CONCEPTUAL STORMWATER MANAGEMENT PLAN

Proposed Residential Subdivision

17 Courtney Drive, Upper Coomera

Lot 182 on RP156422

For Courtney Upper Coomera Developments Pty Ltd

7 September 2026

Document No: OSK7105-0002-D

DOCUMENT CONTROL SHEET

Title:	Conceptual Stormwater Management Plan
Document No:	OSK7105-0002
Original Date of Issue:	2 December 2025
Project Manager:	Thomas Watt
Author:	Ben Grant
Client:	Courtney Upper Coomera Developments Pty Ltd
Client Contact:	Brad Cook - Courtney Upper Coomera Developments Pty Ltd
Client Reference:	17 Courtney Drive, Upper Coomera
Synopsis:	This *Conceptual Stormwater Management Plan* describes the existing site characteristics, and corresponding stormwater quantity and quality management controls to be implemented during the construction and operational phase of the development.

Reviewed by RPEQ	Reg. No.	Signed	Date
Thomas Watt	16222		7 September 2026

Revision/Checking History			
Revision No	**Date**	**Checked By**	**Issued By**
A	2 December 2025	Scott Newland	Ben Grant
B	23 January 2026	Scott Newland	Ben Grant
C	26 March 2026	Thomas Watt	Roshan Beddyson
D	7 September 2026	Thomas Watt	Ben Grant

Distribution		
Recipient	**No of Copies**	**Method**
Courtney Upper Coomera Developments Pty Ltd - Brad Cook	1	PDF

The information contained within this report is provided in good faith in the belief that no information, opinions or recommendations made are misleading. All comments and opinions given in this report are based on information supplied by the client, their agent and third parties.

© Copyright of MLEI Queensland Pty Ltd. No part of this document can be reproduced without the prior permission in writing of the Director of MLEI Queensland.

CONTENTS

1.0 INTRODUCTION....1
1.1 Background....1
1.2 Scope....1
2.0 SITE DESCRIPTION....2
2.1 Location....2
2.2 Site Topography....2
2.3 Vegetation and Land Use....3
2.4 Proposed Development....3
2.5 Proposed Conceptual Drainage....4
2.6 Rainfall Data....4
3.0 DATA....5
4.0 SITE HYDROLOGY....6
4.1 Background....6
4.2 Pre-Development....6
4.2.1 Catchment Definition and Lawful Point of Discharge....6
4.2.2 Coefficient of Runoff....7
4.2.3 Time of Concentration....7
4.2.4 Design Flow Rates....8
4.3 Post-Development....8
4.3.1 Catchment Definition and Lawful Point of Discharge....8
4.3.2 Coefficient of Runoff....9
4.3.3 Time of Concentration....10
4.3.4 Design Flow Rates....10
4.3.5 Change in Flow Rates....11
4.4 External Catchments....11
4.4.1 Catchment Definition and Lawful Point of Discharge....11
4.4.2 Coefficient of Runoff....12
4.4.3 Time of Concentration....12
4.4.4 Design Flow Rates....12
4.4.5 External Catchment Conveyance....13
5.0 STORMWATER QUANTITY ASSESSMENT....14
5.1 Background....14
5.2 Objective....14
5.3 XP-SWMM Model....14
5.3.1 Model Set Up....14
5.3.2 Hydrologic Roughness....14
5.3.3 Catchment Set Up and Parameters....15
5.3.4 Hydrologic Modelling Results....15
5.3.5 Detention Basin Parameters & Results....16
5.3.5.1 Detention Basin Sizing....16
5.3.5.2 Mitigation Effect of Detention Basin....17
6.0 STORMWATER QUALITY ASSESSMENT....19
6.1 Background....19
6.2 Construction Phase....19
6.2.1 Key Pollutants....19
6.2.2 Sediment and Erosion Controls....20
6.2.3 Water Quality Monitoring and Inspections....20
6.2.4 Reporting....21
6.3 Operational Phase....21
6.3.1 Stormwater Quality Objectives....21
6.3.2 Post-Development MUSIC Modelling....22

6.3.3 Stormwater Quality Improvement Devices *22*
6.3.4 Design Parameters of the Stormwater Quality Improvement System *23*
6.3.5 Post-Development Modelling Results - Mitigated *24*
7.0 OPERATIONAL PHASE MAINTENANCE REQUIREMENTS 25
7.1 Bio-retention Basin Maintenance 25
8.0 ASSET HANDOVER 27
9.0 CONCLUSIONS 28

TABLES

Table 1: Site Description 2
Table 2: Pre-Development Coefficient of Runoff 7
Table 3: Pre-Development Time of Concentration 7
Table 4: Pre-Development A Peak Flow Estimation – Rational Method 8
Table 5: Pre-Development B Peak Flow Estimation – Rational Method 8
Table 6: Post-Development Coefficient of Runoff 9
Table 7: Post-Development Time of Concentration 10
Table 8: Post-Development A Peak Flow Estimation – Rational Method 10
Table 9: Post-Development B Peak Flow Estimation – Rational Method 10
Table 10: Change in Peak Flow Rates Estimation (Catchment A) – Rational Method 11
Table 11: Change in Peak Flow Rates Estimation (Catchment B) – Rational Method 11
Table 12: External Catchment Coefficient of Runoff 12
Table 13: External Catchment Time of Concentration 12
Table 14: External Catchment Peak Flow Rates 12
Table 15: Emergency Overland Flow Channel Capacity and Parameters 13
Table 16: Initial Loss (IL) and Continuing Losses (CL) 14
Table 17: Adopted Sub-catchment Parameters 15
Table 18: Anticipated Peak Discharge Rate Catchment B – Extracted from XP-SWMM Model (m3/s) 15
Table 19: Catchment B Detention Basin Characteristics 16
Table 20: Catchment B Detention Basin – Stage/Area Relationship 16
Table 21: Comparison of Mitigated Flows at Outlet (Catchment B) 17
Table 22: Key Pollutants, Construction Phase 19
Table 23: Adopted MUSIC Catchment Areas 22
Table 24: Treatment Train Effectiveness at Receiving Node 24
Table 25: Bio-retention Basin Maintenance Schedule 26
Table 26: Asset Handover Checklist 27

FIGURES

Figure 1: Locality Plan (Source: Nearmap) *2*
Figure 2: Aerial Image of the Site (Source: Nearmap – Image taken 14 June 2025) *3*
Figure 3: Pre, Post and Mitigated Flow Rates for the 1% AEP Design Storm Event (Catchment B) *17*
Figure 4: Operational Phase Treatment Train (Source: MUSIC Model) *23*

APPENDICES

Appendix A Saunders Havill, *Detail Plan* (Ref: 12753 S 01 DT A)
Appendix B Saunders Havill, Concept Plan (Ref: 13087 P 01)
Appendix C OSKA Consulting Group, Pre-Development Catchment Plan (Ref: OSK7105/P001/1)
Appendix D OSKA Consulting Group, Post-Development Catchment Plan (Ref: OSK7105/P002/3) & External Catchment Plan (Ref: OSK7105/P003/3)
Appendix E OSKA Consulting Group, Conceptual Stormwater Management Plan (Ref: OSK7105/P004/3) & Conceptual Stormwater Management Details (Ref: OSK7105/P005/2)
Appendix F OSKA Consulting Group, Preliminary Sediment and Erosion Control Plan (Ref: OSK7105/P006/3) & Preliminary Sediment and Erosion Control Details (Ref: OSK7105/P007/1)
Appendix G OSKA Engineers, Response to Healthy Waters Code (Ref: OSK7105-0003)

1.0 INTRODUCTION

1.1 Background

OSKA Engineers has been commissioned by Courtney Upper Coomera Developments Pty Ltd to prepare a Conceptual Stormwater Management Plan (CSWMP) to support a Development Application for the proposed Residential Subdivision development situated at 17 Courtney Drive, Upper Coomera.

The subject site is described as Lot 182 on RP156422 and has a total site area of 3.340ha.

This revision of the report (D) was issued in response to Council's Information Request (Ref: ROL/2026/54) dated 2 July 2026.

1.2 Scope

This CSWMP details the conceptual planning, layout and design of the stormwater management infrastructure for both the construction and operational phases of this development.

This CSWMP aims to:

- Establish the required performance criteria for the proposed stormwater quantity and quality improvement systems;
- Provide a conceptual design of stormwater infrastructure including stormwater quality improvement devices and stormwater quantity management controls;
- Demonstrate the modelled post-development stormwater quality discharging from the site does not adversely impact on the water quality and ecological values of downstream watercourses;
- Demonstrate stormwater runoff is conveyed through the site to a Lawful Point of Discharge (LPOD) in accordance with the Queensland Urban Drainage Manual (QUDM); and
- Provide reporting and monitoring mechanisms whereby the performance of this system can be measured enabling identification of corrective actions/alterations required to ensure the above mentioned objectives are maintained.

This CSWMP has been prepared in accordance with the IEAust Australian Runoff Quality: Guide to Water Sensitive Urban Design, Queensland State Planning Policy 2017, IPWEA Queensland Urban Drainage Manual (QUDM) Fourth Edition (2017), Water By Design MUSIC Modelling Guidelines V1 – 2010, and City of Gold Coast (CoGC), SC6.12 City Plan Policy – Land Development Guidelines.

2.0 SITE DESCRIPTION

2.1 Location

The subject site is located at 17 Courtney Drive, Upper Coomera. The site fronts Courtney Drive to the north, Baileys Mountain Road to the east and has existing residential properties to the south and west. The site covers a total combined area of 3.340ha, with details as summarised in *Table 1* and as located in *Figure 1.*

Table 1: Site Description

Client	Lot and Property Description	Street Address
Courtney Upper Coomera Developments Pty Ltd	*Lot 182 on RP156422*	*17 Courtney Drive, Upper Coomera*

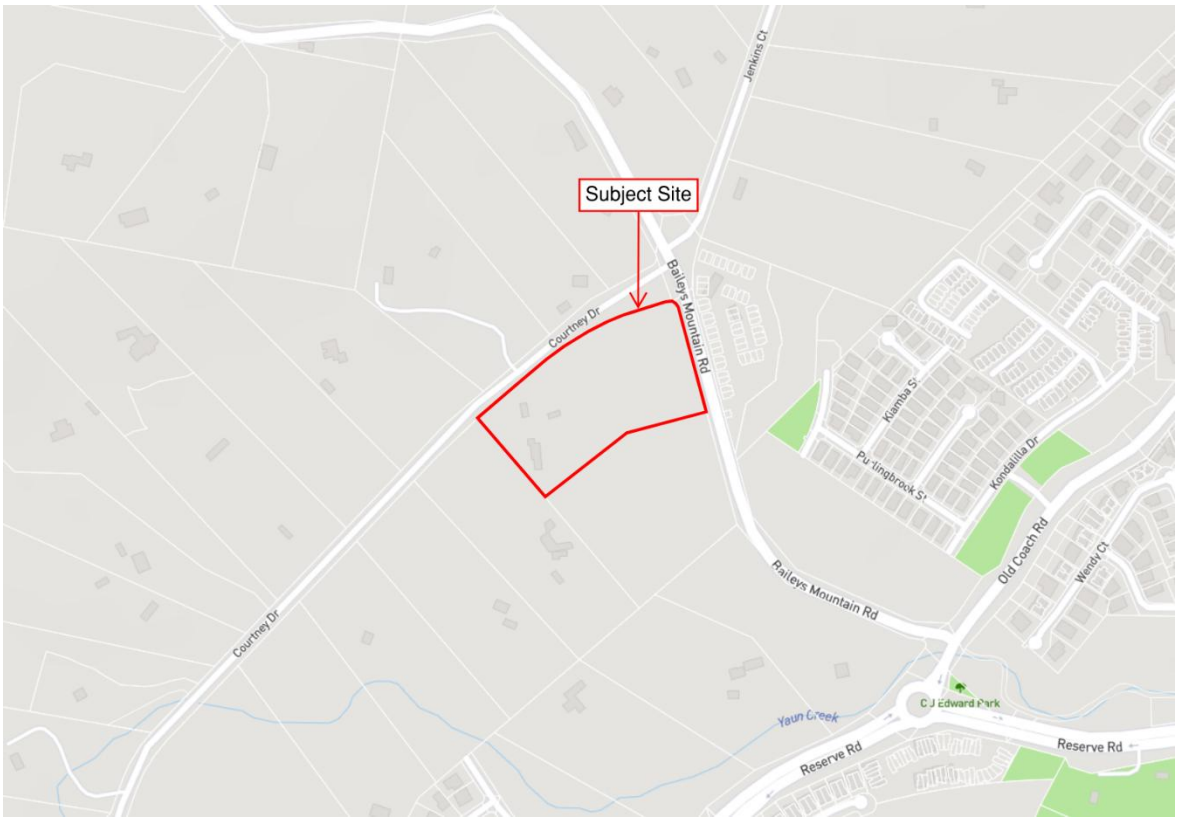


Figure 1: Locality Plan (Source: MetroMaps)

2.2 Site Topography

The majority of the site generally grades to south towards the existing dam on site with a small portion in the north-west of the site that grades towards Courtney Drive. The existing site is relatively steep with spot heights ranging from approximately RL 30.60m AHD to 51.20m AHD. Based on the provided survey and aerial information, any stormwater runoff from the site either drains to the existing dam within the site or to Courtney Drive.

For further information, the site survey has been provided by Saunders Havill, Detail Plan (Ref: 12753 S 01 DT A) included as Appendix A.

2.3 Vegetation and Land Use

The subject site currently consists of two residential dwellings with two detached sheds and a bitumen driveway that runs through to the south-west part of the site. The majority of the subject site is covered in grassed areas with multiple trees throughout the site and a dam in the south-eastern part of the site. Access to the site is gained via an existing bitumen driveway from Courtney Drive to the north.

An aerial photograph taken on the 14 June 2025 of the subject site is included in *Figure 2.*



Figure 2: Aerial Image of the Site (Source: MetroMaps – Image taken 14 June 2025)

2.4 Proposed Development

The proposed development for the site consists of a two stage 63 lot residential subdivision with lot areas ranging between 300-1,036m^2. Access to the proposed development will be gained via one of two new road connections from Courtney Drive and from the future development at 31-53 Courtney Drive (Ref: ROL/2024/116) which will provide access to all lots.

Refer to Appendix B for further proposed layout details prepared by Saunders Havill, Concept Plan (Ref: 13087 P 01).

2.5 Proposed Conceptual Drainage

It is proposed that the majority of the site's captured stormwater be conveyed to a proposed dual-use bio-retention and detention basin. The Stormwater Quality Improvement Device (SQID) will treat the majority of the site's stormwater runoff with at minimum the Q3-month flow rate being treated by the device. The proposed basin will treat stormwater quality as well as mitigate the site's post-development flow rates to those evident in the pre-development scenario (quantity).

The captured flows from the basin are to discharge directly to a proposed swale to the south-east of the site that is to be built as part of the future development at 31-53 Courtney Drive (Ref: ROL/2024/116) which will be a Lawful Point of Discharge (LPOD) for the subject site. The majority of flows from the north-western part of the site that are not conveyed to the proposed basin will be conveyed to the kerb and channel of Courtney Drive with a small portion of flows to the proposed road reserve which will connect into the future development at 31-53 Courtney Drive (Ref: ROL/2024/116).

2.6 Rainfall Data

Rainfall intensity data has been obtained from the Australian Bureau of Meteorology's 2016 Design IFD Rainfall System. The data has been extracted for the nearest grid cell at Latitude 27.8625 (S) and Longitude 153.2875 (E). The IFD data and average rainfall intensities used in this report are in accordance with the procedures outlined in Geosciences Australia, Australian Rainfall and Runoff 2019.

3.0 DATA

Data which has been sourced or provided, in order to prepare this report for the site, was gathered from the following sources:

- Detailed site survey provided by Saunders Havill, Detail Plan (Ref: 12753 S 01 DT A) included as Appendix A;
- Proposed site layout provided by Saunders Havill, Concept Plan (Ref: 13087 P 01) included as Appendix B;
- LIDAR data for the subject site sourced from Australian Government Elevation and Depth Foundation Spatial Data (ELVIS), Date Source: 2014, DEM Data;
- Rainfall and Meteorological 2016 IFD Data by the Australian Bureau of Meteorology;
- Information Extracted from CoGC City Plan Interactive Mapping – Version 13;
- Aerial Imagery by MetroMaps (Accessed on 24 November 2025); and
- MUSIC data sourced from Rainfall Station 40584, Hinze Dam.

4.0 SITE HYDROLOGY

4.1 Background

The following sections define the method and parameters utilised within the hydrologics of the site, in order to establish a simulation of the anticipated flow regime and peak discharge at the Lawful Point of Discharge (LPOD). A Rational Method calculation has been provided for comparison of the pre and post-development peak flow rates.

The Rational Method (Section 4.3 of the Queensland Urban Drainage Manual - QUDM 2017) is a suitable estimation technique, given its flexibility in its data requirements and is able to produce satisfactory estimates of peak site discharges based on the following data input:

Specific intensity frequency duration (IFD) data;

- length/type of flow path;
- contributing catchment areas; and
- coefficient of discharge.

4.2 Pre-Development

4.2.1 Catchment Definition and Lawful Point of Discharge

The pre-development site has been analysed as two internal catchments (A and B) with a total contributing area of 3.340ha with the parameters of each catchment summarised below;

Pre A

- Total Catchment Area 0.535ha
- 0.046ha of impervious surfaces (8.50%)
- Runoff is conveyed as sheet/overland flow towards Courtney Drive (LPOD A).

Pre B

- Total Catchment Area 2.805ha
- 0.094ha of impervious surface (3.35%)
- Runoff is conveyed as sheet/overland flow towards the existing dam on site before being conveyed across the southern site boundary to private property at 176 Baileys Mountain Road (Lot 183 on RP156422) (EPOD B).

The catchment area and LPOD for the subject site are shown on OSKA Consulting Group, Pre-Development Catchment Plan (Ref: OSK7105/P001/1) included as Appendix C.

4.2.2 Coefficient of Runoff

The pre-development coefficients of runoff (C year) were determined using the fraction impervious method as specified in QUDM and based on Table 4.5.4 in QUDM. Using a one hour, ten-year rainfall intensity ($^1I_{10}$) of 64.9 mm/hr and Table 4.5.4 in QUDM with good grass cover and medium permeability, the adopted C_{10} values for all the individual pre-development catchments have been shown in bold in Table 2.

The following pre-development coefficients of runoff (as shown in Table 2) have been adopted in accordance with QUDM Table 4.5.2, which apply the frequency factors for the standard Annual Exceedance Probability (AEP) design storms of 39%, 18%, 10%, 5%, 2% and 1% (corresponding to the 2, 5, 10, 20, 50 and 100-year ARI storms).

Table 2: Pre-Development Coefficient of Runoff

Catchment	C_2	C_5	C_{10}	C_{20}	C_{50}	C_{100}
Pre A	0.60	0.67	**0.70**	0.74	0.81	0.85
Pre B	0.60	0.67	**0.70**	0.74	0.81	0.85

4.2.3 Time of Concentration

The Time of Concentration (TOC) for the pre-development catchments have been calculated in accordance with QUDM Section 4.6.6 – Overland Flow and 4.6.11 - Time of concentration for rural and creek catchments. Friend's Equation ($t = (107*n*L^{0.333})/S^{0.2}$) has been used to calculate the initial travel time using sheet flow and Bransby-Williams' ($t = (58 * L)/(A^{0.1} * S_e^{0.2})$) equation has been used to calculate the travel time using channel flow.

Refer to *Table 3* for the calculated time of concentration for the pre-developed catchments.

Table 3: Pre-Development Time of Concentration

Catchment	Catchment Area (ha)	Time of Concentration		
		Overland flow Friend's Equation	Concentrated Overland Flow Bransby-Williams	Total t_c
Pre-Development Catchment A	0.535	Horton's (n) = 0.035 L = 50m Slope = 15.25% t = 7.99 mins	Length (km) = 0.018 Area (ha) = 0.535 Slope = 15.25% t = 0.64 mins	9 mins
Pre-Development Catchment B	2.805	Horton's (n) = 0.035 L = 50m Slope = 17.22% t = 7.80 mins	Length (km) = 0.077 Area (ha) = 2.805 Slope = 17.22% t = 2.28 mins	10 mins

4.2.4 Design Flow Rates

Pre-development peak flow rates have been estimated for the adopted storms using design rainfall intensities from the Bureau of Meteorology IFD Data. The Rational Method ($Q = 2.78 \times 10^{-3}$ CIA) has been used to estimate the subject site's design peak flow rates. The pre-development peak flows for the subject site are presented in *Tables 4 and 5.*

Table 4: Pre-Development A Peak Flow Estimation – Rational Method

PRE A							
Annual Exceedance Probability	**AEP**	39%	18%	10%	5%	2%	1%
Coefficient of Runoff	**C**	0.60	0.67	0.70	0.74	0.81	0.85
Area of Catchment (ha)	**A**	0.535	0.535	0.535	0.535	0.535	0.535
Average Rainfall Intensity (mm/h)	**I**	119	148	171	195	227	250
Peak Flow Rate (m^3/s)	**Q**	**0.106**	**0.148**	**0.179**	**0.215**	**0.273**	**0.315**

Table 5: Pre-Development B Peak Flow Estimation – Rational Method

PRE B							
Annual Exceedance Probability	**AEP**	39%	18%	10%	5%	2%	1%
Coefficient of Runoff	**C**	0.60	0.67	0.70	0.74	0.81	0.85
Area of Catchment (ha)	**A**	2.805	2.805	2.805	2.805	2.805	2.805
Average Rainfall Intensity (mm/h)	**I**	115	143	164	188	218	240
Peak Flow Rate (m^3/s)	**Q**	**0.536**	**0.745**	**0.899**	**1.082**	**1.374**	**1.581**

4.3 Post-Development

4.3.1 Catchment Definition and Lawful Point of Discharge

The post-development scenario has been analysed as three internal catchments (A, B and C) with a total contributing area of 3.340ha with the parameters of each catchment summarised below;

Post A

- Total Catchment Area 0.251ha
- 0.180ha of impervious surfaces (71.94%)
- Runoff is conveyed to the kerb and channel of Courtney Drive (LPOD A).

Post B

- Total Catchment Area 3.028ha
- 2.129ha of impervious surface (70.30%)
- Runoff is conveyed to a proposed swale to the south-east of the site that is to be built as part of the future development at 31-53 Courtney Drive (Ref: ROL/2024/116) (LPOD B).

Post C

- Total Catchment Area 0.061ha
- 0.049ha of impervious surface (79.76%)
- Runoff is conveyed to the kerb and channel of the proposed road reserve which will connect into the future development at 31-53 Courtney Drive (Ref: ROL/2024/116) (LPOD C).

It is to be noted that as Post C will discharge flows to the proposed road reserve which will connect into the future development at 31-53 Courtney Drive (Ref: ROL/2024/116) and as such will not be compared to the pre-development and no flow rate assessment will be undertaken.

The post-development catchment area and LPOD's are detailed on OSKA Consulting Group, Post-Development Catchment Plan (Ref: OSK7105/P002/3) & External Catchment Plan (Ref: OSK7105/P003/3) included as Appendix D.

4.3.2 Coefficient of Runoff

The post-development coefficients of runoff (C year) were determined using the fraction impervious method as specified in QUDM. Based on the supplied layout plans, the post-development catchments have an approximate total of 2.358ha of impervious surfaces which equates to a fraction impervious (fi) of 0.71.

This report will adopt a fraction impervious value on 0.70 for all developable areas of the development which corresponds to the roof areas having a fraction impervious of 1.00, the ground areas (excluding basin areas/lots) having a fraction impervious of 0.30 and the road reserve areas having a fraction impervious of 0.75. This fraction impervious value has been adopted based on the recommended C_{10} value for areas zoned as Emerging Community in *Table 4.4: Runoff Coefficient vs development category* of the City of Gold Coast. The recommended C_{10} value of 0.80-0.85 correlates to a fraction impervious value of approximately 0.70 and as such will be adopted throughout this report for all developable areas.

Using a one-hour, ten-year rainfall intensity ($^1I_{10}$) of 64.9 mm/hr, the adopted C_{10} values for the individual post-development catchments have been shown in bold in Table 6.

The following post-development Coefficients of Runoff (as shown in *Table 6*) have been adopted in accordance with QUDM Table 4.5.2, which apply the frequency factors for the standard Annual Exceedance Probability (AEP) design storms of 39%, 18%, 10%, 5%, 2% and 1% (corresponding to the 2, 5, 10, 20, 50 and 100-year ARI storms).

Table 6: Post-Development Coefficient of Runoff

Catchment	C_2	C_5	C_{10}	C_{20}	C_{50}	C_{100}
Post A	0.71	0.79	0.83	0.87	0.95	1.00
Post B	0.70	0.78	0.83	0.87	0.95	0.99

4.3.3 Time of Concentration

The Time of Concentration for the post-developed catchments have been calculated in accordance with QUDM Table 4.6.3 – Recommended roof drainage system travel times and Figure 4.5 – Flow travel time in pipes and channels.
In accordance with Table 4.6.3 and Figure 4.5 of QUDM, the post-development time of concentration for each individual catchment has been shown in Table 7.

