PROPOSED RESIDENTIAL SUBDIVISION

DEVELOPMENT APPLICATION - LOT 7 DP1196266
CONCEPT CIVIL ENGINEERING PACKAGE

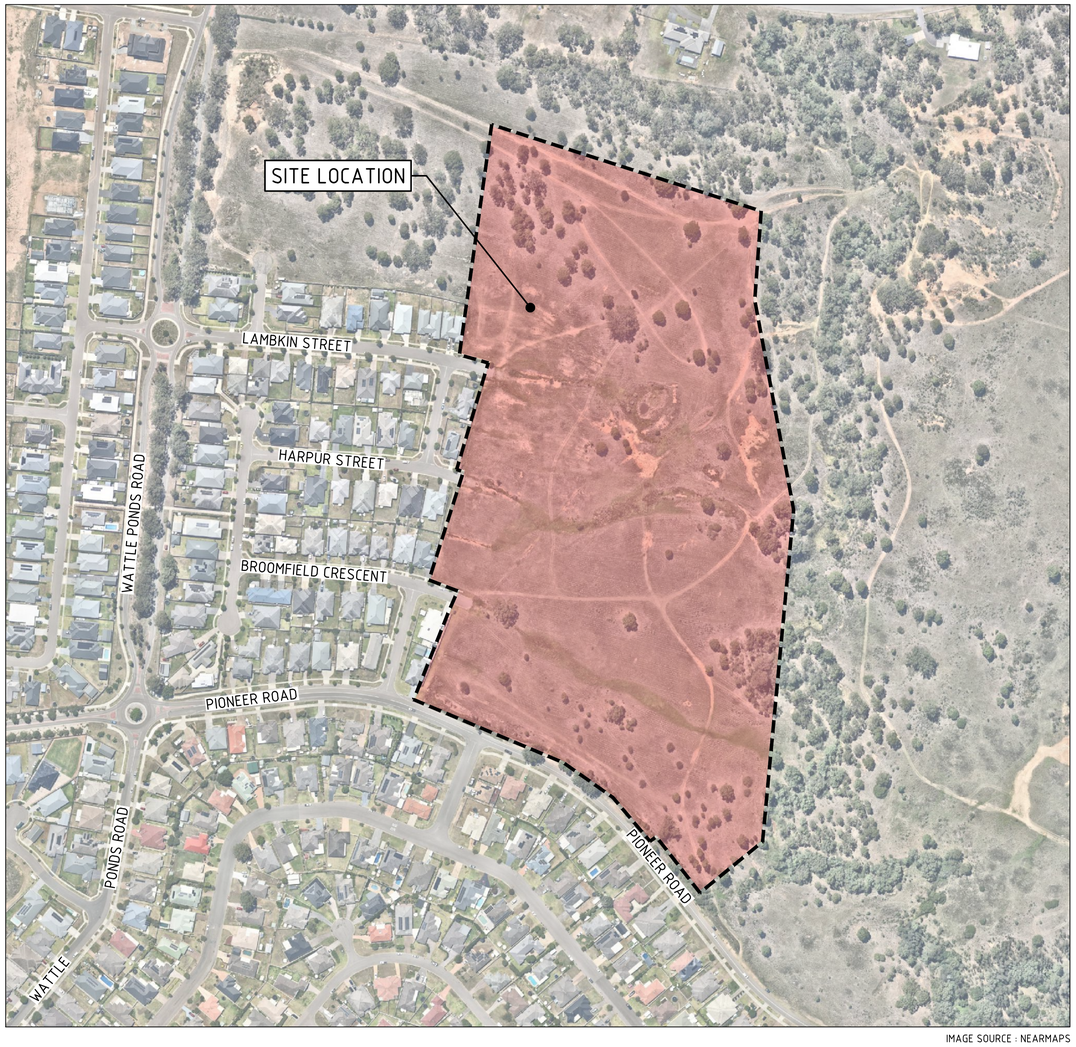

IMAGE SOURCE : NEARMAPS

LOCALITY PLAN

DRAWING LIST

DWGNO	DRAWINGTITLE
DA-C01.01	COVER SHEET, DRAWING LIST AND LOCALITY PLAN
DA-C01.21	PROPOSED SUBDIVISION MASTERPLAN
DA-C01.22	CONSTRUCTION STAGING PLAN - STAGE 1 WORKS
DA-C01.23	CONSTRUCTION STAGING PLAN - STAGE 2 WORKS
DA-C01.24	CONSTRUCTION STAGING PLAN - STAGE 3 WORKS
DA-C01.25	CONSTRUCTION STAGING PLAN - STAGE 4 WORKS
DA-C01.26	CONSTRUCTION STAGING PLAN - STAGE 5 WORKS
DA-C01.27	CONSTRUCTION STAGING PLAN - STAGE 6 WORKS
DA-C01.28	CONSTRUCTION STAGING PLAN - STAGE 7 WORKS
DA-C01.30	OPERATIONAL & COMMUNITY LAND
DA-C01.31	TYPICAL ROAD CROSS SECTIONS - SHEET 1
DA-C01.32	TYPICAL ROAD CROSS SECTIONS - SHEET 2
DA-C01.33	TYPICAL ROAD CROSS SECTIONS - SHEET 3
DA-C02.01	EROSION AND SEDIMENT CONTROL PLAN
DA-C02.11	EROSION AND SEDIMENT CONTROL DETAILS
DA-C03.01	BULK EARTHWORKS CUT AND FILL PLAN
DA-C03.11	BULK EARTHWORKS SECTIONS - SHEET 1
DA-C03.12	BULK EARTHWORKS SECTIONS - SHEET 2
DA-C04.01	SITEWORKS AND STORMWATER MANAGEMENT PLAN - SHEET 1
DA-C04.02	SITEWORKS AND STORMWATER MANAGEMENT PLAN - SHEET 2
DA-C05.01	ALIGNMENT CONTROL PLAN
DA-C04.11	LONGITUDINAL SECTIONS - SHEET 1
DA-C04.12	LONGITUDINAL SECTIONS - SHEET 2
DA-C04.13	LONGITUDINAL SECTIONS - SHEET 3
DA-C04.14	LONGITUDINAL SECTIONS - SHEET 4
DA-C04.15	LONGITUDINAL SECTIONS - SHEET 5
DA-C04.16	LONGITUDINAL SECTIONS - SHEET 6
DA-C04.17	LONGITUDINAL SECTIONS - SHEET 7
DA-C09.01	DETAILS
DA-R01.01	RIPARIAN OFFSET PLAN

NOTES

THESE PLANS ARE CONCEPT AND PROVIDED FOR DA INFORMATION PURPOSES ONLY. THEY ARE PROVIDED TO SHOW THE GENERAL INTENT OF ROAD GRADING AND EARTHWORKS. HOWEVER THESE PLANS ARE NOT FINAL AND AS SUCH DETAILED ENGINEERING PLANS SUBMITTED AS PART OF FUTURE CC/SWC APPLICATIONS WITH COUNCIL OR PRIVATE CERTIFIER MAY DIFFER MATERIALLY FROM WHAT IS SHOWN ON THESE PLANS AS LOT GRADING MAY CHANGE DUE TO REQUIREMENTS OF BUILDERS OR OTHER COMMERCIAL CONSIDERATIONS. THESE PLANS SHALL NOT BE TAKEN TO REPRESENT THE ONLY SCOPE OF EARTHWORKS AND RETAINING THAT CAN BE UNDERTAKEN AS PART OF FUTURE CC/SWC APPLICATION.

DRAWN: C. W-HEALION DESIGNED: E. DOOLAN JOB MANAGER: R. DIERCKE VERIFIER: A. BROWN

NOT FOR CONSTRUCTION

REVISION	DESCRIPTION	ISSUED	VER'D	APP'D	DATE
A	ISSUED FOR CLIENT REVIEW	CWH	AB	ED	05.06.24
B	ISSUED FOR CLIENT REVIEW	CWH	AB	RD	15.07.24
C	ISSUED FOR DEVELOPMENT APPLICATION	RK	AB	RD	22.08.24
D	ISSUED FOR DEVELOPMENT APPLICATION	CWH	AB	RD	11.09.24
E	ISSUED FOR DEVELOPMENT APPLICATION	CWH	CP	RD	31.01.25
F	ISSUED FOR DA APPROVAL	EW	CP	RD	02.06.25

CLIENT: SINGLETON COUNCIL

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SCALE 1:2500@ A1 — 0 25 50 75 100 125m

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ABN 81 094 433 100

PROJECT: **PROPOSED RESIDENTIAL SUBDIVISION OF LOT 7 DP1196266**

SINGLETON LGA

DRAWING TITLE: **CIVIL ENGINEERING PACKAGE**

COVER SHEET, DRAWING LIST AND LOCALITY PLAN

JOB NUMBER: **NL233144**

DRAWING NUMBER: **DA-C01.01** REVISION: **F**

DRAWING SHEET SIZE = A1

Date: 06.06.2025 3:16 PM Plotted By: EMMA WEIR Found: O:\5 Pre-July 24 Projects\Newcastle\YEAR 2023 Jobs\NL233144 - Bridgman Ridge Stages 9-14\0 - Drawings\CIVIL\05-CAD\01-DA\NL233144-DA-C01.01 COVER SHEET.dwg

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SCALE 1:1000 @ A1

0 10 20 30 40 50m

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ZONE R2
ZONE RE1
ZONE R1
CHEAL STREET (MC01)
CHEAL STREET (MC02)
ROURKE STREET
LAMBKIN STREET
HARPUR STREET
BROOMFIELD CRESCENT
PIONEER ROAD
RAWLINGS STREET
HOBDEN STREET
WATERCOURSE
EXISTING

CHEAL STREET (MC01)
19m ROAD RESERVE
5.5/4.5/4.5/4.5
1.5m FOOTPATH
2.5m SHARED PATH

STAGE 6
(APPROVED DA)
DA.8.2020.20.1

ROURKE STREET
18m ROAD RESERVE
4.5/4.5/4.5/4.5
1.5m FOOTPATH

LAMBKIN STREET
19.6m ROAD RESERVE
4.5/4.8/4.8/5.5
1.5m FOOTPATH
2.5m SHARED PATH

EXISTING
RESIDENTIAL
SUBDIVISION

HARPUR STREET
18m ROAD RESERVE
4.5/4.5/4.5/4.5
1.5m FOOTPATH

BROOMFIELD CRESCENT
18m ROAD RESERVE
4.5/4.5/4.5/4.5
1.5m FOOTPATH

EXISTING
RESIDENTIAL
SUBDIVISION

EXISTING TREE
TO BE RETAINED.

OPEN SPACE / PARK
1.22ha

PLAY
GROUND

EXISTING DAM
TO BE FILLED.

LOT 643
DP1313681

BIOFILTRATION STORMWATER
BASIN (CURRENTLY UNDER
CONSTRUCTION BY BRH).

LOT 8
DP1196266

APZ

CHEAL STREET (MC02)
19.6m ROAD RESERVE
5.5/4.8/4.8/4.5
1.5m FOOTPATH
2.5m SHARED PATH

LOT 9
DP1196266

BIOFILTRATION
STORMWATER BASIN.

LEGEND

- PROPOSED BOUNDARY LINE
- EXISTING BOUNDARY LINE
- 1.5m WIDE DRAINAGE EASEMENT
- 20m RIPARIAN OFFSET
- PROJECT CADASTRAL BOUNDARY
- ZONING BOUNDARY
- EXISTING WATERCOURSE
- 1.5m WIDE CONCRETE FOOTPATH (ACCESSIBLE)
- 1.5m WIDE CONCRETE FOOTPATH (NON-ACCESSIBLE)
- 3.0m WIDE CONCRETE FOOTPATH (ACCESSIBLE)
- 2.5m WIDE CONCRETE FOOTPATH (ACCESSIBLE)
- 2.5m WIDE CONCRETE FOOTPATH (NON-ACCESSIBLE)
- 4.0m WIDE CONCRETE FOOTPATH (ACCESSIBLE)
- 1.5m WIDE CONCRETE FOOTPATH (NON-ACCESSIBLE)
- 2.5m WIDE NATURE TRAIL (ACCESSIBLE)
- STAGE 1 LOTS
- STAGE 2 LOTS
- STAGE 3 LOTS
- STAGE 4 LOTS
- STAGE 5 LOTS
- STAGE 6 LOTS
- STAGE 7 LOTS
- APZ (V4 - MJD - 06/09/24)

NOTE

REFER TO LANDSCAPE PLANS FOR DETAILS FOR PLAYGROUND, WALKING TRAILS AND OPEN SPACE AREAS, ENTRY STATEMENT AND CONCEPT CIVIL PLANS.

LOT SUMMARY

STAGE 1	14
STAGE 2	10
STAGE 3	11
STAGE 4	10
STAGE 5	11
STAGE 6	15
STAGE 7	17
TOTAL	88

NOT FOR CONSTRUCTION

REVISION	DESCRIPTION	ISSUED	VER'D	APP'D	DATE
F	ISSUED FOR DEVELOPMENT APPLICATION	CWH	CP	RD	31.01.25
G	ISSUED FOR DA APPROVAL	EW	CP	RD	02.06.25
H	ISSUED FOR DA APPROVAL	EW	CP	RD	05.06.25
I	ISSUED FOR DA APPROVAL	EW	CP	RD	06.05.25
J	ISSUED FOR DA APPROVAL	AP	CP	RD	13.04.26
K	ISSUED FOR DA APPROVAL	DM	CP	RD	14.04.26

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PROJECT: **PROPOSED RESIDENTIAL SUBDIVISION OF LOT 7 DP1196266 INCLUDING WORKS IN LOT 8 DP1196266**

DRAWING TITLE: **PROPOSED SUBDIVISION MASTERPLAN**

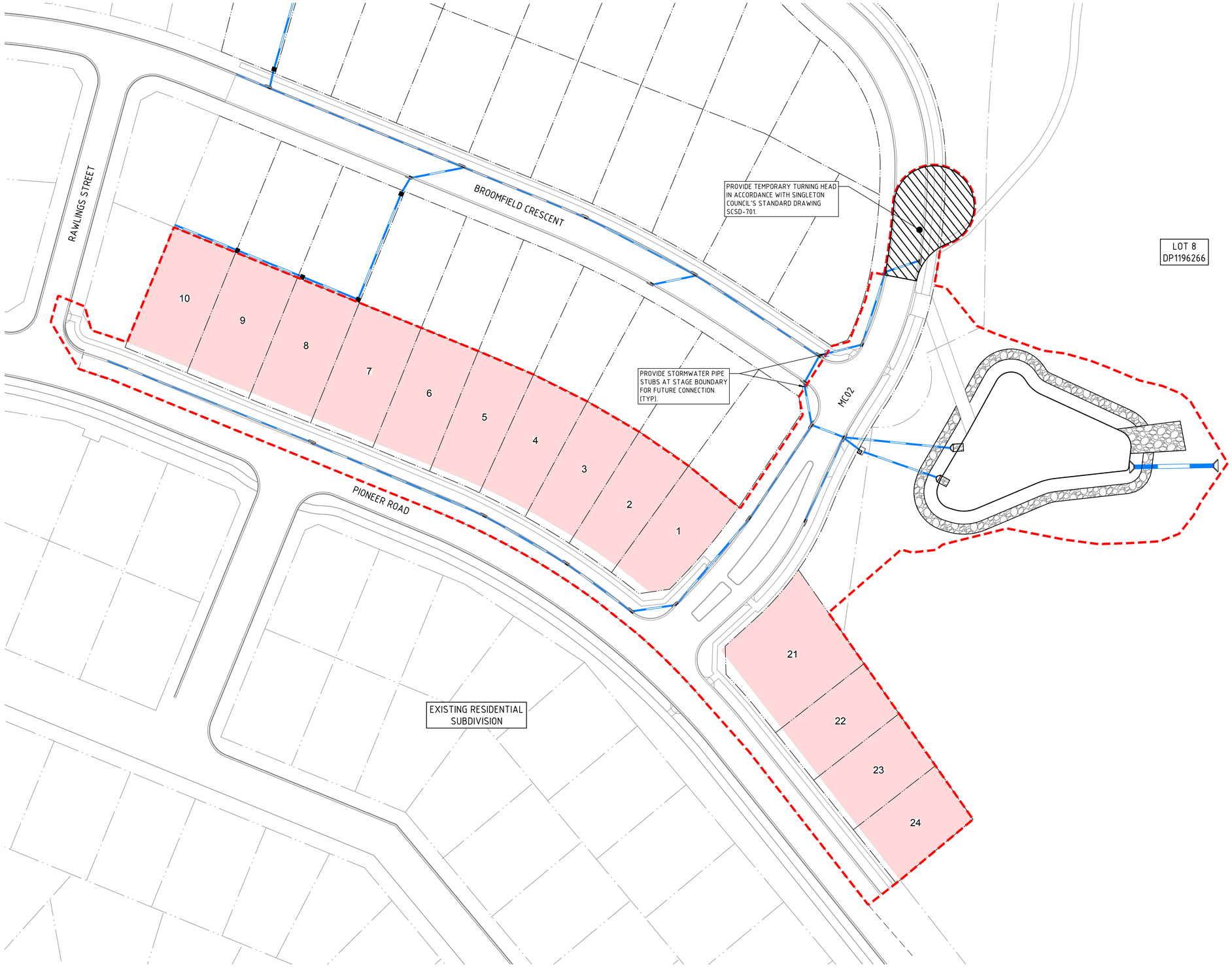
JOB NUMBER: **NL233144**

DRAWING NUMBER: **DA-C01.21**

REVISION: **K**

DRAWING SHEET SIZE = A1

Date : 14.04.2026 3:02 PM Plotted By : DIMITRI MAVROUDIS Found : O:\5 Pre-July 24 Projects\Newcastle\YEAR 2023 Jobs\NL233144 - Bridgman Ridge Stages 9-14\O - Drawings\CIVIL\03-CAD\01-DA\NL233144-DA-C01.21 SUBDIVISION PLAN.dwg



LEGEND

- PROPOSED BOUNDARY LINE
- EXISTING BOUNDARY LINE
- STAGE BOUNDARY LINE
- STORMWATER PIPE
- STORMWATER PIPE STUB
- STAGE 1 LOTS
- STAGE 2 LOTS
- STAGE 3 LOTS
- STAGE 4 LOTS
- STAGE 5 LOTS
- STAGE 6 LOTS
- STAGE 7 LOTS
- TEMPORARY PAVEMENT

DRAWN: C. W-HEALION DESIGNED: E. DOOLAN JOB MANAGER: R. DIERCKE VERIFIER: A. BROWN

NOT FOR CONSTRUCTION

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C	ISSUED FOR DA APPROVAL	EW	CP	RD	06.06.25

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ABN 81 094 433 100

PROJECT: **PROPOSED RESIDENTIAL SUBDIVISION OF LOT 7 DP1196266**

SINGLETON LGA

DRAWING TITLE: **CIVIL ENGINEERING PACKAGE**

CONSTRUCTION STAGING PLAN - STAGE 1 WORKS

JOB NUMBER: **NL233144**

DRAWING NUMBER: **DA-C01.22** REVISION: **C**

DRAWING SHEET SIZE = A1

Date : 06.06.2025 3:16 PM Plotted By : EMMA WEIR Found : O:\5 Pre-July 24 Projects\Newcastle\YEAR 2023 Jobs\NL233144 - Bridgman Ridge Stages 9-14\D - Drawings\CIVIL\03-CAD\01-DA\NL233144-DA-C01.22 STAGING WORKS.dwg

LEGEND

- PROPOSED BOUNDARY LINE
- EXISTING BOUNDARY LINE
- STAGE BOUNDARY LINE
- STORMWATER PIPE
- STORMWATER PIPE STUB
- STAGE 1 LOTS
- STAGE 2 LOTS
- STAGE 3 LOTS
- STAGE 4 LOTS
- STAGE 5 LOTS
- STAGE 6 LOTS
- STAGE 7 LOTS
- TEMPORARY PAVEMENT

DRAWN: C. W-HEALION DESIGNED: E. DOOLAN JOB MANAGER: R. DIERCKE VERIFIER: A. BROWN

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PROJECT
PROPOSED RESIDENTIAL SUBDIVISION OF LOT 7 DP1196266

SINGLETON LGA

DRAWING TITLE
CIVIL ENGINEERING PACKAGE

CONSTRUCTION STAGING PLAN - STAGE 2 WORKS

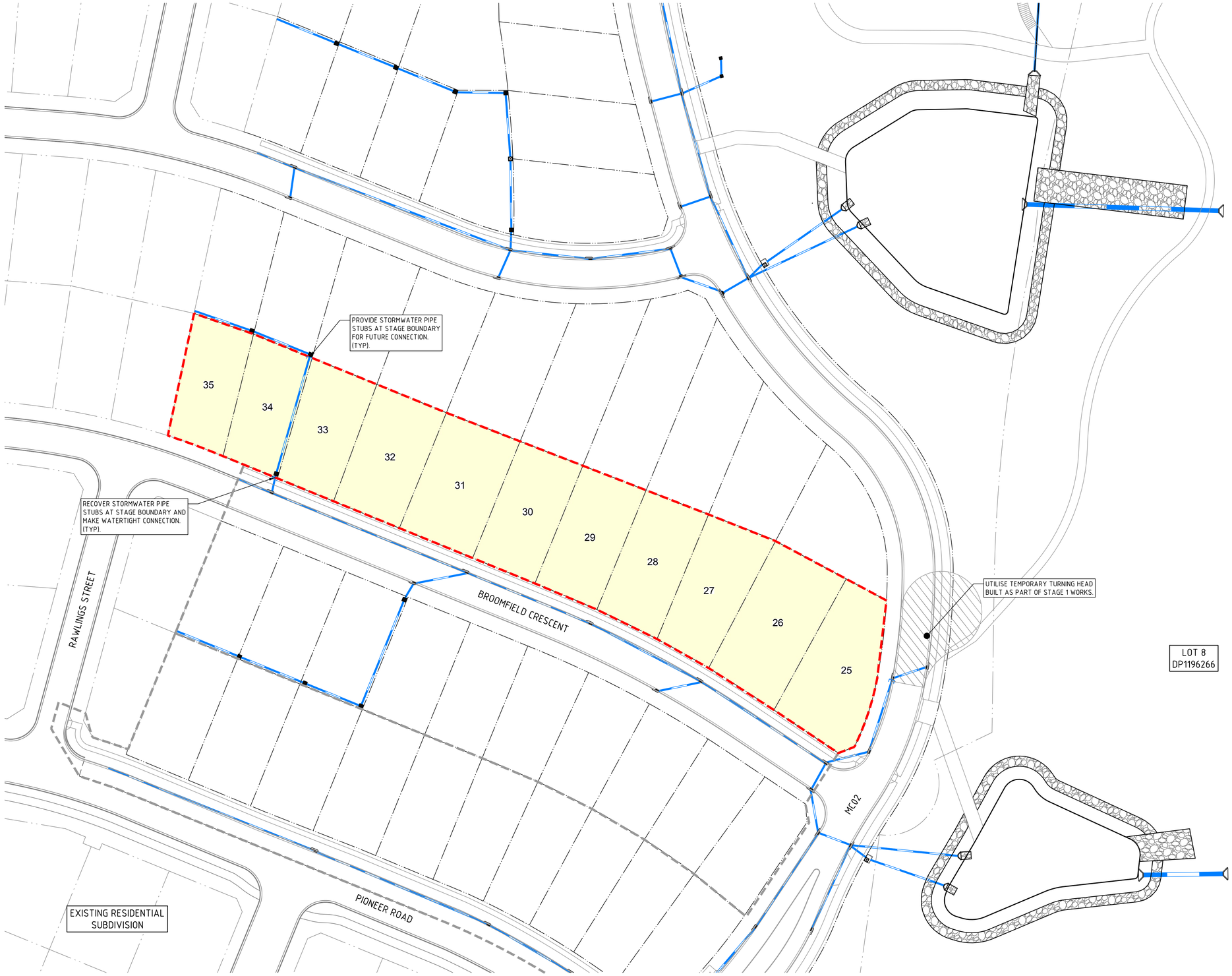
JOB NUMBER **NL233144**

DRAWING NUMBER **DA-C01.23**

REVISION **C**

DRAWING SHEET SIZE = A1

Date : 06.06.2025 3:16 PM Plotted By : EMMA WEIR Found : O:\5 Pre-July 24 Projects\Newcastle\YEAR 2023 Jobs\NL233144 - Bridgman Ridge Stages 9-14\D - Drawings\CIVIL\03-CAD\01-DA\NL233144-DA-C01.22 STAGING WORKS.dwg



LEGEND

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- STAGE BOUNDARY LINE
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- STORMWATER PIPE STUB
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PROJECT: **PROPOSED RESIDENTIAL SUBDIVISION OF LOT 7 DP1196266**

SINGLETON LGA

DRAWING TITLE: **CIVIL ENGINEERING PACKAGE**

CONSTRUCTION STAGING PLAN - STAGE 3 WORKS

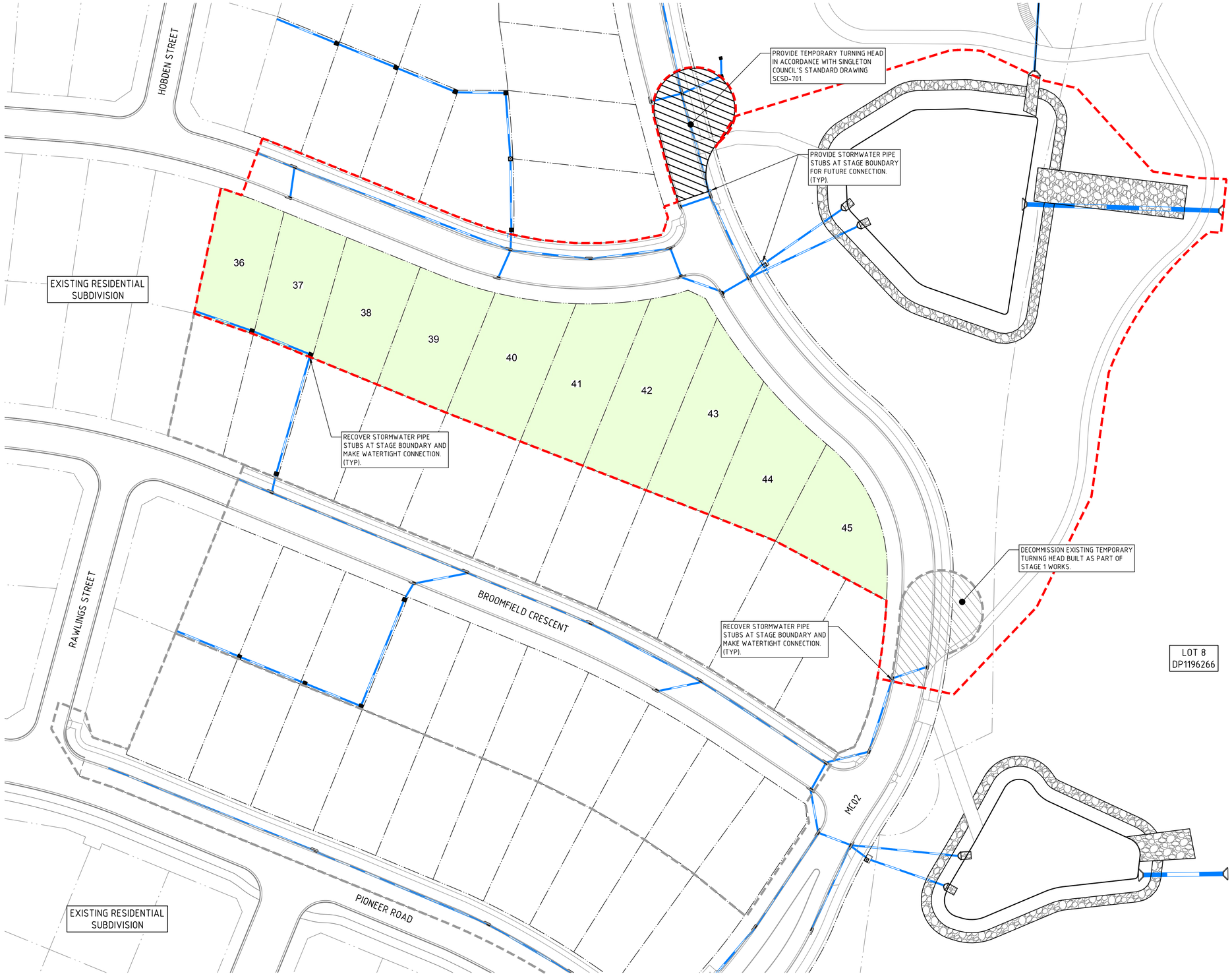
JOB NUMBER: **NL233144**

DRAWING NUMBER: **DA-C01.24**

REVISION: **C**

DRAWING SHEET SIZE = A1

Date: 06.06.2025 3:16 PM Plotted By: EMMA WEIR Found: O:\5 Pre-July 24 Projects\Newcastle\YEAR 2023 Jobs\NL233144 - Bridgman Ridge Stages 9-14\D - Drawings\CIVIL\03-CAD\01-DA\NL233144-DA-C01.22 STAGING WORKS.dwg



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SINGLETON LGA

DRAWING TITLE: **CIVIL ENGINEERING PACKAGE**

CONSTRUCTION STAGING PLAN - STAGE 4 WORKS

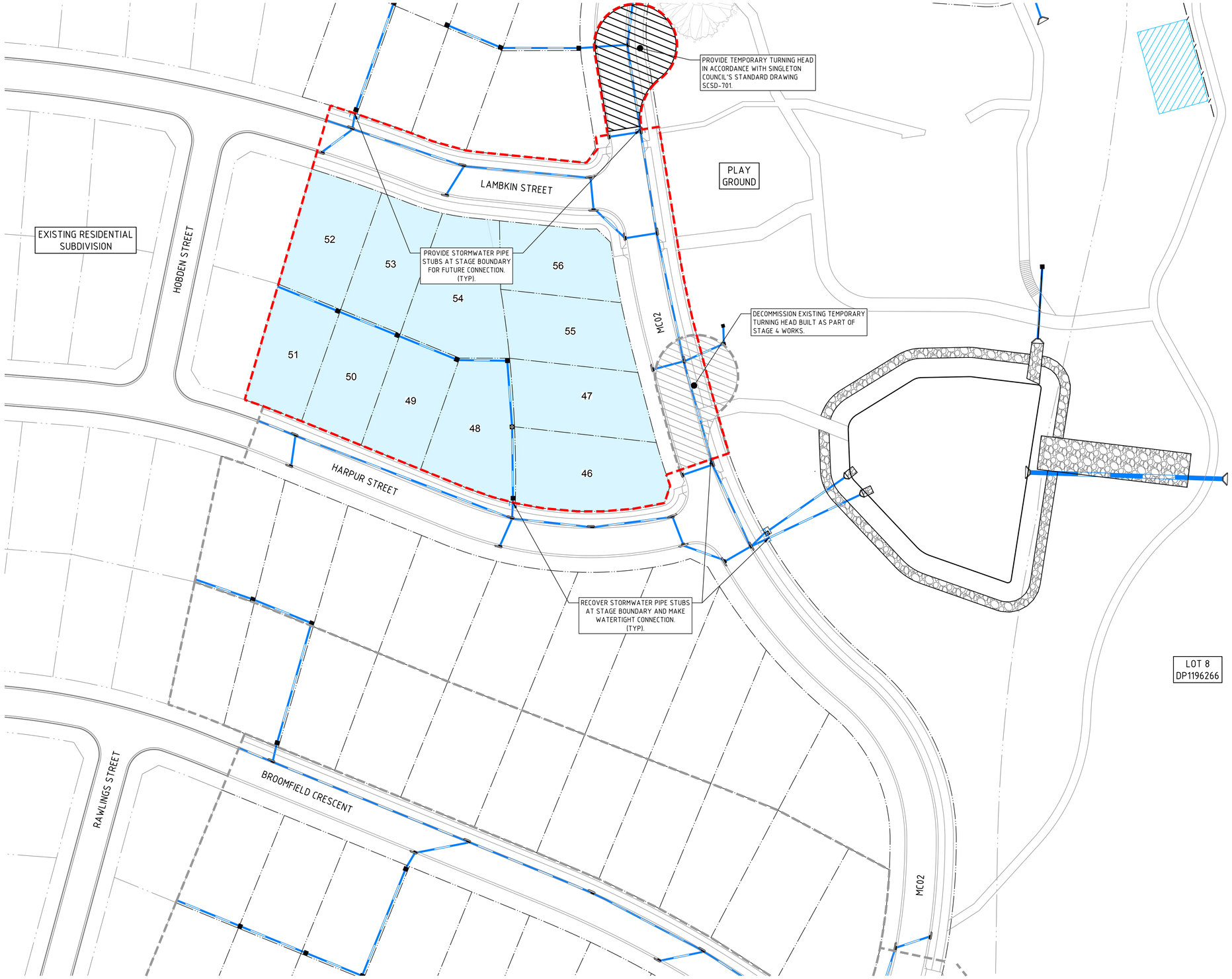
JOB NUMBER: **NL233144**

DRAWING NUMBER: **DA-C01.25**

REVISION: **C**

DRAWING SHEET SIZE = A1

Date : 06.06.2025 3:16 PM Plotted By : EMMA WEIR Found : C:\5 Pre-July 24 Projects\Newcastle\YEAR 2023 Jobs\NL233144 - Bridgman Ridge Stages 9-14\0 - Drawings\CIVIL\03-CAD\01-DA\NL233144-DA-C01.22 STAGING WORKS.dwg



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PROJECT: **PROPOSED RESIDENTIAL SUBDIVISION OF LOT 7 DP1196266**

SINGLETON LGA

DRAWING TITLE: **CIVIL ENGINEERING PACKAGE**

CONSTRUCTION STAGING PLAN - STAGE 5 WORKS

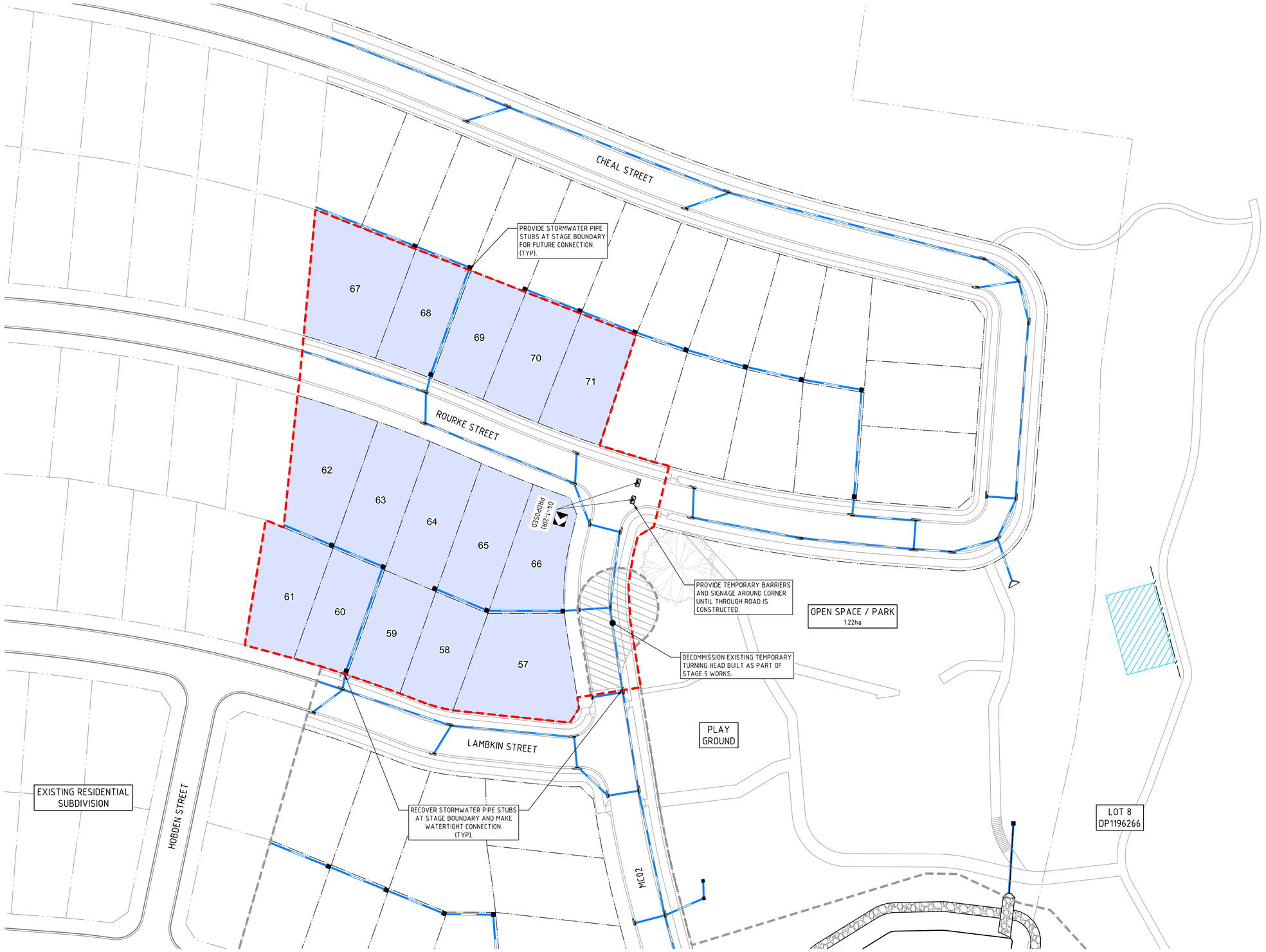
JOB NUMBER: **NL233144**

DRAWING NUMBER: **DA-C01.26**

REVISION: **C**

DRAWING SHEET SIZE = A1

Date : 06.06.2025 3:16 PM Plotted By : EMMA WEIR Found : O:\5 Pre-July 24 Projects\Newcastle\YEAR 2023 Jobs\NL233144 - Bridgman Ridge Stages 9-14\D - Drawings\CIVIL\03-CAD\01-DA\NL233144-DA-C01.22 STAGING WORKS.dwg



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PROJECT: **PROPOSED RESIDENTIAL SUBDIVISION OF LOT 7 DP1196266**

SINGLETON LGA

DRAWING TITLE: **CIVIL ENGINEERING PACKAGE**

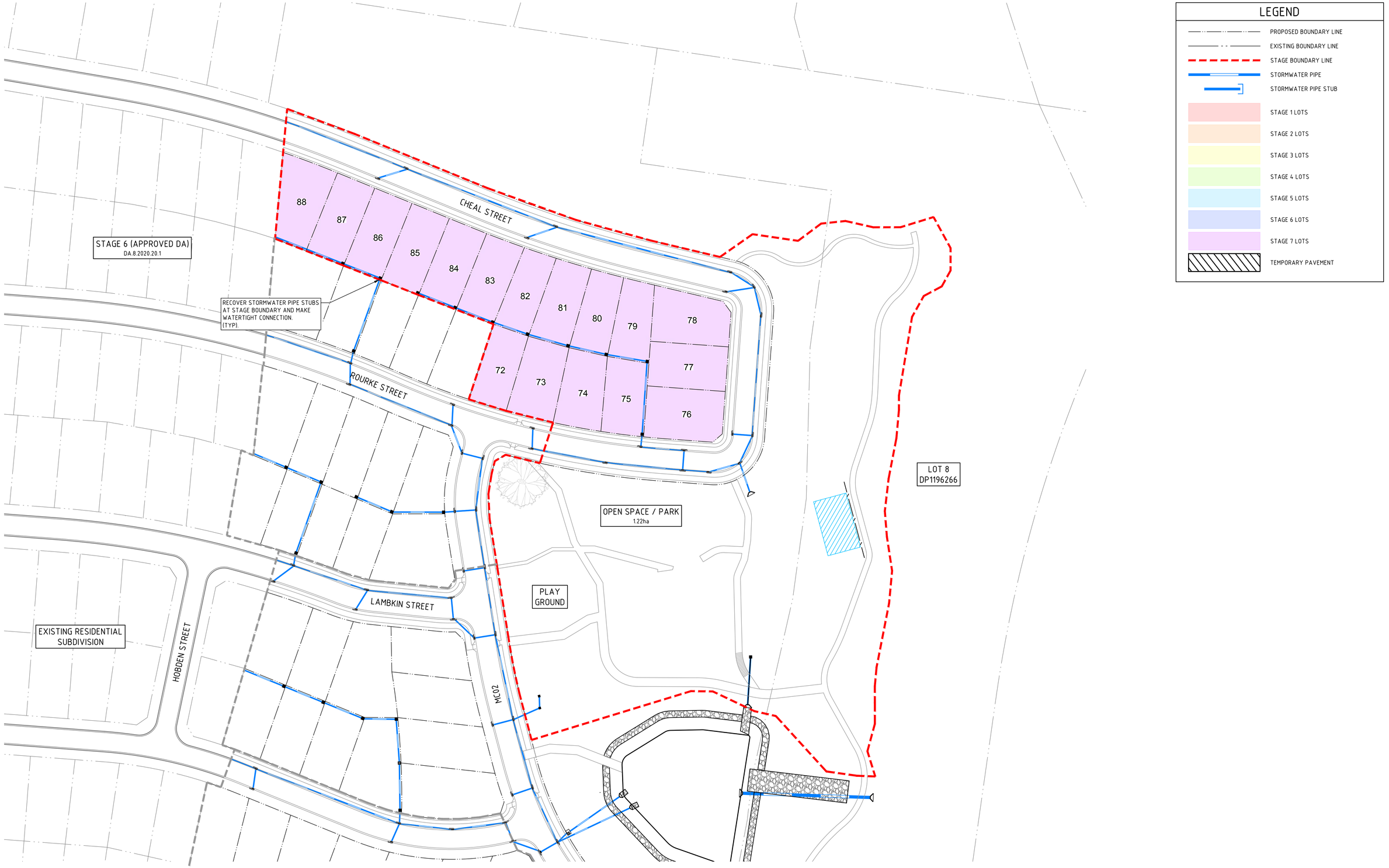
CONSTRUCTION STAGING PLAN - STAGE 6 WORKS

JOB NUMBER: **NL233144**

DRAWING NUMBER: **DA-C01.27** REVISION: **B**

DRAWING SHEET SIZE = A1

Date : 06.06.2025 3:16 PM Plotted By : EMMA WEIR Found : O:\5 Pre-July 24 Projects\Newcastle\YEAR 2023 Jobs\NL233144 - Bridgman Ridge Stages 9-14\0 - Drawings\CIVIL\03-CAD\01-DA\NL233144-DA-C01.22 STAGING WORKS.dwg



DRAWN: C W-HEALION DESIGNED: E DOOLAN JOB MANAGER: R. DIERCKE VERIFIER: A. BROWN

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REVISION	DESCRIPTION	ISSUED	VER'D	APP'D	DATE
A	ISSUED FOR DEVELOPMENT APPLICATION	CWH	CP	RD	31.01.25
B	ISSUED FOR DA APPROVAL	EW	CP	RD	02.06.25

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PROJECT
PROPOSED RESIDENTIAL SUBDIVISION OF LOT 7 DP1196266

SINGLETON LGA

DRAWING TITLE
CIVIL ENGINEERING PACKAGE

CONSTRUCTION STAGING PLAN - STAGE 7 WORKS

JOB NUMBER **NL233144**

DRAWING NUMBER **DA-C01.28**

REVISION **B**

DRAWING SHEET SIZE = A1

Date : 06.06.2025 3:17 PM Plotted By : EMMA WEIR Found : O:\5 Pre-July 24 Projects\Newcastle\YEAR 2023 Jobs\NL233144 - Bridgman Ridge Stages 9-14\O - Drawings\CIVIL\03-CAD\01-DA\NL233144-DA-C01.22 STAGING WORKS.dwg

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LEGEND

- PROPOSED BOUNDARY LINE
- EXISTING BOUNDARY LINE
- 1.5m WIDE DRAINAGE EASEMENT
- ZONING BOUNDARY
- EXISTING WATERCOURSE
- APZ (V4 - MJD - 06/09/24)
- OPERATIONAL LAND 125,592m²

ZONE R2
ZONE RE1
ZONE R1
CHEAL STREET (MC01)
ROURKE STREET
LAMBKIN STREET
CHEAL STREET (MC02)
HARPUR STREET
BROOMFIELD CRESCENT
PIONEER ROAD
EXISTING RESIDENTIAL SUBDIVISION
LOT 8 DP1196266
OPERATIONAL LAND 125,592m²
LOT 9 DP1196266

88 769m² | 87 674m² | 86 670m² | 85 665m² | 84 661m² | 83 661m² | 82 582m² | 81 649m² | 80 588m² | 79 583m² | 78 773m² | 77 700m² | 76 796m² | 75 634m² | 74 667m² | 73 700m² | 72 597m² | 71 676m² | 70 643m² | 69 610m² | 68 636m² | 67 1013m²
62 847m² | 63 702m² | 64 706m² | 65 708m² | 66 680m² | 61 692m² | 60 590m² | 59 567m² | 58 554m² | 57 982m²
52 754m² | 53 703m² | 54 957m² | 56 723m² | 55 737m² | 51 666m² | 50 665m² | 49 664m² | 48 868m² | 47 802m² | 46 961m²
37 720m² | 38 822m² | 39 858m² | 40 960m² | 41 968m² | 42 1168m² | 43 970m² | 44 856m² | 45 826m² | 34 70m² | 33 717m² | 32 803m² | 31 874m² | 30 751m² | 29 762m² | 28 774m² | 27 798m² | 26 1007m² | 25 988m²
12 720m² | 13 720m² | 14 720m² | 15 663m² | 16 677m² | 17 683m² | 18 679m² | 19 677m² | 20 674m² | 8 742m² | 7 741m² | 6 683m² | 5 636m² | 4 621m² | 3 621m² | 2 621m² | 1 668m²
21 1001m² | 22 561m² | 23 567m² | 24 579m²

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REVISION	DESCRIPTION	ISSUED	VER'D	APP'D	DATE
A	ISSUED FOR DEVELOPMENT APPLICATION	EW	CP	RD	23.05.25
B	ISSUED FOR DEVELOPMENT APPLICATION	EW	CP	RD	10.06.25

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PROJECT: **PROPOSED RESIDENTIAL SUBDIVISION OF LOT 7 DP1196266 INCLUDING WORKS IN LOT 8 DP1196266**

