Proposed Carparking Facility at 5 Agnes Street, Agnes Waters Independent Review of Flooding and Stormwater Management

By Neil Collins

Reference: R.11278.001.00.Review of Flooding.docx
Date: September 2021
Confidential

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1 Introduction and Purpose of the Report

This report provides an independent review of flooding and stormwater management associated with a proposed new carpark at 5 Agnes Street, Agnes Water. These works were proposed in development application DA/4/2020 to Gladstone Regional Council (GRC) for a Material Change of Use for a Parking Station, made on 4 March 2020. On 8 December 2020, GRC approved the application, subject to condition.

On 20 January 2021, Peter Robinson and Paul Schubert (Appellants) filed a notice of appeal seeking that the Court refuse the development.

Figure 1-1 shows the existing Site and surrounds.

This report has been prepared by Neil Collins, an acknowledged expert in relation to flooding and stormwater matters. A copy of his CV is included in Appendix A.

Title:
Site and surrounds

Figure: 1-1

Rev: A

BMT endeavours to ensure that the information provided in this map is correct at the time of publication. BMT does not warrant, guarantee or make representations regarding the currency and accuracy of information contained in this map.

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Filepath: I:\A11278_LGML_AgnesWaterAppeal_NC\QGIS\GIS_001_210721_SiteMap.qgz

2 The Existing Site

The existing Site is adjacent to and immediately north-west of the southern intersection of Jeffery Court and Agnes Street. Over half of the Site is used for ad-hoc off-street parking of present, and those areas have previously been filled and gravelled. There are three separate existing stormwater outlets that discharge to open, man-made swale drains that flow to the north-west across the Site.

The gravelled portions of the Site are generally above RL 4mAHD, with the remainder of the Site largely above RL 3mAHD. Figure 2-1 shows the general existing terrain of the Site and surrounds. The proposed developed portion of the Site has an area of 0.312 ha.

Immediately downstream of the Site is an existing man-made lake, which forms part of the Beachouses Estate, a private, gated residential development.

There is a large catchment upstream of the Site that drains across the Site, totalling 32.4 hectares (ha). Immediately downstream of the Site, a large open drainage channel drains to the Beachouses Estate lake and this channel has a catchment area to the lake of 75.7 ha.

Hence, the area of the Site represents less than 0.3% of the total catchment draining to the lake.

The existing stormwater drainage pipe system upstream of the Site is only of very limited capacity, and during any significant flood events, stormwater is conveyed as surface flow via the roadways, with overtopping of the kerb in Agnes Street adjacent to the Site, and with shallow sheet flow across the Site.

Based on Cardno's modelling and reporting of July 2020, the existing stormwater peak flows reaching the Site, approaching the lake from the drainage channel from the west and within the lake downstream of the Site are shown in Table 2-1. The locations of these peak flow locations are shown in Figure 2-1.

Table 2-1 Estimated Existing Design Flows

Event AEP (%)	Location		
	Immediately u/s of Site (m^3/s)	From Western Channel d/s of Site (m^3/s)	Within Lake Downstream (m^3/s)
63	1.5	6.3	4.4
50	1.8	6.3	4.5
20	4.5	6.8	7.6
10	8.2	7.0	10.5
5	11.3	7.0	13.1
2	11.0	7.0	14.0
1	14.5	7.2	17.0

No stormwater quality controls exist for the Site currently, and uncontrolled discharge of sediment, gross pollutants including litter, nutrients and metals occurs from the Site.

Figure 2-1 Peak Flow Locations

3 The Proposed Carpark Facility and Associated Flood / Stormwater Management

Filling is proposed to bring the carpark finished levels up to around RL 4mAHD, on the north-western side, and to around RL 4.5m in the south-east, adjacent to Agnes Street.

The three existing open drainage swales across the Site are to be piped, with the pipe capacity equal to or larger than the existing capacity of the pipes discharging to the Site.

As is the case for the existing situation, during any significant flood events, shallow sheet flow will run across the carpark as no external trunk drainage network upgrades are proposed as part of these works, though stormwater pipes under the carpark have been designed to cater for future upgraded network flows. To ensure sediment, gross pollutants and trash, nutrients and metals in runoff from the proposed carpark are suitably managed, both proprietary litter baskets and storm filter devices are proposed. These coupled with the sealing of the carpark surface will significantly reduce pollutant loads from the Site.

Stormwater detention tanks are also proposed under the carpark, to detain runoff from the carpark and to match existing Site minor flood event run-off characteristics.

4 Development Application (DA) Assessments of Flooding and Flood Impacts and Stormwater Management

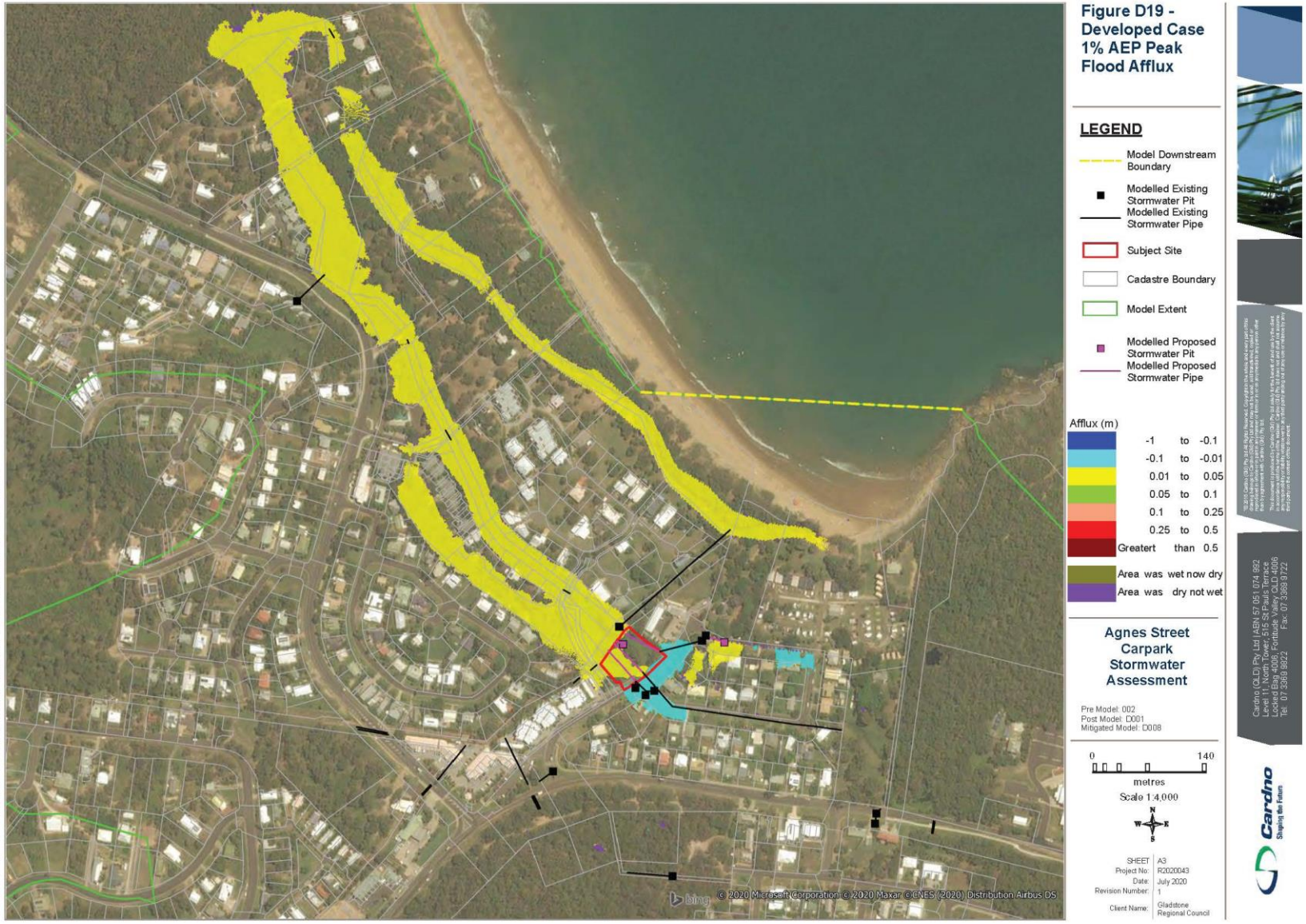
Cardno developed detailed hydrologic (rainfall / run-off) and hydraulic flood models to assess flooding and flood impacts. They also developed a stormwater quality model to assess the efficacy of the proposed treatment system, using the MUSIC software tool.

The rainfall / runoff modelling is based on the XP-RAFTS modelling system and the resultant model is complex, with 23 sub-catchments analysed. Six sub catchments covering 32.4 ha are present upstream of the Site, 10 sub catchments covering 75.7 ha drain to the drainage channel immediately west of the lake and seven sub catchments covering 84.1 ha are downstream of the Site. The resultant flows from the XP-RAFTS model were used in a TUFLOW, two-dimensional hydraulic model that accounted for both pipe and surface flow.

Flooding at the Site during significant flood events is dominated by backwater effects, due to the restricted channel capacity downstream of the Beachouses Estate lake. For this reason, the TUFLOW model developed extends to the ocean, though the Site is several metres above ocean storm tide influence.

Flood modelling was carried out for the existing and post development situations, and the associated results demonstrate that the proposed works do not result in any significant adverse off-Site flood level or velocity impacts (as demonstrated in Figure D19 reproduced below, with impact generally no greater than 1cm).

The MUSIC modelling by Cardno demonstrated load reductions over existing conditions in excess of the targets set under State Government Guidelines.



5 Critical Review of DA Assessments

5.1 Flooding

Detailed and extensive flood analysis using best practice hydrologic and two-dimensional hydraulic modelling has been carried out by Cardno. This work demonstrates that the proposed carpark will have no significant adverse impact on flooding. Based on my review, the modelling is conservative, in terms of predicted flood level impacts in any case.

It is my professional opinion that the proposed development will result in no change to flooding during significant flood events, because of the very small area of total catchment affected.

Based on my Site inspection, properties adjacent to the existing lake within the Beachhouses Estate have living areas elevated well above the 1% AEP flood level, hence, the potential for overfloor flooding impacts are minimal.

5.2 Stormwater Quantity Management

To provide a volumetric runoff match for rainfall /run-off falling over the Site, underground detention tanks with 125m^3 storage volume are proposed. These tanks control Site run-off during small, frequent run-off event, when the flow is confined to the pipe systems. They are ineffective and not needed for significant catchment rainfall/ run-off events.

5.3 Stormwater Quality Management

A comprehensive stormwater quality management system is proposed as part of the development. A combination of inlet screen and underground filter proprietary devices are proposed, for the control of trash / litter, nutrients, sediment of metals. My review concludes that, subject to suitable maintenance, these devices will achieve the desired load reduction targets over the existing situation pollutant loads, where there are no controls or captures of these pollutants.

In addition to the above, I have considered the potential for adverse water quality impacts due to acid sulphate soils, and conclude the following:

- Minimal excavation is proposed and strict testing and treatment for acid sulphate soils is a standard approval requirement.
- The existing Site has already been extensively filled and gravelled with further filing proposed.
- Any unsuitable soils will need to be removed before filling commenced.