Table 7: Post-Development Time of Concentration

Catchment	Catchment Area (ha)	Time of Concentration		
		Roof to Downpipes (Table 4.6.3)	Pipe Flow (Figure 4.5)	Total t_c
Post-Development Catchment A	0.251	t = 5 mins	Length (m) = 40 Slope = 5% t = 1 mins	6 mins
Post-Development Catchment B	3.028	t = 5 mins	Length (m) = 140 Slope = 2% t = 2 mins	7 mins

4.3.4 Design Flow Rates

Post-development peak flow rates have been calculated for the adopted storms using design rainfall intensities from the Bureau of Meteorology 2016 IFD Data. The Rational Method ($Q = 2.78 \times 10^{-3}$ CIA) has been used to estimate the required design peak flow rates for the subject site. The post-development peak flows for the subject site are presented in *Tables 8 and 9.*

Table 8: Post-Development A Peak Flow Estimation – Rational Method

Post-Development A							
Annual Exceedance Probability	**AEP**	39%	18%	10%	5%	2%	1%
Coefficient of Runoff	**C**	0.71	0.79	0.83	0.87	0.95	1.00
Area of Catchment (ha)	**A**	0.251	0.251	0.251	0.251	0.251	0.251
Average Rainfall Intensity (mm/h)	**I**	134	168	194	223	261	291
Peak Flow Rate (m^3/s)	**Q**	**0.066**	**0.092**	**0.112**	**0.135**	**0.174**	**0.201**

Table 9: Post-Development B Peak Flow Estimation – Rational Method

Post-Development B							
Annual Exceedance Probability	**AEP**	39%	18%	10%	5%	2%	1%
Coefficient of Runoff	**C**	0.70	0.78	0.83	0.87	0.95	0.99
Area of Catchment (ha)	**A**	3.028	3.028	3.028	3.028	3.028	3.028
Average Rainfall Intensity (mm/h)	**I**	129	161	186	213	248	275
Peak Flow Rate (m^3/s)	**Q**	**0.762**	**1.062**	**1.291**	**1.553**	**1.985**	**2.296**

4.3.5 Change in Flow Rates

The difference in peak flow rates calculated from the pre and post-developed catchments as estimated via The Rational Method, is detailed in *Tables 10 and 11.*

Table 10: Change in Peak Flow Rates Estimation (Catchment A) – Rational Method

LPOD A							
Annual Exceedance Probability	**AEP**	39%	18%	10%	5%	2%	1%
Pre-Developed Peak Flow Rate (m^3/s)	**Q**	0.106	0.148	0.179	0.215	0.273	0.315
Post-Developed Peak Flow Rate (m^3/s)	**Q**	0.066	0.092	0.112	0.135	0.174	0.201
Change in Peak Flow Rate (m^3/s)	**Q**	**-0.040**	**-0.056**	**-0.067**	**-0.080**	**-0.099**	**-0.114**

The Rational Method assessment has demonstrated that there is a decrease in peak flow rates discharging to Courtney Drive (LPOD A). Therefore, on-site detention will not be required for Catchment A of the proposed development.

Table 11: Change in Peak Flow Rates Estimation (Catchment B) – Rational Method

LPOD B							
Annual Exceedance Probability	**AEP**	39%	18%	10%	5%	2%	1%
Pre-Developed Peak Flow Rate (m^3/s)	**Q**	0.536	0.745	0.899	1.082	1.374	1.581
Post-Developed Peak Flow Rate (m^3/s)	**Q**	0.762	1.062	1.291	1.553	1.985	2.296
Change in Peak Flow Rate (m^3/s)	**Q**	**+0.226**	**+0.317**	**+0.392**	**+0.471**	**+0.611**	**+0.715**

The Rational Method assessment has demonstrated that there is a potential increase in peak flow rates discharging to the proposed swale to the south-east of the site that is to be built as part of the future development at 31-53 Courtney Drive (Ref: ROL/2024/116). Therefore, on-site detention measures may be required to mitigate flows to pre-development conditions with a further hydraulic assessment undertaken using XP-SWMM in Section 5 to confirm the detention requirements.

4.4 External Catchments

The subject site and the surrounding area were examined to determine if any localised external catchments will contribute to the subject site. The site was deemed to contain an influencing external catchment to the north of the subject site. The development will propose to capture the flows up to the 1% AEP event from External Catchment A via an inlet pit and convey the flows through the development via a pipe network. All captured flows from the external catchment are to discharge to the proposed swale to the south-east of the site that is to be built as part of the future development at 31-53 Courtney Drive (Ref: ROL/2024/116). An emergency overland flow channel has been proposed in between Lots 41 and 42 in the event the inlet pit proposed to capture the 1% AEP flows from the external catchment is blocked.

Further information on the external catchment including area, flows, proposed pipe network and emergency overland flow channel will be undertaken in the sections below.

4.4.1 Catchment Definition and Lawful Point of Discharge

The external catchment has a total contributing area of 1.386ha and a breakdown of the external catchment has been shown below:

Ext A

- Total Catchment Area 1.318ha
- 0.264ha of impervious surface (20.00%) – conservative estimate
- Runoff is conveyed as sheet/overland flow to the south-east towards the sag along Courtney Drive and then conveyed across the site's northern boundary.

The external catchments area and LPOD is detailed on OSKA Consulting Group, External Catchment Plan (Ref: OSK7105/P003/3) included as Appendix D.

4.4.2 Coefficient of Runoff

The coefficient of runoff (C year) was determined based on the fraction impervious (f_i) method as specified in QUDM and using the provided survey and latest aerial imagery of the site and surrounding area. Using a one-hour, ten-year rainfall intensity ($^1I_{10}$) of 64.9 mm/hr, the C_{10} value for external catchment is 0.71 and has been shown in bold in Table 12.

The following external catchments Coefficients of Runoff (as shown in *Table 12*) have been adopted in accordance with QUDM Table 4.5.2, which apply the frequency factors for the standard Annual Exceedance Probability (AEP) design storms of 39%, 10%, 5% and 1% (corresponding to the 2, 10, 20 and 100-year ARI storms).

Table 12: External Catchment Coefficient of Runoff

Catchment	C_2	C_{10}	C_{20}	C_{100}
EXT	0.60	**0.71**	0.75	0.85

4.4.3 Time of Concentration

The Time of Concentration for the external catchment has been calculated in accordance with QUDM Section 4.6.6 – Overland Flow and 4.6.11 - Time of concentration for rural and creek catchments. Friend's Equation ($t = (107*n*L^{0.333})/S^{0.2}$) has been used to calculate the initial travel time using sheet flow and Bransby-Williams' ($t = (58 * L)/(A^{0.1} * S_e^{0.2})$) equation has been used to calculate the travel time using channel flow.

Refer to *Table 13* for the calculated time of concentration for the external catchment.

Table 13: External Catchment Time of Concentration

Sub-Catchment	Catchment Area (ha)	Time of Concentration		
		Overland flow Friend's Equation	Concentrated Overland Flow Bransby-Williams	Total t_c
External Catchment	1.318	Horton's (n) = 0.040 L = 50m Slope = 15.00% t = 9.16 mins	Length (km) = 0.110 Area (ha) = 1.386 Slope = 15.00% t = 3.59 mins	13 mins

4.4.4 Design Flow Rates

Design storm flow rates have been calculated for standard storms for the external catchment using design rainfall intensities from the Bureau of Meteorology. The Rational Method ($Q = 2.78 \times 10^{-3}$ CIA) has been used to calculate the design flow rates. The peak flow rates for the external catchment are presented in Table 14.

Table 14: External Catchment Peak Flow Rates

External Catchment					
Annual Exceedance Probability	**AEP**	39%	10%	5%	1%
Coefficient of Runoff	**C**	0.60	0.71	0.75	0.85
Area of Catchment (ha)	**A**	1.318	1.318	1.318	1.318
Average Rainfall Intensity (mm/h)	**I**	104	148	169	215
Peak Flow Rate (m^3/s)	**Q**	**0.229**	**0.384**	**0.460**	**0.670**

4.4.5 External Catchment Conveyance

It is proposed to capture the external catchment flows (up to the 1% AEP event) via an inlet pit and convey the flows (up to the 1% AEP event) through the subject site via a pipe network. All captured flows from the external catchment are to discharge to the proposed swale to the south-east of the site that is to be built as part of the future development at 31-53 Courtney Drive (Ref: ROL/2024/116).

A Manning's equation calculation (9.1) ($Q = \frac{A}{n} \times R^{\frac{2}{3}} \times S^{\frac{1}{2}}$) from QUDM, was undertaken to demonstrate that the external catchment flows can be sufficiently conveyed within the proposed pipe network through the subject site. To convey the 1% AEP flow rate of 0.670m^3/s from the external catchment, a Ø600mm pipe at a minimum 1.15% grade resulting in a maximum capacity (based on a Manning's calculation) of 0.707m^3/s is required to ensure the external flows can be conveyed through the subject site (size to be confirmed in detailed design).

An emergency overland flow channel has been proposed in between Lots 41 and 42 in the event the inlet pit proposed to capture the 1% AEP flows from the external catchment is blocked. To demonstrate that the proposed emergency overland flow channel is capable of conveying the external catchment 1% AEP flow rates, the proposed channel has been sized utilising the Manning's equation (9.1), $Q = \frac{A}{n} \times R^{\frac{2}{3}} \times S^{\frac{1}{2}}$, from QUDM to ensure that it is sized to an adequate capacity to accommodate and safely convey the external flows.

Refer to Table 15 for the calculated concrete box channel capacity.

Table 15: Emergency Overland Flow Channel Capacity and Parameters

Channel Parameters	External Catchment
Channel Depth, d (m)	0.415
Freeboard (m)	0.300
Base Width, W (m)	1.35
Top Width (m)	4.70
Bank Slope (Ratio of V:H)	1 in 4
Manning's Roughness, n	0.013
Longitudinal Grade, S	4.50% (0.045m/m)
Velocity (m/s)	3.288
Depth*Velocity (DV) Product (m^2/s)	0.378
Q - Flow Rate Capacity (m^3/s)	**0.684**
Design Flow Rate – Required (m^3/s)	0.670

For further information on the external catchment stormwater network, refer to the OSKA Consulting Group, Conceptual Stormwater Management Plan (Ref: OSK7105/P004/3) & Conceptual Stormwater Management Details (Ref: OSK7105/P005/2) in *Appendix E.*

5.0 STORMWATER QUANTITY ASSESSMENT

5.1 Background

The following sections define the method and parameters utilised within the hydrologic assessment of the site, to establish a simulation of the anticipated flow regime and peak discharge at the Lawful Point of Discharge (LPOD).

The analysis of hydrology across the subject site was performed using the non-linear runoff routing program XP-SWMM.

5.2 Objective

The following objective has been set for post-development stormwater discharge from the site:

- No net increase in peak flows from the subject site (up to the 1% AEP event), for all design storm events, during the post-developed scenario.

This objective shall be demonstrated via a suitable hydrologic and hydraulic modelling package, by detaining site runoff from the subject site within proposed detention basins.

5.3 XP-SWMM Model

To assess the pre and post-development hydrographs, the industry standard modelling software XP-SWMM has been selected for the analysis. Details of the model set-up and results are summarised in the following sections for the sites LPOD's.

5.3.1 Model Set Up

Rainfall data for the subject site has been obtained from the Australian Bureau of Meteorology's 2016 Design IFD Rainfall System. The data has been extracted for the nearest grid cell at Latitude 27.8625 (S) and Longitude 153.2875 (E). The IFD data and average rainfall intensities used in this report are in accordance with the procedures outlined in IEAust, Australian Rainfall and Runoff (AR&R) 2019. Storm suites for a range of durations from 10 minutes to 180 minutes were simulated in the XP-SWMM model analysis to determine design flow estimations for all events up to and including the 1% AEP.

Initial Loss (IL) and Continuing Losses (CL) were applied to the XP-SWMM model in accordance with Australian Rainfall and Runoff (AR&R) 2019. These values are also varied for the impervious and pervious portions of the catchment. The following loss rates were adopted:

Table 16: Initial Loss (IL) and Continuing Losses (CL)

Storm Losses (XP-SWMM)		
Sub catchment Type	**Initial Loss (mm/hr)**	**Continuing Loss (mm/hr)**
Impervious	0	0
Pervious	25	2.3

Note: The loss rates were maintained for all design storm events up to the 1% AEP event.

5.3.2 Hydrologic Roughness

Hydrologic roughness in the form of Manning's n values were applied to represent the undeveloped and developed portions of the catchment. The following values were adopted:

- Impervious Catchment n = 0.015; and
- Pervious Catchment n = 0.040.

5.3.3 Catchment Set Up and Parameters

The XP-SWMM model has been set up to match the proposed earthworks (lot and road grading) and stormwater drainage for the development and to also accounting for the bypass areas.

The majority of the flows up to the 1% AEP event from Catchment B will be conveyed to the proposed basin. The minor flows (up to 39% AEP) from Lots 54-63 fronting the proposed road reserve that is to be built as part of the future development at 31-53 Courtney Drive (Ref: ROL/2024/116) will be conveyed to the basin with the major flows (above 39% AEP) bypassing the basin. All runoff from the ground areas of Lot 51 will bypass the basin with only the roof flows to be conveyed into the basin.

The adopted sub-catchment areas for the site, slopes and fraction imperviousness, for the pre and post-development scenarios have been tabulated in *Table 17*.

Table 17: Adopted Sub-catchment Parameters

Pre-Development Sub-Catchments			
XP-SWMM Sub-Catchment ID	**Total Area (ha)**	**Slope (%)**	**Fi (%)**
Pre B	**2.805**	**17.22%**	**3.35**
Post-Development Sub-Catchments			
XP-SWMM Sub-Catchment ID	**Total Area (ha)**	**Slope (%)**	**Fi (%)**
Post B	**3.028**	**15.00%**	**70.30**
Post Major to Basin	2.651	15.00%	69.43
Post Minor to Basin	0.354	15.00%	79.39
Post Bypass	0.023	15.00%	30.00

Note: Slopes have been adopted based on detailed survey and aerial imagery for the pre-developed scenario and detailed survey and proposed bulk earthworks levels for the post-development scenario.

5.3.4 Hydrologic Modelling Results

A comparison of the peak median discharges from the pre and post-developed catchment B are detailed in Table 18.

Table 18: Anticipated Peak Discharge Rate Catchment B – Extracted from XP-SWMM Model (m^3/s)

Scenario	39% AEP	18% AEP	10% AEP	5% AEP	2% AEP	1% AEP
Pre-Development B	0.390	0.582	0.748	0.889	1.119	1.294
Storm Event	1.5hr_7	30min_4	45min_6	20min_7	30min_7	25min_5
Post-Development B	0.843	1.060	1.204	1.401	1.651	1.847
Storm Event	10min_7	10min_7	15min_1	15min_2	15min_9	15min_4
Change in Peak Flow Rate (m^3/s)	**+0.453**	**+0.478**	**+0.456**	**+0.513**	**+0.532**	**+0.553**

The XP-SWMM analysis confirms the post-development flow rates discharging to the proposed swale to the south-east of the site that is to be built as part of the future development at 31-53 Courtney Drive (Ref: ROL/2024/116) (LPOD B) are higher than the pre-development flow rates and therefore formal detention structures will be required for Catchment B of the development.

5.3.5 Detention Basin Parameters & Results

5.3.5.1 Detention Basin Sizing

It is proposed to construct a dual-use bio-retention/detention basin to mitigate the post-developed discharge and provide water quality treatment for Catchment B.

The following have been utilised in the design of the detention basin:

- Design of basin to be undertaken using hydrological assessment model (XP-SWMM);
- Provide stormwater attenuation to ensure all total peak flows from Catchment B are not increased by the development for any storm event up to and including the 1% AEP (Q100);
- Allowance for the 0.30m extended detention depth for the water quality component (refer Section 6 for further details);
- Allowance for minimum 0.30m freeboard; and
- The dual-use bio-retention and detention basin is proposed to be located in the south-eastern part of the site.

The following table shows a summary of the basin's characteristics with details of the basin's stage/area relationship for the detention component in Table 20.

Table 19: Catchment B Detention Basin Characteristics

Low Level Outlet	Ø375mm low flow pipe at 0.90% grade. Pipe invert level coincides with the invert level of the 1200mm x 1200mm field inlet within the basin. The top of the 1200mm x 1200mm field inlet coincides with the top of the extended detention zone (at 0.30m above basin floor).
Intermediate Outlet	2 x Ø375mm pipes at 1.50% grade at 0.35m above extended detention zone (at 0.65m above basin floor)
High Level Outlet	10m wide spillway weir at 0.77m above extended detention zone (1.07m above basin floor)
Dimensions	Base area (bottom of detention zone) = 619m^2 Base area (top of detention zone) = 1,191m^2 Basin Depth = 1.15m
Maximum Water Depth within Detention Zone of Basin (m)	39% AEP (Q2) = 0.279 18% AEP (Q5) = 0.462 10% AEP (Q10) = 0.574 5% AEP (Q20) = 0.653 2% AEP (Q50) = 0.764 1% AEP (Q100) = 0.816

Table 20: Catchment B Detention Basin – Stage/Area Relationship

Stage (m)*	Detention Area (m^2)	Detention Storage (m^3)
0	619	0.0
0.05	641	31.5
0.15	686	97.8
0.25	732	168.7
0.35	779	244.2
0.45	827	324.5
0.55	876	409.6
0.65	926	499.7
0.75	977	594.8
0.85	1029	695.1
0.95	1082	800.6
1.05	1136	911.5
1.15	1191	1027.8

**Note: The stage is from the start of the detention zone and excludes the 0.3m extended detention depth of the water quality component of the basin.*

5.3.5.2 *Mitigation Effect of Detention Basin*

A comparison of the peak median discharges for the pre and mitigated post-developed cases for Catchment B is detailed in Table 21.

Table 21: Comparison of Mitigated Flows at Outlet (Catchment B)

Outlet	Storm	Pre-Developed (m^3/s)	Post-Developed Mitigated (m^3/s)	Difference (m^3/s)	Difference (%)
Proposed swale to the south-east of the site (LPOD B)	39%	0.390	0.376	-0.015	-3.72
	18%	0.582	0.448	-0.134	-23.03
	10%	0.748	0.645	-0.103	-13.75
	5%	0.889	0.808	-0.081	-9.09
	2%	1.119	0.942	-0.177	-15.80
	1%	1.294	1.137	-0.157	-12.16

The above table demonstrates the proposed detention basin will ensure the post-development flows discharging from the Catchment B are attenuated to equal or below the pre-development rates.

The hydrograph for the critical duration of the Mitigated 1% AEP storm event compared against the pre and post-development is shown in *Figure 3.*

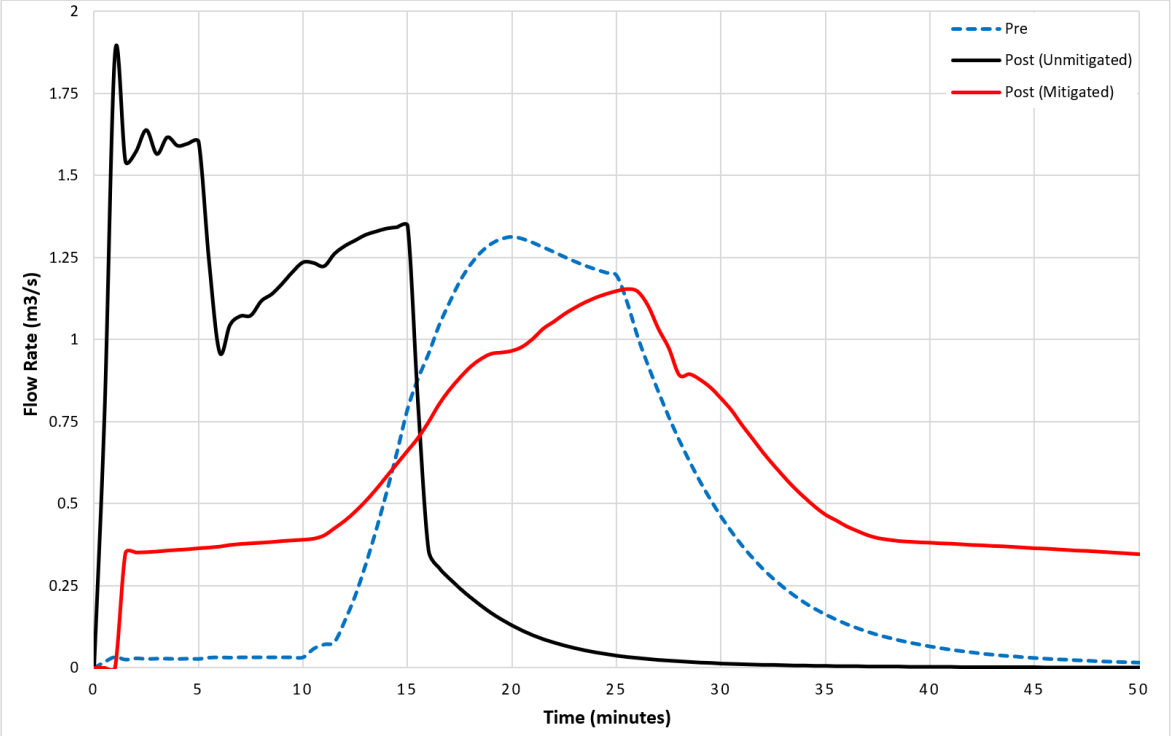


Figure 3: Pre, Post and Mitigated Flow Rates for the 1% AEP Design Storm Event (Catchment B)

The results in the tables and graph above confirm that the proposed detention basin effectively mitigates the runoff to equal or less than pre-developed flows for the full range of storms up to the 3hr event for Catchment B.

The hydraulic analysis using the XP-SWMM model has determined that a minimum detention basin volume of approximately 1,027m^3 is required to mitigate the increase in stormwater flow rates due to the development in Catchment B. The detention basin is to be fitted with an outlet configuration as detailed in Table 19 to satisfy the mitigation requirements. It is concluded that the proposed detention basin effectively mitigates the runoff to equal or less than pre-developed flows for all events up to the 1% AEP event for Catchment B.

Refer OSKA Consulting Group, Conceptual Stormwater Management Plan (Ref: OSK7105/P004/3) & Conceptual Stormwater Management Details (Ref: OSK7105/P005/2) within Appendix E for further details.

6.0 STORMWATER QUALITY ASSESSMENT

6.1 Background

The development of the land has the potential to increase the pollutant loads within stormwater runoff and downstream watercourses. During the construction phase of the development, disturbances to the existing ground have the potential to significantly increase sediment loads entering downstream drainage systems and watercourses. The operational phase of the development will potentially increase the amount of sediments and nutrients washing from the site.

The following sections describe the construction and operational phase controls and water quality modelling of the proposed treatment train in compliance with Council guidelines.

6.2 Construction Phase

A high risk of stormwater pollution will occur from the site during the construction phase due to erosion and sediment transportation off-site to the receiving environment. The majority of this risk results from construction activities disturbing the site and exposing areas of soil to the direct erosive influence of the environment.

The following section outlines the procedures necessary to minimise erosion and control sediment during construction in accordance with the International Erosion Control Association (IECA) Best Practice ESC Document.

6.2.1 Key Pollutants

The key pollutants have been identified for the Construction Phase of this development.

Table 22: Key Pollutants, Construction Phase

Pollutant	Sources
Litter	Paper, construction packaging, food packaging, cement bags, material offcuts.
Sediment	Exposed soils and stockpiles during earthworks and building works.
Hydrocarbons	Fuel and oil spills, leaks from construction equipment and temporary car park areas.
Toxic Materials	Cement slurry, asphalt primer, solvents, cleaning agents, and wash waters (e.g., from tile works).
Acids or Alkaline substances	Acid sulphate soils, cement slurry and wash waters.

6.2.2 Sediment and Erosion Controls

Sediment and Erosion Control devices (S&EC) employed on the site shall be designed and constructed in accordance with the International Erosion Control Association (IECA) Best Practice ESC Document as shown on OSKA Consulting Group, Preliminary Sediment and Erosion Control Plan (Ref: OSK7105/P006/3) & Preliminary Sediment and Erosion Control Details (Ref: OSK7105/P007/1) included as Appendix F.

Pre-Construction

- Stabilised site access/exit onto Courtney Drive to the north;
- Sediment fences to be located around the perimeter of the site;
- Sediment trap to be installed if required;
- Dust fencing to be installed if required; and
- Educate site personnel to the requirements of Erosion and Sediment Control Plan.

Initial Construction

- Maintain construction access/exit, sediment fencing, dust fences and all other existing controls as required;
- Construct diversion drains to convey disturbed site run-off to the temporary sediment traps; and
- Confine construction activities to stages to minimise areas of disturbance at any given time.

Second Stage Construction

- Maintain construction access/exit, sediment fencing, dust fences, diversion drain and all other existing controls as required;
- Progressively revegetate finished areas where applicable;
- Divert runoff from undisturbed areas around disturbed areas; and
- Drainage structure protection around field inlets and gully pits.

During construction, all areas of exposed soils allowing dust generation are to be suitably treated. Treatments will include covering the soil and watering. Road accesses are to be regularly cleaned to prevent the transmission of soil on vehicle wheels and eliminate any build-up of typical road dirt and tyre dust from delivery vehicles.

Adequate waste disposal facilities are to be provided and maintained on the site to cater for all waste materials such as litter, hydrocarbons, toxic materials, acids or alkaline substances.

6.2.3 Water Quality Monitoring and Inspections

To ensure that the water quality objectives are being met during the construction phase of the development, water quality monitoring shall be conducted. Water quality monitoring shall use a calibrated probe or sampling and testing at a NATA registered laboratory.

Location: Monitoring Stations shown on OSKA Consulting Group, *Sediment and Erosion Control Plan* (Ref: OSK7105/P006/3).

Parameters: Site discharge criteria.

Frequency: Following at least 10 mm of rainfall in a 24-hour period.

The contractor shall be responsible for the inspection and maintenance of all sediment and erosion control devices. Additional controls and review of existing controls shall be undertaken in response to the results of the above-mentioned monitoring program.

6.2.4 Reporting

An inspection report shall be written by a suitably qualified and experienced scientist/engineer following each water quality monitoring episode. The report shall include at least the following information:

- Name, address and real property description for the development site;
- Council file reference number (if known);
- Monitoring locations;
- Performance criteria;
- Results for each monitoring location, identifying any breaches of performance criteria;
- Recommended corrective actions to be taken and additional sediment and erosion controls, if required; and
- Inspection reports shall be provided to the contractor for their action and compilation in an on-site register.

