Site_AA.qgz

Culvert 1

Flagstone Creek

New Beith Road

Structure 10

Structure 11

Sandy Creek

LEGEND

- Flagstone City Development Area
- Stage 8 School Site
- New Beith Development Area
- CA3 South Lot Boundary
- CA3 South Road Kerb
- Masterplan Mitigation Devices
- Proposed Drainage Structure

Flood Hazard

- Generally safe for vehicles people and buildings
- Unsafe for small vehicles
- Unsafe for vehicles children and the elderly
- Unsafe for vehicles and people
- Unsafe for vehicles and people
  All buildings vulnerable to structural damage
  Some less robust buildings subject to failure
- Unsafe for vehicles and people
  All building types considered vulnerable to failure

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Appendix B

Flagstone City Stage 8 School Site

Masterplan (M01) Scenario
1% AEP Flood Hazard

Drg Ref
QC4021_002-SKE-01-0043

Q:\Projects\QC4012 PEET Limited\QC4012_002 Flagstone Context Area 3\05 Design\QGIS\Workspaces\QC4012_002-WOR-007-C FMS Figures_School Site_AA.qgz

Culvert 1

Flagstone Creek

New Beith Road

Structure 10

Structure 11

Sandy Creek

LEGEND

- Flagstone City Development Area
- Stage 8 School Site
- New Beith Development Area
- CA3 South Lot Boundary
- CA3 South Road Kerb
- Masterplan Mitigation Devices
- Proposed Drainage Structure

Flood Hazard

- Generally safe for vehicles people and buildings
- Unsafe for small vehicles
- Unsafe for vehicles children and the elderly
- Unsafe for vehicles and people
- Unsafe for vehicles and people
  All buildings vulnerable to structural damage
  Some less robust buildings subject to failure
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Appendix B

Flagstone City Stage 8 School Site

Masterplan (M01) Scenario
1% AEP Flood Hazard (Climate Change)

Drg Ref
QC4021_002-SKE-01-0044

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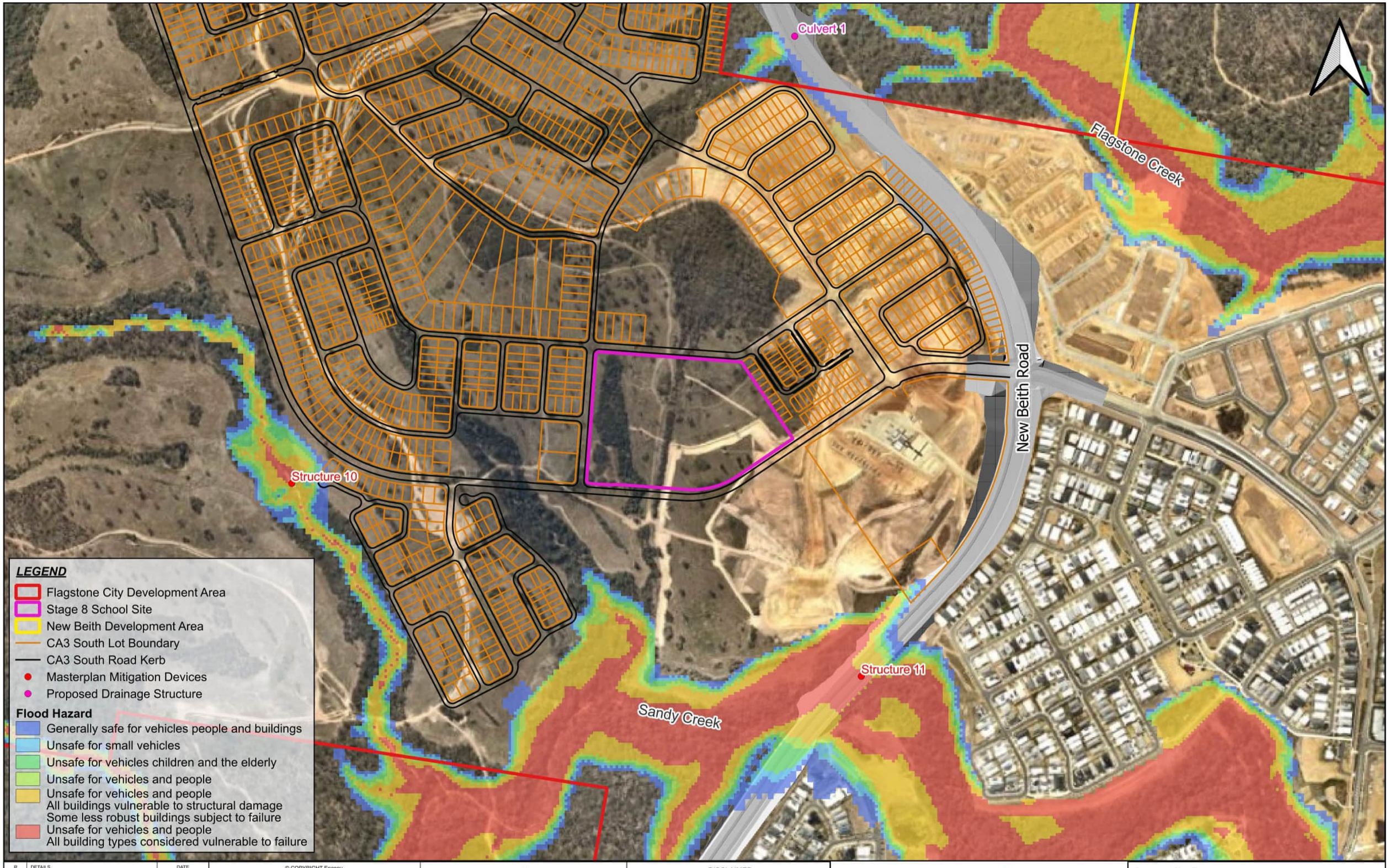

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Appendix B

Flagstone City Stage 8 School Site

Masterplan (M01) Scenario
PMF Flood Hazard

Drg Ref
QC4021_002-SKE-01-0045

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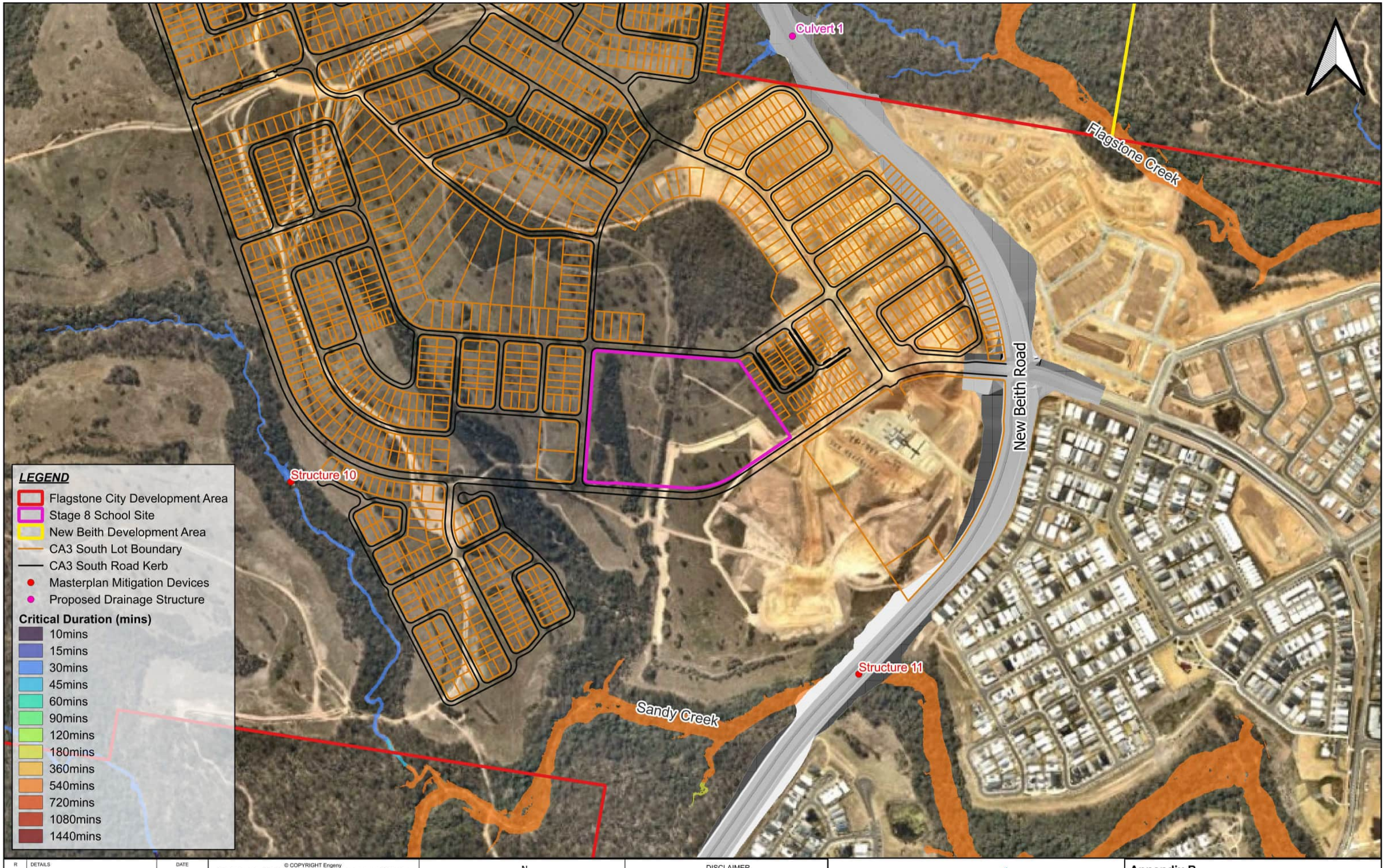

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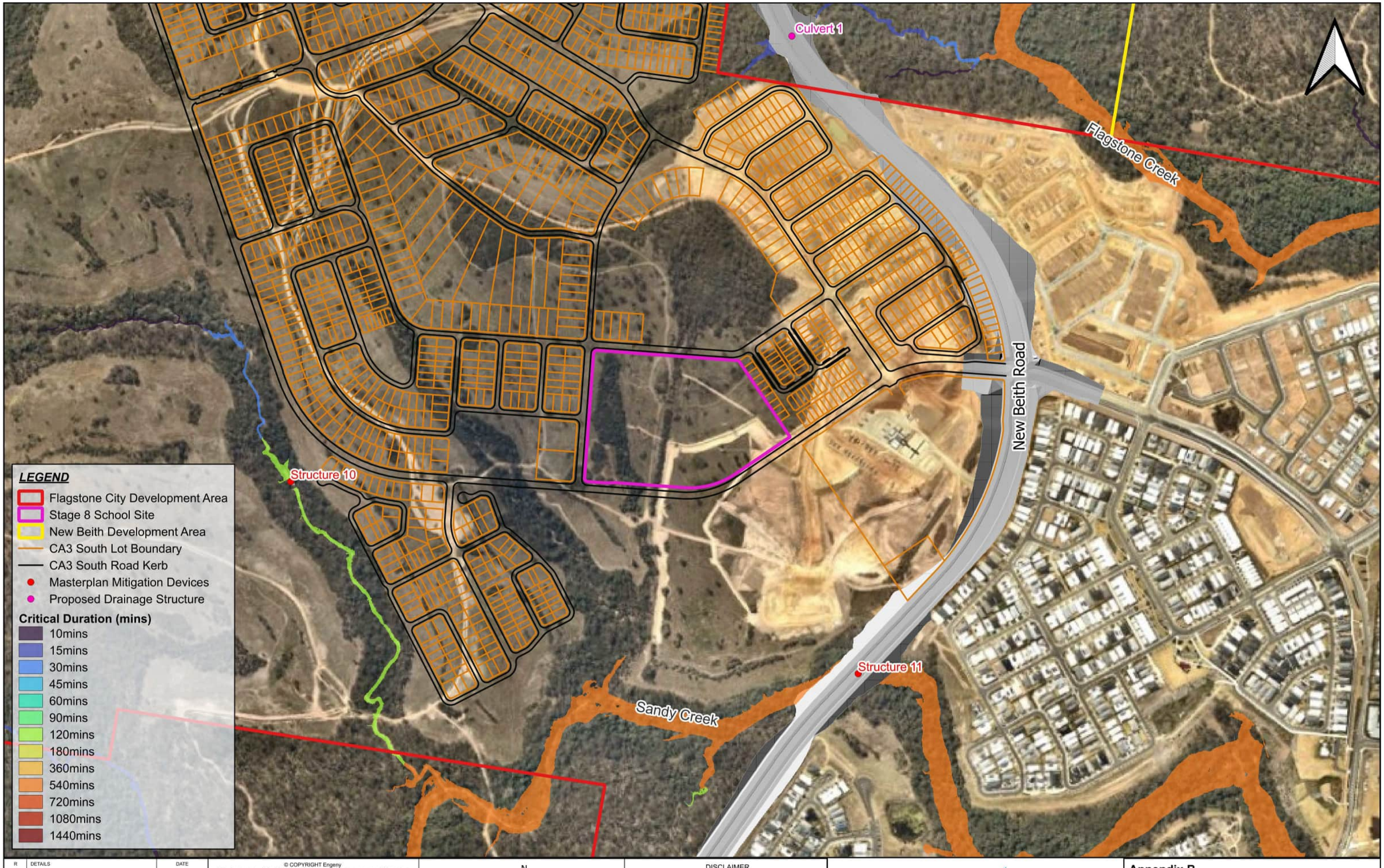
Appendix B

Flagstone City Stage 8 School Site

Masterplan (M01) Scenario
63.2% AEP Critical Duration

Drg Ref.
QC4021_002-SKE-01-0046

Q:\Projects\QC4012 PEET Limited\QC4012_002 Flagstone Context Area 3\05 Design\QGIS\Workspaces\QC4012_002-WOR-007-C FMS Figures_School Site_AA.qgz