6 Key Conclusions

Key conclusions are as follows:

(1) No significant adverse downstream flooding will result from the proposed development, as the Site represents less than 0.3% of the total catchment area flowing to the lake immediately downstream of the Site.

(2) Stormwater quality discharging from the Site will be significantly improved by the proposed development, with trash / litter, sediment, nutrients, and metals captures through the provision of treatment devices on the Site.

(3) The proposed development will not result in unacceptable impacts on stormwater management.

Appendix A Neil Collins CV

Appendix B Relevant Design Drawings

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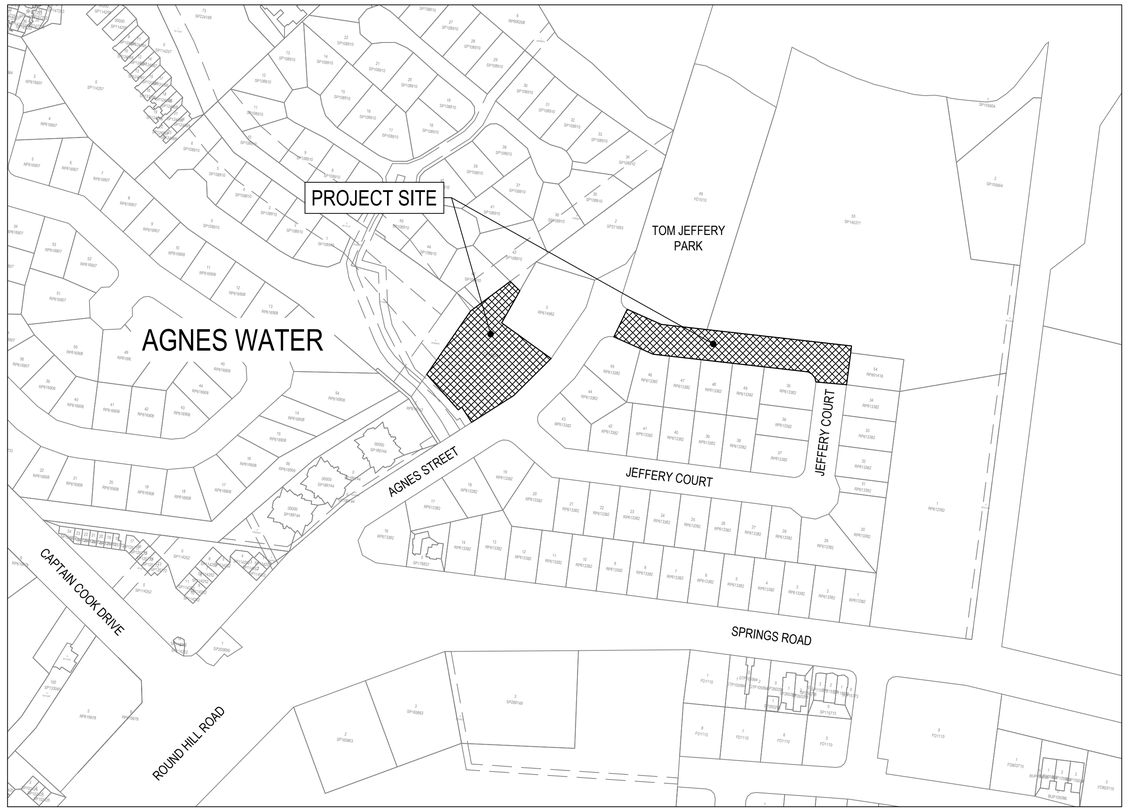
GLADSTONE REGIONAL COUNCIL

AGNES STREET AND JEFFERY COURT
AGNES WATER
PARKING DETAIL DESIGN

GLADSTONE REGIONAL COUNCIL

R2018073-CI-0000
Drawing Number

B
Revision



LOCALITY PLAN
SCALE N.T.S

SCHEDULE OF DRAWINGS

DRAWING No.	DESCRIPTION
R2018073-CI-0000	COVER SHEET
R2018073-CI-0001	LOCALITY PLAN, DRAWING SCHEDULE AND GENERAL NOTES
R2018073-CI-0100	GENERAL ARRANGEMENT PLAN
R2018073-CI-0101	TYPICAL DETAILS PLAN 1 OF 3
R2018073-CI-0103	TYPICAL DETAILS PLAN 3 OF 3
R2018073-CI-0102	TYPICAL DETAILS PLAN 2 OF 3
R2018073-CI-0110	JEFFERY COURT - CARPARK LAYOUT
R2018073-CI-0120	AGNES STREET - CARPARK LAYOUT
R2018073-CI-0121	AGNES STREET - BULK EARTHWORKS AND SETOUT PLAN
R2018073-CI-0111	JEFFERY COURT - BULK EARTHWORKS AND SETOUT PLAN
R2018073-CI-0122	STORMWATER CATCHMENT AND CALCULATIONS PLAN
R2018073-CI-0123	STORMWATER LONGITUDINAL SECTIONS
R2018073-CI-0130	SAFETY IN DESIGN PLAN
R2018073-ST-0100	STRUCTURAL NOTES
R2018073-ST-0101	DETENTION TANK LAYOUT
R2018073-ST-0102	DETENTION TANK SECTIONS AND DETAILS
R2018073-ST-0103	DETENTION TANK ROOF AND BASE SLAB REINFORCEMENT PLAN
R2018073-ST-0104	DETENTION TANK RCBC EASTERN END WALL
R2018073-SK-04	AGNES STREET AND JEFFERY COURT TURN PATH ASSESSMENT

GENERAL:

1. ALL DIMENSIONS WITHIN THIS DRAWING SET ARE IN METRES UNLESS SHOWN OTHERWISE;
2. THE CONTRACTOR SHALL VERIFY THE LOCATIONS OF ALL EXISTING SERVICES WITH THE RELEVANT AUTHORITIES BEFORE COMMENCING CONSTRUCTION. ANY COSTS ASSOCIATED WITH REPAIRING DAMAGE TO EXISTING SERVICES SHALL BE PAID FOR BY THE CONTRACTOR;
3. THE CONTRACTOR SHALL ENSURE ALL SITE SPECIFIC PERMITS ARE IN PLACE PRIOR TO COMMENCEMENT OF WORKS (PERMITS TO DISTURB, POWER LINES ETC.);
4. ALL WORK SHALL BE CARRIED OUT IN ACCORDANCE WITH CAPRICORN MUNICIPAL DEVELOPMENT GUIDELINES (C.M.D.G.) SPECIFICATIONS AND DRAWINGS UNLESS DIRECTED OTHERWISE;
5. ACCESS TO THE WORK AREA SHALL TYPICALLY BE VIA THE EXISTING DRIVEWAY OFF AGNES STREET OR DIRECTLY FROM JEFFERY COURT;
6. THE CONTRACTOR SHALL PROVIDE ALTERNATIVE PEDESTRIAN AND CYCLE ROUTES APPROVED BY GLADSTONE REGIONAL COUNCIL (G.R.C.) PRIOR TO COMMENCEMENT OF ANY WORK ON SITE;
7. THE CONTRACTOR SHALL INFORM G.R.C. AND THE SUPERINTENDENT OF CONSTRUCTION START DATE PRIOR TO COMMENCEMENT OF WORKS;
8. THE CONTRACTOR'S G.R.C. (IF APPLICABLE) APPROVED TRAFFIC MANAGEMENT PLAN (T.M.P.) AND TRAFFIC GUIDANCE SCHEME SHALL BE APPROVED BY THE RELEVANT AUTHORITIES AND IN PLACE PRIOR TO COMMENCEMENT OF WORKS AND SHALL BE IN ACCORDANCE WITH C.M.D.G SPECIFICATION C201;
9. THE CONTRACTOR'S G.R.C. APPROVED EROSION AND SEDIMENT CONTROL PLAN (E.S.C.P.) SHALL BE APPROVED BY G.R.C. AND IN PLACE PRIOR TO COMMENCEMENT OF WORKS IN ACCORDANCE WITH C.M.D.G. SPECIFICATION C211 UNO;
10. CLEARING AND GRUBBING SHALL BE IN ACCORDANCE WITH C.M.D.G. SPECIFICATION C212 AND C202 UNO;
11. ALL MATERIALS SHALL BE TRANSPORTED VIA DESIGNATED CONSTRUCTION ACCESS ROUTES UNLESS DIRECTED OTHERWISE BY THE SUPERINTENDENT;
12. ALL LEVELS IN THIS CONTRACT ARE *AUSTRALIAN HEIGHT DATUM (AHD)*;
13. LEVELS FOR CONNECTION TO EXISTING WORKS MAY BE VARIED WHERE NECESSARY ON SITE TO ACHIEVE A SATISFACTORY SMOOTH FINISH TO THE EXISTING WORKS UPON APPROVAL BY SUPERINTENDENT;
14. ALL LEVELS ARE DTM DERIVED FOR LAYOUTS, SETOUT AND CROSS SECTIONS. CONTRACTOR TO CONFIRM LEVELS ON SITE BEFORE CONSTRUCTION;
15. ALL ROAD SIGNS AND EDGE GUIDE POSTS TO BE IN ACCORDANCE WITH C.M.D.G. SPECIFICATIONS C262 AND C263 RESPECTIVELY; AND
16. DO NOT OBTAIN DIMENSIONS FROM SCALING OFF PLANS.

EARTHWORKS:

17. ALL WORK SHALL BE CARRIED OUT IN ACCORDANCE WITH C.M.D.G. SPECIFICATION C213 UNLESS NOTED OTHERWISE;
18. ALL EARTHWORKS QUANTITIES ARE SOLID FIGURES;
19. EARTHWORKS SPOIL IS TO BE STOCKPILED AS DIRECTED BY THE SUPERINTENDENT. TOPSOIL IS TO BE STRIPPED TO A DEPTH OF 50mm AND STOCKPILED FOR LATER RE-SPREADING. AREAS REQUIRING FILLING OR ROAD WORKS ARE TO BE STRIPPED AND VEGETATION IN OTHER AREAS SHALL BE RETAINED;
20. NOT WITHSTANDING THE LIMITS OF CUTTING AND FILLING SHOWN ON THE DRAWINGS, THE ACTUAL LIMITS SHALL BE DETERMINED ON SITE BY THE SUPERINTENDENT DURING CONSTRUCTION.;
21. SIMILARLY, FINISHED SURFACE LEVELS MAY BE ADJUSTED BY A WRITTEN DIRECTION FROM G.R.C. DURING CONSTRUCTION WITH PRIOR APPROVAL FROM G.R.C.;
22. SILT FENCING IS TO BE PLACED ON THE DOWNSTREAM SIDE OF ALL STOCKPILE SITES AND AN ADEQUATE CUTOFF DRAIN IS TO BE PLACED ON THE UPSTREAM SIDE OF ALL STOCKPILE SITES;
23. BATTER SLOPES TO BE 1 IN 4 MAX UNLESS SPECIFIED OTHERWISE;
24. ALL GROUND SURFACES DISTURBED DURING EARTHWORKS ARE TO BE HYDROMULCHED OR TURFED AS DIRECTED BY THE SUPERINTENDENT; AND
25. CUT / FILL HEIGHTS PROVIDED IN THE DTM MUST BE ADHERED TO EXISTING SURFACE HEIGHTS ARE INTERPOLATED FROM A TRIANGULATED DIGITAL TERRAIN MODEL. IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO CONFIRM THE EXISTING SURFACE LEVELS AND CORRESPONDING CUT / FILL HEIGHTS TO ACHIEVE THE DESIGN SURFACE LEVEL ON SITE.