DRAWING TITLE: **OPERATIONAL & COMMUNITY LAND**

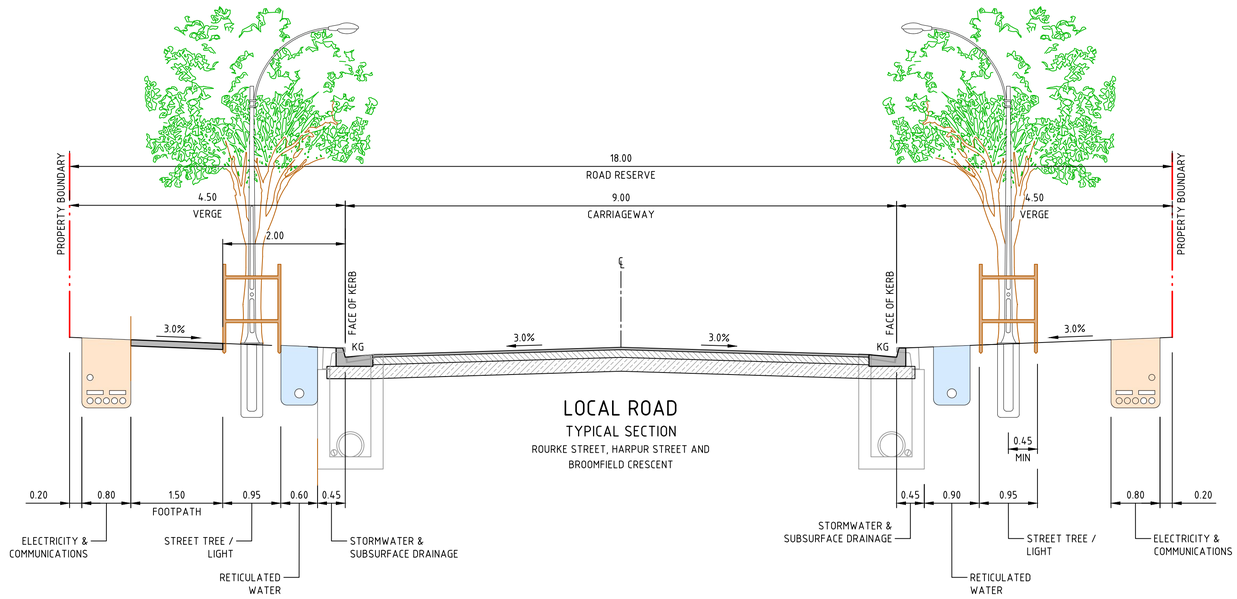
JOB NUMBER: **NL233144**

DRAWING NUMBER: **DA-C01.30**

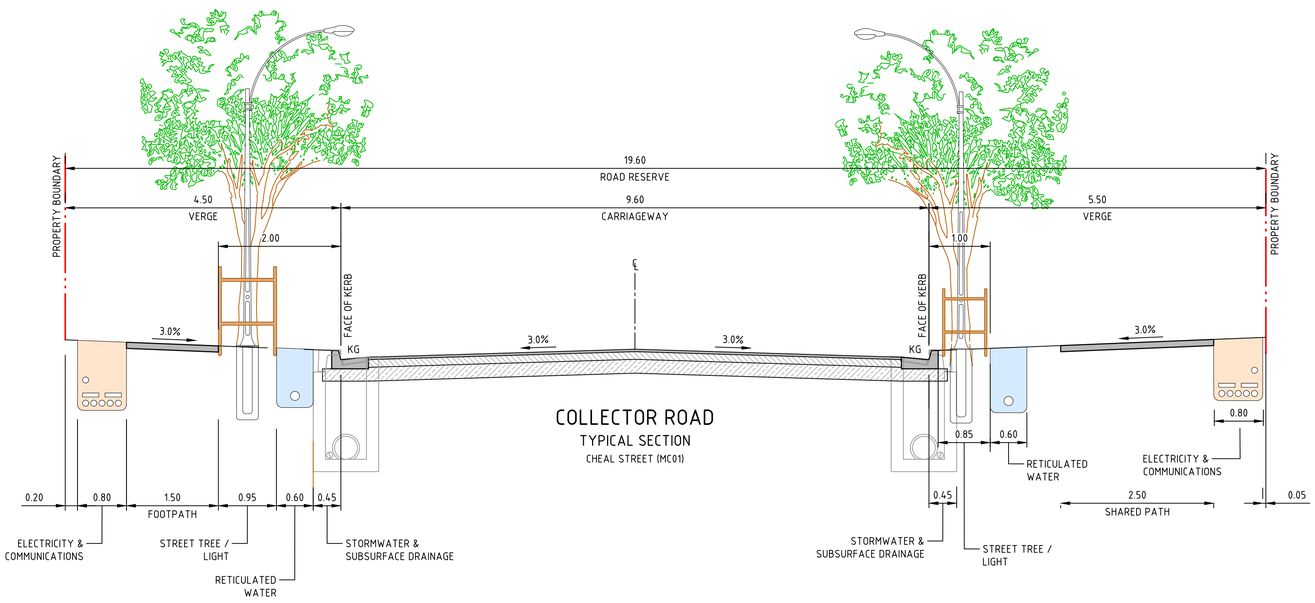
REVISION: **B**

DRAWING SHEET SIZE = A1

Date : 10.06.2025 4:13 PM Plotted By : RYAN DIERCKE Found : O:\5 Pre-July 24 Projects\Newcastle\YEAR 2023 Jobs\NL233144 - Bridgman Ridge Stages 9-14\O - Drawings\CIVIL\03-CAD\01-DA\NL233144-DA-C01.30 OPERATIONAL COM LAND_BASE.dwg



LOCAL ROAD
TYPICAL SECTION
ROURKE STREET, HARPUR STREET AND BROOMFIELD CRESCENT



COLLECTOR ROAD
TYPICAL SECTION
CHEAL STREET (MC01)

DRAWN: C. W-HEALION DESIGNED: E. DOOLAN JOB MANAGER: R. DIERCKE VERIFIER: A. BROWN

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REVISION	DESCRIPTION	ISSUED	VER'D	APP'D	DATE
A	ISSUED FOR CLIENT REVIEW	CWH	AB	ED	05.06.24
B	ISSUED FOR CLIENT REVIEW	CWH	AB	RD	15.07.24
C	ISSUED FOR DEVELOPMENT APPLICATION	RK	AB	RD	22.08.24
D	ISSUED FOR DEVELOPMENT APPLICATION	CWH	AB	RD	11.09.24
E	ISSUED FOR DEVELOPMENT APPLICATION	CWH	CP	RD	31.01.25
F	ISSUED FOR DA APPROVAL	EW	CP	RD	02.06.25

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PROJECT
PROPOSED RESIDENTIAL SUBDIVISION OF LOT 7 DP1196266

SINGLETON LGA

DRAWING TITLE
CIVIL ENGINEERING PACKAGE

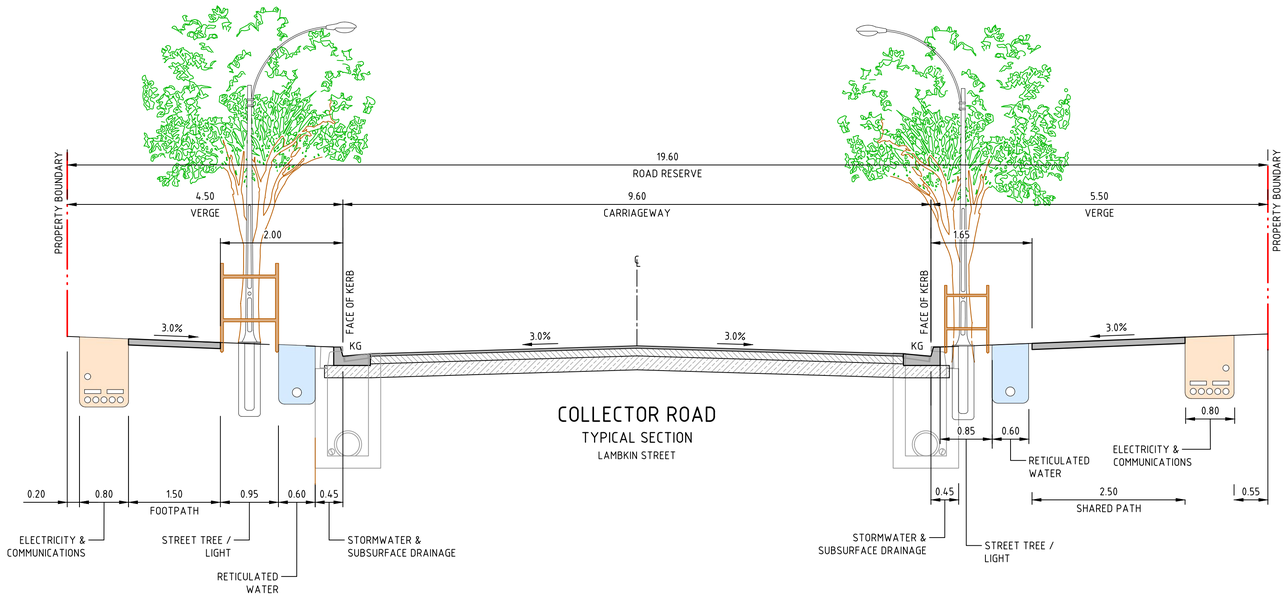
TYPICAL ROAD CROSS SECTIONS - SHEET 1

JOB NUMBER **NL233144**

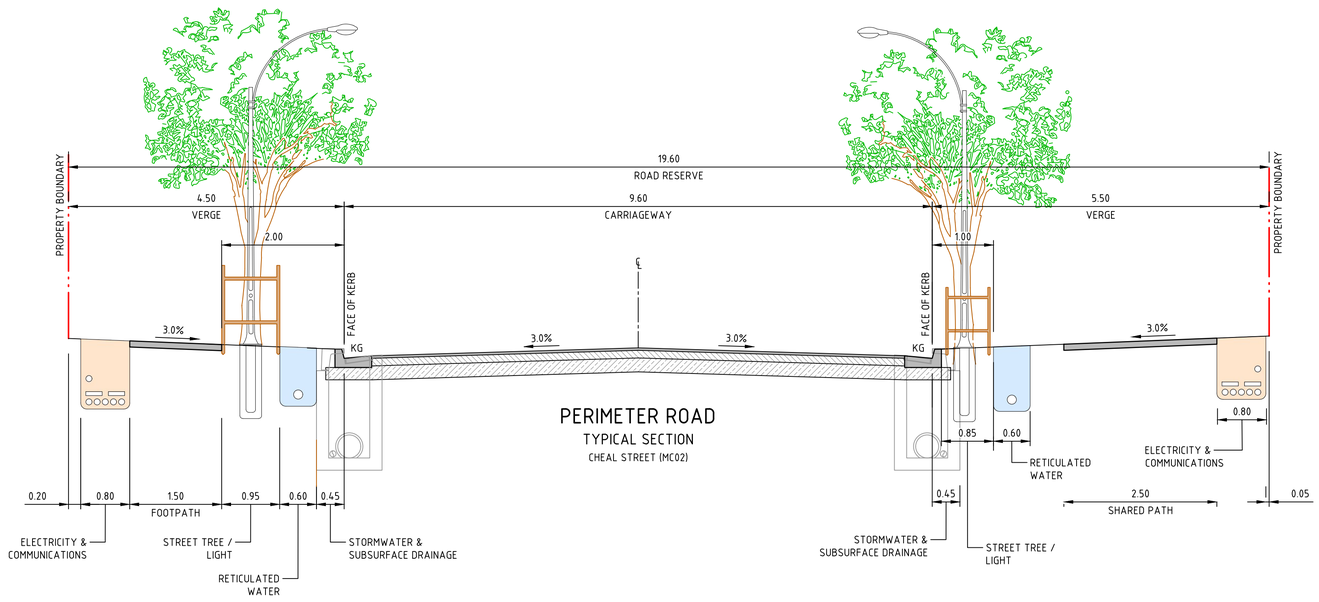
DRAWING NUMBER **DA-C01.31** REVISION **F**

DRAWING SHEET SIZE = A1

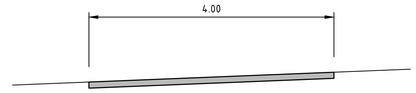
Date : 06.06.2025 3:17 PM Plotted By : EMMA WEIR Found : O:\5 Pre-July 24 Projects\Newcastle\YEAR 2023 Jobs\NL233144 - Bridgman Ridge Stages 9-14\D - Drawings\CIVIL\03-CAD\01-DA\NL233144-DA-C01.31 TYP ROAD XSN.dwg



COLLECTOR ROAD
TYPICAL SECTION
LAMBKIN STREET



PERIMETER ROAD
TYPICAL SECTION
CHEAL STREET (MC02)



WALKING TRAIL
TYPICAL SECTION

DRAWN: C.W-HEALION DESIGNED: E.DOOLAN JOB MANAGER: R. DIERCKE VERIFIER: A. BROWN

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REVISION	DESCRIPTION	ISSUED	VER'D	APP'D	DATE
A	ISSUED FOR CLIENT REVIEW	CWH	AB	RD	15.07.24
B	ISSUED FOR DEVELOPMENT APPLICATION	RK	AB	RD	22.08.24
C	ISSUED FOR DEVELOPMENT APPLICATION	CWH	AB	RD	11.09.24
D	ISSUED FOR DEVELOPMENT APPLICATION	CWH	CP	RD	31.01.25
E	ISSUED FOR DA APPROVAL	EW	CP	RD	02.06.25

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PROJECT: **PROPOSED RESIDENTIAL SUBDIVISION OF LOT 7 DP1196266**

SINGLETON LGA

DRAWING TITLE: **CIVIL ENGINEERING PACKAGE**

TYPICAL ROAD CROSS SECTIONS - SHEET 2

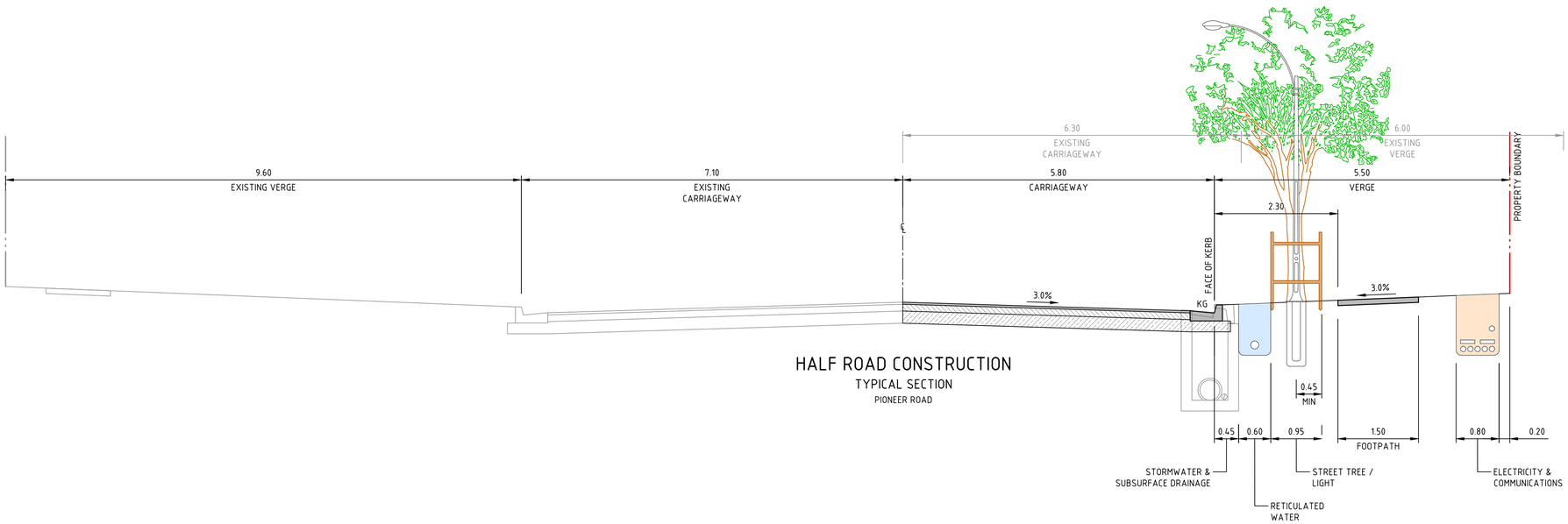
JOB NUMBER: **NL233144**

DRAWING NUMBER: **DA-C01.32**

REVISION: **E**

DRAWING SHEET SIZE = A1

Date: 06.06.2025 3:17 PM Plotted By: EMMA WEIR Found: O:\5 Pre-July 24 Projects\Newcastle\YEAR 2023 Jobs\NL233144 - Bridgman Ridge Stages 9-14\D - Drawings\CIVIL\03-CAD\01-DA\NL233144-DA-C01.31 TYP ROAD.XSN.dwg



HALF ROAD CONSTRUCTION

TYPICAL SECTION

PIONEER ROAD

DRAWN: C.W-HEALION DESIGNED: E. DOOLAN JOB MANAGER: R. DIERCKE VERIFIER: A. BROWN

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REVISION	DESCRIPTION	ISSUED	VER'D	APP'D	DATE
A	ISSUED FOR DEVELOPMENT APPLICATION	CWH	CP	RD	31.01.25
B	ISSUED FOR DA APPROVAL	EW	CP	RD	02.06.25

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PROJECT: **PROPOSED RESIDENTIAL SUBDIVISION OF LOT 7 DP1196266**

SINGLETON LGA

DRAWING TITLE: **CIVIL ENGINEERING PACKAGE**

TYPICAL ROAD CROSS SECTIONS - SHEET 3

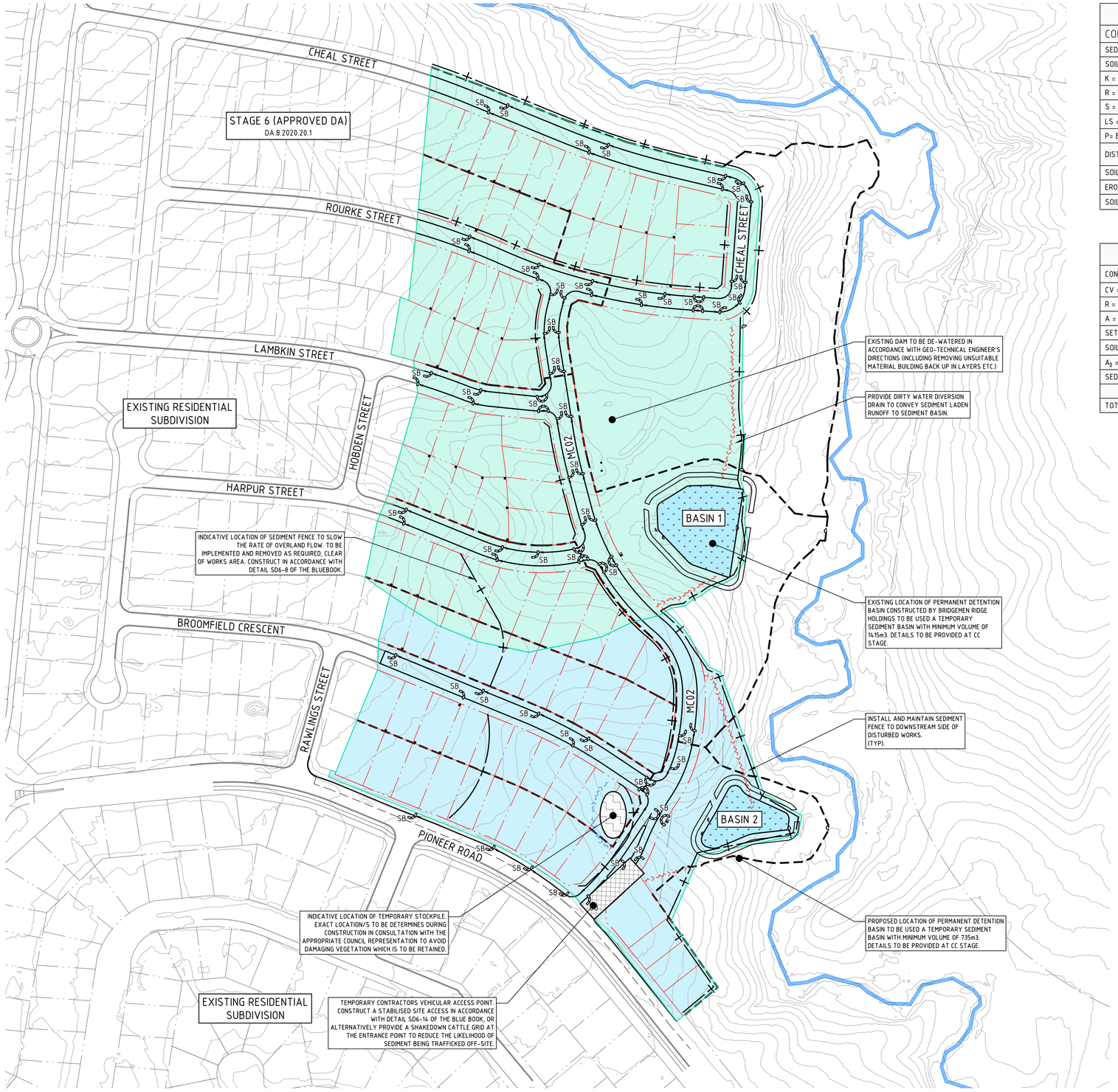
JOB NUMBER: **NL233144**

DRAWING NUMBER: **DA-C01.33**

REVISION: **B**

DRAWING SHEET SIZE = A1

Date: 06.06.2025 3:17 PM Plotted By: EMMA WEIR Found: O:\5 Pre-July 24 Projects\Newcastle\YEAR 2023 Jobs\NL233144 - Bridgman Ridge Stages 9-14\D - Drawings\CIVIL\03-CAD\01-DA\NL233144-DA-C01.31 TYP ROAD XSN.dwg



SITE PARAMETERS

CONSTRAINT	BASIN 1	BASIN 2
SEDIMENT TYPE	F (FINE)	
SOIL HYDROLOGY GROUP	C	
K = SOIL ERODIBILITY (K-FACTOR)	0.037	
R = RAINFALL EROSIVITY (R-FACTOR)	1240	
S = 2 YEAR, 6 HOUR STORM INTENSITY	6.92mm/hr	
LS = SLOPE LENGTH/GRADIENT	2.05 (205m @ 4%)	1.45 (120m@ 5%)
P= EROSION CONTROL PRACTICE (P-FACTOR)	1.3 (TYPICAL)	
DISTURBED CATCHMENT AREA (ha)	7.73	4.28
SOIL LOSS (RUSLE METHOD) (tonnes/ha/yr)	119	86
EROSION HAZARD (TABLE 4.2 BLUE BOOK)	VERY LOW	VERY LOW
SOIL LOSS (RUSLE METHOD) (m^3/ ha / yr)	90	67

SEDIMENT BASIN SIZING

CONSTRAINT	BASIN 1	BASIN 2	UNITS
CV = VOLUMETRIC RUNOFF COEFFICIENT	0.51	0.51	
R = 5 DAY 85th PERCENTILE RAINFALL	24.4	24.4	mm
A = CATCHMENT AREA	7.73	4.02	ha
SETTLING ZONE VOLUME (10 x CV x R x A)	945	490	m^3
SOIL LOSS (RUSLE METHOD)	90	67	m^3/ha/yr
A_2 = DISTURBED CATCHMENT AREA	7.73	4.02	ha
SEDIMENT STORAGE VOLUME (0.17 x SOIL LOSS x A_2)	470	245	m^3
TOTAL BASIN VOLUME REQUIRED	1,415	735	m^3

BASIN MANAGEMENT NOTES:

1. PRIOR TO ANY FORECAST WEATHER EVENT, LIKELY TO RESULT IN SEDIMENT LADEN RUNOFF ON THE SITE, ANY EXISTING DETENTION BASINS/TRAPS SHALL BE DEWATERED TO PROVIDE SUFFICIENT CAPACITY TO CAPTURE SEDIMENT LADEN WATER FROM THE SITE.
2. ANY SEDIMENT LADEN WATER CAPTURED ON-SITE MUST BE TREATED TO ENSURE IT WILL ACHIEVE COUNCIL'S WATER QUALITY OBJECTIVES PRIOR TO ITS RELEASE FROM SITE. A SAMPLE OF THE RELEASED TREATED WATER MUST BE KEPT ON-SITE IN A CLEAR CONTAINER WITH THE SAMPLE DATE RECORDED.
3. NO ALUMINIUM BASED PRODUCTS MAY BE USED TO TREAT TURBID WATER (FLOCCULATING/COAGULANTS) ON-SITE WITHOUT THE PRIOR WRITTEN PERMISSION FROM AN APPROPRIATE COUNCIL OFFICER. THE APPLICANT MUST HAVE DEMONSTRATED ABILITY TO USE SUCH PRODUCTS CORRECTLY AND WITHOUT ENVIRONMENTAL HARM PRIOR TO ANY APPROVAL.
4. THE CHEMICAL/AGENT (FLOCCULATING/COAGULANTS) USED IN TYPE D AND TYPE F BASINS TO TREAT TURBID WATER CAPTURED IN THE BASIN MUST BE APPLIED IN CONCENTRATIONS SUFFICIENT TO ACHIEVE COUNCIL'S WATER QUALITY OBJECTIVES (TSS < 50mg/L, TURBIDITY < 60 NTU, 6.5 < pH < 8.5) WITHIN THE 5-DAY RAINFALL DEPTH USED TO CALCULATE THE CAPACITY OF THE BASIN, AFTER A RAINFALL EVENT.
5. ALL MANUFACTURERS INSTRUCTIONS MUST BE FOLLOWED FOR THE USE OF ANY CHEMICALS/AGENTS USED ON-SITE, EXCEPT WHERE APPROVED BY THE RESPONSIBLE PERSON OR AN APPROPRIATE COUNCIL OFFICER.
6. SUFFICIENT QUANTITIES OF CHEMICALS/AGENTS TO TREAT TURBID WATER (FLOCCULATING/COAGULANTS) MUST BE PLACED SUCH THAT WATER ENTERING THE BASINS/SEDIMENT TRAP MIXES WITH THE CHEMICALS/AGENTS AND IS CARRIED INTO THE BASIN/TRAP.
7. ANY BASIN MUST BE DEWATERED AS SOON AS PRACTICAL, ONCE WATER CAPTURED IN THE BASIN ACHIEVES COUNCIL'S WATER QUALITY OBJECTIVES.
8. INSPECT THE SEDIMENT BASINS AFTER EACH RAINFALL EVENT AND/OR WEEKLY. ENSURE THAT ALL SEDIMENT IS REMOVED ONCE THE SEDIMENT STORAGE ZONE IS FULL. ENSURE THAT OUTLET AND EMERGENCY SPILLWAY WORKS ARE MAINTAINED IN A FULLY OPERATIONAL CONDITION AT ALL TIMES.

LEGEND

- SITE BOUNDARY LINE
- EXISTING PROPERTY BOUNDARY
- STAGING BOUNDARY
- SEDIMENT FENCE
- SB — SANDBAG SEDIMENT FILTER
- DIVERSION DRAIN (CLEAN)
- DIVERSION DRAIN (DIRTY)
- STABILISED SITE ACCESS
- STOCKPILES
- XX.XX — EXISTING CONTOURS (1.0m INTERVAL)
- OVERLAND FLOW PATH
- SEDIMENT BASIN

NOTES

1. ALL EROSION AND SEDIMENTATION CONTROL MEASURES MUST BE APPROPRIATE FOR THE SEDIMENT TYPE(S) OF THE SOILS ON-SITE, IN ACCORDANCE WITH THE 'BLUE BOOK' (MANAGING URBAN STORMWATER – SOILS AND CONSTRUCTION. LANDCOM, 2004), OR OTHER CURRENT RECOGNISED INDUSTRY STANDARDS FOR EROSION AND SEDIMENT CONTROL FOR AUSTRALIAN CONDITIONS. THIS INCLUDES SEDIMENT TRAPS AND LINING OF CHANNELS.
2. THE CONTRACTOR SHALL BE RESPONSIBLE FOR KEEPING A DETAILED WRITTEN RECORD OF ALL EROSION AND SEDIMENT CONTROLS ON-SITE DURING THE CONSTRUCTION PERIOD. THIS RECORD SHALL BE UPDATED ON A DAILY BASIS AND SHALL CONTAIN DETAILS ON THE CONDITION OF CONTROLS AND ANY/ALL MAINTENANCE, CLEANING AND BREACHES. THIS RECORD SHALL BE KEPT ON-SITE AT ALL TIMES AND SHALL BE MADE AVAILABLE FOR INSPECTION BY THE PRINCIPAL CERTIFYING AUTHORITY AND THE SUPERINTENDENT DURING NORMAL WORKING HOURS.
3. INSTALL SEDIMENT PROTECTION FILTERS ON ALL NEW AND EXISTING STORMWATER INLET PITS IN ACCORDANCE WITH EITHER THE MESH AND GRAVEL INLET FILTER DETAIL SD6-11 OR THE GEOTEXTILE INLET FILTER DETAIL SD6-12 OF THE 'BLUE BOOK'.
4. ESTABLISH ALL REQUIRED SEDIMENT FENCES IN ACCORDANCE WITH DETAIL SD6-8 OF THE 'BLUE BOOK'.
5. INSTALL SEDIMENT FENCING, OR OTHER SEDIMENT CONTROL DEVICES, AROUND INDIVIDUAL BUILDING ZONES/AREAS AS REQUIRED AND AS DIRECTED BY THE SUPERINTENDENT OR APPROPRIATE COUNCIL OFFICER.
6. ALL TRENCHES INCLUDING ALL SERVICE TRENCHES AND SWALE EXCAVATION SHALL BE SIDE-CAST TO THE HIGH SIDE AND CLOSED AT THE END OF EACH DAYS WORK.
7. THE CONTRACTOR SHALL ENSURE THAT ALL VEGETATION (TREE, SHRUB AND GROUND COVER) WHICH IS TO BE RETAINED SHALL BE PROTECTED DURING THE DURATION OF CONSTRUCTION.
8. ALL VEGETATION TO BE REMOVED SHALL BE MULCHED ON-SITE AND SPREAD/STOCKPILED AS DIRECTED BY THE SUPERINTENDENT.
9. STRIP TOPSOIL IN AREAS DESIGNATED FOR STRIPPING AND STOCKPILE FOR RE-USE AS REQUIRED. ANY SURPLUS MATERIAL SHALL BE SPREAD ON-SITE AS DIRECTED BY THE SUPERINTENDENT OR REMOVED FROM SITE AND DISPOSED OF IN ACCORDANCE WITH EPA GUIDELINES.
10. CONSTRUCT AND MAINTAIN ALL MATERIAL STOCKPILES IN ACCORDANCE WITH DETAIL SD4-1 OF THE 'BLUE BOOK' (INCLUDING CUT-OFF SWALES TO THE HIGH SIDE AND SEDIMENT FENCES TO THE LOW SIDE).
11. ENSURE STOCKPILES DO NOT EXCEED 2.0m HIGH. PROVIDE WIND AND RAIN EROSION PROTECTION AS REQUIRED IN ACCORDANCE WITH THE 'BLUE BOOK'.
12. PROVIDE WATER TRUCKS OR SPRINKLER DEVICES DURING CONSTRUCTION AS REQUIRED TO SUPPRESS DUST.
13. ONCE CUT/FILL OPERATIONS HAVE BEEN FINALIZED ALL DISTURBED AREAS THAT ARE NOT BEING WORKED ON SHALL BE RE-VEGETATED AS SOON AS IS PRACTICAL.

DRAWN: C.W-HEALION DESIGNED: E. DOOLAN JOB MANAGER: R. DIERCKE VERIFIER: A. BROWN

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REVISION	DESCRIPTION	ISSUED	VER'D	APP'D	DATE
B	ISSUED FOR CLIENT REVIEW	CWH	AB	RD	15.07.24
C	ISSUED FOR DEVELOPMENT APPLICATION	RK	AB	RD	22.08.24
D	ISSUED FOR DEVELOPMENT APPLICATION	CWH	AB	RD	11.09.24
E	ISSUED FOR DEVELOPMENT APPLICATION	CWH	CP	RD	31.01.25
F	ISSUED FOR DA APPROVAL	EW	CP	RD	02.06.25
G	ISSUED FOR DA APPROVAL	EW	CP	RD	06.06.25

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PROJECT: PROPOSED RESIDENTIAL SUBDIVISION OF LOT 7 DP1196266

SINGLETON LGA

DRAWING TITLE: CIVIL ENGINEERING PACKAGE

EROSION AND SEDIMENT CONTROL PLAN

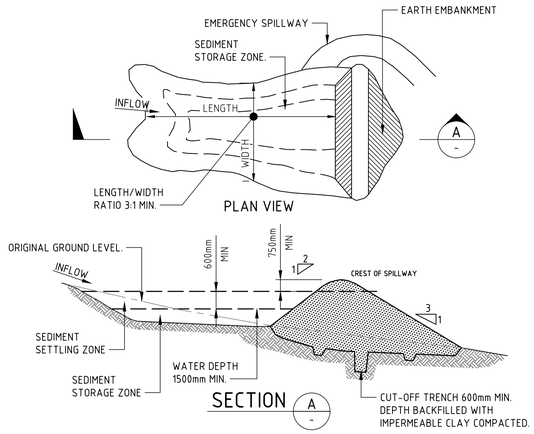
JOB NUMBER: NL233144

DRAWING NUMBER: DA-C02.01

REVISION: G

DRAWING SHEET SIZE = A1

Date: 06.06.2025 3:17 PM Plotted By: EMMA WEIR Found: O:\5 Pre-July 24 Projects\Newcastle\YEAR 2023 Jobs\NL233144 - Bridgman Ridge Stages 9-14\3 - Drawings\CIVIL\03-CAD\01-DA\NL233144-DA-C02.01 ESC PLAN.dwg

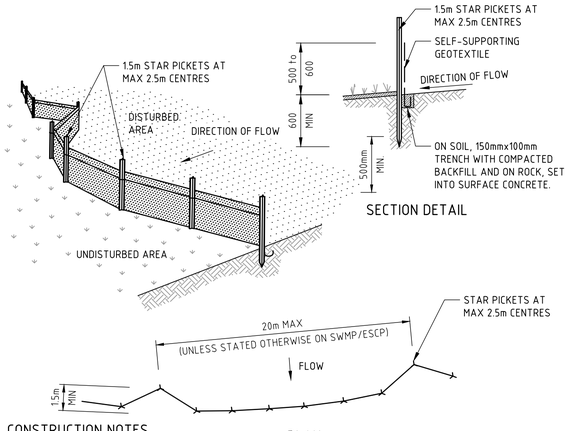


CONSTRUCTION NOTES

1. REMOVE ALL VEGETATION AND TOPSOIL FROM UNDER THE DAM WALL AND FROM WITHIN THE STORAGE AREA.
2. CONSTRUCT A CUT-OFF TRENCH 500mm DEEP AND 1200mm WIDE ALONG THE CENTRELINE OF THE EMBANKMENT EXTENDING TO A POINT ON THE GULLY WALL LEVEL WITH THE RISER CREST.
3. MAINTAIN THE TRENCH FREE OF WATER AND RECOMPACT THE MATERIALS WITH EQUIPMENT AS SPECIFIED IN THE SWMP TO 95 PER CENT STANDARD PROCTOR DENSITY.
4. SELECT FILL FOLLOWING THE SWMP THAT IS FREE OF ROOTS, WOOD, ROCK, LARGE STONE OR FOREIGN MATERIAL.
5. PREPARE THE SITE UNDER THE EMBANKMENT BY RIPPING TO AT LEAST 100mm TO HELP BOND COMPACTED FILL TO THE EXISTING SUBSTRATE.
6. SPREAD THE FILL IN 100mm TO 150mm LAYERS AND COMPACT IT AT OPTIMUM MOISTURE CONTENT FOLLOWING THE SWMP.
7. CONSTRUCT THE EMERGENCY SPILLWAY.
8. REHABILITATE THE STRUCTURE FOLLOWING THE SWMP.

(APPLIES TO 'TYPE D' AND 'TYPE F' SOILS ONLY)

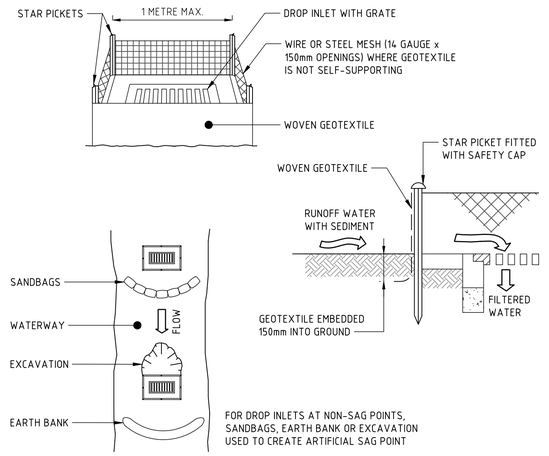
EARTH SEDIMENT BASIN - WET (SD 6-4)



CONSTRUCTION NOTES

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

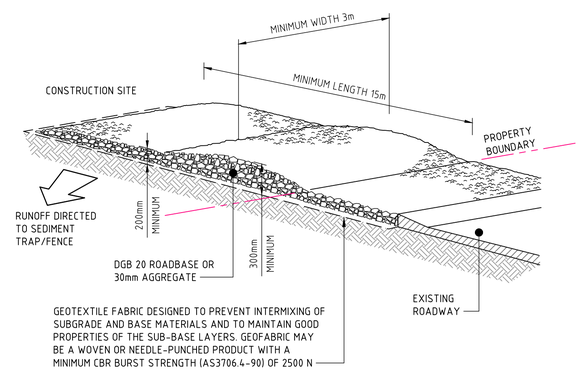
SEDIMENT FENCE (SD 6-8)



CONSTRUCTION NOTES

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

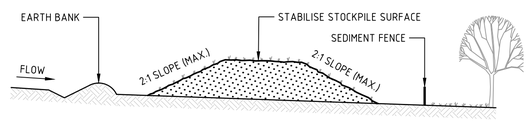
GEOTEXTILE INLET FILTER (SD 6-12)



CONSTRUCTION NOTES

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

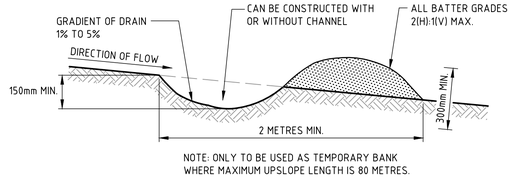
STABILISED SITE ACCESS (SD 6-14)



CONSTRUCTION NOTES

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

STOCKPILES (SD 4-1)

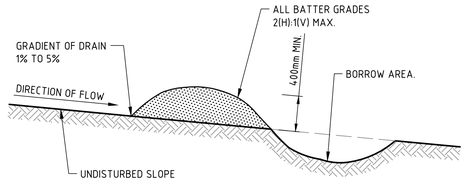


NOTE: ONLY TO BE USED AS TEMPORARY BANK WHERE MAXIMUM UPSLOPE LENGTH IS 80 METRES.

DIRTY WATER DIVERSION DRAIN CONSTRUCTION NOTES:

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

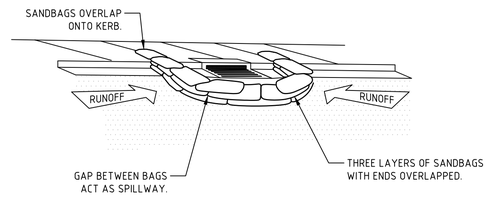
DIRTY WATER DIVERSION DRAIN



CLEAN WATER DIVERSION DRAIN CONSTRUCTION NOTES:

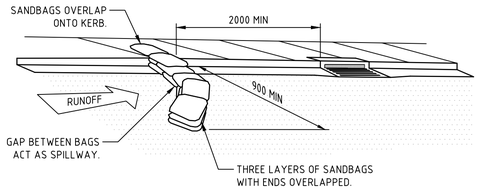
1. BUILD WITH GRADIENTS BETWEEN 1% AND 5%.
2. BANK TO BE FORMED BY PUSHING UP TOPSOIL FROM THE LOWER 'DISTURBED AREA'. NO DISTURBANCE IS TO OCCUR ON THE UPSLOPE 'CLEAN' WATER FLOW PATH AREA.
3. AVOID REMOVING TREES AND SHRUBS IF POSSIBLE - WORK AROUND THEM.
4. ENSURE BANKS ARE PROPERLY COMPACTED TO PREVENT FAILURE. SURFACE SHOULD BE LEFT ROUGH TO PROMOTE GERMINATION OF VEGETATION ON THE BANK.
5. OUTSIDE BATTER (EXPOSED TO CONVEYED FLOWS) SHOULD BE STABILISED VIA SEEDING WITH FAST GROWING COVER CROP IMMEDIATELY FOLLOWING FORMATION.
6. AVOID HAVING EXPOSED DISPERSIVE SOIL ON THE OUTSIDE BATTER. COVER WITH NON-DISPERSIVE TOPSOIL IF PRESENT.

CLEAN WATER DIVERSION DRAIN



SEDIMENT TRAP FOR KERB INLET (AT LOW POINT - SANDBAG)

NOT TO SCALE



SEDIMENT TRAP FOR KERB INLET (ON GRADE - SANDBAG)

NOT TO SCALE

DRAWN: C. W-HEALION DESIGNED: E. DOOLAN JOB MANAGER: R. DIERCKE VERIFIER: A. BROWN

NOT FOR CONSTRUCTION

REVISION	DESCRIPTION	ISSUED	VER'D	APP'D	DATE
A	ISSUED FOR CLIENT REVIEW	CWH	AB	ED	05.06.24
B	ISSUED FOR CLIENT REVIEW	CWH	AB	RD	15.07.24
C	ISSUED FOR DEVELOPMENT APPLICATION	RK	AB	RD	22.08.24
D	ISSUED FOR DEVELOPMENT APPLICATION	CWH	AB	RD	11.09.24
E	ISSUED FOR DEVELOPMENT APPLICATION	CWH	CP	RD	31.01.25
F	ISSUED FOR DA APPROVAL	EW	CP	RD	02.06.25

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PROJECT: **PROPOSED RESIDENTIAL SUBDIVISION OF LOT 7 DP1196266**

SINGLETON LGA

DRAWING TITLE: **CIVIL ENGINEERING PACKAGE**

EROSION AND SEDIMENT CONTROL DETAILS

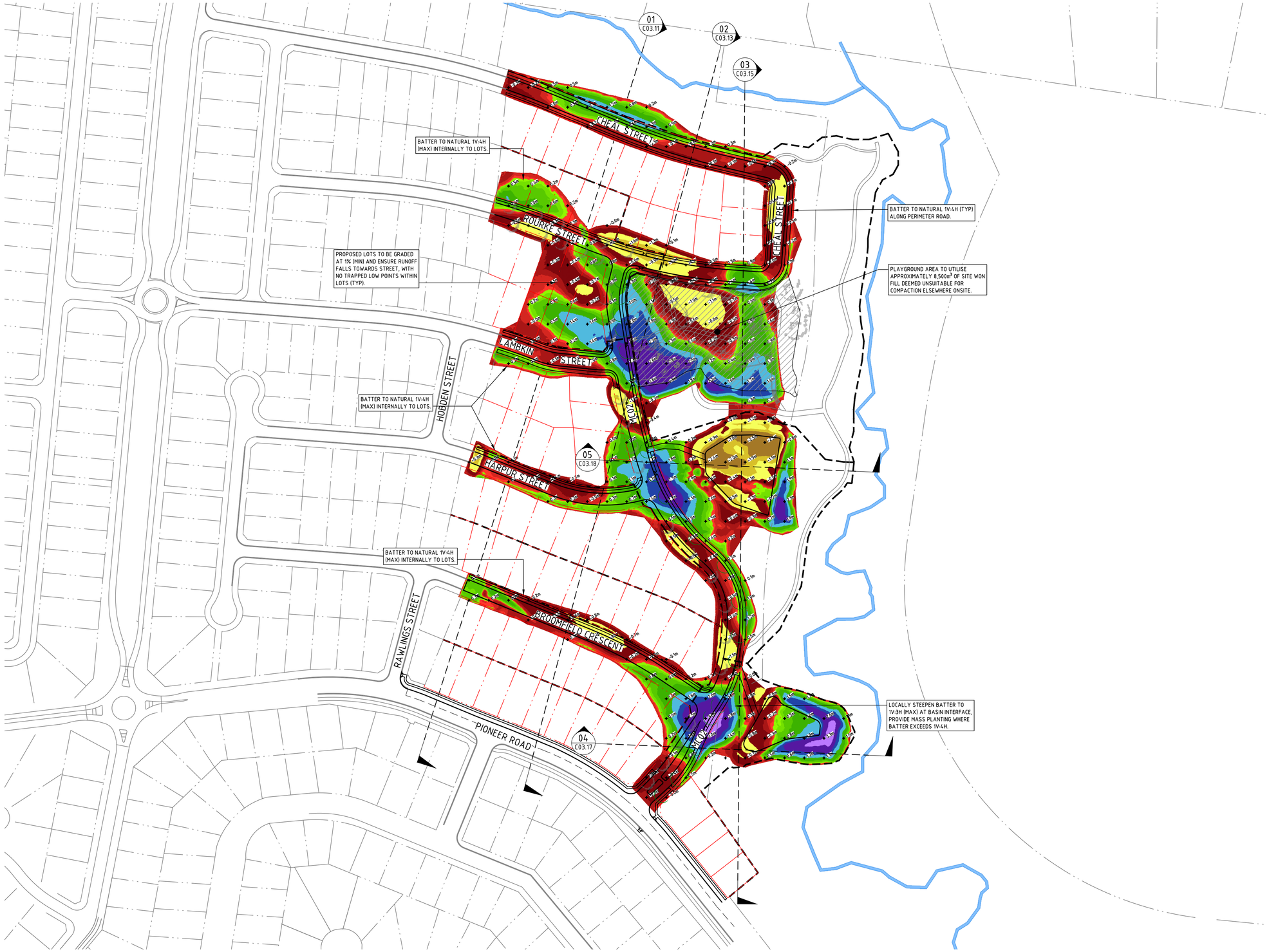
JOB NUMBER: **NL233144**

DRAWING NUMBER: **DA-C02.11**

REVISION: **F**

DRAWING SHEET SIZE = A1

Date : 06.06.2025 3:17 PM Plotted By : EMMA WEIR Found : O:\5 Pre-July 24 Projects\Newcastle\YEAR 2023 Jobs\NL233144 - Bridgman Ridge Stages 9-14\D - Drawings\CIVIL\03-CAD\01-DA\NL233144-DA-C02.01 ESC PLAN.dwg



LEGEND

- PROPOSED PROPERTY BOUNDARY
- EXISTING PROPERTY BOUNDARY
- STAGING BOUNDARY
- + BULK EARTHWORKS SPOT DEPTH

DEPTH OF CUT

- 20m	TO	- 3m
- 3m	TO	- 2m
- 2m	TO	- 1.5m
- 1.5m	TO	- 1m
- 1m	TO	- 0.5m
- 0.5m	TO	- 0.25m
- 0.25m	TO	- 0.1m
- 0.1m	TO	- 0.0m

DEPTH OF FILL

0.0m	TO	0.1m
0.1m	TO	0.25m
0.25m	TO	0.5m
0.5m	TO	1m
1m	TO	1.5m
1.5m	TO	2m
2m	TO	3m
3m	TO	5m

FILL AREA FOR UNSUITABLE TOPSOIL

NOTES

1. BULK EARTHWORKS LEVELS AND VOLUMES ARE BASED ON A COMPARISON OF THE DESIGN SURFACE (MINUS 250mm) AND THE EXISTING SURFACE LEVEL AS SURVEYED.
2. NO ALLOWANCE HAS BEEN MADE FOR SELECT LAYERS OR UNSUITABLE MATERIAL THAT IS LIKELY TO BE PRESENT.
3. NO ALLOWANCE HAS BEEN MADE FOR TEMPORARY SEDIMENT DAMS
4. NO ALLOWANCE HAS BEEN MADE FOR SERVICE TRENCHES, DRAINAGE TRENCHES, DRAINAGE INFRASTRUCTURE (PITS, CULVERTS, ETC) IN THE LEVELS OR VOLUMES PRESENTED ON THIS PLAN.
5. NO ALLOWANCE FOR ANY TEMPORARY BATTERS DURING WORKS.
6. NO BULKING FACTORS HAVE BEEN CONSIDERED/ALLOWED FOR.
7. BULK EARTHWORKS OF CUT / FILL APPROXIMATELY 30,000m³. DETAILED GRADING AND EARTHWORKS TO BE PROVIDED AT DETAILED DESIGN.
8. APPROXIMATE BULK EARTHWORKS VOLUMES BASED ON THE NOTES ABOVE ARE AS FOLLOWS;
   - BULK CUT = 22,647m³
   - BULK FILL = 27,125m³
   - BULK CUT/FILL BALANCE = 4,478m³ (IMPORT)
9. ALL BULK EARTHWORKS TO BE UNDERTAKEN IN ACCORDANCE WITH SITE SPECIFIC GEOTECHNICAL REPORT AND BULK EARTHWORKS NOTES.