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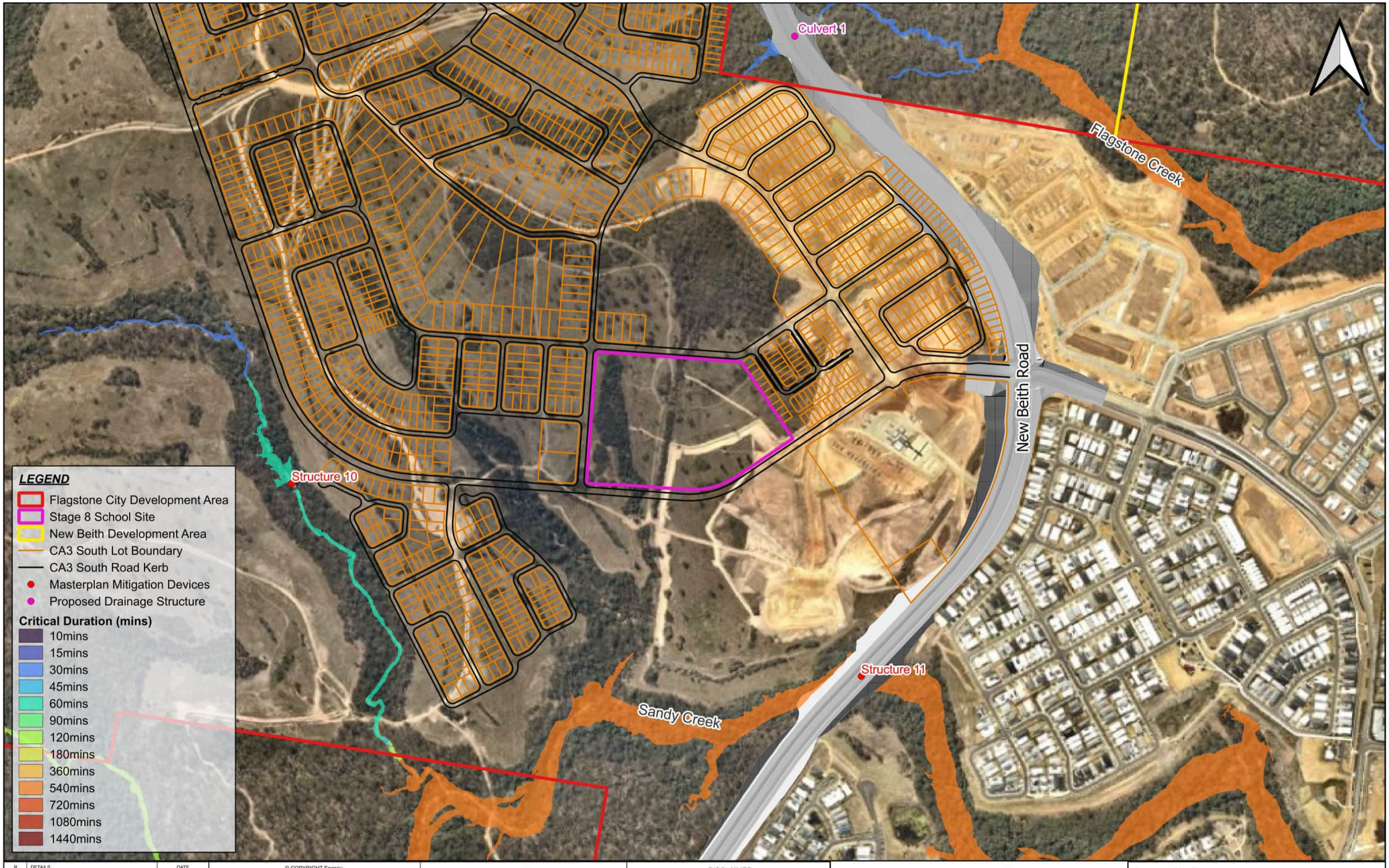
Flagstone City Stage 8 School Site

Masterplan (M01) Scenario
50% AEP Critical Duration

Drg Ref: QC4021_002-SKE-01-0047

Q:\Projects\QC4012 PEET Limited\QC4012_002 Flagstone Context Area 3\05 Design\QGIS\Workspaces\QC4012_002-WOR-007-C FMS Figures_School Site_AA.qgz



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Appendix B

Flagstone City Stage 8 School Site

Masterplan (M01) Scenario
20% AEP Critical Duration

Drg Ref: QC4021_002-SKE-01-0048

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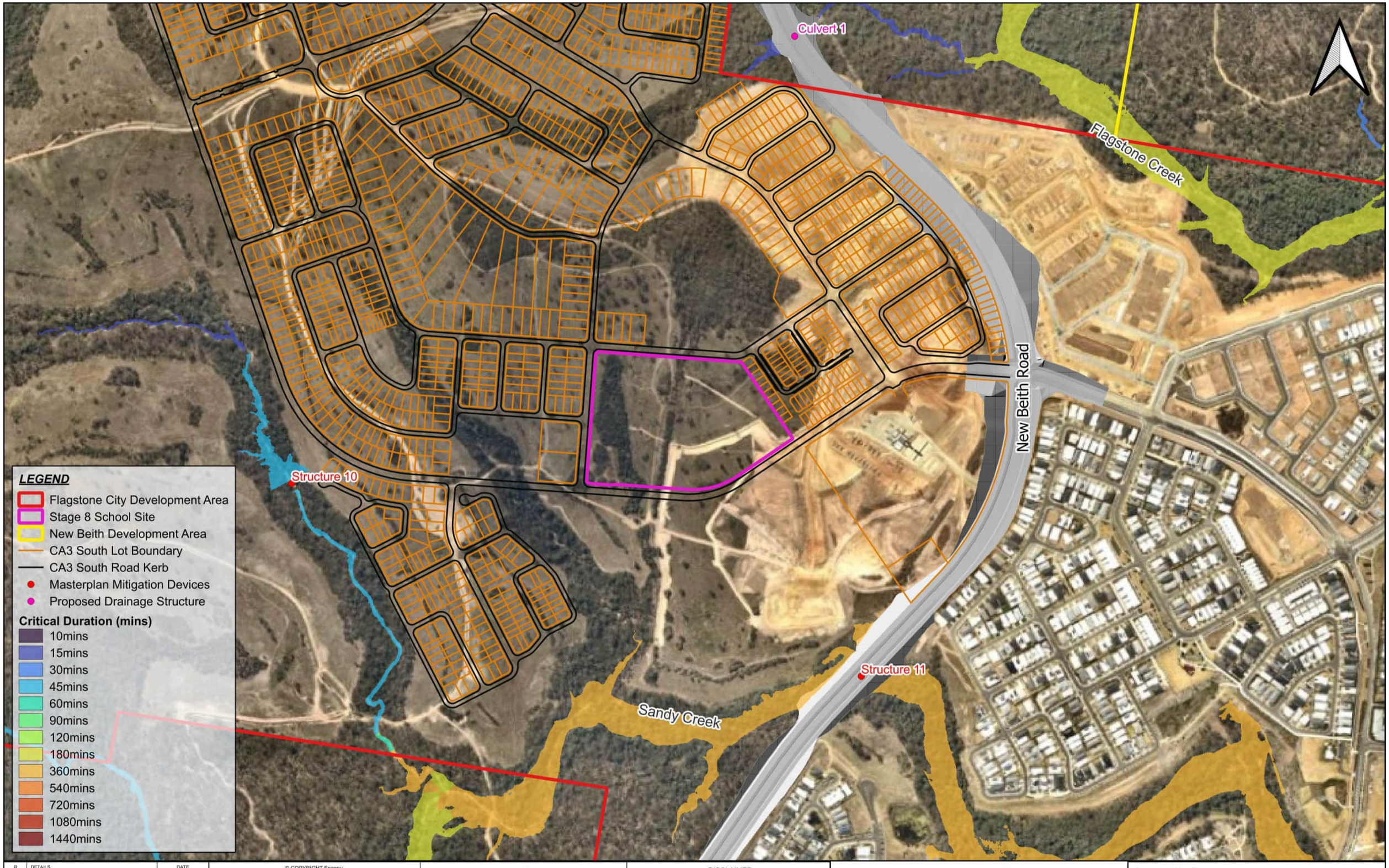

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Appendix B

Flagstone City Stage 8 School Site

Masterplan (M01) Scenario
10% AEP Critical Duration

Drg Ref.
QC4021_002-SKE-01-0049

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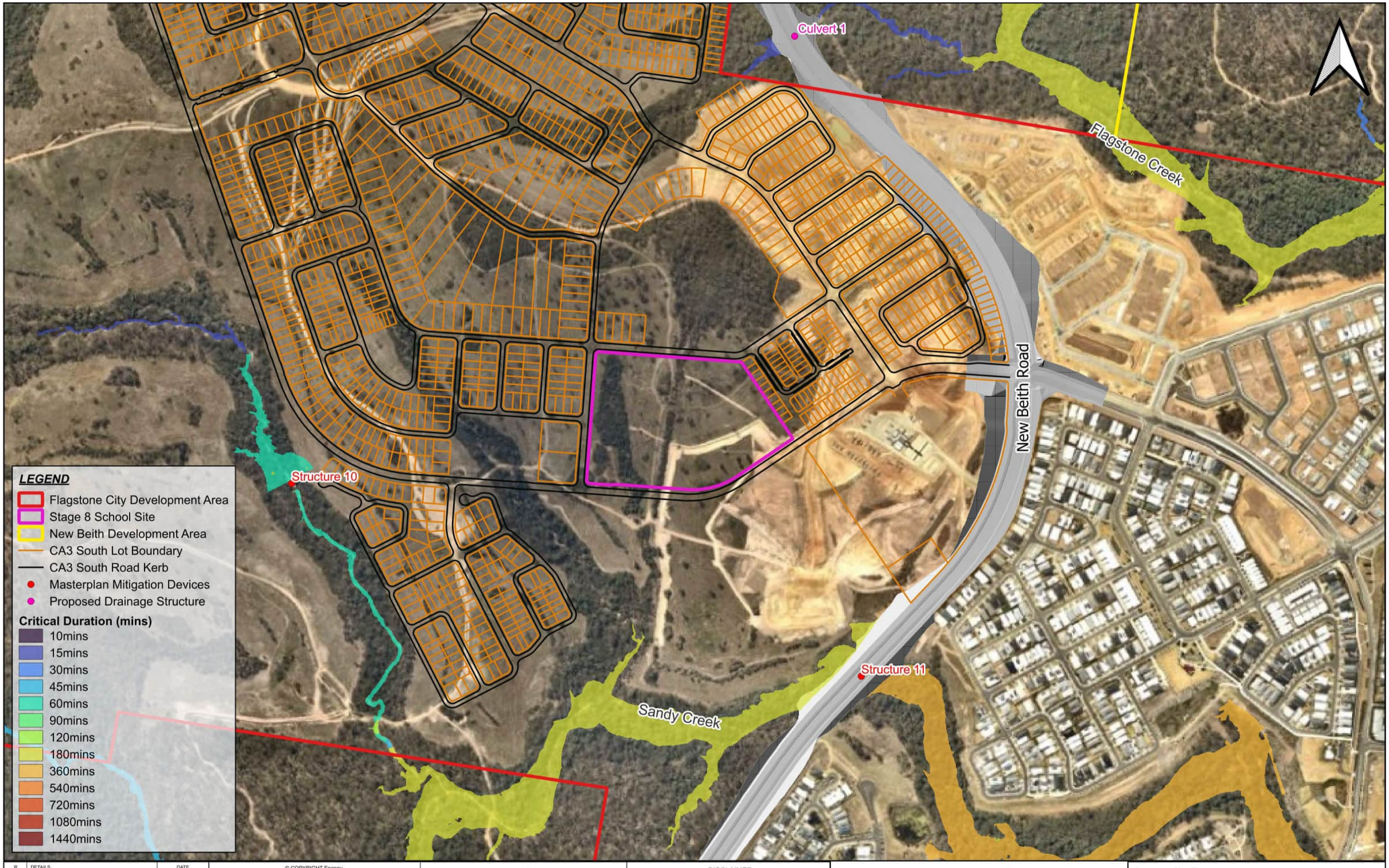