PAVEMENT:

26. ALL WORK SHALL BE CARRIED OUT IN ACCORDANCE WITH CMDG PAVEMENT DESIGN TABLE D2.05.3, UNLESS NOTED OTHERWISE;
27. PAVEMENT THICKNESS SHOWN ON THESE DRAWINGS IS PROVISIONAL ONLY AND SHALL BE CONFIRMED AFTER SUBGRADE TESTING. THE CONTRACTOR SHALL INITIALLY EXCAVATE 200mm BELOW FINISHED SURFACE LEVEL AND CARRY OUT CBR TESTING TO CONFIRM THE REQUIRED PAVEMENT DESIGN.

STORMWATER:

28. ALL WORK SHALL BE IN ACCORDANCE WITH CMDG STORMWATER DRAINAGE C220;
29. THE LEVELS AND SLOPES SHOWN ON STORMWATER STRUCTURES ARE INDICATIVE ONLY;
30. ALL HEADWALLS SHALL TYPICALLY BE CAST INSITU TYPE REFER DTMR STD. DRAWING 1303, 1316, 1318, AND 1320 FOR CONSTRUCTION DETAILS;
31. TEMPORARY BRACING, PROPPING ETC. TO DRAINAGE PIPES, CULVERTS AND STRUCTURES MAY BE REQUIRED DURING CONSTRUCTION. STRUCTURES SHALL BE MAINTAINED IN A STABLE POSITION AND NO PART SHALL BE OVERSTRESSED DURING CONSTRUCTION;
32. ALL LOCATIONS, ORIENTATION AND LEVELS SHALL BE VERIFIED ON SITE BEFORE COMMENCING ANY WORK. DISCREPANCIES SHALL BE REFERRED TO THE SUPERINTENDENT;
33. GEOTEXTILE IN ACCORDANCE WITH CMDG OPEN DRAINS C224 SHALL BE PLACED UNDER ALL ROCK PROTECTION AND STEEL WIRE MATTRESSES;
34. CONCRETE CLASS TO BE 32MPa/20 TO AS 3600;
35. COVER TO REINFORCEMENT IS 40mm;
36. REINFORCING STEEL TO BE AUSTRALIAN MADE GRADE D500N TO AS 4671 REINFORCING MESH TO AS4671;

SEDIMENT EROSION:

37. ALL CONTROL MEASURES TO BE INSPECTED AT LEAST WEEKLY AND AFTER SIGNIFICANT RUNOFF PRODUCING STORM EVENTS;
38. CONTROL MEASURES MAY BE REMOVED WHEN ON-SITE EROSION IS CONTROLLED AND 70% PERMANENT SOIL COVERAGE IS OBTAINED OVER ALL UPSTREAM DISTURBED LAND;
39. IN AREAS WHERE RUNOFF TURBIDITY IS TO BE CONTROLLED, EXPOSED SURFACES TO BE EITHER MULCHED, COVERED WITH EROSION CONTROL BLANKETS OR TOPSOIL AND SEEDED IF EARTHWORKS ARE EXPECTED TO BE DELAYED FOR MORE THAN 14 DAYS; AND
40. STRAW BALE SEDIMENT TRAPS ARE A SECONDARY OPTION WHICH GENERALLY SHOULD NOT BE USED IF OTHER OPTIONS ARE AVAILABLE.

SEDIMENT FENCE:

41. NOT TO BE LOCATED IN AREAS OF CONCENTRATED FLOW;
42. NORMALLY LOCATED ALONG THE CONTOUR WITH A MAXIMUM CATCHMENT AREA 0.6HA PER 100m LENGTH OF FENCE;
43. WOVEN FABRICS ARE PREFERRED, NON-WOVEN FABRICS MAY BE USED ON SMALL WORK SITES. I.E. OPERATIONAL PERIOD LESS THAN 6 MONTHS OR ON SITES WHERE SIGNIFICANT SEDIMENT RUNOFF IS NOT EXPECTED;
44. FENCES ARE REQUIRED 2m MIN FROM TOE OF CUT OR FILL BATTERS, WHERE NOT PRACTICAL ONE FENCE CAN BE AT THE TOE WITH A SECOND FENCE 1m MIN AWAY. FENCE SHOULD NOT BE LOCATED PARALLEL WITH TOE IF CONCENTRATION OF FLOW WILL OCCUR BEHIND THE FENCE.

RETAINING STRUCTURES:

45. ALL WALLS TO HAVE SUITABLE DRAINAGE DESIGN (IN ACCORDANCE WITH MANUFACTURERS SPECIFICATIONS) INCLUDED WITH SLOTTED PIPE CONNECTIONS TO THE STORMWATER SYSTEM. IF NO STORMWATER PIT IS ADJACENT TO THE OUTLET, CONNECT TO KERB ADAPTER;
46. END OF WALL LOCATIONS HAVE BEEN SHOWN DIAGRAMMATICALLY, HOWEVER FINAL LENGTH TO BE DETERMINED BY THE SUPERINTENDENT WHERE THE HEIGHT DIFFERENCE FROM TOP & BOTTOM OF BATTER EXCEEDS 400mm;
47. ALL RETAINING WALLS TO BE DESIGNED AND CERTIFIED (BY OTHERS) AND CONSTRUCTED AS 'DIAMOND BLOCK' WALLS (BY 'ADBRI MASONRY' MANUFACTURERS) OR APPROVED EQUIVALENT WHERE ALTERNATIVE PRODUCTS ARE PROPOSED, DETAILS ARE TO BE SUBMITTED TO SUPERINTENDENT PRIOR TO ORDERING;
48. FINAL WALL OFFSET TO SUIT WALL HEIGHT AND DEPTH OF NO FINES INFILL IN ACCORDANCE WITH MANUFACTURERS SPECIFICATIONS AND TO BE CONFIRMED BY SUPERINTENDENT PRIOR TO CONSTRUCTION;
49. WHERE SERVICES CROSS UNDER WALLS WITH STRIP FOOTING, PROVIDE L11TM400 TRENCH MESH, CENTRAL IN 600Wx150D FOOTING. EXTEND FOOTING TRENCH MESH MIN 600mm EACH SIDE OF SERVICE CROSSING TRENCH;
50. CONTRACTOR IS RESPONSIBLE FOR CONSTRUCTION OF SAFETY FENCING COMPLIANT WITH CURRENT SPECIFICATION AT THE TOP OF ALL BATTERS AND WALLS AND TO REMAIN IN PLACE AFTER CONSTRUCTION;
51. SAFETY FENCE TO BE 1.2m WELDMESH FENCE IN ACCORDANCE WITH CMDG STANDARD DRAWING CMDG-G-015; AND
52. REFER TO DEPARTMENT OF MAIN ROADS STANDARD DRAWINGS SD1476, SD1477, SD1479 AND SD1480 FOR W-BEAM CONSTRUCTION DETAIS,

UNDERGROUND STRUCTURES:

53. ALL UNDERGROUND STRUCTURES, PARTICULARLY THOSE WITHIN THE AGNES STREET CAR PARK SHALL BE DESIGNED WITH ADEQUATE FOUNDATIONS ACCOUNTING FOR BUOYANCY EFFECTS EXPECTED WITHIN THE PROJECT AREA. FOUNDATION DESIGN TO BE UNDERTAKEN FOLLOWING THE CLEARING OF SITE.

LINEMARKING AND SIGNAGE:

54. ALL SIGNAGE AND LINEMARKING SHALL BE CONSTRUCTED IN ACCORDANCE WITH AS1742.1 - 2014 AND DTMR MUTCD GUILDEINES.

Rev.	Date	Description	Des.	Verif.	Appd.
B	15/07/2020	RE-ISSUE FOR APPROVAL	CK	PM	TD
A	11/06/2019	ISSUE FOR CONSTRUCTION	GM	CGF	CH
1	1/05/2019	PRELIMINARY - FOR APPROVAL	GM	GM	CH

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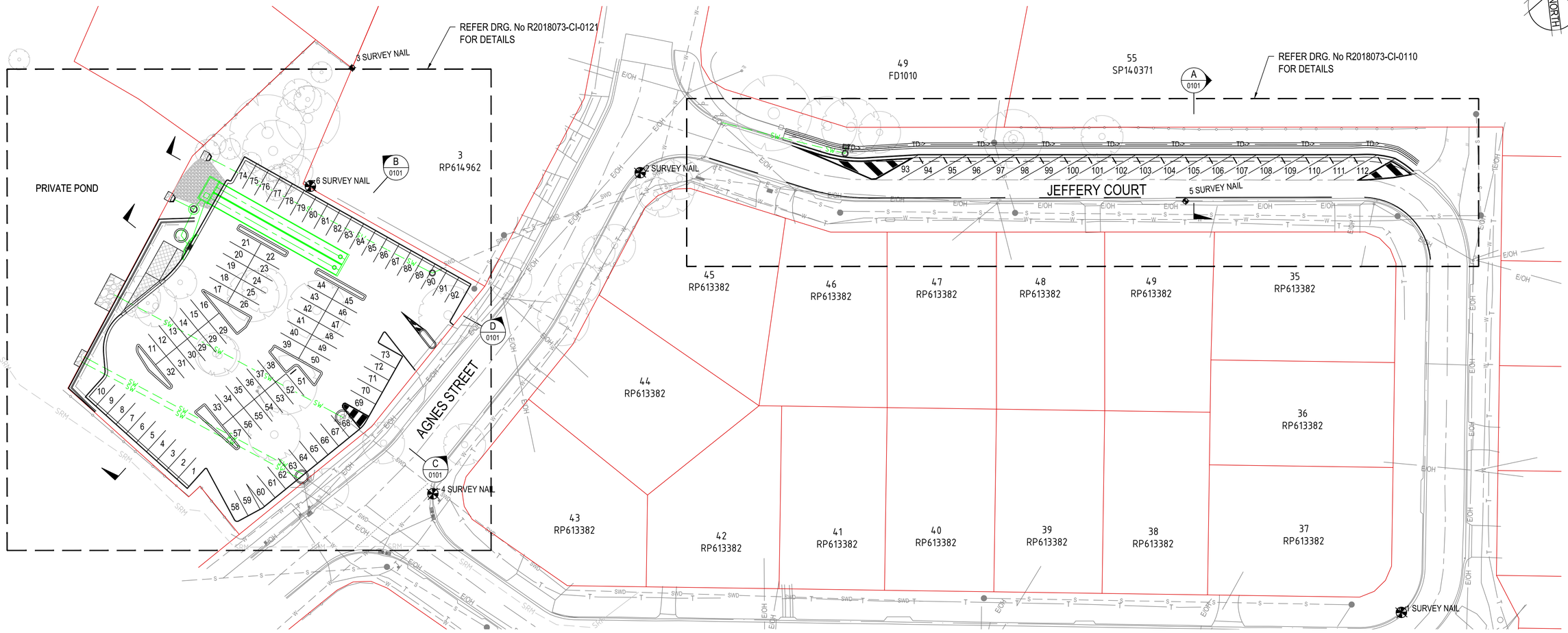
Designed	GM/CK	Date 15/07/2020
Verified	CGF/PM	Date 15/07/2020
Approved	T.DOYLE	RPEQ. 10283 Date 15/07/2020

Client: GLADSTONE REGIONAL COUNCIL
Project: AGNES STREET AND JEFFERY COURT AGNES WATER PARKING DETAIL DESIGN
Title: LOCALITY PLAN, DRAWING SCHEDULE AND GENERAL NOTES

Status: FOR APPROVAL
FOR CONSTRUCTION PURPOSES WHEN STAMPED

Datum	GRID	Scale	Size
AHD	MGA-56	AS SHOWN	A1

Drawing Number: R2018073-CI-0001
Revision: B



SURVEY STATION TABLE

POINT #	EASTINGS	NORTHINGS	LEVELS	COMMENT
1	389036.73	7321955.58	5.09	SURVEY NAIL
2	388902.10	7322055.27	4.64	SURVEY NAIL
3	388849.89	7322081.27	0.00	SURVEY NAIL
4	388856.03	7321999.25	4.37	SURVEY NAIL
5	389004.73	7322038.10	4.83	SURVEY NAIL
6	388839.33	7322059.70	4.62	SURVEY NAIL

SERVICE LOCATIONS

It is the responsibility of the Foreman to contact the relevant service authorities to ascertain the exact location of services prior to construction.