NOT FOR CONSTRUCTION

DRAWN: C. W-HEALION DESIGNED: E. DOOLAN JOB MANAGER: R. DIERCKE VERIFIER: A. BROWN

REVISION	DESCRIPTION	ISSUED	VER'D	APP'D	DATE
C	ISSUED FOR DEVELOPMENT APPLICATION	RK	AB	RD	22.08.24
D	ISSUED FOR DEVELOPMENT APPLICATION	CWH	AB	RD	11.09.24
E	ISSUED FOR DEVELOPMENT APPLICATION	CWH	CP	RD	31.01.25
F	ISSUED FOR DA APPROVAL	EW	CP	RD	02.06.25
G	ISSUED FOR DA APPROVAL	EW	CP	RD	05.06.25
H	ISSUED FOR DA APPROVAL	EW	CP	RD	06.06.25

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SCALE 1:1500 @ A1

0 15 30 45 60 75m

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PROJECT: **PROPOSED RESIDENTIAL SUBDIVISION OF LOT 7 DP1196266**

SINGLETON LGA

DRAWING TITLE: **CIVIL ENGINEERING PACKAGE**

BULK EARTHWORKS CUT AND FILL PLAN

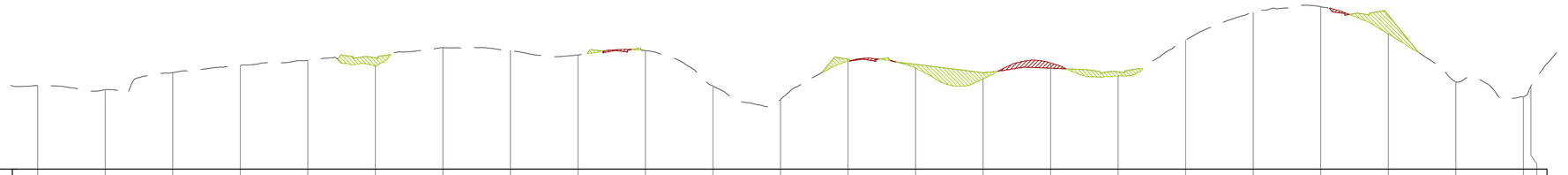
JOB NUMBER: **NL233144**

DRAWING NUMBER: **DA-C03.01**

REVISION: **H**

DRAWING SHEET SIZE = A1

Date : 06.06.2025 3:18 PM Plotted By : EMMA WEIR Found : O:\5 Pre-July 24 Projects\Newcastle\YEAR 2023 Jobs\NL233144 - Bridgman Ridge Stages 9-14\D - Drawings\CIVIL\03-CAD\01-DA\NL233144-DA-C03.01 BE PLAN.dwg

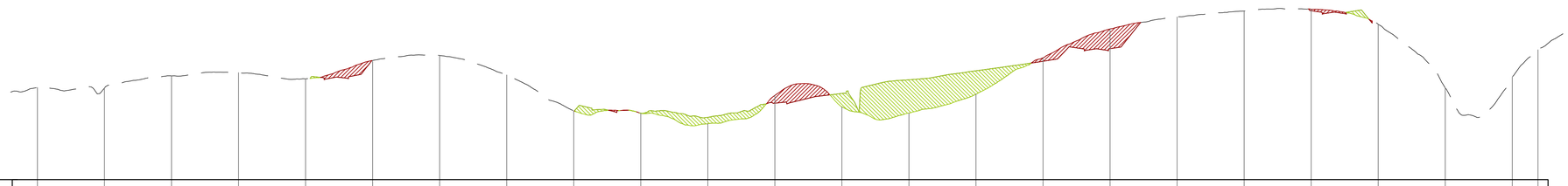


DATUM RL 59.0

FINISHED DESIGN SURFACE (DS)							67.223							67.125	66.738	66.118	66.451	66.186				70.378									
EXISTING NATURAL SURFACE (NS)	65.171	64.87	66.125	66.659	67.038	66.612	67.971	67.752	67.426	67.754	65.133	64.138	66.981	66.458	65.666	66.835	65.863	68.53	70.554	70.998	68.987	65.451	64.348	65.13							
CHAINAGE	0	25	50	75	100	125	150	175	200	225	250	275	300	325	350	375	400	425	450	475	500	525	550	552.797							

LONGITUDINAL SECTION ALONG BE01

HORIZONTAL SCALE 1:1000@A1
VERTICAL SCALE 1:200@A1



DATUM RL 56.0

FINISHED DESIGN SURFACE (DS)										60.975	60.652	61.717	62.448	63.468	64.14	64.85	65.791				68.632										
EXISTING NATURAL SURFACE (NS)	62.89	62.849	63.759	63.999	63.54	64.913	65.285	63.826	61.14	60.963	60.184	62.3	61.442	60.979	62.385	65.109	67.27	68.165	68.609	68.745	67.613	62.849	63.617	65.706							
CHAINAGE	0	25	50	75	100	125	150	175	200	225	250	275	300	325	350	375	400	425	450	475	500	525	550	559.585							

LONGITUDINAL SECTION ALONG BE02

HORIZONTAL SCALE 1:1000@A1
VERTICAL SCALE 1:200@A1

DRAWN: C. W-HEALION DESIGNED: E. DOOLAN JOB MANAGER: R. DIERCKE VERIFIER: A. BROWN

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E	ISSUED FOR DEVELOPMENT APPLICATION	CWH	CP	RD	31.01.25
F	ISSUED FOR DA APPROVAL	EW	CP	RD	02.06.25

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SCALE 1:100 @ A1 — 0 1 2 3 4 5m
SCALE 1:500 @ A1 — 0 5 10 15 20 25m

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PROJECT: PROPOSED RESIDENTIAL SUBDIVISION OF LOT 7 DP1196266

SINGLETON LGA

DRAWING TITLE: CIVIL ENGINEERING PACKAGE

BULK EARTHWORKS SECTIONS - SHEET 1

JOB NUMBER: NL233144

DRAWING NUMBER: DA-C03.11

REVISION: F

DRAWING SHEET SIZE = A1

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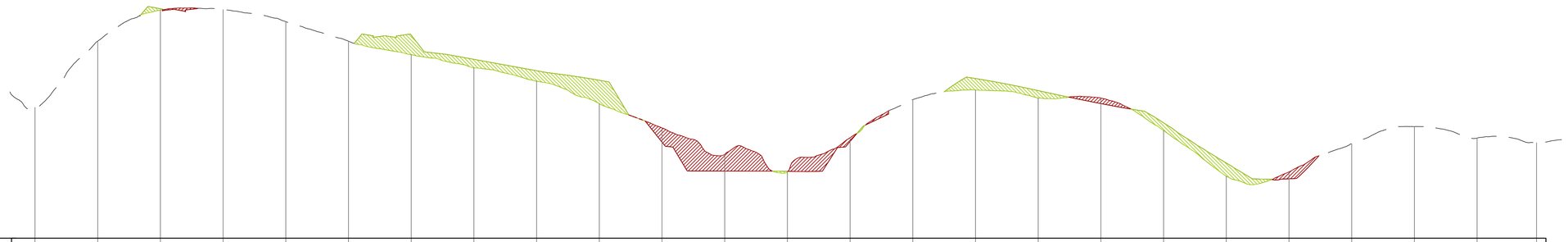
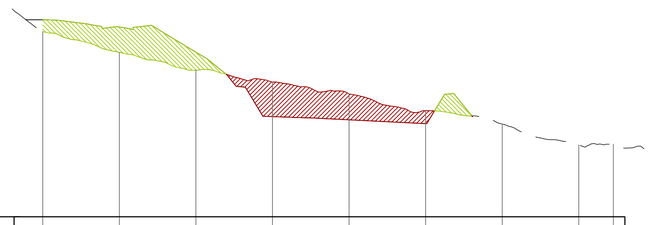


DATUM RL 49.0

FINISHED DESIGN SURFACE (DS)			67.26				65.16	63.231	62.325	61.57	56.643	54.34	54.32	56.697		61.705	60.742	59.711	58.178	54.982	53.722					
EXISTING NATURAL SURFACE (NS)	59.401	64.68	67.143	67.188	66.229	64.672	63.599	62.562	61.494	59.705	57.776	55.67	54.278	56.995	60.026	60.79	60.159	60.153	57.566	53.927	54.278	56.512	57.883	56.967	56.593
CHAINAGE	0	25	50	75	100	125	150	175	200	225	250	275	300	325	350	375	400	425	450	475	500	525	550	575	598.691

LONGITUDINAL SECTION ALONG BE03

HORIZONTAL SCALE 1:1000@A1
VERTICAL SCALE 1:200@A1

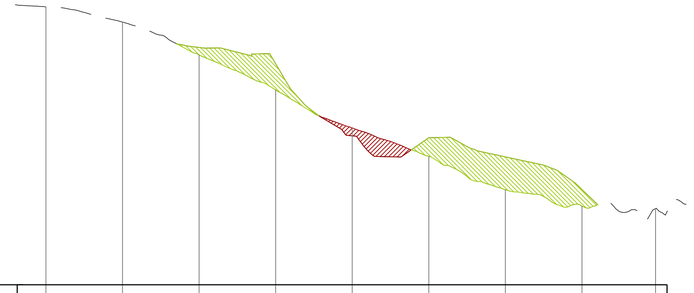


DATUM RL 48.0

FINISHED DESIGN SURFACE (DS)	60.862	60.393	58.745	54.541	54.33	54.087			
EXISTING NATURAL SURFACE (NS)	60.086	58.736	57.566	56.791	56.018	54.929	54.054	52.69	52.736
CHAINAGE	0	25	50	75	100	125	150	175	186.299

LONGITUDINAL SECTION ALONG BE04

HORIZONTAL SCALE 1:1000@A1
VERTICAL SCALE 1:200@A1



DATUM RL 44.0

FINISHED DESIGN SURFACE (DS)			59.493	58.428	53.724	53.6	52.349	50.219	
EXISTING NATURAL SURFACE (NS)	62.144	61.15	59.001	56.72	54.241	52.393	50.203	49.139	48.972
CHAINAGE	0	25	50	75	100	125	150	175	199.027

LONGITUDINAL SECTION ALONG BE05

HORIZONTAL SCALE 1:1000@A1
VERTICAL SCALE 1:200@A1

DRAWN: C. W-HEALION DESIGNED: E. DOOLAN JOB MANAGER: R. DIERCKE VERIFIER: A. BROWN

NOT FOR CONSTRUCTION

REVISION	DESCRIPTION	ISSUED	VER'D	APP'D	DATE
A	ISSUED FOR CLIENT REVIEW	CWH	AB	ED	05.06.24
B	ISSUED FOR CLIENT REVIEW	CWH	AB	RD	15.07.24
C	ISSUED FOR DEVELOPMENT APPLICATION	RK	AB	RD	22.08.24
D	ISSUED FOR DEVELOPMENT APPLICATION	CWH	AB	RD	11.09.24
E	ISSUED FOR DEVELOPMENT APPLICATION	CWH	CP	RD	31.01.25
F	ISSUED FOR DA APPROVAL	EW	CP	RD	02.06.25

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SCALE 1:100 @ A1 — 0 1 2 3 4 5m
SCALE 1:500@A1 — 0 5 10 15 20 25m

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ABN 81 094 433 100

PROJECT: **PROPOSED RESIDENTIAL SUBDIVISION OF LOT 7 DP1196266**

SINGLETON LGA

DRAWING TITLE: **CIVIL ENGINEERING PACKAGE**

BULK EARTHWORKS SECTIONS - SHEET 2

JOB NUMBER: **NL233144**

DRAWING NUMBER: **DA-C03.12**

REVISION: **F**

DRAWING SHEET SIZE = A1

Date : 06.06.2025 3:18 PM Plotted By : EMMA WEIR Found : O:\5 Pre-July 24 Projects\Newcastle\YEAR 2023 Jobs\NL233144 - Bridgman Ridge Stages 9-14\D - Drawings\CIVIL\03-CAD\01-DA\NL233144-DA-C03.11 BE SECTIONS.dwg

STAGE 6 (APPROVED DA)
DA.8.2020.20.1

CONNECT PROPOSED STORMWATER TO EXISTING LINE CONSTRUCTED AS PART OF STAGE 6.

DETAILED LOT GRADING TO BE CONDUCTED AT DETAILED DESIGN STAGE.

CHEAL STREET (MC01)

ROURKE STREET

CHEAL STREET (MC01)

LOT 8
DP1196266

DETAILED LOT GRADING TO BE CONDUCTED AT DETAILED DESIGN STAGE.

CONNECT PROPOSED STORMWATER TO EXISTING LINE CONSTRUCTED AS PART OF STAGE 6.

DETAILED LOT GRADING TO BE CONDUCTED AT DETAILED DESIGN STAGE.

EXISTING TREE TO REMAIN.

OPEN SPACE / PARK

EXCLUSION FENCE

DRAINAGE SWALE TO BE CONSTRUCTED TO CONVEY STORMWATER RUNOFF TO BIOFILTRATION BASIN FOR TREATMENT.

LOT 9
DP1196266

LAMBKIN STREET

HOBDEN STREET

EXISTING RESIDENTIAL SUBDIVISION

PLAY GROUND

CHEAL STREET (MC02)

DETAILED GRADING TO BE CONDUCTED AT DETAILED DESIGN STAGE.

PROPOSED CAR PARKING TO BE DESIGNED IN ACCORDANCE WITH AS2890 (5 SPACES TOTAL). PROVIDE 2 x ACCESSIBLE SPACES WITH ASSOCIATED SHARED SPACE AS PER AS2890.6.

BIO-FILTRATION BASIN TO BE CONSTRUCTED IN ACCORDANCE WITH SINGLETON COUNCIL'S SCSD-418.

BIO-FILTRATION BASIN TO BE PROVIDED WITH 3m MAINTENANCE ACCESS TRACK AS PER SCSD-418.

CONNECT PROPOSED STORMWATER TO EXISTING LINE CONSTRUCTED AS PART OF STAGE 3B.

PROVIDE REMOVABLE BOLLARDS.

COMBINED BIO-FILTRATION AND DETENTION BASIN 1. DETENTION BASIN WITH MINIMUM 4325m³ STORAGE VOLUME. BIOFILTRATION TO HAVE MINIMUM 650m² FILTER SURFACE AREA. BASE OF BASIN AT 54.00m AHD AND TOP OF BASIN 56.00m AHD

INDICATIVE LOCATION OF BASIN MAINTENANCE VEHICLE ACCESS POINT.

BASIN 1

ROCK LINED WEIR TO BE CONSTRUCTED TO DIRECT MAJOR FLOWS TO EXISTING TRIBUTARY.

EROSION PROTECTION AT HEADWALL OUTLET. REFER TO C02.01 FOR DETAIL.

EXISTING LOW FLOW OUTLET BUILT AS PART OF STAGE 6 TO BE REMOVED AND UPGRADED.

EXISTING TEMPORARY BASIN BUILT AS PART OF STAGE 6 TO BE ALTERED TO ALLOW FOR ULTIMATE CATCHMENTS.

HARPUR STREET

PROVIDE GROSS POLLUTANT TRAP (HUMEGUARD OR APPROVED EQUIVALENT) AT STORMWATER OUTLET.

PROVIDE MINIMUM 0.5% FALL IN THE BASE OF BASIN TO DRAIN TOWARDS OUTLET.

CONTINUES ON SHEET 2

LEGEND

- PROPOSED BOUNDARY LINE
- EXISTING BOUNDARY LINE
- 1.5m WIDE DRAINAGE EASEMENT
- ZONING BOUNDARY
- DRAINAGE SWALE
- KG — KERB AND GUTTER IN ACCORDANCE WITH SCSD-101
- KR — KERB RAMP IN ACCORDANCE WITH SCSD-303
- DENOTES HERITAGE EXCLUSION FENCING
- DESIGN CONTOURS (0.5m INTERVALS)
- EXISTING CONTOURS (0.5m INTERVALS)
- WATERCOURSE
- 1.5m WIDE CONCRETE FOOTPATH (ACCESSIBLE)
- 1.5m WIDE CONCRETE FOOTPATH (NON-ACCESSIBLE)
- 3.0m WIDE CONCRETE FOOTPATH (ACCESSIBLE)
- 2.5m WIDE CONCRETE FOOTPATH (NON-ACCESSIBLE)
- 4.0m WIDE CONCRETE FOOTPATH (ACCESSIBLE)
- 1.5m WIDE CONCRETE FOOTPATH (NON-ACCESSIBLE)
- 2.5m WIDE NATURE TRAIL (ACCESSIBLE)
- BASIN MAINTENANCE ACCESS
- STORMWATER PIPE
- EXISTING STORMWATER PIPE
- STORMWATER PIT
- HEADWALL
- GROSS POLLUTANT TRAP
- DETENTION BASIN
- BIO-FILTRATION FILTER MEDIA
- RIP RAP ENERGY DISSIPATER

NOTE

1. GRADING SHOWN IS INDICATIVE ONLY, WITH LOT BENCHING AND LOCATIONS FOR RETAINING WALLS TO BE FINALISED AT DETAILED DESIGN STAGE.
2. REFER TO LANDSCAPE PLANS FOR DETAILS FOR PLAYGROUND, WALKING TRAILS AND OPEN SPACE AREAS.
3. WALKING TRAIL ALIGNMENTS ARE APPROXIMATE ONLY AND SHALL BE CONFIRMED AT THE DETAILED DESIGN / SUBDIVISION WORKS CERTIFICATE. TRAILS TO GENERALLY AVOID EXISTING VEGETATION WHERE PRACTICAL.
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F	ISSUED FOR DEVELOPMENT APPLICATION	CWH	CP	RD	30.05.25
G	ISSUED FOR DA APPROVAL	EW	CP	RD	02.06.25
H	ISSUED FOR DA APPROVAL	EW	CP	RD	05.06.25

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PROJECT: PROPOSED RESIDENTIAL SUBDIVISION OF LOT 7 DP1196266

SINGLETON LGA

DRAWING TITLE: CIVIL ENGINEERING PACKAGE

SITEWORKS AND STORMWATER MANAGEMENT PLAN - SHEET 1

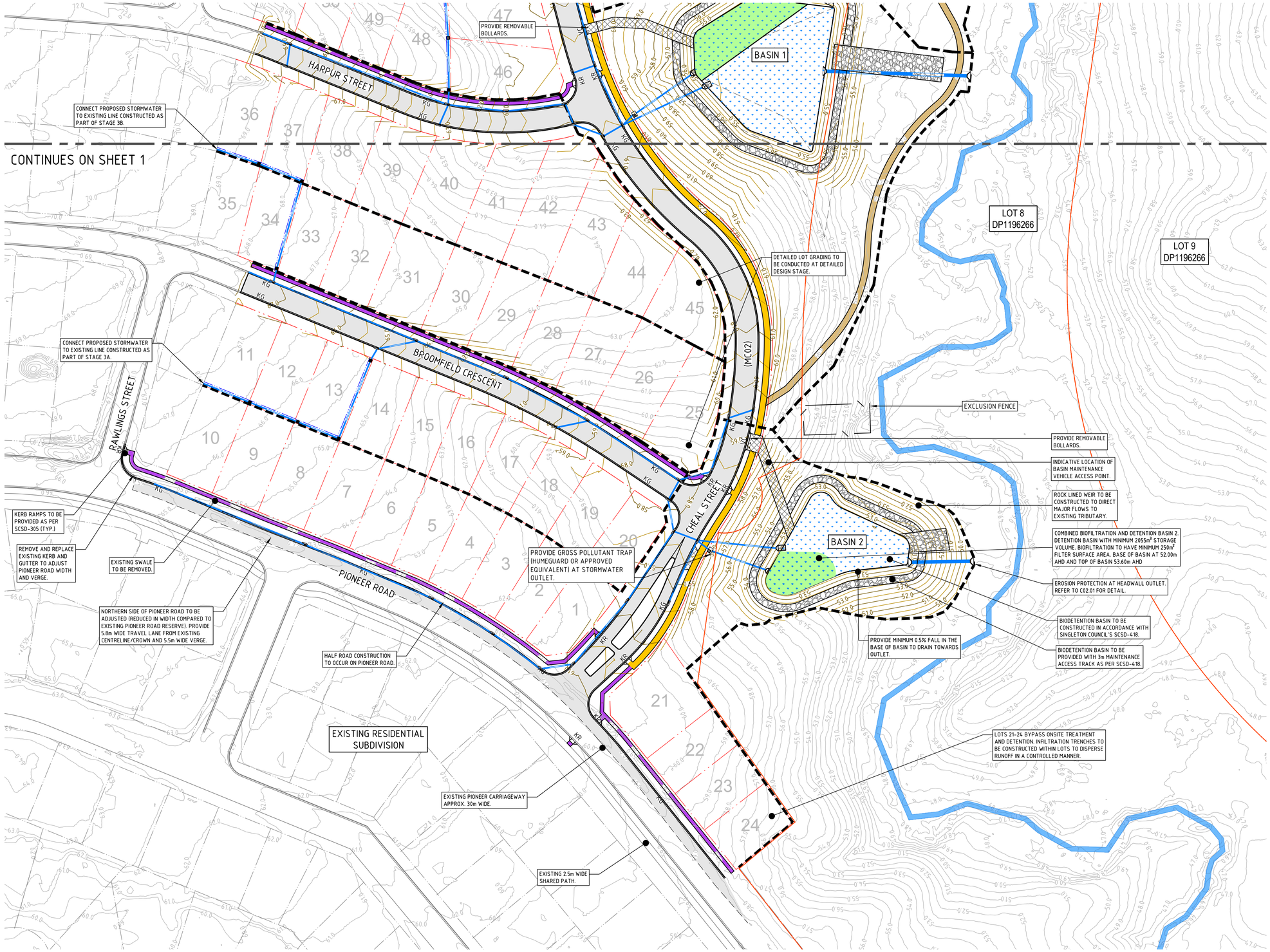
JOB NUMBER: NL233144

DRAWING NUMBER: DA-C04.01

REVISION: H

DRAWING SHEET SIZE = A1

Date : 06.06.2025 3:19 PM Plotted By : EMMA WEIR Found : O:\5 Pre-July 24 Projects\Newcastle\YEAR 2023 Jobs\NL233144 - Bridgman Ridge Stages 9-14\O - Drawings\CIVIL\03-CAD\01-DA\NL233144-DA-C04.01 SITEWORKS.dwg



LEGEND

- PROPOSED BOUNDARY LINE
- EXISTING BOUNDARY LINE
- 1.5m WIDE DRAINAGE EASEMENT
- ZONING BOUNDARY
- DRAINAGE SWALE
- KG — KERB AND GUTTER IN ACCORDANCE WITH SCSD-101
- KR — KERB RAMP IN ACCORDANCE WITH SCSD-303
- DENOTES HERITAGE EXCLUSION FENCING
- XX.XX — DESIGN CONTOURS (0.5m INTERVALS)
- XX.XX — EXISTING CONTOURS (0.5m INTERVALS)
- WATERCOURSE
- 1.5m WIDE CONCRETE FOOTPATH (ACCESSIBLE)
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- 1.5m WIDE CONCRETE FOOTPATH (NON-ACCESSIBLE)
- 2.5m WIDE NATURE TRAIL (ACCESSIBLE)
- BASIN MAINTENANCE ACCESS
- STORMWATER PIPE
- EXISTING STORMWATER PIPE
- STORMWATER PIT
- HEADWALL
- GROSS POLLUTANT TRAP
- DETENTION BASIN
- BIO-FILTRATION FILTER MEDIA
- RIP RAP ENERGY DISSIPATER

NOTE

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REVISION	DESCRIPTION	ISSUED	VER'D	APP'D	DATE
D	ISSUED FOR DEVELOPMENT APPLICATION	CWH	AB	RD	11.09.24
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G	ISSUED FOR DA APPROVAL	EW	CP	RD	02.06.25
H	ISSUED FOR DA APPROVAL	EW	CP	RD	05.06.25
I	ISSUED FOR DA APPROVAL	EW	CP	RD	06.06.25

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SCALE 1:800@A1 — 0 8 16 24 32 40m

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ABN 81 094 433 100

PROJECT: PROPOSED RESIDENTIAL SUBDIVISION OF LOT 7 DP1196266

SINGLETON LGA

DRAWING TITLE: CIVIL ENGINEERING PACKAGE

SITEWORKS AND STORMWATER MANAGEMENT PLAN - SHEET 2

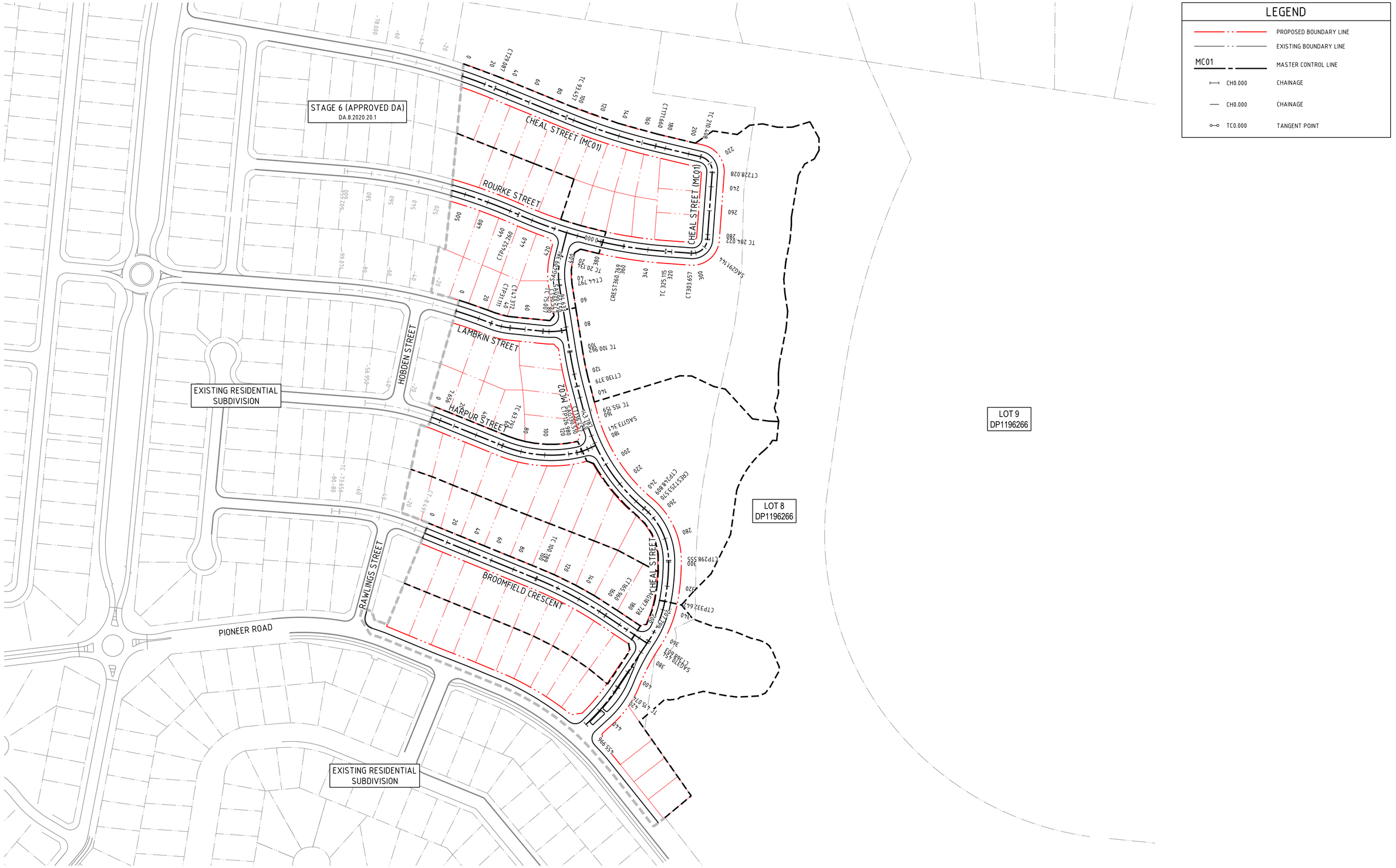
JOB NUMBER: NL233144

DRAWING NUMBER: DA-C04.02

REVISION: I

DRAWING SHEET SIZE = A1

Date : 06.06.2025 3:19 PM Plotted By : EMMA WEIR Found : O:\5 Pre-July 24 Projects\Newcastle\YEAR 2023 Jobs\NL233144 - Bridgman Ridge Stages 9-14\O - Drawings\CIVIL\03-CAD\01-DA\NL233144-DA-C04.01 SITEWORKS.dwg



LEGEND

- PROPOSED BOUNDARY LINE
- EXISTING BOUNDARY LINE
- MC01 — MASTER CONTROL LINE
- CH0.000 — CHAINAGE
- CH0.000 — CHAINAGE
- TC0.000 — TANGENT POINT

DRAWN: C. W-HEALION DESIGNED: E. DOOLAN JOB MANAGER: R. DIERCKE VERIFIER: A. BROWN

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E	ISSUED FOR DEVELOPMENT APPLICATION	CWH	CP	RD	31.01.25
F	ISSUED FOR DA APPROVAL	EW	CP	RD	02.06.25

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PROJECT: **PROPOSED RESIDENTIAL SUBDIVISION OF LOT 7 DP1196266**

SINGLETON LGA

DRAWING TITLE: **CIVIL ENGINEERING PACKAGE**

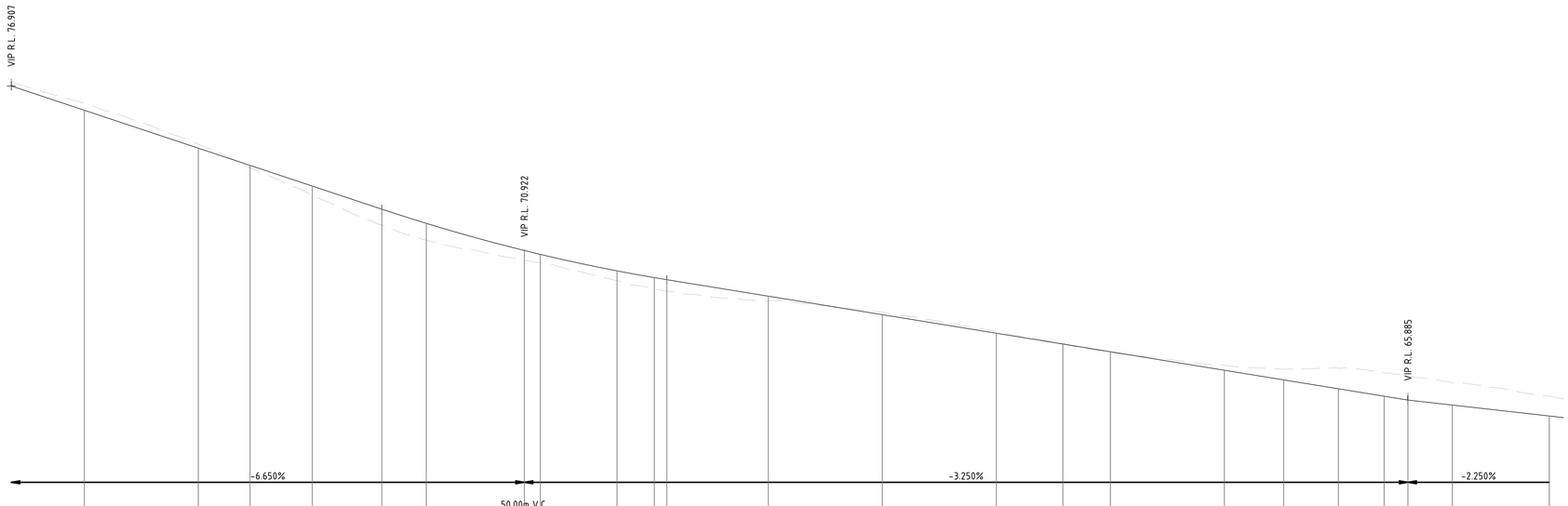
ALIGNMENT CONTROL PLAN

JOB NUMBER: **NL233144**

DRAWING NUMBER: **DA-C05.01** REVISION: **F**

DRAWING SHEET SIZE = A1

Date : 06.06.2025 3:19 PM Plotted By : EMMA WEIR Found : O:\5 Pre-July 24 Projects\Newcastle\YEAR 2023 Jobs\NL233144 - Bridgman Ridge Stages 9-14\D - Drawings\CIVIL\03-CAD\01-DA\NL233144-DA-C05.01 ALIGNMENT CONTROL PLAN.dwg



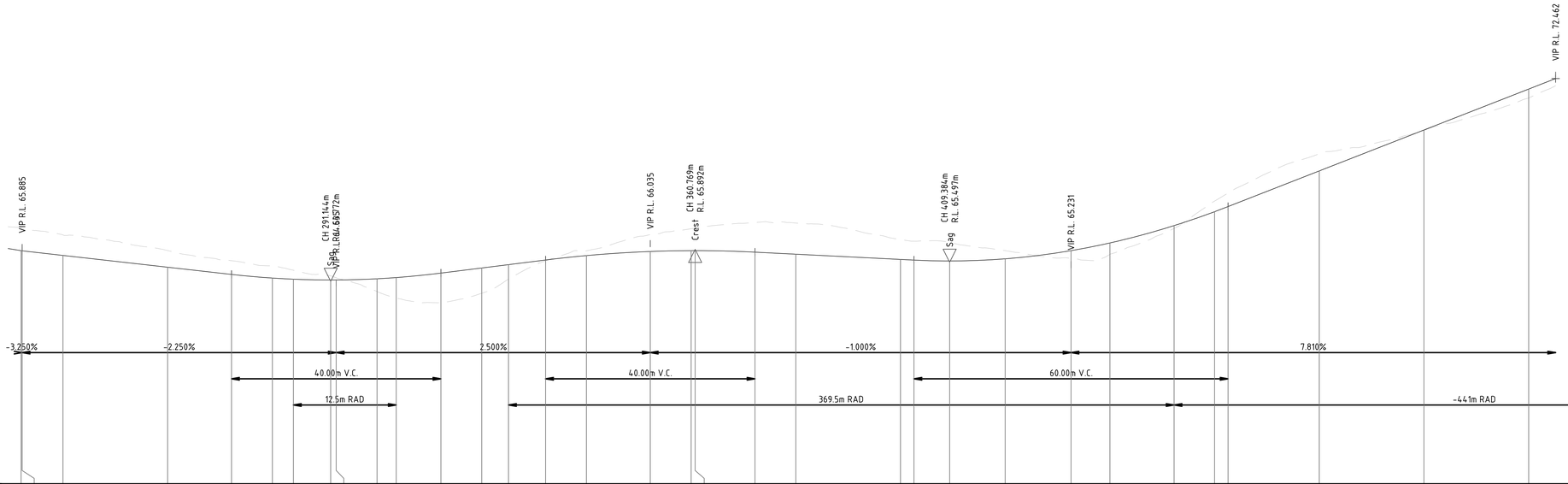
DESIGN GRADELINE

VERTICAL GEOMETRY

HORIZONTAL GEOMETRY

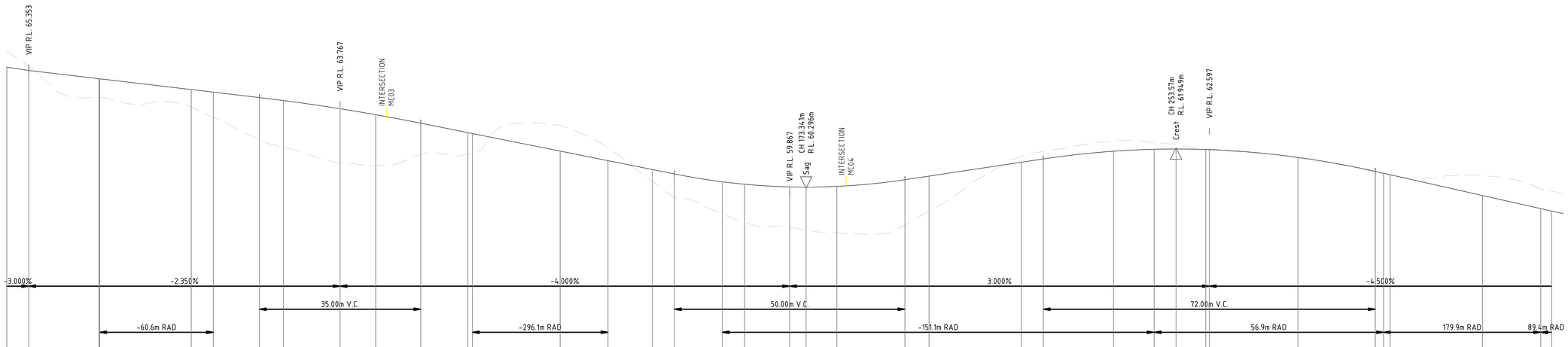
DATUM RL 58.0

| | | |


VIP R.L. 72.462
VIP R.L. 65.885
CH 291.144m
R.L. 65.572m
VIP R.L. 66.035
CH 360.769m
R.L. 65.892m
Crest
CH 409.384m
R.L. 65.497m
Sag
VIP R.L. 65.231
DESIGN GRADELINE
-3.250%
-2.250%
2.500%
-1.000%
7.810%
VERTICAL GEOMETRY
40.00m V.C.
40.00m V.C.
60.00m V.C.
HORIZONTAL GEOMETRY
12.5m RAD
369.5m RAD
-441m RAD

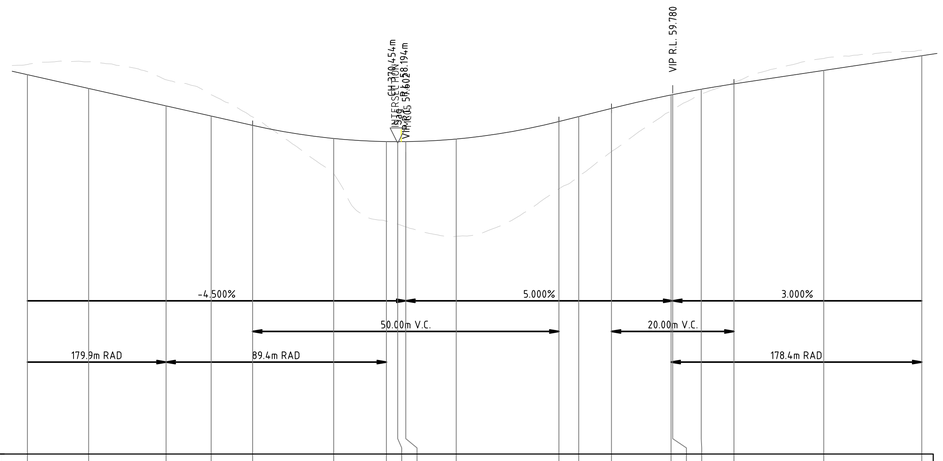
DATUM RL 57.0

| | | |


VIP R.L. 65.353
VIP R.L. 63.767
INTERSECTION MC03
VIP R.L. 59.867
CH 173.341m
R.L. 60.296m
Sag
INTERSECTION MC04
CH 253.57m
R.L. 61.949m
Crest
VIP R.L. 62.597
DESIGN GRADELINE
VERTICAL GEOMETRY
HORIZONTAL GEOMETRY
-3.000%
-2.350%
-4.000%
3.000%
-4.500%
35.00m V.C.
50.00m V.C.
72.00m V.C.
-60.6m RAD
-296.1m RAD
-151.1m RAD
56.9m RAD
179.9m RAD
89.4m RAD

DATUM RL 51.0

| | | |



DATUM RL 48.0

FINISHED SURFACE	60.382		59.932		59.363	59.032	58.727	58.298	58.197	58.194	58.196	58.281	58.852	59.013	59.28	59.72	59.73	59.906	60.08	60.52	61
EXISTING SURFACE	60.714		60.802		60.215	59.729	58.999	57.145	55.599	55.502	55.413	55.104	56.656	57.051	57.87	59.196	59.231	59.745	60.126	60.911	61.179
SETOUT COORDS (EASTINGS)																					
SETOUT COORDS (NORTHINGS)																					
CHAINAGE	310		320		332.642	340	346.77	360	368.603	370.454	371.177	380	396.77	400	405.339	415.074	415.339	420	425.339	440	455.996

LONGITUDINAL SECTION ALONG CHEAL STREET (MC02)

HORIZONTAL SCALE 1:500@A1
VERTICAL SCALE 1:100@A1

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SCALE 1:500@A1 — 0 5 10 15 20 25m

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ABN 81 094 433 100

PROJECT
PROPOSED RESIDENTIAL SUBDIVISION OF LOT 7 DP1196266

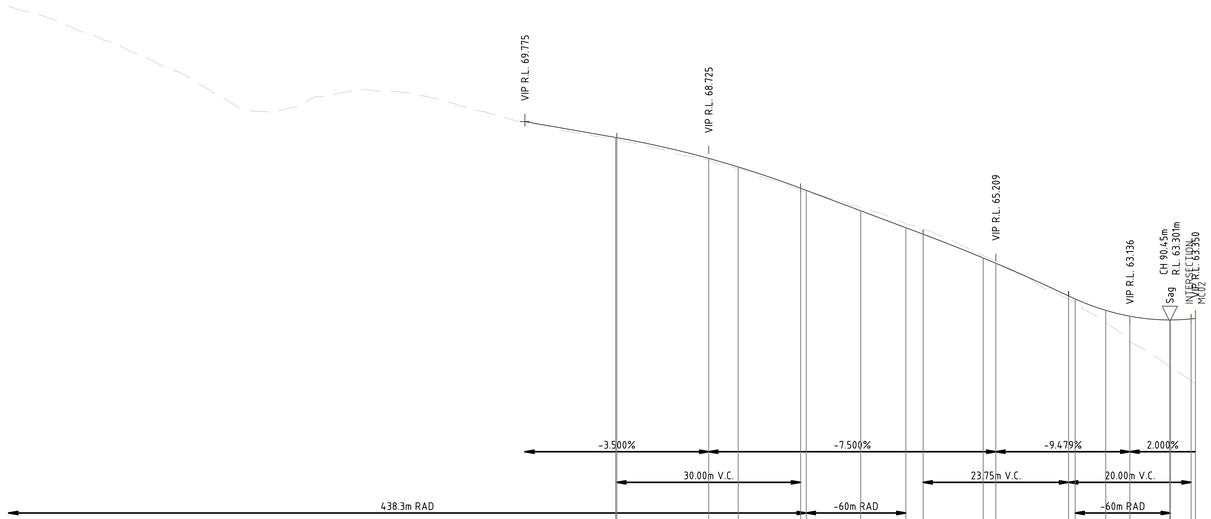
SINGLETON LGA

DRAWING TITLE
CIVIL ENGINEERING PACKAGE

LONGITUDINAL SECTIONS - SHEET 4

JOB NUMBER **NL233144**
DRAWING NUMBER **DA-C04.14**
REVISION **F**
DRAWING SHEET SIZE = A1

Date: 06.06.2025 3:19 PM Plotted By: EMMA WEIR Found: O:\6 Pre-July 24 Projects\Newcastle\YEAR 2023 Jobs\NL233144 - Bridgman Ridge Stages 9-14\D - Drawings\CIVIL\03-CAD\01-DA\NL233144-DA-C05.21 ROAD LONG SECTIONS.dwg



LONGITUDINAL SECTION ALONG LAMBKIN STREET

HORIZONTAL SCALE 1:500@A1

VERTICAL SCALE 1:100@A1

DRAWN: C. W-HEALION DESIGNED: E. DOOLAN JOB MANAGER: R. DIERCKE VERIFIER: A. BROWN

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SCALE 1:100 @ A1 — 0 1 2 3 4 5m

SCALE 1:500@ A1 — 0 5 10 15 20 25m

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PROJECT: **PROPOSED RESIDENTIAL SUBDIVISION OF LOT 7 DP1196266**

SINGLETON LGA

DRAWING TITLE: **CIVIL ENGINEERING PACKAGE**

LONGITUDINAL SECTIONS - SHEET 5

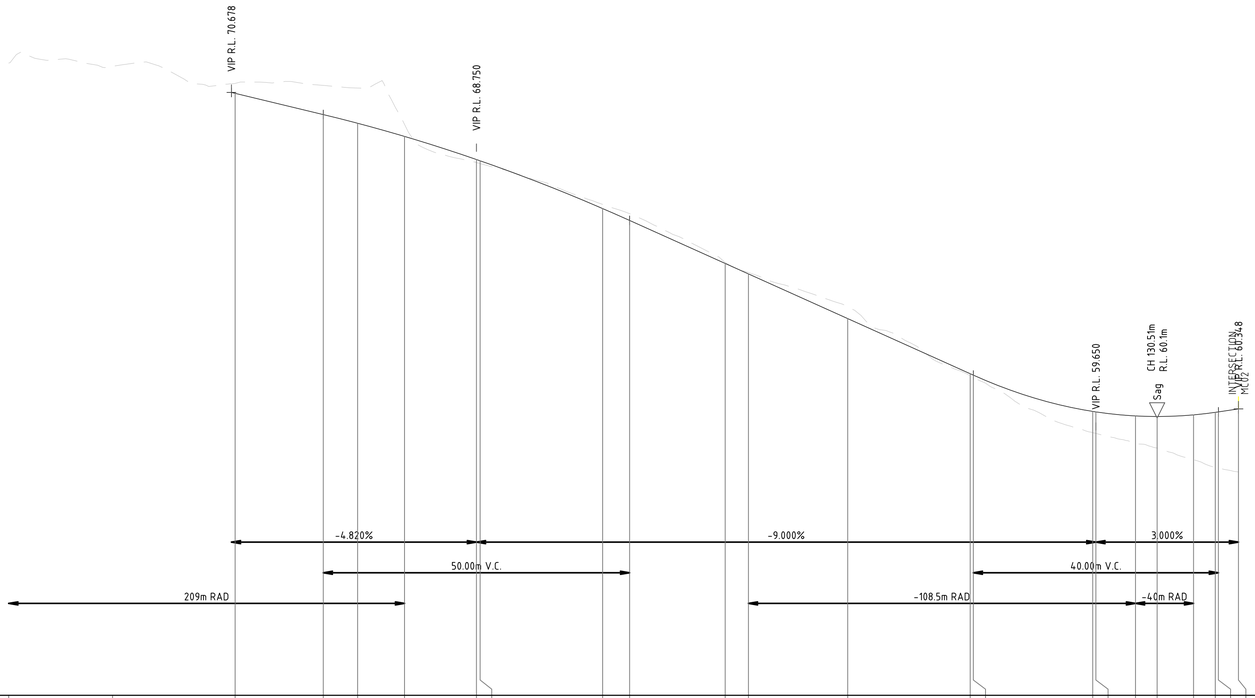
JOB NUMBER: **NL233144**

DRAWING NUMBER: **DA-C04.15**

REVISION: **F**

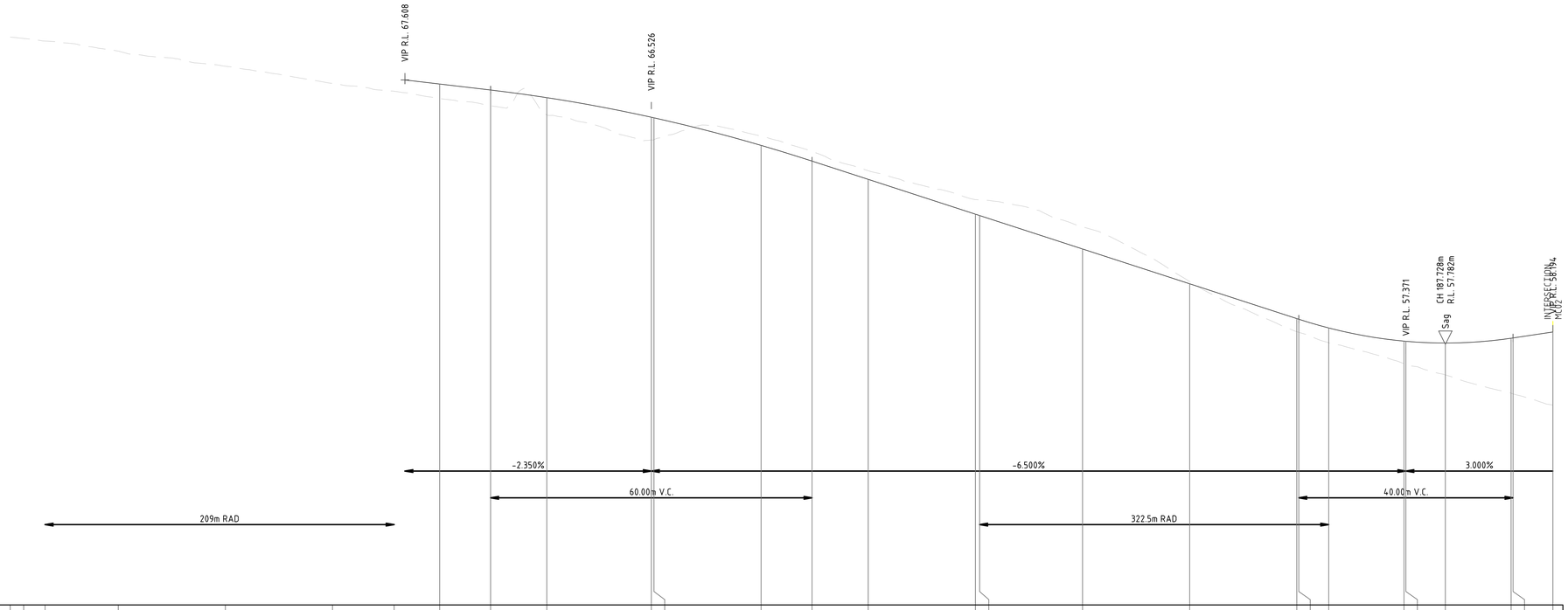
DRAWING SHEET SIZE = A1

Date: 06.06.2025 3:19 PM Plotted By: EMMA WEIR Found: O:\5 Pre-July 24 Projects\Newcastle\YEAR 2023 Jobs\NL233144 - Bridgman Ridge Stages 9-14\0 - Drawings\CIVIL\05-CAD\01-DA\NL233144-DA-C05.21 ROAD LONG SECTIONS.dwg