If the above-mentioned performance criteria are exceeded and results from the downstream monitoring stations show significant deterioration from upstream results (if applicable), the contractor shall implement all recommendation of the inspection report within one (1) working day of receipt of the report.

6.3 Operational Phase

The following sections provide details of the Stormwater Quality Improvement Devices (SQID's) proposed for the operational phase of the development. OSKA Consulting Group, Conceptual Stormwater Management Plan (Ref: OSK7105/P004/3) & Conceptual Stormwater Management Details (Ref: OSK7105/P005/2) in Appendix E illustrates the size and location of the proposed SQID's.

6.3.1 Stormwater Quality Objectives

To protect the water quality of the downstream watercourses, the following Water Quality Objectives (WQO's) have been applied to stormwater runoff from the site in accordance with CoGC SC6.12.4.5.4.2 Stormwater quality objectives (operational phase) and the criteria of the CoGC Healthy Waters Code as addressed in OSKA Engineers, Response to Healthy Waters Code (Ref: OSK7105-0003) included as Appendix G.

Best Management Practices (BMP) are required to be demonstrated for all Development Applications within the City of Gold Coast and are recommended to be implemented by the developer. Where practicable, methods such as first flush devices, and discharging stormwater to landscaped/grassed areas prior to discharge to the LPOD, are to be incorporated into the site's stormwater strategy, where the opportunity is available.

The following load reduction targets must be achieved when assessing the post-development treatment train (comparison of unmitigated developed case versus developed mitigated case).

- 80% reduction in Total Suspended Sediment (TSS).
- 60% reduction in Total Phosphorus (TP).
- 45% reduction in Total Nitrogen (TN).
- 90% reduction in litter (sized 5 mm or greater).

6.3.2 Post-Development MUSIC Modelling

To assess the potential quantities of pollutants anticipated to be discharged from the site, the water quality modelling package 'Model for Urban Stormwater Improvement Conceptualisation' (MUSIC) V6.3 by eWATER has been applied. MUSIC Modelling Parameters and delineated data have been sourced from Water by Design, MUSIC Modelling Guidelines, and where possible, via online MUSIC Link data.

Rainfall data has been sourced from Rainfall Station 40584, (Hinze Dam) using a date range from 1974 to 2010 and a 6 Minute Time Step, in accordance with CoGC requirements.

6.3.3 Stormwater Quality Improvement Devices

A Water Sensitive Urban Design (WSUD) approach has been adopted for the site with the majority of the runoff from Catchment B being treated by a bio-retention basin. The bio-retention basin will treat runoff from Catchment B as it is deemed more suitable for the proposed site use. To minimise the bypass areas from the development, rear allotment drainage has been proposed for Lots 5-10, 34-37 and 53 to ensure all minor flows (at least Q3 month) are directed into the proposed basin with localised grading to occur directing all ground flows into the pits. There will be a small amount of bypass with the ground areas from Lot 51 to bypass the basin with only the flows from the roof area being conveyed to the basin.

The runoff from Catchments A and C will bypass the proposed basin with flows discharging directly to the kerb and channel of either Courtney Drive (Catchment A) or the proposed road reserve which will connect into the future development at 31-53 Courtney Drive.

The proposed SQID's have been provided for modelling purposes only and is subject to Council approval. Accordingly, similar alternative devices may be adopted with Council review and approval.

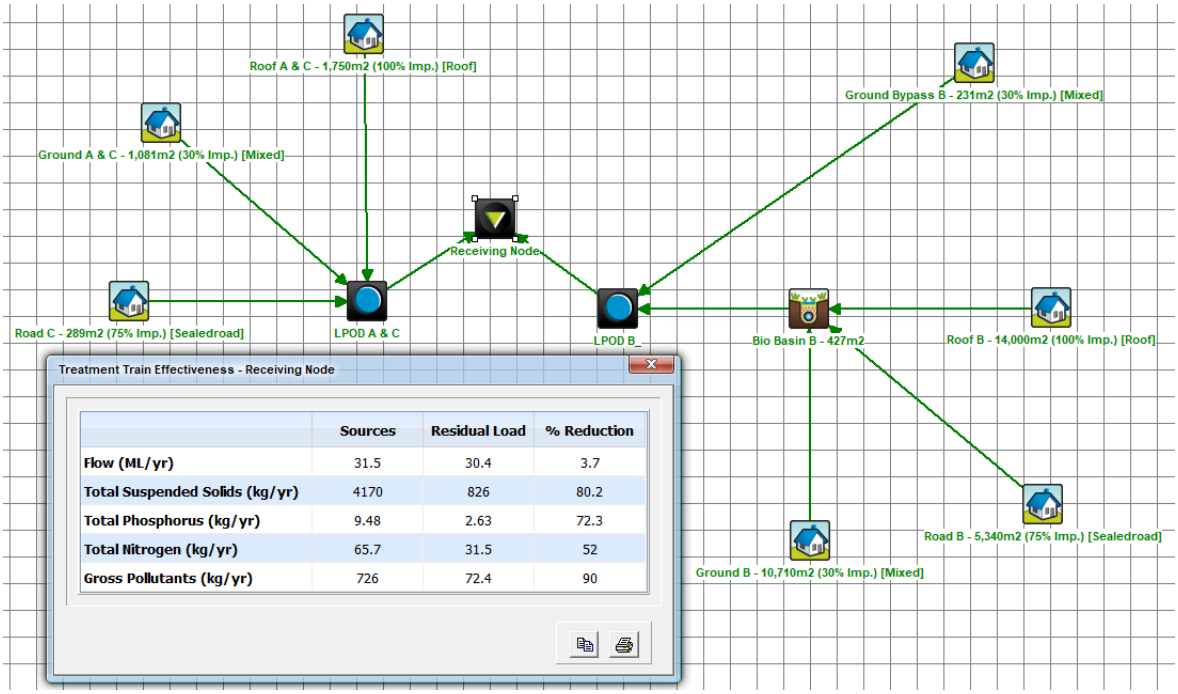
The adopted MUSIC catchment areas for the subject site are as follows:

Table 23: Adopted MUSIC Catchment Areas

Catchment	Area (m^2)	% Impervious
Roof B (Residential)	14,000	100
Road B (Residential)	5,340	75
Ground B (Residential)	10,710	30
Ground Bypass B (Residential)	231	30
Roof A & C Bypass (Residential)	1,750	100
Road C Bypass (Residential)	289	75
Ground A & C Bypass (Residential)	1,081	30
Total Site	**33,401**	

Note all lots that grade to the rear will have rear allotment drainage that is to capture and convey flows to the proposed basin.

An illustration of the MUSIC model of the adopted operational treatment train for the post-development site has been provided in *Figure 4.*



	Sources	Residual Load	% Reduction
Flow (ML/yr)	31.5	30.4	3.7
Total Suspended Solids (kg/yr)	4170	826	80.2
Total Phosphorus (kg/yr)	9.48	2.63	72.3
Total Nitrogen (kg/yr)	65.7	31.5	52
Gross Pollutants (kg/yr)	726	72.4	90

Figure 4: Operational Phase Treatment Train (Source: MUSIC Model)

6.3.4 Design Parameters of the Stormwater Quality Improvement System

Detailed design of the stormwater treatment train shall be in accordance with the Water Sensitive Urban Design (WSUD), Technical Design Guidelines for South East Queensland – Version 1 (June 2006).

Bio-Retention Basin

A bio-retention basin is designed to pond stormwater allowing it to percolate through a layer of filter media, typically sandy loam. Runoff passing through the filter media is collected with a perforated pipe discharging to the downstream drainage infrastructure. The bio-retention basin shall be located to treat all stormwater from the development area. A bund will be constructed to separate the bio-retention system and the open detention basin. This will ensure that the filter and surface area relationship detailed below is achieved.

The bio-retention basins have been modelled with the following properties:

- Filter media — Sandy Loam;
  5 – 10% Organic Content in accordance with AS1289.4.1.1;
  Average D_{50} 0.45 mm;
  K_{sat} 200 mm/hr;
  TN Content = 400 mg/kg
  Orthophosphate Content = 30 mg/kg
- Filter media depth — 0.70 m
- Drainage layer — 0.40m;
- Extended detention depth — 0.30 m;
- Seepage — 0 mm/hr;
- Filter Area — 427m^2;
- Surface Area — 513m^2.

6.3.5 Post-Development Modelling Results - Mitigated

The modelled Stormwater Quality Improvement Devices (SQID) have demonstrated a reduction in the amount of sediments and nutrients discharging from the proposed residential development. *Table 24* illustrates the effectiveness of the SQID's in the treatment train for the development.

Table 24: Treatment Train Effectiveness at Receiving Node

Parameter	Post	Post Mitigated	Reduction	Water Quality Objectives
Flow (ML/yr)	31.5	30.4	**3.7 %**	-
TSS (kg/yr)	4170	826	**80.2 %**	80 %
TP (kg/yr)	9.48	2.63	**72.3 %**	60 %
TN (kg/yr)	65.7	31.5	**52.0 %**	45 %
Gross Pollutants (kg/yr)	726	72.4	**90.0 %**	90 %

The results demonstrate that the proposed SQID's meet the intended Water Quality Objectives for Gross Pollutants, Suspended Solids, Phosphorous and Nitrogen levels, in accordance with the City of Gold Coast Requirements.

7.0 OPERATIONAL PHASE MAINTENANCE REQUIREMENTS

The proposed stormwater management devices will require maintenance and monitoring to ensure that they function as designed. The following section provides an outline of the necessary maintenance tasks for the proposed devices.

7.1 Bio-retention Basin Maintenance

The most intensive period of maintenance is during the plant establishment period (first two years) when weed removal and replanting may be required. It is also the time when large loads of sediments could impact on plant growth particularly in developing catchments with poor building controls.

Maintenance is primarily concerned with:

- Maintenance of flow to and through the bio-retention basin;
- Maintaining vegetation;
- Preventing undesired overgrowth vegetation from taking over the bio-retention basin;
- Removal of accumulated sediments; and
- Litter and debris removal.

Vegetation maintenance will include:

- Fertilising plants;
- Removal of noxious plants or weeds; and
- Re-establishment of plants that die.

Sediments accumulated at the inlets need to be monitored. Depending on the catchment activities the deposition of sediment can tend to smother plants and reduce the ponding volume available. Should excessive sediment build-up it will impact on the plant health and require removal before it reduces the infiltration rate of the filter media. The proposed SQID's will require regular maintenance and monitoring to ensure that it functions as designed.

Table 25: Bio-retention Basin Maintenance Schedule

Bio-retention Basin Maintenance Checklist			
Inspection Frequency: 3 Monthly	**Date of Visit:**		
Location:			
Description:			
Site Visibility:			
Inspection Items	**Yes**	**No**	**Action Required (Details)**
Sediment accumulation at inflow points?			
Litter basin?			
Erosion at inlet or other key structures (e.g. crossovers)?			
Traffic damage present?			
Evidence of dumping (Building waste, oils etc)?			
Vegetation condition satisfactory (density, weeds etc)?			
Replanting required?			
Mowing required?			
Clogging of drainage points (sediment or debris)?			
Evidence of ponding?			
Damage/vandalism to structures present?			
Surface clogging visible?			
Drainage system inspected?			
Resettling of system required?			
Comments:			

8.0 ASSET HANDOVER

The proposed stormwater quality devices shall be dedicated to Council following the time of practical completion for the proposed development. An Asset Handover Checklist is provided as *Table 26* as a guideline for the necessary steps to be taken prior to the end of the maintenance period.

Table 26: Asset Handover Checklist

Asset Location:		
Construction By:		
Maintenance Period:		
Treatment:	**Y**	**N**
Actual treatment performance equivalent to design:		
Maintenance:		
Maintenance Plans Provided:		
Inspection and maintenance undertaken as per maintenance plan:		
Inspection and maintenance forms provided:		
Asset inspected for defects:		
Asset Information:		
Design assessment checklist provided:		
As constructed plans provided:		
Copies of all permits provided:		
Digital files provided:		

9.0 CONCLUSIONS

OSKA Engineers has been commissioned by Courtney Upper Coomera Developments Pty Ltd to prepare a Conceptual Stormwater Management Plan (CSWMP) to support a Development Application (DA) to the City of Gold Coast (CoGC) for the proposed Residential Subdivision situated at 17 Courtney Drive, Upper Coomera. This CSWMP intends to provide an optimised stormwater management system that would be compatible and readily integrated into the proposed site use.

This CSWMP details the conceptual planning, layout and design of the stormwater management infrastructure for both the construction and operational phases of this development and satisfies the requirements of the City of Gold Coast's Land Development Guidelines.

A hydrological analysis demonstrated that the anticipated post-development peak flow rates discharging from Catchment A are lower the pre-development flow rates. Therefore, onsite stormwater detention will not be required for Catchment A.

A hydrological analysis demonstrated that the anticipated post-development peak flow rates discharging from Catchment B are higher than the pre-development flow rates. A hydraulic model was built using the XP-SWMM software program, to estimate the required detention volume and arrangement. This report and stormwater management plan defined the layout of the proposed detention arrangement, which is to be provided in the form of a combined bio-retention and detention basin with approximate detention volume of 1,027m^3 at a depth of 1.15m in conjunction with the water quality aspect of the basin. This strategy demonstrates no adverse or actionable nuisance associated with the increased runoff rate on surrounding properties and infrastructure.

OSKA Engineers has adopted a Water Sensitive Urban Design (WSUD) approach, in accordance with the State Planning Policy, to managing the stormwater runoff from the proposed development by treating stormwater runoff within a bio-retention basin with a filter area of 427m^2. The SQID's utilised within the MUSIC model have been adopted to demonstrate a potential treatment system, pending Council approval.

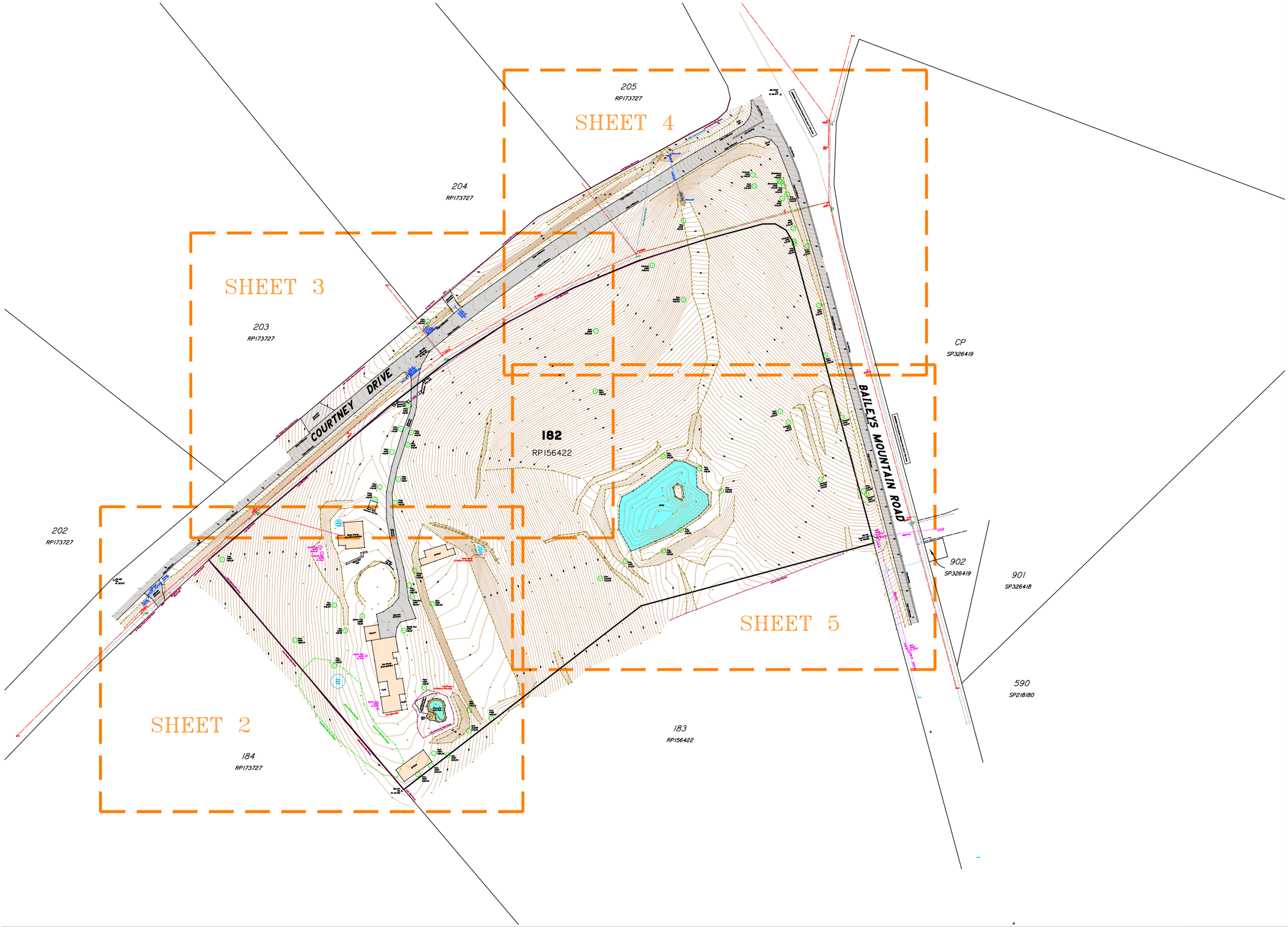
A monitoring and maintenance plan for the proposed infrastructure has been included. A concept sediment and erosion control plan is provided for the construction phase of the development and shall be implemented by the contractor and developer.

This stormwater quality strategy has defined the preliminary requirements and layout of the proposed development to demonstrate compliance with the State Planning Policy 2017 and the CoGC Planning Scheme Stormwater Quality Management requirements.

APPENDIX

A

Saunders Havill, Detail Plan (Ref: 12753 S 01 DT A)



LEGEND

Quality levels are shown on linetypes along with service type eg. E(A) — First Letter is the Service (Elec) and the second is Quality Level (A)

	by Survey	by Records
U/G ELECTRICITY	E(A) E(B)	E(C) E(D)
O/H ELECTRICITY	E E	E E
O/H TELECOMMUNICATIONS	T T	T T
U/G TELECOMMUNICATIONS	T(A) T(B)	T(C) T(D)
U/G DRAINAGE	D(A) D(B)	D(C) D(D)
SEWERAGE	S(A) S(B)	S(C) S(D)
WATER	W(A) W(B)	W(C) W(D)
GAS	G(A) G(B)	G(C) G(D)
FENCE	// //	

SYMBOLS

Sewer Manhole	SMH
Gully Trap	GT
Stormwater Manhole	SWMH
Fire Hydrant	FH
Valve	V
Water Meter	WM
Electricity Box / Pillar	EBox
Electric Light Pole	ELP
Power Pole	PP
Electricity Manhole	EMH
Electricity Pit	EPit
Traffic Signal Pit	TrPit
Traffic Light	TL
Telecommunications Manhole	TMH
Telecommunications Pit	TPit
Tree / Shrub	

ABBREVIATIONS

MH	Manhole
SL	Surface Level
IL	Invert Level
BM	Bench Mark
Ø	Diameter
RCP	Reinforced Concrete Pipe
GI	Galvanised Iron
Ø, H, S	Trunk diameter, Height, Spread (canopy diameter)

NOTES

This Plan has been prepared from a combination of field survey and existing records for the purpose of showing the physical features of the land to assist in designing future development, and should not be used for any other purpose.

The title boundaries shown hereon have been reinstated as per Saunders Havill Identification survey plan IS339894. All other boundaries were not verified or marked at the time of survey, but were determined by existing title dimensions and occupation (where available), not by field measurement. As such, these dimensions could be out of date and incorrect by modern standards. This plan should not be used for building to boundary, or to prescribed set-backs, without further boundary survey.

Services shown hereon were located where possible by field survey. If not able to be so located, known services have been shown from the records of the relevant authorities or service providers where available and have been noted accordingly on this plan. All services shown from records only will need verification prior to, or during work on site.

Prior to any demolition, excavation or construction on site, the relevant authority should be contacted for:

* Verification of all services plotted from records only, and
* Possible location of any services altered since this survey was completed or any new services installed either on or adjacent to the site.

Before starting any demolition, excavation or construction on the site, the relevant person should make an independent and updated enquiry of "dial before you dig" and any relevant service providers to ascertain the existence of further services (if any) and the accurate location of those not able to have been surveyed at the time of preparing this plan.

* No responsibility can be accepted by Saunders Havill Group Pty Ltd, for any damage caused to any underground service or any loss or injury so suffered if enquiry and verification have not been completed in accordance with this note.

** This note is an integral part of this plan/data. Reproduction of this plan or any part of it without this note being included in full will render the information shown on such reproduction invalid and not suitable for use.

QUALITY LEVELS

This plan shows Quality classifications of sub surface utility data as per AS5488-2013. The following classifications apply.

Quality Level D - (least accurate level and if used on its own has a high risk of damage) QL-D information is generally obtained from existing records provided by utilities as a result of a Dial Before You Dig enquiry being lodged. In many cases the asset depicted on the plan is in a schematic format only and intended only to indicate its presence.

Quality Level C - (low accuracy and a high risk of damage) Is described as a surface feature correlation or an interpretation of the approximate location and attributes of a subsurface utility asset using a combination of existing records and site survey of visible evidence – for example you can see the pit lids shown on the plan but the actual position of underground connection between pits is still assumed.

Quality Level B - (significant risk reduction) Provides relative subsurface feature locations in three dimensions. The minimum requirement for QL-B is relative spatial position, this can be achieved via an electromagnetic frequency locating device. An electronic location provided by a DBYD Certified Locator to QL-B standard would have a maximum horizontal tolerance of plus or minus 300mm and a maximum vertical tolerance of plus or minus 500mm.

Quality Level A - (meets location accuracy standards for minimum risk when excavating) Is the highest Quality Level accuracy and consists of positive identification of the attribute and location of a subsurface utility at a point to an absolute spatial position in three dimensions. It is the only quality level that defines a subsurface utility as 'Validated'.

PROJECT COORDINATE SYSTEM NOTES

Horizontal Meridian is MGA2020 (Zone 56) See IS339894
Project coordinates are based on plane or ground distances.
The coordinate origin is based on truncated values for C9301.

Base Point for MGA transformations: C9301
Project Coordinate: 28 005.934 E, 918 020.115 N
MGA2020 Coordinate: 528 005.934 E, 6 918 020.115 N
Rotation Project to MGA: none
Scale Factor: Project x 0.9995957 = MGA
Reverse Scale Factor: MGA x 1.0004045 = Project

Saunders Havill
BOWEN HILLS | SPRINGFIELD
1300 123 744 | mail@saundershavill.com

N

ISSUES

NO.	DRAWN	DATE	DESCRIPTION	CHECKED
A	MD	24/10/2025	ORIGINAL ISSUE	JL

LOT DESCRIPTION
LOT 182 ON RP156422

LOCALITY:
UPPER COOMERA
LOCAL GOVERNMENT:
GOLD COAST CITY

SURVEYED	DATE
BC	SEP / OCT 2025

LEVEL DATUM: AHD Der.
ORIGIN OF LEVELS: PM 27784
RL OF ORIGIN: 6.614
CONTOUR INTERVAL: 0.20m

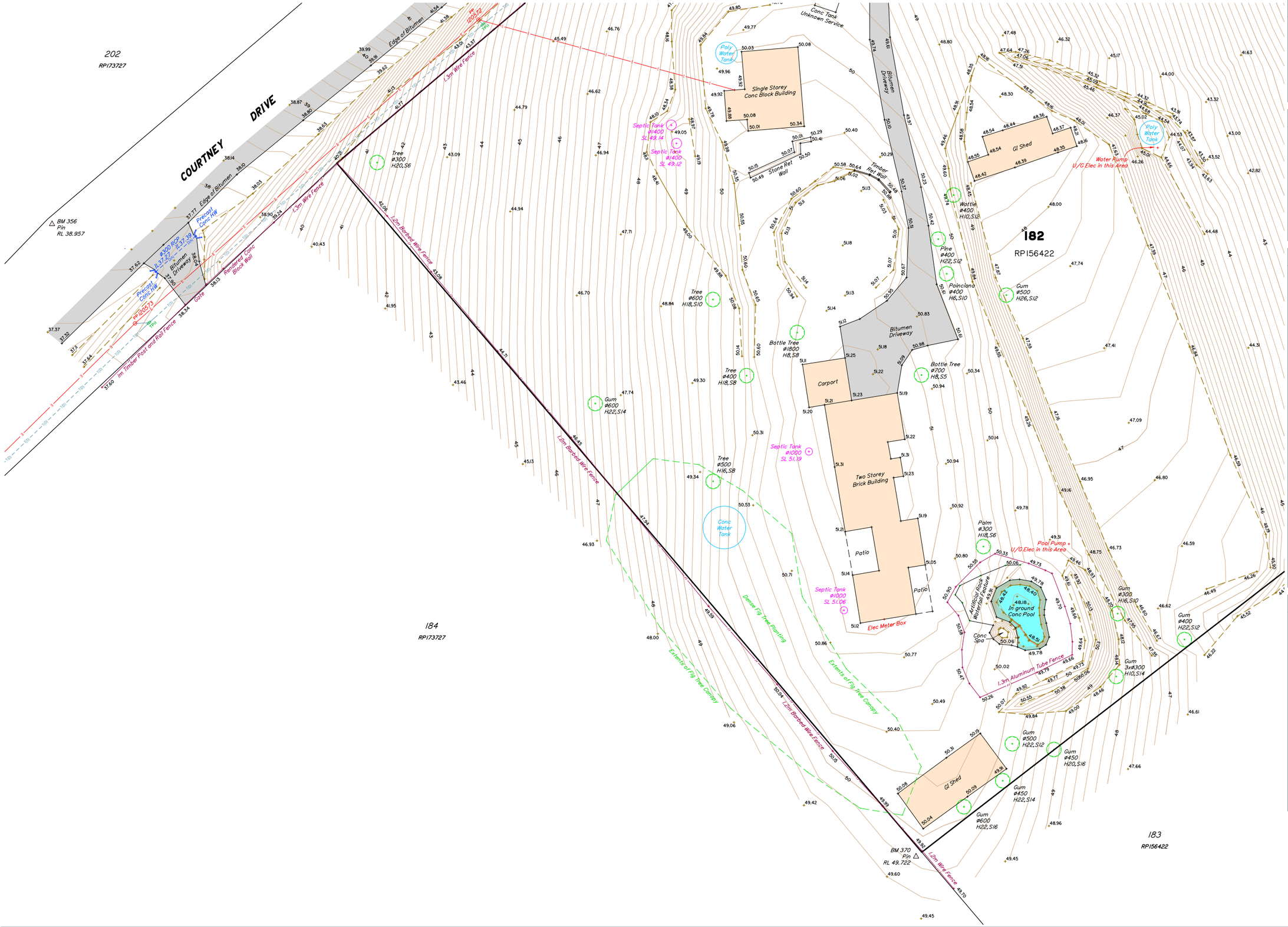
CLIENT
KASA GROUP HOLDINGS PTY LTD

SCALE
1:750@A1
1:1500@A3
0 5 10 30m

PROJECT
17 COURTNEY DRIVE, COOMERA

DRAWING TITLE
DETAIL PLAN
(SHEET 1 of 5)

DRAWING NO.
12753 S 01 DT A



LEGEND

Quality levels are shown on linetypes along with service type eg. E(A) – First Letter is the Service (Elec) and the second is Quality Level (A)

	by Survey	by Records
U/G ELECTRICITY	E(A) E(B)	E(C) E(D)
O/H ELECTRICITY	E E	E E
O/H TELECOMMUNICATIONS	T T	T T
U/G TELECOMMUNICATIONS	T(A) T(B)	T(C) T(D)
U/G DRAINAGE	D(A) D(B)	D(C) D(D)
SEWERAGE	S(A) S(B)	S(C) S(D)
WATER	W(A) W(B)	W(C) W(D)
GAS	G(A) G(B)	G(C) G(D)
FENCE	// //	

SYMBOLS

Sewer Manhole	SMH
Gully Trap	GT
Stormwater Manhole	SWMH
Fire Hydrant	FH
Valve	V
Water Meter	WM
Electricity Box / Pillar	EBox
Electric Light Pole	ELP
Power Pole	PP
Electricity Manhole	EMH
Electricity Pit	EPit
Traffic Signal Pit	TrPit
Traffic Light	TL
Telecommunications Manhole	TMH
Telecommunications Pit	TPit
Tree / Shrub	

ABBREVIATIONS

MH	Manhole
SL	Surface Level
IL	Invert Level
BM	Bench Mark
Ø	Diameter
RCP	Reinforced Concrete Pipe
GI	Galvanised Iron
Ø, H, S	Trunk diameter, Height, Spread (canopy diameter)

NOTES

This Plan has been prepared from a combination of field survey and existing records for the purpose of showing the physical features of the land to assist in designing future development, and should not be used for any other purpose.