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Appendix B

Flagstone City Stage 8 School Site

Masterplan (M01) Scenario
5% AEP Critical Duration

Drg Ref.
QC4021_002-SKE-01-0050

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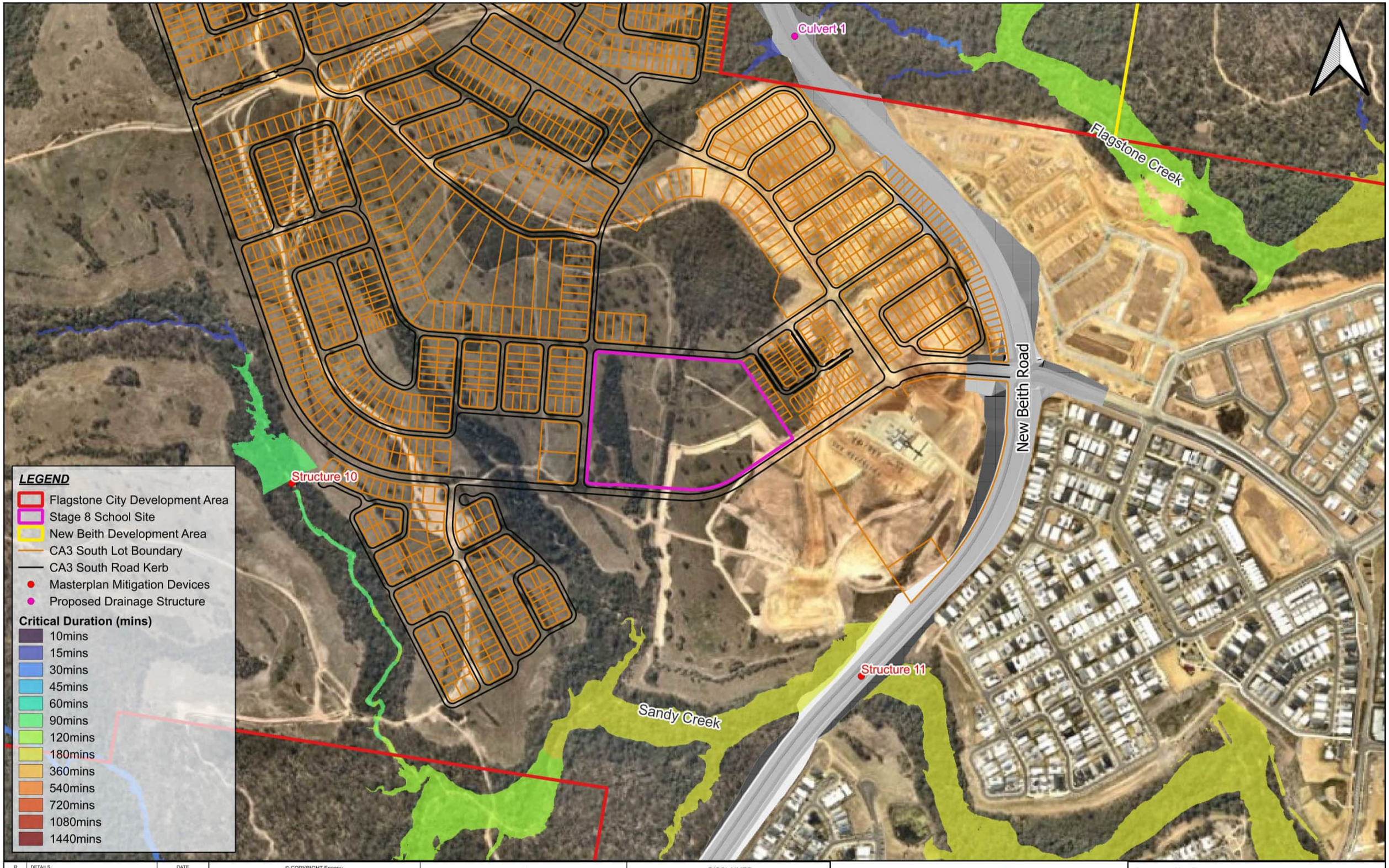

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Appendix B

Flagstone City Stage 8 School Site

Masterplan (M01) Scenario
2% AEP Critical Duration

Drg Ref: QC4021_002-SKE-01-0051

Q:\Projects\QC4012 PEET Limited\QC4012_002 Flagstone Context Area 3\05 Design\QGIS\Workspaces\QC4012_002-WOR-007-C FMS Figures_School Site_AA.qgz

Culvert 1

Flagstone Creek

New Beith Road

Structure 10

Structure 11

Sandy Creek

LEGEND

- Flagstone City Development Area
- Stage 8 School Site
- New Beith Development Area
- CA3 South Lot Boundary
- CA3 South Road Kerb
- Masterplan Mitigation Devices
- Proposed Drainage Structure

Critical Duration (mins)

- 10mins
- 15mins
- 30mins
- 45mins
- 60mins
- 90mins
- 120mins
- 180mins
- 360mins

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Appendix B

Flagstone City Stage 8 School Site

Masterplan (M01) Scenario
1% AEP Critical Duration

Drg Ref
QC4021_002-SKE-01-0052

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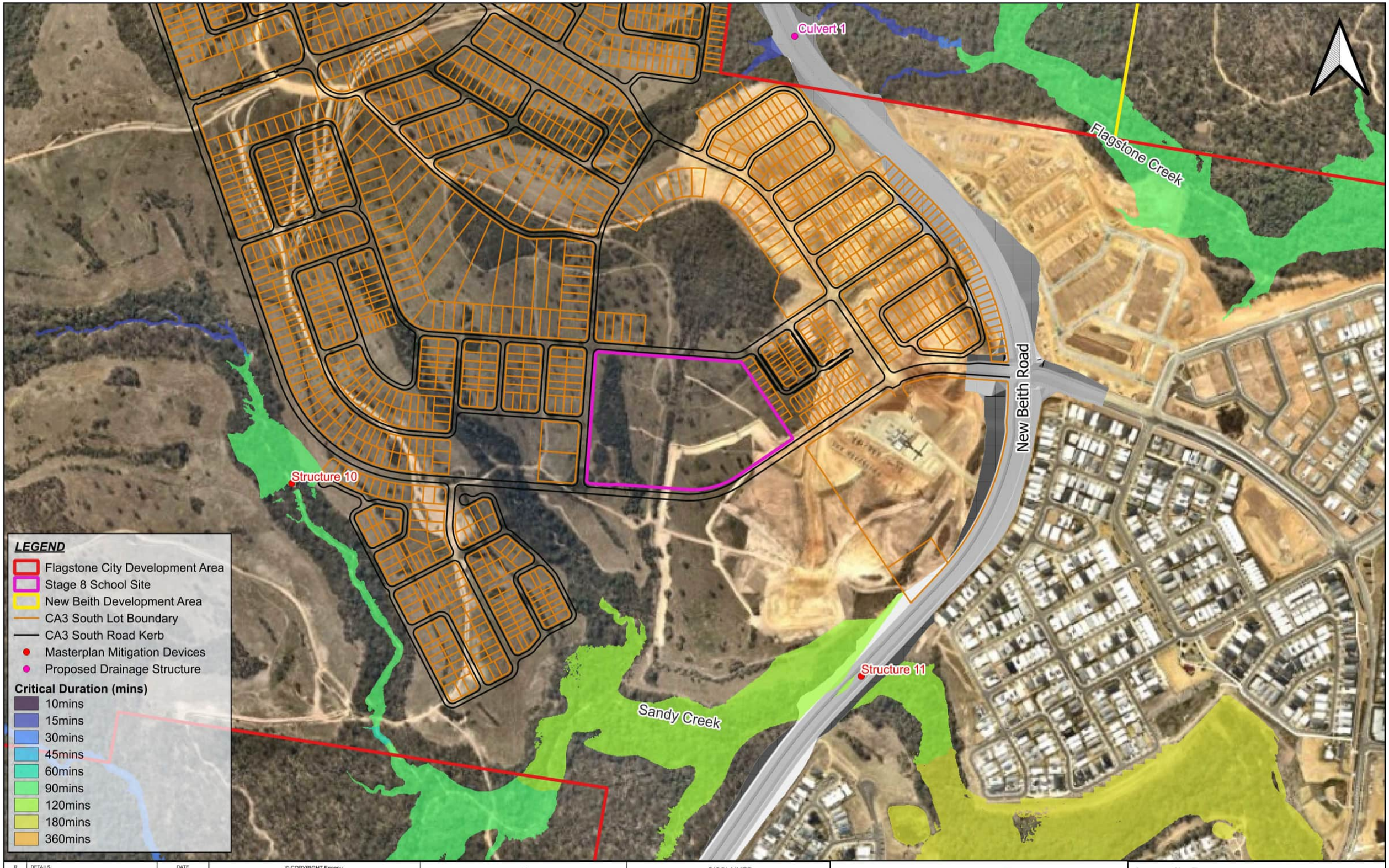

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Appendix B

Flagstone City Stage 8 School Site

Masterplan (M01) Scenario
1% AEP Critical Duration (Climate Change)

Drg Ref
QC4021_002-SKE-01-0053

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Culvert 1

Flagstone Creek

New Beith Road

Structure 10

Structure 11

Sandy Creek

LEGEND

- Flagstone City Development Area
- Stage 8 School Site
- New Beith Development Area
- CA3 South Lot Boundary
- CA3 South Road Kerb
- Masterplan Mitigation Devices
- Proposed Drainage Structure

Critical Duration (mins)

- 10mins
- 15mins
- 30mins
- 45mins
- 60mins
- 90mins
- 120mins
- 180mins
- 360mins

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Appendix B

Flagstone City Stage 8 School Site

Masterplan (M01) Scenario
PMF Critical Duration

Drg Ref
QC4021_002-SKE-01-0054

Q:\Projects\QC4012 PEET Limited\QC4012_002 Flagstone Context Area 3\05 Design\QGIS\Workspaces\QC4012_002-WOR-007-C FMS Figures_School Site_AA.qgz

Appendix G – Flagstone City CA3 South SBSMP

Level 3, 545 Queen Street, Brisbane QLD 4000
PO Box 10183, Brisbane QLD 4000
www.engeny.com.au
P: 07 3221 7174
E: admin@engeny.com.au

18 February 2026

Peet Flagstone City
Issued via email

Attention: Troy Thompson

Dear Troy

RE: FURTHER ISSUES LETTER (DEV2024/1491/3) FOR A MINOR CHANGE APPLICATION RELATING TO THE PDA DEVELOPMENT PERMIT FOR RECONFIGURING A LOT (DEV2024/1491)

Peet Flagstone City (Peet) were issued with a Further Issues Letter on 26 September 2025 for the Context Area 3 (CA3) South Minor Change application (Ref. DEV2024/1491/3). The Further Issues Letter requests additional engineering justification regarding the proposed stormwater quality treatment trains.

Engeny were engaged by Peet to prepare a response to item 2f of the Further Issues Letter which is provided below in Table 1 and should be read in conjunction with the revised *CA3 South SBSMP (Engeny, February 2026).*

TABLE 1 FURTHER ISSUES LETTER (DEV2024/1491/3) RESPONSES

Item No.	Item Description	Engeny Response
2. Engineering		
f)	Update the SBSWMP to justify the bio-retention basins which exceed the filter media 800sqm upper limit as specified in the Water by Design (2014). Bioretention Technical Design Guidelines (Version 1.1) Healthy Waterways Ltd, Brisbane.	The revised *CA3 South SBSMP (Engeny, February 2026)* provides justification of the proposed bioretention basin filter areas in Section 2.2.4. Whilst the combined filter areas for several catchments (2_Upper, 3, 5, 7, 9 and 10) exceed the maximum requirements recommended by WBD, it is proposed that these filter areas will be delivered as discrete cells which will sum to the total filter area requirements provided. This allows for the maximum bioretention cell filter area requirements to be met, whilst also addressing the constraints of the Site and satisfying the water quality objectives. Where multiple pipe inlets to a bioretention basin are proposed, the individual cells should be in accordance with the ratio of the upstream catchments to ensure uniform water quality treatment. The above design requirements will be implemented as part of the detailed design phase. **This item is considered satisfied.**

We trust this response adequately addresses the stormwater quality items in the Further Issues Letter, however, please don't hesitate to contact Jesse Hunter should there be any further queries.

Regards,

Jesse Hunter
Senior Engineer (RPEQ 36257)

cc. Jordan Pyne (Peet), Nick Meadows (RPS), Emma Gurney (RPS), Dan Collins (Colliers) Corey Gibb (Colliers)

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PEET LIMITED

Flagstone City CA3 South

Site-Based Stormwater Management Plan

QC4012_002-REP-004-4

18 FEBRUARY 2026

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Rev	Date	Description	Author	Reviewer	Project Mgr.	Approver
0	27/02/2024	Draft Issue	Jesse Hunter	Mark Page	Jesse Hunter	Mark Page
1	15/03/2024	Final Issue	Jesse Hunter	Mark Page	Jesse Hunter	Mark Page
2	23/08/2024	Further Issues Response	Jesse Hunter	Mark Page	Jesse Hunter	Mark Page
3	1/08/2025	Stage 10 Minor Change Application	Simon Tang	Jesse Hunter	Jesse Hunter	Mark Page
4	18/02/2026	RFI Response (DEV2024/1491/3)	Simon Tang	Jesse Hunter	Jesse Hunter	Mark Page
Signatures:						

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1. INTRODUCTION

Engeny Australia Pty Ltd (Engeny) was engaged by Peet Limited (Peet) to prepare a Site-Based Stormwater Management Plan (SBSMP) for the proposed Context Area 3 (CA3) South development at Flagstone City located in Flagstone, Queensland.

1.1 Project Purpose and Scope

This SBSMP was developed to quantify Peet's obligations for the construction of stormwater quality and quantity infrastructure to protect the downstream Environmental Values (EV's) and achieve the Water Quality Objectives (WQOs) for the Site, as outlined in the endorsed Stormwater IMP (Peet, July 2018) (ref. DEV2012/209/6/8).

The scope of the project has included the following:

- Development of a Model for Urban Stormwater Improvement Conceptualisation (MUSIC) model to estimate pollutant loads generated by the proposed development.
- Development of a stormwater quality treatment train at each catchment outlet of the proposed development sized to achieve the required load-based reduction targets (WQOs).
- Development of a local hydrologic WBNM model for the Existing and Developed Scenarios.
- Simulation of the models for the 63.2% AEP design storm event for the critical envelope of durations and the full ensemble of temporal patterns.
- Sizing of detention basins at each catchment outlet to mitigate the Developed Scenario peak flow runoff to the Existing Scenario for the 63.2% AEP only, to achieve the waterway stability requirements over the Site.
- Consideration of stormwater quantity and flooding requirements to manage peak flow increase from the development.
- Preparation of a SBSMP report.

1.2 Site Characteristics

The Flagstone City development is intersected by Flagstone Creek, Sandy Creek and Sandy Gully. The proposed overall development covers a total area of approximately 1,037 ha made up of a combination of future development, future open space and retained natural vegetation, and is estimated to yield approximately 11,000 dwellings. The Flagstone City CA3 South development is located within Context Area 3 between Flagstone Creek and Sandy Creek, and west of CA2 Stages 2-5. The proposed development currently discharges runoff into both waterways and is proposed to maintain this condition in the Developed Scenario. The location of the proposed CA3 South development and its surroundings is shown in Figure 1.1.