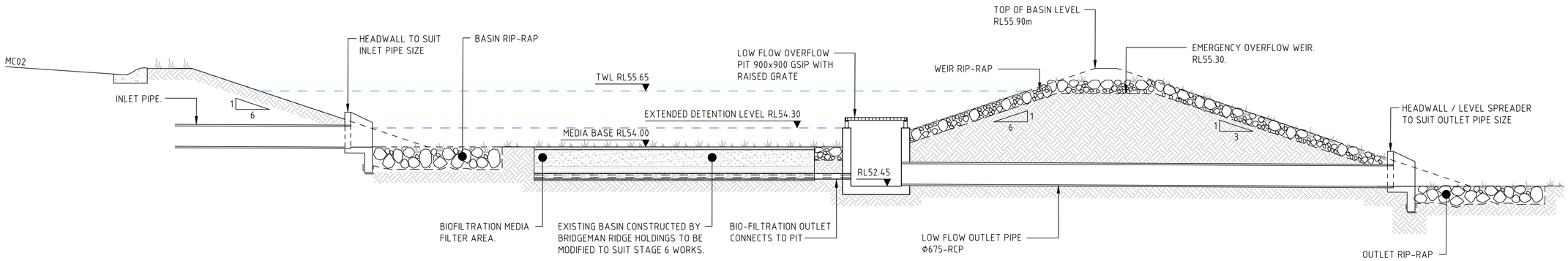

VIP R.L. 70.618
VIP R.L. 68.750
VIP R.L. 59.650
CH 130.5m
R.L. 60.1m
Sag
INTERSECTION
R.L. 60.348
DESIGN GRADELINE
-4.820%
-9.000%
3.000%
VERTICAL GEOMETRY
50.00m V.C.
40.00m V.C.
HORIZONTAL GEOMETRY
209m RAD
-108.5m RAD
-40m RAD

DATUM RL 51.0

| | | |

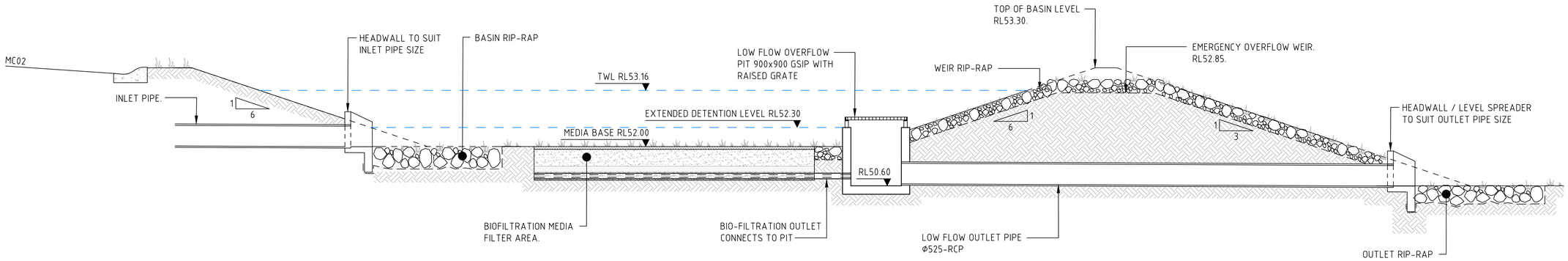

VIP R.L. 67.608
VIP R.L. 66.526
VIP R.L. 57.371
CH 187.720m
R.L. 57.782m
Sag
INTERSECTION
MAJOR R.L. 58.194

| | | |



TYPICAL BIOFILTRATION / DETENTION BASIN 1 DETAIL AND LOW FLOW OUTLET CONFIGURATION

SCALE 1:50



TYPICAL BIOFILTRATION / DETENTION BASIN 2 DETAIL AND LOW FLOW OUTLET CONFIGURATION

SCALE 1:50

DRAWN: C. W-HEALION DESIGNED: E. DOOLAN JOB MANAGER: R. DIERCKE VERIFIER: A. BROWN

NOT FOR CONSTRUCTION

REVISION	DESCRIPTION	ISSUED	VER'D	APP'D	DATE
A	ISSUED FOR CLIENT REVIEW	CWH	AB	ED	05.06.24
B	ISSUED FOR CLIENT REVIEW	CWH	AB	RD	15.07.24
C	ISSUED FOR DEVELOPMENT APPLICATION	RK	AB	RD	22.08.24
D	ISSUED FOR DEVELOPMENT APPLICATION	CWH	AB	RD	11.09.24
E	ISSUED FOR DEVELOPMENT APPLICATION	CWH	CP	RD	31.01.25
F	ISSUED FOR DA APPROVAL	EW	CP	RD	02.06.25

CLIENT: SINGLETON COUNCIL

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ARCHITECT

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SCALE 1:50@ A1 — 0 0.5 1 1.5 2 2.5m

NORTHROP
Newcastle
Level 1, 215 Pacific Hwy, Charlestown NSW 2290
Ph (02) 4943 1777 Email newcastle@northrop.com.au
ABN 81 094 433 100

PROJECT: **PROPOSED RESIDENTIAL SUBDIVISION OF LOT 7 DP1196266**

SINGLETON LGA

DRAWING TITLE: **CIVIL ENGINEERING PACKAGE**

DETAILS

JOB NUMBER: **NL233144**

DRAWING NUMBER: **DA-C09.01**

REVISION: **F**

DRAWING SHEET SIZE = A1

Date : 06.06.2025 3:19 PM Plotted By : EMMA WEIR Found : O:\5 Pre-July 24 Projects\Newcastle\YEAR 2023 Jobs\NL233144 - Bridgman Ridge Stages 9-14\D - Drawings\CIVIL\03-CAD\01-DA\NL233144-DA-C09.01 DETAILS.dwg

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SCALE 1:1000 @ A1

0 10 20 30 40 50m

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ABN 81 094 433 100

LEGEND

- PROPOSED BOUNDARY LINE
- EXISTING BOUNDARY LINE
- 30m RIPARIAN OFFSET
- 15m RIPARIAN OFFSET
- EXISTING WATERCOURSE (RETAINED)
- EXISTING WATERCOURSE (REMOVED)
- APZ

1st ORDER STREAM.
20m VEGETATED RIPARIAN ZONE.
34.00
CHEAL STREET (MC01)
ROURKE STREET
67.50
3RD ORDER STREAM.
62.50
EXISTING WATERCOURSE
30m VEGETATED RIPARIAN ZONE.
OPEN SPACE / PARK
1.22ha
12.19
ENCROACHMENT AREA = 55.5m²
30.00
30.00
PLAY GROUND
EXISTING DAM/TEMPORARY STORMWATER BASIN TO BE REMOVED.
LAMBKIN STREET
CHEAL STREET (MC02)
1ST ORDER STREAM TO BE REMOVED.
HARPUR STREET
ENCROACHMENT AREA = 25m²
ENCROACHMENT AREA = 396m²
65.00
ENCROACHMENT AREA = 229.7m²
43.50
BROOMFIELD CRESCENT
ENCROACHMENT AREA = 276m²
LOT 9 DP1196266
ENCROACHMENT AREA = 30m²
VEGETATED RIPARIAN ZONE OFFSET AREA = 1129.8m²
PIONEER ROAD
ENCROACHMENT AREA = 117.6m²
43.50
EXISTING RESIDENTIAL SUBDIVISION
LOT 8 DP1196266

NOT FOR CONSTRUCTION

REVISION	DESCRIPTION	ISSUED	VER'D	APP'D	DATE
A	ISSUED FOR DEVELOPMENT APPLICATION	CWH	AB	RD	31.01.25
B	ISSUED FOR DA APPROVAL	EW	CP	RD	02.06.25
C	ISSUED FOR DA APPROVAL	EW	CP	RD	06.06.25

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ARCHITECT

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PROJECT: **PROPOSED RESIDENTIAL SUBDIVISION OF LOT 7 DP1196266 INCLUDING WORKS IN LOT 8 DP1196266**

DRAWING TITLE: **CIVIL ENGINEERING PACKAGE**

RIPARIAN OFFSET PLAN

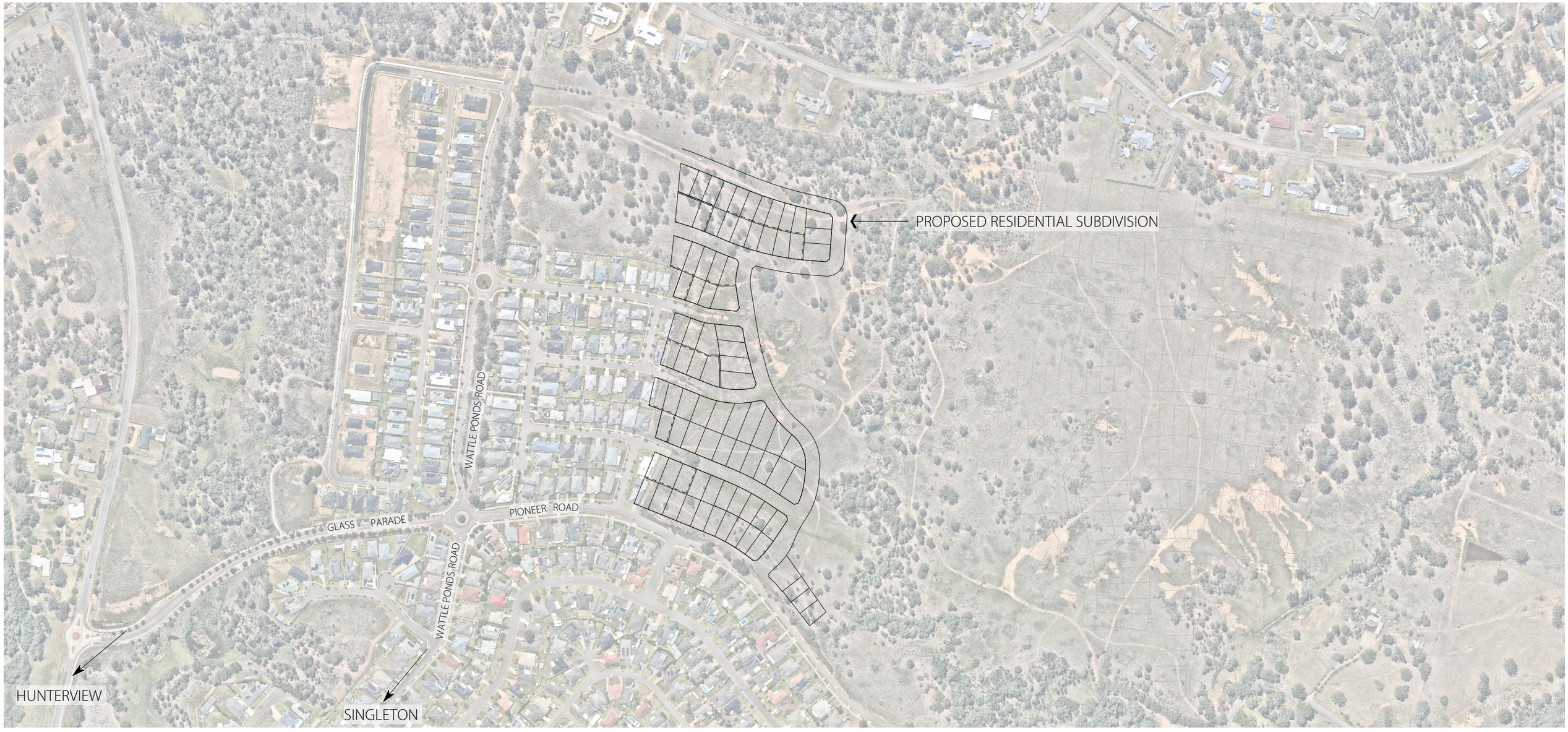
JOB NUMBER: **NL233144**

DRAWING NUMBER: **DA-R01.01**

REVISION: **C**

DRAWING SHEET SIZE = A1

Date : 06.06.2025 3:19 PM Plotted By : EMMA WEIR Found : O:\5 Pre-July 24 Projects\Newcastle\YEAR 2023 Jobs\NL233144 - Bridgman Ridge Stages 9-14\O - Drawings\CIVIL\03-CAD\01-DA\NL233144-DA-R01.01 RIPARIAN OFFSET.dwg



DRAWING REGISTER

DRAWING NUMBER	SHEET NAME	REV. No.	REV. DATE
15270.5 DA L000	COVER PAGE	G	6/6/25
15270.5 DA L010	SITE PLAN	G	6/6/25
15270.5 DA L101	KEY DIAGRAM	G	6/6/25
15270.5 DA L102	LANDSCAPE PLAN AREA 1	G	6/6/25
15270.5 DA L103	LANDSCAPE PLAN AREA 2	G	6/6/25
15270.5 DA L104	LANDSCAPE PLAN - PARK	G	6/6/25
15270.5 DA L105	LANDSCAPE PLAN AREA 3	G	6/6/25
15270.5 DA L106	ENTRY FEATURE 1 DETAIL	F	31/1/25
15270.5 DA L201	PLANT PALETTE	G	6/6/25
15270.5 DA L202	PLANT PALETTE 2	G	6/6/25
15270.5 DA L203	MATERIAL PALETTE	F	31/1/25
15270.5 DA L204	PLAYGROUND EQUIPMENT PALETTE	G	6/6/25

landscape development application

Proposed Residential Subdivision

Singleton Council

Pioneer Road HUNTERVIEW 2330 Lot: 7 & 8 DP: 1196266

terras landscape architects

SITE PLAN | L010

Proposed Residential Subdivision

APZ MARKER SHOWN BY HATCH

PROPOSED STREET TREE SPECIES WITHIN APZ PROVIDE <30% CANOPY COVER AND CANOPYS SEPARATED BY 2-5m IN ACCORDANCE WITH Planning For Bushfire Requirements 2019.

SIGNIFICANT FEATURE TREE TO BE RETAINED & PROTECTED

EXISTING TREE SPECIES TO BE RETAINED & PROTECTED

STREET TREES OFFSET 3m FROM INLET PITS, 10 SETBACK FROM INTERSECTIONS. REFER FOLLOWING PAGES FOR STREET SPECIES.

MASS PLANTING TO INNER & OUTER BANK OF BIOFILTRATION BASIN #1 REFER SHEET L202 FOR SPECIES.

STREET TREES TO BE CENTRED ON LOTS WHERE THE WIDTH OF THE LOT FRONTAGE IS LESS THAN 26M AS PER SINGLETON COUNCIL DCP

ALL PATHS AND TRAILS TO CIVIL DOCUMENTATION.

EXISTING PASTURE GRASS AREAS TO BE RETAINED, IMPLEMENT WEED MANAGEMNT STRATEGY AND MAINTAIN AT 100MM HIGH IN ACCORDANCE WITH Planning For Bushfire Requirements 2019.

MASS PLANTING TO INNER & OUTER BANK OF NEW PROPOSED BIOFILTRATION BASIN #2 REFER SHEET L202 FOR SPECIES.

ENTRY FEATURE WALL CONCEPT REFER SHEET L106

LEGEND

- BIOFILTRATION BASINS
- APZ
- BAL-FZ
- BAL 29
- BAL 19
- BAL 12.5
- PASTURE GRASS
- ZONING BOUNDARY BETWEEN R1 & RE1
- RIPARIAN CORRIDOR
- EXISTING WATERWAY

REV	DATE	COMMENTS
G	6/6/25	ISSUE FOR DA
F	31/1/25	FOR REVIEW
E	29/1/25	FOR REVIEW

PROJECT:
Proposed Residential Subdivision

SITE:
Pioneer Road HUNTERVIEW 2330 Lot: 7 & 8 DP: 1196266

CLIENT:
Singleton Council

15120.5-DA_ Bridgman Ridge Stages 9-14+.vwx 6/6/25

DRAWN:	DATE:	SCALE:
AN/ GF	27/05/2024	1:3000 @A3

JOB NUMBER:	PHASE:	DWG No:	REV:
15270.5	DA	L010	G

3 L010 KEY DIAGRAM
Scale: 1:3000

north

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KEY DIAGRAM | L101

Proposed Residential Subdivision

1 L101 KEY DIAGRAM
Scale: 1:3000

LEGEND

- PROPOSED TURF AREA
- PASTURE GRASS EXISTING TO BE RETAINED
- PROPOSED MASS PLANTING
- PROPOSED TREES IN MULCH & PLANTING
- PROPOSED CONCRETE PATHS BY CIVIL
- WALKING TRAILS AND CONCRETE PATHS AS PER CIVIL
- PROPOSED PLAYGROUND
- STAGE BOUNDARY
- PROPOSED STEPPING STONES
- WATER MANAGEMENT BASINS
- EXISTING WATERWAY
- SHADING STRUCTURE
- EXISTING PARK TREE TO BE RETAINED & PROTECTED
- New Park Tree *Waterhousia floribunda*
- NEW STREET TREE *Pyrus calleryana* 'Chanticleer'
- NEW STREET TREE *Tristaniopsis laurina*
- NEW STREET TREE *Magnolia grandiflora*
- NEW STREET TREE *Melaleuca quinquenervia*
- EXISTING FEATURE TREE TO BE MAINTINAED

REV	DATE	COMMENTS
G	6/6/25	ISSUE FOR DA
F	31/1/25	FOR REVIEW
E	29/1/25	FOR REVIEW

PROJECT:
Proposed Residential Subdivision

SITE:
Pioneer Road HUNTERVIEW
2330 Lot: 7 & 8 DP: 1196266

CLIENT:
Singleton Council

15120.5-DA_ Bridgman Ridge Stages 9-14+.vwx 6/6/25

DRAWN: AN/ GF
DATE: 27/05/2024
SCALE: 1:3000 @A3

JOB NUMBER: 15270.5
PHASE: DA
DWG No: L101
REV: G

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LANDSCAPE PLAN AREA 1 | L102

Proposed Residential Subdivision

Magnolia Grandiflora
Southern Magnolia

Waterhousia floribunda
Weeping Lilly Pilly

Tristaniopsis laurina
Water Gum

***Pyrus calleryana* 'Chanticleer'**
Ornamental Pear

PEDESTRIAN CONCRETE FOOTPATHS OF VARYING WIDTHS & ACCESSIBILITY TO CIVIL ENGINEERS DETAILS.

30M LENGTH HERITAGE FENCE AS PER CIVIL

PROPOSED COMMUNITY OPEN SPACE PARK REFER SHEET L104

PROPOSED COMMUNITY PLAYGROUND REFER SHEET L104

DRAINAGE SWALE TO DIRECT WATERFLOW TO BASIN. REFER CIVIL ENGINEER DETAIL

NEW TURF TO BASIN BATTERS GRADIENTS AS PER CIVIL DOCUMENTATION

INLET ZONE

MASS PLANTING TO BASIN CENTRE REFER SHEET L202

MASS PLANTING TO OUTER EDGE OF PROPOSED BIOFILTRATION BASIN REFER SPECIES ON SHEET L202

3m WIIDE MAINTENANCE TRACK TO BASIN PERIMETER AS PER COUNCIL DCP

north

1 L102 LANDSCAPE PLAN AREA 1
Scale: 1:1500

LEGEND

- PROPOSED TURF AREA
- PASTURE GRASS EXISTING TO BE RETAINED
- PROPOSED MASS PLANTING
- PROPOSED TREES IN MULCH & PLANTING
- PROPOSED CONCRETE PATHS BY CIVIL
- WALKING TRAILS AND CONCRETE PATHS AS PER CIVIL
- PROPOSED PLAYGROUND
- STAGE BOUNDARY
- PROPOSED STEPPING STONES
- WATER MANAGEMENT BASINS
- EXISTING WATERWAY
- SHADING STRUCTURE
- EXISTING PARK TREE TO BE RETAINED & PROTECTED
- New Park Tree *Waterhousia floribunda*
- NEW STREET TREE *Pyrus calleryana* 'Chanticleer'
- NEW STREET TREE *Tristaniopsis laurina*
- NEW STREET TREE *Magnolia grandiflora*
- NEW STREET TREE *Melaleuca quinquenervia*
- EXISTING FEATURE TREE TO BE MAINTINAED

REV	DATE	COMMENTS
G	6/6/25	ISSUE FOR DA
F	31/1/25	FOR REVIEW
E	29/1/25	FOR REVIEW

PROJECT:
Proposed Residential Subdivision

SITE:
Pioneer Road HUNTERVIEW 2330 Lot: 7 & 8 DP: 1196266

CLIENT:
Singleton Council

15120.5-DA_ Bridgman Ridge Stages 9-14+.vwx 6/6/25

DRAWN:	DATE:	SCALE:
AN/ GF	27/05/2024	1:1500 @A3

JOB NUMBER:	PHASE:	DWG No:	REV:
15270.5	DA	L102	G

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LANDSCAPE PLAN AREA 2 | L103

Proposed Residential Subdivision

1 L103 LANDSCAPE PLAN AREA 2
Scale: 1:1500

LEGEND

- PROPOSED TURF AREA
- PASTURE GRASS EXISTING TO BE RETAINED
- PROPOSED MASS PLANTING
- PROPOSED TREES IN MULCH & PLANTING
- PROPOSED CONCRETE PATHS BY CIVIL
- WALKING TRAILS AND CONCRETE PATHS AS PER CIVIL
- PROPOSED PLAYGROUND
- STAGE BOUNDARY
- PROPOSED STEPPING STONES
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- EXISTING WATERWAY
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- NEW STREET TREE *Melaleuca quinquenervia*
- EXISTING FEATURE TREE TO BE MAINTINAED

REV	DATE	COMMENTS
G	6/6/25	ISSUE FOR DA
F	31/1/25	FOR REVIEW
E	29/1/25	FOR REVIEW

PROJECT:
Proposed Residential Subdivision

SITE:
Pioneer Road HUNTERVIEW 2330 Lot: 7 & 8 DP: 1196266

CLIENT:
Singleton Council

15120.5-DA_ Bridgman Ridge Stages 9-14+.vwx 6/6/25

DRAWN:	DATE:	SCALE:
AN/ GF	27/05/2024	1:1500 @A3

JOB NUMBER: **15270.5** PHASE: **DA** DWG No: **L103** REV: **G**

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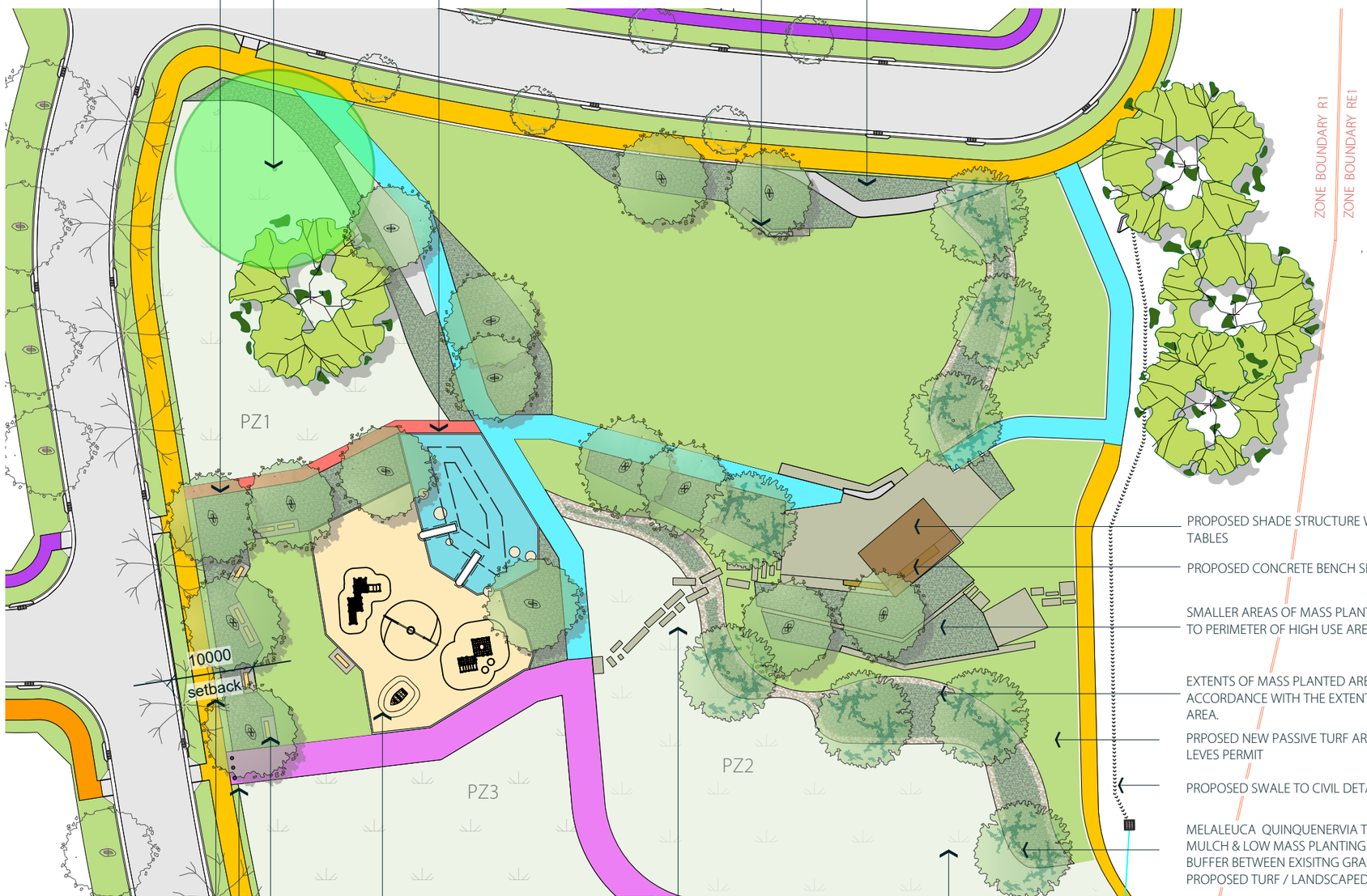
LANDSCAPE PLAN - PARK | L104

Proposed Residential Subdivision



LANDSCAPE AREAS	
PROPOSED MASS PLANTING	2325m2
PROPOSED TURF AREAS	3050m2
PLAYGROUND MULCH AREA	452m2
SITE TOTAL EXISTING PASTURE GRASS TO BE RETAINED/IMPLEMENT WEED MANAGEMNT & MAINTAIN AT 100MM HIGH	19,600m2 (approx 2Ha)
EXISTING PASTURE GRASS ZONE 1 & 2 (PZ1, PZ2) WITHIN PLAYGROUND AND OPEN SPACE	2426m2
EXISTING PASTURE GRASS ZONE 3 & 4 (PZ3, PZ4) AROUND BIOBASINS	17200m2

LEGEND

- PROPOSED TURF AREA
- PASTURE GRASS EXISTING TO BE RETAINED
- PROPOSED MASS PLANTING
- PROPOSED TREES IN MULCH & PLANTING
- PROPOSED CONCRETE PATHS BY CIVIL
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- STAGE BOUNDARY
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- EXISTING FEATURE TREE TO BE MAINTINAED

REV	DATE	COMMENTS
G	6/6/25	ISSUE FOR DA
F	31/1/25	FOR REVIEW
E	29/1/25	FOR REVIEW

PROJECT:
Proposed Residential Subdivision

SITE:
Pioneer Road HUNTERVIEW
2330 Lot: 7 & 8 DP: 1196266

CLIENT:
Singleton Council

15120.5-DA_ Bridgman Ridge Stages 9-14+.vwx 6/6/25

DRAWN:	DATE:	SCALE:
AN / GF	27/05/2024	1:600 @A3

JOB NUMBER:	PHASE:	DWG No:	REV:
15270.5	DA	L104	G

1 / L104 LANDSCPAE PLAN - PARK
Scale: 1:600

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LANDSCAPE PLAN AREA 3 | L105

Proposed Residential Subdivision

1 / L105 ENTRY FEATURE WALL LAYOUT PLAN
Scale: 1:500

LEGEND

- PROPOSED TURF AREA
- PASTURE GRASS EXISTING TO BE RETAINED
- PROPOSED MASS PLANTING
- PROPOSED TREES IN MULCH & PLANTING
- PROPOSED CONCRETE PATHS BY CIVIL
- WALKING TRAILS AND CONCRETE PATHS AS PER CIVIL
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- EXISTING FEATURE TREE TO BE MAINTINAED

REV	DATE	COMMENTS
G	6/6/25	ISSUE FOR DA
F	31/1/25	FOR REVIEW
E	29/1/25	FOR REVIEW

PROJECT:
Proposed Residential Subdivision

SITE:
Pioneer Road HUNTERVIEW 2330 Lot: 7 & 8 DP: 1196266

CLIENT:
Singleton Council

15120.5-DA_ Bridgman Ridge Stages 9-14+.vwx 6/6/25

DRAWN: AN/ GF | DATE: 27/05/2024 | SCALE: 1:3000 @A3

JOB NUMBER: **15270.5** | PHASE: **DA** | DWG No: **L105** | REV: **G**

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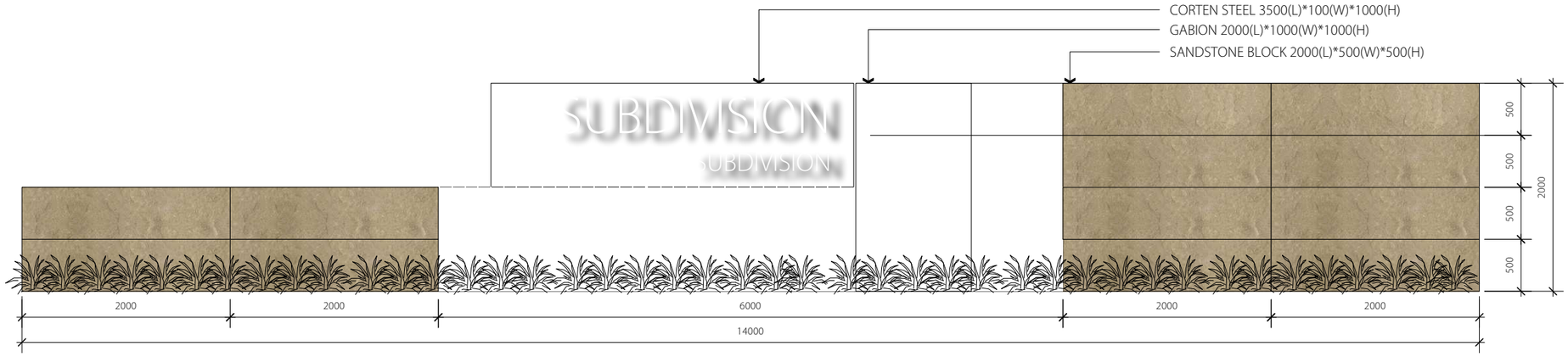
ENTRY FEATURE 1 DETAIL | L106

Proposed Residential Subdivision



1 / L106 ENTRY FEATURE 1 CONCEPT
Scale: 1:50

2 / L106 ENTRY FEATURE PLAN 1
Scale: 1:50

north

REV	DATE	COMMENTS
F	31/1/25	FOR REVIEW
E	29/1/25	FOR REVIEW
D	30/08/24	ISSUE FOR DA

PROJECT:
Proposed Residential Subdivision

SITE:
Pioneer Road HUNTERVIEW
2330 Lot: 7 & 8 DP: 1196266

CLIENT:
Singleton Council

15120.5-DA_ Bridgman Ridge Stages 9-14+.vwx 6/6/25

DRAWN:	DATE:	SCALE:
ZL / GF	27/05/2024	1:50 @A3

JOB NUMBER:	PHASE:	DWG No:	REV:
15270.5	DA	L106	F

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PLANT PALETTE | L201

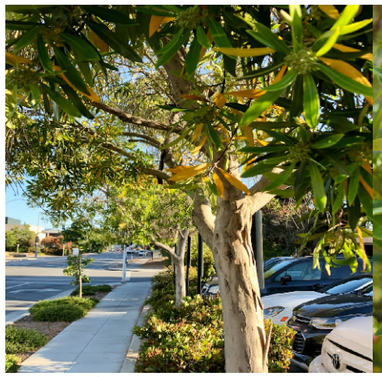
Proposed Residential Subdivision

STREET TREES

Magnolia grandiflora
Southern Magnolia

Pyrus calleryana 'Chanticleer'
Ornamental Pear

Waterhousia floribunda
Weeping Lilly Pilly



Tristaniopsis laurina
Water Gum

PARK TREES

Waterhousia floribunda
Weeping Lilly Pilly

Melaleuca quinquinervia
Broad -Leaved Paperbark

PLANT SCHEDULE - TREES					
STREETSCAPE					
ID	**Botanical Name**	**Common Name**	**Height**	**Spread**	**Pot Size**
Mg	Magnolia grandiflora	Southern Magnolia	18000	11000	75lt
PcC	Pyrus calleryana Chanticleer	Ornamental Pear	11000	6000	75lt
TI	Tristaniopsis laurina	Water Gum	8000	6000	75lt
Wf	Waterhousia floribunda	Weeping Lilly Pilly	8000	12000	75lt
LOCAL PARK					
ID	**Botanical Name**	**Common Name**	**Height**	**Spread**	**Pot Size**
MelQui	Melaleuca quinquenervia	Broad-Leaved Paperbark	10000	12000	75lt
Wf	Waterhousia floribunda	Weeping Lilly Pilly	8000	12000	75lt

REV	DATE	COMMENTS
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PROJECT:
Proposed Residential Subdivision

SITE:
Pioneer Road HUNTERVIEW
2330 Lot: 7 & 8 DP: 1196266

CLIENT:
Singleton Council

15120.5-DA_ Bridgman Ridge Stages 9-14+.vwx 6/6/25

DRAWN: AN / GF
DATE: 27/05/2024
SCALE: @A3

JOB NUMBER: **15270.5**
PHASE: **DA**
DWG No: **L201**
REV: **G**

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PLANT PALETTE 2 | L202

Proposed Residential Subdivision

PCT /ID: 3315 Derived from ***Central Hunter Ironbark-Spotted Gum Forest*** Plant Community Type (predominant on site)

Lomandra glauca
Lomandra Blue Ridge

Lomandra tanika longifolia
Mat Rush

Brachyscome multifida
Cut - leaf Daisy

Leptospermum polygalifolium
Tea Tree

Callistemon linearis
Bottle Brush

Myoporum montanum
Water Bush

Chrysocephalum apiculatum
Yellow Buttons

Westringia fruticosa 'Low Horizon'
Westringia Low Horizon

Banksia spinulosa
Hairpin Banksia

Acacia elongata
Swamp Wattle

Hardenbergia violacea purple
Purple Pea Flower

Ficinia nodosa
Knotted Club Rush

Myoporum parvifolium
Creeping Boobialla

Callistemon viminalis 'Better John'
Dwarf Bottle Brush

PLANT SCHEDULE - MASS UNDERPLANTING

ID	Botanical Name	Common Name	Spread	Pot Size
BanSpi1	Banksia spinulosa	Hairpin Banksia	400	150mm
BrMu	Brachyscome multifida	Cut Leaf Daisy	400	150mm
ChrApi	Chrysocephalum apiculatum	common everlasting, yellow buttons	400	150mm
LogI	Lomandra glauca	Aussie Blue Grass	400	150mm
MyPa	Myoporum parvifolium	Carpet Spreading Myoporum	1100	150mm
ID	**Botanical Name**	**Common Name**	**Spread**	**Pot Size**
AcEl	Acacia elongata	Swamp Wattle	3000	200mm
CaLi	Callistemon linearis	Narrow-leaved Bottlebrush	750	200mm
CvBJ	Callistemon viminalis 'Better John'	Weeping Bottlebrush	900	200mm
HarVio	Hardenbergia violacea `Meema`	parilla, purple coral pea, happy wanderer, native lilac, '	1000	200mm
LePo	Leptospermum polygalifolium	"Tantoon, Lemon-Scented Tea Tree"	3000	200mm
LIT	Lomandra longifolia 'Tanika'	Spiny-head mat rush	804	200mm
MyMo	Myoporum montanum	"Western Boobialla, Western Bush"	3000	200mm
MyPa	Myoporum parvifolium	Carpet Spreading Myoporum	1100	200mm
WfLH	Westringia fruticosa 'Low Horizon'	Coastal Rosemary,	1000	200mm

PLANT SCHEDULE - CENTRE OF BIORETENTION BASINS 1 & 2 COMBINED (AREA 3810m2)

ID	QTY	Botanical Name	Common Name	Height	Width	Pot Size	RATE /m2	% OF AREA
CaIn	7619	Carex inversa	Knob Sedge	0.3 - 0.45m	0.0 - 0.3m	TUBE	8	25
GaSi	7619	Gahnia sieberiana	Red-fruit Saw Sedge	0.9 - 1.5m	1.2 - 2.0m	TUBE	8	25
IsNo	7619	Isolepis nodosa	Knobby Club-rush	0.6 - 0.75m	0.3 - 0.6m	TUBE	8	25
JuUs	7619	Juncus usitatus	Common Rush	0.9 - 1.5m	0.6 - 0.9m	TUBE	8	25

OUTER EDGE OF BIORETENTION BASINS 1 & 2 COMBINED OUTER EDGE (AREA 1725m2)

ID		Botanical Name	Common Name	Height	Width	Pot Size	RATE /m2	% OF AREA
LomLonTan	4493	Lomandra longifolia 'Tanika'	Spiny-head mat rush	0.45 - 0.6m	0.6 - 0.9m	TUBE	8	50
DiRe	4493	Dianella revoluta	"Spreading Flax Lily, Blueberry Lily, Blue Fla	0.75 - 0.9m	0.3 - 0.6m	TUBE	8	50

BASIN PLANTING

Lomandra tanika longifolia
Mat Rush

Ficinia nodosa
Knotted Club Rush

Gahnia siberiana
Saw Sedge

Juncus usiatus
Commun Rush

Carex inversa
Knob Sedge

Carex apressa
Tall Sedge

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SCALE: @A3

JOB NUMBER: **15270.5**
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REV: **G**

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MATERIAL PALETTE | L203

Proposed Residential Subdivision

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D	30/08/24	ISSUE FOR DA

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PLAYGROUND EQUIPMENT PALETTE | L204

Proposed Residential Subdivision

PLAYGROUND EQUIPMENT IMAGES ARE REPRESENTATIVE ONLY.

ALL POSTS TO BE 125mm x 125mm ALUMINIUM STRUCTURAL POSTS (NO TIMBER)
REFER MODULPAY 6351-T6 ALLOY.

J-2243 1200H DOUBLE ROTOMOULDED SLIDE
- POSTS TO BE 125mm x 125mm ALUMINIUM STRUCTURAL POSTS

P-8322 CARRILLO
POSTS TO BE 125mm x 125mm ALUMINIUM STRUCTURAL POSTS

R-8086 SEE-SOAR ROCKER

S-8910 ZODIAC 35

S-8738 RETRO T SWING

Y-9205 GEO² TWYNAM

PLAYGROUND EQUIPMENT REFERENCE FROM MODUPLAY 2024 BROCHURE			
CODE	**NAME**	**QTY**	**RANGE**
J-2243	DOUBLE ROTOMOULDED SLIDE	2	Slides
P-8322	CARRILLO	1	Inclusive
R-8086	SEE-SOAR ROCKER	1	Inclusive
S-8910	ZODIAC 35	1	SWINGS
S-8738	RETRO T SWING	1	T SWING
Y-9205	GEO² TWYNAM	1	GeoClimber

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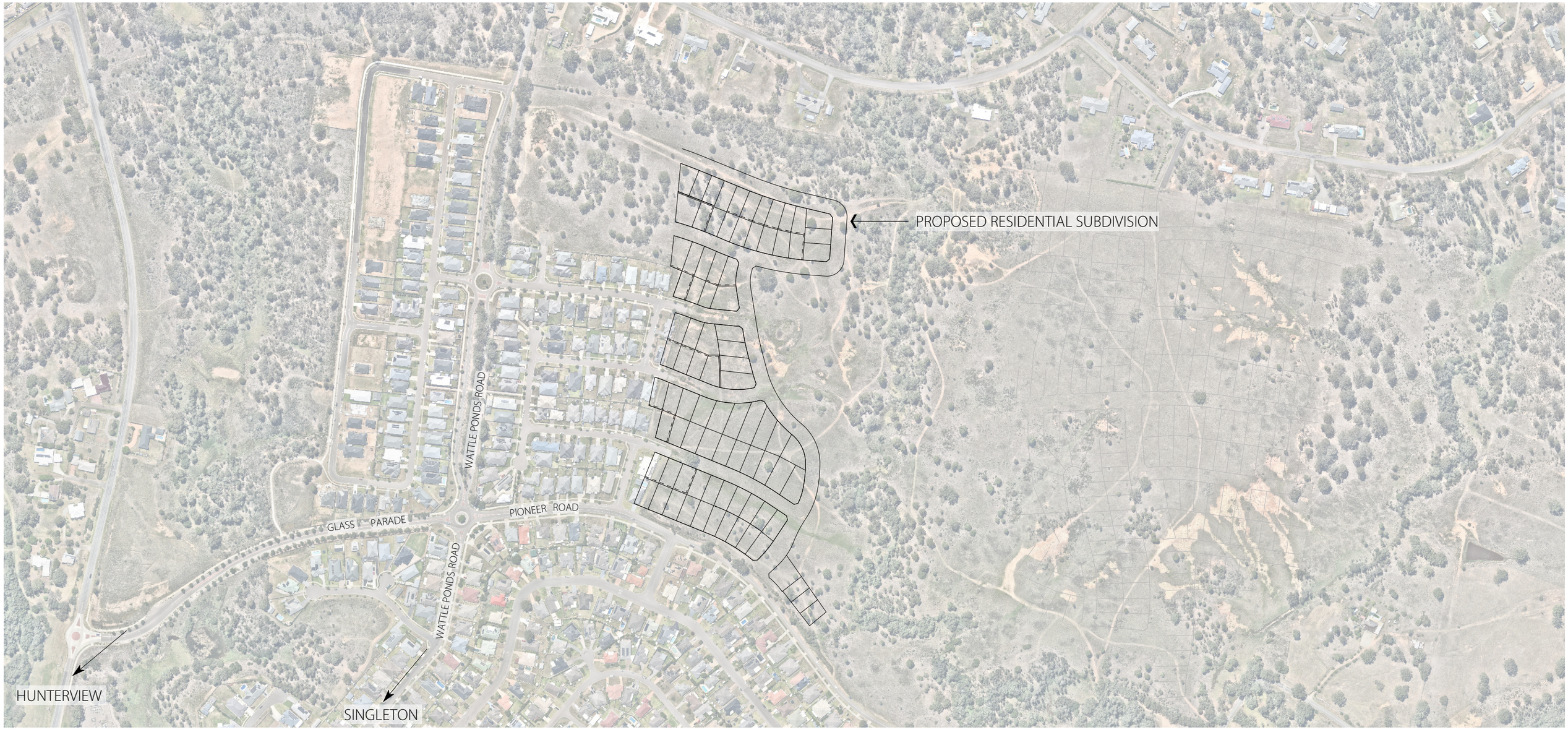

DRAWING REGISTER

DRAWING NUMBER	SHEET NAME	REV. No.	REV. DATE
15270.5 DA L000	COVER PAGE	G	6/6/25
15270.5 DA L010	SITE PLAN	G	6/6/25
15270.5 DA L101	KEY DIAGRAM	G	6/6/25
15270.5 DA L102	LANDSCAPE PLAN AREA 1	G	6/6/25
15270.5 DA L103	LANDSCAPE PLAN AREA 2	G	6/6/25
15270.5 DA L104	LANDSCAPE PLAN - PARK	G	6/6/25
15270.5 DA L105	LANDSCAPE PLAN AREA 3	G	6/6/25
15270.5 DA L106	ENTRY FEATURE 1 DETAIL	F	31/1/25
15270.5 DA L201	PLANT PALETTE	G	6/6/25
15270.5 DA L202	PLANT PALETTE 2	G	6/6/25
15270.5 DA L203	MATERIAL PALETTE	F	31/1/25
15270.5 DA L204	PLAYGROUND EQUIPMENT PALETTE	G	6/6/25

landscape development application

Proposed Residential Subdivision

Singleton Council

Pioneer Road HUNTERVIEW 2330 Lot: 7 & 8 DP: 1196266

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SITE PLAN | L010

Proposed Residential Subdivision

APZ MARKER SHOWN BY HATCH

PROPOSED STREET TREE SPECIES WITHIN APZ PROVIDE <30% CANOPY COVER AND CANOPYS SEPARATED BY 2-5m IN ACCORDANCE WITH Planning For Bushfire Requirements 2019.

SIGNIFICANT FEATURE TREE TO BE RETAINED & PROTECTED

EXISTING TREE SPECIES TO BE RETAINED & PROTECTED

STREET TREES OFFSET 3m FROM INLET PITS, 10 SETBACK FROM INTERSECTIONS. REFER FOLLOWING PAGES FOR STREET SPECIES.

MASS PLANTING TO INNER & OUTER BANK OF BIOFILTRATION BASIN #1 REFER SHEET L202 FOR SPECIES.

STREET TREES TO BE CENTRED ON LOTS WHERE THE WIDTH OF THE LOT FRONTAGE IS LESS THAN 26M AS PER SINGLETON COUNCIL DCP

ALL PATHS AND TRAILS TO CIVIL DOCUMENTATION.

EXISTING PASTURE GRASS AREAS TO BE RETAINED, IMPLEMENT WEED MANAGEMNT STRATEGY AND MAINTAIN AT 100MM HIGH IN ACCORDANCE WITH Planning For Bushfire Requirements 2019.

MASS PLANTING TO INNER & OUTER BANK OF NEW PROPOSED BIOFILTRATION BASIN #2 REFER SHEET L202 FOR SPECIES.

ENTRY FEATURE WALL CONCEPT REFER SHEET L106

LEGEND

- BIOFILTRATION BASINS
- APZ
- BAL-FZ
- BAL 29
- BAL 19
- BAL 12.5
- PASTURE GRASS
- ZONING BOUNDARY BETWEEN R1 & RE1
- RIPARIAN CORRIDOR
- EXISTING WATERWAY

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Singleton Council

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DRAWN:	DATE:	SCALE:
AN/ GF	27/05/2024	1:3000 @A3

JOB NUMBER:	PHASE:	DWG No:	REV:
15270.5	DA	L010	G

3 L010 KEY DIAGRAM
Scale: 1:3000

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KEY DIAGRAM | L101

Proposed Residential Subdivision

1 L101 KEY DIAGRAM
Scale: 1:3000

LEGEND

- PROPOSED TURF AREA
- PASTURE GRASS EXISTING TO BE RETAINED
- PROPOSED MASS PLANTING
- PROPOSED TREES IN MULCH & PLANTING
- PROPOSED CONCRETE PATHS BY CIVIL
- WALKING TRAILS AND CONCRETE PATHS AS PER CIVIL
- PROPOSED PLAYGROUND
- STAGE BOUNDARY
- PROPOSED STEPPING STONES
- WATER MANAGEMENT BASINS
- EXISTING WATERWAY
- SHADING STRUCTURE
- EXISTING PARK TREE TO BE RETAINED & PROTECTED
- New Park Tree *Waterhousia floribunda*
- NEW STREET TREE *Pyrus calleryana* 'Chanticleer'
- NEW STREET TREE *Tristaniopsis laurina*
- NEW STREET TREE *Magnolia grandiflora*
- NEW STREET TREE *Melaleuca quinquenervia*
- EXISTING FEATURE TREE TO BE MAINTINAED

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LANDSCAPE PLAN AREA 1 | L102

Proposed Residential Subdivision

Magnolia Grandiflora
Southern Magnolia

Waterhousia floribunda
Weeping Lilly Pilly

Tristaniopsis laurina
Water Gum

***Pyrus calleryana* 'Chanticleer'**
Ornamental Pear

PEDESTRIAN CONCRETE FOOTPATHS OF VARYING WIDTHS & ACCESSIBILITY TO CIVIL ENGINEERS DETAILS.