The title boundaries shown hereon have been reinstated as per Saunders Havill Identification survey plan IS339894. All other boundaries were not verified or marked at the time of survey, but were determined by existing title dimensions and occupation (where available), not by field measurement. As such, these dimensions could be out of date and incorrect by modern standards. This plan should not be used for building to boundary, or to prescribed set-backs, without further boundary survey.

Services shown hereon were located where possible by field survey. If not able to be so located, known services have been shown from the records of the relevant authorities or service providers where available and have been noted accordingly on this plan. All services shown from records only will need verification prior to, or during work on site.

Prior to any demolition, excavation or construction on site, the relevant authority should be contacted for:

* Verification of all services plotted from records only, and
* Possible location of any services altered since this survey was completed or any new services installed either on or adjacent to the site.

Before starting any demolition, excavation or construction on the site, the relevant person should make an independent and updated enquiry of "dial before you dig" and any relevant service providers to ascertain the existence of further services (if any) and the accurate location of those not able to have been surveyed at the time of preparing this plan.

* No responsibility can be accepted by Saunders Havill Group Pty Ltd, for any damage caused to any underground service or any loss or injury so suffered if enquiry and verification have not been completed in accordance with this note.

** This note is an integral part of this plan/data. Reproduction of this plan or any part of it without this note being included in full will render the information shown on such reproduction invalid and not suitable for use.

QUALITY LEVELS

This plan shows Quality classifications of sub surface utility data as per AS5488-2013. The following classifications apply.

Quality Level D - (least accurate level and if used on its own has a high risk of damage) QL-D information is generally obtained from existing records provided by utilities as a result of a Dial Before You Dig enquiry being lodged. In many cases the asset depicted on the plan is in a schematic format only and intended only to indicate its presence.

Quality Level C - (low accuracy and a high risk of damage) Is described as a surface feature correlation or an interpretation of the approximate location and attributes of a subsurface utility asset using a combination of existing records and site survey of visible evidence – for example you can see the pit lids shown on the plan but the actual position of underground connection between pits is still assumed.

Quality Level B - (significant risk reduction) Provides relative subsurface feature locations in three dimensions. The minimum requirement for QL-B is relative spatial position, this can be achieved via an electromagnetic frequency locating device. An electronic location provided by a DBYD Certified Locator to QL-B standard would have a maximum horizontal tolerance of plus or minus 300mm and a maximum vertical tolerance of plus or minus 500mm.

Quality Level A - (meets location accuracy standards for minimum risk when excavating) Is the highest Quality Level accuracy and consists of positive identification of the attribute and location of a subsurface utility at a point to an absolute spatial position in three dimensions. It is the only quality level that defines a subsurface utility as 'Validated'.

Saunders Havill
BOWEN HILLS | SPRINGFIELD
1300 123 744 | mail@saundershavill.com

N

ISSUES				
NO.	DRAWN	DATE	DESCRIPTION	CHECKED
A	MD	24/10/2025	ORIGINAL ISSUE	JL

LOT DESCRIPTION: LOT 182 ON RP156422

LOCALITY: UPPER COOMERA

LOCAL GOVERNMENT: GOLD COAST CITY

SURVEYED	DATE
BC	SEP / OCT 2025

LEVEL DATUM: AHD Der.

ORIGIN OF LEVELS: PM 27784

RL OF ORIGIN: 6.614

CONTOUR INTERVAL: 0.20m

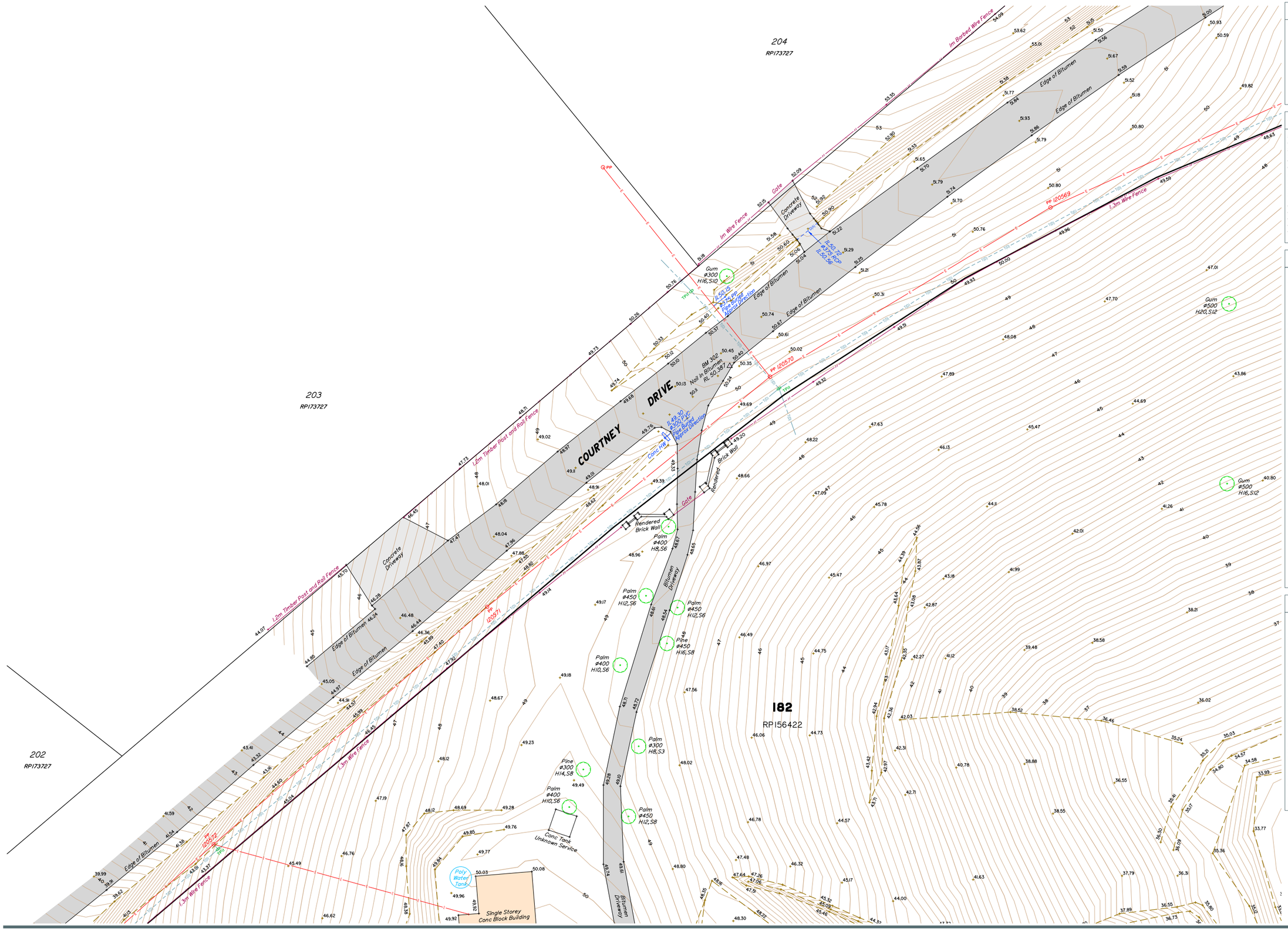
CLIENT: KASA GROUP HOLDINGS PTY LTD

SCALE: 1:250@A1 1:500@A3 (0 2.5 5 12.5m)

PROJECT: 17 COURTNEY DRIVE, COOMERA

DRAWING TITLE: DETAIL PLAN (SHEET 2 of 5)

DRAWING NO.: 12753 S 01 DT A



LEGEND

Quality levels are shown on linetypes along with service type eg. E(A) — First Letter is the Service (Elec) and the second is Quality Level (A)

	by Survey	by Records
U/G ELECTRICITY	E(A) E(B)	E(C) E(D)
O/H ELECTRICITY	E	E
O/H TELECOMMUNICATIONS	T	T
U/G TELECOMMUNICATIONS	T(A) T(B)	T(C) T(D)
U/G DRAINAGE	D(A) D(B)	D(C) D(D)
SEWERAGE	S(A) S(B)	S(C) S(D)
WATER	W(A) W(B)	W(C) W(D)
GAS	G(A) G(B)	G(C) G(D)
FENCE	//	//

SYMBOLS

Sewer Manhole	SMH
Gully Trap	GT
Stormwater Manhole	SWMH
Fire Hydrant	FH
Valve	V
Water Meter	WM
Electricity Box / Pillar	EBox
Electric Light Pole	ELP
Power Pole	PP
Electricity Manhole	EMH
Electricity Pit	EPit
Traffic Signal Pit	TrPit
Traffic Light	TL
Telecommunications Manhole	TMH
Telecommunications Pit	TPit
Tree / Shrub	

ABBREVIATIONS

MH	Manhole
SL	Surface Level
IL	Invert Level
BM	Bench Mark
Ø	Diameter
RCP	Reinforced Concrete Pipe
GI	Galvanised Iron
Ø, H, S	Trunk diameter, Height, Spread (canopy diameter)

NOTES

This Plan has been prepared from a combination of field survey and existing records for the purpose of showing the physical features of the land to assist in designing future development, and should not be used for any other purpose.

The title boundaries shown hereon have been reinstated as per Saunders Havill Identification survey plan IS339894. All other boundaries were not verified or marked at the time of survey, but were determined by existing title dimensions and occupation (where available), not by field measurement. As such, these dimensions could be out of date and incorrect by modern standards. This plan should not be used for building to boundary, or to prescribed set-backs, without further boundary survey.

Services shown hereon were located where possible by field survey. If not able to be so located, known services have been shown from the records of the relevant authorities or service providers where available and have been noted accordingly on this plan. All services shown from records only will need verification prior to, or during work on site.

Prior to any demolition, excavation or construction on the site, the relevant authority should be contacted for:

* Verification of all services plotted from records only, and
* Possible location of any services altered since this survey was completed or any new services installed either on or adjacent to the site.

Before starting any demolition, excavation or construction on the site, the relevant person should make an independent and updated enquiry of "dial before you dig" and any relevant service providers to ascertain the existence of further services (if any) and the accurate location of those not able to have been surveyed at the time of preparing this plan.

* No responsibility can be accepted by Saunders Havill Group Pty Ltd, for any damage caused to any underground service or any loss or injury so suffered if enquiry and verification have not been completed in accordance with this note.

** This note is an integral part of this plan/data. Reproduction of this plan or any part of it without this note being included in full will render the information shown on such reproduction invalid and not suitable for use.

QUALITY LEVELS

This plan shows Quality classifications of sub surface utility data as per AS5488-2013. The following classifications apply.

Quality Level D - (least accurate level and if used on its own has a high risk of damage) QL-D information is generally obtained from existing records provided by utilities as a result of a Dial Before You Dig enquiry being lodged. In many cases the asset depicted on the plan is in a schematic format only and intended only to indicate its presence.

Quality Level C - (low accuracy and a high risk of damage) Is described as a surface feature correlation or an interpretation of the approximate location and attributes of a subsurface utility asset using a combination of existing records and site survey of visible evidence – for example you can see the pit lids shown on the plan but the actual position of underground connection between pits is still assumed.

Quality Level B - (significant risk reduction) Provides relative subsurface feature locations in three dimensions. The minimum requirement for QL-B is relative spatial position, this can be achieved via an electromagnetic frequency locating device. An electronic location provided by a DBYD Certified Locator to QL-B standard would have a maximum horizontal tolerance of plus or minus 300mm and a maximum vertical tolerance of plus or minus 500mm.

Quality Level A - (meets location accuracy standards for minimum risk when excavating) Is the highest Quality Level accuracy and consists of positive identification of the attribute and location of a subsurface utility at a point to an absolute spatial position in three dimensions. It is the only quality level that defines a subsurface utility as 'Validated'.

Saunders Havill
BOWEN HILLS | SPRINGFIELD
1300 123 744 | mail@saundershavill.com

N

ISSUES				
NO.	DRAWN	DATE	DESCRIPTION	CHECKED
A	MD	24/10/2025	ORIGINAL ISSUE	JL

LOT DESCRIPTION
LOT 182 ON RP156422

LOCALITY:
UPPER COOMERA

LOCAL GOVERNMENT:
GOLD COAST CITY

SURVEYED	DATE
BC	SEP / OCT 2025

LEVEL DATUM: AHD Der.

ORIGIN OF LEVELS: PM 27784
RL OF ORIGIN: 6.614

CONTOUR INTERVAL: 0.20m

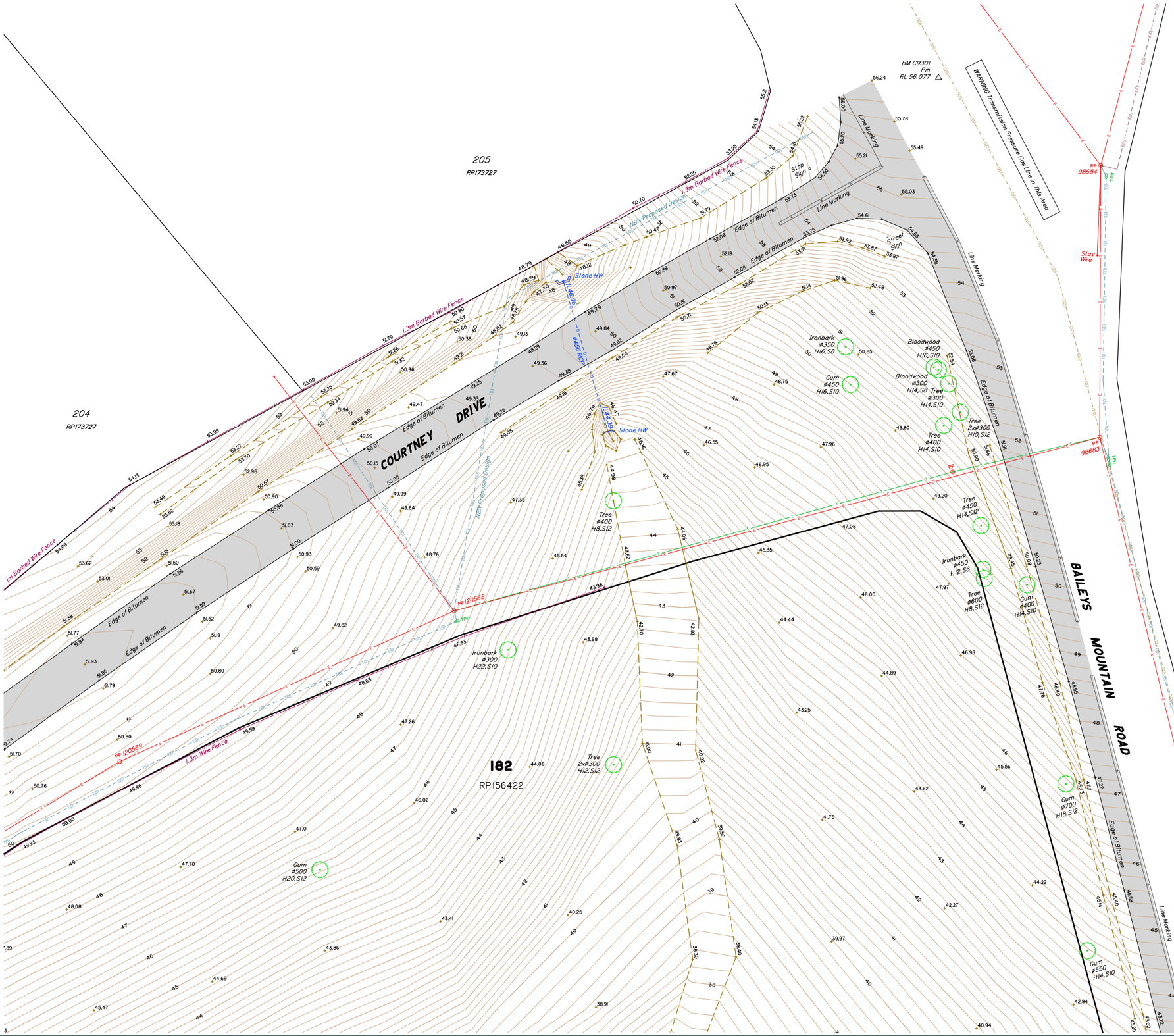
CLIENT
KASA GROUP HOLDINGS PTY LTD

SCALE
1:250@A1
1:500@A3
0 2.5 5 12.5m

PROJECT
17 COURTNEY DRIVE, COOMERA

DRAWING TITLE
DETAIL PLAN
(SHEET 3 of 5)

DRAWING NO.
12753 S 01 DT A



LEGEND

Quality levels are shown on linetypes along with service type eg. E(A) – First Letter is the Service (Elec) and the second is Quality Level (A)

	by Survey	by Records
U/G ELECTRICITY	E(A) – E(B)	E(C) – E(D)
O/H ELECTRICITY	E – E	E – E
O/H TELECOMMUNICATIONS	T – T	T – T
U/G TELECOMMUNICATIONS	T(A) – T(B)	T(C) – T(D)
U/G DRAINAGE	D(A) – D(B)	D(C) – D(D)
SEWERAGE	S(A) – S(B)	S(C) – S(D)
WATER	W(A) – W(B)	W(C) – W(D)
GAS	G(A) – G(B)	G(C) – G(D)
FENCE	// – //	

SYMBOLS

Sewer Manhole	SMH
Gully Trap	GT
Stormwater Manhole	SWMH
Fire Hydrant	FH
Valve	V
Water Meter	WM
Electricity Box / Pillar	EBox
Electric Light Pole	ELP
Power Pole	PP
Electricity Manhole	EMH
Electricity Pit	EPit
Traffic Signal Pit	TrPit
Traffic Light	TL
Telecommunications Manhole	TMH
Telecommunications Pit	TPit
Tree / Shrub	

ABBREVIATIONS

MH	Manhole
SL	Surface Level
IL	Invert Level
BM	Bench Mark
Ø	Diameter
RCP	Reinforced Concrete Pipe
GI	Galvanised Iron
Ø, H, S	Trunk diameter, Height, Spread (canopy diameter)

NOTES

This Plan has been prepared from a combination of field survey and existing records for the purpose of showing the physical features of the land to assist in designing future development, and should not be used for any other purpose.

The title boundaries shown hereon have been reinstated as per Saunders Havill Identification survey plan IS339894. All other boundaries were not verified or marked at the time of survey, but were determined by existing title dimensions and occupation (where available), not by field measurement. As such, these dimensions could be out of date and incorrect by modern standards. This plan should not be used for building to boundary, or to prescribed set-backs, without further boundary survey.

Services shown hereon were located where possible by field survey. If not able to be so located, known services have been shown from the records of the relevant authorities or service providers where available and have been noted accordingly on this plan. All services shown from records only will need verification prior to, or during work on site.

Prior to any demolition, excavation or construction on site, the relevant authority should be contacted for:

* Verification of all services plotted from records only, and
* Possible location of any services altered since this survey was completed or any new services installed either on or adjacent to the site.

Before starting any demolition, excavation or construction on the site, the relevant person should make an independent and updated enquiry of "dial before you dig" and any relevant service providers to ascertain the existence of further services (if any) and the accurate location of those not able to have been surveyed at the time of preparing this plan.

* No responsibility can be accepted by Saunders Havill Group Pty Ltd, for any damage caused to any underground service or any loss or injury so suffered if enquiry and verification have not been completed in accordance with this note.

** This note is an integral part of this plan/data. Reproduction of this plan or any part of it without this note being included in full will render the information shown on such reproduction invalid and not suitable for use.

QUALITY LEVELS

This plan shows Quality classifications of sub surface utility data as per AS5488-2013. The following classifications apply.

Quality Level D - (least accurate level and if used on its own has a high risk of damage) QL-D information is generally obtained from existing records provided by utilities as a result of a Dial Before You Dig enquiry being lodged. In many cases the asset depicted on the plan is in a schematic format only and intended only to indicate its presence.

Quality Level C - (low accuracy and a high risk of damage) Is described as a surface feature correlation or an interpretation of the approximate location and attributes of a subsurface utility asset using a combination of existing records and site survey of visible evidence – for example you can see the pit lids shown on the plan but the actual position of underground connection between pits is still assumed.

Quality Level B - (significant risk reduction) Provides relative subsurface feature locations in three dimensions. The minimum requirement for QL-B is relative spatial position, this can be achieved via an electromagnetic frequency locating device. An electronic location provided by a DBYD Certified Locator to QL-B standard would have a maximum horizontal tolerance of plus or minus 300mm and a maximum vertical tolerance of plus or minus 500mm.

Quality Level A - (meets location accuracy standards for minimum risk when excavating) Is the highest Quality Level accuracy and consists of positive identification of the attribute and location of a subsurface utility at a point to an absolute spatial position in three dimensions. It is the only quality level that defines a subsurface utility as 'Validated'.