NOTE:
THE SERVICES INFORMATION SHOWN ON THIS DRAWING ARE INDICATIVE ONLY AND HAVE BEEN DERIVED FROM THE FOLLOWING SOURCES:
- **SURFACE LOCATIONS OF SERVICES LOCATED BY THE SURVEYOR**
- **PLAN DATA PROVIDED BY SERVICE AUTHORITIES**

THE CONTRACTOR OR CONSTRUCTION AUTHORITY IS TO CONFIRM THE ACTUAL LOCATIONS OF ALL EXISTING UNDERGROUND SERVICES PRIOR TO COMMENCEMENT OF CONSTRUCTION WORKS.THE CONTRACTOR IS TO MAKE THEM SELF AWARE OF ALL SERVICES. ANY DAMAGES WILL BE REPAIRED AT THE CONTRACTORS EXPENSE.

DIAL BEFORE YOU DIG

GENERAL ARRANGEMENT PLAN

SCALE 1:400 @ A1

NEW CARPARKS

AGNES STREET	92 No.
JEFFERY COURT	20 No.

LEGEND

- EXISTING TOP OF BANK
- EXISTING BOTTOM OF BANK
- EXISTING SEWER MAIN AND MANHOLE
- EXISTING OVERHEAD ELECTRICAL CABLE AND POWER POLE
- EXISTING EXISTING WATER MAIN
- EXISTING STORMWATER MAIN
- EXISTING UNDERGROUND TELSTRA CABLE
- EXISTING FENCE
- RP BOUNDARY
- PROPOSED STORMWATER PIPE
- PROPOSED CONCRETE INVERT 600mm
- TREE
- SURVEY MARK
- NEW GUARD RAIL

0 10 20 30 40m
SCALE 1:400 @A1

Rev.	Date	Description	Des.	Verif.	Appd.
B	15/07/2020	RE-ISSUE FOR APPROVAL	CK	PM	TD
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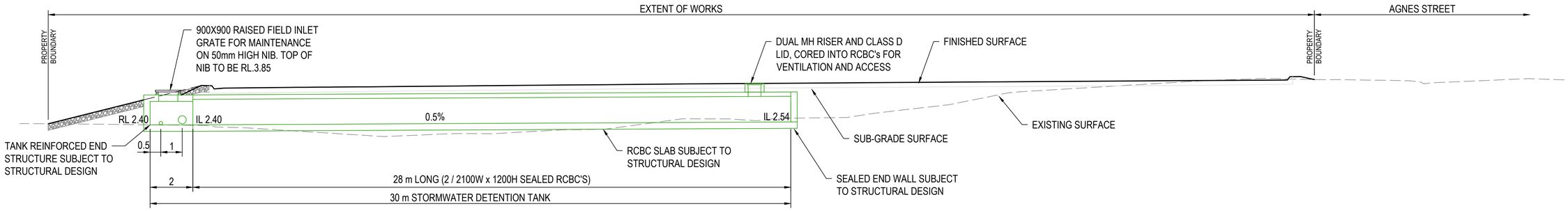
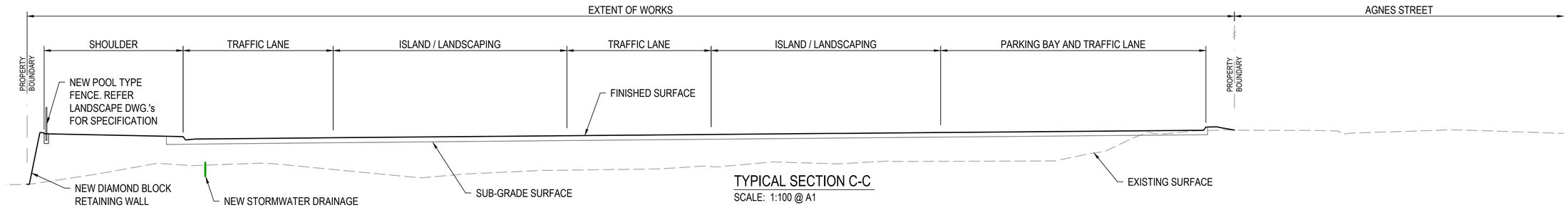
Approved	T.DOYLE	RPEQ. 10283 Date 15/07/2020

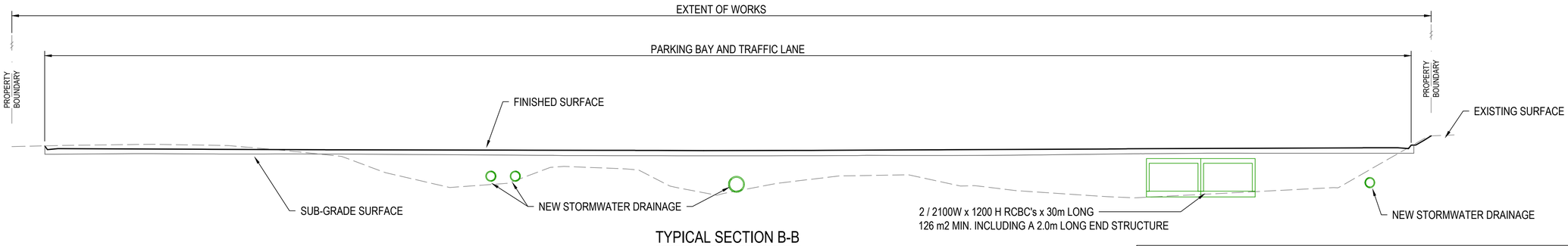
Client: GLADSTONE REGIONAL COUNCIL
Project: AGNES STREET AND JEFFERY COURT AGNES WATER PARKING DETAIL DESIGN
Title: GENERAL ARRANGEMENT PLAN
Status: FOR APPROVAL FOR CONSTRUCTION PURPOSES WHEN STAMPED
Datum: AHD | GRID: MGA-56 | Scale: AS SHOWN | Size: A1
Drawing Number: R2018073-CI-0100 | Revision: B



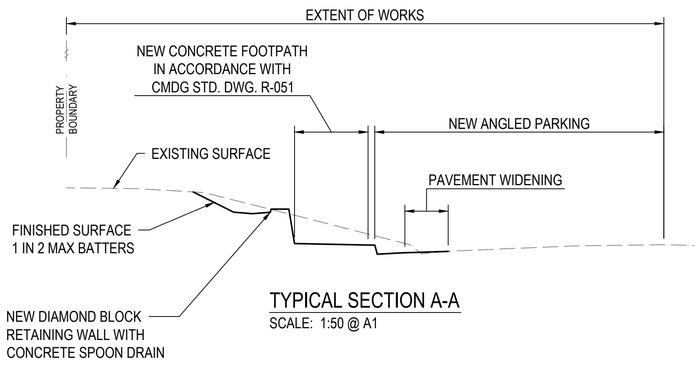
TYPICAL SECTION D-D
SCALE: 1:100 @ A1



TYPICAL SECTION C-C
SCALE: 1:100 @ A1

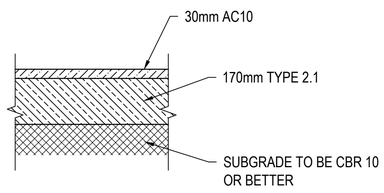


TYPICAL SECTION B-B
SCALE: 1:100 @ A1

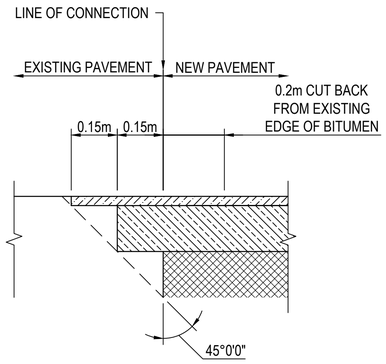


TYPICAL SECTION A-A
SCALE: 1:50 @ A1

0 1 2 4 6 8 10m
SCALE 1:100 @A1

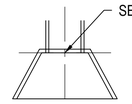
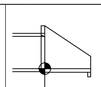
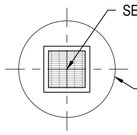


PAVEMENT DETAIL
SCALE: 1:100



CUTBACK DETAIL
SCALE: 1:100

STRUCTURE SETOUT POINTS

STRUCTURE	HORIZONTAL SETOUT ('SO')	VERTICAL SETOUT ('LP')
HEADWALL	 SETOUT EASTING NORTHING INVERT LEVEL	 INVERT OF PIPE
MAINTENANCE CHAMBER	 SETOUT EASTING NORTHING R.L. TOP OF LID	FINISHED SURFACE LEVEL CHAMBER/PIT COVER
FIELD INLET	 SETOUT EASTING NORTHING F.S.L. MANHOLE SHALL BE PLACED CENTERED WITH INLET PIT	TOP OF GRATE OR COVER

Rev.	Date	Description	Des.	Verif.	Appd.
B	15/07/2020	RE-ISSUE FOR APPROVAL	CK	PM	TD
A	11/06/2019	ISSUE FOR CONSTRUCTION	GM	CGF	CH
1	1/05/2019	PRELIMINARY - FOR APPROVAL	GM	CGF	CGF