30M LENGTH HERITAGE FENCE AS PER CIVIL

PROPOSED COMMUNITY OPEN SPACE PARK REFER SHEET L104

PROPOSED COMMUNITY PLAYGROUND REFER SHEET L104

DRAINAGE SWALE TO DIRECT WATERFLOW TO BASIN. REFER CIVIL ENGINEER DETAIL

NEW TURF TO BASIN BATTERS GRADIENTS AS PER CIVIL DOCUMENTATION

INLET ZONE

MASS PLANTING TO BASIN CENTRE REFER SHEET L202

MASS PLANTING TO OUTER EDGE OF PROPOSED BIOFILTRATION BASIN REFER SPECIES ON SHEET L202

3m WIIDE MAINTENANCE TRACK TO BASIN PERIMETER AS PER COUNCIL DCP

north

1 L102 LANDSCAPE PLAN AREA 1
Scale: 1:1500

LEGEND

- PROPOSED TURF AREA
- PASTURE GRASS EXISTING TO BE RETAINED
- PROPOSED MASS PLANTING
- PROPOSED TREES IN MULCH & PLANTING
- PROPOSED CONCRETE PATHS BY CIVIL
- WALKING TRAILS AND CONCRETE PATHS AS PER CIVIL
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JOB NUMBER:	PHASE:	DWG No:	REV:
15270.5	DA	L102	G

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LANDSCAPE PLAN AREA 2 | L103

Proposed Residential Subdivision

1 L103 LANDSCAPE PLAN AREA 2
Scale: 1:1500

LEGEND

- PROPOSED TURF AREA
- PASTURE GRASS EXISTING TO BE RETAINED
- PROPOSED MASS PLANTING
- PROPOSED TREES IN MULCH & PLANTING
- PROPOSED CONCRETE PATHS BY CIVIL
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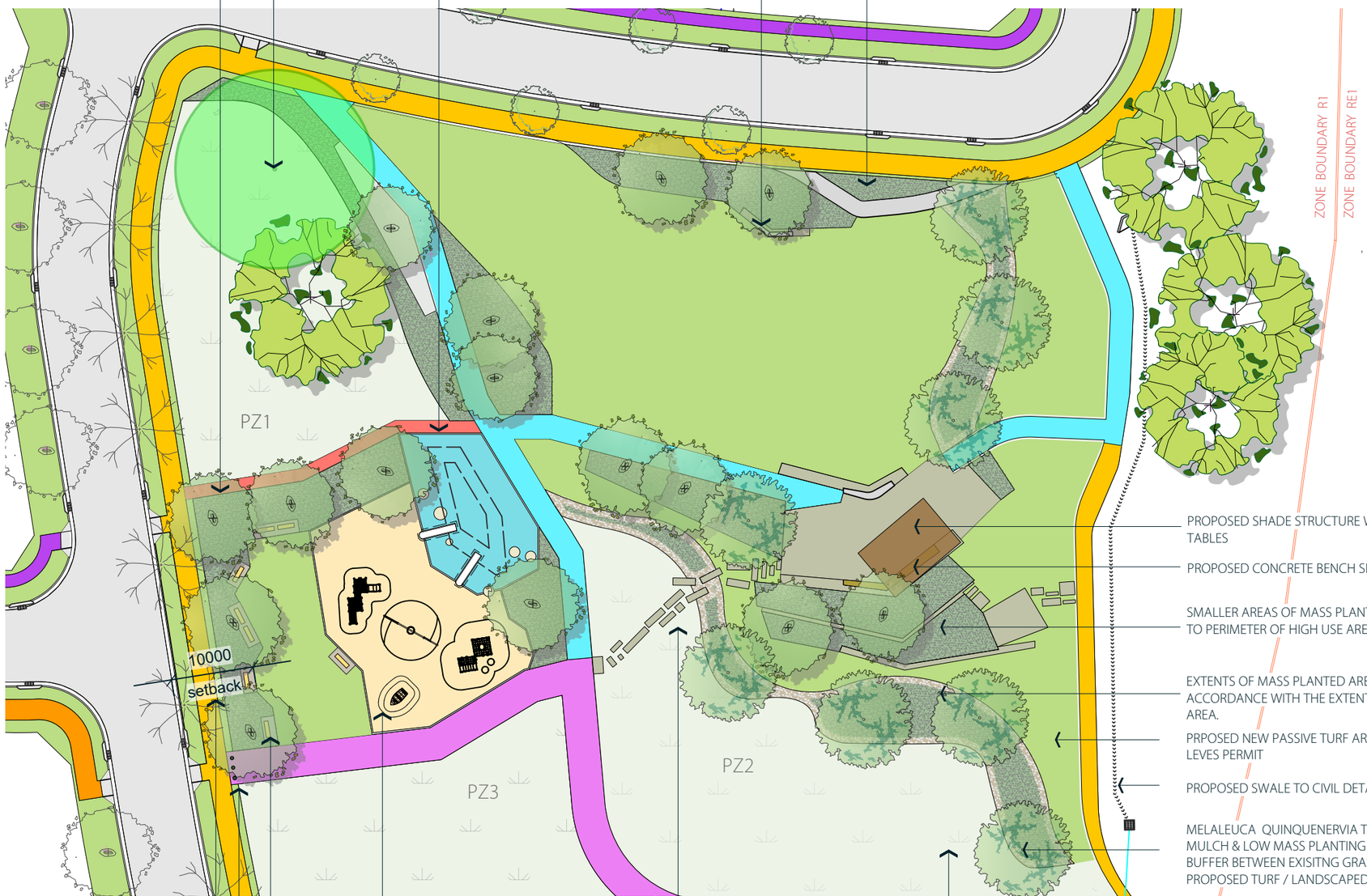
LANDSCAPE PLAN - PARK | L104

Proposed Residential Subdivision



LANDSCAPE AREAS	
PROPOSED MASS PLANTING	2325m2
PROPOSED TURF AREAS	3050m2
PLAYGROUND MULCH AREA	452m2
SITE TOTAL EXISTING PASTURE GRASS TO BE RETAINED/IMPLEMENT WEED MANAGEMNT & MAINTAIN AT 100MM HIGH	19,600m2 (approx 2Ha)
EXISTING PASTURE GRASS ZONE 1 & 2 (PZ1, PZ2) WITHIN PLAYGROUND AND OPEN SPACE	2426m2
EXISTING PASTURE GRASS ZONE 3 & 4 (PZ3, PZ4) AROUND BIOBASINS	17200m2

LEGEND

- PROPOSED TURF AREA
- PASTURE GRASS EXISTING TO BE RETAINED
- PROPOSED MASS PLANTING
- PROPOSED TREES IN MULCH & PLANTING
- PROPOSED CONCRETE PATHS BY CIVIL
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DRAWN:	DATE:	SCALE:
AN / GF	27/05/2024	1:600 @A3

JOB NUMBER:	PHASE:	DWG No:	REV:
15270.5	DA	L104	G

1 / L104 LANDSCPAE PLAN - PARK
Scale: 1:600

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LANDSCAPE PLAN AREA 3 | L105

Proposed Residential Subdivision

1 / L105 ENTRY FEATURE WALL LAYOUT PLAN
Scale: 1:500

LEGEND

- PROPOSED TURF AREA
- PASTURE GRASS EXISTING TO BE RETAINED
- PROPOSED MASS PLANTING
- PROPOSED TREES IN MULCH & PLANTING
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- EXISTING FEATURE TREE TO BE MAINTINAED

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DRAWN: AN/ GF | DATE: 27/05/2024 | SCALE: 1:3000 @A3

JOB NUMBER: **15270.5** | PHASE: **DA** | DWG No: **L105** | REV: **G**

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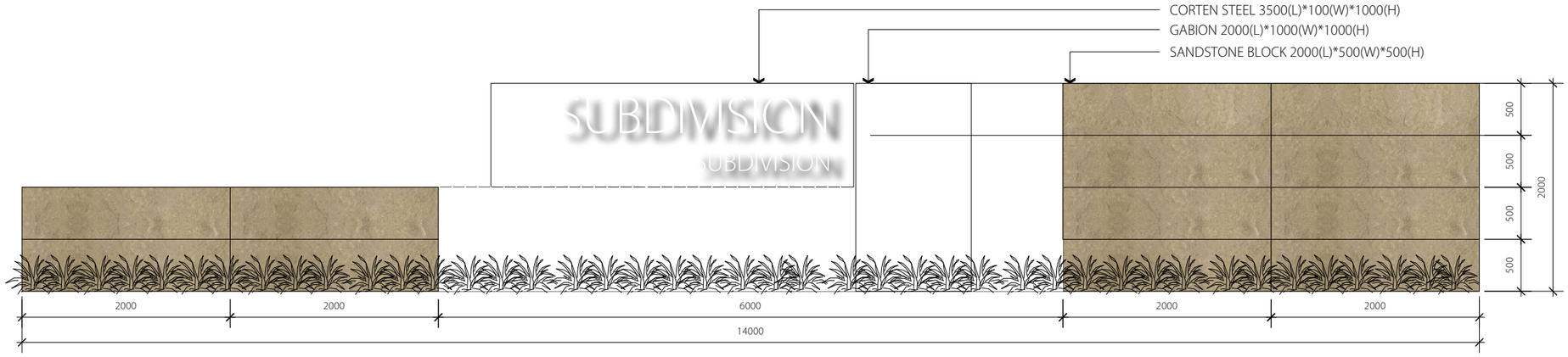
ENTRY FEATURE 1 DETAIL | L106

Proposed Residential Subdivision



1 / L106 ENTRY FEATURE 1 CONCEPT
Scale: 1:50

2 / L106 ENTRY FEATURE PLAN 1
Scale: 1:50

north

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PLANT PALETTE | L201

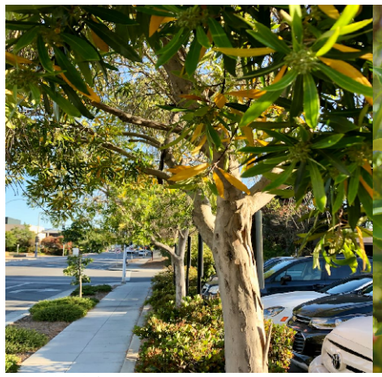
Proposed Residential Subdivision

STREET TREES

Magnolia grandiflora
Southern Magnolia

Pyrus calleryana 'Chanticleer'
Ornamental Pear

Waterhousia floribunda
Weeping Lilly Pilly



Tristaniopsis laurina
Water Gum

PARK TREES

Waterhousia floribunda
Weeping Lilly Pilly

Melaleuca quinquinervia
Broad -Leaved Paperbark

PLANT SCHEDULE - TREES					
STREETSCAPE					
ID	**Botanical Name**	**Common Name**	**Height**	**Spread**	**Pot Size**
Mg	Magnolia grandiflora	Southern Magnolia	18000	11000	75lt
PcC	Pyrus calleryana Chanticleer	Ornamental Pear	11000	6000	75lt
TI	Tristaniopsis laurina	Water Gum	8000	6000	75lt
Wf	Waterhousia floribunda	Weeping Lilly Pilly	8000	12000	75lt
LOCAL PARK					
ID	**Botanical Name**	**Common Name**	**Height**	**Spread**	**Pot Size**
MelQui	Melaleuca quinquenervia	Broad-Leaved Paperbark	10000	12000	75lt
Wf	Waterhousia floribunda	Weeping Lilly Pilly	8000	12000	75lt

REV	DATE	COMMENTS
G	6/6/25	ISSUE FOR DA
F	31/1/25	FOR REVIEW
E	29/1/25	FOR REVIEW

PROJECT:
Proposed Residential Subdivision

SITE:
Pioneer Road HUNTERVIEW
2330 Lot: 7 & 8 DP: 1196266

CLIENT:
Singleton Council

15120.5-DA_ Bridgman Ridge Stages 9-14+.vwx 6/6/25

DRAWN: AN / GF
DATE: 27/05/2024
SCALE: @A3

JOB NUMBER: **15270.5**
PHASE: **DA**
DWG No: **L201**
REV: **G**

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PLANT PALETTE 2 | L202

Proposed Residential Subdivision

PCT /ID: 3315 Derived from ***Central Hunter Ironbark-Spotted Gum Forest*** Plant Community Type (predominant on site)

Lomandra glauca
Lomandra Blue Ridge

Lomandra tanika longifolia
Mat Rush

Brachyscome multifida
Cut - leaf Daisy

Leptospermum polygalifolium
Tea Tree

Callistemon linearis
Bottle Brush

Myoporum montanum
Water Bush

Chrysocephalum apiculatum
Yellow Buttons

Westringia fruticosa 'Low Horizon'
Westringia Low Horizon

Banksia spinulosa
Hairpin Banksia

Acacia elongata
Swamp Wattle

Hardenbergia violacea purple
Purple Pea Flower

Ficinia nodosa
Knotted Club Rush

Myoporum parvifolium
Creeping Boobialla

Callistemon viminalis 'Better John'
Dwarf Bottle Brush

PLANT SCHEDULE - MASS UNDERPLANTING

ID	Botanical Name	Common Name	Spread	Pot Size
BanSpi1	Banksia spinulosa	Hairpin Banksia	400	150mm
BrMu	Brachyscome multifida	Cut Leaf Daisy	400	150mm
ChrApi	Chrysocephalum apiculatum	common everlasting, yellow buttons	400	150mm
LogI	Lomandra glauca	Aussie Blue Grass	400	150mm
MyPa	Myoporum parvifolium	Carpet Spreading Myoporum	1100	150mm
ID	**Botanical Name**	**Common Name**	**Spread**	**Pot Size**
AcEl	Acacia elongata	Swamp Wattle	3000	200mm
CaLi	Callistemon linearis	Narrow-leaved Bottlebrush	750	200mm
CvBJ	Callistemon viminalis 'Better John'	Weeping Bottlebrush	900	200mm
HarVio	Hardenbergia violacea `Meema`	parilla, purple coral pea, happy wanderer, native lilac, '	1000	200mm
LePo	Leptospermum polygalifolium	"Tantoon, Lemon-Scented Tea Tree"	3000	200mm
LIT	Lomandra longifolia 'Tanika'	Spiny-head mat rush	804	200mm
MyMo	Myoporum montanum	"Western Boobialla, Western Bush"	3000	200mm
MyPa	Myoporum parvifolium	Carpet Spreading Myoporum	1100	200mm
WfLH	Westringia fruticosa 'Low Horizon'	Coastal Rosemary,	1000	200mm

PLANT SCHEDULE - CENTRE OF BIORETENTION BASINS 1 & 2 COMBINED (AREA 3810m2)

ID	QTY	Botanical Name	Common Name	Height	Width	Pot Size	RATE /m2	% OF AREA
CaIn	7619	Carex inversa	Knob Sedge	0.3 - 0.45m	0.0 - 0.3m	TUBE	8	25
GaSi	7619	Gahnia sieberiana	Red-fruit Saw Sedge	0.9 - 1.5m	1.2 - 2.0m	TUBE	8	25
IsNo	7619	Isolepis nodosa	Knobby Club-rush	0.6 - 0.75m	0.3 - 0.6m	TUBE	8	25
JuUs	7619	Juncus usitatus	Common Rush	0.9 - 1.5m	0.6 - 0.9m	TUBE	8	25

OUTER EDGE OF BIORETENTION BASINS 1 & 2 COMBINED OUTER EDGE (AREA 1725m2)

ID		Botanical Name	Common Name	Height	Width	Pot Size	RATE /m2	% OF AREA
LomLonTan	4493	Lomandra longifolia 'Tanika'	Spiny-head mat rush	0.45 - 0.6m	0.6 - 0.9m	TUBE	8	50
DiRe	4493	Dianella revoluta	"Spreading Flax Lily, Blueberry Lily, Blue Fla	0.75 - 0.9m	0.3 - 0.6m	TUBE	8	50

BASIN PLANTING

Lomandra tanika longifolia
Mat Rush

Ficinia nodosa
Knotted Club Rush

Gahnia siberiana
Saw Sedge

Juncus usiatus
Commun Rush

Carex inversa
Knob Sedge

Carex apressa
Tall Sedge

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MATERIAL PALETTE | L203

Proposed Residential Subdivision

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F	31/1/25	FOR REVIEW
E	29/1/25	FOR REVIEW
D	30/08/24	ISSUE FOR DA

PROJECT:

Proposed Residential Subdivision

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Pioneer Road HUNTERVIEW 2330 Lot: 7 & 8 DP: 1196266

CLIENT:

Singleton Council

15120.5-DA_ Bridgman Ridge Stages 9-14+.vwx 6/6/25

DRAWN: ZL / GF

DATE: 27/05/2024

SCALE: @A3

JOB NUMBER: **15270.5**

PHASE: **DA**

DWG No: **L203**

REV: **F**

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PLAYGROUND EQUIPMENT PALETTE | L204

Proposed Residential Subdivision

PLAYGROUND EQUIPMENT IMAGES ARE REPRESENTATIVE ONLY.

ALL POSTS TO BE 125mm x 125mm ALUMINIUM STRUCTURAL POSTS (NO TIMBER)
REFER MODULPAY 6351-T6 ALLOY.

J-2243 1200H DOUBLE ROTOMOULDED SLIDE
- POSTS TO BE 125mm x 125mm ALUMINIUM STRUCTURAL POSTS

P-8322 CARRILLO
POSTS TO BE 125mm x 125mm ALUMINIUM STRUCTURAL POSTS

R-8086 SEE-SOAR ROCKER

S-8910 ZODIAC 35

S-8738 RETRO T SWING

Y-9205 GEO² TWYNAM

PLAYGROUND EQUIPMENT REFERENCE FROM MODUPLAY 2024 BROCHURE			
CODE	**NAME**	**QTY**	**RANGE**
J-2243	DOUBLE ROTOMOULDED SLIDE	2	Slides
P-8322	CARRILLO	1	Inclusive
R-8086	SEE-SOAR ROCKER	1	Inclusive
S-8910	ZODIAC 35	1	SWINGS
S-8738	RETRO T SWING	1	T SWING
Y-9205	GEO² TWYNAM	1	GeoClimber

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NORTHROP

CIVIL

Engineering Concept Design Report

for

Proposed Residential Subdivision – Stages 9 -14

For Singleton Council

Level 1, 215 Pacific Highway
Charlestown NSW 2290
02 4943 1777
newcastle@northrop.com.au
ABN 81 094 433 100

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1. Introduction

1.1. Background

Northrop Consulting Engineers Pty Ltd have been engaged by Singleton Council to prepare an Engineering Design Report to support the Development Application (DA) for the proposed residential subdivision, herein known as “the site”. The proposed development consists of 88 lots, half road construction to complete the full width of Pioneer Road, associated stormwater water quality/ quantity facilities, open space/park and playground, and a new community walking trail.

The purpose of this report is to summarise the proposed design solutions for the engineering aspects for a DA submission to Singleton Council. We note the information contained in this report is not intended to present detailed design solutions but rather provide solutions proportionate with a conceptual design suitable for DA assessment. The report should be read in conjunction with the preliminary engineering design plans NL233144 DA-C01.01 to DA-C09.01, herein referred to as the “civil drawings”.

In line with the objectives and controls of Singleton Council’s Development Control Plan (DCP), supporting Engineering Design Guideline and Australian Standards, and industry best practice; the conceptual engineering design has considered the following general aspects which will be discussed in further detail in the following sections of this report:

- Sediment & Erosion Control.
- Access and Internal Road.
- Site Grading and Bulk Earthworks.
- Concept Stormwater Management Strategy.

1.2. Site Description

The site is located North of Singleton within the Hunterview suburb and is bound to the west by the existing Bridgman Ridge Estate Stages 3A, Stages 3B 1-2, to the north by existing rural development, to the east by an area zoned RE1 –Public Recreation, and south by Pioneer Road and Hunterview Estate. The site has an area of approximately 12.92ha.

Levels on site range from approximately 76m AHD in the northwestern corner to 50m AHD along the eastern boundary, and generally slope at 4% falling from west to east. An aerial view of the proposed development site is shown in Figure 1 below.

The site is currently sparsely vegetated land, which undulates and is separated by ridges and gullies containing watercourse which generally flow to the main watercourse, an unnamed tributary of the Hunter River. Within the site there is currently an existing basin, and a temporary sediment/ detention basin constructed as part of the stage 6 works.

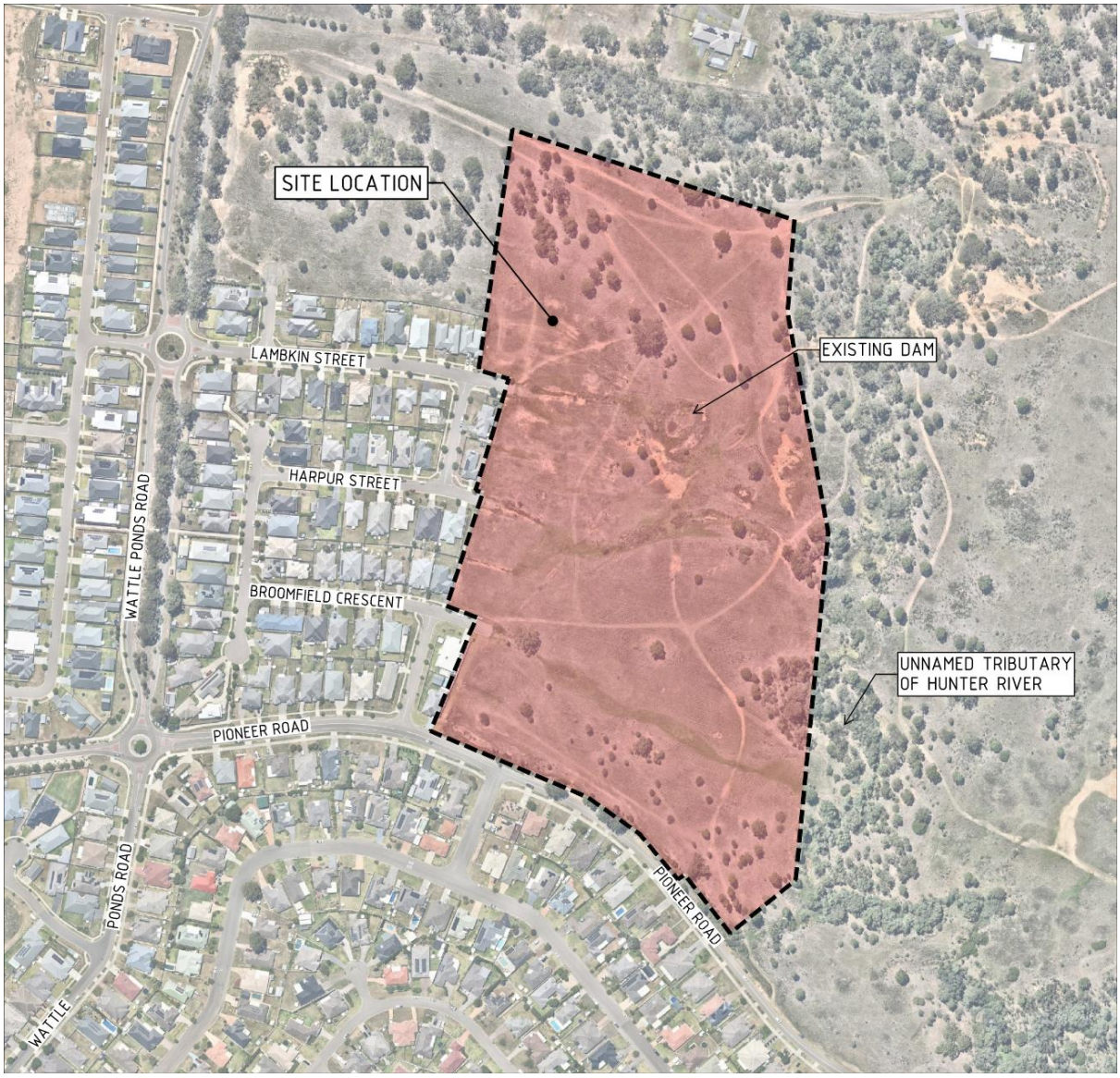

Figure 1 Aerial Image of Development Site (Nearmap, 2024)

2. Proposed Development

2.1. General

The proposed development allows for 88 lots, half road upgrade of Pioneer Road, associated stormwater water quality/ quantity facilities, open space/park, playground and a new community cycleway.

Details of the development are represented in the civil drawings enclosed and shown indicatively in Figure 2 below.

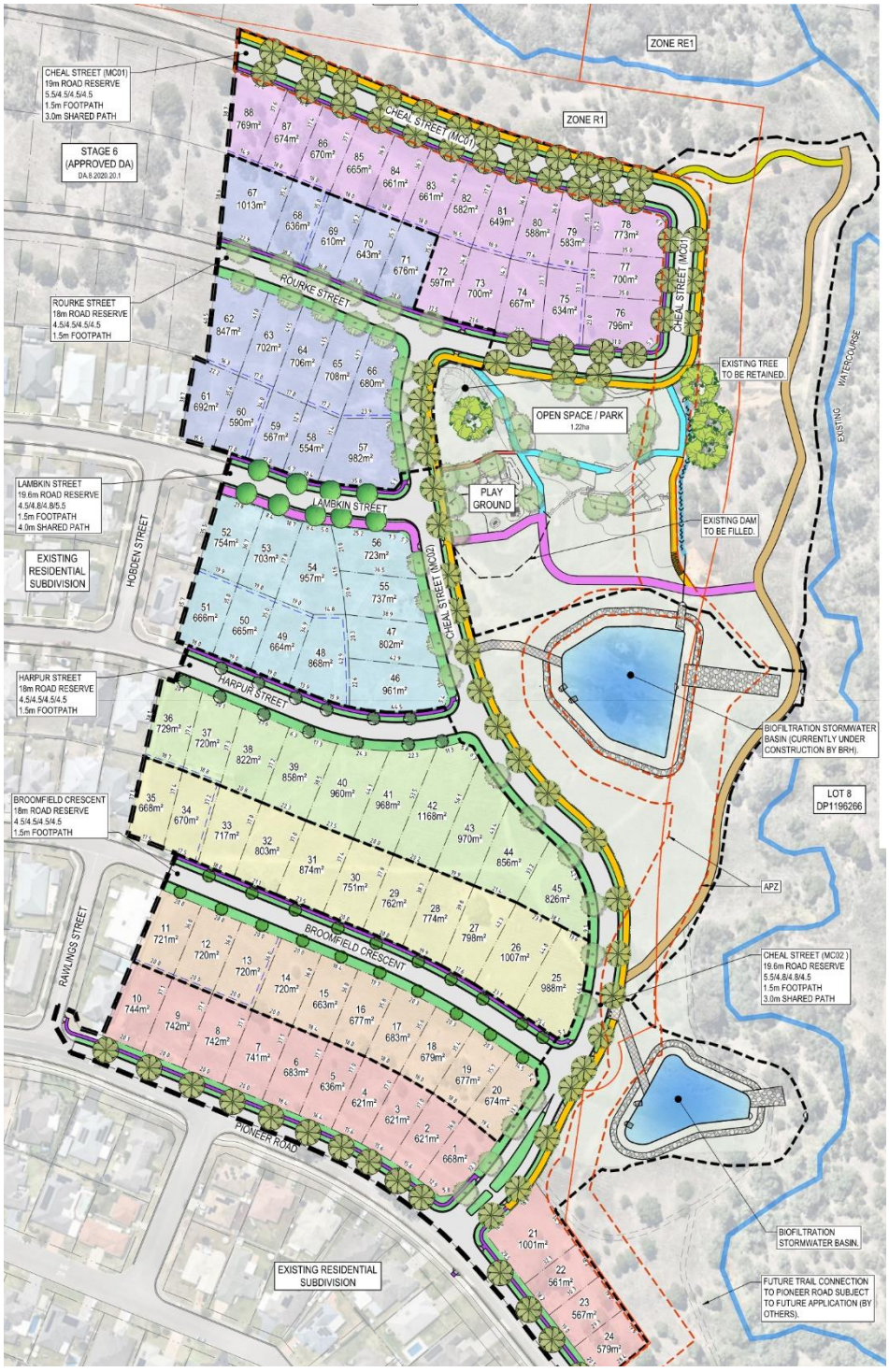

Figure 2 Proposed Site Layout

2.2. Major Components of the Development

The proposed residential subdivision development will incorporate the following major components:

- Site Regrading – Bulk earthworks and regrading are proposed across the site. The maximum depth of fill or cut is approximately 3.3m and 2.5m respectively above and below existing surface. Preliminary earthworks modelling has determined that approximately 28,000m^3 of cut and fill will be required across the site, and which will result in a balanced earthworks outcome. Approximately 8,500m^3 of site won fill is proposed to be used to fill in the green space area, which would otherwise be deemed unsuitable for compaction elsewhere onsite. The 28,000m^3 cut to fill balance includes the 8,500m^3 volume of unsuitable material.
- Road Network – the road network has been designed to generally be in accordance with Singleton Council Engineering Design Guidelines and Austroads “Guide to Traffic Engineering Practice”.
- Access – 1.5m concrete footpath, 3.0m and 4.0m wide shared path concrete footpath and 3.0 and 4.0m wide gravel trail within the watercourse and open/green space areas.
- Flooding – A flood study was conducted for the entire Bridgman Ridge Estate in 2011 by RGH Consulting Group. The site is not expected to be impacted by flood water from the unnamed tributary.
- Stormwater Management – The proposed development includes water quality management at a subdivision scale. Stormwater runoff is proposed to be managed via a biofiltration basin with a Gross Pollutant Trap (GPT) pre-treatment to capture and treat the majority of site runoff. In addition, an end-of-line detention basin is proposed to manage stormwater flow from within the site and upstream catchments. A total of two combined biofiltration-detention basins are proposed to treat the site, with one basin to be already constructed by BRH as part of the Stage 6 works.

3. Erosion and Sediment Control

The proposed development will typically involve stripping, bulk earthworks, service construction, road construction and shaping of basins and channels. These works pose the risk of erosion, sediment, and pollutant runoff into adjacent waterways. To avoid this, and comply with Council and legislation requirements, Erosion and Sediment Control practices will be implemented during construction works.

Preliminary Soil and Water Management Plans have been prepared indicating how compliance with DCP requirements could be achieved during construction. It is expected that this plan will be further detailed for Subdivision Works Certificate for each stage and help inform the selected Contractor in development of their own Environmental Management plan.

3.1. General Design Requirements

In general, soil and water management required during construction and establishment periods shall be undertaken in line with the requirements outlined in ‘Managing Urban Stormwater, Soils and Construction’ (The Blue Book) prepared by Landcom and Singleton Council’s design and construction policies. As a general guide, the following principles shall be employed with the aim to minimise soil disturbance and erosion and where such disturbance is required to prevent migration and deposition onto neighbouring property and water courses. Some of the general principles which shall be employed are included below.

3.1.1. Prior to Construction Commencing

A copy of the approved Soil and Water Management Plan shall be kept onsite and always made available to all construction personnel.

As part of general site induction, all personnel shall be made aware of the general intent as well as the specific requirements/ mitigation measures of the soil and water management plan.

A maintenance schedule for all mitigation measures shall be developed and implemented.

Areas where the existing vegetation is proposed to be retained shall be designated as ‘No-Go’ areas and appropriate protective fencing shall be erected to prevent unauthorized access by vehicles and personnel.

Install sediment protection filters on all new and existing stormwater inlet pits in accordance with either the mesh and gravel inlet filter detail SD6-11 or the geotextile inlet filter detail SD6-12 of the 'Blue Book'.

Install sediment fencing around individual work zones/ areas which require specific protection or have a higher potential for erosion.

Establish all sediment fences along site work boundaries or topographical features in accordance with detail SD6-8 of the 'Blue Book'.

Earth diversion mounds/ swales shall be constructed to divert clean stormwater around undisturbed areas as well as collect potentially sediment laden runoff from upslope disturbed areas. Diversion systems shall be constructed from swale side-cast on down slope.

3.1.2. During Construction Activities

The contractor shall ensure that all vegetation (tree, shrub, and ground cover) which is to be retained shall be protected during the duration of construction.

All trees to be removed shall be mulched onsite and spread/ stockpiled or opted for reuse as sediment filters in lieu of sediment fencing or protective ground cover/ stabilisation for disturbed areas to be revegetated.

All trenches shall be side-cast to the high side and closed at the end of each day's work.

Strip topsoil in areas designated for stripping and stockpile for re-use as required. Any surplus material shall be removed from site and disposed of in accordance with EPA guidelines.

Construct and maintain all material stockpiles in accordance with detail SD4-1 of the 'Blue Book' (including cut-off swales to the high side and sediment fences to the low side) and provide wind and rain erosion protection as required in accordance with detail SD6-12 of the 'Blue Book'.

Provide water trucks or sprinkler devices during construction as required to suppress dust throughout the construction operations.

Once cut/ fill operations have been finalised, all disturbed areas that are not being worked on shall be re-vegetated as soon as is practical, either temporarily or permanently in accordance with the landscape design.

The contractor shall keep a detailed written record of all erosion and sediment controls on-site during the construction period. This record shall be updated daily and shall contain details on the condition of controls and any/ all maintenance, cleaning, and breaches. This record shall be kept on-site at all times and shall be made available for inspection by the principal certifying authority and the Superintendent during normal working hours.

Water captured within the sediment basin during construction shall be managed and discharged in accordance with the Sediment Basin Dewatering Procedure outlined below.

3.1.3. After Completion of Construction Works

Environmental management controls shall be maintained in good order until the site is deemed sufficiently stabilized. For areas of bulk earthworks, minimum 90% ground cover should be achieved for the extent of works prior to decommissioning of temporary sediment basins or removal of controls.

Temporary protection of permanent bioretention basins should be kept in place until at least 70% of dwelling construction within the stage has been completed, and verge and landscape areas achieve 90% cover.

All environmental management devices should be cleaned and removed of sediment and pollutants to a suitable disposal location prior to removal.

4. Pedestrian and Vehicular Access

4.1. General

The proposed internal access network has been designed to provide appropriate accessibility for vehicles throughout the site. In developing the proposed development layout, due consideration has also been given to site-specific elements, including:

- To direct stormwater drainage to nominated end of line water quality treatment basins.
- Connecting into the existing road network within the Bridgman Ridge Estate and Pioneer Road.

Preliminary engineering design has been undertaken for the development including site grading using 3D computer modelling. As part of this application, engineering design plans have been provided for:

- Road layout including typical road sections.
- Preliminary grading and levels including contours and road longitudinal sections.

4.2. Road Grading

The longitudinal road profiles typically vary between 1.0% as a minimum up to approximately 10.0% as a preferred maximum to suit the general topography of the existing site, which is in accordance with Council's Engineering Design Guideline for Urban Local (1 and 2) roads which permits 15.0% maximum longitudinal grades. Preliminary road long-sections and typical cross-sections have been prepared and are included in the civil drawings.

4.3. Road Classification

The road carriageways and verge widths within the proposed development have been designed to match the widths within the existing Bridgman Ridge Estate development. Typical sections of the different road carriageways have been provided within the engineering design plans.

4.4. Pavement Design

Pavement design will be based on the requirements of Singleton Councils Engineering Design Guidelines for all internal development roads. A preliminary pavement design has been undertaken by Douglas Partners, however detailed pavement design will be undertaken as part of the detailed design following site investigate and laboratory testing.

5. Site Grading and Bulk Earthworks

5.1. General

Earthworks and regrading will be required across much of the site to provide access, drainage, and create residential lots in accordance with Council's engineering guidelines Section 7. Preliminary earthworks and grading plans have been included in the civil drawing set to offer additional information. It is important to note that these preliminary gradings have only been undertaken for the main road corridors and open space and that earthworks and regrading will also occur within the lot areas, which are not depicted in the concept/DA plans. These will be further developed and defined as part of the detailed design plans for the Subdivision Works Certificate.

3D computer modelling of the site has been undertaken to determine fill depths and volume. The expected maximum depth of cut is to be approximately 2.5m and the expected maximum depth of fill is approximately 3.3m as shown in the civil drawings. The main areas of cut/ fill are expected to include the following:

- Grading for road networks a minimum of 1.0% and maximum of 15% longitudinal grade.
- The proposed water quality and quantity basins will require adjustments to existing surface levels to achieve the necessary embankment heights and floor depths/ grades within the basins.
- Some filling of development lot areas may occur to smooth out any localised surface high or low points which might affect the development lot. This would allow surface runoff to be managed in a sheet flow manner rather than concentrating into small gullies which may produce erosion problems and drainage issue for allotments and improve lot presentation for sales.
- Landscaping of public open space may involve some shaping and regrading of the natural surface; however, it would be expected that this would be relatively minor.

The civil drawings depict the proposed extent of cut/ fill and surface grading within the road corridors as well as a general allotment regrading extent. The open space/park and playground area is to be levelled with the excavated material found on site that is not suitable for building/foundations. Based on a design surface to existing surface volume calculation, it is anticipated that 28,000m³ of cut and fill will be required to achieve the proposed design levels, and which will allow for a generally balanced site outcome. Caution is recommended when re-using high plasticity clay soils in areas of lot fill, or for road embankment construction and should be suitably determined in accordance with the site-specific geotechnical report prepared by Douglas Partners.

6. Preliminary Services Advice

6.1. Potable Water

A preliminary investigation into the potable water connection points for the proposed residential subdivision was undertaken. From the EGIS Report 2024, Figure 3 shows there is a connection point for the Rix Creek Supply on Pioneer Road which will adequately supple the proposed development.

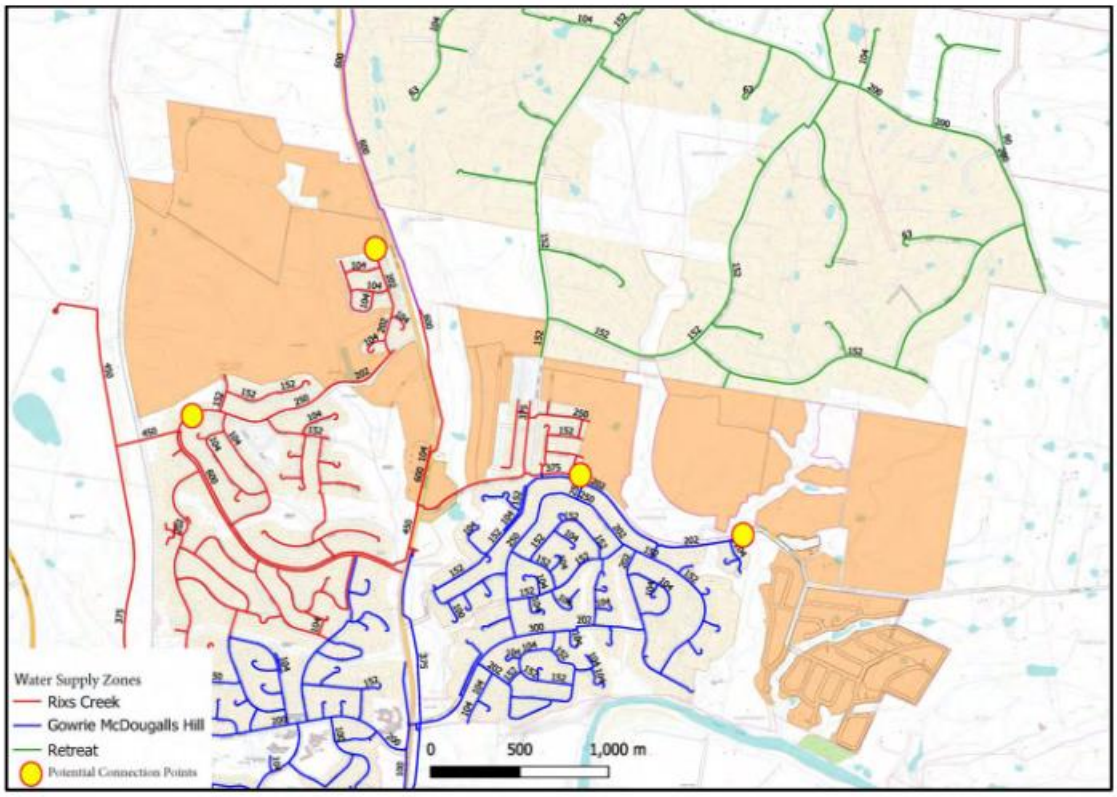

FIGURE 6-4 Potential Connection Points to Supply Growth Areas

Figure 3 Water Supply Points (EGIS, 2024)

Full details for the provisions of the internal potable water system for the proposed subdivision will be provided at the Subdivision Work Certificate Stage.

6.2. Sewer

A Wastewater Servicing Strategy was completed by EGIS (2024) which included a large area surrounding and including the proposed site. From this strategy, it is assumed that a large area of development land including the site will gravitate to a new Sewer Pumping Station. The proposed sewer servicing strategy is outlined in Appendix B.

Full details for the provisions of the internal sewer system for the proposed subdivision will be provided at the Subdivision Work Certificate Stage.

7. Stormwater Management Strategy

7.1. General Philosophy

The proposed development incorporates an Integrated Water Cycle Management Plan. Water quality and water quantity will be managed to comply with Singleton Council's DCP and Engineering Design Guidelines, section 13 – Stormwater Drainage. In summary, the proposed treatment strategy involves the following and is to be read in conjunction with the Catchment Plan in Figure 4 below and the Civil Drawings:

- A conventional piped drainage network will be provided throughout the Road Reserve corridors with pit and pipes being designed to convey and treat minor storm events (up to 10% AEP) to meet Council's objectives and Australian Rainfall and Runoff (AR&R) guidelines.
- Provision for overland flow to be conveyed through the subdivision to safely convey and manage major rainfall events (i.e. up to the 1% AEP event). These are primarily aligned within Road Reserves and ultimately overflow toward the east to the existing natural gully.
- Gross Pollutant Traps (GPTs) shall be provided end of line prior to water discharging into the biofiltration basins to provide pollutant removal. A total of two GPT's are proposed to treat minor flows captured in the pit and pipe network prior to discharging into the respective biofiltration basins. The GPT's will treat the green and yellow catchments shown below.
- Two biofiltration basins are proposed for the site to treat and detain runoff from minor rainfall events and attenuate runoff from less frequent major events up to and including the major design storm event 1% AEP. The biofiltration basins are designed to provide water treatment and detention.
- A minor 1st order stream, previously built over as part of the approved adjoining stage 6 subdivision works, will be filled and built over as part of the overall integration between the existing and proposed subdivision masterplan. The proposed stormwater network, including basins and outlets, have been setout to not encroach the inner 50% portion of the Vegetated Riparian Zone (VRZ) of the existing 3rd order stream located to the east of the development. The Department of Planning and Environment states that the VRZ is 30m from the edge of the existing creek line for a 3rd order stream, with detention basins allowed within the 50% outer VRZ (i.e. 15m+ from the existing creek line). The proposed basins and outlet controls have been located by at least 15m from the edge of the existing creeks edge.

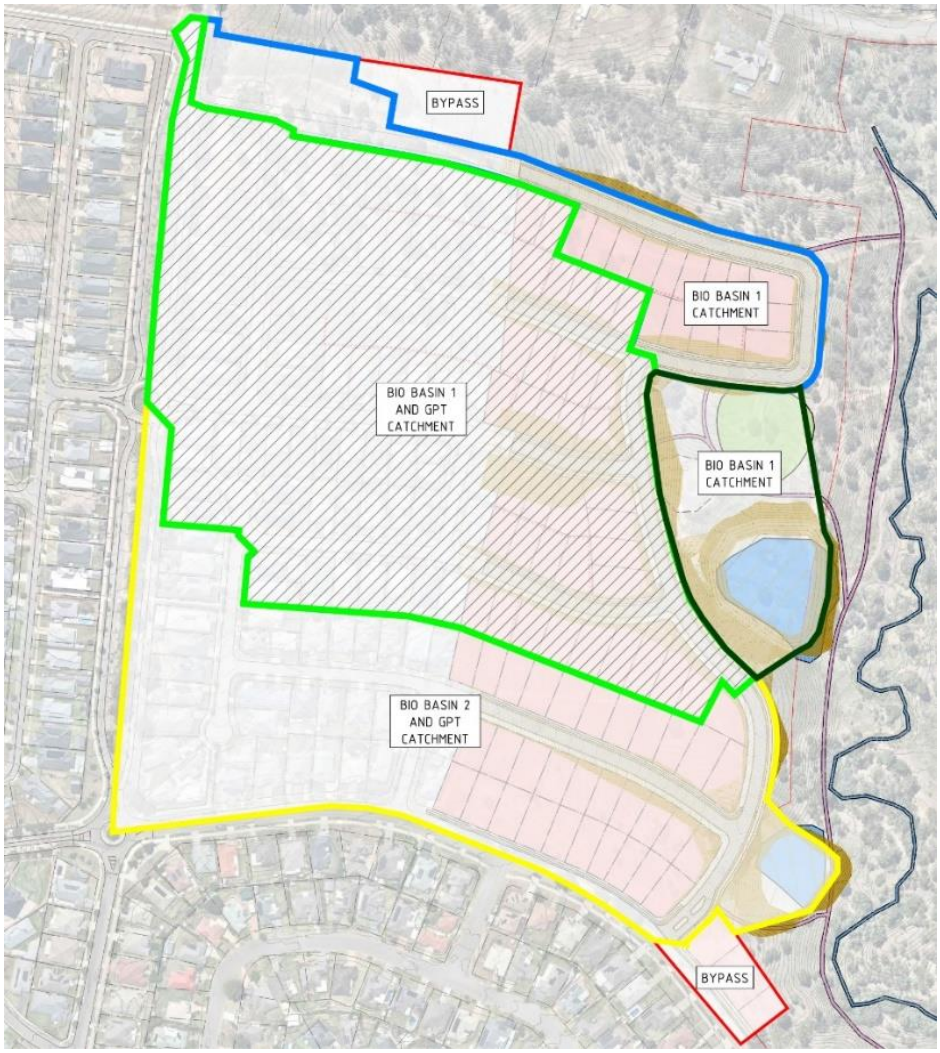

Figure 4 Catchment Plan

7.2. Minor/ Major Stormwater Conveyance

The general strategy for the minor storm events is to convey stormwater runoff from the development and upstream catchments via a piped drainage system to the proposed detention and treatment systems, eventually discharging to an unnamed Tributary of the Hunter River. To achieve this, each lot will be graded to the street or be provided with an inter allotment drainage connection, which will discharge stormwater runoff from the lot to the trunk infrastructure in the road network. The pit/ pipe network will be sized to convey the 10% AEP storm event.

The major storm event, being the 1% AEP storm event, will be conveyed to the discharge point via a combination of road carriageways, and defined overland flow swales/ channels, toward the natural gully to the east.

A flood study was conducted for the entire Bridgman Ridge Estate in 2011 by RGH Consulting Group, (Appendix A). The site is not expected to be impacted by flood water from the unnamed tributary.

Concept stormwater management plans have been prepared for the proposed development. Refer to the Civil drawings provided.

7.3. Onsite Stormwater Detention

Preliminary hydrological modelling has been undertaken to assess the contributing catchment in both the pre and post developed scenarios. A model to predict the peak flow for a range of storm durations and frequencies to assess the impact of the proposed development on the hydrologic regime has been developed. The model was then used to develop detention measures which have been designed to ensure no net increase in peak flow during storm events up to and including the 1% Annual Exceedance Probability (AEP) storm event.

Stormwater runoff inflows for the regional catchment conditions has been modelled using the DRAINS software package. The model was used to design the stormwater network required to capture and divert the regional flow upstream of the subject site, and to assess the sizing requirement for detention basins. Parameters which were adopted in the DRAINS model are discussed below.

Basin safety fencing or dense vegetation shall be determined pending the final basin slope/depth, depth of water and overall risk category.

It is noted that the latest Australian Rainfall and Runoff Guidelines (2019) have been used in the preparation of the study.

7.3.1. DRAINS Modelling

A hydrological model utilising the initial and continuing loss methodologies of ARR2019 was created in DRAINS which was used to generate runoff hydrographs for the pre-developed and post-developed site. ARR2019 rainfall data from the Bureau of Meteorology (BOM) was used to generate the design storms.

7.3.1.1. Storm Losses

Storm losses used for this investigation have been obtained from the ARR Data Hub. Storm losses provided by the ARR Data Hub are intended for rural catchments. As the post developed catchment is considered urban, a reduction factor of 0.7 was applied to the initial loss, as recommended by the ARR 2019 guidelines. Similarly, the modelled continuing losses have been reduced by a factor of 0.4 for both the pre and post developed catchment, in accordance with the advice provided in the lates Department of Primary Industry and Environment (DPIE) guidelines. See Table 1 below.

Table 1 Adopted DRAINS Rainfall Loss Rates

	Initial Loss (mm)	Continuing Loss (mm/ hr)
ARR Data Hub	28.0	1.8
Rural Previous (Pre-Developed)	28.0	0.72
Urban Previous (Post-Developed)	19.6	0.72
Urban Impervious (Post-Developed)	0	0

7.3.1.2. Burst Rainfall Data

The latest NSW Specific Transformation pre-burst depth have been added from the ARR Data Hub to the design rainfall events and distributed evenly over the timesteps prior to the burst of the design storm events. The model was run for a range of storm events over a duration between 5 minutes and 6 hours.

7.3.1.3. IFD Data

Rainfall Intensity-Frequency–Duration (IFD) depths for the ARR 2019 have been obtained from the Bureau of Meteorology (BOM) for a location over the catchment centroid.

The “East-Coast South” temporal patterns have been adopted for the ARR 2019 hydrology.

7.3.2. Study Catchments

The DRAINS model included two existing case catchment (refer to Table 2 and two sub-catchments for the developed case (refer to Table 3*).* These have been based on a combination of LiDAR, and the design surface.