The proposed layout prepared by RPS is provided in Appendix A.

1.3 Project History and Context

Peet has received approval for a previous ROL (1 into 2 lots) and Context Plan for Flagstone City Context Area 3 (Ref. DEV2020/1154) dated 31 May 2022.

Recently, Peet has received Development Application approval for the CA3 South Development on 7 May 2025 (Ref. DEV2024/1491).

This report is prepared in support of a Minor Change application to the DA approval.

1.4 Project Data and Guidelines

The following data has been utilised for this assessment:

- Flagstone Context Area 3 (ref. 110056-639H) (RPS, 17 February 2026).
- Flagstone Context Area 3 design earthworks data (Colliers, 18 July 2025).
- Flagstone City Stormwater Infrastructure Master Plan Version 1.4 (ref. DEV2012/209/6/8) (Peet, July 2018).
- 2021 1-metre LiDAR sourced from Logan City Council (LCC).
- Greenbank Thompson Road station (ID 40659) rainfall data.

The stormwater planning and associated modelling was undertaken in accordance with the following guidelines:

- Queensland Urban Drainage Manual (IPWEA, 2016).
- Australian Rainfall and Runoff (ARR) 2019 (Ball, et al, 2019).
- State Planning Policy (DILGP, 2016).
- MUSIC Modelling Guidelines (Water by Design, 2018).
- Wetland Technical Design Guidelines (Water by Design, 2017).
- Bioretention Technical Design Guidelines (Water by Design, 2014).

1.5 Performance Criteria

Several objectives have been adopted for the Flagstone City development with respect to the management of flooding and stormwater quality. The endorsed Stormwater IMP (Peet, July 2018) (ref. DEV2012/209/6/8) and *Flagstone City – Masterplan Flood Management Strategy Report (ref. QC4012_002-REP-001-5) (Engeny, December 2024)* outlines the framework and performance criteria for management of stormwater quality and stormwater quantity which are summarised below:

- Stormwater Quality:
  - 80% reduction in total suspended solids.
  - 60% reduction in total phosphorus.
  - 45% reduction in total nitrogen.
  - 90% reduction in gross pollutants.
  - Mitigation of the Developed Scenario 63.2% AEP design event peak flow to not exceed the Existing Scenario peak flow.
- Stormwater Quantity:
  - No increases to peak flows downstream of the Flagstone City development.
  - No development within the 1% AEP flood extent unless peak flows are appropriately mitigated to ensure no increases across the range of design events.
  - Existing watercourses to be maintained for conveyance of stormwater runoff.

The proposed CA3 South development has also been designed with consideration of the *Flagstone City Total Water Cycle Management (Engeny, April 2025)*.

Figure 1.1: CA3 South Study Area (RPS, February 2026)

2. STORMWATER QUALITY MANAGAMENT

2.1 Construction Phase

An Erosion and Sediment Control program and plan will be prepared for the construction phase of the development. This will be completed for the Site as part of the site contractor's management of the Site and is to be kept on Site and implemented for the duration of the construction phase.

2.2 Operational Phase

The SPP (July 2017), LCC Stormwater Quality and Flow Management Guidelines (July 2013) and the Logan Planning Scheme (LCC, February 2023) provide the criteria intended to ensure development at the Site is carried out in a way that will achieve the relevant WQOs.

The load-based reduction targets required at the Site are outlined below in Table 2.1.

TABLE 2.1: ADOPTED WATER QUALITY OBJECTIVES

Pollutant	Minimum Load-Based Reduction Target (%)
Total Suspended Solids (TSS)	80
Total Phosphorus (TP)	60
Total Nitrogen (TN)	45
Gross Pollutants (GP)	90

2.2.1 Climate Data

Climate data for the catchment was sourced from the Bureau of Meteorology (BOM). Rainfall data was obtained from the Greenbank Thompson Road station (ID 40659) for the 10 years between 1980 and 1989 at six (6) minute intervals, resulting in a mean annual rainfall of 784 mm.

2.2.2 Catchment Properties

The proposed bioretention basin locations and associated contributing catchment areas for water quality treatment are outlined in Figure 2.1. A lumped catchment approach was adopted for this study and is considered appropriate based on inspection of aerial imagery and the intended use of the Site. The land use of the proposed development area was assumed to be a mix of residential and commercial use. Rainfall-runoff and pollutant-export parameters were adopted from the recommended values identified in *MUSIC Modelling Guidelines (Water by Design, 2018)*.

As part of this amended report, a detailed assessment was undertaken to identify the fraction impervious values of the updated catchments based on the latest provided context plan. Table 2.2 provides a summary of the updated catchments information and MUSIC model parameters implemented.

TABLE 2.2: MUSIC MODEL PARAMETERS

Catchment	Area (ha)	Fraction Impervious (%)
1	2.9	89.7
2_Lower	6.0	60.9
2_Upper	19.3	55.2
3	14.9	10.2
4	10.0	67.6
5	12.2	77.1
6	9.2	87.8
7	32.3	75.8
8	2.3	77.7
9	13.6	73.9
10	51.4	70.4

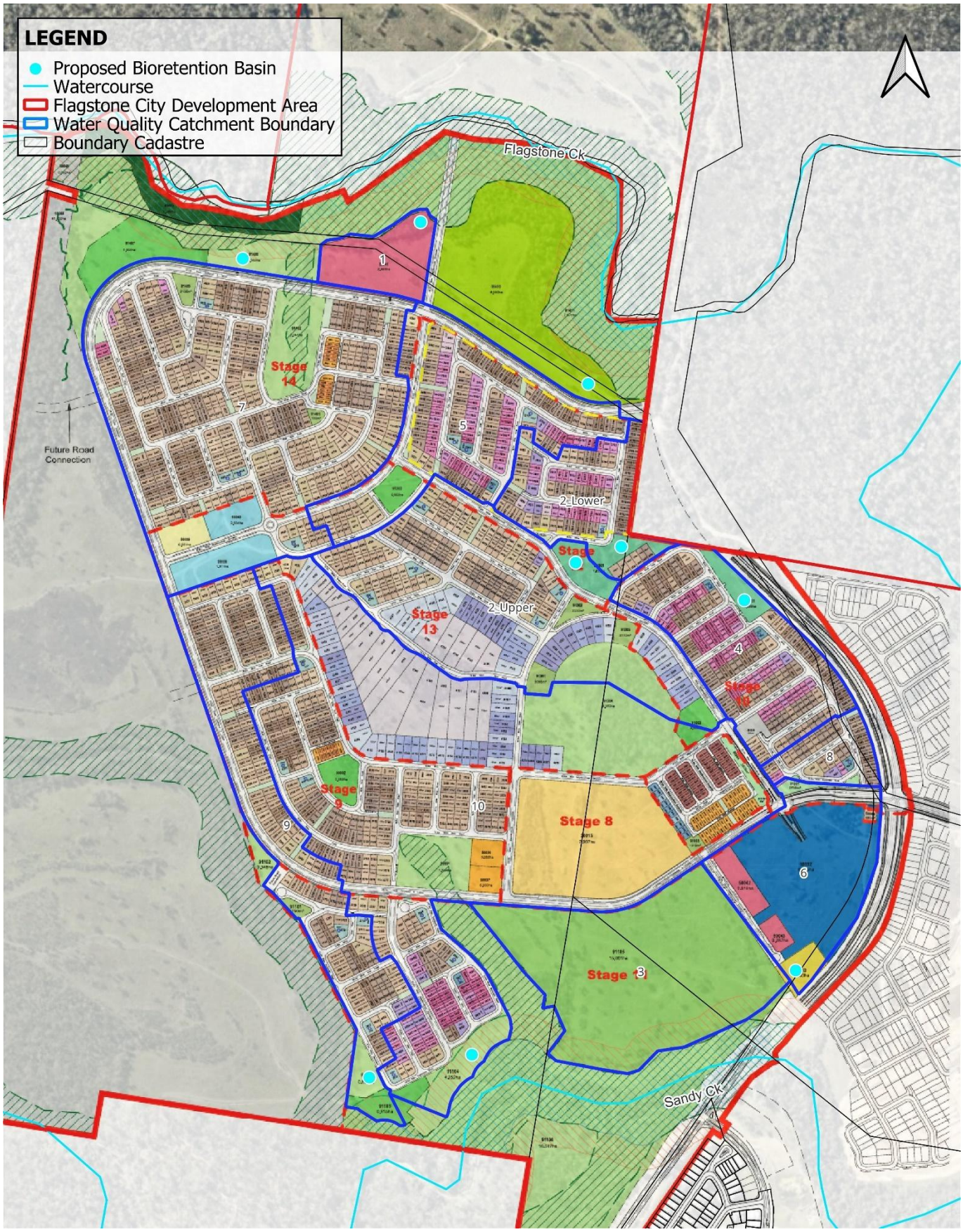

Figure 2.1: MUSIC Modelling Catchments

2.2.3 Treatment System

Stormwater runoff from each catchment will be discharged into a bioretention basin at the catchment outlet upstream of the receiving waterway. Each bioretention basin is proposed to include a coarse sediment inlet pond for contributing catchments exceeding 5 ha, and a coarse sediment forebay for contributing catchment areas between 2 ha and 5 ha. This is in accordance with the *Bioretention Technical Design Guidelines (Water by Design, 2014).*

It is noted that Catchment 1 and Catchment 6, medium-density and health precinct areas, respectively, are anticipated to be some form of community title. As such, the treatment system may be specified in the future as an equivalent proprietary device that will be managed and maintained by the landowner, and not transferred into Councils ownership. Should this proprietary device be proposed in the future, it is expected that sizing of the treatment system will be undertaken to demonstrate the load-based pollutant reduction targets are achieved as outlined in this report. It is requested that any approval conditions are worded in such a way that will allow for a proprietary device to be proposed for these catchments in the future.

2.2.4 Treatment Train and Sizing

The bioretention system has been modelled in MUSIC in accordance with the MUSIC Modelling Guidelines (Water by Design, 2018). The treatment train produced in MUSIC is outlined in Figure 2.2.

Sizing of the coarse sediment inlet ponds and coarse sediment forebays was undertaken in accordance with the equations presented in the *Wetland Technical Design Guidelines (Water by Design, 2017)* for a design removal efficiency of 80%.

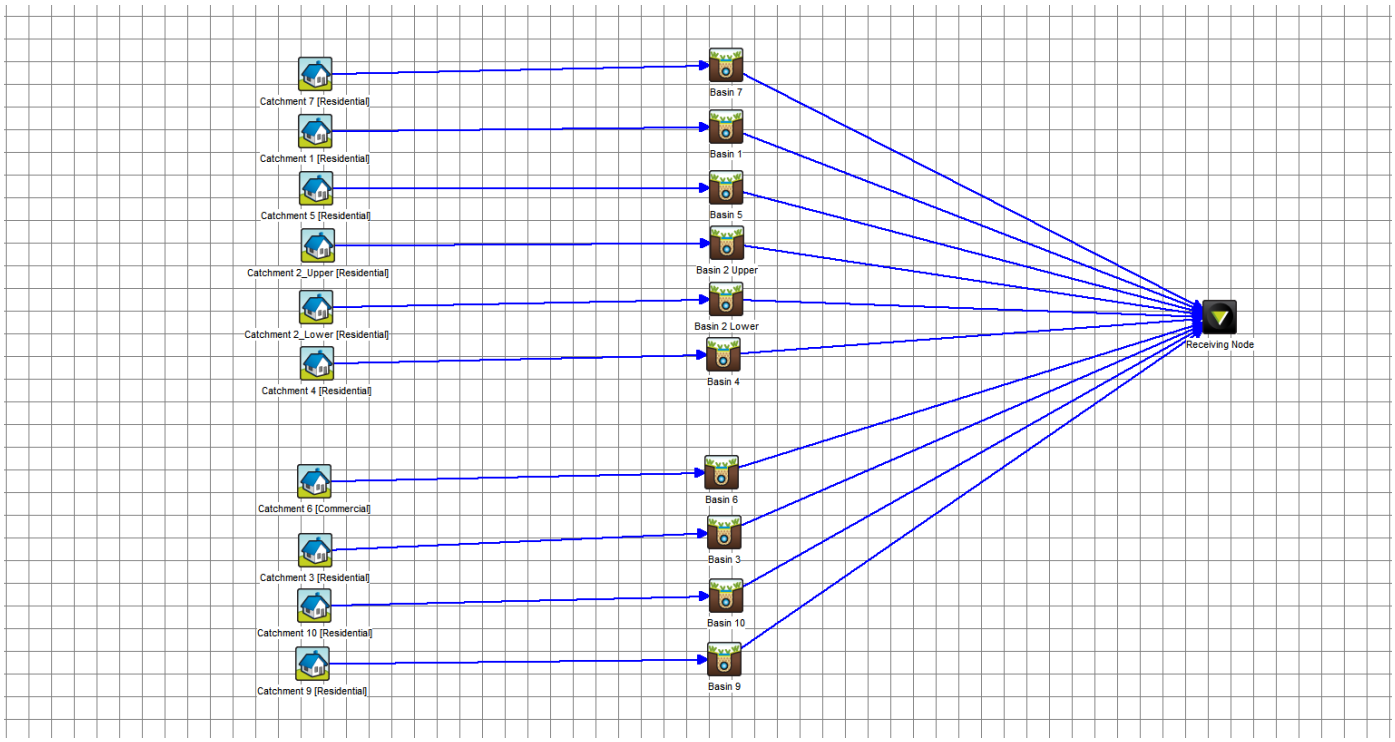

Figure 2.2: MUSIC Model Layout

The details of the proposed treatment train is included in Table 2.3. It is proposed that all basins are constructed with a saturated zone depth of 0.45 m, filter media depth of 0.5 m and extended detention depth of 0.3 m.