Saunders Havill
BOWEN HILLS | SPRINGFIELD
1300 123 744 | mail@saundershavill.com

N

ISSUES				
NO.	DRAWN	DATE	DESCRIPTION	CHECKED
A	MD	24/10/2025	ORIGINAL ISSUE	JL

LOT DESCRIPTION
LOT 182 ON RP156422

LOCALITY:
UPPER COOMERA
LOCAL GOVERNMENT:
GOLD COAST CITY

SURVEYED	DATE
BC	SEP / OCT 2025

LEVEL DATUM: AHD Der.
ORIGIN OF LEVELS: PM 27784
RL OF ORIGIN: 6.614
CONTOUR INTERVAL: 0.20m

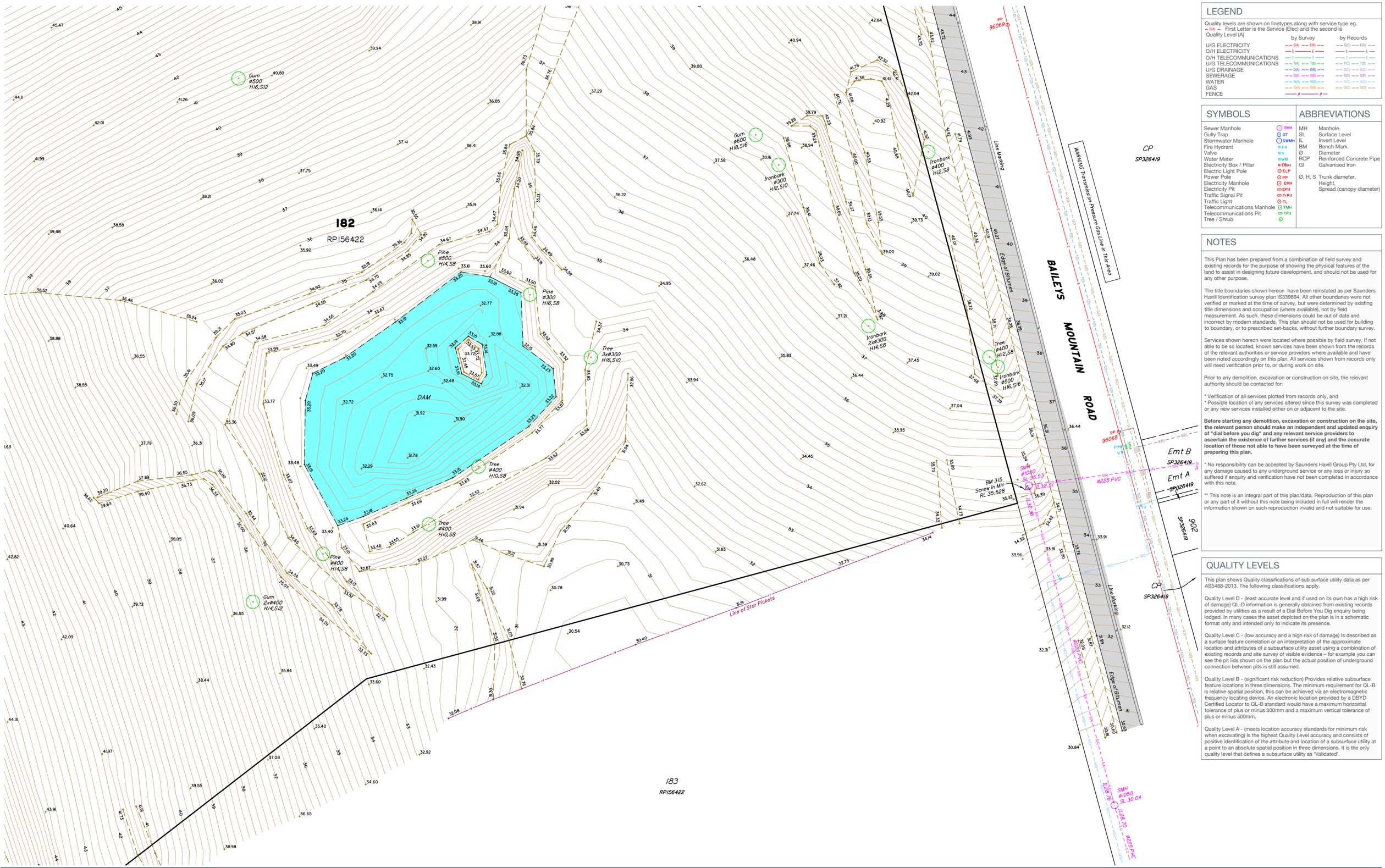
CLIENT
KASA GROUP HOLDINGS PTY LTD

SCALE
1:250@A1
1:500@A3
0 2.5 5 12.5m

PROJECT
17 COURTNEY DRIVE, COOMERA

DRAWING TITLE
DETAIL PLAN
(SHEET 4 of 5)

DRAWING NO.
12753 S 01 DT A



LEGEND

Quality levels are shown on linetypes along with service type eg. — E(A) — First Letter is the Service (Elec) and the second is Quality Level (A)

	by Survey	by Records
U/G ELECTRICITY	E(A) E(B)	E(C) E(D)
O/H ELECTRICITY	E E	E E
O/H TELECOMMUNICATIONS	T T	T T
U/G TELECOMMUNICATIONS	T(A) T(B)	T(C) T(D)
U/G DRAINAGE	D(A) D(B)	D(C) D(D)
SEWERAGE	S(A) S(B)	S(C) S(D)
WATER	W(A) W(B)	W(C) W(D)
GAS	G(A) G(B)	G(C) G(D)
FENCE	// //	

SYMBOLS

Sewer Manhole	SMH
Gully Trap	GT
Stormwater Manhole	SWMH
Fire Hydrant	FH
Valve	V
Water Meter	WM
Electricity Box / Pillar	EBox
Electric Light Pole	ELP
Power Pole	PP
Electricity Manhole	EMH
Electricity Pit	EPit
Traffic Signal Pit	TrPit
Traffic Light	TL
Telecommunications Manhole	TMH
Telecommunications Pit	TPit
Tree / Shrub	

ABBREVIATIONS

MH	Manhole
SL	Surface Level
IL	Invert Level
BM	Bench Mark
Ø	Diameter
RCP	Reinforced Concrete Pipe
GI	Galvanised Iron
Ø, H, S	Trunk diameter, Height, Spread (canopy diameter)

NOTES

This Plan has been prepared from a combination of field survey and existing records for the purpose of showing the physical features of the land to assist in designing future development, and should not be used for any other purpose.

The title boundaries shown hereon have been reinstated as per Saunders Havill Identification survey plan IS339894. All other boundaries were not verified or marked at the time of survey, but were determined by existing title dimensions and occupation (where available), not by field measurement. As such, these dimensions could be out of date and incorrect by modern standards. This plan should not be used for building to boundary, or to prescribed set-backs, without further boundary survey.

Services shown hereon were located where possible by field survey. If not able to be so located, known services have been shown from the records of the relevant authorities or service providers where available and have been noted accordingly on this plan. All services shown from records only will need verification prior to, or during work on site.

Prior to any demolition, excavation or construction on site, the relevant authority should be contacted for:

* Verification of all services plotted from records only, and
* Possible location of any services altered since this survey was completed or any new services installed either on or adjacent to the site.

Before starting any demolition, excavation or construction on the site, the relevant person should make an independent and updated enquiry of "dial before you dig" and any relevant service providers to ascertain the existence of further services (if any) and the accurate location of those not able to have been surveyed at the time of preparing this plan.

* No responsibility can be accepted by Saunders Havill Group Pty Ltd, for any damage caused to any underground service or any loss or injury so suffered if enquiry and verification have not been completed in accordance with this note.

** This note is an integral part of this plan/data. Reproduction of this plan or any part of it without this note being included in full will render the information shown on such reproduction invalid and not suitable for use.

QUALITY LEVELS

This plan shows Quality classifications of sub surface utility data as per AS5488-2013. The following classifications apply.

Quality Level D - (least accurate level and if used on its own has a high risk of damage) QL-D information is generally obtained from existing records provided by utilities as a result of a Dial Before You Dig enquiry being lodged. In many cases the asset depicted on the plan is in a schematic format only and intended only to indicate its presence.

Quality Level C - (low accuracy and a high risk of damage) Is described as a surface feature correlation or an interpretation of the approximate location and attributes of a subsurface utility asset using a combination of existing records and site survey of visible evidence – for example you can see the pit lids shown on the plan but the actual position of underground connection between pits is still assumed.

Quality Level B - (significant risk reduction) Provides relative subsurface feature locations in three dimensions. The minimum requirement for QL-B is relative spatial position, this can be achieved via an electromagnetic frequency locating device. An electronic location provided by a DBYD Certified Locator to QL-B standard would have a maximum horizontal tolerance of plus or minus 300mm and a maximum vertical tolerance of plus or minus 500mm.

Quality Level A - (meets location accuracy standards for minimum risk when excavating) Is the highest Quality Level accuracy and consists of positive identification of the attribute and location of a subsurface utility at a point to an absolute spatial position in three dimensions. It is the only quality level that defines a subsurface utility as 'Validated'.

Saunders Havill
BOWEN HILLS | SPRINGFIELD
1300 123 744 | mail@saundershavill.com

N

ISSUES

NO.	DRAWN	DATE	DESCRIPTION	CHECKED
A	MD	24/10/2025	ORIGINAL ISSUE	JL

LOT DESCRIPTION
LOT 182 ON RP156422

LOCALITY:
UPPER COOMERA
LOCAL GOVERNMENT:
GOLD COAST CITY

SURVEYED	DATE
BC	SEP / OCT 2025

LEVEL DATUM: AHD Der.
ORIGIN OF LEVELS: PM 27784
RL OF ORIGIN: 6.614
CONTOUR INTERVAL: 0.20m

CLIENT
KASA GROUP HOLDINGS PTY LTD

SCALE
1:250@A1
1:500@A3
0 2.5 5 12.5m

PROJECT
17 COURTNEY DRIVE, COOMERA

DRAWING TITLE
DETAIL PLAN
(SHEET 5 of 5)

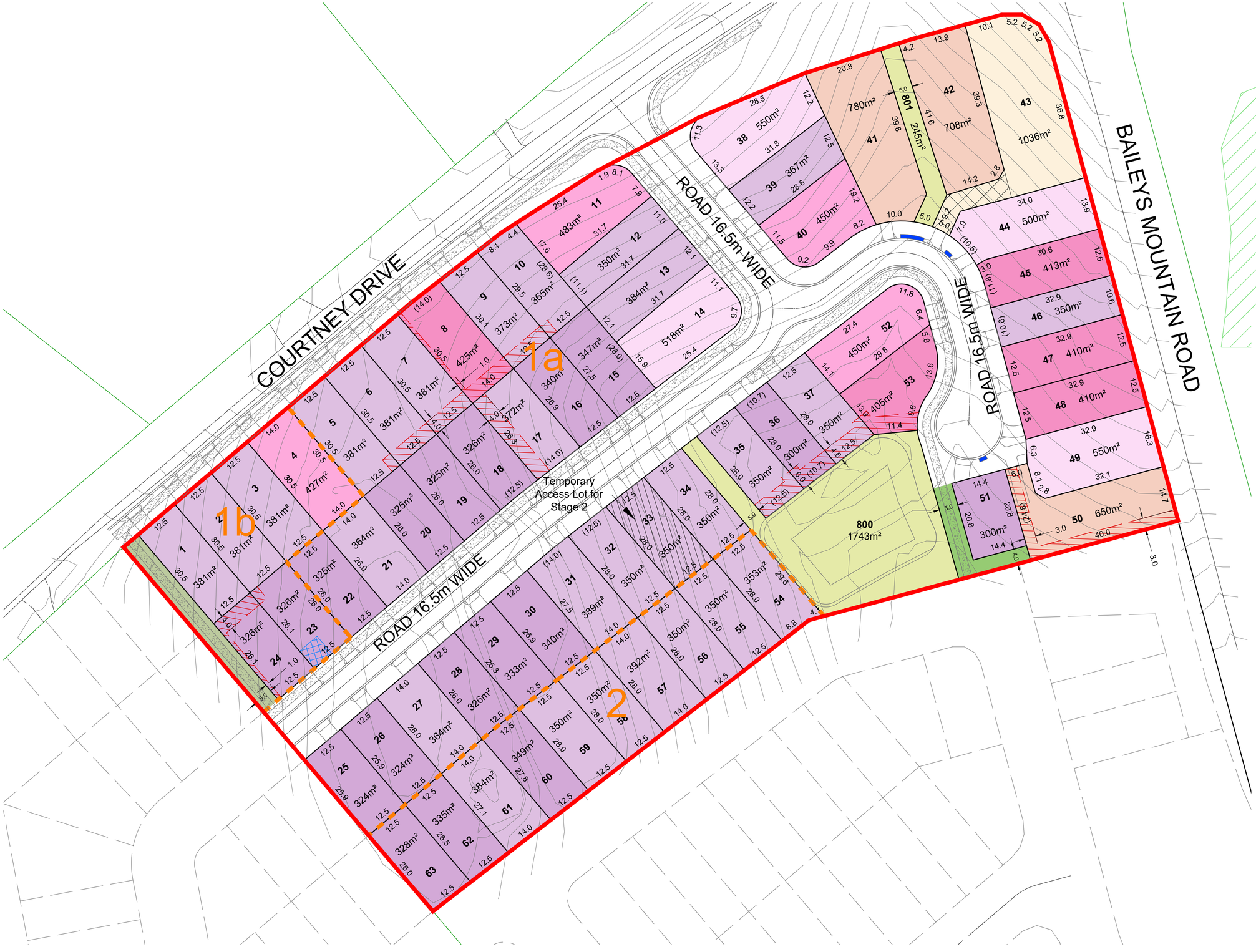
DRAWING NO.
12753 S 01 DT A

APPENDIX

B

Saunders Havill, Concept Plan (Ref: 13087 P 01)

PROPOSAL PLAN



NOTES:
General

1. Stage 1b - will proceed once sewerage is available via the adjacent development.
2. Stage 2 - will proceed only after roadworks and servicing from the adjacent development has been delivered.
3. Lot 23 - the proposed temporary turnaround easement can be extinguished once the new road connects with the new road in the adjacent development.
4. Lot 33 - is intended to provide the interim access arrangement for the stormwater basin maintenance track and will only be released as a house lot once Stage 2 (and the ultimate maintenance track) is available.

LEGEND

- Site Boundary
- Contour (1.0m interval)
- Proposed Temporary Turnaround
- Proposed Temporary Easement
- Proposed Access Easement
- Proposed Easement for Drainage & Services purposes
- Stage Boundary
- 1 Stage Number
- Bin Pad Location
- Proposed 2.0m Footpath

DEVELOPMENT STATISTICS - Overall			
RESIDENTIAL ALLOTMENTS	**No. Lots**	**%**	**Net Area**
300m² - < 350m²	18	28.6%	0.589 ha
350m² - < 400m²	28	44.4%	1.024 ha
400m² - < 450m²	6	9.5%	0.424 ha
450m² - < 500m²	3	4.8%	0.138 ha
500m² - < 600m²	4	6.3%	0.212 ha
600m² - < 1000m²	3	4.8%	0.213 ha
> 1000m²	1	1.6%	0.104 ha
Total Residential Allotments	**63**	**100.0%**	**2.704 ha**

Land Budget	**Area (Ha)**	**%**	
Area of Subject Site / Stage	3.341 ha		
Net Residential Area (no roads)	2.704 ha	80.9%	
Detention / Drainage	0.199 ha	6.0%	
Open Space	0.018 ha	0.5%	
Open Space Linkage	0.029 ha	0.9%	
Road Areas	0.391 ha	11.7%	
Total	**3.341 ha**	**100.0%**	

SCALE @A1 1:500 @A3 1:1000 - LENGTHS ARE IN METRES

5 0 5 10 15 20 25 30 35 40 45 50 55 60

Saunders Havill
BOWEN HILLS | SPRINGFIELD
1300 123 744 saundershavill.com

DISCLAIMER
THIS PLAN WAS PREPARED AS A CONCEPTUAL LAYOUT ONLY. IT IS NOT SUITABLE FOR ANY OTHER PURPOSE. PROPERTY DIMENSIONS, AREAS, LOT NUMBERS, AND OTHER FEATURES ARE BASED ON EXISTING INFORMATION AND MAY NOT HAVE BEEN VERIFIED BY SURVEY. THESE DETAILS MAY CHANGE SUBJECT TO DEVELOPMENT APPROVAL OR FURTHER DESIGN. PAVEMENT AND CENTRELINES SHOWN ARE INDICATIVE ONLY AND ARE SUBJECT TO ENGINEERING DESIGN. THE DESIGNS DOCUMENTED HEREIN REMAIN THE PROPERTY OF SAUNDERS HAVILL GROUP AND MUST NOT BE REPRODUCED OR USED IN WHOLE OR PART WITHOUT WRITTEN PERMISSION. SAUNDERS HAVILL GROUP ACCEPTS NO RESPONSIBILITY FOR ANY USE OR RELIANCE BY THIRD PARTIES. REPRODUCTION WITHOUT THIS NOTE IN FULL RENDERS THE INFORMATION INVALID.

SOURCE
PROJECTION: SURVEY COORDINATES AS PER SAUNDERS HAVILL DWG No. S01 DT A DATED 24/10/2025
CONTOURS: AS PER SAUNDERS HAVILL DWG No. S01 DT A DATED 24/10/2025

N

CLIENT
COURTNEY UPPER COOMER DEVELOPMENTS PTY LTD

SITE ADDRESS
17 COURTNEY DRIVE, UPPER COOMERA

RP DESCRIPTION
LOT 182 ON RP156422

DRAWN
KA

DATE
26/08/2026

DRAWING NO.
13087 P 01 Rev E - PRO 01

STAGING PLAN - STAGE 1a



NOTES:
General

1. Stage 1b - will proceed once sewerage is available via the adjacent development.
2. Stage 2 - will proceed only after roadworks and servicing from the adjacent development has been delivered.
3. Lot 23 - the proposed temporary turnaround easement can be extinguished once the new road connects with the new road in the adjacent development.
4. Lot 33 - is intended to provide the interim access arrangement for the stormwater basin maintenance track and will only be released as a house lot once Stage 2 (and the ultimate maintenance track) is available.

LEGEND

- Site Boundary
- Contour (1.0m interval)
- Proposed Temporary Easement
- Proposed Access Easement
- Proposed Easement for Drainage & Services purposes
- Stage Boundary
- 1 Stage Number
- Bin Pad Location
- Proposed 2.0m Footpath

DEVELOPMENT STATISTICS - Stage 1a			
RESIDENTIAL ALLOTMENTS	**No. Lots**	**%**	**Net Area**
300m² - < 350m²	13	27.7%	0.423 ha
350m² - < 400m²	18	38.3%	0.657 ha
400m² - < 450m²	5	10.6%	0.381 ha
450m² - < 500m²	3	6.4%	0.138 ha
500m² - < 600m²	4	8.5%	0.212 ha
600m² - < 1000m²	3	6.4%	0.213 ha
> 1000m²	1	2.1%	0.104 ha
Total Residential Allotments	**47**	**100.0%**	**2.128 ha**
Land Budget	**Area (Ha)**	**%**	
Area of Subject Site / Stage	**2.736 ha**		
Net Residential Area (no roads)	2.128 ha	77.8%	
Detention / Drainage	0.199 ha	7.3%	
Open Space	0.018 ha	0.7%	
Road Areas	0.391 ha	14.3%	
Total	**2.736 ha**	**100.0%**	

SCALE @A1 1:500 @A3 1:1000 - LENGTHS ARE IN METRES

5 0 5 10 15 20 25 30 35 40 45 50 55 60

Saunders Havill
BOWEN HILLS | SPRINGFIELD
1300 123 744 saundershavill.com

DISCLAIMER
THIS PLAN WAS PREPARED AS A CONCEPTUAL LAYOUT ONLY. IT IS NOT SUITABLE FOR ANY OTHER PURPOSE. PROPERTY DIMENSIONS, AREAS, LOT NUMBERS, AND OTHER FEATURES ARE BASED ON EXISTING INFORMATION AND MAY NOT HAVE BEEN VERIFIED BY SURVEY. THESE DETAILS MAY CHANGE SUBJECT TO DEVELOPMENT APPROVAL OR FURTHER DESIGN. PAVEMENT AND CENTRELINES SHOWN ARE INDICATIVE ONLY AND ARE SUBJECT TO ENGINEERING DESIGN. THE DESIGNS DOCUMENTED HEREIN REMAIN THE PROPERTY OF SAUNDERS HAVILL GROUP AND MUST NOT BE REPRODUCED OR USED IN WHOLE OR PART WITHOUT WRITTEN PERMISSION. SAUNDERS HAVILL GROUP ACCEPTS NO RESPONSIBILITY FOR ANY USE OR RELIANCE BY THIRD PARTIES. REPRODUCTION WITHOUT THIS NOTE IN FULL RENDERS THE INFORMATION INVALID.

SOURCE
PROJECTION: SURVEY COORDINATES AS PER SAUNDERS HAVILL DWG No. S01 DT A DATED 24/10/2025
CONTOURS: AS PER SAUNDERS HAVILL DWG No. S01 DT A DATED 24/10/2025

N

CLIENT
COURTNEY UPPER COOMER DEVELOPMENTS PTY LTD

SITE ADDRESS
17 COURTNEY DRIVE, UPPER COOMERA

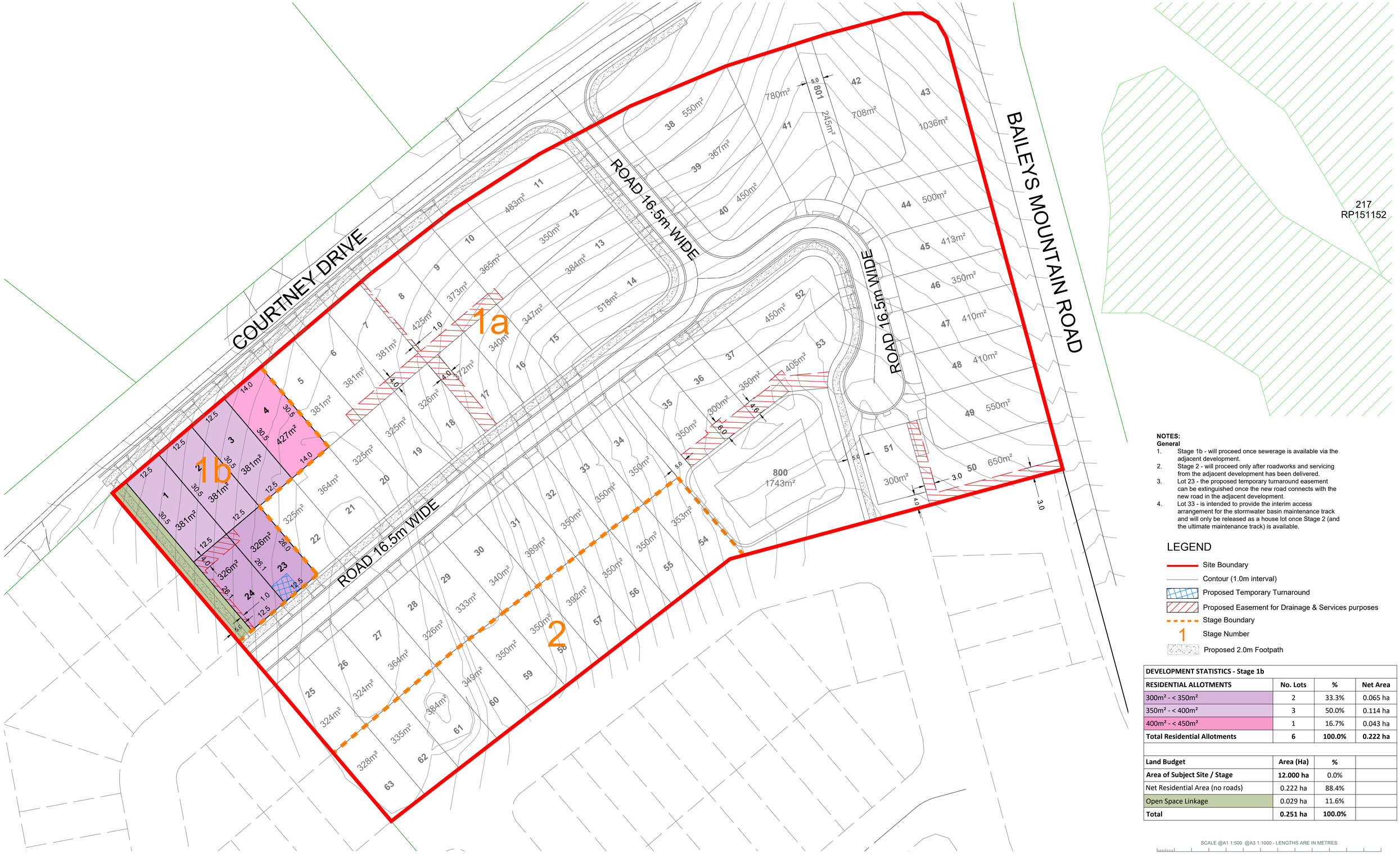
RP DESCRIPTION
LOT 182 ON RP156422

DRAWN
KA

DATE
26/08/2026

DRAWING NO.
13087 P 01 Rev E - STG 1a

STAGING PLAN - STAGE 1b



NOTES:
General

1. Stage 1b - will proceed once sewerage is available via the adjacent development.
2. Stage 2 - will proceed only after roadworks and servicing from the adjacent development has been delivered.
3. Lot 23 - the proposed temporary turnaround easement can be extinguished once the new road connects with the new road in the adjacent development.
4. Lot 33 - is intended to provide the interim access arrangement for the stormwater basin maintenance track and will only be released as a house lot once Stage 2 (and the ultimate maintenance track) is available.

LEGEND

- Site Boundary
- Contour (1.0m interval)
- Proposed Temporary Turnaround
- Proposed Easement for Drainage & Services purposes
- Stage Boundary
- 1 Stage Number
- Proposed 2.0m Footpath

DEVELOPMENT STATISTICS - Stage 1b			
RESIDENTIAL ALLOTMENTS	**No. Lots**	**%**	**Net Area**
300m² - < 350m²	2	33.3%	0.065 ha
350m² - < 400m²	3	50.0%	0.114 ha
400m² - < 450m²	1	16.7%	0.043 ha
Total Residential Allotments	**6**	**100.0%**	**0.222 ha**
Land Budget	**Area (Ha)**	**%**	
Area of Subject Site / Stage	**12.000 ha**	0.0%	
Net Residential Area (no roads)	0.222 ha	88.4%	
Open Space Linkage	0.029 ha	11.6%	
Total	**0.251 ha**	**100.0%**	

SCALE @A1 1:500 @A3 1:1000 - LENGTHS ARE IN METRES

5 0 5 10 15 20 25 30 35 40 45 50 55 60

Saunders Havill
BOWEN HILLS | SPRINGFIELD
1300 123 744 saundershavill.com

DISCLAIMER
THIS PLAN WAS PREPARED AS A CONCEPTUAL LAYOUT ONLY. IT IS NOT SUITABLE FOR ANY OTHER PURPOSE. PROPERTY DIMENSIONS, AREAS, LOT NUMBERS, AND OTHER FEATURES ARE BASED ON EXISTING INFORMATION AND MAY NOT HAVE BEEN VERIFIED BY SURVEY. THESE DETAILS MAY CHANGE SUBJECT TO DEVELOPMENT APPROVAL OR FURTHER DESIGN. PAVEMENT AND CENTRELINES SHOWN ARE INDICATIVE ONLY AND ARE SUBJECT TO ENGINEERING DESIGN. THE DESIGNS DOCUMENTED HEREIN REMAIN THE PROPERTY OF SAUNDERS HAVILL GROUP AND MUST NOT BE REPRODUCED OR USED IN WHOLE OR PART WITHOUT WRITTEN PERMISSION. SAUNDERS HAVILL GROUP ACCEPTS NO RESPONSIBILITY FOR ANY USE OR RELIANCE BY THIRD PARTIES. REPRODUCTION WITHOUT THIS NOTE IN FULL RENDERS THE INFORMATION INVALID.