Table 2 Existing Case Catchments

Catchment	Area (ha)	Percentage Impervious (%)
Existing Catchment	25.08	0

Table 3 Developed Case Catchments

Catchment	Area (ha)	Percentage Impervious (%)
Catchment 1 (C1)	16.66	70
Catchment 2 (C2)	8.03	70
Bypass Catchment	0.39	70

As shown in Figure 4, Catchments 1 and 2 are to be directed to Basins 1 and 2 respectively and was modelled in DRAINS as such.

The impervious fraction of 70% was used for the entire site as per Singleton Council’s Engineering Design Guidelines. The time of concentration was determined for each of the catchments, with the kinematic equation applied to determine the overland flow path time for the catchments which were pervious.

7.3.3. Developed Case Stormwater Network

In the developed case, minor flows are proposed to be captured and diverted via the proposed pit/ pipe network and towards the detention basin. Major flows from this site are to flow overland through the road carriageway towards the proposed basins.

The two basins have been integrated into the site layout as shown in the Civil Drawings provided. Discharge from the basin will be controlled by a piped outlet during minor flows and via overland flow for major flows and is proposed to be conveyed to Unnamed Tributary of Hunter River east of the proposed site.

As part of the Stage 6 works, a temporary detention/ sediment basin was constructed to attenuate the post developed flow rates to a predeveloped rate for the Stage 6 extent of works. The existing basin has low flow (Ø375 Pipe) and high flow (13m wide weir I.L. 55.02m AHD) outlets and a storage capacity of 1920m^3. The proposed Basin 1 has been designed to account for the existing stage 6 basin footprint, however additional works, including removing and upgrading the low flow outlet pipe and extending the basin weir outlet, will be required on the basin to account for the ultimate catchment.

The existing basin is to be modified to have a volume of 4630m^3 and minimum biofiltration media area of 650m^2. The increase in storage is proposed to be primarily gained by cutting further west and modifying the outlet controls to be Ø450 RCP pipe and 8m wide weir I.L. 55.55m AHD. The basin media and outlet controls are to be constructed only once the full site is established, as to not impact the proposed biofiltration media with sediment laden runoff during construction.

Table 4 Basin Parameters

Basin	Volume (m^3)	Top RL (m)	Base RL (m)	Base Area (m^2)
1	4630	56.00	54.00	2498
2	1765	53.55	52.00	1248

7.3.4. Results

The predeveloped and developed case models were run for events ranging from the 20% AEP to the 1% AEP. The results are summarised in Table 5 below.

Table 5 Peak Storm Event Site Discharge Flow Rates

AEP (%)	Outlet Flow Rate (m^3/ s)					
	Pre-Developed Site Discharge	Entire Developed Scenario Site Discharge	Basin Top Water Level (m. AHD)		Approximately Basin Depth (m)	
			Basin 1	Basin 2	Basin 1	Basin 2
20	1.29	1.19	55.12	52.99	0.82	0.69
10	2.09	1.43	55.38	53.13	1.08	0.83
5	2.76	2.14	55.65	53.24	1.35	0.94
2	4.22	3.86	55.81	52.35	1.51	0.05
1	5.44	5.24	55.9	53.43	1.6	1.13

The detention basins are shown to effectively attenuate runoff from the development up to and including the 1% AEP peak flow. Further details of the proposed basins are provided within the civil drawings.

We note the DRAINS model can be provided to Council for review upon request.

7.4. Stormwater Quality

Water quality treatment has been assessed generally in accordance with Singleton Council's Development Control Plan and Engineering Design Guidelines. To substantiate the effectiveness of the proposed water quality control measures, stormwater quality modelling was undertaken using the Model for Urban Stormwater Improvement and Conceptualisation (MUSIC) V6.3.0.

7.4.1. Treatment Targets

The stormwater pollutant reduction targets for the development specified by Singleton Council DCP are shown below in Table 6.

Table 6 Singleton Council Reduction Targets for Pollutants

Pollutant	Reduction Target
Total Suspended Solids (TSS)	80%
Total Phosphorus (TP)	45%
Total Nitrogen (TN)	45%
Gross Pollutants <5mm (GP)	70%

7.4.2. MUSIC Parameters

In order to establish a MUSIC model, rainfall and evaporation records in the vicinity of the site were sough.

To develop a model that could comprehensively assess the performance of the proposed stormwater management plan, 6-minute pluviography data from BOM station 061158, located in Glendon Brook, was used. Rainfall between 1997-2007 was used for MUSIC water quality simulation.

Monthly areal potential evapotranspiration (PET) rates for the site were established from PET data provided by the Climate Atlas of Australia (BoM). The monthly average PET adopted by the model was taken Cessnock Airport data from 2009-2023 and is shown in Table 7.

Table 7 Areal Potential Evapotranspiration Data used in MUSIC Modelling

Month	Areal Potential Evapotranspiration (mm/ month)
January	180
February	140
March	115
April	85
May	65
June	50
July	60
August	85
September	120
October	140
November	150
December	175

The Base and Storm Flow concentration parameters for the land uses have been adopted from the 2015 NSW MUSIC Modelling Guidelines. Parameters for the source node inputs used are summaries in Table 8 and Table 9

Table 8 Concentration Parameters for TSS, TP, and TN (Table 5-6 and 5-7 NSW MUSIC Modelling Guidelines)

	Base Flow		Storm Flow	
	Mean (log mg/ L)	Std Dev (mg/ L)	Mean (log mg/ L)	Std Dev (mg/ L)
Total Suspended Solids	1.20	0.17	2.15	0.32
Total Phosphorus	-0.85	0.19	-0.60	0.25
Total Nitrogen	0.11	0.12	0.30	0.19

Table 9 Rainfall-Runoff Parameters (Table 5-5 NSW MUSIC Modelling Guidelines)

Property	Rainfall-Runoff Parameter	Residential
Impervious Area	Rainfall Threshold (mm/ day)	1.00
Pervious Area	Soil Storage Capacity (mm)	98
	Initial Storage (% of capacity)	25
	Field Capacity (mm)	70
	Infiltration Capacity Coefficient – a	250
	Infiltration Capacity Exponent - b	1.30
Groundwater	Initial depth (mm)	10
	Daily Recharge Rate (%)	60
	Daily Baseflow Rate (%)	45
	Daily Deep Seepage Rate (%)	0

7.4.3. Stormwater Treatment Train

Stormwater runoff from the site was modelled in MUSIC. The source node adopted to represent the development was Urban Residential and Revegetated Land. The impervious area assumed for the nodes were 70% and 0% respectively, which were based of Singleton Councils Engineering Guidelines.

The above source nodes were modelled as part of the treatment train. The Stormwater treatment for the site is described below.

Gross Pollutant Traps (GPT):

A proprietary GPT has been proposed at the catchment outlet to remove gross pollutants and attached nutrients before runoff discharges into the proposed biofiltrations basins. The proprietary GPT unit will treat the 3-monthly ARI (Annual Recurrence Interval) peak flow rate approaching each unit.

Research presented in Australian Runoff Quality (Engineers Australia 2009) suggests that roughly 1m^3/ hectare/ year of gross pollutants and sediment could be expected from a typical residential catchment. It is expected that with full development, the GPTs will need maintenance on average twice per year. Should dry weather hydrocarbon spill or any other spill occur, additional maintenance should be carried out to ensure the device operates as intended.

The Pollutant removal efficiencies and high flow bypass were taken from the NSW MUSIC Modelling Guidelines (August 2015) shown in Table 10

Table 10 GPT Removal Efficiency (MUSIC Guidelines)

Pollutant	% Removal Efficiency
Total Suspended Solids	65%
Total Phosphorous	15%
Total Nitrogen	14%
Gross Pollutants	90%

Biofiltration Basin:

To attain the stormwater quality targets, a biofiltration basin within the proposed detention basin has been proposed for the site.

Biofiltration systems are designed with the primary intent of removing suspended pollutants from stormwater before the water is discharged to the local waterway. The stormwater temporarily ponds on the surface within the extended detention zone before slowly filtering through the soil media. The soil media controls the flow rate of water through the system as well as providing a growing media for the plants. Pollutants are retained through fine filtration, absorption, and biological uptake. Treated stormwater is collected at the base of the system via a network of perforated pipes located within the gravel drainage layer to be discharged to the outlet pits. Stormwater will enter these basins via a riprap-lined weir designed to dissipate energy.

Two biofiltration basins with filter media surface areas of 600m^2 and 250m^2 have been proposed. The high flow bypass for the basins has been modelled as 50% of the 1EY flows to prevent scour damage in higher intensity rainfall events. The basin has been modelled with the parameters from the NSW MUSIC Modelling Guidelines, shown in Table 11

Table 11: Biofiltration Basin Parameters

Parameters	Value
Extended Detention Depth	0.30m
Exfiltration Rate	0 mm/ hr
Filter Depth	0.50m
Saturated Hydraulic Conductivity	100mm/ hr
Total Nitrogen Content in Filter	400 mg/ kg
Orthophosphate Content of Filter Media	40 mg/ kg

A schematic of the MUSIC model can be seen in Table 11.

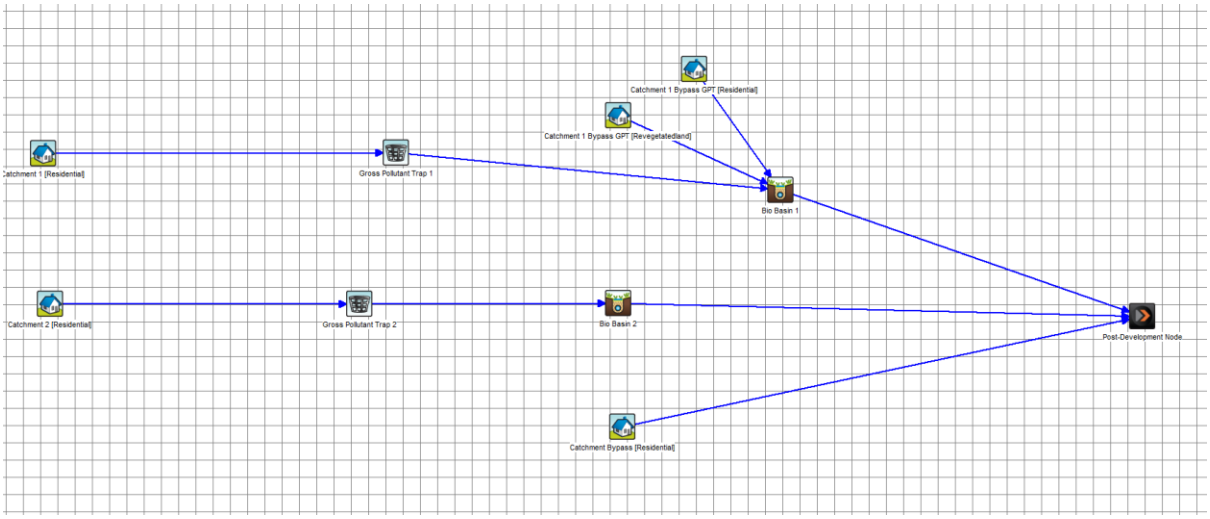

Figure 5 – MUSIC Model Layout Schematic

7.4.4. MUSIC Results

The results from the site analysis are shown below in Table 12

Table 12: Sitewide MUSIC results - Post Development Node

Pollutants		Sources	Residual Load	Reduction	Target Reduction
Total Suspended Solids (TSS)	kg/ yr	16900	2220	86.9%	80%
Total Phosphorus (TP)	kg/ yr	27.7	11.1	60%	45%
Total Nitrogen (TN)	kg/ yr	205	110	46.3%	45%
Gross Pollutants (GP)	kg/ yr	3580	78.8	97.8%	70%

Table 12 shows that the proposed stormwater management strategy is predicted to achieve the load reduction targets set out in Singleton Council's DCP, as estimated by MUSIC.

Through adoption of the above measures, it is considered that the proposed treatment train will effectively meet the design intent of Singleton Council's water quality requirements. Ongoing maintenance of the implemented measures throughout the occupational phase of the development will be required to ensure the devices continue to operate as intended.

8. Conclusions

The proposed preliminary engineering design presented above and depicted on the civil drawings has been prepared to support a Development Application submission to Singleton Council. The preliminary engineering design has considered Council's DCP, Council's Engineering Guidelines, Australian Standards, and industry best practice. The preliminary engineering design confirms that all requirements will be adequately met at detailed design.

Based on our investigations and preliminary designs, the proposed development can adequately manage and address internal access, stormwater management, and site grading. Should you have any queries, please feel free to contact the undersigned on (02) 4943 1777.

Yours faithfully,

Emma Doolan
Civil Engineer
BEng (Civil) (Hons)

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Appendix A: Flood Report

RGH CONSULTING GROUP
Multi-discipline Engineering

STORMWATER DESIGN STRATEGY

For:

A PROPOSED RESIDENTIAL LAND SUBDIVISION

"BRIDGMAN RIDGE ESTATE"

PIONEER ROAD & WATTLE PONDS ROAD, SINGLETON

Our Ref. 20110216 R01 Rev.02 November 2011

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	Revision Title	Prepared	Reviewed	Date
01	Client Review	A.J.G.	B.T.R.	22.11.11
02	DA Issue	A.J.G.	B.T.R.	24.11.11

Signed: Date: 24/11/2011

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Director – RGH Consulting Group Pty Ltd

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1.0 EXECUTIVE SUMMARY

RGH Consulting Group Pty Ltd (RGH) has been engaged by Bridgman Ridge Holdings Pty Ltd (the Client) to undertake strategic engineering design associated with the management of stormwater within the Central Stages of the proposed Bridgman Ridge Estate residential subdivision, being the subject site, approximately 3 kilometres (km) north of Singleton, at Singleton Heights within the Singleton Shire Council (SSC) local government area (LGA). The proposed residential land release totals approximately 230 residential housing lots and is located on the corner of Wattle Ponds Road and Pioneer Road.

SSC requires that developments manage stormwater both quantitatively and qualitatively prior to runoff discharging into receiving waterways or receiving drainage infrastructure. This is to be managed during and after construction and involves a number of modelling techniques to achieve SCC's requirements. RGH has produced a set of conceptual engineering drawings to accompany this report which are attached in Appendix A. The remaining Appendices contain engineering calculation details and background design information for detailed review if required.

SSC possessed no flooding information or studies for the existing watercourse located immediately to the east and RGH conducted catchment hydrological analysis and watercourse hydraulic analysis to confirm the 1 in 100 year Average Recurrence Interval (100ARI) design flood to ensure any proposed works will not affect flood levels upstream.

The development will contain a larger percentage of impervious site coverage post construction resulting in an increase in the maximum rate of runoff which can cause flash flooding to downstream catchments. This is managed by providing on-site detention (OSD) basins to retard the rate of stormwater release to match or be less than the rates for the pre-development existing condition. This quantitative modelling involves the determination of the existing predevelopment site discharge rates and then modelling and design of proposed conditions to achieve SCC's requirements. It was found that by constructing three OSD basins as shown on the RGH Drawings, the quantitative requirement of SSC was achieved.

After construction, the development is also expected to generate an increase in the amount of pollutants being transported by stormwater that will leave the development. SCC specifies different target percentages of reduction for different types of pollutants. The qualitative models prepared involved the inclusion of storm water filters within OSD basins to clean the stormwater before leaving the site. The modelling tested the performance of the treatment train with respect to achieving the targets specified. It was found that by constructing three OSD basins, each with a bio-retention filter as shown on the RGH Drawings, the qualitative requirement of SSC was achieved.

During construction, implementation of water quality control as defined in the NSW Department of Housing Publication "*Managing Urban Stormwater - Soils and*

Construction" (The Blue Book) is to be adopted to maximise the capture of sediments and minimise erosion of disturbed soils during the construction phase. Modelling involved utilising the methods as outlined within the Blue Book to determine the maximum areas of disturbance allowable before temporary sediment basins are required to be implemented. Therefore this report also provides future designers with estimates of the factors adopted for the detailed sediment and erosion control design during the construction period.

Therefore this report has summarised the modelling techniques employed, the results of the modelling, and provides recommendations as to the most economical method to achieve Councils design requirements for the proposal. It will also provide a guideline to allow detailed designs to progress and Council to review and approve the staged release of the residential subdivision proposed.

2.0 SITE AND CATCHMENT DESCRIPTION

The Subject Site is situated on the north eastern corner of the intersection of Wattle Ponds Road and Pioneer Road. Its northern boundary adjoins existing rural residential land, and its eastern extent is bordered by an existing watercourse which drains a catchment of approximately 1.5 square kilometres (km^2) to the north which consists of existing rural residential properties. Land on the western alignment of Wattle Ponds Road is currently undeveloped farm land, and on the southern alignment of Pioneer Road is existing residential development known as "Hunterview Estate". Land to the east of the watercourse will form future stages of the Bridgman Ridge Estate. Figure 1 below is a locality map showing the location of the proposal in relation to Singleton.

Figure 1 – Locality Map for Bridgman Ridge Estate (SCC LGA)

The Subject Site will cover a total area of approximately 25 Hectares (ha) and consists primarily of previously operated farmland. The site consists of many sub-catchments with gradients varying from 3% up to 15% in some areas. The abovementioned watercourse flows through the Hunterview Development to its south which forms a tributary of the Hunter River located approximately 1km to the south of the development.

The site is undulating and is dissected by ridgelines and gullies containing watercourses which generally flow to the main watercourse along its eastern extremity. Some areas of adjoining allotments discharge stormwater into the site, and a small proportion of the site will discharge to Pioneer Road.

Geotechnical soil reviews have been undertaken by Geotech Solutions Pty Ltd and generally indicate that the site soil profile consists of silty clays overlying siltstone or sandstone. While this type of soil and its profile has a high runoff potential, it is considered that it will provide good structural engineering properties.

Upstream of the Subject Site, a stormwater catchment of approximately 2km^2 was measured. This catchment consists of rural residential land, generally cleared near residences, although main watercourses remain reasonably wooded.

3.0 FLOODING INVESTIGATION

Review of SSC's Design Specification will show that it does not contain specific instruction to designers with regard to flood modelling techniques to be adopted, but it does reference the Engineers Australia Publication, "*Australian Rainfall and Runoff*", 2001 (ARR). ARR consists of two volumes, Volume 1 containing eight chapters or books and Volume 2 consisting of maps for the derivation of factors used in flood estimation. A review of this document was undertaken to determine the most suitable method to utilise in the determination of the peak flows for the catchment.

3.1 Flood Catchment Hydrology

Section 2 of Book III of Volume 1 of ARR, "*Choice of Flood Estimation Methods and Design Standards*" provides discussion and guidance upon the methodology adopted to determine the design flood peak discharge. Section 2.4 outlines the methodology for small ungauged catchments and references Section 1.4 of Book IV of Volume 1, "*Estimation of Design Peak Discharges*". Section 1 of Book IV covers estimation of peak discharges for small to medium rural catchments and this methodology was adopted for this catchment.

There exist four tributaries which enter the main watercourse within the total Bridgman Ridge development. Three of these originate upon the Subject Site, and one originates on the future Bridgman Ridge stages to the east. To ensure accuracy of modelling, the catchment area upstream at each of the entry points, or nodes, was modelled to obtain the increase in flow at each node.

A spreadsheet showing the hydrological calculations for the 100ARI associated with external catchment is attached within Appendix B for detailed review if required. A summary of the flow rates at the various nodes is provided within Table 1 below.

Table 1 – Summary of Hydrological Catchment Analysis

Node	Description	Area (km^2)	Flow Rate (m^3/s)
1	Total Catchment Outlet at Pioneer Rd	2.12	9.63
2	Catchment Area 1st Junction U/S of Node 1	2.06	9.36
3	Catchment Area next Junction U/S of Node 2	1.82	8.74
4	Catchment Area next Junction U/S of Node 3	1.55	7.90
5	Catchment Area U/S of Subject Site	1.43	7.29

3.2 Flooding Hydraulic Modelling

Hydraulic analysis of the watercourse through the Subject Site was undertaken using the software programme HECRAS which is a widely used and accepted analysis programme developed by the United States Army Corps of Engineers. The HECRAS model extended from the northern boundary of the Subject Site, to just downstream of the Pioneer Road box culvert outlet adjacent to the southern boundary of the Subject Site.

RGH selected the 100ARI as the most suitable design ARI as that was the event producing the greatest runoff from the Subject Site, as well as the nominated event within "*Element 12 – Stormwater Management - Singleton DCP 2007*" for trunk drainage and overland flow paths.

The Manning's roughness factor in HECRAS modelling adopted was 0.085 and 0.043 for the overbank areas, which correlates to a natural stream cross section and long grassed overbank areas. The expansion and contraction coefficients adopted for the model were similar to those adopted at bridge abutments as outlined within the HECRAS Users Manual, being 0.3 and 0.1 respectively. Careful location of sections modelled was undertaken to ensure HECRAS interpolated between sections correctly. The system was modelled under steady state flow conditions using peak flows as determined by Section 3.1 of this report, at each of the nominated stages along the watercourse.

The existing culvert beneath Pioneer Road was also included within the model to assess its performance and its affect on the immediately adjacent areas upstream and within the Subject Site. The modelling confirmed that this culvert and the Pioneer Road formation are the flow controls during the 100ARI design event modelled.

3.3 Resultant Flood Levels

Table 2 provides a list of the existing 100ARI flood levels at various stages along the watercourse.

Table 2 – HECRAS Results Summary for the 100ARI

River Station	Q Total (m^3/s)	100ARI Flood Level (mAHD)
1043.41	7.90	56.51
1023.41	7.90	55.85
717.65	8.74	52.04
676.47	8.74	51.38
539.62	9.36	49.60
499.61	9.36	48.98
322.1	9.63	46.49
230.85	9.63	45.35
57.58	9.63	42.51
46.99	9.63	42.47

While the model included sections at no greater than 10m intervals, RGH selected the

above critical locations as these are the locations which will have the most relevance to the location and design of OSD basins, and their outlets. RGH refers the reader to the conceptual drawings in Appendix A for reference to River Station locations as listed within Table 2, and also to review a plan showing the extent of flooding within the water course. This flooding extent is also plotted on all OSD basin plan views to show that the proposed basins do not affect the 100ARI flood level.

4.0 STORMWATER MANAGEMENT

It is proposed to construct the development in stages, and the post-development catchments were dictated by the site topography and do not necessarily relate to land release staging. This report has undertaken methodology associated with the overall drainage strategy for the release of the Stages as listed above.

4.1 Catchment Hydrology

Council currently requires that site stormwater systems be modelled using the Rational Method, in accordance with the Engineers Australia Publication "*Australian Rainfall and Runoff*" (ARR), and the OSD system be modelled using a runoff routing method. Therefore hydrological calculations were performed using the "DRAINS" program to model and design the OSD system.

SCC's Element 12 of DCP 2007 refers designers to ARR for determination of input values for land use types which are used in creating the models. The existing site consists primarily of grazing paddocks and sparsely populated tree coverage. Generally the Subject Site contains well graded dry gullies and there is an existing earthen dam water storage located within the mid-section of the Subject Site. Bore holes as excavated and logs documented in the geotechnical report reveal that the site soil profile consists of sandy clays overlying rock. Site gradients typically vary between 4% to 8%.

The predevelopment DRAINS model prepared adopted an antecedent moisture content of 3, grassed depressions storage of 5mm, and paved depression storage of 1mm. A roughness coefficient, n*, of 0.2 was adopted for predevelopment catchment areas which equates to grassed prairie site coverage in accordance with Table 1.4 of Book VIII of ARR. No predevelopment impervious areas were applied to the predevelopment model. The conceptual drawings contained in Appendix A show the predevelopment site catchment as modelled within DRAINS.

Element 12 does not specifically nominate a minimum site impervious area so RGH adopted a site impervious percentage of 0.65 or 65% and a conservative roughness coefficient of 0.17. For the rural residential catchment, a impervious percentage of 40% was adopted. For roadway and other paved areas a roughness coefficient of 0.012 was adopted.

4.2 On-site Detention

Preliminary and idealised hydraulic design of the proposed OSD basins was undertaken. It is proposed to construct three OSD basins to treat the majority of the site. It should also be noted that two sub-catchments of the site cannot drain to OSD basins and untreated outflows from these sub-catchments have been compensated for within the OSD basins hydraulic design, resulting in an overall post development discharge from all basins being less than the predevelopment flows for the existing site in accordance with Element 12. Copies of *RGH Concept Sketch Designs* are included within Appendix A of this

report for review if required.

Predevelopment modelling was undertaken using DRAINS to confirm the flow rates from the existing site, which will be the target flows for the post development design. The results obtained for each of the 1, 10 and 100 year ARI design storms are presented within Table 3 below. The subject site was divided into 6 sub-catchments due to the number of watercourses contained within the subject site.

Table 3 – Predevelopment DRAINS Results Summary

Sub-catchment	Discharge, Q (m^3/s)		
	1 ARI	10 ARI	100 ARI
1	0.033	0.184	0.437
2	0.017	0.096	0.213
3	0.047	0.264	0.641
4	0.055	0.306	0.743
5	0.048	0.267	0.643
6	0.359	0.942	1.679
Q, Total (m^3/s)	**0.559**	**2.059**	**4.356**

The OSD system was also modelled using the software program DRAINS to perform the runoff routing analysis. It is assumed that the pipe network system will be designed to convey the minor system ARI, and that detailed designers will ensure the 100 ARI surface flows will be either captured or directed to OSD basins by carefully designing roads and capture pits where necessary.

Element 12 nominates that for detention basins, the design ARI required to be modelled are the 1, 10 and 100 year events, provided a depth of no greater than 1.2m within the basin during the 20 year ARI is achieved. Basin geometry must comply with Councils requirements which nominate a maximum inundated side slope of 6 horizontal to 1 vertical (6:1), maximum embankment slopes of 4:1 and minimum basin floor gradient of 2%. Scour protection is also proposed to overflow weirs, as required by Councils Element 12.

The post development design results are presented within Table 4 below and comparison with Table 3 will show that the post development rates and depth relationships have been achieved. Please note that the post development catchment labels do not necessarily correspond with the pre development labels as catchment areas will vary with the construction of roads and regrading which will affect flow direction slightly. A copy of all DRAINS data is included within Appendix B for review.

RGH also conducted a review of the flow velocities and depths over the basin spillways for all of the design storms modelled to ensure that during an event, the safe velocity-depth product as set out in ARR was not exceeded. The velocity depth products for the design were all well below the $0.4m^2/s$ safe value. The results of this analysis are shown below in Table 5.

Table 4 – Post Development DRAINS Results Summary

Sub-catchment	Discharge, Q (m^3/s)			20 ARI Basin Depth (m)
	1 ARI	10 ARI	100 ARI	
Basin 1 Pipe	0.056	0.084	0.094	1.10
Basin 2 Pipe	0.219	0.282	0.298	1.18
Basin 3 Pipe	0.032	0.042	0.043	1.18
Basin 1 Spillway	0	0	0.167	-
Basin 2 Spillway	0	0.932	2.293	-
Basin 3 Spillway	0	0.047	0.360	-
4 (Uncontrolled)	0.194	0.436	0.726	-
5(Uncontrolled)	0.039	0.096	0.159	-
Q Total (m^3/s)	**0.540**	**1.919**	**4.140**	**-**

Table 5 – Post Development Spillway Analysis

Basin Spillway	Velocity Depth Product (m^2/s)			
	1 ARI	10 ARI	20 ARI	100 ARI
Basin 1	0	0	0	0.05
Basin 2	0	0.07	0.11	0.17
Basin 3	0	0.01	0.03	0.09

Therefore the management of stormwater from a qualitative perspective has been considered, modelled and will comply with all of Councils requirements as set out within its relevant policies and guidelines.

4.3 Stormwater Quality

For this development, it was deemed appropriate by RGH design engineers to incorporate bio-retention beds within the OSD basins and in the vicinity of outlets. The sizes of these bio-retention beds were designed by modelling with the "MUSIC" program which is an acronym for "*Model for Urban Stormwater Improvement Conceptualisation*" and has been, for recent years, a widely accepted modelling method for development projects. Council provides pollutant retention targets for different types of pollutants within its Element 12 and are reproduced in Table 6 below.

A bio-retention filter bed of one metre (m) depth with course sand (1.0mm particle size typical) was modelled. The Sydney Catchment Authority DRAFT Training manual for MUSIC provides saturated hydraulic conductivity rates for a range of filter mediums, and the rate of 360mm/hr was adopted for course sand. An extended detention depth of 0.5m was adopted and the bed is to contain a 100mm uPVC agg-line subsoil drainage line and geofabric sock discharging to the basin outlet. Other factors adopted in the MUSIC model were consistent with the infiltration rate of the natural soils occurring upon the site as per the soil testing results conducted by Geotech Solutions Pty Ltd in its geotechnical report for the subject site. Plantings as shown within the RGH drawings attached to this report should be installed as they achieve a high rate of nutrient uptake.

The filter will be located at the OSD basin outlet and the agg-line will discharge at the same point as the OSD outlet pipe point of discharge. The *RGH Drawings* show the

typical arrangement for the bio-retention filter and the basin outlet detail, while Table 6 below provides a summary of the water quality design details.

Table 6 – Post Construction Stormwater Management Pollution Retention Targets

Pollutant	Retention Criteria
Total Suspended Solids (TSS)	80% of average annual load
Total Phosphorus (TP)	45% of average annual load
Total Nitrogen (TN)	45% of average annual load
Litter (GP)	Retention of litter greater than 50mm for flows up to 50% of the 1 year ARI peak flow
Coarse Sediment (GP)	Retention of sediment coarser than 0.125mm for flows up to 50% of the 1 year ARI peak flow
Oil and Grease	None visible for flows up to 50% of the 1 year ARI peak flow in areas with concentrated hydrocarbon deposition

During larger flow events, stormwater will inundate the outlet arrangement and normal drowned orifice flow control will occur. The arrangement including a sloped trash rack should minimise blockage during larger events.

A screen capture of the idealised catchments from the MUSIC model is shown in Figure 2 below, as is the MUSIC results in Figure 3.

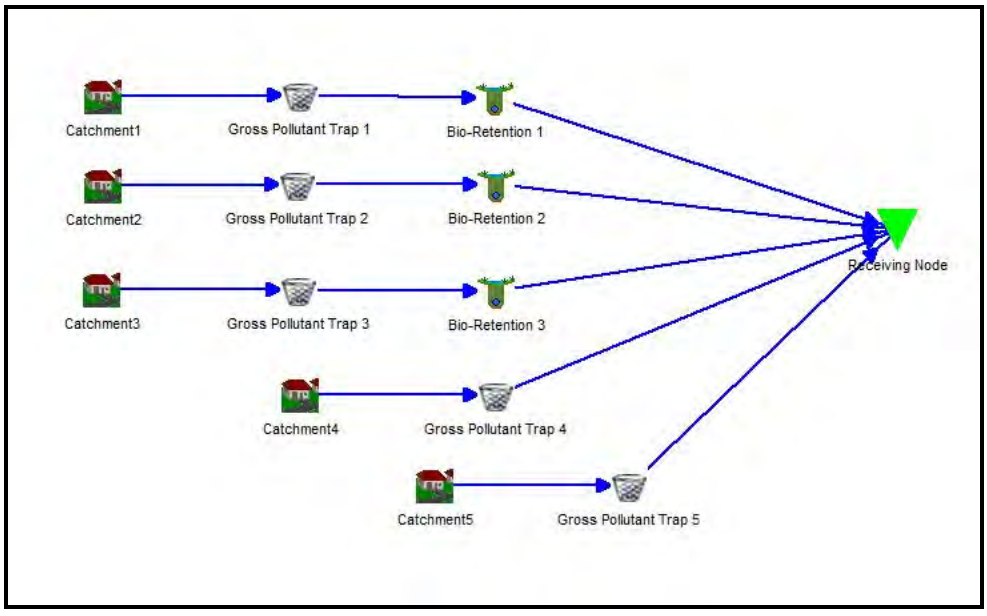


Figure 2 – Idealised MUSIC Model

As for the OSD design, review of the post development catchment plan in the RGH Design Sketches shows that flow generated from Catchments 4 and 5 bypasses the basins. Therefore the pollutant retention for these catchments must be compensated for within the water quality modelling for Basins 1, 2 and 3. Figure 3 clearly indicates that the idealised model for the proposal compensates for this and treats the stormwater to achieve the water quality targets for the pollutants listed in Table 6 above, with the results as can be seen in Figure 3 below.

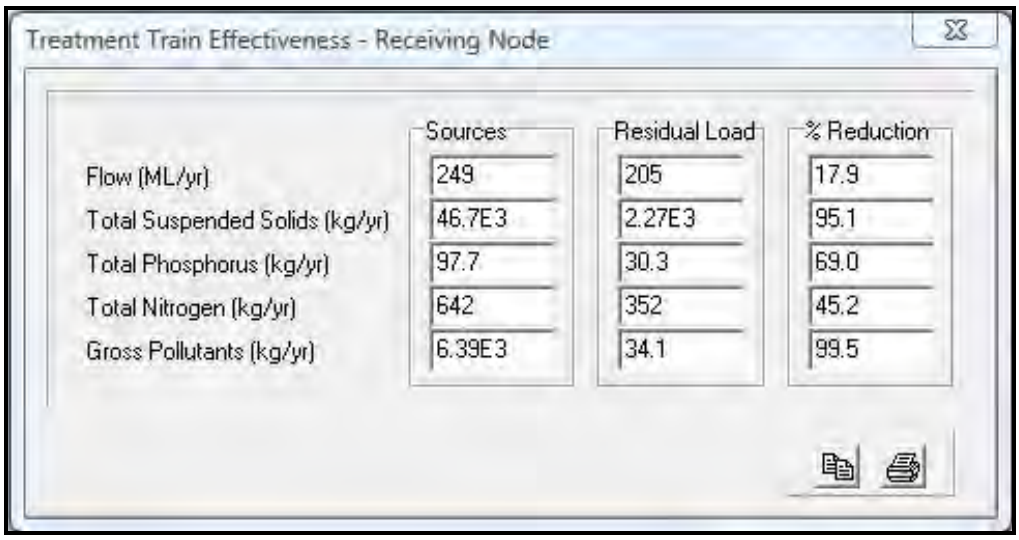


Figure 3 – MUSIC Model Results

Therefore the proposed long term water quality measures are met with the design as proposed.

3.5 Sediment and Erosion Control

Sediment and erosion control design shall be undertaken in accordance with the NSW Landcom publication "*Urban Stormwater Management - Soils and Construction*", more commonly referred to as the "Blue Book". Detailed calculations prepared by RGH are attached in the Appendices to this report and are based upon the maximum possible disturbed ground area for each catchment draining to OSD basins. In reality, staged release of land will disturb much less area than the total basin catchment, and sediment and erosion control design and plans will need to be undertaken for each individual stage construction drawing set. The calculations performed for this report are to show that the proposed basin area could act as construction sediment basin if the greater percentage of a basin catchment was constructed simultaneously.

The Blue Book RUSLE method was adopted to undertake detailed calculations for the sediment and erosion control design. The geotechnical report bore logs identified the USCS soil types as CH, which are typically of Soil Hydrological Group C or D, and sediment Type F was adopted with a RUSLE "k" factor of 0.033. This represents a mid-range for the soil testing as reported, and was therefore adopted. Other factors calculated or adopted were the soil erosivity factors of 1390 and Erosion Control Practice (P) and Ground Cover (C) factors of 1.3 and 1.0 respectively. The 5 day rainfall depth was adopted and 75th

percentile adopted because the site is not expected to be disturbed longer than 6 months. The 75th percentile 5 day rainfall depth adopted was 24.4mm.

The three basin catchments were modelled as currently Stage 3 within Catchment 4 is under construction, and construction associate with the relatively small Catchment 5 will not exceed 2500m^2 in disturbed area and therefore a basin will not be required for Catchment 5. The required basin volumes to treat sediments during construction were calculated and compared against the available OSD basin volumes as designed to confirm whether the OSD basins will adequately cater for sediment storage and settlement during construction within the respective catchments. Table 7 below provides a summary of the calculations and comparisons with the OSD volumes. A copy of the Blue Book spreadsheet calculations is included in Appendix B for review if required.

Table 7 – Summary of Sediment Basin Requirements Design

Catchment No.	Basin Volume Required (m^3)	Available OSD Basin Volume (m^3)	Maximum Disturbed Area with no Basin (Ha)
1	64	440	1.8
2	255	850	1.3
3	107	750	1.3

As can be seen, the proposed OSD Basins will cater for sediment for the proposed catchments.

The "Blue Book" standard details for Type F sediment basins (Drawing SD6-4, p. 6-19) shows that an "Earth Basin – Wet" is required for sediment basins. This type of basin does not require a riser outlet and any maintenance procedure should be undertaken as follows:

- Regular flocculation and pumped removal of the sediment basin stored water to discharge as clean water into the existing watercourses adjacent to the ponds
- Flocculation and pumping to occur after each storm event
- After pumping, siltation and gross litter build up to be mechanically removed in preparation for the next storm and disposed of appropriately

Therefore it is considered that the above sediment and erosion control strategy will adequately capture siltation and control sedimentation carried by stormwater to acceptable standards during the construction period.

3.6 Stormwater System Maintenance

The stormwater drainage system will need to be maintained at regular intervals and it is recommended that monitoring and recording of the performance of a stormwater system be undertaken at least regularly over a period of one year until such time as typical maintenance periods can be established. Initially, it is recommended that inspections of all new stormwater systems at quarterly intervals and after large rainfall events be conducted until a suitable baseline can be estimated. Suitable intervals for maintenance work to be undertaken can then be programmed.

The MUSIC programme user guide suggests that bio-retention filters should adequately serve a development for 25 years. As this part of the stormwater management system drains low flows, the basin invert should be visible and limited ponding existent a few days after rainfall events. Replacement of subsoil lines and sand filter media should be undertaken if the basin stores water longer than 1 week after rainfall. It should be noted that during wet periods, the basin may hold water for extended periods until the filter empties the basin due to constant trickle feed from the catchment. Table 8 below provides a schedule of maintenance procedures for the stormwater system.

The on-site detention basin has been designed in accordance with Councils requirements with all aspects of maintenance being considered. Councils maximum batter gradients have been proposed and therefore should be easily accessed by plant to be mown or slashed as required. Access for the removal of sedimentation can also easily be achieved. Outlet lines from the bio-retention filter can be flushed if necessary to clear any obstructions. Filter mediums will need to be replaced by plant machinery, and plantings also replaced. The OSD outlet control and trash rack should be cleared of debris whenever the site is visited by maintenance staff. It is not expected that trash or litter will build up on the outlet, however regular inspection should be undertaken.

Table 8 – Schedule of Maintenance Procedures

Item	Inspection Interval	Maintenance Interval	Task/Procedure
Pits and Pipes Network	Yearly	As required / Yearly	Remove and Dispose of Debris from Item
OSD Basins and Outlet	Yearly	As required / Yearly	De-silt and Disposal of sediment
Bio-retention Filter and Outlet	Yearly	25 Years As Required	Replace Filter Medium Remove and Dispose of Debris from Item

5.0 CONCLUSIONS AND RECOMMENDATIONS

RGH Consulting Group has undertaken a design review for a stormwater management strategy in accordance with the requirements of Singleton Shire Council, associated with the release of land within a residential subdivision at Singleton Heights, known as Bridgman Ridge, for Bridgman Ridge Holdings Pty Ltd. This strategy involves calculations and review to confirm that Councils stormwater management principles can be achieved for the development.

This report has shown that Councils requirements for on-site stormwater detention, short term construction stormwater quality, and long term stormwater quality have been met provided the detailed designs adopt the design strategies suggested. It has been proposed to combine stormwater detention basins with water quality devices to meet Councils requirements, and an overview of sediment and erosion control has also been provided. Detailed design adopting the items designed and described in this report will need to be produced in order to provide adequate tender and construction documentation for constructors.

Therefore it is the recommendation of RGH Consulting Group that the strategy contained within this report with regard to the stormwater management measures suggested be approved and adopted by Council for use by detailed designers in the production of future civil engineering design documentation.

6.0 REFERENCES

Geotech Solutions Pty Ltd, ***"Report on Geotechnical Investigation – Stage 3 Bridgman Ridge Estate, Singleton North"***, Ref. 889-002/0, May 2011.

NSW Landcom, ***"Urban Stormwater Management Soils and Construction"***, Vol.1, 4th Edition, NSW State Government, 2004.

Pilgrim, D.H., ***"Australian Rainfall and Runoff"***, Engineers Australia, 2001.

Singleton Shire Council, ***"Singleton DCP 2007, Element 12-Stormwater Management", 17 December 2007.***

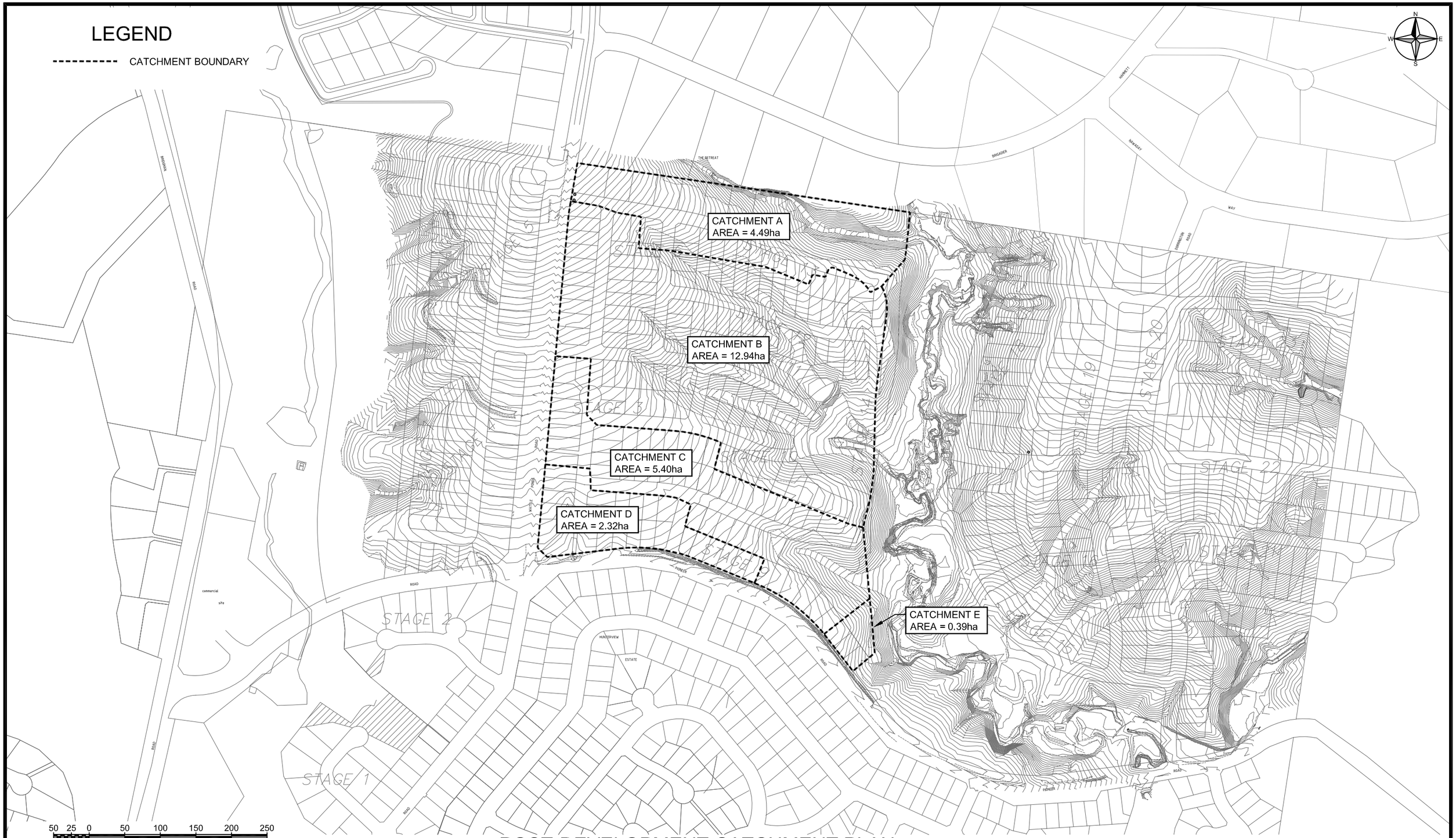
Sydney Catchment Authority, ***"A Guide to the Use of MUSIC in Sydney's Drinking Water Catchments – Draft Training Version"***, 2006.

APPENDIX A

RGH CONCEPTUAL ENGINEERING DRAWINGS

LEGEND

---------- CATCHMENT BOUNDARY



A3 DO NOT SCALE DRAWINGS. VERIFY ALL DIMENSIONS ON SITE.

POST-DEVELOPMENT CATCHMENT PLAN

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REVISION	DESCRIPTION	DATE
A	PRELIMINARY	23/11/11

DRAWING TITLE: ARI FLOOD EXTENTS PLAN
KEY PLAN

ADDRESS: BRIDGMAN RIDGE,
SINGLETON HEIGHTS

PROJECT: PROPOSED CIVIL DESIGN

FOR: BRIDGMAN RIDGE HOLDINGS P/L

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MIE AUST CPENG 2342830

signed date

SCALE	1:5000	INIT.
DRAWN	J.W	
CHECKED	A.J.G	
DESIGNED	A.J.G	
DATE	OCT 2011	
JOB NUMBER	20110216	

SHEET SK03

REV A

LEGEND

- 113.552 HECRAS RIVER STATION NUMBER
- FLOODWAY MODELLING CENTRELINE
- PMF FLOOD EXTENT

SHEET 1

SHEET 2

SHEET 3

SHEET 4

25 12.5 0 25 50 75 100 125

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A3 DO NOT SCALE DRAWINGS. VERIFY ALL DIMENSIONS ON SITE.