Several of the proposed treatment trains include filter areas exceeding the maximum 800 sqm upper limit as specified in the *Bioretention Technical Design Guidelines (WBD, October 2014).* These treatment trains will be designed with multiple discrete cells to ensure the filter area of each cell does not exceed 800 sqm, the total combined filter area of all cells will match the surface area requirements outlined in Table 2.3 below. Where multiple pipe outlets discharge to a treatment train with multiple cells, the area of the cells should be equivalent to the ratio of the upstream catchments to ensure uniform water quality treatment. These design requirements will be implemented at the detailed design phase.

The table below also includes details of the coarse sediment treatment measures proposed upstream of each bioretention basin. These have been specified based on the following criteria as outlined in the *Bioretention Technical Design Guidelines (WBD, October 2014)*:

- No treatment for catchments smaller than 2 ha.
- Sediment forebays required for catchments greater than 2 ha and less than 5 ha.
- Sediment ponds required for catchments greater than 5 ha.

It's noted that whilst Catchment 2_Lower exceeds 5 ha it is proposed that a sediment forebay is constructed in place of a sediment pond. It is requested that a relaxation of the criteria is approved due to site constraints. It's also noticed that Catchment 8 is proposed to drain east underneath the New Beith Road and connecting into the Stage 5 stormwater network. Suitable allowances were considered for development in Stage 5 to manage the post-developed case stormwater quality criteria. Therefore, no bioretention system was considered for catchment 8.

TABLE 2.3: TREATMENT TRAIN PARAMETERS

Catchment	Filter Media Surface Area (m^2)	Coarse Sediment Removal Device	Coarse Sediment Device Surface Area (m^2)	Sediment Pond Depth (m)	Minimum Sediment Storage Volume (m^3)
1	250	Forebay	N/A	N/A	N/A
2_Lower	400	Forebay	N/A	N/A	N/A
2_Upper	1120	Inlet Pond	60	1.5	9.7
3	860	Inlet Pond	15	1.5	7.2
4	680	Inlet Pond	35	1.5	4.4
5	1000	Inlet Pond	45	1.5	6.2
6	750	Inlet Pond	40	1.5	4.5
7	2200	Inlet Pond	105	1.5	16.0
9	940	Inlet Pond	40	1.5	5.7
10	3200	Inlet Pond	155	1.5	25.5

2.3 MUSIC Modelling Results

Results of the MUSIC model is presented in Table 2.4. The results of the MUSIC modelling indicate that the load-based reduction targets have been achieved with the proposed treatment train. As such, the proposed treatment measures will be adopted for the development Site.

TABLE 2.4: MUSIC MODEL RESULTS

Catchment	TSS Reduction (%)	TP Reduction (%)	TN Reduction (%)	GP Reduction (%)
1	82.1	60.5	49.1	100
2_Lower	83.2	60.8	50.1	100
2_Upper	83	60.5	50.7	100
3	84.8	60	56.5	100
4	81.5	60	50	100
5	83.5	62.5	52	100
6	80.4	64.4	52.1	100
7	82.8	61	50.2	100
9	82.1	60.1	49.5	100
10	82.8	61.8	50.8	100

3. WATERWAY STABILITY MANAGEMENT

A local WBNM hydrologic model was developed to assess the change in peak flows at each of the catchment outlets in the Existing and Developed Scenarios for the 63.2% AEP event. Detention basins were sized such that the Developed Scenario peak flows were mitigated to Existing Scenario flows, this is considered sufficient to address the performance criteria outlined in the *Flagstone City – Masterplan Flood Management Strategy Report (ref. QC4012_002-REP-001-5) (Engeny, 2024).* The following sections summarise the hydrologic model build and results.

3.1 Catchment Delineation

Catchment delineation to each discharge location into Flagstone Creek and Sandy Creek was undertaken using 2021 LiDAR sourced from Logan City Council. Catchment mapping for the Existing and Developed Scenarios is provided in Figure 3.1 and Figure 3.2, parameters are summarised in Table 3.1.

TABLE 3.1: CATCHMENT DETAILS

	Existing Scenario		Developed Scenario	
Catchment	Catchment Area (ha)	Fraction Impervious (%)	Catchment Area (ha)	Fraction Impervious (%)
1	2.9	0	2.9	89.7
2	26	0	-	-
2_Lower	-	-	6.0	60.9
2_Upper	-	-	19.3	55.2
3	35.2	0	14.9	10.2
4	9.2	0	10.0	67.6
5	11.3	0	12.2	77.1
6	10.8	0	9.2	87.8
7	29.7	0	32.3	75.8
8	5.1	0	2.3	77.7
9	13.2	0	13.6	73.9
10	31.8	0	51.4	70.4

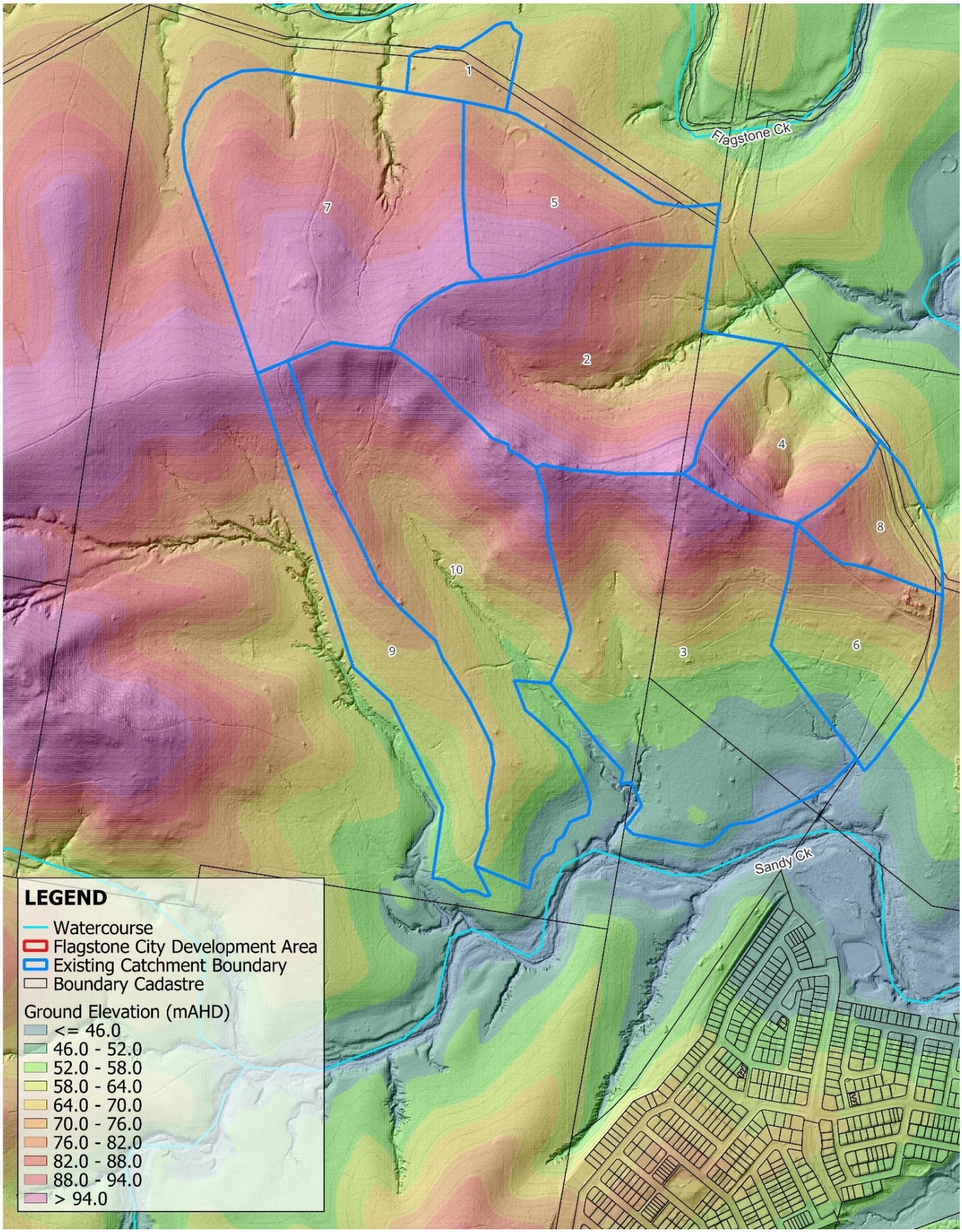

Figure 3.1: Existing Scenario Catchments

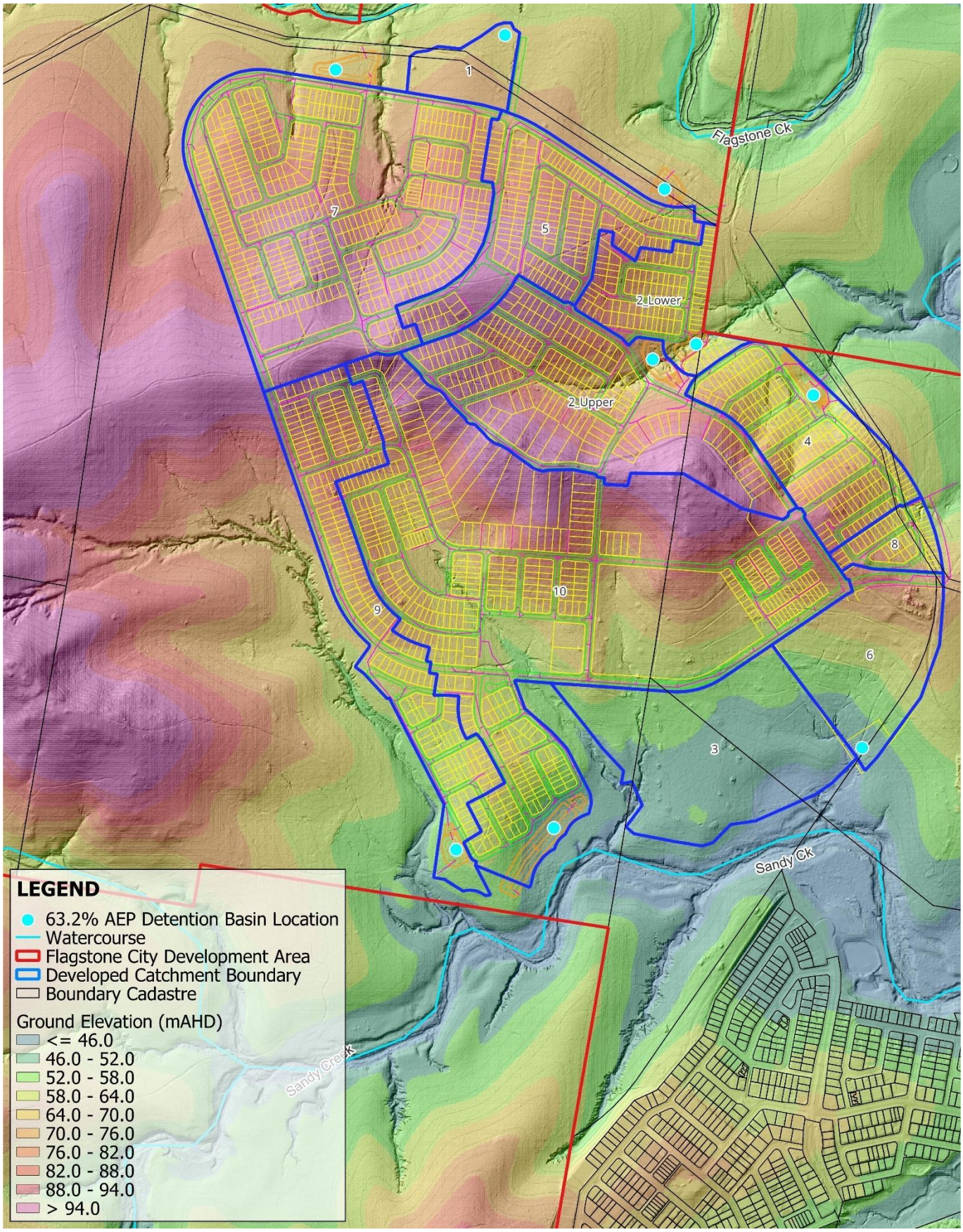

Figure 3.2: Developed Scenario Catchments

3.2 Rainfall-Runoff Parameters

The assumed rainfall-loss parameters adopted in WBNM are in accordance with the endorsed Masterplan FMS and summarised as follows:

- Application of storm initial loss of 24 mm, as per ARR 2019 specifications, for all pervious surfaces.
- Application of storm continuing loss of 1.6 mm/h, as per ARR 2019 specifications, for all pervious surfaces.
- Application of initial and continuing losses of 1 mm and 0 mm/h, respectively, for all impervious surfaces.
- Application of ARR 2019 rainfall depths sourced from the Bureau of Meteorology (BoM), as per ARR 2019 specifications.
- Application of ARR 2019 median pre-burst rainfall depths, as per ARR 2019 specifications, prior to main burst.
- Simulation of the full ensemble of ten (10) temporal patterns for the East Coast North region, as per ARR 2019 specifications.
- No application of Aerial Reduction Factors.
- WBNM default value of C = 1.6 was adopted.

3.3 Detention Basin Sizing

Detention basins are proposed to mitigate the 63.2% AEP peak flow runoff from the Developed Scenario catchments to Existing Scenario flow prior to entering the waterway downstream. The detention volume is proposed to be located above the extended detention depth of the bioretention basins and all outlet pipes are proposed at the extended detention surface level. Details of the proposed detention parameters are summarised below in Table 3.2. It is assumed that events rarer the 63.2% AEP are diverted around the basin, an emergency overflow weir for each basin will be sized at the detailed design phase.