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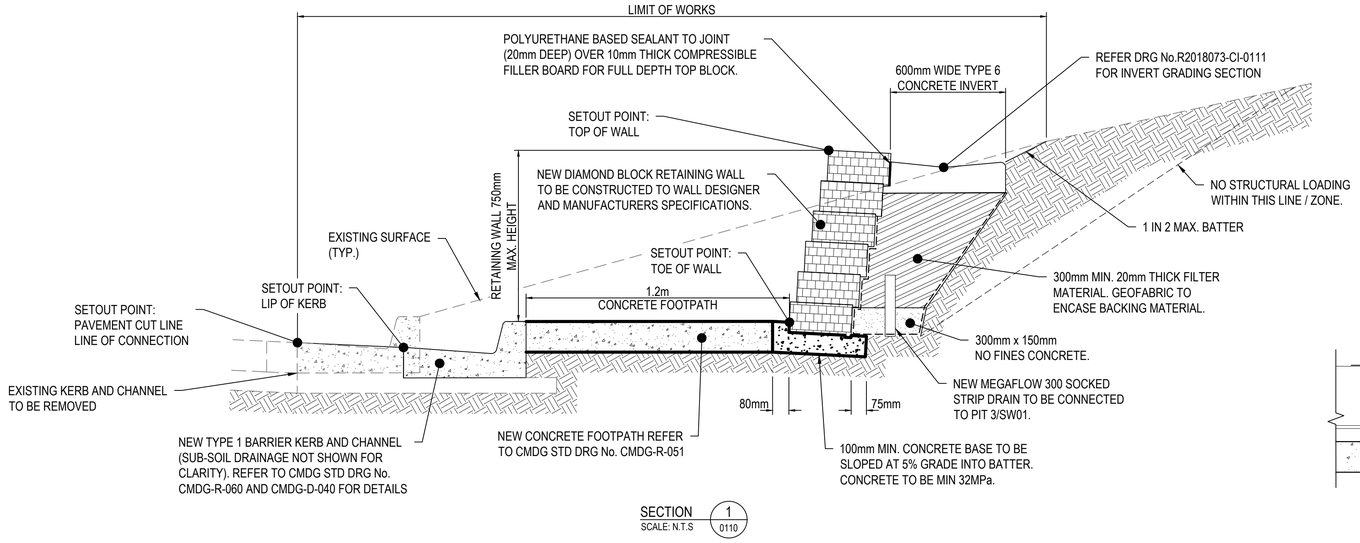
Checked	GM/CK	Date 15/07/2020
Designed	GM/CK	Date 15/07/2020
Verified	CGF/PM	Date 15/07/2020
Approved	T.DOYLE	RPEQ. 10283 Date 15/07/2020

Client: GLADSTONE REGIONAL COUNCIL
Project: AGNES STREET AND JEFFERY COURT
AGNES WATER
PARKING DETAIL DESIGN
Title: TYPICAL DETAILS PLAN 1 OF 3

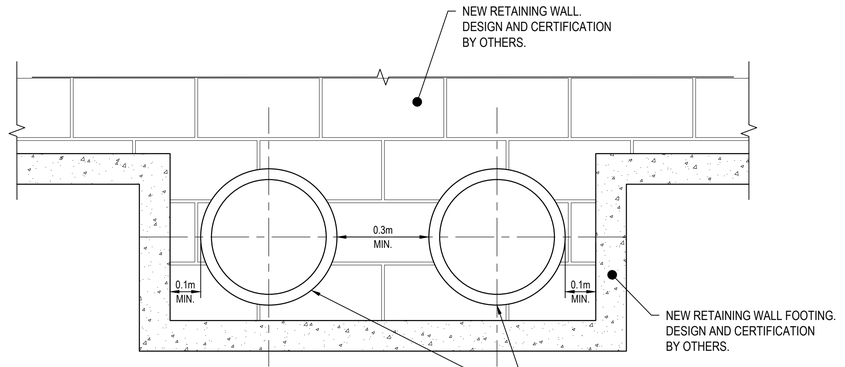
Status: FOR APPROVAL
FOR CONSTRUCTION PURPOSES WHEN STAMPED

Datum	GRID	Scale	Size
AHD	MGA-56	AS SHOWN	A1

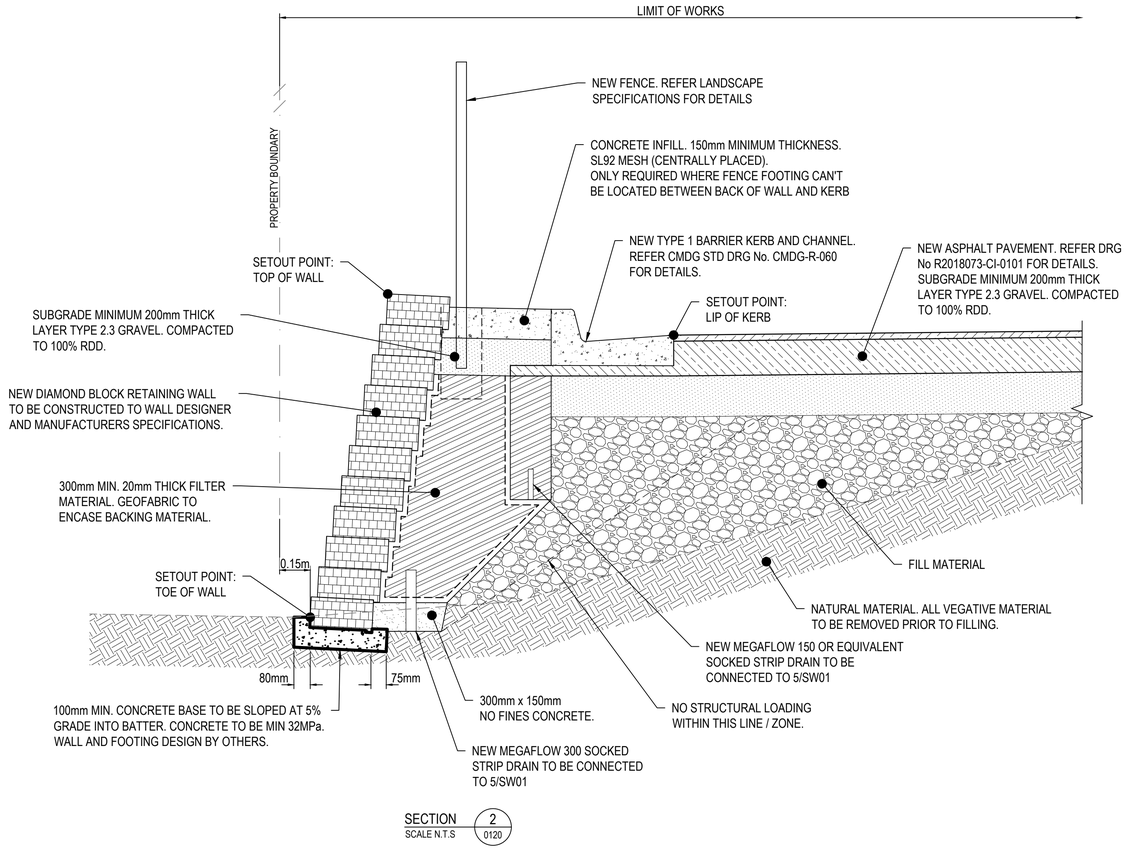
Drawing Number: R2018073-CI-0101
Revision: B



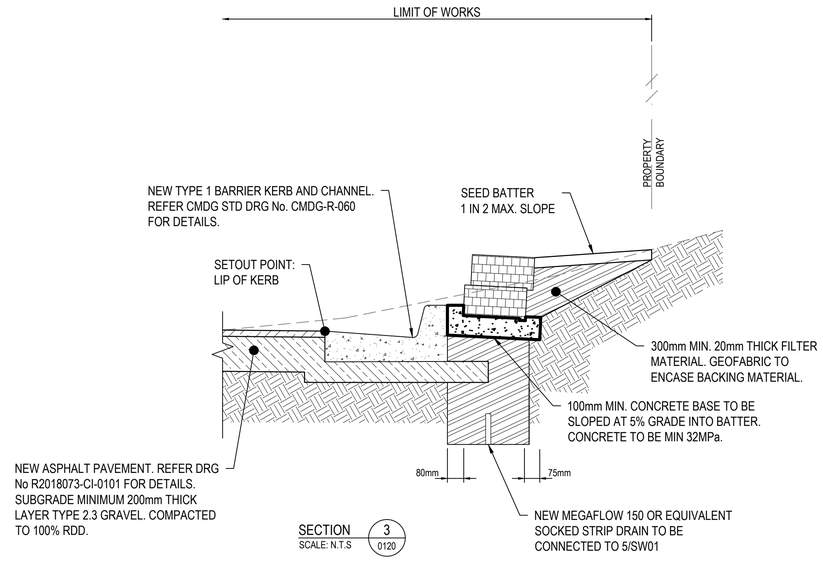
SECTION 1 / 0110
SCALE: N.T.S



ELEVATION - / 0120
SCALE 1:10 (A1)



SECTION 2 / 0120
SCALE N.T.S



SECTION 3 / 0120
SCALE: N.T.S

0 0.2 0.4 0.6 0.8 1m
SCALE 1:10 @A1

Rev.	Date	Description	Des.	Verif.	Appd.
B	15/07/2020	RE-ISSUE FOR APPROVAL	CK	PM	TD
A	11/06/2019	ISSUE FOR CONSTRUCTION	GM	CGF	CH
1	1/05/2019	PRELIMINARY - FOR APPROVAL	GM	CGF	CGF

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Designed	GM/CK	Date 15/07/2020
Verified	CGF/PM	Date 15/07/2020
Approved	T.DOYLE	RPEQ. 10283 Date 15/07/2020

Client: GLADSTONE REGIONAL COUNCIL
Project: AGNES STREET AND JEFFERY COURT AGNES WATER PARKING DETAIL DESIGN
Title: TYPICAL DETAILS PLAN 2 OF 3

Status: FOR APPROVAL
FOR CONSTRUCTION PURPOSES WHEN STAMPED

Datum	GRID	Scale	Size
AHD	MGA-56	AS SHOWN	A1

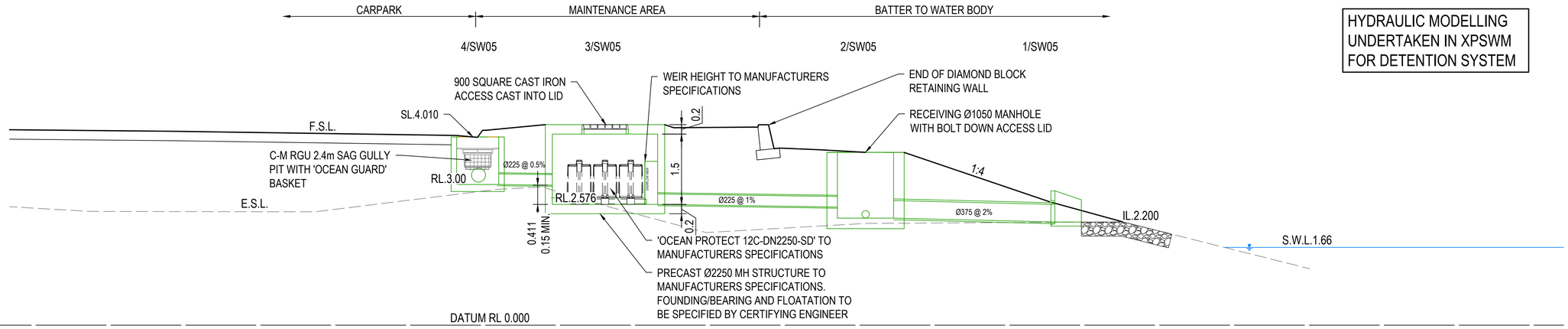
Drawing Number: R2018073-CI-0102
Revision: B