SOURCE
PROJECTION: SURVEY COORDINATES AS PER SAUNDERS HAVILL DWG No. S01 DT A DATED 24/10/2025
CONTOURS: AS PER SAUNDERS HAVILL DWG No. S01 DT A DATED 24/10/2025

N

CLIENT
COURTNEY UPPER COOMER DEVELOPMENTS PTY LTD

SITE ADDRESS
17 COURTNEY DRIVE, UPPER COOMERA

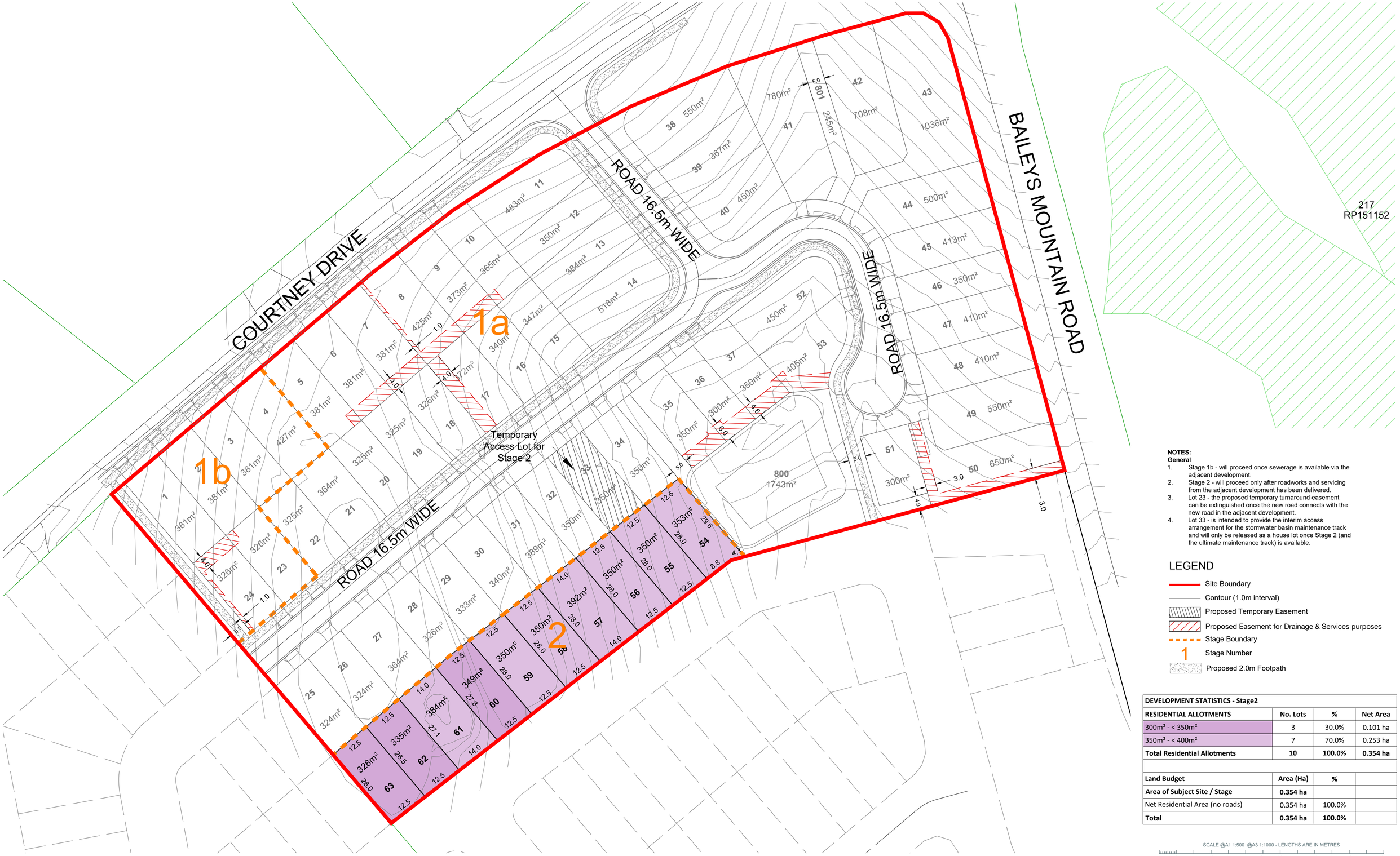
RP DESCRIPTION
LOT 182 ON RP156422

DRAWN
KA

DATE
26/08/2026

DRAWING NO.
13087 P 01 Rev E - STG 1b

STAGING PLAN - STAGE 2



NOTES:
General

1. Stage 1b - will proceed once sewerage is available via the adjacent development.
2. Stage 2 - will proceed only after roadworks and servicing from the adjacent development has been delivered.
3. Lot 23 - the proposed temporary turnaround easement can be extinguished once the new road connects with the new road in the adjacent development.
4. Lot 33 - is intended to provide the interim access arrangement for the stormwater basin maintenance track and will only be released as a house lot once Stage 2 (and the ultimate maintenance track) is available.

LEGEND

- Site Boundary
- Contour (1.0m interval)
- Proposed Temporary Easement
- Proposed Easement for Drainage & Services purposes
- Stage Boundary
- 1 Stage Number
- Proposed 2.0m Footpath

DEVELOPMENT STATISTICS - Stage2			
RESIDENTIAL ALLOTMENTS	**No. Lots**	**%**	**Net Area**
300m² - < 350m²	3	30.0%	0.101 ha
350m² - < 400m²	7	70.0%	0.253 ha
Total Residential Allotments	**10**	**100.0%**	**0.354 ha**
Land Budget	**Area (Ha)**	**%**	
Area of Subject Site / Stage	**0.354 ha**		
Net Residential Area (no roads)	0.354 ha	100.0%	
Total	**0.354 ha**	**100.0%**	

SCALE @A1 1:500 @A3 1:1000 - LENGTHS ARE IN METRES

5 0 5 10 15 20 25 30 35 40 45 50 55 60

Saunders Havill
BOWEN HILLS | SPRINGFIELD
1300 123 744 saundershavill.com

DISCLAIMER
THIS PLAN WAS PREPARED AS A CONCEPTUAL LAYOUT ONLY. IT IS NOT SUITABLE FOR ANY OTHER PURPOSE. PROPERTY DIMENSIONS, AREAS, LOT NUMBERS, AND OTHER FEATURES ARE BASED ON EXISTING INFORMATION AND MAY NOT HAVE BEEN VERIFIED BY SURVEY. THESE DETAILS MAY CHANGE SUBJECT TO DEVELOPMENT APPROVAL OR FURTHER DESIGN. PAVEMENT AND CENTRELINES SHOWN ARE INDICATIVE ONLY AND ARE SUBJECT TO ENGINEERING DESIGN. THE DESIGNS DOCUMENTED HEREIN REMAIN THE PROPERTY OF SAUNDERS HAVILL GROUP AND MUST NOT BE REPRODUCED OR USED IN WHOLE OR PART WITHOUT WRITTEN PERMISSION. SAUNDERS HAVILL GROUP ACCEPTS NO RESPONSIBILITY FOR ANY USE OR RELIANCE BY THIRD PARTIES. REPRODUCTION WITHOUT THIS NOTE IN FULL RENDERS THE INFORMATION INVALID.

SOURCE
PROJECTION: SURVEY COORDINATES AS PER SAUNDERS HAVILL DWG No. S01 DT A DATED 24/10/2025
CONTOURS: AS PER SAUNDERS HAVILL DWG No. S01 DT A DATED 24/10/2025

N

CLIENT
COURTNEY UPPER COOMER DEVELOPMENTS PTY LTD

SITE ADDRESS
17 COURTNEY DRIVE, UPPER COOMERA

RP DESCRIPTION
LOT 182 ON RP156422

DRAWN
KA

DATE
26/08/2026

DRAWING NO.
13087 P 01 Rev E - STG 2

APPENDIX

C

OSKA Consulting Group, Pre-Development Catchment Plan (Ref: OSK7105/P001/1)

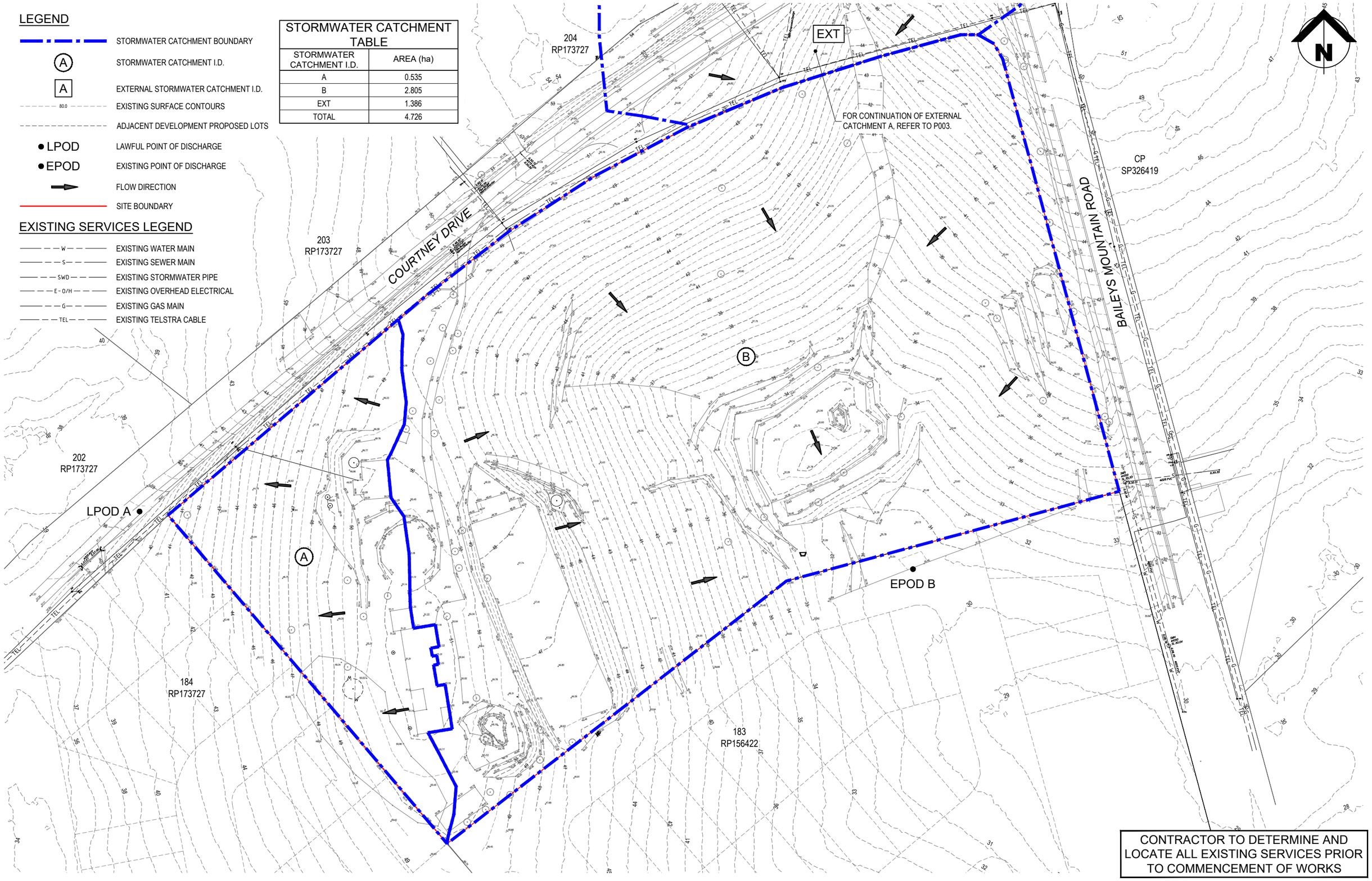
LEGEND

- STORMWATER CATCHMENT BOUNDARY
- (A) STORMWATER CATCHMENT I.D.
- [A] EXTERNAL STORMWATER CATCHMENT I.D.
- 80.0 EXISTING SURFACE CONTOURS
- ADJACENT DEVELOPMENT PROPOSED LOTS
- ● LPOD LAWFUL POINT OF DISCHARGE
- ● EPOD EXISTING POINT OF DISCHARGE
- FLOW DIRECTION
- SITE BOUNDARY

EXISTING SERVICES LEGEND

- W EXISTING WATER MAIN
- S EXISTING SEWER MAIN
- SWD EXISTING STORMWATER PIPE
- E-O/H EXISTING OVERHEAD ELECTRICAL
- G EXISTING GAS MAIN
- TEL EXISTING TELSTRA CABLE

STORMWATER CATCHMENT TABLE	
STORMWATER CATCHMENT I.D.	AREA (ha)
A	0.535
B	2.805
EXT	1.386
TOTAL	4.726



CONTRACTOR TO DETERMINE AND LOCATE ALL EXISTING SERVICES PRIOR TO COMMENCEMENT OF WORKS

REV	DESCRIPTION	DRAWN	DATE
1	ISSUED FOR INFORMATION	M.S.	27-03-26
0	ISSUED FOR INFORMATION	M.S.	02-12-25

DRAWN M.S. | DESIGN B.G. | APPROVED T.W.

SIGNED

DATE

OSKA CONSULTING GROUP

THIS DESIGN AND PLAN IS COPYRIGHT AND IS NOT TO BE USED OR REPRODUCED WHOLLY OR IN PART OR TO BE USED ON ANY PROJECT WITHOUT THE WRITTEN PERMISSION OF OSKA CONSULTING GROUP

DRAWING IS NOT TO BE SCALED

SCALE

1:500 AT A1 | 1:1000 AT A3 — 0 — 10 — 20m

CLIENT

COURTNEY UPPER COOMERA DEVELOPMENTS PTY LTD

PROJECT

PROPOSED RESIDENTIAL SUBDIVISION
17 COURTNEY DRIVE
UPPER COOMERA 4209 QLD

STAGE / PHASE

FOR INFORMATION ONLY NOT FOR CONSTRUCTION

TITLE

PRE-DEVELOPMENT CATCHMENT PLAN

DRAWING NUMBER: OSK7105-P001

REVISION: 1

OSK105-7105-P001-Pre-Dev Catchment Plan.dwg

APPENDIX

D

OSKA Consulting Group, Post-Development Catchment Plan (Ref: OSK7105/P002/3) & External Catchment Plan (Ref: OSK7105/P003/3)

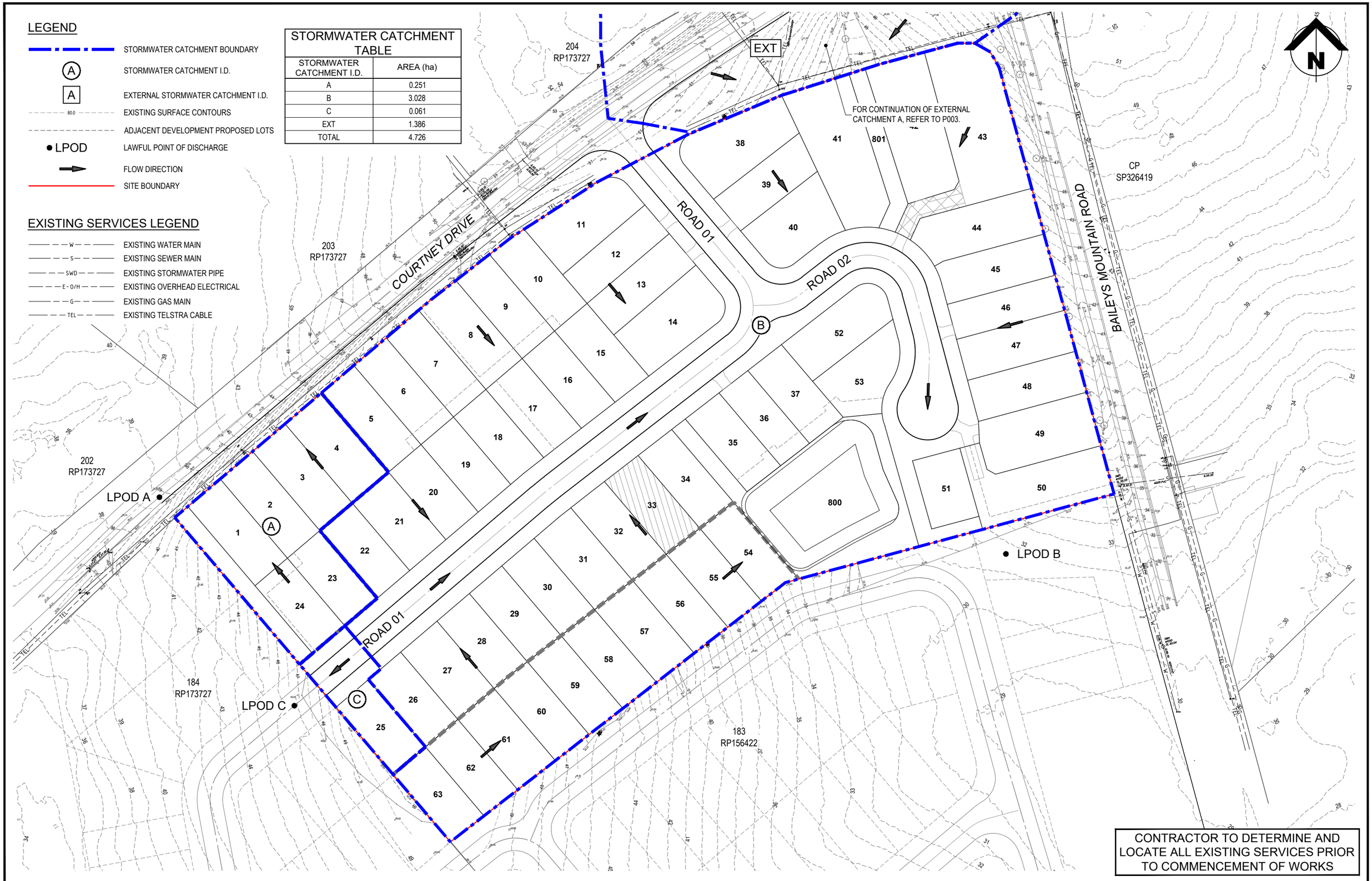
LEGEND

- STORMWATER CATCHMENT BOUNDARY
- (A) STORMWATER CATCHMENT I.D.
- [A] EXTERNAL STORMWATER CATCHMENT I.D.
- 80.0 EXISTING SURFACE CONTOURS
- ADJACENT DEVELOPMENT PROPOSED LOTS
- ● LPOD LAWFUL POINT OF DISCHARGE
- FLOW DIRECTION
- SITE BOUNDARY

EXISTING SERVICES LEGEND

- W EXISTING WATER MAIN
- S EXISTING SEWER MAIN
- SWD EXISTING STORMWATER PIPE
- E-O/H EXISTING OVERHEAD ELECTRICAL
- G EXISTING GAS MAIN
- TEL EXISTING TELSTRA CABLE

STORMWATER CATCHMENT TABLE	
STORMWATER CATCHMENT I.D.	AREA (ha)
A	0.251
B	3.028
C	0.061
EXT	1.386
TOTAL	4.726



CONTRACTOR TO DETERMINE AND LOCATE ALL EXISTING SERVICES PRIOR TO COMMENCEMENT OF WORKS

REV	DESCRIPTION	DRAWN	DATE
3	ISSUED FOR REPORT	B.G.	03-09-26
2	ISSUED FOR INFORMATION	M.S.	27-03-26
1	ISSUED FOR INFORMATION	R.B.	23-01-26
0	ISSUED FOR INFORMATION	M.S.	02-12-25

DRAWN M.S. | DESIGN B.G. | APPROVED T.W.

SIGNED

DATE

OSKA CONSULTING GROUP

THIS DESIGN AND PLAN IS COPYRIGHT AND IS NOT TO BE USED OR REPRODUCED WHOLLY OR IN PART OR TO BE USED ON ANY PROJECT WITHOUT THE WRITTEN PERMISSION OF OSKA CONSULTING GROUP

DRAWING IS NOT TO BE SCALED

SCALE

1:500 AT A1 | 1:1000 AT A3 | 0 | 10 | 20m

CLIENT

COURTNEY UPPER COOMERA DEVELOPMENTS PTY LTD

PROJECT

PROPOSED RESIDENTIAL SUBDIVISION
17 COURTNEY DRIVE
UPPER COOMERA 4209 QLD

TITLE

POST-DEVELOPMENT CATCHMENT PLAN

STAGE / PHASE

FOR INFORMATION ONLY NOT FOR CONSTRUCTION

DRAWING NUMBER: OSK7105-P002

REVISION: 3

OSK105-7105-P002-3 Upper Coomera

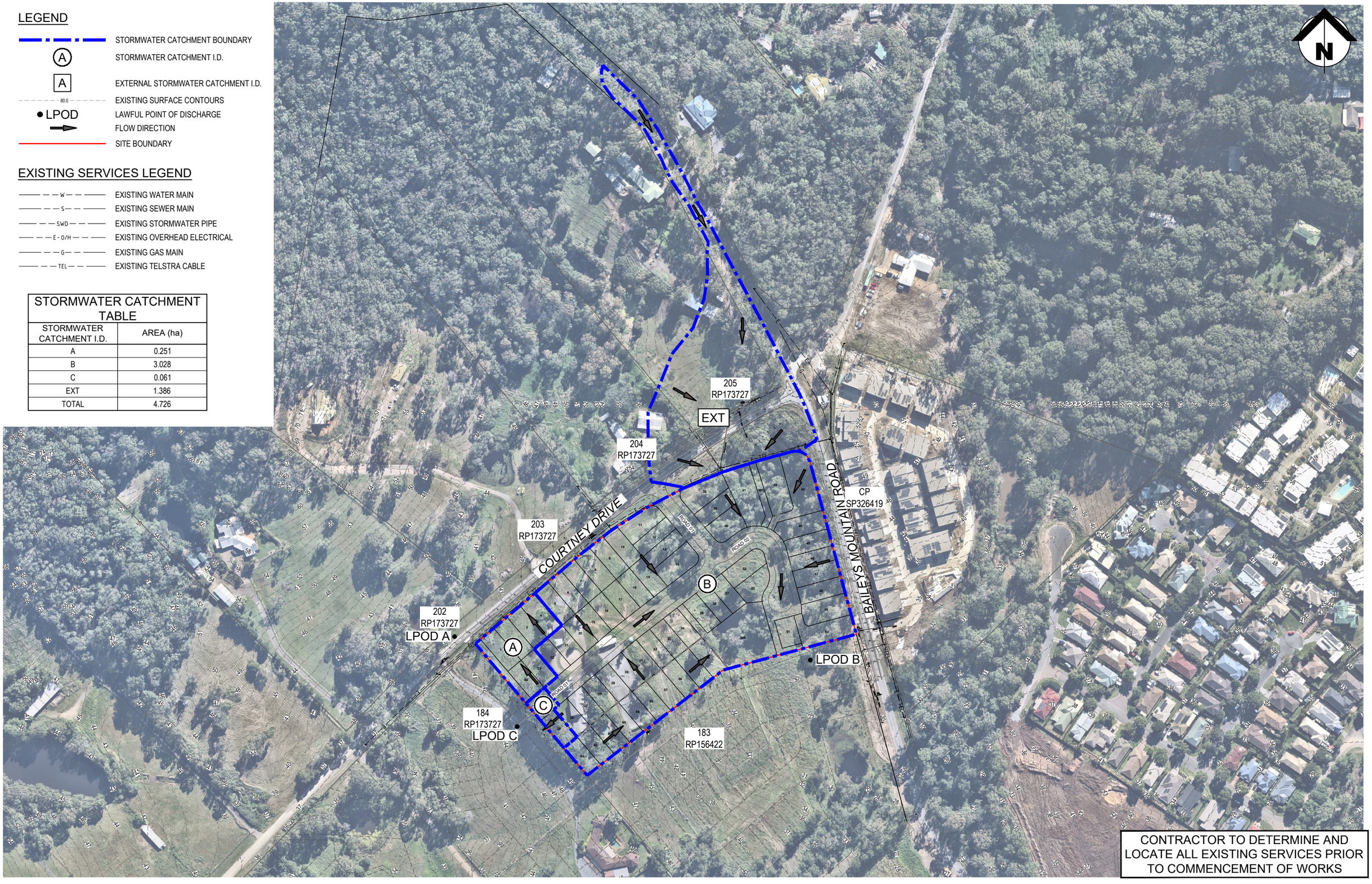
LEGEND

- STORMWATER CATCHMENT BOUNDARY
- (A) STORMWATER CATCHMENT I.D.
- [A] EXTERNAL STORMWATER CATCHMENT I.D.
- 80.0 EXISTING SURFACE CONTOURS
- ● LPOD LAWFUL POINT OF DISCHARGE
- FLOW DIRECTION
- SITE BOUNDARY

EXISTING SERVICES LEGEND

- W EXISTING WATER MAIN
- S EXISTING SEWER MAIN
- SWD EXISTING STORMWATER PIPE
- E-O/H EXISTING OVERHEAD ELECTRICAL
- G EXISTING GAS MAIN
- TEL EXISTING TELSTRA CABLE

STORMWATER CATCHMENT TABLE	
STORMWATER CATCHMENT I.D.	AREA (ha)
A	0.251
B	3.028
C	0.061
EXT	1.386
TOTAL	4.726



CONTRACTOR TO DETERMINE AND LOCATE ALL EXISTING SERVICES PRIOR TO COMMENCEMENT OF WORKS

REV	DESCRIPTION	DRAWN	DATE
3	ISSUED FOR REPORT	B.G.	03-09-26
2	ISSUED FOR INFORMATION	M.S.	27-03-26
1	ISSUED FOR INFORMATION	R.B.	23-01-26
0	ISSUED FOR INFORMATION	M.S.	02-12-25

DRAWN M.S. | DESIGN B.G. | APPROVED T.W.