It's noted that basins 2_Lower and 2_Upper are co-located within the same open space area, it is proposed that discharge from the upper basin (Basin 2_Upper) will be diverted around the lower basin (Basin 2_Lower) to avoid any repeat treatment of flows through the treatment train and repeat mitigation of flows. It's also noticed that Catchment 8 is proposed to drain east underneath the New Beith Road and connecting into the Stage 5 stormwater network. Suitable allowances were considered for development in Stage 5 to manage post-developed case 63.2% AEP runoff and therefore no detention basin for catchment 8 was proposed.

TABLE 3.2: DETENTION BASIN PARAMETERS

Catchment	63.2% AEP Peak Volume (m^3)	63.2% AEP Peak Depth (m)	Outlet Configuration
1	380	1.45	225 mm RCP
2_Lower	710	0.77	2x225 mm RCP
2_Upper	1700	0.86	4x300 mm RCP
4	1350	0.85	3x225 mm RCP
5	1980	1.25	375 mm RCP
6	1440	1.5	375mm RCP
7	4980	1.32	600 mm RCP
9	1820	1.08	450 mm RCP
10	8660	1.55	600 mm RCP

3.4 WBNM Results

The peak flow results at each catchment outlet location into Flagstone Creek and Sandy Creek is provided below in Table 3.3. The results demonstrate that the 63.2% AEP peak flows are sufficiently mitigated in the Developed Scenario such that they do not exceed the Existing Scenario flows. The combined discharge from Catchment 2_Upper and Catchment 2_Lower in the Developed Scenario are assessed at the property boundary (lawful point of discharge) from the Site.

TABLE 3.3: PEAK FLOW RESULTS

Catchment	Existing Scenario 63.2% AEP Peak Flow (m^3/s)	Developed Scenario (Unmitigated) 63.2% AEP Peak Flow (m^3/s)	Developed Scenario (Mitigated) 63.2% AEP Peak Flow (m^3/s)	Peak Flow Difference (m^3/s)
1	0.13	0.48	0.13	0
2	0.86	1.94	0.81	-0.05
3	1.11	0.55	N/A	N/A
4	0.34	0.76	0.28	-0.06
5	0.41	1.71	0.33	-0.08
6	0.39	1.42	0.36	-0.03
7	0.96	4	0.86	-0.1
8	0.22	0.34	N/A	N/A
9	0.47	1.53	0.44	-0.03
10	1.02	3.06	0.94	-0.08

4. STORMWATER QUANTITY MANAGEMENT

Stormwater quantity management is proposed to be achieved through a masterplan solution as outlined in the *Flagstone City Masterplan Flood Management Strategy (FMS) (Engeny, December 2024) (Ref. QC4012_002-REP-001-5)*. It is proposed that the relevant mitigation structures for CA3 South are constructed in accordance with the Masterplan FMS report to achieve the stormwater quantity and flooding objectives. This report was submitted with the Flagstone CA3 South Further Issues response.

5. PERFORMANCE CRITERIA COMPLIANCE

The performance criteria for the development relating to stormwater quality and stormwater quantity was outlined in Section 1 of this report. These performance criteria are outlined in the endorsed *Stormwater IMP (Peet, July 2018) (ref. DEV2012/209/6/8)* and are required to be achieved to facilitate development. The method for satisfying each of the relevant criteria for CA3 South is summarised below:

- Stormwater Quality:
  - The load-based reduction targets are achieved through the implementation of ten (10) bioretention basins proposed at the outlet of each developed catchment.
  - The waterway stability targets are achieved through the implementation of nine (9) 63.2% AEP detention basins located at the outlet of each developed catchment which mitigate peak flow in the Developed Scenario to Existing Scenario flows.
- Stormwater Quantity:
  - Stormwater quantity is achieved through the implementation of the *Flagstone City Masterplan Flood Management Strategy (FMS) (Engeny, December 2024) (Ref. QC4012_002-REP-001-5).* This report was submitted with the Flagstone CA3 South TMR RFI Response.

6. SUMMARY AND CONCLUSION

The proposed Flagstone City CA3 South development is required to meet a range of performance criteria associated with stormwater quality and quantity management. The performance criteria are specified in *Flagstone City Masterplan Flood Management Strategy Report (ref. QC4012_002-REP-001-5) (Engeny, December 2024)* and have been defined to protect Environmental Values (EVs) of the downstream receiving waterways and achieve the required Water Quality Objectives (WQOs). It is proposed that a total of nine (9) 63.2% AEP detention basins and ten (10) bioretention basins are constructed at the development discharge locations into Flagstone Creek and Sandy Creek. Details of the basins are provided in the sections above and it is considered that the proposed basins are suitable to achieve the performance criteria for the Flagstone City development.

7. QUALIFICATIONS

(a) In preparing this document, including all relevant calculation and modelling, Engeny Australia Pty Ltd (Engeny) has exercised the degree of skill, care and diligence normally exercised by members of the engineering profession and has acted in accordance with accepted practices of engineering principles.

(b) Engeny has used reasonable endeavours to inform itself of the parameters and requirements of the project and has taken reasonable steps to ensure that the works and document is as accurate and comprehensive as possible given the information upon which it has been based including information that may have been provided or obtained by any third party or external sources which has not been independently verified.

(c) Engeny reserves the right to review and amend any aspect of the works performed including any opinions and recommendations from the works included or referred to in the works if:

  (i) Additional sources of information not presently available (for whatever reason) are provided or become known to Engeny; or

  (ii) Engeny considers it prudent to revise any aspect of the works in light of any information which becomes known to it after the date of submission.

(d) Engeny does not give any warranty nor accept any liability in relation to the completeness or accuracy of the works, which may be inherently reliant upon the completeness and accuracy of the input data and the agreed scope of works. All limitations of liability shall apply for the benefit of the employees, agents and representatives of Engeny to the same extent that they apply for the benefit of Engeny.

(e) This document is for the use of the party to whom it is addressed and for no other persons. No responsibility is accepted to any third party for the whole or part of the contents of this Report.

(f) If any claim or demand is made by any person against Engeny on the basis of detriment sustained or alleged to have been sustained as a result of reliance upon the Report or information therein, Engeny will rely upon this provision as a defence to any such claim or demand.

(g) This Report does not provide legal advice.

APPENDIX A: CA3 SOUTH LAYOUT

Legend

- Application Boundary
- Stage Boundary
- Lease Area (Signage)
- Environmental Constraints
- Indicative Core Corridor (100m)
- Indicative Outer Corridor (200m)
- Existing Q100
- Concept Design Contours (1m)
- 1 Possible Multiple Residential Allotment (Max. no. of dwellings)
- Potential School Site for Acquisition (12ha)

TO BE READ IN CONJUNCTION WITH 110056-640E STAGES 8-14 OVERALL STATISTICS

PLAN REF: 110056 – 639
Rev No: E
DATE: 30 JULY 2025
CLIENT: PEET
DRAWN BY: JC / MM
CHECKED BY: MD

0 100 200 300 400 500 1 : 7,500 @ A3

FLAGSTONE CA3 SOUTH
STAGES 8 - 14
OVERALL PLAN OF SUBDIVISION

URBAN DESIGN
Level 8
31 Duncan Street
PO Box 1559
Fortitude Valley QLD 4006
T +61 7 3539 9500
W rpsgroup.com

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CA3 SOUTH - Stage 8 - 14 Yield Breakdown

Lot Type	Stage 8	Stage 9	Stage 10	Stage 11	Stage 12	Stage 13	Stage 14	Overall	
	Yield	Yield	Yield	Yield	Yield	Yield	Yield	Yield	%
20.5m Deep Product									
Premium Villa 12.5m Allotment	—	8	—	—	—	—	—	8	**0%**
Courtyard 14m Allotment	—	2	—	—	—	—	—	2	**0%**
Subtotal	**—**	**10**	**—**	**—**	**—**	**—**	**—**	**10**	**1%**
25m Deep Terrace Product									
Terrace 9.5m Allotment	—	32	—	—	—	—	—	32	**2%**
Subtotal	**—**	**32**	**—**	**—**	**—**	**—**	**—**	**32**	**2%**
25m Deep Product									
Villa 10.5m Allotment	—	—	25	17	11	—	—	53	**3%**
Premium Villa 12.5m Allotment	—	—	26	17	38	—	2	83	**5%**
Courtyard 14m Allotment	—	—	12	12	30	—	3	57	**3%**
Premium Courtyard 16m Allotment	—	—	4	11	5	1	—	21	**1%**
Premium Traditional 20m Allotment	—	—	—	—	4	—	—	4	**0%**
Possible Multiple Residential Allotment	—	—	3	1	2	—	—	6	**0%**
Subtotal	**—**	**—**	**70**	**58**	**90**	**1**	**5**	**224**	**13%**
28m Deep Terrace Product									
Terrace 7.5m Allotment	—	5	—	—	—	—	10	15	**1%**
Terrace 9.5m Allotment	—	26	—	—	—	—	4	30	**2%**
Subtotal	**—**	**31**	**—**	**—**	**—**	**—**	**14**	**45**	**3%**
30m Deep Product									
Villa 10.5m Allotment	—	60	39	12	29	—	52	192	**12%**
Premium Villa 12.5m Allotment	—	95	66	28	67	23	111	390	**24%**
Courtyard 14m Allotment	—	108	34	33	43	63	152	433	**26%**
Premium Courtyard 16m Allotment	—	26	3	10	8	35	43	125	**8%**
Traditional 18m Allotment	—	4	—	—	—	1	—	5	**0%**
Premium Traditional 20m Allotment	—	9	1	6	4	15	16	51	**3%**
Possible Multiple Residential Allotment	—	3	—	6	3	6	3	21	**1%**
Subtotal	**—**	**305**	**143**	**95**	**154**	**143**	**377**	**1217**	**74%**
50m+ Deep Product									
Courtyard 14m Allotment	—	—	—	—	—	25	—	25	**2%**
Premium Courtyard 16m Allotment	—	—	5	—	—	20	—	25	**2%**
Traditional 18m Allotment	—	—	3	—	—	17	—	20	**1%**
Premium Traditional 20m Allotment	—	—	2	—	—	16	—	18	**1%**
Ridgetop Allotment	—	—	—	—	—	21	—	21	**1%**
Subtotal	**—**	**—**	**10**	**—**	**—**	**99**	**—**	**109**	**7%**
Total Residential Allotments	**—**	**378**	**223**	**153**	**244**	**243**	**396**	**1637**	**100%**
Residential Net Density	**—**	**16.8 dw/ha**	**15.0 dw/ha**	**13.1 dw/ha**	**16.5 dw/ha**	**8.8 dw/ha**	**15.0 dw/ha**	**13.6 dw/ha**	
Super Lots									
Local Centre	—	—	—	—	—	2	—	2	
District Centre	—	—	—	1	—	—	—	1	
Ambulance	—	—	—	1	—	—	—	1	
Child Care	—	2	—	—	—	—	—	2	
Community Centre	—	—	—	—	—	1	—	1	
State Primary School	1	—	—	—	—	—	—	1	
Medium Density Allotment	—	—	—	2	—	—	1	3	
Balance Allotment	—	—	2	—	—	—	2	4	
Subtotal	**1**	**2**	**2**	**4**	**—**	**3**	**3**	**15**	
Utilities									
Water Booster Pump Station	—	—	1	—	—	—	—	1	
Total Area of Utilities	**—**	**—**	**1**	**—**	**—**	**—**	**—**	**1**	
Total Allotments	**1**	**380**	**226**	**157**	**244**	**246**	**399**	**1653**	
Maximum Potential Residential Dwellings (Includes Multiple Residential Allotments)	**—**	**381**	**226**	**165**	**252**	**254**	**401**	**1679**	
Maximum Potential Net Residential Density	**—**	**16.9 dw/ha**	**15.2 dw/ha**	**14.1 dw/ha**	**17.1 dw/ha**	**9.2 dw/ha**	**15.2 dw/ha**	**14.0 dw/ha**	