KEY PLAN

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KEY PLAN

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JOB NUMBER	20110216	

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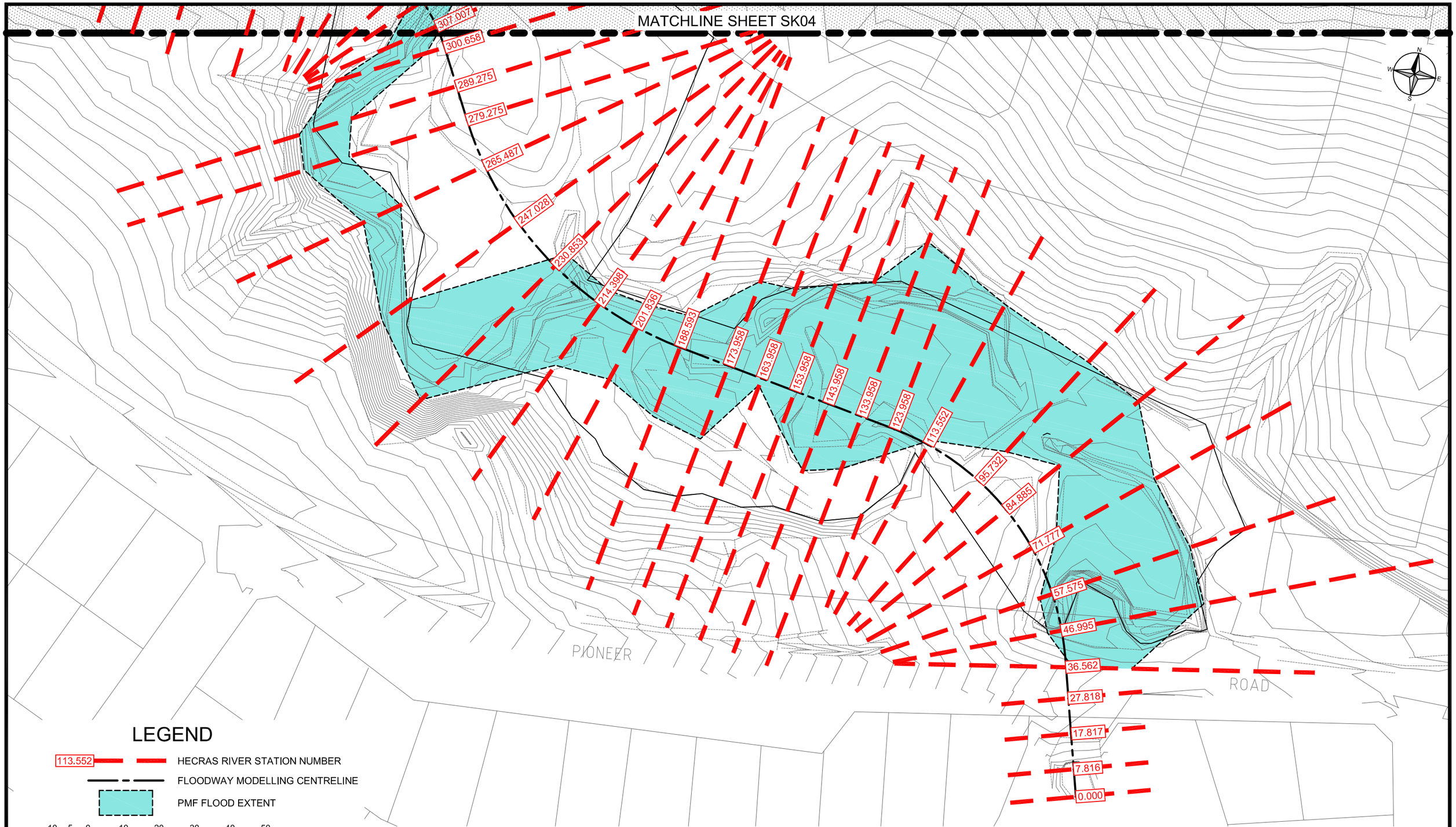
MATCHLINE SHEET SK04



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FLOODWAY MODELLING CENTRELINE

PMF FLOOD EXTENT

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CATCHMENT PLAN

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MATCHLINE SHEET SK07

MATCHLINE SHEET SK05

ROAD

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LEGEND

- 113.552 — HECRAS RIVER STATION NUMBER
- WATER LEVEL
- FLOODWAY MODELLING CENTRELINE
- PMF FLOOD EXTENT

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CATCHMENT PLAN

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SHEET SK06

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MATCHLINE SHEET SK08

LEGEND

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- FLOODWAY MODELLING CENTRELINE
- PMF FLOOD EXTENT

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ADDRESS: BRIDGMAN RIDGE, SINGLETON HEIGHTS

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CATCHMENT PLAN

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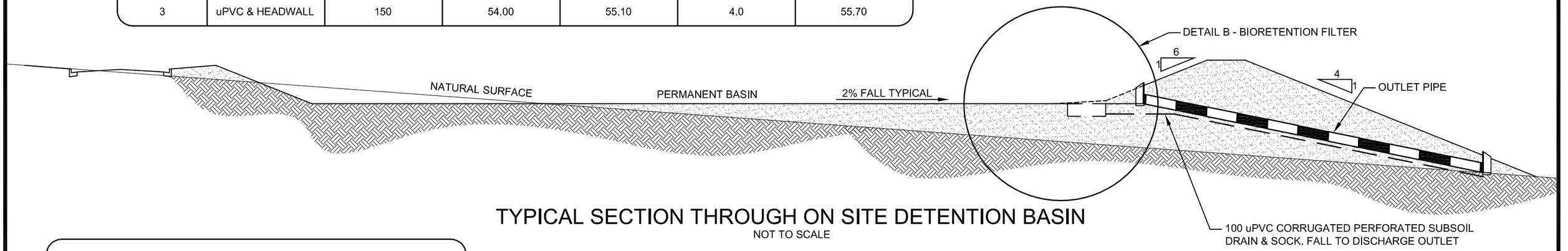
DESIGNED	A.J.G		
DATE	OCT 2011		
JOB NUMBER	20110216		

SHEET: SK08

REV: A

ONSITE DETENTION DETAILS

BASIN №	OUTLET CONTROL TYPE	OUTLET CONTROL SIZE mm	OUTLET CONTROL INVERT LEVEL (m AHD)	OVERFLOW WEIR LEVEL (m AHD)	OVERFLOW WEIR WIDTH (m)	MINIMUM BASIN WALL LEVEL (m AHD)
1	uPVC & HEADWALL	225	58.00	59.20	3.0	59.70
2	RCP & HEADWALL	375	54.00	55.02	13.0	55.70
3	uPVC & HEADWALL	150	54.00	55.10	4.0	55.70

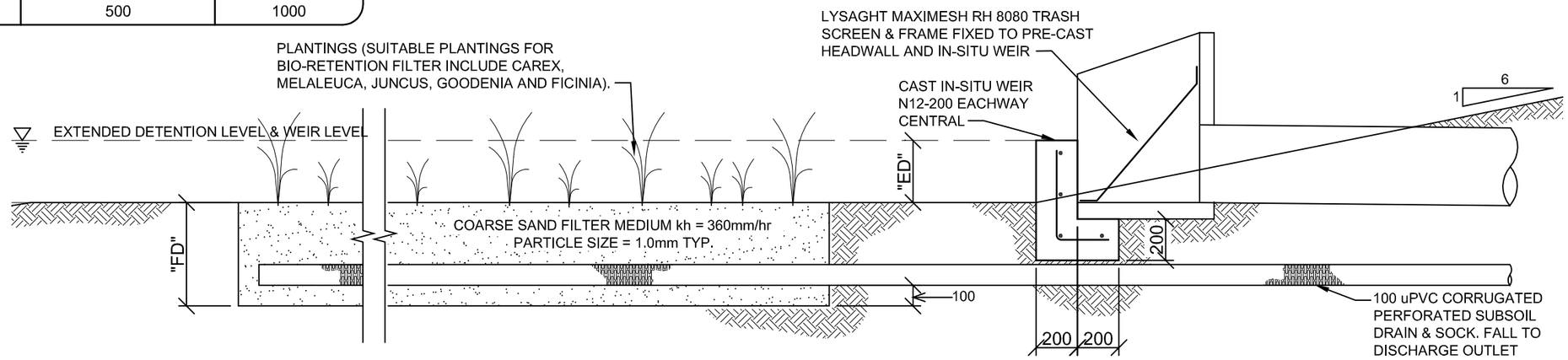


TYPICAL SECTION THROUGH ON SITE DETENTION BASIN

NOT TO SCALE

BIO-RETENTION FILTER DETAILS

BASIN №	FILTER AREA (m²)	EXTENDED DETENTION DEPTH "ED" (mm)	FILTER DEPTH "FD" (mm)
1	80	500	1000
2	150	500	1000
3	80	500	1000



DETAIL B - TYPICAL SECTION - BIORETENTION FILTER DETAIL

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JOB NUMBER	20110216	

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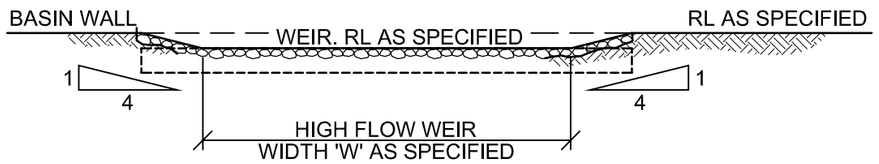

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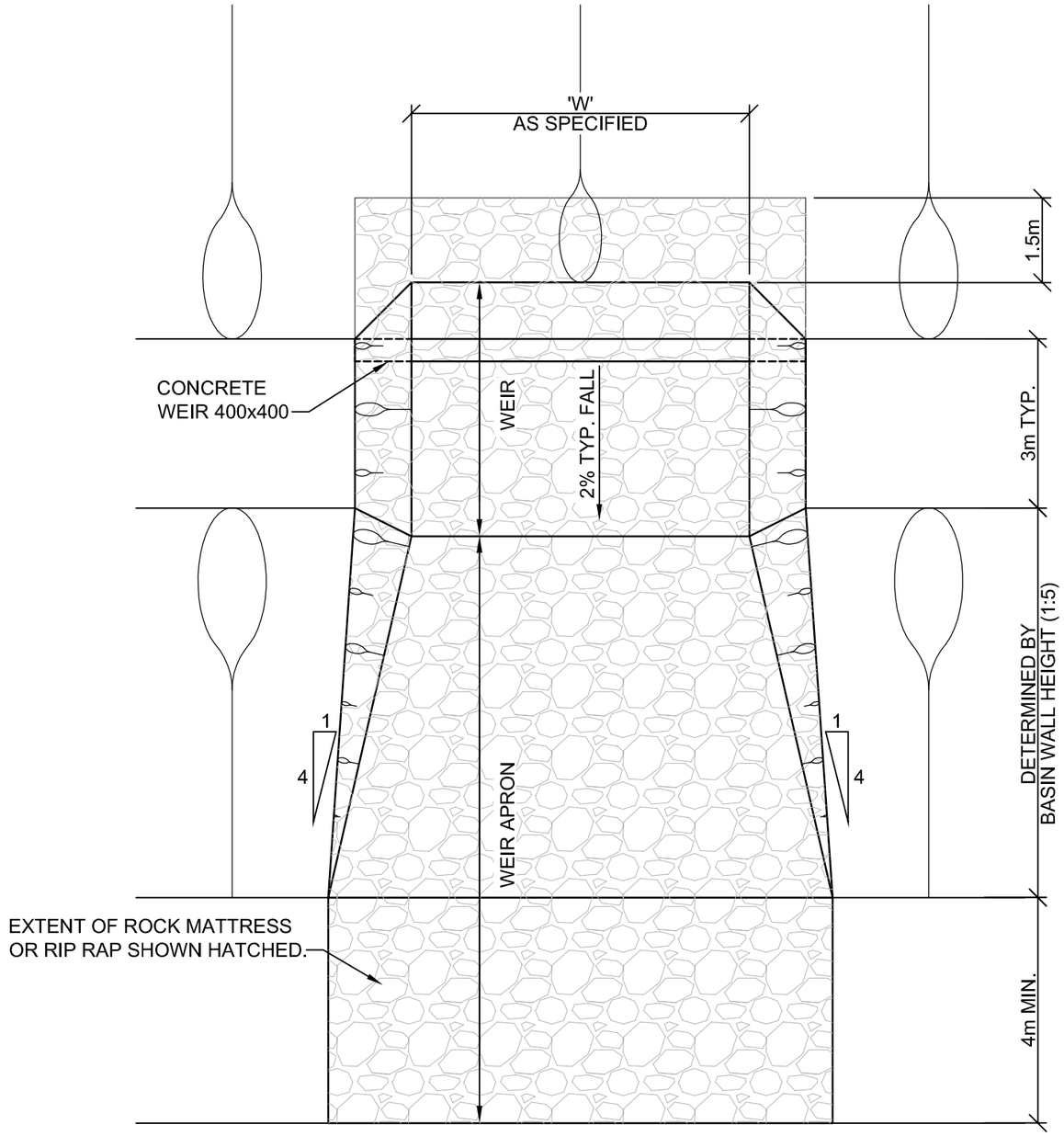

PLAN ON TYPICAL BASIN WEIR

(REFER TABLE FOR DIMENSIONS)

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SHEET 6

ADDRESS: BRIDGMAN RIDGE,
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PROJECT: PROPOSED CIVIL DESIGN

FOR: BRIDGMAN RIDGE HOLDINGS P/L

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SCALE	1:1000	INIT.
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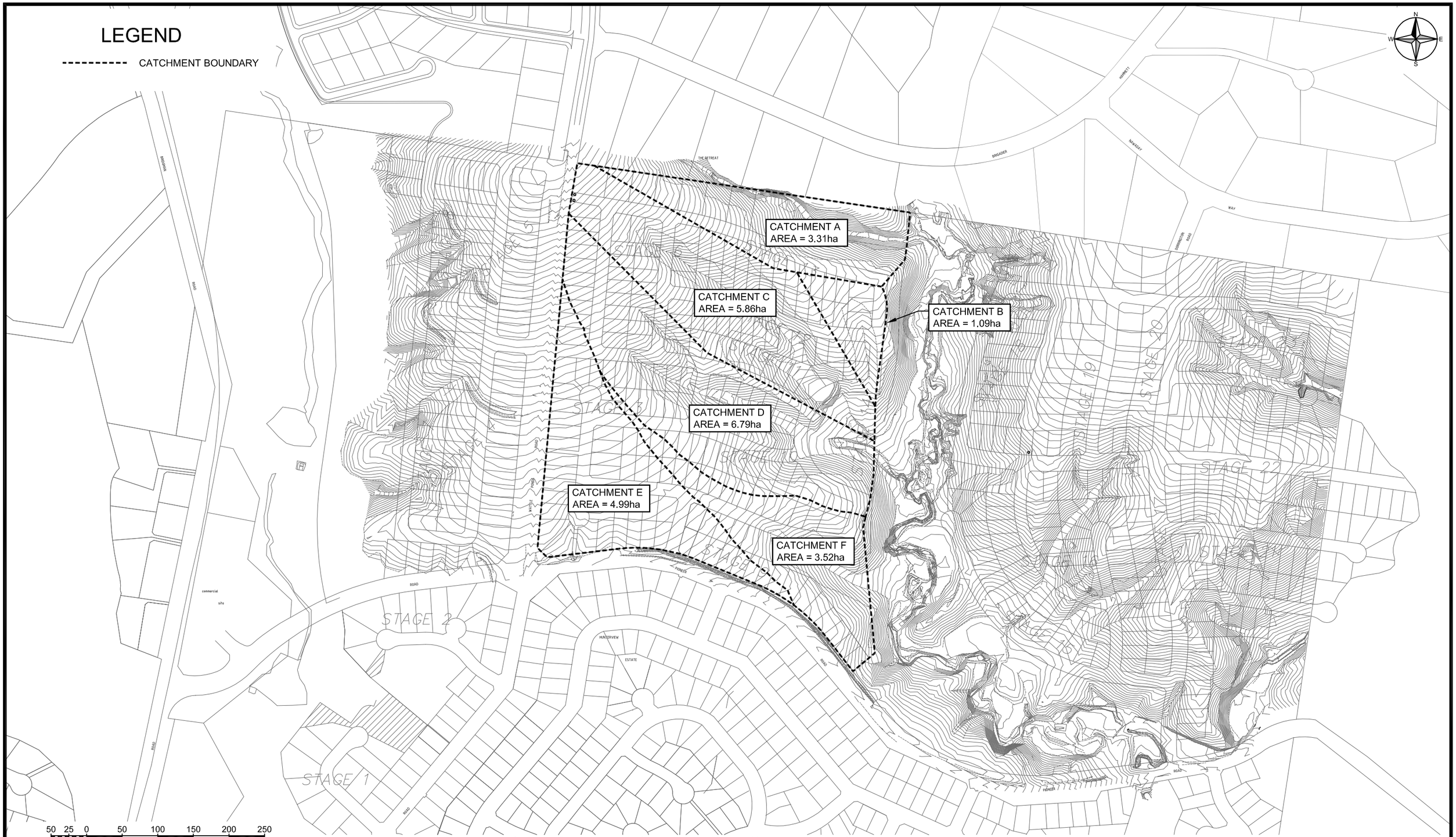
CHECKED	A.J.G	
DESIGNED	A.J.G	
DATE	OCT 2011	
JOB NUMBER	20110216	

SHEET: SK10

REV: A

LEGEND

CATCHMENT BOUNDARY



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PRE-DEVELOPMENT CATCHMENT PLAN

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A	PRELIMINARY	23/11/11

DRAWING TITLE: ARI FLOOD EXTENTS PLAN
KEY PLAN

ADDRESS: BRIDGMAN RIDGE,
SINGLETON HEIGHTS

PROJECT: PROPOSED CIVIL DESIGN

FOR: BRIDGMAN RIDGE HOLDINGS P/L

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signed date

SCALE	5000	INIT.
DRAWN	J.W	
CHECKED	A.J.G	
DESIGNED	A.J.G	
DATE	OCT 2011	
JOB NUMBER	20110216	

SHEET: SK02

REV: A

APPENDIX B

CALCULATIONS AND MODELLING DATA

ATTACHMENT 1: CATCHMENT HYDROLOGY CALCULATIONS

ATTACHMENT 2: HECRAS DESIGN OUTPUT SUMMARY

ATTACHMENT 3: DRAINS DESIGN OUTPUT SUMMARY

ATTACHMENT 4: EROSION AND SEDIMENT CONTROL CALCULATIONS

ARR HYDROLOGIC DESIGN SHEET FOR RURAL EASTERN NSW SMALL TO MEDIUM CATCHMENTS

Job : 20110216 - Bridgman Ridge Singleton Date: 40869.4

C_{10} :	0.20	ARI :	100	ZONE :	B	$I_{12,50}$:	10.1	Site:	Below 500m	FF_Y :	1.382
						$I_{12,2}$:	5.0			C_{YY} :	0.276

[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]	[11]	[12]	[13]	[14]
Catchment Data		FLOW TIMES			Runoff Coefficient			Design Flood Magnitude	Bypass Flow Calculations				
Sub-Catchment Name	Sub-Catchment Area (km^2)	Time of Concentration, t_C (hr)	Time of Concentration, t_C (min)	Intensity, I (mm/h)	**C_{10}** (from Fig. 5.1, Vol. 2)	**FF_Y** (from Fig. 1.2, Vol. 1)	**C_{YY}** [6] x [7]	**Q_{YY}** = 0.278 . C_{YY} . I . A (m^3/s)	Bypass Flow from U/S (m^3/s)	Total Flow Rate (m^3/s)	Pipe Capacity from Hydraulic Calcs (m^3/s)	Bypass Flow to D/S (m^3/s)	Remarks
1	2.1200	1.01	60	54.46	0.200	1.382	0.300	9.629	0.00	9.63	0.00	9.63	Catchment Area above outlet Node
2	2.0600	1.00	60	54.46	0.200	1.382	0.300	9.356	0.00	9.36	0.00	9.36	Catchment Area above 1st Junction
3	1.8200	0.95	57	57.57	0.200	1.382	0.300	8.738	0.00	8.74	0.00	8.74	Catchment Area above 2nd Junction
4	1.5500	0.90	53	61.15	0.200	1.382	0.300	7.905	0.00	7.90	0.00	7.90	Catchment Area above 3rd Junction
5	1.4300	0.87	52	61.15	0.200	1.382	0.300	7.293	0.00	7.29	0.00	7.29	Catchment Area above Site

20110216_BRIDGMAN RIDGE - HECRAS OUTPUT SUMMARY TABLE_20111020

Reach	River Sta	Profile	Q Total (m3/s)	Min Ch El (m)	W.S. Elev (m)	Crit W.S. (m)	E.G. Elev (m)	E.G. Slope (m/m)	Vel Chnl (m/s)	Flow Area (m2)	Top Width (m)	Froude # Chl
1	1073.41	PF#1	7.9	57.05	57.58	57.5	57.65	0.051867	1.24	6.38	20.17	0.7
1	1063.41	PF#1	7.9	56.21	57.44		57.46	0.008878	0.57	13.86	37.2	0.3
1	1053.41	PF#1	7.9	56.36	57.34		57.36	0.011041	0.62	12.82	36.09	0.33
1	1043.41	PF#1	7.9	56.51	57.23		57.25	0.01225	0.62	12.71	38.35	0.34
1	1033.41	PF#1	7.9	56.3	57.11		57.13	0.011832	0.62	12.82	38.14	0.34
1	1023.41	PF#1	7.9	55.85	57.01		57.03	0.009076	0.61	12.96	31.9	0.31
1	1007.01	PF#1	7.9	56.1	56.57	56.56	56.66	0.098531	1.33	5.95	27.04	0.9
1	989.66	PF#1	8.74	55.37	56.34		56.36	0.007023	0.59	14.85	31.67	0.27
1	960.46	PF#1	8.74	55.17	55.75		55.87	0.073279	1.53	5.71	17.05	0.84
1	947.62	PF#1	8.74	53.69	55.04	54.79	55.18	0.041628	1.66	5.27	7.81	0.64
1	937.62	PF#1	8.74	53.7	54.36	54.36	54.54	0.106566	1.9	4.61	12.99	1.02
1	927.62	PF#1	8.74	53.22	54.17	53.63	54.18	0.00291	0.44	20	34.12	0.18
1	917.62	PF#1	8.74	53.09	54.15		54.15	0.002149	0.39	22.55	36.81	0.16
1	907.62	PF#1	8.74	53.19	54.09		54.12	0.007211	0.71	12.34	20.39	0.29
1	897.62	PF#1	8.74	52.61	54.05		54.07	0.003627	0.63	13.81	15.89	0.22
1	887.62	PF#1	8.74	52.7	54.01		54.03	0.003523	0.54	16.35	24.94	0.21
1	877.62	PF#1	8.74	52.4	53.96		53.98	0.006287	0.61	14.43	27.06	0.26
1	867.62	PF#1	8.74	52.56	53.82		53.87	0.024805	0.94	9.24	26.32	0.5
1	857.62	PF#1	8.74	52.19	53.58		53.64	0.020519	1.04	8.4	16.72	0.47
1	847.62	PF#1	8.74	52.12	53.46		53.49	0.01054	0.79	11.01	20.14	0.34
1	837.62	PF#1	8.74	52.33	53.42		53.43	0.002904	0.53	16.56	21.53	0.19
1	827.63	PF#1	8.74	51.92	53.38		53.4	0.005518	0.57	15.21	28.1	0.25
1	817.64	PF#1	8.74	52.14	53.26		53.3	0.018296	0.88	9.88	23.55	0.44
1	807.64	PF#1	8.74	51.77	52.99		53.07	0.028866	1.29	6.76	12.64	0.56
1	797.65	PF#1	8.74	52.15	52.87		52.89	0.010345	0.69	12.68	28.75	0.33
1	787.66	PF#1	8.74	51.71	52.71		52.76	0.014955	0.95	8.84	17.86	0.41
1	777.66	PF#1	8.74	51.61	52.59		52.64	0.010166	0.93	9.44	14.97	0.35
1	767.66	PF#1	8.74	51.48	52.38		52.46	0.027875	1.26	6.93	13.16	0.55
1	757.66	PF#1	8.74	50.81	52.36		52.38	0.002839	0.52	16.88	21.48	0.19
1	747.66	PF#1	8.74	50.91	52.25		52.31	0.024328	1.04	8.39	18.92	0.5

1	737.66	PF#1	8.74	50.92	52.21		52.22	0.003454	0.54	16.27	22.35	0.2
1	727.66	PF#1	8.74	51.07	52.15		52.18	0.006455	0.67	13.04	21.34	0.27
1	717.65	PF#1	8.74	50.5	52.04		52.07	0.020598	0.81	10.79	31.91	0.44
1	707.65	PF#1	8.74	50.4	51.71		51.78	0.042242	1.21	7.21	19.14	0.63
1	697.65	PF#1	8.74	50.39	51.65		51.67	0.004084	0.47	18.46	36.11	0.21
1	687.65	PF#1	8.74	50.41	51.54		51.59	0.01865	0.95	9.18	19.89	0.45
1	676.47	PF#1	8.74	50.04	51.38		51.41	0.012526	0.85	10.26	19.19	0.37
1	666.47	PF#1	8.74	50.15	51.32		51.33	0.004957	0.44	19.64	48.85	0.22
1	656.47	PF#1	8.74	49.93	51.01	51.01	51.18	0.113712	1.83	4.77	14.52	1.02
1	646.47	PF#1	8.74	49.28	51	50.24	51.01	0.001524	0.33	26.46	41.42	0.13
1	636.47	PF#1	9.36	49.34	50.98		50.99	0.001875	0.44	21.51	25.68	0.15
1	626.47	PF#1	9.36	49.18	50.89		50.95	0.014608	1.08	8.67	12.51	0.41
1	616.47	PF#1	9.36	49.4	50.61		50.7	0.053361	1.29	7.25	21.42	0.71
1	606.46	PF#1	9.36	48.94	50.52		50.54	0.006101	0.61	15.25	27.45	0.26
1	596.46	PF#1	9.36	49.02	50.45		50.48	0.00642	0.75	12.49	17.28	0.28
1	586.46	PF#1	9.36	48.82	50.32		50.36	0.025662	0.93	10.1	28.83	0.5
1	576.46	PF#1	9.36	48.4	49.7		49.95	0.066307	2.21	4.24	6.27	0.86
1	569.62	PF#1	9.36	48.1	49.84		49.84	0.001312	0.29	32.78	57.37	0.12
1	559.62	PF#1	9.36	48.37	49.81		49.82	0.003021	0.46	20.24	32.33	0.19
1	549.62	PF#1	9.36	48.06	49.72		49.77	0.010897	0.99	9.42	12.12	0.36
1	539.62	PF#1	9.36	47.95	49.6		49.64	0.015792	0.88	10.58	21.3	0.4
1	529.62	PF#1	9.36	47.75	49.45		49.48	0.014226	0.79	11.79	26.26	0.38
1	519.61	PF#1	9.36	48.41	49.36		49.38	0.007033	0.63	14.88	28.85	0.28
1	509.61	PF#1	9.36	48.63	49.14		49.22	0.059938	1.27	7.34	24.78	0.75
1	499.61	PF#1	9.36	47.53	48.98		49.01	0.009702	0.69	13.61	28.81	0.32
1	491.39	PF#1	9.63	47.25	48.93		48.95	0.005375	0.65	14.93	22.38	0.25
1	483.13	PF#1	9.63	47.24	48.78		48.85	0.031011	1.21	7.96	17.2	0.57
1	474.1	PF#1	9.63	47.44	48.67		48.7	0.008892	0.78	12.3	20.46	0.32
1	465.44	PF#1	9.63	47.18	48.66		48.67	0.001434	0.4	24.33	28.24	0.14
1	455.59	PF#1	9.63	47.09	48.62		48.65	0.005967	0.73	13.14	17.1	0.27
1	447.58	PF#1	9.63	47.08	48.5		48.57	0.014168	1.16	8.31	10.52	0.42
1	438.13	PF#1	9.63	46.96	48.23		48.36	0.036793	1.62	5.93	9.27	0.65

1	425.03	PF#1	9.63	46.79	48.23		48.24	0.002319	0.5	19.46	23.96	0.17
1	413.07	PF#1	9.63	46.63	48.15		48.19	0.00596	0.96	10.03	11.92	0.29
1	402.16	PF#1	9.63	46.41	47.89		48.04	0.039612	1.79	5.58	12.26	0.65
1	392.16	PF#1	9.63	46.2	47.68		47.75	0.018755	1.2	8.22	14.88	0.45
1	381.96	PF#1	9.63	46.34	47.5		47.56	0.017225	1.03	9.39	16.67	0.43
1	362.39	PF#1	9.63	46.45	47.35		47.4	0.004542	0.5	12.77	22.47	0.23
1	348.1	PF#1	9.63	45.48	47.15		47.25	0.026743	1.42	6.77	9.75	0.54
1	336.33	PF#1	9.63	45.43	47.03		47.07	0.008977	0.86	11.19	15.55	0.32
1	322.1	PF#1	9.63	45.22	46.49	46.49	46.74	0.106908	2.21	4.35	9.27	1.03
1	315.21	PF#1	9.63	44.93	46.41	45.59	46.42	0.00427	0.62	15.56	21.05	0.23
1	307.01	PF#1	9.63	44.83	46.36		46.38	0.006037	0.74	13.1	17.85	0.27
1	300.66	PF#1	9.63	44.99	46.34		46.35	0.002893	0.51	19.03	26.3	0.19
1	289.27	PF#1	9.63	45.56	46.01	46.01	46.26	0.016206	0.48	5.67	15.45	0.36
1	279.27	PF#1	9.63	45.52	45.76	45.52	45.85	0.006443	0.23	7.25	13.19	0.21
1	265.49	PF#1	9.63	46.19	45.68		45.74	0.003054		9.04	11.62	0
1	247.03	PF#1	9.63	45.88	45.58		45.65	0.002992		8.28	8.77	0
1	230.85	PF#1	9.63	45.21	45.35		45.48	0.015359	0.24	6.13	16.9	0.29
1	214.4	PF#1	9.63	44.08	45.23		45.25	0.006708	0.66	14.7	25.94	0.28
1	201.84	PF#1	9.63	44.22	45.09		45.13	0.014727	0.86	11.19	23.75	0.4
1	188.59	PF#1	9.63	44.05	44.63	44.59	44.74	0.080449	1.46	6.57	22.5	0.87
1	173.96	PF#1	9.63	43.36	44.43		44.45	0.007319	0.64	14.8	34.58	0.29
1	163.96	PF#1	9.63	42.84	44.33		44.35	0.012428	0.76	12.75	28.88	0.36
1	153.96	PF#1	9.63	42.93	44.21		44.23	0.012487	0.64	15.05	43.8	0.35
1	143.96	PF#1	9.63	42.76	44.09		44.11	0.010791	0.55	17.4	56.85	0.32
1	133.96	PF#1	9.63	42.06	44.03		44.04	0.004869	0.44	20.96	58.37	0.22
1	123.96	PF#1	9.63	42.48	43.99		44	0.003116	0.38	21.68	50.19	0.18
1	113.55	PF#1	9.63	42.46	43.98		43.98	0.000606	0.23	32.38	43.65	0.09
1	95.73	PF#1	9.63	43.48	43.89		43.94	0.044153	1.05	9.16	34.26	0.64
1	84.89	PF#1	9.63	42.36	43.54	43.31	43.58	0.024551	0.92	10.42	28.79	0.49
1	71.78	PF#1	9.63	42.06	42.82	42.82	42.93	0.142856	1.52	6.34	31.24	1.08
1	57.58	PF#1	9.63	40.01	42.51	40.89	42.51	0.001068	0.33	28.81	32.55	0.11
1	46.99	PF#1	9.63	40.72	42.47	41.89	42.49	0.008674	0.56	17.08	44.75	0.29
1	27.8		Culvert									
1	7.82	PF#1	9.63	40.22	41.79	40.86	41.8	0.001002	0.39	26.83	53.43	0.12

20110216_BRIDGMAN RIDGE PREDEVELOPMENT DATA

PIT / NODE DETAILS — Version 9

Name	Type	Family	Size	Ponding Volume (cu.m)	Pressure Change Coeff. Ku	Surface Elev (m)	Max Pond Depth (m)	Base Inflow (cu.m/s)	Blocking Factor	x	y	Bolt-down lid	id	Part Full Shock Loss
N1	Node					50		0		208	-188		1	
N2	Node					50		0		303	-189		8	
N3	Node					50		0		430	-192		15	
N4	Node					50		0		511	-194		18	
N5	Node					50		0		587	-192		19	
N6	Node					50		0		641	-192		20	

DETENTION BASIN DETAILS

Name	Elev	Surf. Area	Init Vol. (cu.m)	Outlet Type	K	Dia(mm)	Centre RL	Pit Family	Pit Type	x	y	HED	Crest RL	Crest Length(m)	id

SUB-CATCHMENT DETAILS

Name	Pit or Node	Total Area (ha)	Paved Area %	Grass Area %	Supp Area %	Paved Time (min)	Grass Time (min)	Supp Time (min)	Paved Length (m)	Grass Length (m)	Supp Length (m)	Paved Slope(%) %	Grass Slope %	Supp Slope %	Paved Rough	Grass Rough	Supp Rough	Lag Time or Factor	Gutter Length (m)	Gutter Slope %	Gutter FlowFactor
PRECAT1	N1	3.31	0	100	0	5	0	0	0	430	0	0	7.4	0	0	0.2	0	0			
PRECAT2	N2	1.09	0	100	0	5	0	0	0	200	0	0	7.5	0	0	0.2	0	0			
PRECAT3	N3	5.86	0	100	0	5	0	0	0	550	0	0	6	0	0	0.2	0	0			
PRECAT4	N4	6.79	0	100	0	5	0	0	0	550	0	0	6	0	0	0.2	0	0			
PRECAT5	N5	4.99	0	100	0	5	0	0	0	350	0	0	4.3	0	0	0.2	0	0			
PRECAT6	N6	3.52	0	100	0	5	0	0	0	3.87	0	0	4.2	0	0	0.2	0	0			

PIPE DETAILS

Name	From	To	Length (m)	U/S IL (m)	D/S IL (m)	Slope (%)	Type	Dia (mm)	I.D. (mm)	Rough	Pipe Is	No. Pipes	Chg From	At Chg	Chg (m)	Rl (m)	Chg (m)	RL (m)	etc (m)

DETAILS of SERVICES CROSSING PIPES

Pipe	Chg (m)	Bottom Elev (m)	Height of Service (m)	Chg (m)	Bottom Elev (m)	Height of Service (m)	Chg (m)	Bottom Elev (m)	Height of Service (m)	etc etc

CHANNEL DETAILS

Name	From	To	Type	Length (m)	U/S IL (m)	D/S IL (m)	Slope (%)	Base Width (m)	L.B. Slope (1:?)	R.B. Slope (1:?)	Manning n	Depth (m)	Roofed

20110216_BRIDGMAN RIDGE PREDEVELOPMENT RESULTS

DRAINS results prepared 24 October, 2011 from Version 2011.06

PIT / NODE DETAILS

Name	Max HGL	Max Pond HGL	Max Surface Flow Arriving (cu.m/s)	Version 8 Max Pond Volume (cu.m)	Min Freeboard (m)	Overflow (cu.m/s)	Constraint

SUB-CATCHMENT DETAILS

Name	Max Flow Q (cu.m/s)	Paved Max Q (cu.m/s)	Grassed Max Q (cu.m/s)	Paved Tc (min)	Grassed Tc (min)	Supp. Tc (min)	Due to Storm
PRECAT1	0.033	0	0.033	5	52.74	0	AR&R 1 year, 20 minutes storm, average 35.3 mm/h, Zone 1
PRECAT2	0.017	0	0.017	5	34.78	0	AR&R 1 year, 25 minutes storm, average 31.4 mm/h, Zone 1
PRECAT3	0.047	0	0.047	5	68.23	0	AR&R 1 year, 25 minutes storm, average 31.4 mm/h, Zone 1
PRECAT4	0.055	0	0.055	5	68.23	0	AR&R 1 year, 25 minutes storm, average 31.4 mm/h, Zone 1
PRECAT5	0.048	0	0.048	5	57.49	0	AR&R 1 year, 25 minutes storm, average 31.4 mm/h, Zone 1
PRECAT6	0.359	0	0.359	5	3.88	0	AR&R 1 year, 25 minutes storm, average 31.4 mm/h, Zone 1
	0.559						

Outflow Volumes for Total Catchment (0.00 impervious + 25.6 pervious = 25.6 total ha)

Storm	Total Rainfall cu.m	Total Runoff cu.m (Runoff %)	Impervious Runoff cu.m (Runoff %)	Pervious Runoff cu.m (Runoff %)
AR&R 1 year, 5 minutes storm, average 64 mm/h, Zone 1	1363.2	74.81 (5.5%)	0.00 (0.0%)	74.81 (5.5%)
AR&R 1 year, 10 minutes storm, average 48.6 mm/h, Zone 1	2070.36	128.67 (6.2%)	0.00 (0.0%)	128.67 (6.2%)
AR&R 1 year, 15 minutes storm, average 40.5 mm/h, Zone 1	2587.95	171.79 (6.6%)	0.00 (0.0%)	171.79 (6.6%)
AR&R 1 year, 20 minutes storm, average 35.3 mm/h, Zone 1	3007.56	240.90 (8.0%)	0.00 (0.0%)	240.90 (8.0%)
AR&R 1 year, 25 minutes storm, average 31.4 mm/h, Zone 1	3344.1	263.73 (7.9%)	0.00 (0.0%)	263.73 (7.9%)
AR&R 1 year, 30 minutes storm, average 28.6 mm/h, Zone 1	3655.08	260.86 (7.1%)	0.00 (0.0%)	260.86 (7.1%)
AR&R 1 year, 45 minutes storm, average 22.8 mm/h, Zone 1	4370.76	309.52 (7.1%)	0.00 (0.0%)	309.52 (7.1%)
AR&R 1 year, 1 hour storm, average 19.3 mm/h, Zone 1	4933.08	427.74 (8.7%)	0.00 (0.0%)	427.74 (8.7%)
AR&R 1 year, 1.5 hours storm, average 14.9 mm/h, Zone 1	5712.66	439.88 (7.7%)	0.00 (0.0%)	439.88 (7.7%)
AR&R 1 year, 2 hours storm, average 12.4 mm/h, Zone 1	6338.88	514.98 (8.1%)	0.00 (0.0%)	514.98 (8.1%)
AR&R 1 year, 3 hours storm, average 9.51 mm/h, Zone 1	7292.27	148.72 (2.0%)	0.00 (0.0%)	148.72 (2.0%)
AR&R 1 year, 4.5 hours storm, average 7.28 mm/h, Zone 1	8373.46	171.48 (2.0%)	0.00 (0.0%)	171.48 (2.0%)

PIPE DETAILS

Name	Max Q (cu.m/s)	Max V (m/s)	Max U/S HGL (m)	Max D/S HGL (m)	Due to Storm

CHANNEL DETAILS

Name	Max Q (cu.m/s)	Max V (m/s)	Due to Storm

DETENTION BASIN DETAILS

Name	Max WL	MaxVol	Max Q Total	Max Q Low Level	Max Q High Level

CONTINUITY CHECK for AR&R 1 year, 25 minutes storm, average 31.4 mm/h, Zone 1

Node	Inflow (cu.m)	Outflow (cu.m)	Storage Change (cu.m)	Difference %
N1	25.22	25.22	0	0
N2	13.29	13.29	0	0

N3	36.23	36.23	0	0
N4	41.98	41.98	0	0
N5	36.71	36.71	0	0
N6	110.3	110.3	0	0

DRAINS results prepared 24 October, 2011 from Version 2011.06

PIT / NODE DETAILS

Name	Max HGL	Max Pond HGL	Max Surface Flow Arriving (cu.m/s)	Version 8 Max Pond Volume (cu.m)	Min Freeboard (m)	Overflow (cu.m/s)	Constraint

SUB-CATCHMENT DETAILS

Name	Max Flow Q (cu.m/s)	Paved Max Q (cu.m/s)	Grassed Max Q (cu.m/s)	Paved Tc (min)	Grassed Tc (min)	Supp. Tc (min)	Due to Storm
PRECAT1	0.184	0	0.184	5	48.79	0	AR&R 10 year, 45 minutes storm, average 42.9 mm/h, Zone 1
PRECAT2	0.096	0	0.096	5	32.93	0	AR&R 10 year, 1 hour storm, average 36 mm/h, Zone 1
PRECAT3	0.264	0	0.264	5	64.6	0	AR&R 10 year, 1 hour storm, average 36 mm/h, Zone 1
PRECAT4	0.306	0	0.306	5	64.6	0	AR&R 10 year, 1 hour storm, average 36 mm/h, Zone 1
PRECAT5	0.267	0	0.267	5	50.75	0	AR&R 10 year, 45 minutes storm, average 42.9 mm/h, Zone 1
PRECAT6	0.942	0	0.942	5	2.22	0	AR&R 10 year, 5 minutes storm, average 127 mm/h, Zone 1
	2.059						

Outflow Volumes for Total Catchment (0.00 impervious + 25.6 pervious = 25.6 total ha)

Storm	Total Rainfall cu.m	Total Runoff cu.m (Runoff %)	Impervious Runoff cu.m (Runoff %)	Pervious Runoff cu.m (Runoff %)
AR&R 10 year, 5 minutes storm, average 127 mm/h, Zone 1	2705.1	677.13 (25.0%)	0.00 (0.0%)	677.13 (25.0%)
AR&R 10 year, 10 minutes storm, average 95 mm/h, Zone 1	4047	1393.25 (34.4%)	0.00 (0.0%)	1393.25 (34.4%)
AR&R 10 year, 15 minutes storm, average 79 mm/h, Zone 1	5048.1	1998.52 (39.6%)	0.00 (0.0%)	1998.52 (39.6%)
AR&R 10 year, 20 minutes storm, average 68 mm/h, Zone 1	5793.6	2433.42 (42.0%)	0.00 (0.0%)	2433.42 (42.0%)
AR&R 10 year, 25 minutes storm, average 60 mm/h, Zone 1	6390	2761.70 (43.2%)	0.00 (0.0%)	2761.70 (43.2%)
AR&R 10 year, 30 minutes storm, average 54 mm/h, Zone 1	6901.2	3006.32 (43.6%)	0.00 (0.0%)	3006.32 (43.6%)
AR&R 10 year, 45 minutes storm, average 42.9 mm/h, Zone 1	8223.93	3662.30 (44.5%)	0.00 (0.0%)	3662.30 (44.5%)
AR&R 10 year, 1 hour storm, average 36 mm/h, Zone 1	9201.6	4159.97 (45.2%)	0.00 (0.0%)	4159.97 (45.2%)
AR&R 10 year, 1.5 hours storm, average 27.9 mm/h, Zone 1	10696.86	4722.51 (44.1%)	0.00 (0.0%)	4722.51 (44.1%)
AR&R 10 year, 2 hours storm, average 23.3 mm/h, Zone 1	11910.96	5142.74 (43.2%)	0.00 (0.0%)	5142.74 (43.2%)
AR&R 10 year, 3 hours storm, average 17.9 mm/h, Zone 1	13725.72	5686.25 (41.4%)	0.00 (0.0%)	5686.25 (41.4%)
AR&R 10 year, 4.5 hours storm, average 13.8 mm/h, Zone 1	15872.76	5921.20 (37.3%)	0.00 (0.0%)	5921.20 (37.3%)

PIPE DETAILS

Name	Max Q (cu.m/s)	Max V (m/s)	Max U/S HGL (m)	Max D/S HGL (m)	Due to Storm

CHANNEL DETAILS

Name	Max Q (cu.m/s)	Max V (m/s)	Due to Storm

DETENTION BASIN DETAILS

Name	Max WL	MaxVol	Max Q Total	Max Q Low Level	Max Q High Level

CONTINUITY CHECK for AR&R 10 year, 1 hour storm, average 36 mm/h, Zone 1

Node	Inflow	Outflow	Storage Change	Difference

	(cu.m)	(cu.m)	(cu.m)	%
N1	541.28	541.28	0	0
N2	186.75	186.75	0	0
N3	926.96	926.96	0	0
N4	1074.07	1074.07	0	0
N5	811.66	811.66	0	0
N6	619.24	619.24	0	0

DRAINS results prepared 24 October, 2011 from Version 2011.06

PIT / NODE DETAILS

Name	Max HGL	Max Pond HGL	Max Surface Flow Arriving (cu.m/s)	Version 8 Max Pond Volume (cu.m)	Min Freeboard (m)	Overflow (cu.m/s)	Constraint

SUB-CATCHMENT DETAILS

Name	Max Flow Q (cu.m/s)	Paved Max Q (cu.m/s)	Grassed Max Q (cu.m/s)	Paved Tc (min)	Grassed Tc (min)	Supp. Tc (min)	Due to Storm
PRECAT1	0.437	0	0.437	5	41.06	0	AR&R 100 year, 45 minutes storm, average 66 mm/h, Zone 1
PRECAT2	0.213	0	0.213	5	22.53	0	AR&R 100 year, 25 minutes storm, average 93 mm/h, Zone 1
PRECAT3	0.641	0	0.641	5	54.53	0	AR&R 100 year, 1 hour storm, average 55 mm/h, Zone 1
PRECAT4	0.743	0	0.743	5	54.53	0	AR&R 100 year, 1 hour storm, average 55 mm/h, Zone 1
PRECAT5	0.643	0	0.643	5	42.71	0	AR&R 100 year, 45 minutes storm, average 66 mm/h, Zone 1
PRECAT6	1.679	0	1.679	5	1.84	0	AR&R 100 year, 5 minutes storm, average 202 mm/h, Zone 1
	4.356						

Outflow Volumes for Total Catchment (0.00 impervious + 25.6 pervious = 25.6 total ha)

Storm	Total Rainfall cu.m	Total Runoff cu.m (Runoff %)	Impervious Runoff cu.m (Runoff %)	Pervious Runoff cu.m (Runoff %)
AR&R 100 year, 5 minutes storm, average 202 mm/h, Zone 1	4302.6	2211.96 (51.4%)	0.00 (0.0%)	2211.96 (51.4%)
AR&R 100 year, 10 minutes storm, average 151 mm/h, Zone 1	6432.6	3819.79 (59.4%)	0.00 (0.0%)	3819.79 (59.4%)
AR&R 100 year, 15 minutes storm, average 123 mm/h, Zone 1	7859.7	4863.26 (61.9%)	0.00 (0.0%)	4863.26 (61.9%)
AR&R 100 year, 20 minutes storm, average 106 mm/h, Zone 1	9031.2	5706.94 (63.2%)	0.00 (0.0%)	5706.94 (63.2%)
AR&R 100 year, 25 minutes storm, average 93 mm/h, Zone 1	9904.5	6240.80 (63.0%)	0.00 (0.0%)	6240.80 (63.0%)
AR&R 100 year, 30 minutes storm, average 84 mm/h, Zone 1	10735.2	6739.88 (62.8%)	0.00 (0.0%)	6739.88 (62.8%)
AR&R 100 year, 45 minutes storm, average 66 mm/h, Zone 1	12652.2	7924.94 (62.6%)	0.00 (0.0%)	7924.94 (62.6%)
AR&R 100 year, 1 hour storm, average 55 mm/h, Zone 1	14058	8804.90 (62.6%)	0.00 (0.0%)	8804.90 (62.6%)
AR&R 100 year, 1.5 hours storm, average 42.6 mm/h, Zone 1	16332.84	10111.80 (61.9%)	0.00 (0.0%)	10111.80 (61.9%)
AR&R 100 year, 2 hours storm, average 35.5 mm/h, Zone 1	18147.6	11076.63 (61.0%)	0.00 (0.0%)	11076.63 (61.0%)
AR&R 100 year, 3 hours storm, average 27.4 mm/h, Zone 1	21010.32	12582.63 (59.9%)	0.00 (0.0%)	12582.63 (59.9%)
AR&R 100 year, 4.5 hours storm, average 21.2 mm/h, Zone 1	24384.24	13950.94 (57.2%)	0.00 (0.0%)	13950.94 (57.2%)

PIPE DETAILS

Name	Max Q (cu.m/s)	Max V (m/s)	Max U/S HGL (m)	Max D/S HGL (m)	Due to Storm

CHANNEL DETAILS

Name	Max Q (cu.m/s)	Max V (m/s)	Due to Storm

DETENTION BASIN DETAILS

Name	Max WL	MaxVol	Max Q Total	Max Q Low Level	Max Q High Level

CONTINUITY CHECK for AR&R 100 year, 45 minutes storm, average 66 mm/h, Zone 1

Node	Inflow (cu.m)	Outflow (cu.m)	Storage Change (cu.m)	Difference %
N1	1023.85	1023.85	0	0
N2	347.4	347.4	0	0
N3	1782.28	1782.28	0	0
N4	2065.13	2065.13	0	0
N5	1540.6	1540.6	0	0
N6	1165.68	1165.68	0	0

20110216_BRIDGMAN RIDGE POST DEVELOPMENT DATA

PIT / NODE DETAILS — Version 9

Name	Type	Family	Size	Ponding Volume (cu.m)	Pressure Change Coeff. Ku	Surface Elev (m)	Max Pond Depth (m)	Base Inflow (cu.m/s)	Blocking Factor	x	y	Bolt-down lid	id	Part Full Shock Loss
OUT4	Node					66		0		371	-367		10	
OUT5	Node					59		0		522	-412		12	
OUT1	Node					57.5		0		528	-178		1	
OUT2	Node					52		0		529	-277		3	
OUT3	Node					52		0		533	-358		6	

DETENTION BASIN DETAILS

Name	Elev	Surf. Area	Init Vol. (cu.m)	Outlet Type	K	Dia(mm)	Centre RL	Pit Family	Pit Type	x	y	HED	Crest RL	Crest Length(m)	id
Basin1	58	440	0	Culvert	0.5					457	-172	No			32
	60	2800													
Basin2	54	850	0	Culvert	0.5					457	-260	No			34
	56	3000													
Basin3	54	750	0	Culvert	0.5					457	-335	No			38
	56	3400													

SUB-CATCHMENT DETAILS

Name	Pit or Node	Total Area (ha)	Paved Area %	Grass Area %	Supp Area %	Paved Time (min)	Grass Time (min)	Supp Time (min)	Paved Length (m)	Grass Length (m)	Supp Length (m)	Paved Slope(%) %	Grass Slope %	Supp Slope %	Paved Rough	Grass Rough	Supp Rough	Lag Time or Factor	Gutter Length (m)	Gutter Slope %	Gutter FlowFactor
CAT4	OUT4	2.32	65	35	0	5	0	0	190	190	0	3.2	3.2	0	0.012	0.17	0	0			
CAT5	OUT5	0.39	65	35	0	5	0	0	40	40	0	7.5	7.5	0	0.012	0.17	0	0			
CAT1	Basin1	4.49	50	50	0	5	0	0	420	420	0	4.8	4.8	0	0.012	0.17	0	0			
CAT2	Basin2	12.94	65	35	0	5	0	0	480	480	0	5.6	5.6	0	0.012	0.17	0	0			
CAT3	Basin3	5.4	65	35	0	5	0	0	500	500	0	5.2	5.2	0	0.012	0.17	0	0			