SIGNED

DATE

OSKA CONSULTING GROUP

THIS DESIGN AND PLAN IS COPYRIGHT AND IS NOT TO BE USED OR REPRODUCED WHOLLY OR IN PART OR TO BE USED ON ANY PROJECT WITHOUT THE WRITTEN PERMISSION OF OSKA CONSULTING GROUP

DRAWING IS NOT TO BE SCALED

SCALE

1:1250 AT A1
1:2500 AT A3
0 25 50m

CLIENT

COURTNEY UPPER COOMERA DEVELOPMENTS PTY LTD

PROJECT

PROPOSED RESIDENTIAL SUBDIVISION
17 COURTNEY DRIVE
UPPER COOMERA 4209 QLD

STAGE / PHASE

FOR INFORMATION ONLY NOT FOR CONSTRUCTION

TITLE

EXTERNAL CATCHMENT PLAN

DRAWING NUMBER

OSK7105-P003

REVISION

3

OSK7105-P003 Rev 3 Sheet 1 of 1.pdf

APPENDIX

E

OSKA Consulting Group, Conceptual Stormwater Management Plan (Ref: OSK7105/P004/3) & Conceptual Stormwater Management Details (Ref: OSK7105/P005/2)

202
RP173727

203
RP173727

204
RP173727

205
RP173727

COURTNEY DRIVE

STAGE 1b

STAGE 1a

STAGE 2

ROAD 01

ROAD 02

ROAD 03

184
RP173727

183
RP156422

CP
SP326419

BAILEYS MOUNTAIN ROAD

RAISED KERB OR SIMILAR TO BE CONSTRUCTED AT THE END OF ROAD 01 TO PROMOTE SHEET FLOW ONTO ADJOINING PROPERTY. RAISED KERB TO BE REMOVED ONCE DEVELOPMENT ON ADJOINING PROPERTY OCCURS.

LOT 33 TO BE WITHHELD UNTIL STAGE 2 TO ALLOW FOR TEMPORARY BASIN ACCESS IF REQUIRED

PROPOSED TEMPORARY BASIN ACCESS TRACK

RETAINING WALL NOT TO BE CONSTRUCTED UNTIL STAGE 2 TO ALLOW FOR TEMPORARY BASIN ACCESS IF REQUIRED

PROPOSED ULTIMATE BASIN ACCESS

PROPOSED SEDIMENT FOREBAY

PROPOSED Ø600mm PIPE AT MINIMUM 1.15% GRADE TO CONVEY EXTERNAL CATCHMENT FLOWS UP TO 1% AEP (SIZE TO BE CONFIRMED IN DETAILED DESIGN)

PROPOSED INLET PIT/S TO CAPTURE EXTERNAL CATCHMENT FLOWS UP TO THE 1% AEP

PROPOSED EMERGENCY OVERLAND FLOW CHANNEL TO CONVEY EXTERNAL CATCHMENT 1% AEP FLOWS IN THE EVENT OF BLOCKAGE. REFER P005 FOR DETAILS

10m WEIR AT 0.77m ABOVE DETENTION INVERT. FINAL LOCATION AND DISCHARGE POINT TO BE CONFIRMED IN DETAILED DESIGN

2 x Ø375mm OUTLET PIPES AT 1.50% GRADE AT 0.35m ABOVE DETENTION INVERT

Ø375mm OUTLET PIPE AT 0.90% GRADE

BIO-RETENTION & DETENTION BASIN B:	
FILTER AREA:	472m²
SURFACE AREA:	513m²
DETENTION BASE AREA:	619m²
DETENTION TOP AREA:	1,191m²
BASIN FLOOR IL:	31.95m AHD
TOP OF BASIN:	33.40m AHD

LEGEND

- STORMWATER CATCHMENT BOUNDARY
- 80.0 EXISTING SURFACE CONTOURS
- LPOD LAWFUL POINT OF DISCHARGE
- SWD PROPOSED STORMWATER DRAINAGE
- SWD PROPOSED STORMWATER MAIN (CONSTRUCTED BY OTHERS)
- PROPOSED SWALE
- FLOW DIRECTION
- SITE BOUNDARY
- PROPOSED BIO-RETENTION & DETENTION BASIN
- PROPOSED BIO-RETENTION BASIN FILTER AREA

EXISTING SERVICES LEGEND

- S EXISTING SEWER MAIN
- W EXISTING WATER MAIN
- SWD EXISTING STORMWATER PIPE
- TEL EXISTING TELECOMMUNICATIONS CABLE
- E EXISTING ELECTRICAL CABLE
- G EXISTING GAS MAIN

NOTE:

BASIN MAINTENANCE ACCESS IS TO BE CONSTRUCTED OUT OF CONCRETE AND DESIGNED AND CONSTRUCTED IN ACCORDANCE WITH CITY OF GOLD COAST STANDARDS AND REQUIREMENTS. SEDIMENT FOREBAY WILL BE DESIGNED AND INCORPORATED INTO BASIN (IF REQUIRED).

CONTRACTOR TO DETERMINE AND LOCATE ALL EXISTING SERVICES PRIOR TO COMMENCEMENT OF WORKS

REV	DESCRIPTION	DRAWN	DATE
3	ISSUED FOR REPORT	B.G.	03-09-26
2	ISSUED FOR INFORMATION	M.S.	27-03-26
1	ISSUED FOR INFORMATION	R.B.	23-01-26
0	ISSUED FOR INFORMATION	M.S.	02-12-25

DRAWN M.S. | DESIGN B.G. | APPROVED T.W.

SIGNED

DATE

OSKA CONSULTING GROUP

THIS DESIGN AND PLAN IS COPYRIGHT AND IS NOT TO BE USED OR REPRODUCED WHOLLY OR IN PART OR TO BE USED ON ANY PROJECT WITHOUT THE WRITTEN PERMISSION OF OSKA CONSULTING GROUP

DRAWING IS NOT TO BE SCALED

SCALE
1:500 AT A1 0 10 20m
1:1000 AT A3

CLIENT
COURTNEY UPPER COOMERA DEVELOPMENTS PTY LTD

PROJECT
PROPOSED RESIDENTIAL SUBDIVISION
17 COURTNEY DRIVE
UPPER COOMERA 4209 QLD

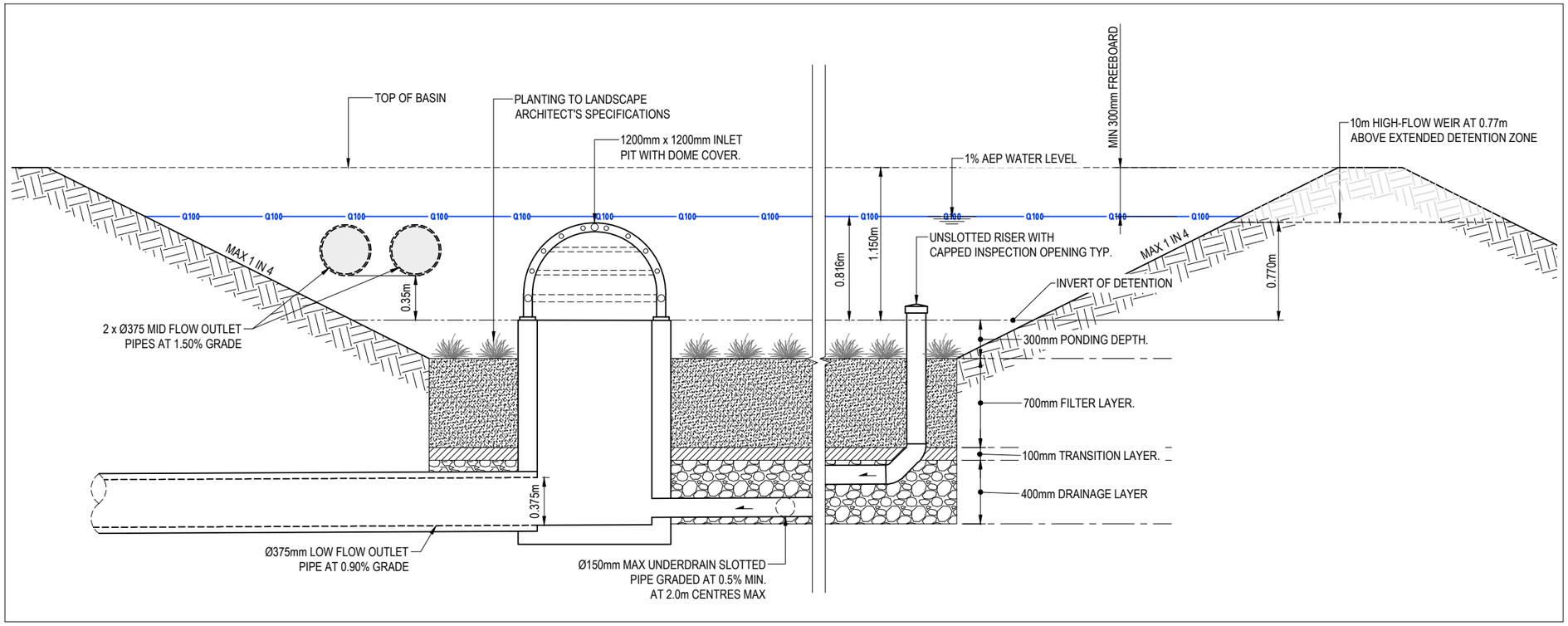
STAGE / PHASE
FOR INFORMATION ONLY NOT FOR CONSTRUCTION

TITLE
CONCEPTUAL STORMWATER MANAGEMENT PLAN

DRAWING NUMBER
OSK7105-P004

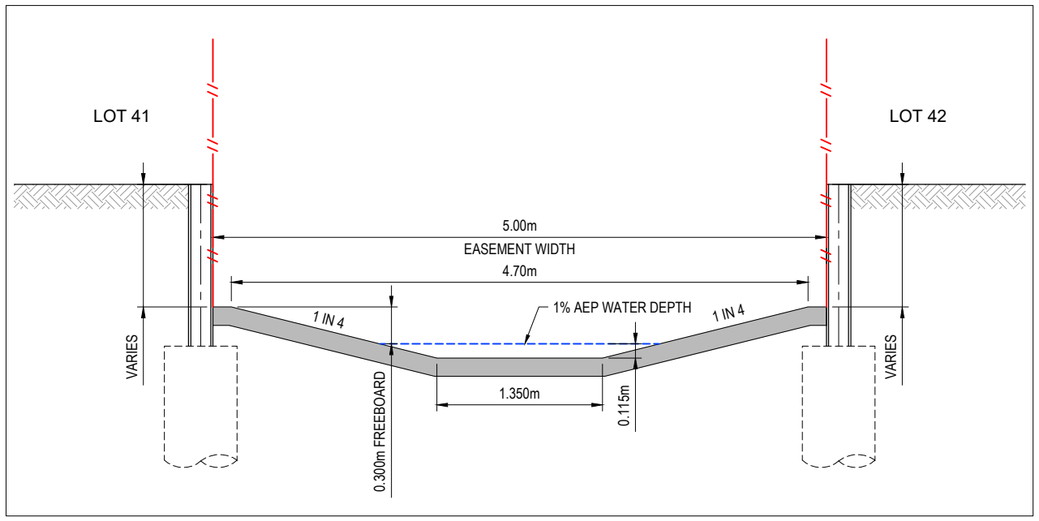
REVISION
3

OSKA PROJECTS\7105-P\CAD\7105-P004.dwg, Konica Minolta



BIO-RETENTION BASIN - TYPICAL SECTION

NTS



EMERGENCY OVERLAND FLOW CHANNEL TYPICAL DETAIL

SCALE: 1:25 (A1)

CONTRACTOR TO DETERMINE AND LOCATE ALL EXISTING SERVICES PRIOR TO COMMENCEMENT OF WORKS

REV	DESCRIPTION	DRAWN	DATE
2	ISSUED FOR REPORT	B.G.	03-09-26
1	ISSUED FOR INFORMATION	M.S.	27-03-26
0	ISSUED FOR INFORMATION	M.S.	02-12-25

DRAWN M.S. | DESIGN B.G. | APPROVED T.W.

SIGNED

DATE

OSKA CONSULTING GROUP

THIS DESIGN AND PLAN IS COPYRIGHT AND IS NOT TO BE USED OR REPRODUCED WHOLLY OR IN PART OR TO BE USED ON ANY PROJECT WITHOUT THE WRITTEN PERMISSION OF OSKA CONSULTING GROUP

DRAWING IS NOT TO BE SCALED

SCALE

1:25 AT A1 1:50 AT A3 0 1m

CLIENT

COURTNEY UPPER COOMERA DEVELOPMENTS PTY LTD

PROJECT

PROPOSED RESIDENTIAL SUBDIVISION
17 COURTNEY DRIVE
UPPER COOMERA 4209 QLD

TITLE

CONCEPTUAL STORMWATER MANAGEMENT DETAILS

STAGE / PHASE

FOR INFORMATION ONLY NOT FOR CONSTRUCTION

DRAWING NUMBER

OSK7105-P005

REVISION

2

Sarah Spurr

APPENDIX

F

OSKA Consulting Group, Preliminary Sediment and Erosion Control Plan (Ref: OSK7105/P006/3) & Preliminary Sediment and Erosion Control Details (Ref: OSK7105/P007/1)

202
RP173727

203
RP173727

204
RP173727

205
RP173727

184
RP173727

183
RP156422

CP
SP326419

COURTNEY DRIVE

BAILEYS MOUNTAIN ROAD

ROAD 01

ROAD 02

STAGE 1b

STAGE 1a

STAGE 2

LPOD A

LPOD B

LPOD C

MS1

MS2

S.E.P.

800

801

SEDIMENT & EROSION CONTROL LEGEND

- SF — SEDIMENT FENCE
- PROPOSED SWALE
  TEMPORARY SEDIMENT PONDS WITHIN FUTURE BIO RETENTION BASINS
- S.E.P. — LOCATION OF STABILISED ENTRY/EXIT POINT
- DSP — DRAINAGE STRUCTURE PROTECTION
- MS1 — WATER QUALITY MONITORING STATION
- FLOW ARROW
- LPOD — LAWFUL POINT OF DISCHARGE
- 80.0 — FINISHED SURFACE CONTOURS
- 80.0 — EXISTING SURFACE CONTOURS
- SWD — PROPOSED STORMWATER PIPE
- SWD — PROPOSED STORMWATER MAIN (CONSTRUCTED BY OTHERS)
- STAGE BOUNDARY
- SITE BOUNDARY

CONCEPT ONLY

IT IS THE CONTRACTOR'S RESPONSIBILITY TO MAINTAIN ADEQUATE SEDIMENT & EROSION CONTROL DURING ALL PHASES OF CONSTRUCTION TO THE SATISFACTION OF BOTH THE SUPERINTENDENT AND COUNCIL.

CONTRACTOR TO DETERMINE AND LOCATE ALL EXISTING SERVICES PRIOR TO COMMENCEMENT OF WORKS

REV	DESCRIPTION	DRAWN	DATE
3	ISSUED FOR REPORT	B.G.	03-09-26
2	ISSUED FOR INFORMATION	M.S.	27-03-26
1	ISSUED FOR INFORMATION	R.B.	23-01-26
0	ISSUED FOR INFORMATION	M.S.	02-12-25

DRAWN M.S. | DESIGN B.G. | APPROVED T.W.

SIGNED

DATE

OSKA CONSULTING GROUP

THIS DESIGN AND PLAN IS COPYRIGHT AND IS NOT TO BE USED OR REPRODUCED WHOLLY OR IN PART OR TO BE USED ON ANY PROJECT WITHOUT THE WRITTEN PERMISSION OF OSKA CONSULTING GROUP

DRAWING IS NOT TO BE SCALED

SCALE
1:500 AT A1 | 1:1000 AT A3 — 0 10 20m

CLIENT
COURTNEY UPPER COOMERA DEVELOPMENTS PTY LTD

PROJECT
PROPOSED RESIDENTIAL SUBDIVISION
17 COURTNEY DRIVE
UPPER COOMERA 4209 QLD

STAGE / PHASE
FOR INFORMATION ONLY NOT FOR CONSTRUCTION

TITLE
PRELIMINARY SEDIMENT & EROSION CONTROL PLAN

DRAWING NUMBER
OSK7105-P006

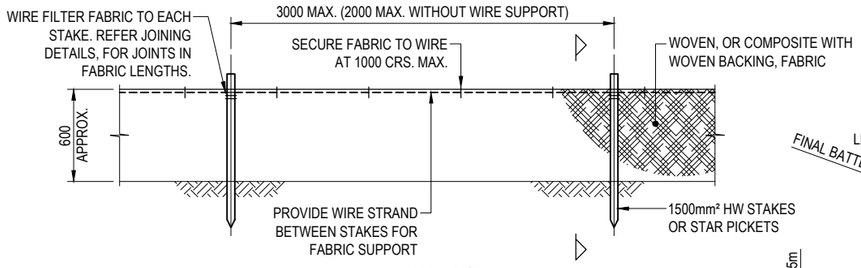
REVISION
3

OSK7105-P006-[3]-Sep-26, Tahnee Saun

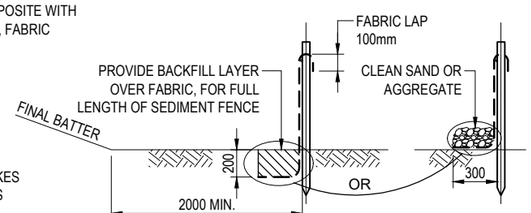
CONTRACTOR TO DETERMINE AND LOCATE ALL EXISTING SERVICES PRIOR TO COMMENCEMENT OF WORKS

CONCEPT ONLY

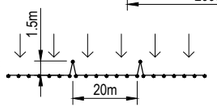
IT IS THE CONTRACTOR'S RESPONSIBILITY TO MAINTAIN ADEQUATE SEDIMENT & EROSION CONTROL DURING ALL PHASES OF CONSTRUCTION TO THE SATISFACTION OF BOTH THE SUPERINTENDENT AND COUNCIL.



ELEVATION



SECTION

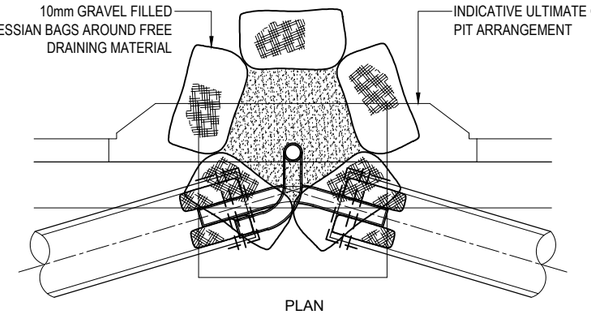


NOTE: INSTALL 1.5m (MIN.) DEEP 'RETURNS' AT 20m SPACING (MAX.) ON UPSLOPE SIDE OF FENCELINE (5-10m MAX SPACING IF FENCE ALIGNED AT ANGLE TO CONTOUR). EG:

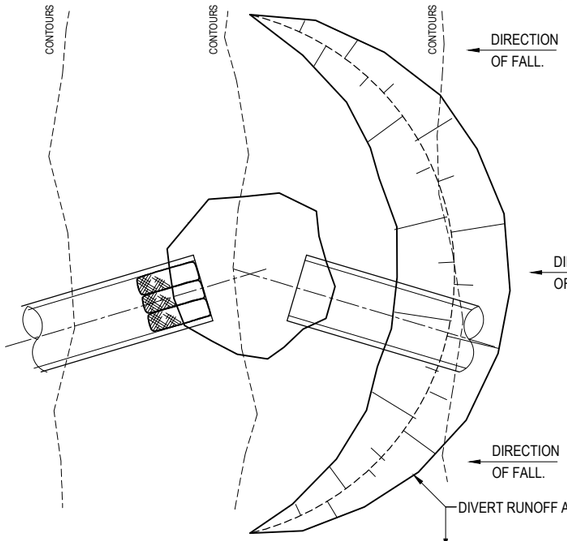
SEDIMENT FENCE DETAILS

N.T.S.

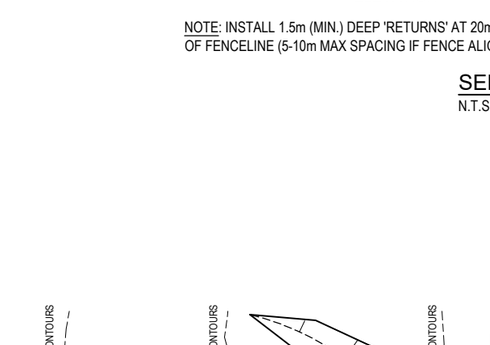
SF DENOTES SEDIMENT FENCE. REFER PLAN FOR LOCATION AND EXTENTS.



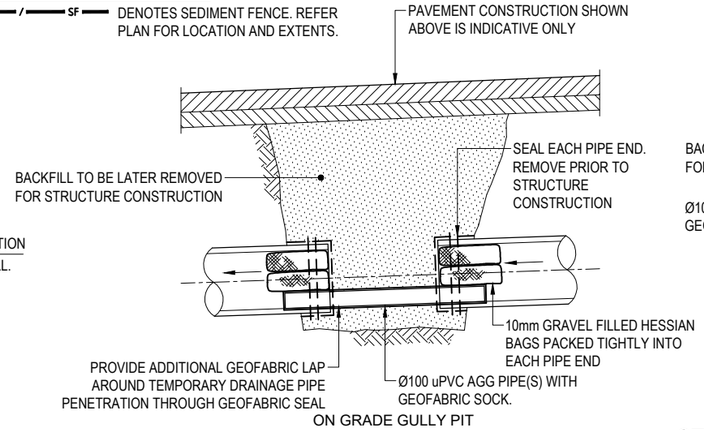
PLAN



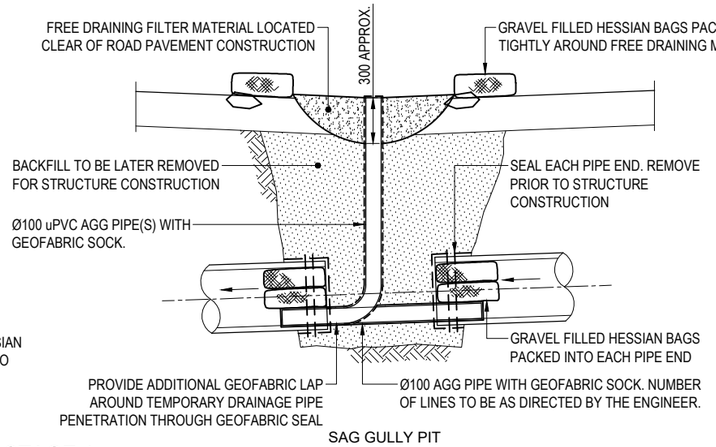
PLAN



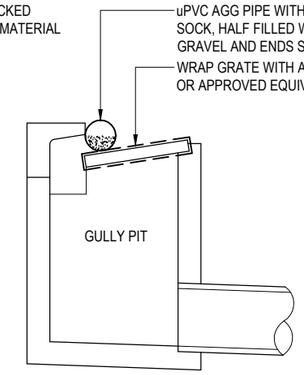
STAGE 1
EXCAVATION AND PIPE INSTALLATION



ON GRADE GULLY PIT



SAG GULLY PIT



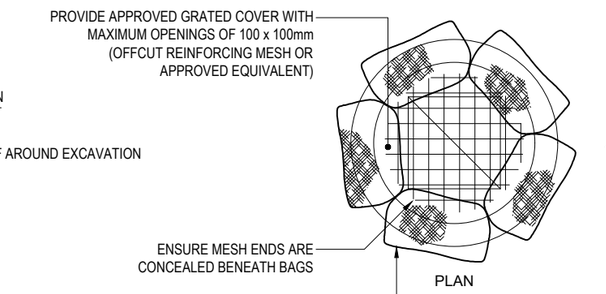
STAGE 2
STRUCTURE COMPLETE

STAGE 1
EXCAVATION, PIPE INSTALLATION AND INTERIM BACKFILLING

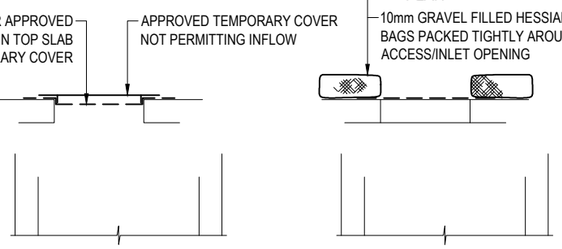
ROADWAY GULLY PIT

N.T.S.

DSP DENOTES DRAINAGE STRUCTURE PROTECTION. REFER PLAN FOR LOCATION & EXTENTS.



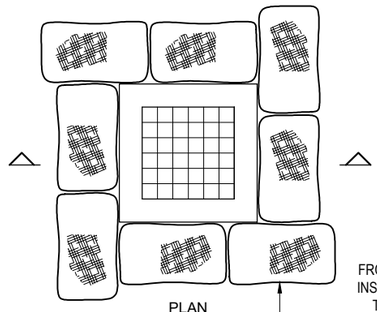
PLAN



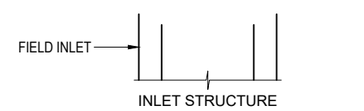
ACCESS CHAMBER

INLET STRUCTURE

STAGE 2

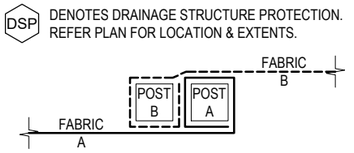


PLAN



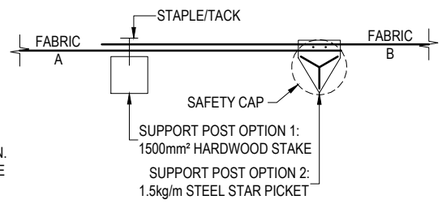
INLET STRUCTURE

STAGE 3



FABRIC TO FOLD AROUND EACH STAKE ONE FULL TURN. STAKE B TO BE DRIVEN TIGHTLY AGAINST STAKE A. THE TOPS OF BOTH STAKES TO BE SECURED WITH WIRE.