CA3 SOUTH - Stage 8 - 14 Land Budget

Land Use	Stage 8	Stage 9	Stage 10	Stage 11	Stage 12	Stage 13	Stage 14	Overall	
	Area	Area	Area	Area	Area	Area	Area	Area	%
	9.607 ha	27.225 ha	19.337 ha	66.007 ha	16.220 ha	36.655 ha	144.021 ha	319.072 ha	100.0%
Saleable Area									
Residential Allotments	—	14.554 ha	8.763 ha	6.286 ha	9.627 ha	20.708 ha	16.547 ha	76.485 ha	24.0%
Medium Density	—	—	—	0.905 ha	—	—	2.863 ha	3.768 ha	1.2%
Local Centre	—	—	—	—	—	1.945 ha	—	1.945 ha	0.6%
District Centre	—	—	—	6.335 ha	—	—	—	6.335 ha	2.0%
Ambulance	—	—	—	0.600 ha	—	—	—	0.600 ha	0.2%
Child Care	—	0.700 ha	—	—	—	—	—	0.700 ha	0.2%
Community Centre	—	—	—	—	—	0.551 ha	—	0.551 ha	0.2%
State Primary School	7.007 ha	—	—	—	—	—	—	7.007 ha	2.2%
Total Area of Allotments	**7.007 ha**	**15.254 ha**	**8.763 ha**	**14.126 ha**	**9.627 ha**	**23.204 ha**	**19.410 ha**	**97.391 ha**	**30.5%**
Utilities									
Water Booster Pump Station	—	—	0.068 ha	—	—	—	—	0.068 ha	0.0%
Area of Utilities	**—**	**—**	**0.068 ha**	**—**	**—**	**—**	**—**	**0.068 ha**	**0.0%**
Road									
North South Arterial Dedication (incl. batters)	—	—	3.050 ha	9.501 ha	—	—	0.126 ha	12.677 ha	4.0%
Trunk Connector 2 Lanes (23.7m)	1.578 ha	2.474 ha	1.121 ha	0.144 ha	0.028 ha	0.327 ha	4.052 ha	9.724 ha	3.0%
Neighbourhood Connector (20.2m)	1.022 ha	1.026 ha	1.094 ha	1.225 ha	1.642 ha	1.016 ha	0.688 ha	7.713 ha	2.4%
Neighbourhood Access Street (16.5m)	—	5.229 ha	3.446 ha	3.124 ha	3.246 ha	4.373 ha	6.177 ha	25.595 ha	8.0%
Laneway (6.5m)	—	0.363 ha	—	—	—	—	0.083 ha	0.446 ha	0.1%
Pedestrian Linkages	—	0.365 ha	0.042 ha	0.088 ha	0.255 ha	0.130 ha	0.638 ha	1.518 ha	0.5%
Total Area of New Road	**2.600 ha**	**9.457 ha**	**8.753 ha**	**14.082 ha**	**5.171 ha**	**5.846 ha**	**11.764 ha**	**57.673 ha**	**18.1%**
Open Space									
Conservation Buffer	—	—	—	—	—	—	1.988 ha	1.988 ha	0.6%
Corridor Park / Conservation	—	1.564 ha	—	21.807 ha	—	6.350 ha	18.067 ha	47.788 ha	15.0%
Stormwater Management	—	—	0.699 ha	—	1.422 ha	—	—	2.121 ha	0.7%
Regional Sports	—	—	—	15.001 ha	—	—	—	15.001 ha	4.7%
District Sports	—	—	—	—	—	—	8.560 ha	8.560 ha	2.7%
Neighbourhood Recreation Park	—	0.580 ha	0.539 ha	0.816 ha	—	0.502 ha	1.905 ha	4.342 ha	1.4%
Local Recreation Park	—	0.103 ha	—	0.175 ha	—	0.753 ha	0.293 ha	1.324 ha	0.4%
Local Linear Recreation Park	—	0.267 ha	0.273 ha	—	—	—	—	0.540 ha	0.2%
Total Open Space	**—**	**2.514 ha**	**1.511 ha**	**37.799 ha**	**1.422 ha**	**7.605 ha**	**30.813 ha**	**81.664 ha**	**25.6%**
Balance Allotments									
Balance Allotment	—	—	0.242 ha	—	—	—	82.034 ha	82.276 ha	25.8%
Total Balance Allotments	**—**	**—**	**0.242 ha**	**—**	**—**	**—**	**82.034 ha**	**82.276 ha**	**25.8%**

PLAN REF: **110056 – 640**
Rev No: **E**
DATE: 30 JULY 2025
CLIENT: PEET
DRAWN BY: JC / MM
CHECKED BY: MD

Not to Scale @ A3

FLAGSTONE CA3 SOUTH
STAGES 8 - 14
OVERALL PLAN OF SUBDIVISION STATISTICS

URBAN DESIGN
Level 8
31 Duncan Street
PO Box 1559
Fortitude Valley QLD 4006
T +61 7 3539 9500
W rpsgroup.com

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Appendix H – Code Response Tables

8.2 Overlay codes

8.2.1 Acid sulfate soils overlay code

8.2.1.1 Application

1. This code applies to accepted development (subject to requirements) and assessable development for which the Acid sulfate soils overlay code is identified in the 'assessment benchmarks for assessable development and requirements for accepted development' column in Table 5.10.1.1 - Acid sulfate soils overlay map OM-01.00 in Part 5.
2. When using this code, reference should be made to section 5.3.2 - Determining the category of development and category of assessment and, where applicable, section 5.3.3 - Determining the requirements for accepted development and assessment benchmarks and other matters for assessable development located in Part 5 - Tables of assessment.

8.2.1.2 Purpose

1. The purpose of code is to ensure that acid sulfate soils do not adversely affect the natural and built environment and human health and safety.
2. The purpose of the code will be achieved through the following overall outcomes:
    a. Development:
        i. avoids the disturbance of acid sulfate soils; or
        ii. protects ecosystems, the built environment and personal health and safety by managing any disturbed acid sulfate soils and associated drainage waters.

8.2.1.3 Requirements for assessment

Part A - Requirements for accepted development (subject to requirements) and assessment benchmarks for assessable development

Table 8.2.1.3.1 - Acid sulfate soils overlay code: accepted development (subject to requirements) and assessable development

Performance outcomes	Acceptable outcomes	Comments
For accepted development (subject to requirements) and assessable development		
Land in the Potential and actual acid sulfate soil area		
PO1 Development in the Potential and actual acid sulfate soil area identified on Acid sulfate soils overlay map OM-01.01 that involves disturbing soil or sediment at or below 5 metres AHD: a. avoids disturbing acid sulfate soils; or b. is managed to avoid the: i. release of acid and metal contaminants; ii. release of nutrients that contribute to coastal algal blooms. Editor's note - For development to which this overlay code applies, undertake an acid sulfate soils investigation conforming to the current version of Guidelines for Sampling and Analysis of Lowland Acid Sulfate Soils in Queensland and the current Queensland Acid Sulfate Soil Technical Manual: Laboratory Methods Guidelines. Where the presence of acid sulfate soils is confirmed, prepare an acid sulfate soils management plan in accordance with the current Queensland Acid Sulfate Soil Technical Manual: Soil Management Guidelines.	**AO1.1** Development in the Potential and actual acid sulfate soils area at or below 5 metres AHD identified on Acid sulfate soils overlay map OM-01.01 does not involve: a. excavating or otherwise removing 100m^3 or more of soil or sediment; or b. filling of land involving 500m^3 or more of material with an average depth of 0.5 of a metre or greater; or c. extracting ground water. **AO1.2** Development in the Potential and actual acid sulfate soils area above 5 metres AHD and at or below 20 metres AHD area identified on Acid sulfate soils overlay map OM-01.01 does not involve excavating or otherwise removing 100m^3 or more of soil or sediment at or below 5 metres AHD.	**PO1 / AO1.1 / AO1.2 Complies** Refer to Northrop's Civil Engineering Report and Soil Survey's Geotechnical Investigation (Ref. 1-29174 BR1.1) for relevant details. No ASS have been encountered within the subject site. An Acid Sulfate Soils Investigation Report will be provided if required by LCC and the Department of Environment and Heritage Protection.

Treatment and disposal of acid sulfate soils		
PO2 Development manages the treatment and disposal of acid sulfate soils.	**AO2** Where acid sulfate soils are identified, the acid sulfate soils are managed in accordance with an acid sulfate soils management plan prepared in accordance with the current Queensland Acid Sulfate Soil Technical Manual: Soil Management Guidelines.	**PO2 / AO2 Complies** Refer to Northrop's Civil Engineering Report and Soil Survey's Geotechnical Investigation (Ref. 1-29174 BR1.1) for relevant details. The presence of acid sulfate soils is considered unlikely; however, should they be identified, they will be managed in accordance with relevant guidelines and best practice.

Editor's note - The following documents will assist in undertaking an acid sulfate soil investigation and assessment:

- Queensland Acid Sulfate Soil Technical Manual, Soil Management Guidelines
- Queensland Acid Sulfate Soil Technical Manual, Legislation and Policy Guide
- National Acid Sulfate Soils Guidance: National acid sulfate sampling and identification methods manual
- Acid Sulfate Soils: Laboratory Methods Guidelines
- Australian Standard 4969 - Analysis of acid sulfate soil - Dried samples - Methods of test
- National Acid Sulfate Soils Guidance: National acid sulfate soils identification and laboratory methods manual
- National Acid Sulfate Soils Guidance: Guidelines for the dredging of acid sulfate soil sediments and associated dredge spoil management
- National Acid Sulfate Soils Guidance: Guidance for the dewatering of acid sulfate soils in shallow groundwater environments
- National Acid Sulfate Soils Guidance: Overview and management of monosulfidic black ooze (MBO) accumulations in waterways and wetlands

9.4.2 Filling and excavation code

9.4.2.1 Application

1. This code applies to:
    a. material change of use:
        i. that is accepted development (subject to requirements) or code assessable and for which the Filling and excavation code is identified in the 'assessment benchmarks for assessable development and requirements for accepted development' column in a table of assessment in section 5.5 - Categories of development and assessment - Material change of use in Part 5 - Tables of assessment;
        ii. that is made impact assessment in a table of assessment in section 5.5 - Categories of development and assessment - Material change of use or section 5.9 - Categories of development and assessment - local plans in Part 5 - Tables of assessment;
    b. reconfiguring a lot:
        i. that is code assessable and for which the Filling and excavation code is identified in the 'assessment benchmarks for assessable development and requirements for accepted development' column in Table 5.6.1 - Reconfiguring a lot in Part 5 - Tables of assessment;
        ii. that is impact assessable in Table 5.6.1 - Reconfiguring a lot in Part 5 - Tables of assessment;
    c. operational work that is accepted development (subject to requirements) and code assessable operational work - filling or excavation for which the Filling and excavation code is identified in the 'assessment benchmarks for assessable development and requirements for accepted development' column in Table 5.8.1 - Operational work.
2. When using this code, reference should be made to section 5.3.2 - Determining the category of development and category of assessment and, where applicable, section 5.3.3 - Determining the 'assessment benchmarks for assessable development and requirements for accepted development' located in Part 5 - Tables of assessment.

9.4.2.2 Purpose

1. The purpose of the code is to protect premises, people and natural processes from adverse impacts associated with filling or excavation.
2. The purpose of the code will be achieved through the following overall outcomes:
    a. development protects:
        i. natural physical processes and ecosystems;
        ii. existing and planned infrastructure;
        iii. personal health and safety and premises;

iv. visual amenity.

9.4.2.3 Assessment benchmarks for assessable development and requirements for accepted development

Part A - Requirements for accepted development (subject to requirements) and assessment benchmarks for assessable development

Table 9.4.2.3.1 - Filling and excavation code: accepted development (subject to requirements) and assessable development

Performance outcomes	Acceptable outcomes	Comments
For accepted development (subject to requirements) and assessable development		
Protection of natural processes and ecosystems		
PO1 The discharge of sediments and pollutants from filling or excavation does not adversely affect a waterway or the stormwater network.	**AO1** The discharge of sediments and pollutants to a waterway or stormwater network complies with part 3.3 - Filling and excavation standards in Planning scheme policy 5 - Infrastructure.	**PO1 / AO1 Complies** The proposed development will comply with all relevant policies, State Planning Policy and IECA guidelines to ensure water quality is not regraded in received waterways or the stormwater network. Refer to Northrop's Civil Engineering Report for relevant details.
PO2 Topsoil and spoil stockpiled on the premises do not adversely affect natural processes and ecosystems.	**AO2** Topsoil and spoil is stockpiled to comply with part 3.3 - Filling and excavation standards in Planning scheme policy 5 - Infrastructure.	**PO2 / AO2 Complies** Stockpile locations will be designated in areas that will minimize impact to any existing natural processes and ecosystems.
PO3 Filling is carried out using stable, solid and clean earth, free of organic and putrescible waste, rubbish and refuse material.	**AO3** Filling complies with part 3.3 - Filling and excavation standards in Planning scheme policy 5 - Infrastructure.	**PO3 / AO3 Complies** Any unsuitable material will be disposed of off-site and replaced with clean fill as required.

Protection of existing and planned infrastructure		
PO4 Filling or excavation works do not adversely affect infrastructure, including any services.	**AO4** Filling or excavation works comply with part 3.3 - Filling and excavation standards in Planning scheme policy 5 - Infrastructure.	**PO4 / AO4 Complies** The proposed development will not adversely affect existing infrastructure, as the site is currently undeveloped vegetated land with no existing services. The design has been developed to integrate with the infrastructure to be delivered under Flagstone City CA3 South (DEV2024/1491). Refer to Northrop's Civil Engineering Report for relevant details.
Protection and enhancement of personal health and safety and premises		
PO5 Filling or excavation works do not adversely affect personal health and safety.	**AO5** Filling or excavation works comply with part 3.3 - Filling and excavation standards in Planning scheme policy 5 - Infrastructure.	**PO5 / AO5 Complies** Construction of the proposed development will not adversely affect personal health and safety.
Surface water flow		
PO6 Surface water drainage does not cause any of the following: a. ponding on any premises; or b. a hazard or adversely affect personal health and safety and premises; or c. diversion or concentration of flow from or onto adjoining premises or infrastructure.	**AO6** Surface water drainage complies with part 3.3 - Filling or excavation standards in Planning scheme policy 5 - Infrastructure.	**PO6 / AO6 Complies** The proposed development will not adversely impact on surface water drainage. Refer to Northrop's Civil Engineering Report for relevant details.
Batters		

PO7 A batter: a. does not adversely affect the natural physical processes and ecosystems; b. protects existing and planned infrastructure; c. is safe, stable and easily maintained; d. is landscaped to enhance visual amenity.	**AO7** A batter is designed and constructed to comply with the standards specified in 3.3.6 - Batters and retaining walls in Planning scheme policy 5 - Infrastructure.	**PO7 / AO7 Complies** The proposed development has landscaped batters at suitable grades with appropriate landscape treatments where necessary. Refer to Northrop's Civil Engineering Report for relevant details.
Retaining walls		
PO8 A retaining wall: a. is not constructed of timber and is not located on existing or proposed lot boundaries, or movement networks; b. does not adversely affect the natural physical processes and ecosystems; c. is located to avoid conflict with adjoining premises; d. is located such that existing and planned infrastructure is not adversely affected; e. protects the visual amenity of adjoining premises or a public open space; f. is located within the premises that is being filled; g. is located within the premises that is cut and is designed to take any surcharge loading allowable on the uphill lot; h. is safe and stable; i. enables easy access for maintenance.	**AO8** A retaining wall is designed and constructed to comply with the standards specified in section 3.3.6.2 - Retaining walls in Planning scheme policy 5 - Infrastructure.	**PO8 / AO8 Complies** Any retaining walls required in the proposed development will be designed and constructed to comply with the relevant standards.
Filling of a dam		

PO9 The filling of a dam: a. does not adversely affect the natural physical processes and ecosystems; b. creates a safe and stable surface; c. is integrated into the landscape.	**AO9** The filling of a dam complies with part 3.3 - Filling and excavation standards in Planning scheme policy 5 - Infrastructure.	**N/A** The proposed development does not comprise of dams that require filling.