XREFs:
CAD File: \\aurcknv01\Regional_QLD\Projects\Central Queensland\Rockhampton\PROJECTS 2020\PROJECTS\R2020\043-GRC-AGNESWATERS CPARK\DESIGN & TECHNICAL\PRE-VARIATION DESIGN - R2018073022 - DESIGN_ Drawings\R2018073-CI-0102.DWG

CARPARK | MAINTENANCE AREA | BATTER TO WATER BODY

4/SW05 | 3/SW05 | 2/SW05 | 1/SW05

HYDRAULIC MODELLING UNDERTAKEN IN XPSWM FOR DETENTION SYSTEM

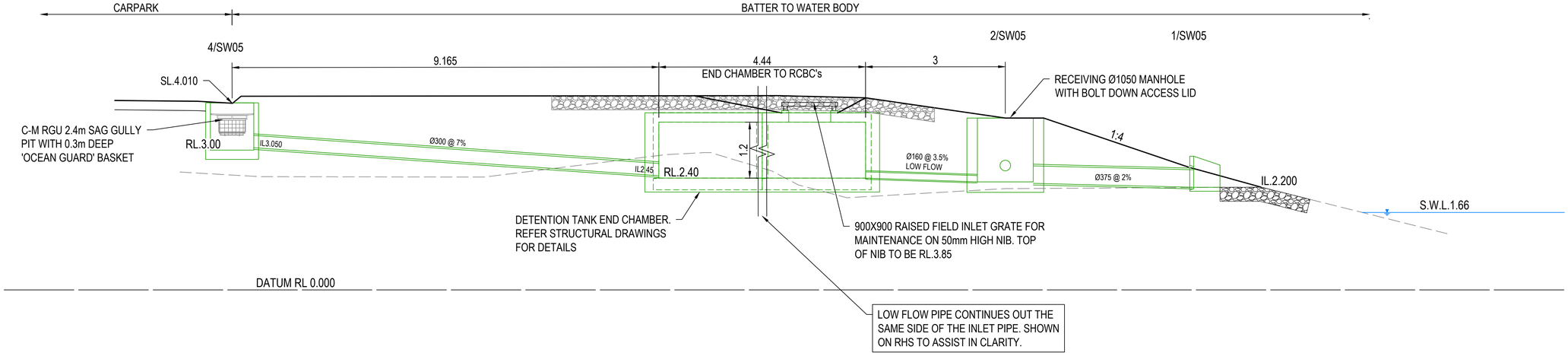


STORMWATER LINE SW05

SCALE: 1:50 @ A1

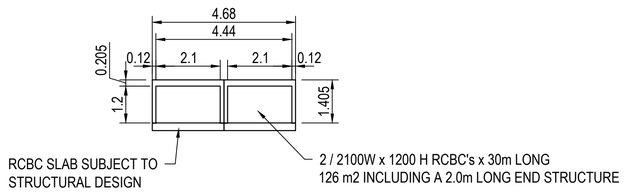
CARPARK | BATTER TO WATER BODY

4/SW05 | 2/SW05 | 1/SW05



STORMWATER LINE SW05 TO DETENTION TANK

SCALE: 1:50 @ A1



DETENTION TANK RCBC's

SCALE: 1:100 @ A1

0 1 2 3 4 5m

SCALE 1:50 @A1

Rev.	Date	Description	Des.	Verif.	Appd.
A	17/07/2020	ISSUE - FOR APPROVAL	CK	CGF	TD

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Verified	CGF/PM	Date 15/07/2020
Approved	T.DOYLE	RPEQ. 10283 Date 15/07/2020

Client: GLADSTONE REGIONAL COUNCIL

Project: AGNES STREET AND JEFFERY COURT
AGNES WATER
PARKING DETAIL DESIGN

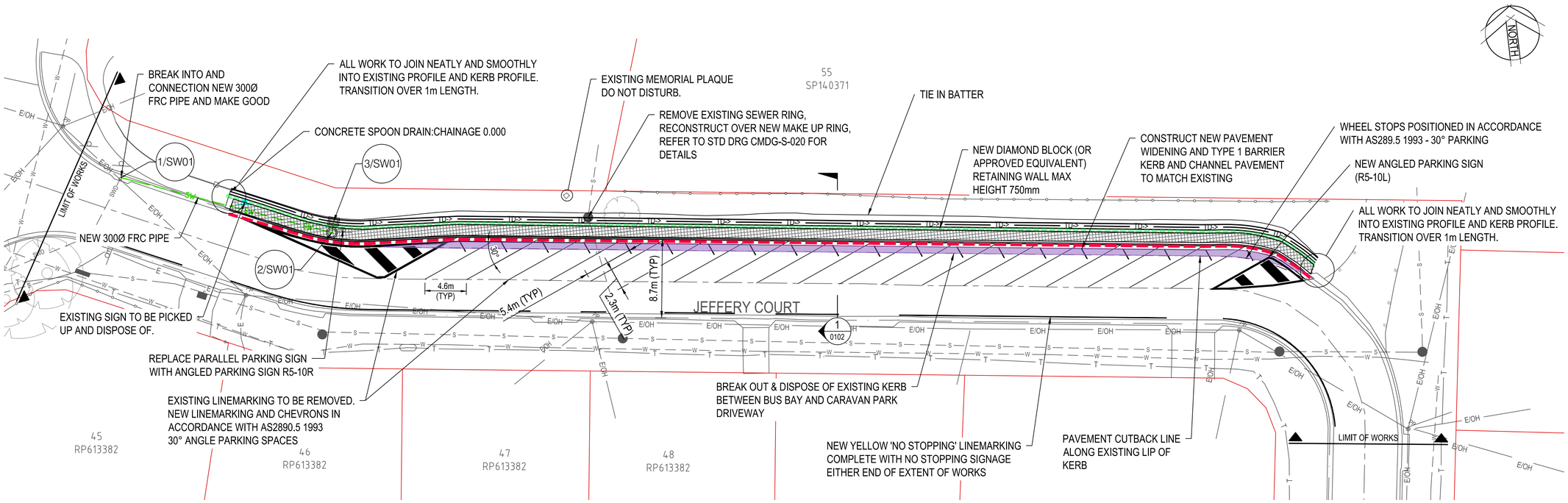
Title: TYPICAL DETAILS PLAN 3 OF 3

Status: FOR APPROVAL
FOR CONSTRUCTION PURPOSES WHEN STAMPED

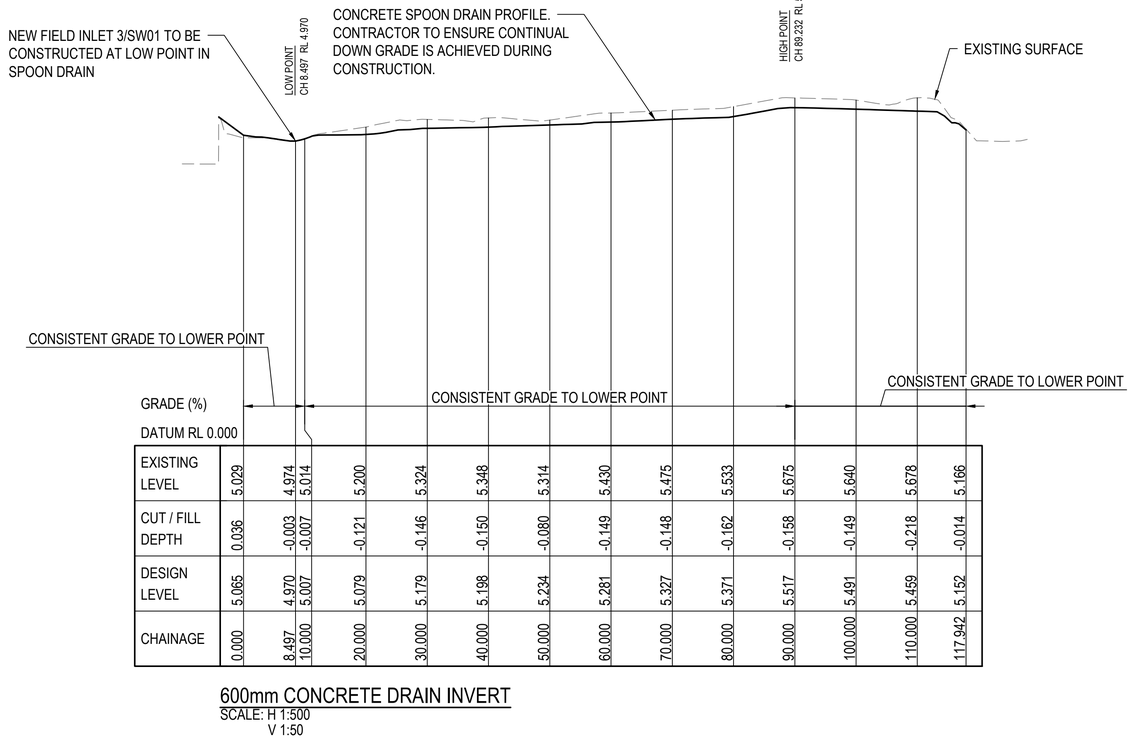
Datum	GRID	Scale	Size
AHD	MGA-56	AS SHOWN	A1

Drawing Number: R2018073-CI-0103

Revision: A



JEFFERY COURT PLAN
SCALE 1:250 @ A1



EXISTING LEVEL	5.029		4.974	5.014	5.200	5.324	5.348	5.314	5.430	5.475	5.533	5.675	5.640	5.678	5.166
CUT / FILL DEPTH	0.036		-0.003	-0.007	-0.121	-0.146	-0.150	-0.080	-0.149	-0.148	-0.162	-0.158	-0.149	-0.218	-0.014
DESIGN LEVEL	5.065		4.970	5.007	5.079	5.179	5.198	5.234	5.281	5.327	5.371	5.517	5.491	5.459	5.152
CHAINAGE	0.000	8.497	10.000	20.000	30.000	40.000	50.000	60.000	70.000	80.000	90.000	100.000	110.000	117.942	

600mm CONCRETE DRAIN INVERT
SCALE: H 1:500
V 1:50

LEGEND

- EXISTING TOP OF BANK
- EXISTING BOTTOM OF BANK
- EXISTING SEWER MAIN AND MANHOLE
- EXISTING OVERHEAD ELECTRICAL CABLE AND POWER POLE
- EXISTING EXISTING WATER MAIN
- EXISTING STORMWATER MAIN
- EXISTING UNDERGROUND TELSTRA CABLE
- RP BOUNDARY
- EXISTING FENCE
- TREE
- PAVEMENT WIDENING
- NEW TYPE 1 KERB AND CHANNEL
- NEW 1.2m CONCRETE FOOTPATH
- NEW DIAMOND BLOCK RETAINING WALL (OR APPROVED EQUIVALENT)
- NEW TABLE DRAIN
- NEW STORM WATER PIPES
- 1/SW01 NEW STORM WATER STRUCTURE

NOTE:
ALL WORKS SHALL TIE IN NEATLY AND SMOOTHLY HORIZONTALLY AND VERTICALL TO SURROUNDING SURFACE / PROFILE.

DIAL BEFORE YOU DIG

SERVICE LOCATIONS

It is the responsibility of the Foreman to contact the relevant service authorities to ascertain the exact location of services prior to construction.