METHOD 1

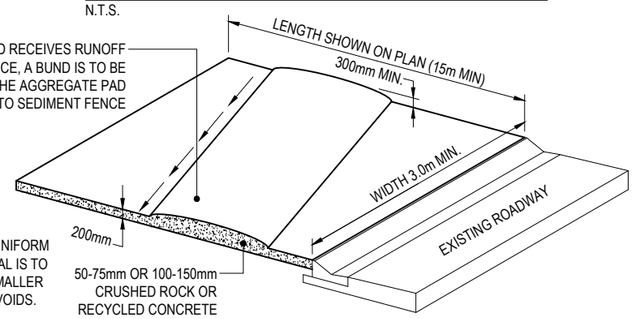


METHOD 2

SEDIMENT FENCE FABRIC JOINING DETAILS

N.T.S.

IF ENTRY/EXIT PAD RECEIVES RUNOFF FROM SOIL DISTURBANCE, A BUND IS TO BE INSTALLED ACCROSS THE AGGREGATE PAD TO DIRECT RUNOFF TO SEDIMENT FENCE



NOTE:
ROCK IS TO BE UNIFORM SIZE. IE. MATERIAL IS TO NOT CONTAIN SMALLER ROCKS FILLING VOIDS.

STABILISED ENTRY/EXIT POINT

N.T.S. OR APPROVED EQUIVALENT

SEP DENOTES STABILISED ENTRY/EXIT POINT, REFER PLAN FOR LOCATIONS.

REV	DESCRIPTION	DRAWN	DATE
1	ISSUED FOR INFORMATION	M.S.	27-03-26
0	ISSUED FOR INFORMATION	M.S.	02-12-25

DRAWN M.S. | DESIGN B.G. | APPROVED T.W.

SIGNED

DATE

OSKA CONSULTING GROUP

THIS DESIGN AND PLAN IS COPYRIGHT AND IS NOT TO BE USED OR REPRODUCED WHOLLY OR IN PART OR TO BE USED ON ANY PROJECT WITHOUT THE WRITTEN PERMISSION OF OSKA CONSULTING GROUP

DRAWING IS NOT TO BE SCALED

SCALE: NOT TO SCALE

CLIENT: COURTNEY UPPER COOMERA DEVELOPMENTS PTY LTD

PROJECT: PROPOSED RESIDENTIAL SUBDIVISION
17 COURTNEY DRIVE
UPPER COOMERA 4209 QLD

STAGE / PHASE: FOR INFORMATION ONLY NOT FOR CONSTRUCTION

TITLE: PRELIMINARY SEDIMENT & EROSION CONTROL DETAILS

DRAWING NUMBER: OSK7105-P007

REVISION: 1

OSK105-2017-Civil-Plot-24 Nov 25 10:07:01

APPENDIX

G

OSKA Engineers, Response to Healthy Waters Code (Ref: OSK7105-0003)

City Plan code template

This code template supports the preparation of a development application against either the acceptable outcome(s) or performance outcome(s) contained in the code. Development assessment rules are outlined in **Section 5.3.3** of the City Plan.

Please note:

Note: In accordance with Section 2.1 of City Plan, an assessment against State interest - Water quality (policies 4 and 5) of the State Planning Policy 2017 is required as the Healthy water development code does not fully integrate this State interest. A response table for policies 4 and 5 have been included below.

For assessment against the overall outcomes, refer to the appropriate code.

Note: The whole of the planning scheme is identified as the assessment benchmark for impact assessable development. This specifically includes assessment of impact assessable development against this strategic framework. The strategic framework may contain intentions and requirements that are additional to and not necessarily repeated in zone, overlay or other codes. In particular, the performance outcomes in zone codes address only a limited number of aspects, predominantly related to built form. Development that is impact assessable must also be assessed against the overall outcomes of the code as well as the strategic framework.

9.4.5 Healthy waters code

9.4.5.3 Specific benchmarks for assessment

PART B – ASSESSABLE DEVELOPMENT BENCHMARKS

Table 9.4.5-3: Healthy waters code – for assessable development

Performance outcomes	Acceptable outcomes	Does the proposal meet the acceptable outcome? If not, justify how the proposal meets either the performance outcome or overall outcome	Internal use
Erosion and sediment control			
PO1 Stormwater discharge from a development site achieves the construction phase water quality objectives of **SC6.12 City Plan policy – Land development guidelines**, **Section 4 – Stormwater drainage and water sensitive urban design standards**.	**AO1** No acceptable outcome provided.	**PO** The stormwater discharge from the development extent achieves the construction phase water quality objectives of SC6.12 City Plan policy – Land development guidelines, Section 4 – Stormwater drainage and water sensitive urban design standards. Refer to OSKA Consulting Group, Conceptual Stormwater Management Plan (Ref: OSK7105-0002) prepared for 17 Courtney Drive, Upper Coomera for further details on the proposed treatment system.	
PO2 Erosion, sediment and dust is appropriately managed during the construction phase.	**AO2** The level of risk for soil erosion and sediment pollution to the environment is determined by an erosion hazard assessment, completed by a suitably-qualified person in accordance with the criteria in **Table 9.4.5-4: Erosion hazard assessment**. Where the erosion hazard assessment has a risk score of: (a) less than or equal to 10: A deemed to comply report is prepared by a suitably qualified person for Council approval, including conceptual location and design drawings of each treatment measure in plan and section views, in	**AO** An erosion hazard assessment was completed for the development in accordance with Table 9.4.5-4 and the proposed development totalled a risk score of 16. A concept sediment and erosion control plan is included in OSKA Consulting Group, Conceptual Stormwater Management Plan (Ref: OSK7105-0002) prepared for 17 Courtney Drive, Upper Coomera. A detailed sediment and erosion plan will be required as part of the detailed design phase to ensure the plan addresses devices and management measures to control erosion and sediment for the pre-construction, construction and post-construction phases of the development, in accordance with the Best Practice Erosion and Sediment Control: International Erosion Control Association, (IECA) 2008.	

Performance outcomes	Acceptable outcomes	Does the proposal meet the acceptable outcome? If not, justify how the proposal meets either the performance outcome or overall outcome	Internal use
	accordance with the *Best Practice Erosion and Sediment Control: International Erosion Control Association, (IECA) 2008, Australasia Chapter 2008.* (b) greater than 10 or developments involving multiple stages of disturbance or more than 1.25 ha of land: (i) For material change of use or reconfiguring a lot, a conceptual erosion and sediment control plan (ESCP) is prepared by a suitably-qualified person for Council approval in accordance with **SC6.12 City Plan policy – Land development guidelines, Section 4 – Stormwater drainage and water sensitive urban design standards**, and the *Best Practice Erosion and Sediment Control: International Erosion Control Association (IECA) 2008, Australasia Chapter 2008*. (ii) For operational work, a detailed ESCP is prepared by a suitably-qualified person in accordance with **SC6.12 City Plan policy – Land development guidelines, Section 4 – Stormwater drainage and water sensitive urban design standards**, and *Best Practice Erosion and Sediment Control: International Erosion Control Association (IECA) 2008, Australasia Chapter 2008*. The ESCP is to detail appropriate		

Performance outcomes	Acceptable outcomes	Does the proposal meet the acceptable outcome? If not, justify how the proposal meets either the performance outcome or overall outcome	Internal use
	treatment measures for the construction phase of development, demonstrating how the minimum design objectives in **Table 9.4.5-5: Stormwater design objectives** are achieved, including: (a) measures to ensure the release of sediment-laden stormwater for the nominated design storm are minimised when the design storm is exceeded; (b) detailed design, installation, construction, monitoring and maintenance requirements of all approved proprietary products in accordance with local conditions and manufacturer's recommendations; and (c) details of how the ESCP aligns with the approved development staging plan.		
Stormwater quality			
PO3 Development appropriately manages stormwater quality to:	**AO3.1** For post developed sites, the following minimum pollutant reduction targets are achieved: (a) Gross pollutants (>5mm) – 90%; (b) Total Suspended Solids (TSS) – 80%, (c) Total Phosphorus (TP) – 60%; and (d) Total Nitrogen (TN) – 45%.	**AO** A Conceptual Stormwater Management Plan (CSWMP) has been prepared for the proposed Residential Subdivision situated at 17 Courtney Drive, Upper Coomera. The CSWMP details the proposed treatment measures to be implemented to ensure compliance with SC6.12 City Plan policy – Land development guidelines. Refer to the OSKA Consulting Group, Conceptual Stormwater Management Plan (Ref: OSK7105-0002) prepared for 17 Courtney Drive, Upper Coomera for further information.	
	AO3.2	**N/A**	

Performance outcomes	Acceptable outcomes	Does the proposal meet the acceptable outcome? If not, justify how the proposal meets either the performance outcome or overall outcome	Internal use
(a) protect natural ecosystems; (b) protect water quality; (c) reduce runoff and peak flows; and (d) meet the water quality objectives and environmental values for Queensland waters. **Note: Water quality objectives and environmental values for Queensland waters are contained within *Schedule 1* of the *Environmental Protection (Water) Policy 2009*. Water quality objectives are locally specific and vary between and within river catchments.** **Note: A stormwater quality management plan prepared by a suitably qualified person in accordance with SC6.12 City Plan policy – Land development guidelines, Section 4 – Stormwater drainage and water sensitive urban design standards, is Council's preferred method for addressing this performance outcome.**	For development on land less than 1.25ha, a deemed to comply solution for stormwater quality is achieved in accordance with **Table 9.4.5-6: Stormwater quality deemed to comply solutions**.		
	AO3.3 For development on land greater than 1.25ha, a stormwater quality management plan is to be prepared by a suitably qualified person in accordance with **SC6.12 City Plan policy – Land development guidelines**, **Section 4 – Stormwater drainage and water sensitive urban design standards**, is required.	**AO** A Conceptual Stormwater Management Plan (CSWMP) has been prepared for the proposed Residential Subdivision situated at 17 Courtney Drive, Upper Coomera. The CSWMP details the proposed treatment measures to be implemented to ensure compliance with SC6.12 City Plan policy – Land development guidelines. Refer to the OSKA Consulting Group, Conceptual Stormwater Management Plan (Ref: OSK7105-0002) prepared for 17 Courtney Drive, Upper Coomera for further information.	
Waterway stability			
PO4 In-stream erosion, downstream of urban development is prevented by controlling the rate (or magnitude) and duration of sediment transporting flows.	**AO4** Post-development peak 0.632 Annual Exceedance Probability (AEP) event discharge within receiving waterway is limited to pre-development peak 0.632 AEP event discharge and is in accordance with **SC6.12 City Plan policy – Land development guidelines**, **Section 4 – Stormwater drainage and water sensitive urban design standards.**	**N/A** The development does not propose to discharge directly to any waterways.	
Stormwater quantity control			
PO5	**AO5** The following is achieved external to the	**AO**	

Performance outcomes	Acceptable outcomes	Does the proposal meet the acceptable outcome? If not, justify how the proposal meets either the performance outcome or overall outcome	Internal use
Stormwater quantity management outcomes demonstrate no adverse impact on stormwater flooding or the drainage of properties external to the subject site.	development site: (a) no increase in peak flood flow rate from the development site for all events up to and including the 1% AEP; (b) no increase in peak flood velocities from the development site for all events up to and including the 1% AEP; (c) no increase in peak flood level from the development site for all events up to and including the 1% AEP; and (d) stormwater outfalls or discharge is located to avoid conflict with existing usage of downstream land or impacts on existing watercourse or drainage.	The development proposes a detention basin to ensure post development flow rates are mitigated to pre-development rates and that there is no increased runoff on downstream properties in accordance with SC6.12 City Plan policy – Land development guidelines, Section 4 – Stormwater drainage and water sensitive urban design standards. Refer to the OSKA Consulting Group, Conceptual Stormwater Management Plan (Ref: OSK7105-0002) prepared for 17 Courtney Drive, Upper Coomera for further details.	
Lawful point of discharge			
PO6 Development ensures the stormwater systems are designed to not cause actionable nuisance that would adversely affect adjoining (upstream or downstream) properties.	**AO6** A lawful point of discharge must be identified and demonstrated that all discharge point/s from the development are in accordance with **SC6.12 City Plan policy – Land development guidelines**, **Section 4 – Stormwater drainage and water sensitive urban design standards**.	**AO** The development proposed to discharge flows to the kerb and channel of Courtney Drive, the proposed swale to the south-east of the site that is to be built as part of the future development at 31-53 Courtney Drive (Ref: ROL/2024/116) and the kerb and channel of the proposed road reserve which will connect into the future development at 31-53 Courtney Drive (Ref: ROL/2024/116) (LPOD C) which are a Lawful Points of Discharge in accordance with SC6.12 City Plan policy – Land development guidelines, Section 4 – Stormwater drainage and water sensitive urban design standards. Refer to the OSKA Consulting Group, Conceptual Stormwater Management Plan (Ref: OSK7105-0002) prepared for 17 Courtney Drive, Upper Coomera for further details.	
Overland flow paths			

Performance outcomes	Acceptable outcomes	Does the proposal meet the acceptable outcome? If not, justify how the proposal meets <u>either</u> the performance outcome or overall outcome	Internal use
PO7 Development must not obstruct free open surface flow of stormwater through a site.	**AO7** Overland flowing stormwater is allowed free open surface flow between the street and any waterway at the rear or sides of a property, in accordance with the provisions of the *Building Code of Australia*.	**N/A**	
Whole of life costs			
PO8 Stormwater infrastructure is designed and constructed to: (a) remain fit for purpose for the life of the development and maintains full functionality in the design flood event; (b) be cost effective to maintain; and (c) ensure no structural damage to existing stormwater infrastructure.	**AO8** No acceptable outcome provided.	**PO** The proposed stormwater infrastructure for the development has been designed to be fit for purpose for the development and is a cost effective solution. A Maintenance Management Plan will be required during the detailed design phase to ensure sufficient maintenance of the treatment system throughout the life of the development. Any damages that occur to the existing Council infrastructure during construction will be rectified. Refer to the OSKA Consulting Group, Conceptual Stormwater Management Plan (Ref: OSK7105-0002) prepared for 17 Courtney Drive, Upper Coomera for further details.	
Landscape integration			
PO9 Stormwater treatment devices and stormwater infrastructure are designed to:	**AO9.1** Where stormwater treatment devices and stormwater infrastructure are integrated into public open space, a Statement of Landscape Intent is to be prepared by a suitably qualified person, for approval by Council. The plan is to demonstrate that the operation of stormwater infrastructure does not compromise the function of any co-located uses and reflect the design principles within **SC6.12 City Plan policy –**	**PO** The proposed stormwater treatment devices and stormwater infrastructure have been designed to be incorporated within the landscape outcomes, enhance visual amenity and to protect the environment in accordance with SC6.12 City Plan policy – Land development guidelines, Section 4 – Stormwater drainage and water sensitive urban design standards.	

Performance outcomes	Acceptable outcomes	Does the proposal meet the acceptable outcome? If not, justify how the proposal meets either the performance outcome or overall outcome	Internal use
(a) integrate with the urban design and landscape outcomes of the development; (b) complement natural environments, wetlands and watercourses; (c) protect environmental values; (d) enhance visual amenity; and (e) incorporate CPTED principles in accordance with **SC6.12 City Plan policy – Land development guidelines, Section 4 – Stormwater drainage and water sensitive urban design standards**.	**Land development guidelines**, **Section 4 – Stormwater drainage and water sensitive urban design standards.** **Note: A Statement of landscape intent is to be prepared in accordance with SC6.13 City Plan policy – Landscape work.**	Refer to the OSKA Consulting Group, Conceptual Stormwater Management Plan (Ref: OSK7105-0002) prepared for 17 Courtney Drive, Upper Coomera for further details.	
	AO9.2 Stormwater treatment devices are located offline to any upstream catchment. **Note: This provision relates to the integration of stormwater treatment devices and stormwater infrastructure into the landscape. Development identified on the Environmental significance – wetlands and watercourse overlay map will still require assessment against the Environmental significance overlay code.**	**AO** The development has an external catchment that impacts the site which will be captured and conveyed through the site via a pit and pipe network to ensure it does not impact the development. The proposed treatment device will be located offline to the external catchment. Refer to the OSKA Consulting Group, Conceptual Stormwater Management Plan (Ref: OSK7105-0002) prepared for 17 Courtney Drive, Upper Coomera for further details.	
	AO9.3 All stormwater outlets that are located adjacent to watercourses, creeks and drainage paths are aligned at a maximum of 45 degrees to the downstream direction of flow, and energy dissipation measures installed to minimise scour.	**AO** All stormwater outlets will be constructed to minimise scour on the receiving catchment. Further details will be provided at the detail design phase. Refer to the OSKA Consulting Group, Conceptual Stormwater Management Plan (Ref: OSK7105-0002) prepared for 17 Courtney Drive, Upper Coomera for further information on the location of the stormwater outlets.	
Public safety			
PO10 Stormwater treatment devices and stormwater infrastructure minimise impacts on public health and safety.	**AO10** All stormwater quantity control measures are designed in accordance with **SC6.12 City Plan policy – Land development guidelines**, **Section 4 – Stormwater drainage and water sensitive urban**	**AO** The development proposes a detention basin to ensure post development flow rates are mitigated to pre-development rates and that there is no increased runoff on downstream properties in accordance with SC6.12 City Plan policy – Land development guidelines,	

Performance outcomes	Acceptable outcomes	Does the proposal meet the acceptable outcome? If not, justify how the proposal meets either the performance outcome or overall outcome	Internal use
	design standards.	Section 4 – Stormwater drainage and water sensitive urban design standards. Refer to the OSKA Consulting Group, Conceptual Stormwater Management Plan (Ref: OSK7105-0002) prepared for 17 Courtney Drive, Upper Coomera for further details.	
Maintenance access			
PO11 Maintenance access is provided for all stormwater management systems and considers: (a) the type of vehicle or machinery needed to service particular assets; and (b) the need to ensure a safe working environment for maintenance personnel and the public.	**AO11.1** All weather vehicle access is to be provided to inlet zones of the stormwater treatment systems in accordance with **Table 9.4.5-7: Maintenance access requirements (slope).**	**AO** A Conceptual Stormwater Management Plan (CSWMP) has been prepared for the proposed Residential Subdivision situated at 17 Courtney Drive, Upper Coomera. The CSWMP details the proposed treatment measures to be implemented to ensure compliance with SC6.12 City Plan policy – Land development guidelines. Refer to the OSKA Consulting Group, Conceptual Stormwater Management Plan (Ref: OSK7105-0002) prepared for 17 Courtney Drive, Upper Coomera for further information.	
	AO11.2 Maintenance access is to be provided around the perimeter of all stormwater treatment systems in accordance with **Table 9.4.5-8: Maintenance access requirements (size).**	**AO** Maintenance access has been provided around the perimeter of the proposed basin in accordance with Table 9.4.5-8: Maintenance access requirements (size). Refer to the OSKA Consulting Group, Conceptual Stormwater Management Plan (Ref: OSK7105-0002) prepared for 17 Courtney Drive, Upper Coomera for further information.	
	AO11.3 A maintenance buffer is provided around the perimeter of all stormwater treatment devices and adjoining private property	**N/A**	

Performance outcomes	Acceptable outcomes	Does the proposal meet the acceptable outcome? If not, justify how the proposal meets either the performance outcome or overall outcome	Internal use
	equal to: (a) 1m in width; or (b) the width of a perimeter maintenance access, as delivered in AO11.2, plus 0.5m. The maintenance buffer is measured from the adjacent allotment boundary to the top of batter around the treatment measure. The maximum slope on the maintenance buffer is 1 in 10.		
Fauna movement			
PO12 Stormwater conveyance structures and channels are designed to ensure the safe movement of native fauna and provide for terrestrial and aquatic passage.	**AO12.1** Stormwater drainage structures and channels minimise impacts on aquatic fauna and associated habitats and provide opportunities for beneficial habitat uses of structures in accordance with the *Department of Primary Industries and Fisheries – Fisheries guidelines for Fish-friendly structures (2006).*	**N/A**	
	AO12.2 Stormwater drainage structures allow for the safe movement of terrestrial fauna in accordance with: (a) the Queensland Government Fauna Sensitive Road Design Manual Volume 2: Preferred Practices; and (b) the Queensland Government Koala-Sensitive Design Guidelines.	**N/A**	

Performance outcomes	Acceptable outcomes	Does the proposal meet the acceptable outcome? If not, justify how the proposal meets either the performance outcome or overall outcome	Internal use
Wastewater management			
PO13 Development does not discharge wastewater to receiving waters or areas external to the site unless demonstrated to be the best-practice environmental management for that site and takes into consideration: (a) the applicable water quality objectives for the receiving waters; and (b) the potential adverse impact on ecosystem health of receiving waters.	**AO13** Where the development involves the discharge of wastewater, a Wastewater Management Plan (WWMP) is prepared, demonstrating compliance with the performance outcome, by a suitably qualified person and submitted to the Council, detailing all of the following: (a) wastewater type; (b) climatic conditions; (c) water quality objectives; (d) best-practice environmental management; (e) waste management hierarchy; and (f) the WWMP provides for the management of wastewater in accordance with a wastewater management hierarchy that: (i) avoids wastewater discharge to watercourses; or (ii) if wastewater discharge to the environment cannot practicably be avoided wastewater discharge to watercourses is minimised through re-use, recycling, recovery and treatment for disposal to sewer, surface water and groundwater.	**N/A** The proposed development does not propose to discharge wastewater into receiving waters. All wastewater will be discharged appropriately into Council's sewerage network.	
Dewatering management			
PO14 Dewatering occurs in accordance with an	**AO14** No acceptable outcome provided.	**N/A**	

approved Dewatering management plan.			
Woongoolba flood mitigation catchment area			
PO15 In the Woongoolba flood mitigation catchment area, shown on the **Water catchments and dual supply system area overlay map**, peak outflow and its timing for Q2, Q5 and Q10 for rainfall events up to 72 hours does not change as a result of development.	**AO15** No acceptable outcome provided.	**N/A**	

State Planning Policy July 2017

Policies	Demonstrate how the proposal meets the policy?	Internal use
State interest – water quality		
ASSESSMENT BENCHMARK 4 (POLICY 4): At the construction phase, development achieves the applicable stormwater management design objectives in table A (appendix 2) of the State Planning Policy.	A sediment and erosion control plan is included in OSKA Consulting Group, Conceptual Stormwater Management Plan (Ref: OSK7105-0002) prepared for 17 Courtney Drive, Upper Coomera. The plan addresses devices and management measures to control erosion and sediment for the pre-construction, construction and post-construction phases of the development, in accordance with the Best Practice Erosion and Sediment Control: International Erosion Control Association, (IECA) 2008 to ensure compliance with Assessment Benchmark 4 (Policy 4) of the State Planning Policy.	
ASSESSMENT BENCHMARK 5 (POLICY 5): (5) At the post-construction phase, development: a) achieves the applicable stormwater management design objectives on-site, as identified in table B (appendix 2) of the State Planning Policy; or b) achieves an alternative locally appropriate solution off-site that achieves an equivalent or improved water quality outcome to the relevant stormwater management design objectives in table B (appendix 2) of the State Planning Policy.	A Conceptual Stormwater Management Plan (CSWMP) has been prepared for the Proposed Residential Subdivision situated at 17 Courtney Drive, Upper Coomera. The CSWMP details the proposed treatment measures to be implemented to ensure compliance with Assessment Benchmark (Policy 5) of the State Planning Policy. Refer to OSKA Consulting Group, Conceptual Stormwater Management Plan (Ref: OSK7105-0002) prepared for 17 Courtney Drive, Upper Coomera.	

Table 9.4.5-3: Erosion hazard assessment

Controlling factor	Points	Score
Average slope of the whole site prior to operational works		
Slope less than 2%	0	
More than or equal to 2% but less than 5%	1	
More than or equal to 5% but less than 10%	2	
More than or equal to 10% but less than 15%	4	
More than or equal to 15%	5	5
Soil type (to be disturbed)		
Gravels and sandy soils	1	
Sandy loam	2	2
Clays on flood plains	3	
Shallow soils on slopes	4	
Clays on slopes greater than 5%/imported fill or untested fill	5	
Anticipated duration of site disturbance		
Duration less than 2 weeks	0	
More than 2 weeks but less than 3 months	2	
More than 3 months but less than 6 months	4	
More than 6 months	5	5
Anticipated erosive rainfall risk during site disturbance		
Low (monthly average rainfall less than 45 mm)	0	
Moderate (monthly average rainfall 46 - 100 mm)	1	
High (monthly average rainfall 101 - 225 mm)	2	2
Very high (monthly average rainfall 226 - 1500 mm)	4	
Extreme (monthly average rainfall more than 1500 mm)	5	

Off-site sediment control (down-slope of the soil disturbance)		
Score 1 point if there is no purpose-built sediment trap (e.g. sediment basin, gross pollutant trap or purpose-built wetland).	1	0
Run-off entering the site		
Score 1 point if stormwater run-off is not diverted from entering the site or away from soil disturbance.	1	0
Extent of site disturbance		
Score 2 points if the building works requires reshaping of the ground surface.	2	2
Total Score **Note: High erosion risk - if score 11 or greater, or five for any factor.**		16

This Erosion Hazard Assessment form is adapted from the *Best Practice Erosion and Sediment Control, International Erosion Control Association (Australasia), IECA 2008 Appendix H - Building Sites, the Brisbane City Council Erosion Hazard Assessment Form* and *Attachment 2 to the QDC Draft Part 16 Erosion and Sediment Control*.