9.4.3 Infrastructure code

9.4.3.1 Application

1. This code applies to:
    a. material change of use:
        i. that is accepted development (subject to requirements) or code assessable and for which the Infrastructure code is identified in the 'assessment benchmarks for assessable development and requirements for accepted development' column in a table of assessment in section 5.5 - Categories of development and assessment - Material change of use in Part 5 - Tables of assessment;
        ii. that is made impact assessment in a table of assessment in section 5.5 - Categories of development and assessment - Material change of use or section 5.9 - Categories of development and assessment - Local plans in Part 5 - Tables of assessment;
    b. reconfiguring a lot:
        i. that is code assessable and for which the Infrastructure code is identified in the 'assessment benchmarks for assessable development and requirements for accepted development' column in Table 5.6.1 - Reconfiguring a lot in Part 5 - Tables of assessment;
        ii. made impact assessment in Table 5.6.1 - Reconfiguring a lot in Part 5 - Tables of assessment;
    c. operational work that is infrastructure work:
        i. that is accepted development (subject to requirements) or code assessable and for which the Infrastructure code is identified in the 'assessment benchmarks for assessable development and requirements for accepted development' column Table 5.8.1 - Operational work in Part 5 - Tables of assessment.
2. When using this code, reference should be made to section 5.3.2 - Determining the category of development and category of assessment and, where applicable, section 5.3.3 - Determining the 'assessment benchmarks for assessable development and requirements for accepted development' located in Part 5 - Tables of assessment.

9.4.3.2 Purpose

1. The purpose of the code is to ensure that infrastructure is provided to service development.
2. The purpose of the code will be achieved through the following overall outcomes:
    a. development protects the existing infrastructure and planned infrastructure networks being the:
        i. movement network;
        ii. park network;

iii. water network;
iv. sewerage network;
v. stormwater network;
vi. other networks including electricity, gas and telecommunications;
vii. land for community facilities network;

b. development other than operational work provides infrastructure that is necessary to service the development, including elements of:
i. a safe, efficient and legible road network;
ii. a safe, efficient and legible public transport network;
iii. a safe, efficient and legible cycle network;
iv. a safe, efficient and legible pedestrian network;
v. a safe, efficient and legible parks network;
vi. a safe and efficient water network;
vii. a safe and efficient sewerage network;
viii. a safe and efficient stormwater network;
ix. safe and efficient other networks including electricity, gas and telecommunications;
x. a safe and efficient road lighting network;
xi. land for a community facilities network;

c. development integrates with existing and planned infrastructure networks;
d. infrastructure is designed and constructed to deliver a standard of service that is efficient and equitable;
e. the cost to the community for the life of the infrastructure is minimised by providing for a suitable design life, ease of maintenance and ease of replacement;
f. development appropriately manages refuse and recycling storage and collection;
g. infrastructure protects personal health and safety and premises;
h. infrastructure protects environmental values.

9.4.3.3 Assessment benchmarks for assessable development and requirements for accepted development

Part A - Requirements for accepted development (subject to requirements) and assessment benchmarks for assessable development

Table 9.4.3.3.1 - Infrastructure code: accepted development (subject to requirements) and assessable development

Performance outcomes	Acceptable outcomes	Comments
For accepted development (subject to requirements) and assessable development		
Provision, design, construction and location of infrastructure		
PO1 Development is demonstrated to be capable of being serviced by necessary infrastructure.	**AO1** Reports, plans and drawings are provided in accordance with part 2 of Planning scheme policy 5 - Infrastructure.	**AO1 Complies** The development can be adequately serviced by all engineering services including stormwater drainage, sewer reticulation, water reticulation, electrical and communications services. Refer to Northrop's Civil Engineering Report for relevant details.
PO2 Development: a. provides necessary infrastructure to service the development; b. provides that the design, construction and location of necessary infrastructure: i. protects existing and planned infrastructure networks; ii. services proposed development; iii. integrates with existing and planned infrastructure networks; iv. delivers a standard of service that is efficient and equitable; v. minimises the cost to the community for the life of the infrastructure by providing a suitable design life, ease of	**AO2** Development: a. in a water supply service area connects to the water network in accordance with the SEQ Water Supply and Sewerage Design and Construction Code; b. not in a water supply service area provides a tank with a minimum storage capacity of 45,000 litres; c. in a sewerage supply service area connects to the waste water network in accordance with the SEQ Water Supply and Sewerage Design and Construction Code; d. not in a sewerage supply service area complies with part 1 of the Queensland Plumbing and Wastewater Code;	**AO2(a) / AO2(c) / AO2(e) / AO2(i) / AO2(j) / AO2(k) Complies** **AO2(b) / AO2(d) / AO2(f) / AO2(g) /AO2(h) N/A** Refer to Northrop's Civil Engineering Report for relevant details.

maintenance and ease of replacement; vi. protects personal health, safety and premises; vii. protects environmental values.	e. provides stormwater infrastructure in accordance with part 3.6 of Planning scheme policy 5 - Infrastructure; f. provides a movement network infrastructure in accordance with part 3.4 of Planning scheme policy 5 - Infrastructure; g. provides parks in accordance with part 3.12 of Planning scheme policy 5 - Infrastructure; h. provides road lighting in accordance with part 3.5 of Planning scheme policy 5 - Infrastructure; i. provides electricity reticulation in accordance with part 3.8 of Planning scheme policy 5 - Infrastructure; j. provides gas and telecommunications reticulation in accordance with part 3.9 of Planning scheme policy 5 - Infrastructure. k. is consistent with the general planning layouts in part 7.2 of Planning scheme policy 5 - Infrastructure. Editor's note - The delivery of any part of a network identified in the plans for trunk infrastructure is governed by Part 4 - Local government infrastructure plan.	
Location of development		
PO3 Development is located to protect trunk infrastructure networks.	**AO3** Development is located outside a network identified in Local government infrastructure plan map LGIP-03.00 to 08.00 Plans for trunk infrastructure in Schedule 3 - Local government infrastructure plan mapping and tables.	**PO3 / AO3 Complies** The development has been designed to align with the proposed infrastructure works delivered through Flagstone City CA3 South (PDA Development Approval DEV2024/1491). Refer

		to Northrop's Civil Engineering Report for relevant details.
Fire fighting		
PO4 Development in a water service area accessed by common private title provides: a. fire hydrant infrastructure; b. unimpeded access for emergency services vehicles. Editor's note - The term common private title refers to areas such as access roads in community title developments or strata title unit access, which are private and under group or body corporate control.	**AO4** Development in a water service area involving a material change of use or reconfiguring a lot where, or to be, accessed by common private title ensures that fire hydrant placement and technical requirements for streets and access ways are in accordance with: a. Australian Standard (AS) 2419.1 - 2005 *Fire hydrant installations*; b. QFES: *Fire Hydrant and vehicle access guidelines for residential, commercial and industrial lots*.	**PO4 / AO4 Complies** Refer to Northrop's Civil Engineering Report for relevant details. Full water network design to be prepared by a qualified hydraulic design consultant.
PO5 Development not in a water service area provides sufficient water storage with adequate pressure, volume and flow to service development for fire fighting purposes.	**AO5** Development: a. is connected to a reticulated water supply scheme that has sufficient flow and pressure characteristics for fire fighting purposes at all times with a minimum pressure and flow of 10 litres per second at 200kPa; or b. has on-site water storage in accordance with Table 9.4.3.3.2 - Water storage for fire fighting, dedicated or retained for fire fighting purposes that is made of fire resistant materials and is: i. a separate tank; or	**N/A** Development is within a proposed water service area. Refer to Northrop's Civil Engineering Report for relevant details.

	ii. a reserve section in the bottom part of the main water supply tankwater tank. Editor's note - The requirement in AO5 is: - in addition to the requirement for potable water supply/storage in AO2 in Table 9.4.3.3.1 - Infrastructure code: accepted development (subject to requirements) and assessable development; - reflected in AO5 in Table 8.2.3.3.1 - Bushfire hazard overlay code: accepted development (subject to requirements) and assessable development.	
Waste management		
PO6 Development provides refuse and recycling collection and storage facilities that are located and managed so that adverse impacts on building occupants, neighbouring properties and the public realm are minimised.	**AO6.1** Development provides refuse and recycling collection and storage facilities in accordance with Planning scheme policy 9 - Waste management. **AO6.2** Development ensures that the location and design of refuse and recycling collection and storage facilities does not have any adverse impact including odour, noise or visual impacts on the amenity of land uses within or adjoining the development. Note - Planning scheme policy 9 - Waste management provides guidance on how to achieve this outcome.	**PO6 / AO6.1 / AO6.2 Complies** Refer to Group GSA's Architectural Drawings for relevant details.
Disposal of trade waste		
PO7 The disposal of trade waste in a sewerage supply service area does not adversely affect the sewerage network.	**AO7** The disposal of trade waste in a sewerage supply service area complies with the sewer admission standards in section 3.2.6 - Sewer admission standards in Planning scheme policy 3 - Environmental management.	**N/A** The development does not propose a use requiring trade waste proposal.

Roof water drainage and surface water drainage		
PO8 Development provides stormwater infrastructure for the drainage of the premises so as not to cause any of the following: a. ponding of stormwater on the premises; b. a hazard to personal health and safety; c. damage to premises; d. an increased risk of flooding to premises within the catchment.	**AO8** Development complies with the standards for stormwater infrastructure specified in part 3.6 of Planning scheme policy 5 - Infrastructure.	**PO8 / AO8 Complies** Refer to Section 6.0 of Northrop's Civil Engineering Report for full details on the stormwater management strategy.
Natural flow of surface water		
PO9 Development provides that the natural flow of surface water is: a. not altered so as to cause a risk to personal health and safety or damage to property; b. not increased in intensity, velocity or frequency; c. not concentrated onto adjoining premises.	**AO9** Development complies with the standards for stormwater infrastructure specified in part 3.6 of Planning scheme policy 5 - Infrastructure.	**PO9 / AO9 Complies** Refer to Section 6.0 of Northrop's Civil Engineering Report for full details on the stormwater management strategy.
Water sensitive urban design		
PO10 Development which provides stormwater infrastructure incorporates water sensitive urban design principles having regard to: a. protecting existing natural features and ecological processes; b. protecting the natural hydrologic behaviour of catchments;	**AO10** Development complies with the standards for stormwater infrastructure specified in part 3.6 of Planning scheme policy 5 - Infrastructure.	**PO10 / AO10 Complies** Refer to Section 6.0 of Northrop's Civil Engineering Report for full details on the stormwater management strategy.

c. protecting the existing natural flow and water quality regimes of waterways; d. protecting water quality of surface and ground waters; e. minimising demand on the water network; f. minimising sewage discharges to the natural environment; g. integrating water into the landscape to enhance visual and ecological values.		
Movement network		
PO11 The projected traffic levels for a use do not adversely affect the planned standards of service for a road or intersection.	**AO11** Development does not cause or contribute to projected traffic levels: a. exceeding the maximum vehicle trips per day in Table 3.4.1.4.2 in Planning scheme policy 5 - Infrastructure; or b. exceeding the maximum control delays through intersections in peak periods in Table 3.4.1.4.3 in Planning scheme policy 5 - Infrastructure.	**PO11 / AO11** The development proposes uses consistent with the approved use. No extension to the public road network is proposed. Pedestrian connections to public areas are consistent with infrastructure proposed as part of Flagstone City CA3 South (PDA Development Approval DEV2024/1491).
Integrated movement concept report		
PO12 Development which generates more than 3,000 vehicle trips per average weekday is designed to integrate the movement network to minimise the transportation costs required to service the use.	**AO12** Development which generates more than 3,000 vehicle trips per average weekday provides an integrated movement concept report which integrates the planning of the movement network in accordance with part 2 and 3 of Planning scheme policy 5 - Infrastructure.	**PO12 / AO12** Refer to Bitzios Consulting's Traffic Report (Ref. P2300.001T) for relevant details regarding the reconfiguration of a lot under DEV2023/1414. In the ultimate scenario (Flagstone City CA3 South), the proposed school is located within a road network designed to accommodate the anticipated number of trips generated by the development.

For assessable development only		
Land use and transport integration		
PO13 Development within 400 metres of existing or future public passenger transport facilities where the total site area is 5,000m^2 or more: a. supports a road hierarchy which facilitates efficient, safe and accessible bus services connecting to existing and future public passenger transport facilities; b. enhances connectivity between existing and future public passenger transport facilities and other transport modes; c. optimises the walkable catchment to existing and future public passenger transport facilities; d. provides for direct and safe access to and use of existing or future public passenger transport facilities. Note - SPP code: Land use and transport integration in Appendix 4 of the state planning policy provides guidance to achieve this outcome.	**AO13** No acceptable outcome provided.	**PO13 Complies** No extension to the public road network is proposed. Pedestrian connections to public areas is consistent with infrastructure proposed as part of Flagstone City CA3 South (PDA Development Approval DEV2024/1491).

Table 9.4.3.3.2 - Water storage for fire fighting

Column 1 Lot size / use type	Column 2 Water requirement
For each residential lot:	
a. less than 1,000m^2	5,000 litres
b. between 1,000m^2 and less than 1 hectare	10,000 litres

c. greater than 1 hectare	20,000 litres
Multiple dwelling	5,000 litres per dwelling up to a maximum of 20,000 litres
A use other than Multiple dwelling	5,000 litres or the prevailing rural fire brigade standard