0 5 10 15 20 25m
SCALE 1:250 @A1

Rev.	Date	Description	Des.	Verif.	Appd.
B	15/07/2020	RE-ISSUE FOR APPROVAL	CK	PM	TD
A	11/06/2019	ISSUE FOR CONSTRUCTION	GM	CGF	CH
1	1/05/2019	PRELIMINARY - FOR APPROVAL	GM	CGF	CGF

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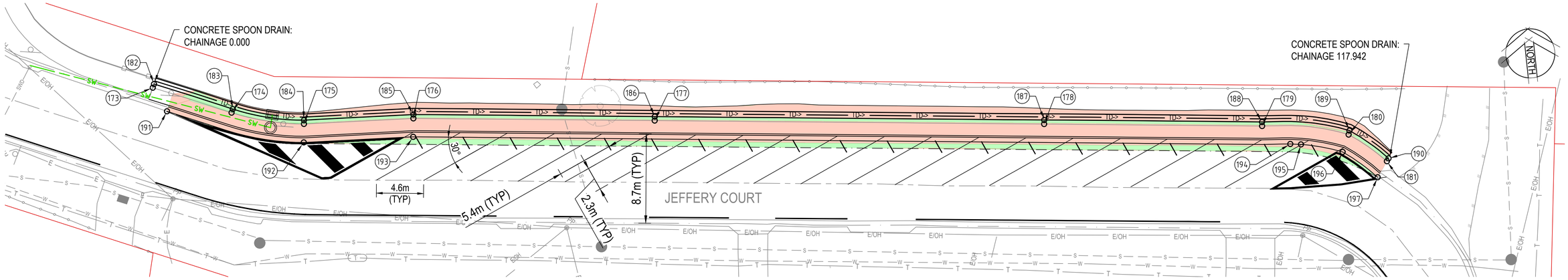
Verified	CGF/PM	Date 15/07/2020
Approved	T.DOYLE	RPEQ. 10283 Date 15/07/2020

Client: GLADSTONE REGIONAL COUNCIL
Project: AGNES STREET AND JEFFERY COURT
AGNES WATER
PARKING DETAIL DESIGN
Title: JEFFERY COURT - CARPARK LAYOUT

Status: FOR APPROVAL
FOR CONSTRUCTION PURPOSES WHEN STAMPED

Datum	GRID	Scale	Size
AHD	MGA-56	AS SHOWN	A1

Drawing Number: R2018073-CI-0110
Revision: B



SETOUT PLAN
SCALE 1:200 @ A1

SURVEY STATION TABLE				
POINT #	EASTINGS	NORTHINGS	LEVELS	COMMENT
173	388930.30	7322059.57	4.62	BRTW
174	388937.69	7322056.34	4.65	BRTW
175	388944.59	7322054.50	4.67	BRTW
176	388955.27	7322053.93	4.68	BRTW
177	388978.66	7322051.26	4.77	BRTW
178	389016.42	7322046.96	4.90	BRTW
179	389037.55	7322044.55	4.95	BRTW
180	389045.85	7322042.84	4.95	BRTW
181	389049.29	7322039.85	4.99	BRTW
182	388930.45	7322059.91	5.14	TRWL

SURVEY STATION TABLE				
POINT #	EASTINGS	NORTHINGS	LEVELS	COMMENT
183	388937.84	7322056.67	5.10	TRWL
184	388944.63	7322054.87	5.12	TRWL
185	388955.31	7322054.30	5.17	TRWL
186	388978.71	7322051.64	5.29	TRWL
187	389016.46	7322047.35	5.50	TRWL
188	389037.58	7322044.94	5.55	TRWL
189	389045.97	7322043.21	5.52	TRWL
190	389049.48	7322040.12	5.23	TRWL
191	388931.44	7322057.13	4.47	KLIP
192	388944.39	7322052.71	4.52	KLIP

SURVEY STATION TABLE				
POINT #	EASTINGS	NORTHINGS	LEVELS	COMMENT
193	388955.07	7322052.14	4.53	KLIP
194	389040.10	7322042.52	4.80	KLIP
195	389041.13	7322042.37	4.80	KLIP
196	389045.10	7322041.21	4.81	KLIP
197	389048.24	7322038.39	4.84	KLIP

LEGEND

- EXISTING TOP OF BANK
- EXISTING BOTTOM OF BANK
- EXISTING SEWER MAIN AND MANHOLE
- EXISTING OVERHEAD ELECTRICAL CABLE AND POWER POLE
- EXISTING EXISTING WATER MAIN
- EXISTING STORMWATER MAIN
- EXISTING UNDERGROUND TELSTRA CABLE
- RP BOUNDARY
- EXISTING FENCE
- TREE
- EARTHWORKS CUT
- EARTHWORKS FILL
- (188) SETOUT POINT

SETOUT POINT LEGEND	
FOK	FRONT OF KERB
KLIP	LIP OF KERB
BFOK	BARRIER KERB - FRONT OF KERB
ELIP	EDGE RESTRAINT - LIP OF KERB
TRTW	TOP OF RETAINING WALL
BRTW	BOTTOM OF RETAINING WALL

DIAL BEFORE YOU DIG

SERVICE LOCATIONS

It is the responsibility of the Foreman to contact the relevant service authorities to ascertain the exact location of services prior to construction.

0 5 10 15 20m
SCALE 1:200 @A1

Rev.	Date	Description	Des.	Verif.	Appd.
B	15/07/2020	RE-ISSUE FOR APPROVAL	CK	PM	TD
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Verified	CGF/PM	Date 15/07/2020
Approved	RPEQ. 10283	Date 15/07/2020
	T.DOYLE	

Client: GLADSTONE REGIONAL COUNCIL

Project: AGNES STREET AND JEFFERY COURT
AGNES WATER
PARKING DETAIL DESIGN

Title: JEFFERY COURT - BULK EARTHWORKS AND SETOUT PLAN

Status: FOR APPROVAL
FOR CONSTRUCTION PURPOSES WHEN STAMPED

Datum	GRID	Scale	Size
AHD	MGA-56	AS SHOWN	A1

Drawing Number: R2018073-CI-0111
Revision: B

NOTE:
ALL WORKS SHALL TIE IN NEATLY AND SMOOTHLY HORIZONTALLY AND VERTICALLY TO SURROUNDING SURFACE / PROFILE.

LEGEND

- EXISTING TOP OF BANK
- EXISTING BOTTOM OF BANK
- EXISTING SEWER MAIN AND MANHOLE
- EXISTING OVERHEAD ELECTRICAL CABLE AND POWER POLE
- EXISTING EXISTING WATER MAIN
- EXISTING STORMWATER MAIN
- EXISTING UNDERGROUND TELSTRA CABLE
- RP BOUNDARY
- EXISTING FENCE
- TREE
- NEW TYPE 1 KERB AND CHANNEL
- NEW TYPE 9 KERB AND CHANNEL
- NEW TYPE 3 BARRIER KERB
- NEW TYPE 5 SEMI-MOUNTABLE KERB
- NEW TYPE 10 FLUSH KERB
- NEW DIAMOND BLOCK RETAINING WALL WITH 1.2m WELDMESH FENCE (OR APPROVED EQUIVALENT)
- NEW STORM WATER PIPES
- NEW STORM WATER STRUCTURE
- NEW CONCRETE ISLANDS
- NEW TYPE A COMMERCIAL DRIVEWAY SLAB
- LANDSCAPING BY OTHERS
- EXISTING POWER POLE TO BE REMOVED AND DISPOSED OF (BY OTHERS)
- NEW FENCE, REFER LANDSCAPE SPECIFICATIONS

DIAL BEFORE YOU DIG

SERVICE LOCATIONS

It is the responsibility of the Foreman to contact the relevant service authorities to ascertain the exact location of services prior to construction.

AGNES STREET PLAN

SCALE 1:250 @ A1

0 5 10 15 20 25m
SCALE 1:250 @A1

Rev.	Date	Description	Des.	Verif.	Appd.
B	15/07/2020	RE-ISSUE FOR APPROVAL	CK	PM	TD
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1	1/05/2019	PRELIMINARY - FOR APPROVAL	GM	CGF	CGF

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Verified	CGF/PM	Date 15/07/2020
Approved	T.DOYLE	RPEQ. 10283 Date 15/07/2020

Client: GLADSTONE REGIONAL COUNCIL
Project: AGNES STREET AND JEFFERY COURT AGNES WATER PARKING DETAIL DESIGN
Title: AGNES STREET - CARPARK LAYOUT

Status			
FOR APPROVAL FOR CONSTRUCTION PURPOSES WHEN STAMPED			
Datum	GRID	Scale	Size
AHD	MGA-56	AS SHOWN	A1
Drawing Number			Revision
R2018073-CI-0120			B

AGNES STREET PLAN
SCALE 1:250 @ A1

SETOUT POINT LEGEND	
FOK	FRONT OF KERB
KLIP	LIP OF KERB
BFOK	BARRIER KERB - FRONT OF KERB
ELIP	EDGE RESTRAINT - LIP OF KERB
TRTW	TOP OF RETAINING WALL
BRTW	BOTTOM OF RETAINING WALL

LEGEND

EARTHWORKS CUT

EARTHWORKS FILL

(188) SETOUT POINT

SURVEY STATION TABLE				
POINT #	EASTINGS	NORTHINGS	LEVELS	COMMENT
1	388823.34	7321999.97	4.42	FOK
2	388818.51	7321998.03	4.40	BFOK
3	388817.86	7321998.30	4.39	BFOK
4	388813.76	7322008.53	4.45	BFOK
5	388813.28	7322008.64	4.38	BFOK
6	388809.89	7322005.64	4.35	KLIP
7	388792.96	7322024.77	4.22	KLIP
8	388796.18	7322027.63	4.20	KLIP
9	388796.95	7322028.85	4.19	KLIP
10	388797.13	7322032.79	4.17	KLIP
11	388800.70	7322039.08	4.13	KLIP
12	388801.90	7322039.85	4.12	KLIP
13	388809.08	7322044.44	4.08	KLIP
14	388809.38	7322044.63	4.08	KLIP
15	388814.93	7322049.87	4.05	KLIP
16	388823.85	7322062.22	4.16	KLIP
17	388824.94	7322062.36	4.16	KLIP
18	388827.67	7322066.12	4.20	KLIP
19	388867.33	7322037.44	4.47	KLIP
20	388862.91	7322031.32	4.50	BFOK
21	388862.93	7322030.93	4.50	BFOK
22	388863.42	7322030.44	4.51	BFOK
23	388855.27	7322022.78	4.48	BFOK
24	388850.51	7322030.53	4.44	BFOK
25	388850.01	7322030.55	4.43	BFOK
26	388848.88	7322028.99	4.43	BFOK
27	388848.95	7322028.58	4.44	BFOK
28	388853.08	7322025.59	4.46	BFOK
29	388844.76	7322014.08	4.46	BFOK
30	388843.41	7322012.80	4.46	BFOK
31	388793.94	7322021.90	4.37	TRTW
32	388791.93	7322024.27	4.35	TRTW
33	388789.67	7322026.82	4.47	TRTW
34	388792.51	7322030.64	4.41	TRTW
35	388795.41	7322034.87	4.34	TRTW
36	388798.35	7322038.96	4.32	TRTW
37	388801.31	7322043.09	4.33	TRTW