PIPE DETAILS

Name	From	To	Length (m)	U/S IL (m)	D/S IL (m)	Slope (%)	Type	Dia (mm)	I.D. (mm)	Rough	Pipe Is	No. Pipes	Chg From	At Chg	Chg (m)	Rl (m)	Chg (m)	RL (m)	etc (m)
B1_OUT1	Basin1	OUT1	32	58	57.25	2.34	Concrete, not under roads	225	225	0.013	NewFixed	1	Basin1	0					
B2_OUT2	Basin2	OUT2	40	54	51.5	6.25	Concrete, not under roads	375	375	0.013	NewFixed	1	Basin2	0					
B3_OUT3	Basin3	OUT3	40	54	51.5	6.25	Concrete, not under roads	150	150	0.013	NewFixed	1	Basin3	0					

DETAILS of SERVICES CROSSING PIPES

Pipe	Chg (m)	Bottom Elev (m)	Height of Service (m)	Chg (m)	Bottom Elev (m)	Height of Service (m)	Chg (m)	Bottom Elev (m)	Height of Service (m)	etc etc

CHANNEL DETAILS

Name	From	To	Type	Length (m)	U/S IL (m)	D/S IL (m)	Slope (%)	Base Width (m)	L.B. Slope (1:?)	R.B. Slope (1:?)	Manning n	Depth (m)	Roofed

OVERFLOW ROUTE DETAILS

Name	From	To	Travel Time (min)	Spill Level (m)	Crest Length (m)	Weir Coeff. C	Cross Section	Safe Depth Major Storms (m)	SafeDepth Minor Storms (m)	Safe DxV (sq.m/sec)	Bed Slope (%)	D/S Area Contributing %	id
OF1	Basin1	OUT1	0.3	59.2	3	1.6	OF1	0.9	0.9	0.4	1	0	53
OF2	Basin2	OUT2	0.3	55.02	13	1.6	OF2	0.9	0.9	0.4	1	0	55
OF3	Basin3	OUT3	0.3	55.1	4	1.6	OF3	0.9	0.9	0.4	1	0	67

20110216_BRIDGMAN RIDGE POST DEVELOPMENT RESULTS

DRAINS results prepared 25 October, 2011 from Version 2011.06

PIT / NODE DETAILS

Name	Max HGL	Max Pond HGL	Max Surface Flow Arriving (cu.m/s)	Version 8 Max Pond Volume (cu.m)	Min Freeboard (m)	Overflow (cu.m/s)	Constraint
OUT1	57.4		0				
OUT2	51.69		0				
OUT3	51.61		0				

SUB-CATCHMENT DETAILS

Name	Max Flow Q (cu.m/s)	Paved Max Q (cu.m/s)	Grassed Max Q (cu.m/s)	Paved Tc (min)	Grassed Tc (min)	Supp. Tc (min)	Due to Storm
CAT4	0.194	0.194	0	12.68	37.69	0	AR&R 1 year, 20 minutes storm, average 35.3 mm/h, Zone 1
CAT5	0.039	0.039	0	7.45	12.01	0	AR&R 1 year, 25 minutes storm, average 31.4 mm/h, Zone 1
CAT1	0.247	0.247	0	16.47	56.29	0	AR&R 1 year, 25 minutes storm, average 31.4 mm/h, Zone 1
CAT2	0.91	0.91	0	16.87	58.23	0	AR&R 1 year, 25 minutes storm, average 31.4 mm/h, Zone 1
CAT3	0.372	0.372	0	17.44	61.02	0	AR&R 1 year, 25 minutes storm, average 31.4 mm/h, Zone 1

Outflow Volumes for Total Catchment (15.9 impervious + 9.61 pervious = 25.5 total ha)

Storm	Total Rainfall cu.m	Total Runoff cu.m (Runoff %)	Impervious Runoff cu.m (Runoff %)	Pervious Runoff cu.m (Runoff %)
AR&R 1 year, 5 minutes storm, average 64 mm/h, Zone 1	1362.13	690.19 (50.7%)	690.19 (81.3%)	0.00 (0.0%)
AR&R 1 year, 10 minutes storm, average 48.6 mm/h, Zone 1	2068.74	1130.85 (54.7%)	1130.85 (87.7%)	0.00 (0.0%)
AR&R 1 year, 15 minutes storm, average 40.5 mm/h, Zone 1	2585.93	1453.38 (56.2%)	1453.38 (90.1%)	0.00 (0.0%)
AR&R 1 year, 20 minutes storm, average 35.3 mm/h, Zone 1	3005.21	1714.86 (57.1%)	1714.86 (91.5%)	0.00 (0.0%)
AR&R 1 year, 25 minutes storm, average 31.4 mm/h, Zone 1	3341.48	1924.58 (57.6%)	1924.58 (92.4%)	0.00 (0.0%)
AR&R 1 year, 30 minutes storm, average 28.6 mm/h, Zone 1	3652.22	2118.36 (58.0%)	2118.36 (93.0%)	0.00 (0.0%)
AR&R 1 year, 45 minutes storm, average 22.8 mm/h, Zone 1	4367.34	2564.33 (58.7%)	2564.33 (94.2%)	0.00 (0.0%)
AR&R 1 year, 1 hour storm, average 19.3 mm/h, Zone 1	4929.22	2914.73 (59.1%)	2914.73 (94.8%)	0.00 (0.0%)
AR&R 1 year, 1.5 hours storm, average 14.9 mm/h, Zone 1	5708.19	3400.52 (59.6%)	3400.52 (95.5%)	0.00 (0.0%)
AR&R 1 year, 2 hours storm, average 12.4 mm/h, Zone 1	6333.92	3790.74 (59.8%)	3790.74 (96.0%)	0.00 (0.0%)
AR&R 1 year, 3 hours storm, average 9.51 mm/h, Zone 1	7286.56	4384.84 (60.2%)	4384.84 (96.5%)	0.00 (0.0%)
AR&R 1 year, 4.5 hours storm, average 7.28 mm/h, Zone 1	8366.9	5058.57 (60.5%)	5058.57 (96.9%)	0.00 (0.0%)

PIPE DETAILS

Name	Max Q (cu.m/s)	Max V (m/s)	Max U/S HGL (m)	Max D/S HGL (m)	Due to Storm
B1_OUT1	0.056	1.93	58.154	57.404	AR&R 1 year, 2 hours storm, average 12.4 mm/h, Zone 1
B2_OUT2	0.219	3.97	54.188	51.688	AR&R 1 year, 2 hours storm, average 12.4 mm/h, Zone 1
B3_OUT3	0.032	2.41	54.105	51.605	AR&R 1 year, 4.5 hours storm, average 7.28 mm/h, Zone 1

CHANNEL DETAILS

Name	Max Q (cu.m/s)	Max V (m/s)	Due to Storm

OVERFLOW ROUTE DETAILS

Name	Max Q U/S	Max Q D/S	Safe Q	Max D	Max DxV	Max Width	Max V	Due to Storm
OF1	0	0	1.324	0	0	0	0	
OF2	0	0	5.296	0	0	0	0	
OF3	0	0	1.729	0	0	0	0	

DETENTION BASIN DETAILS

Name	Max WL	MaxVol	Max Q Total	Max Q Low Level	Max Q High Level
Basin1	58.4	234.8	0.056	0.056	0
Basin2	54.77	899.2	0.219	0.219	0
Basin3	54.55	551.7	0.032	0.032	0

CONTINUITY CHECK for AR&R 1 year, 25 minutes storm, average 31.4 mm/h, Zone 1

Node	Inflow (cu.m)	Outflow (cu.m)	Storage Change (cu.m)	Difference %
OUT4	182.22	182.22	0	0
OUT5	30.63	30.63	0	0
Basin1	271.27	186.54	40.79	16.2
OUT1	186.54	186.54	0	0
Basin2	1016.33	785.41	109.26	12
OUT2	785.41	785.41	0	0
Basin3	424.13	133.39	327.64	-8.7
OUT3	133.39	133.39	0	0

Run Log for 20110216_POSTDEV_20111020 run at 17:02:24 on 25/10/2011

DRAINS results prepared 25 October, 2011 from Version 2011.06

PIT / NODE DETAILS

Version 8

Name	Max HGL	Max Pond HGL	Max Surface Flow Arriving (cu.m/s)	Max Pond Volume (cu.m)	Min Freeboard (m)	Overflow (cu.m/s)	Constraint
OUT1	57.47		0				
OUT2	51.72		0.932				
OUT3	51.65		0.047				

SUB-CATCHMENT DETAILS

Name	Max Flow Q (cu.m/s)	Paved Max Q (cu.m/s)	Grassed Max Q (cu.m/s)	Paved Tc (min)	Grassed Tc (min)	Supp. Tc (min)	Due to Storm
CAT4	0.436	0.399	0.037	10.91	29	0	AR&R 10 year, 20 minutes storm, average 68 mm/h, Zone 1
CAT5	0.096	0.076	0.021	6.89	9.27	0	AR&R 10 year, 25 minutes storm, average 60 mm/h, Zone 1
CAT1	0.615	0.543	0.072	13.42	41.32	0	AR&R 10 year, 20 minutes storm, average 68 mm/h, Zone 1
CAT2	2.158	2.018	0.139	13.71	42.75	0	AR&R 10 year, 20 minutes storm, average 68 mm/h, Zone 1
CAT3	0.881	0.826	0.056	14.13	44.79	0	AR&R 10 year, 20 minutes storm, average 68 mm/h, Zone 1

Outflow Volumes for Total Catchment (15.9 impervious + 9.61 pervious = 25.5 total ha)

Storm	Total Rainfall cu.m	Total Runoff cu.m (Runoff %)	Impervious Runoff cu.m (Runoff %)	Pervious Runoff cu.m (Runoff %)
AR&R 10 year, 5 minutes storm, average 127 mm/h, Zone 1	2702.98	1542.77 (57.1%)	1526.39 (90.6%)	16.38 (1.6%)
AR&R 10 year, 10 minutes storm, average 95 mm/h, Zone 1	4043.83	2483.78 (61.4%)	2362.58 (93.7%)	121.20 (8.0%)
AR&R 10 year, 15 minutes storm, average 79 mm/h, Zone 1	5044.15	3264.22 (64.7%)	2986.41 (94.9%)	277.81 (14.6%)
AR&R 10 year, 20 minutes storm, average 68 mm/h, Zone 1	5789.07	3879.68 (67.0%)	3450.96 (95.6%)	428.72 (19.7%)
AR&R 10 year, 30 minutes storm, average 54 mm/h, Zone 1	6895.8	4789.66 (69.5%)	4141.15 (96.3%)	648.51 (25.0%)
AR&R 10 year, 45 minutes storm, average 42.9 mm/h, Zone 1	8217.49	5860.49 (71.3%)	4965.40 (96.9%)	895.09 (28.9%)
AR&R 10 year, 1 hour storm, average 36 mm/h, Zone 1	9194.4	6664.07 (72.5%)	5574.63 (97.2%)	1089.45 (31.5%)
AR&R 10 year, 1.5 hours storm, average 27.9 mm/h, Zone 1	10688.49	7805.75 (73.0%)	6506.39 (97.6%)	1299.36 (32.3%)
AR&R 10 year, 2 hours storm, average 23.3 mm/h, Zone 1	11901.64	8717.01 (73.2%)	7262.94 (97.9%)	1454.07 (32.5%)
AR&R 10 year, 3 hours storm, average 17.9 mm/h, Zone 1	13714.98	10056.00 (73.3%)	8393.78 (98.1%)	1662.23 (32.2%)
AR&R 10 year, 25 minutes storm, average 60 mm/h, Zone 1	6385	4378.57 (68.6%)	3822.60 (96.0%)	555.96 (23.1%)
AR&R 10 year, 4.5 hours storm, average 13.8 mm/h, Zone 1	15860.34	11478.52 (72.4%)	9731.71 (98.4%)	1746.81 (29.3%)

PIPE DETAILS

Name	Max Q (cu.m/s)	Max V (m/s)	Max U/S HGL (m)	Max D/S HGL (m)	Due to Storm
B1_OUT1	0.084	2.13	58.573	57.467	AR&R 10 year, 3 hours storm, average 17.9 mm/h, Zone 1
B2_OUT2	0.282	4.21	54.219	51.719	AR&R 10 year, 2 hours storm, average 23.3 mm/h, Zone 1
B3_OUT3	0.042	2.39	54.701	51.65	AR&R 10 year, 4.5 hours storm, average 13.8 mm/h, Zone 1

CHANNEL DETAILS

Name	Max Q (cu.m/s)	Max V (m/s)	Due to Storm

OVERFLOW ROUTE DETAILS

Name	Max Q U/S	Max Q D/S	Safe Q	Max D	Max DxV	Max Width	Max V	Due to Storm
OF1	0	0	1.324	0	0	0	0	
OF2	0.932	0.932	5.296	0.096	0.07	13.19	0.74	s storm, average 23.3 mm/h, Zone 1
OF3	0.047	0.047	1.729	0.033	0.01	4.07	0.35	rs storm, average 13.8 mm/h, Zone 1

DETENTION BASIN DETAILS

Name	Max WL	MaxVol	Max Q Total	Max Q Low Level	Max Q High Level
Basin1	58.91	742.8	0.084	0.084	0
Basin2	55.15	1547.1	1.214	0.282	0.932
Basin3	55.14	1518.6	0.089	0.042	0.047

CONTINUITY CHECK for AR&R 10 year, 25 minutes storm, average 60 mm/h, Zone 1

Node	Inflow (cu.m)	Outflow (cu.m)	Storage Change (cu.m)	Difference %
OUT4	418.33	418.33	0	0
OUT5	72.42	72.42	0	0
Basin1	668.25	403.75	125.85	20.7
OUT1	403.75	403.75	0	0
Basin2	2274.1	1703.47	158.48	18.1
OUT2	1703.47	1703.47	0	0
Basin3	945.47	210.92	1145.52	-43.5
OUT3	210.92	210.92	0	0

Run Log for 20110216_POSTDEV_20111020 run at 17:02:24 on 25/10/2011

DRAINS results prepared 25 October, 2011 from Version 2011.06

PIT / NODE DETAILS

Version 8

Name	Max HGL	Max Pond HGL	Max Surface Flow Arriving (cu.m/s)	Max Pond Volume (cu.m)	Min Freeboard (m)	Overflow (cu.m/s)	Constraint

OUT1	57.47	0	
OUT2	51.72	1.386	
OUT3	51.65	0.138	

SUB-CATCHMENT DETAILS

Name	Max Flow Q (cu.m/s)	Paved Max Q (cu.m/s)	Grassed Max Q (cu.m/s)	Paved Tc (min)	Grassed Tc (min)	Supp. Tc (min)	Due to Storm
CAT4	0.527	0.472	0.06	10.84	28.66	0	AR&R 20 year, 25 minutes storm, average 70 mm/h, Zone 1
CAT5	0.119	0.089	0.03	6.78	8.72	0	AR&R 20 year, 25 minutes storm, average 70 mm/h, Zone 1
CAT1	0.749	0.641	0.111	12.93	38.92	0	AR&R 20 year, 20 minutes storm, average 79 mm/h, Zone 1
CAT2	2.592	2.381	0.217	13.21	40.26	0	AR&R 20 year, 20 minutes storm, average 79 mm/h, Zone 1
CAT3	1.066	0.982	0.086	13.6	42.19	0	AR&R 20 year, 20 minutes storm, average 79 mm/h, Zone 1

Outflow Volumes for Total Catchment (15.9 impervious + 9.61 pervious = 25.5 total ha)

Storm	Total Rainfall cu.m	Total Runoff cu.m (Runoff %)	Impervious Runoff cu.m (Runoff %)	Pervious Runoff cu.m (Runoff %)
AR&R 20 year, 5 minutes storm, average 149 mm/h, Zone 1	3171.22	1882.61 (59.4%)	1818.39 (91.9%)	64.22 (5.4%)
AR&R 20 year, 10 minutes storm, average 112 mm/h, Zone 1	4767.47	3124.86 (65.5%)	2813.86 (94.6%)	311.00 (17.3%)
AR&R 20 year, 15 minutes storm, average 92 mm/h, Zone 1	5874.2	4085.71 (69.6%)	3504.05 (95.7%)	581.66 (26.3%)
AR&R 20 year, 20 minutes storm, average 79 mm/h, Zone 1	6725.53	4822.53 (71.7%)	4034.97 (96.2%)	787.55 (31.1%)
AR&R 20 year, 25 minutes storm, average 70 mm/h, Zone 1	7449.17	5448.85 (73.1%)	4486.25 (96.6%)	962.60 (34.3%)
AR&R 20 year, 30 minutes storm, average 63 mm/h, Zone 1	8045.1	5934.15 (73.8%)	4857.89 (96.8%)	1076.26 (35.5%)
AR&R 20 year, 45 minutes storm, average 49.6 mm/h, Zone 1	9500.88	7126.16 (75.0%)	5765.75 (97.3%)	1360.41 (38.0%)
AR&R 20 year, 1 hour storm, average 41.6 mm/h, Zone 1	10624.64	8072.31 (76.0%)	6466.56 (97.6%)	1605.75 (40.2%)
AR&R 20 year, 2 hours storm, average 26.9 mm/h, Zone 1	13740.52	10518.53 (76.6%)	8409.71 (98.1%)	2108.82 (40.8%)
AR&R 20 year, 3 hours storm, average 20.7 mm/h, Zone 1	15860.34	12162.71 (76.7%)	9731.73 (98.4%)	2430.98 (40.7%)
AR&R 20 year, 1.5 hours storm, average 32.3 mm/h, Zone 1	12374.13	9461.51 (76.5%)	7557.60 (97.9%)	1903.91 (40.9%)
AR&R 20 year, 4.5 hours storm, average 16 mm/h, Zone 1	18388.8	13949.59 (75.9%)	11308.56 (98.6%)	2641.03 (38.2%)

PIPE DETAILS

Name	Max Q (cu.m/s)	Max V (m/s)	Max U/S HGL (m)	Max D/S HGL (m)	Due to Storm
B1_OUT1	0.089	2.25	58.717	57.47	AR&R 20 year, 3 hours storm, average 20.7 mm/h, Zone 1
B2_OUT2	0.288	4.23	54.222	51.722	AR&R 20 year, 1 hour storm, average 41.6 mm/h, Zone 1
B3_OUT3	0.042	2.4	54.736	51.65	AR&R 20 year, 4.5 hours storm, average 16 mm/h, Zone 1

CHANNEL DETAILS

Name	Max Q (cu.m/s)	Max V (m/s)	Due to Storm

OVERFLOW ROUTE DETAILS

Name	Max Q U/S	Max Q D/S	Safe Q	Max D	Max DxV	Max Width	Max V	Due to Storm
OF1	0	0	1.324	0	0	0	0	
OF2	1.386	1.386	5.296	0.122	0.11	13.24	0.87	storm, average 41.6 mm/h, Zone 1
OF3	0.138	0.138	1.729	0.062	0.03	4.12	0.55	rs storm, average 16 mm/h, Zone 1

DETENTION BASIN DETAILS

Name	Max WL	MaxVol	Max Q Total	Max Q Low Level	Max Q High Level
Basin1	59.1	1000.5	0.089	0.089	0
Basin2	55.18	1621.3	1.674	0.288	1.386
Basin3	55.18	1600	0.18	0.042	0.138

CONTINUITY CHECK for AR&R 20 year, 20 minutes storm, average 79 mm/h, Zone 1

Node	Inflow (cu.m)	Outflow (cu.m)	Storage Change (cu.m)	Difference %
OUT4	457.81	457.81	0	0
OUT5	79.61	79.61	0	0
Basin1	752.19	437.3	291.87	3.1
OUT1	437.3	437.3	0	0
Basin2	2495.25	1960.86	168.25	14.7
OUT2	1960.86	1960.86	0	0
Basin3	1037.66	226.04	1152.86	-32.9
OUT3	226.04	226.04	0	0

Run Log for 20110216_POSTDEV_20111020 run at 17:02:24 on 25/10/2011

DRAINS results prepared 25 October, 2011 from Version 2011.06

PIT / NODE DETAILS

Name	Max HGL	Max Pond HGL	Max Surface Flow Arriving (cu.m/s)	Version 8 Max Pond Volume (cu.m)	Min Freeboard (m)	Overflow (cu.m/s)	Constraint
OUT1	57.47		0.167				
OUT2	51.73		2.293				
OUT3	51.65		0.36				

SUB-CATCHMENT DETAILS

Name	Max Flow Q (cu.m/s)	Paved Max Q (cu.m/s)	Grassed Max Q (cu.m/s)	Paved Tc (min)	Grassed Tc (min)	Supp. Tc (min)	Due to Storm
CAT4	0.726	0.621	0.115	9.95	24.28	0	AR&R 100 year, 20 minutes storm, average 106 mm/h, Zone 1
CAT5	0.159	0.114	0.047	6.42	6.96	0	AR&R 100 year, 15 minutes storm, average 123 mm/h, Zone 1
CAT1	1.061	0.858	0.222	12.05	34.6	0	AR&R 100 year, 20 minutes storm, average 106 mm/h, Zone 1
CAT2	3.586	3.19	0.433	12.3	35.79	0	AR&R 100 year, 20 minutes storm, average 106 mm/h, Zone 1
CAT3	1.475	1.317	0.173	12.64	37.5	0	AR&R 100 year, 20 minutes storm, average 106 mm/h, Zone 1

Outflow Volumes for Total Catchment (15.9 impervious + 9.61 pervious = 25.5 total ha)

Storm	Total Rainfall cu.m	Total Runoff cu.m (Runoff %)	Impervious Runoff cu.m (Runoff %)	Pervious Runoff cu.m (Runoff %)
AR&R 100 year, 5 minutes storm, average 202 mm/h, Zone 1	4299.23	2859.34 (66.5%)	2521.86 (94.1%)	337.49 (20.9%)
AR&R 100 year, 10 minutes storm, average 151 mm/h, Zone 1	6427.57	4788.97 (74.5%)	3849.15 (96.0%)	939.82 (38.8%)
AR&R 100 year, 15 minutes storm, average 123 mm/h, Zone 1	7853.55	6076.78 (77.4%)	4738.43 (96.7%)	1338.35 (45.3%)
AR&R 100 year, 20 minutes storm, average 106 mm/h, Zone 1	9024.13	7124.02 (78.9%)	5468.45 (97.2%)	1655.57 (48.7%)
AR&R 100 year, 25 minutes storm, average 93 mm/h, Zone 1	9896.75	7872.43 (79.5%)	6012.63 (97.4%)	1859.80 (49.9%)
AR&R 100 year, 30 minutes storm, average 84 mm/h, Zone 1	10726.8	8577.09 (80.0%)	6530.28 (97.6%)	2046.81 (50.7%)
AR&R 100 year, 45 minutes storm, average 66 mm/h, Zone 1	12642.3	10219.03 (80.8%)	7724.84 (98.0%)	2494.19 (52.4%)
AR&R 100 year, 1 hour storm, average 55 mm/h, Zone 1	14047	11430.36 (81.4%)	8600.85 (98.2%)	2829.51 (53.5%)
AR&R 100 year, 1.5 hours storm, average 42.6 mm/h, Zone 1	16320.06	13339.98 (81.7%)	10018.40 (98.4%)	3321.57 (54.1%)
AR&R 100 year, 2 hours storm, average 35.5 mm/h, Zone 1	18133.4	14830.82 (81.8%)	11149.24 (98.6%)	3681.58 (53.9%)
AR&R 100 year, 3 hours storm, average 27.4 mm/h, Zone 1	20993.88	17188.73 (81.9%)	12933.13 (98.8%)	4255.60 (53.9%)
AR&R 100 year, 4.5 hours storm, average 21.2 mm/h, Zone 1	24365.16	19808.13 (81.3%)	15035.58 (99.0%)	4772.56 (52.0%)

PIPE DETAILS

Name	Max Q (cu.m/s)	Max V (m/s)	Max U/S HGL (m)	Max D/S HGL (m)	Due to Storm
B1_OUT1	0.094	2.38	58.877	57.473	AR&R 100 year, 2 hours storm, average 35.5 mm/h, Zone 1
B2_OUT2	0.298	4.26	54.227	51.727	AR&R 100 year, 20 minutes storm, average 106 mm/h, Zone 1
B3_OUT3	0.043	2.43	54.796	51.65	AR&R 100 year, 2 hours storm, average 35.5 mm/h, Zone 1

CHANNEL DETAILS

Name	Max Q (cu.m/s)	Max V (m/s)	Due to Storm

OVERFLOW ROUTE DETAILS

Name	Max Q U/S	Max Q D/S	Safe Q	Max D	Max DxV	Max Width	Max V	Due to Storm
OF1	0.167	0.167	1.324	0.083	0.05	3.17	0.66	rs storm, average 35.5 mm/h, Zone 1
OF2	2.293	2.293	5.296	0.165	0.17	13.33	1.06	ites storm, average 106 mm/h, Zone 1
OF3	0.36	0.36	1.729	0.11	0.09	4.22	0.8	rs storm, average 35.5 mm/h, Zone 1

DETENTION BASIN DETAILS

Name	Max WL	MaxVol	Max Q Total	Max Q Low Level	Max Q High Level
Basin1	59.31	1336.7	0.262	0.094	0.167
Basin2	55.25	1752.6	2.591	0.298	2.293
Basin3	55.25	1747.9	0.403	0.043	0.36

CONTINUITY CHECK for AR&R 100 year, 20 minutes storm, average 106 mm/h, Zone 1

Node	Inflow (cu.m)	Outflow (cu.m)	Storage Change (cu.m)	Difference %
OUT4	666.23	666.23	0	0
OUT5	114.26	114.26	0	0
Basin1	1156.98	501.36	507.52	12.8
OUT1	501.36	501.36	0	0
Basin2	3661.69	3085.03	184.69	10.7
OUT2	3085.03	3085.03	0	0
Basin3	1524.85	248.36	1169.49	7
OUT3	248.36	248.36	0	0

Run Log for 20110216_POSTDEV_20111020 run at 17:02:24 on 25/10/2011

Note: These "Detailed Calculation" spreadsheets relate only to high erosion hazard lands as identified in figure 4.6 or where the designer chooses to use the RUSLE to size sediment basins. The "Standard Calculation" spreadsheets should be used on low erosion hazard lands as identified by figure 4.6 and where the designer chooses not to run the RUSLE in calculations.

1. Site Data Sheet

Site Name: **20110216 - BRIDGMAN RIDGE ESTATE - SINGLETON HEIGHTS NSW**

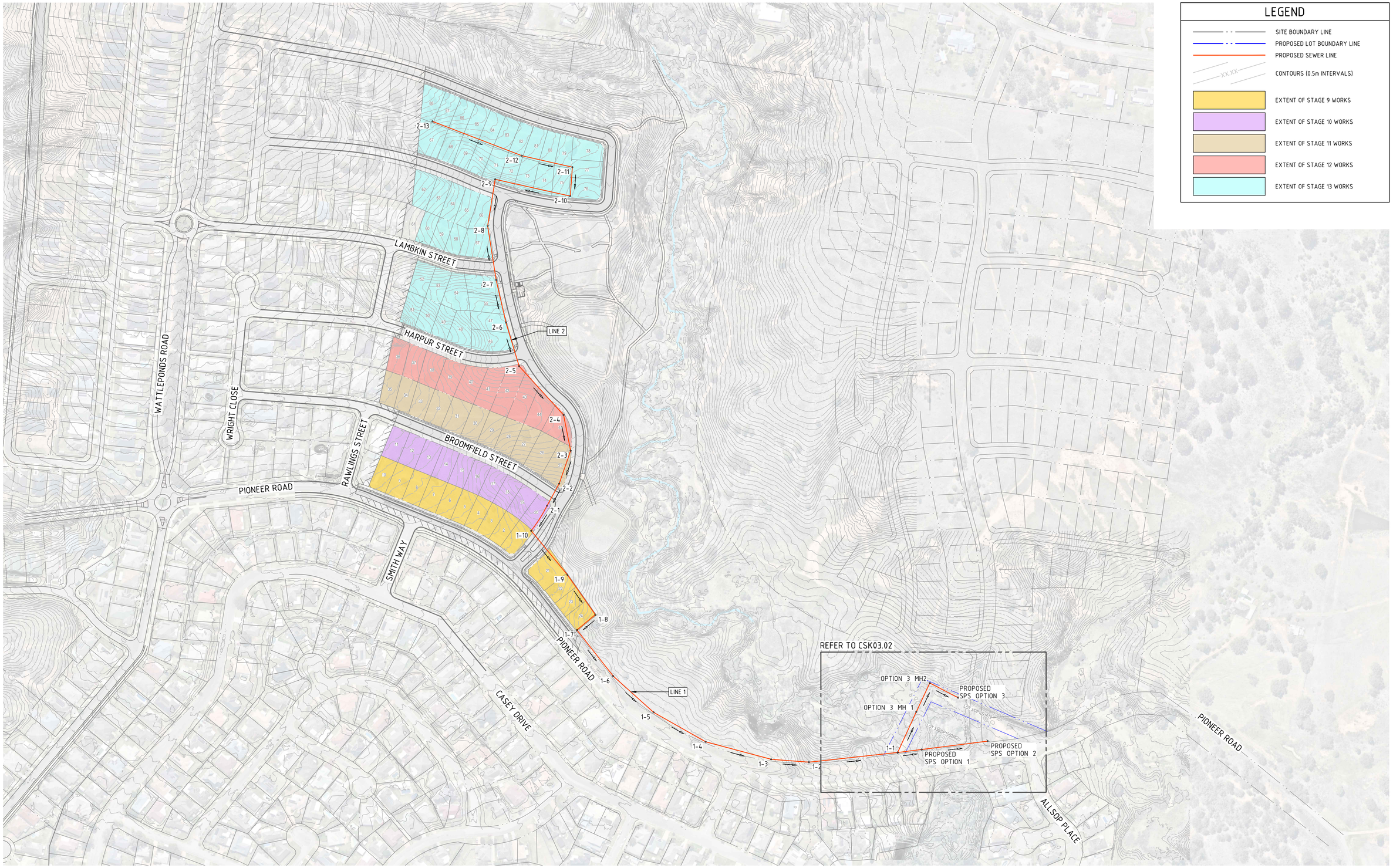
Site Location: **HUNTER - UPPER**

Precinct: Stages 3, 6 and 9-14

Description of Site: Existing Paddocks with Watercourse- Proposed Subdivision. "Max" indicates the maximum area for this site which can be disturbed without requiring a basin by the RUSLE method.

Site area	Site						Remarks
	1	2	3	Max 1	Max 2	Max 3	
Total catchment area (ha)	4.49	12.94	5.40	4.49	12.94	5.40	
Disturbed catchment area (ha)	4.49	12.94	5.40	1.79	1.29	1.29	
Soil analysis							
% sand (faction 0.02 to 2.00 mm	5	5	5	5	5	5	Soil texture should be assessed through mechanical dispersion only. Dispersing agents (e.g. Calgon) should not be used
% silt (fraction 0.002 to 0.02 mm)	10	10	10	10	10	10	
% clay (fraction finer than 0.002 mm)	85	85	85	85	85	85	
Dispersion percentage	10.0	10.0	10.0	10.0	10.0	10.0	E.g. enter 10 for dispersion of 10%
% of whole soil dispersible	9	9	9	9	9	9	See Section 6.3.3(e)
Soil Texture Group	F	F	F	F	F	F	See Section 6.3.3(c), (d) and (e)
Rainfall data							
Design rainfall depth (days)	5	5	5	5	5	5	See Sections 6.3.4 (d) and (e)
Design rainfall depth (percentile)	75	75	75	75	75	75	See Sections 6.3.4 (f) and (g)
x-day, y-percentile rainfall event	19	19	19	19	19	19	See Section 6.3.4 (h)
Rainfall intensity: 2-year, 6-hour storm	7.5	7.5	7.5	7.5	7.5	7.5	See IFD chart for the site
RUSLE Factors							
Rainfall erosivity (*R*-factor)	1390	1390	1390	1390	1390	1390	Automatic calculation from above data
Soil erodibility (*K*-factor)	0.033	0.033	0.033	0.033	0.033	0.033	RUSLE data can be obtained from Appendixes A, B and C
Slope length (m)	500	600	500	500	600	500	
Slope gradient (%)	4.8	5.6	5.2	4.8	5.6	5.2	
Length/gradient (*LS*-factor)	1.82	2.53	2.53	1.82	2.53	2.53	
Erosion control practice (*P*-factor)	1.3	1.3	1.3	1.3	1.3	1.3	
Ground cover (*C*-factor)	1	1	1	1	1	1	
Calculations							
Soil loss (t/ha/yr)	109	151	151	109	151	151	
Soil Loss Class	2	2	2	2	2	2	See Section 4.4.2(b)
Soil loss (m^3/ha/yr)	83	116	116	83	116	116	
Sediment basin storage volume, m^3	64	255	107	0	0	0	See Sections 6.3.4(i) and 6.3.5 (e)

Appendix B: Sewer Servicing Strategy



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SCALE 1:2000@ A1 — 0 20 40 60 80 100m

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PROJECT: **PROPOSED SUBDIVISION**

BRIDGMAN RIDGE
SINGLETON, NSW 2330

DRAWING TITLE: **CIVIL SKETCH**

PROPOSED SEWER SERVICING OVERALL PLAN

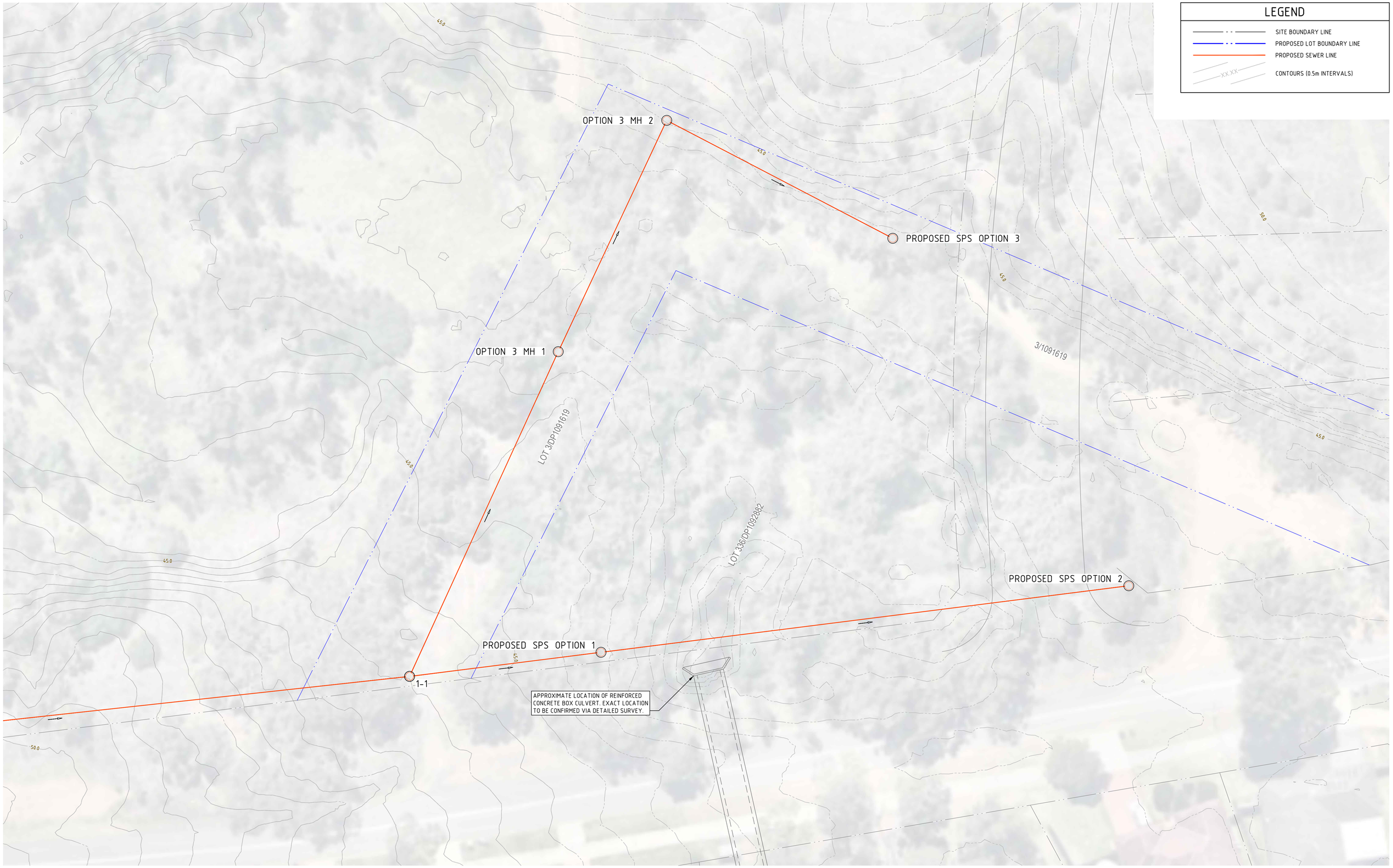
JOB NUMBER: **NL233144**

DRAWING NUMBER: **CSK03.01**

REVISION: **A**

DRAWING SHEET SIZE = A1

Date : 01.08.2024 2:38 PM Plotted By : DIMITRI MAVROUDIS Found : Y:\YEAR 2023 Jobs\NL233144 - Bridgman Ridge Stages 9-14\O - Drawings\CIVIL\02-SKETCH\CSK03.01 - SEWER SERVICING\NL233144-CSK03.01-SEWER SERVICING.dwg



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SCALE 1:250@ A1 — 0 2.5 5 7.5 10 12.5m

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PROJECT: **PROPOSED SUBDIVISION**

BRIDGMAN RIDGE
SINGLETON, NSW 2330

DRAWING TITLE: **CIVIL SKETCH**

PROPOSED SEWER SERVICING AND SEWER PUMP STATION OPTIONS

JOB NUMBER: **NL233144**

DRAWING NUMBER: **CSK03.02**

REVISION: **A**

DRAWING SHEET SIZE = A1

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	Option 1 JOINS	Pit Angle 11°	Pit Angle 11°	Pit Angle 15°	Pit Angle 12°	Pit Angle 10°	Pit Angle 88°	Pit Angle -85°	Pit Angle -4°	2 JOINS Angle 77°
STRUCTURE NAME	1-1	1-2	1-3	1-4	1-5	1-6	1-7	1-8	1-9	1-10
STRUCTURE TYPE										
TENURE										
PIPE SIZE	150-UPVC	150-UPVC	150-UPVC	150-UPVC	150-UPVC	150-UPVC	150-UPVC	150-UPVC	150-UPVC	
GRADE	5.25%	5.74%	0.50%	0.50%	0.50%	0.50%	0.50%	3.17%	0.50%	
BEDDING TYPE										
BULKHEAD SPACING										
DATUM R.L.	22.0	99.31	42.20	75.32	66.63	60.34	65.24	26.61	54.19	63.40
DEPTH TO INVERT	1.375	1.385	3.285	3.830	4.165	4.205	3.465	1.555	3.585	3.640
	1.325	1.270	3.255	3.800	4.135	4.175	3.385	1.475	3.555	
INVERT LEVEL	44.615	49.875	52.405	52.815	53.175	53.510	53.865	54.080	55.880	56.225
	44.665	49.985	52.435	52.845	53.205	53.540	53.945	54.160	55.910	
FINISHED SURFACE	45.990	51.260	55.695	56.645	57.340	57.715	57.330	55.630	59.465	59.865
NATURAL SURFACE	45.990	51.260	55.695	56.645	57.340	57.715	57.330	55.630	59.465	59.865
CHAINAGE	0.000	99.305	141.510	216.825	283.455	343.790	409.025	435.635	489.825	553.225

LINE 1

HORIZONTAL SCALE 1:1000 @ A1 0 10 20 30 40 50m

VERTICAL SCALE 1:200 @ A1 0 2 4 6 8 10m

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PROJECT: **PROPOSED SUBDIVISION**

BRIDGMAN RIDGE
SINGLETON, NSW 2330

DRAWING TITLE: **CIVIL SKETCH**

LONGITUDINAL SECTIONS - SHEET 1

JOB NUMBER: **NL233144**

DRAWING NUMBER: **CSK03.03**

REVISION: **A**

DRAWING SHEET SIZE = A1

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	Option 1 JOINS	Pit Angle 2°	Pit Angle -10°	Pit Angle -30°	Pit Angle -31°	Pit Angle 26°	Pit Angle 4°	Pit Angle 4°	Pit Angle 18°	Pit Angle 93°	Pit Angle -98°	Pit Angle -81°	Pit Angle 8°	
STRUCTURE NAME	1-10	2-1	2-2	2-3	2-4	2-5	2-6	2-7	2-8	2-9	2-10	2-11	2-12	
STRUCTURE TYPE														
TENURE														
PIPE SIZE		150-UPVC	150-UPVC	150-UPVC	150-UPVC	150-UPVC	150-UPVC	150-UPVC	150-UPVC	150-UPVC	150-UPVC	150-UPVC	150-UPVC	
GRADE		0.50%	0.55%	1.90%	0.55%	0.60%	1.20%	3.82%	2.35%	0.80%	0.80%	3.56%	2.43%	
BEDDING TYPE														
BULKHEAD SPACING														
DATUM R.L.	33.0	33.00	28.02	38.82	40.41	73.58	50.62	48.63	60.98	52.33	85.60	32.29	57.81	
DEPTH TO INVERT	3.640	3.560	1.935	1.905	1.535	1.030	2.675	2.625	4.095	4.045	1.745	1.715	1.680	1.150
INVERT LEVEL	56.225	56.305	56.470	56.500	56.655	57.160	57.895	57.945	58.170	58.220	58.660	58.690	59.295	59.825
FINISHED SURFACE	59.865	59.865	58.405	58.185	58.185	58.185	60.570	60.570	62.260	62.260	60.405	60.405	60.975	60.975
NATURAL SURFACE	59.865	59.865	55.915	57.965	57.965	58.185	61.420	61.420	62.410	62.410	59.760	59.760	59.915	59.915
CHAINAGE	0.000	0.000	33.005	55.915	61.030	57.965	99.850	61.420	140.260	62.410	213.840	59.760	264.455	59.915

CHAINAGE	0.000	33.005	61.030	99.850	140.260	213.840	264.455	313.090	374.065	426.400	511.995	544.290	602.100	
FINISHED SURFACE	59.865	58.405	58.185	60.570	62.260	60.405	60.975	63.210	64.800	66.315	65.655	66.845	69.260	
INVERT LEVEL	56.225	56.470	56.655	57.895	58.170	58.660	59.295	61.685	63.145	63.595	64.360	65.590	67.205	
DEPTH TO INVERT	3.640	1.935	1.535	2.675	4.095	1.745	1.680	1.525	1.650	2.720	1.295	1.255	2.050	

LINE 2

HORIZONTAL SCALE 1:1000 @ A1 0 10 20 30 40 50m

VERTICAL SCALE 1:200 @ A1 0 2 4 6 8 10m

VERIFIER: X.XXXX

JOB MANAGER: LMCRAE

DESIGNED: CDAO

DRAWN: JSTAUB

NOT FOR CONSTRUCTION

REVISION	DESCRIPTION	ISSUED	VER'D	APP'D	DATE
A	ISSUED FOR INFORMATION	DM	LM	CD	01.08.24

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PROJECT: **PROPOSED SUBDIVISION**

BRIDGMAN RIDGE
SINGLETON, NSW 2330

DRAWING TITLE: **CIVIL SKETCH**

LONGITUDINAL SECTIONS - SHEET 2

JOB NUMBER: **NL233144**

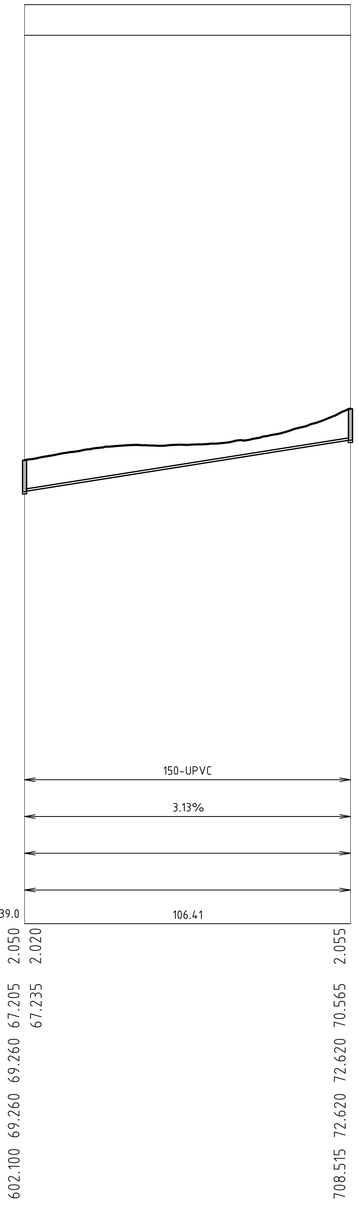
DRAWING NUMBER: **CSK03.04**

REVISION: **A**

DRAWING SHEET SIZE = A1

Date : 01.08.2024 2:38 PM Plotted By : DIMITRI MAVROUDIS Found : Y:\YEAR 2023 Jobs\NL233144 - Bridgman Ridge Stages 9-14\O - Drawings\CIVIL\02-SKETCH\CSK03.01 - SEWER SERVICING\NL233144-CSK03.01-SEWER SERVICING.dwg

STRUCTURE NAME	2-12	2-13
STRUCTURE TYPE	Pit Angle 8°	
TENURE		



PIPE SIZE	150-UPVC	
GRADE	3.13%	
BEDDING TYPE		
BULKHEAD SPACING		
DATUM R.L.	39.0	106.41
DEPTH TO INVERT	2.050	2.020 2.055
INVERT LEVEL	67.205	67.235 70.565
FINISHED SURFACE	69.260	72.620 72.620
NATURAL SURFACE	69.260	72.620 72.620
CHAINAGE	602.100	708.515

LINE 2

VERIFIER: X.XXXX
JOB MANAGER: LMCRAE
DESIGNED: CDAO
DRAWN: JSTAUB

HORIZONTAL SCALE 1:1000 @ A1 0 10 20 30 40 50m

VERTICAL SCALE 1:200 @ A1 0 2 4 6 8 10m

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PROJECT: **PROPOSED SUBDIVISION**
BRIDGMAN RIDGE
SINGLETON, NSW 2330

DRAWING TITLE: **CIVIL SKETCH**
LONGITUDINAL SECTIONS - SHEET 3

JOB NUMBER: **NL233144**
DRAWING NUMBER: **CSK03.05**
REVISION: **A**
DRAWING SHEET SIZE = A1

Date : 01.08.2024 2:38 PM Plotted By : DIMITRI MAVROUDIS Found : Y:\YEAR 2023 Jobs\NL233144 - Bridgman Ridge Stages 9-14\O - Drawings\CIVIL\02-SKETCH\CSK03.01 - SEWER SERVICING\NL233144-CSK03.01-SEWER SERVICING.dwg

STRUCTURE NAME	PROPOSED SPS OPTION 3	Pit Angle -92° MH 1	Pit Angle -1° MH 2	Option 1 JOINS Angle 59° 1-1
STRUCTURE TYPE				
TENURE				
PIPE SIZE		150-UPVC	150-UPVC	150-UPVC
GRADE		0.50%	2.00%	4.16%
BEDDING TYPE				
BULKHEAD SPACING				
DATUM R.L.	13.0	35.45	35.52	49.66
DEPTH TO INVERT	2.300	2.890	2.810	1.245	1.140	1.375
INVERT LEVEL	41.480	41.655	41.735	42.445	42.545	44.615
FINISHED SURFACE	43.775	44.545	43.690	45.990
NATURAL SURFACE	43.775	44.545	43.690	45.990
CHAINAGE	0.000	35.450	70.975	120.635

LINE Option 3

STRUCTURE NAME	SPS OPTION 2	SPS OPTION 1	Option 1 JOINS Angle 59° 1-1
PIPE SIZE		150-UPVC	150-UPVC
GRADE		0.50%	5.74%
DATUM R.L.	12.0	73.97	26.83
DEPTH TO INVERT	4.700	4.205	1.055	1.375
INVERT LEVEL	39.555	39.925	43.075	44.615
FINISHED SURFACE	44.255	44.130	45.990
NATURAL SURFACE	44.255	44.130	45.990
CHAINAGE	0.000	73.965	100.795

LINE Options 1 and 2

HORIZONTAL SCALE 1:1000 @ A1 0 10 20 30 40 50m

VERTICAL SCALE 1:200 @ A1 0 2 4 6 8 10m

DESIGNED: CDAO DRAWN: JSTAUB JOB MANAGER: LMCRAE VERIFIER: X.XXXX

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PROJECT: **PROPOSED SUBDIVISION**

BRIDGMAN RIDGE
SINGLETON, NSW 2330

DRAWING TITLE: **CIVIL SKETCH**

LONGITUDINAL SECTIONS - SHEET 4

JOB NUMBER: **NL233144**

DRAWING NUMBER: **CSK03.06**

REVISION: **A**

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