SURVEY STATION TABLE				
POINT #	EASTINGS	NORTHINGS	LEVELS	COMMENT
38	388804.18	7322047.17	4.35	TRTW
46	388807.03	7322051.27	4.36	TRTW
47	388809.33	7322054.59	4.34	TRTW
48	388810.39	7322056.11	4.30	TRTW
49	388816.70	7322055.61	4.20	TRTW
50	388793.77	7322021.76	4.29	BRTW
51	388791.70	7322024.10	3.90	BRTW
52	388789.29	7322026.81	2.95	BRTW
53	388793.91	7322033.48	3.03	BRTW
54	388796.56	7322037.31	2.87	BRTW
55	388799.60	7322041.70	2.35	BRTW
56	388802.29	7322045.59	2.06	BRTW
57	388805.04	7322049.55	2.02	BRTW
58	388808.32	7322054.29	1.97	BRTW
59	388810.06	7322056.80	2.46	BRTW
60	388816.75	7322056.27	3.98	BRTW
61	388820.30	7322011.80	4.37	ELIP
62	388820.35	7322012.15	4.37	ELIP
63	388817.59	7322016.47	4.32	ELIP
64	388814.83	7322020.78	4.27	ELIP
65	388814.42	7322020.85	4.27	ELIP
66	388812.73	7322019.77	4.26	ELIP
67	388812.64	7322019.36	4.26	ELIP
68	388819.52	7322011.59	4.37	ELIP
69	388819.90	7322011.54	4.37	ELIP
70	388808.72	7322024.56	4.23	ELIP
71	388808.86	7322025.25	4.22	ELIP
72	388806.22	7322029.38	4.20	ELIP
73	388803.61	7322033.47	4.17	ELIP
74	388803.08	7322033.44	4.17	ELIP
75	388803.07	7322031.69	4.18	ELIP
76	388804.63	7322028.44	4.21	ELIP
77	388804.71	7322028.31	4.21	ELIP
78	388808.00	7322024.60	4.23	ELIP
105	388822.11	7322033.49	4.21	ELIP
106	388822.52	7322033.39	4.21	ELIP
107	388824.21	7322034.48	4.22	ELIP

SURVEY STATION TABLE				
POINT #	EASTINGS	NORTHINGS	LEVELS	COMMENT
108	388825.40	7322036.11	4.22	ELIP
109	388825.36	7322036.50	4.22	ELIP
110	388817.00	7322042.55	4.13	ELIP
111	388816.57	7322042.15	4.12	ELIP
112	388819.36	7322037.78	4.17	ELIP
114	388832.95	7322047.06	4.25	ELIP
115	388833.37	7322047.13	4.26	ELIP
116	388833.72	7322047.61	4.26	ELIP
117	388833.65	7322048.03	4.26	ELIP
118	388825.39	7322054.01	4.16	ELIP
119	388824.97	7322053.94	4.15	ELIP
120	388824.62	7322053.46	4.15	ELIP
121	388824.68	7322053.04	4.15	ELIP
122	388828.82	7322050.05	4.20	ELIP
123	388846.72	7322037.10	4.40	ELIP
124	388847.12	7322037.14	4.40	ELIP
125	388847.49	7322037.65	4.40	ELIP
126	388847.43	7322038.07	4.40	ELIP
127	388839.16	7322044.05	4.32	ELIP
128	388838.74	7322043.98	4.32	ELIP
129	388838.39	7322043.49	4.32	ELIP
130	388838.46	7322043.08	4.32	ELIP
131	388842.59	7322040.09	4.36	ELIP
132	388832.92	7322026.27	4.32	ELIP
133	388835.61	7322022.07	4.36	ELIP
134	388836.02	7322021.99	4.36	ELIP
135	388837.64	7322024.04	4.37	ELIP
136	388837.58	7322024.46	4.36	ELIP
137	388833.45	7322027.45	4.32	ELIP
138	388829.32	7322030.44	4.27	ELIP
139	388828.90	7322030.37	4.27	ELIP
140	388828.55	7322029.89	4.27	ELIP
141	388828.06	7322029.57	4.27	ELIP
142	388827.98	7322029.17	4.27	ELIP
143	388830.73	7322024.87	4.32	ELIP

SERVICE LOCATIONS

It is the responsibility of the Foreman to contact the relevant service authorities to ascertain the exact location of services prior to construction.

DIAL BEFORE YOU DIG 1100

0 5 10 15 20 25m
SCALE 1:250 @A1

Rev.	Date	Description	Des.	Verif.	Appd.
B	15/07/2020	RE-ISSUE FOR APPROVAL	CK	PM	TD
A	11/06/2019	ISSUE FOR CONSTRUCTION	GM	CGF	CH
1	1/05/2019	PRELIMINARY - FOR APPROVAL	GM	CGF	CGF

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Drawn	AW/AE	Date 15/07/2020
Checked	GM/CK	Date 15/07/2020
Designed	GM/CK	Date 15/07/2020
Verified	CGF/PM	Date 15/07/2020
Approved	T.DOYLE	RPEQ. 10283 Date 15/07/2020

Client: GLADSTONE REGIONAL COUNCIL

Project: AGNES STREET AND JEFFERY COURT
AGNES WATER
PARKING DETAIL DESIGN

Title: AGNES STREET - BULK EARTHWORKS AND SETOUT PLAN

Status: FOR APPROVAL
FOR CONSTRUCTION PURPOSES WHEN STAMPED

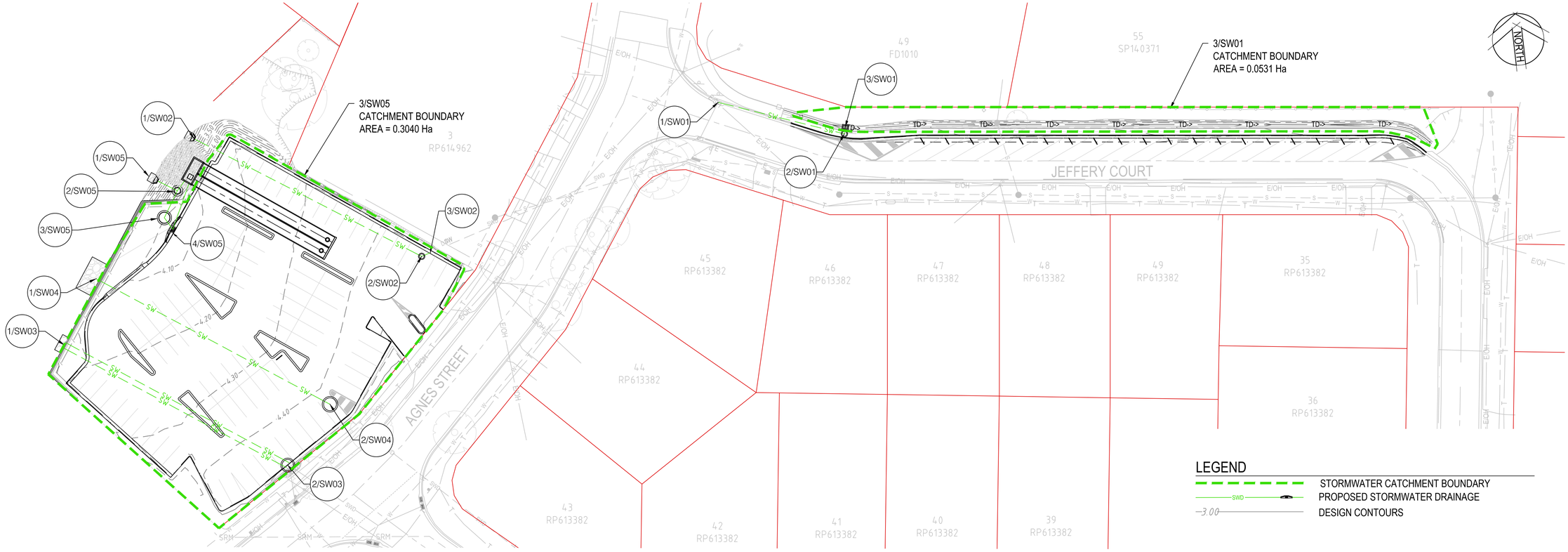
Datum	GRID	Scale	Size
AHD	MGA-56	AS SHOWN	A1

Drawing Number: R2018073-CI-0121

Revision: B

DATE PLOTTED: 15 July 2020 4:04 PM BY : CHASE KEMPE

XREFs: X-SURVEY-BASE; R2018073-12D-DESIGN-STRS; R2018073-DES-DRN; R2018073-12D-CUT-FILL; P1 LS DRAIN_01; PLOT_LS_DR_001
CAD File: \\aurokrvf01\Regional_QLD\Projects\Central Queensland\Rockhampton\PROJECTS 2020\PROJECTS\R2020043-GRC-AGNESWATERS CPARK\DESIGN & TECHNICAL\PRE-VARIATION DESIGN - F



CATCHMENT PLAN
SCALE 1:400 @ A1

NOTES;
1. EXTERNAL NETWORK NOT ASSESSED
2. STORMWATER QUALITY AND DETENTION TANK HYDRAULICS VERIFIED USING XPSWM

DESIGN ARI	LOCATION		SUB-CATCHMENT RUNOFF							INLET DESIGN										DRAIN DESIGN														PART FULL		HEAD LOSSES									DESIGN LEVELS							
	STRUCTURE No	DRAIN SECTION	Tc	I	fi	C	A	CxA	Qc	Qa	Qw			dg	Vg	dg.Vg	STRUCTURE	Qg	Qb		Tc	I	CxA	Qrat	Qp	V	L	S			Qcap	Vcap		Vp		S / DO	V2/2g	Ku	hu	Kw	hw	Sf	hl									
			SUB-CATCHMENT TIME OF CONC.	RAINFALL INTENSITY	FRACTION IMPERVIOUS	COEFFICIENT OF RUNOFF	SUB-CATCHMENT AREA	EQUIVALENT IMPERVIOUS AREA	SUB-CATCHMENT DISCHARGE	FLOW IN K&C (INC. BYPASS)	HALF ROAD CAPACITY	ROAD GRADE AT INLET	ROAD XFALL AT INLET	FLOW WIDTH	FLOW DEPTH	FLOW VELOCITY	Velocity-Depth	TYPE AND DESCRIPTION	FLOW INTO INLET	BYPASS FLOW	BYPASS STRUCTURE	TOTAL TIME OF CONC.	RAINFALL INTENSITY	TOTAL (C x A)	PEAK FLOW	PIPE FLOW	PIPE VELOCITY	REACH LENGTH	PIPE GRADE	PIPE SIZE	PIPE CLASS	CAPACITY FLOW	CAPACITY VELOCITY	PARTIAL DEPTH	PARTIAL DEPTH VELOCITY	I2D KU Method	I2D KU/KW CHART IDENTIFIER	SUBMERGENCE RATIO	VELOCITY HEAD	U/S HEAD LOSS COEFFICIENT	U/S HEAD LOSS	W.S.E COEFFICIENT (Kw = Ku where Ds>Hc)	CHANGE IN W.S.E	PIPE FRICTION SLOPE (HGL grade)	PIPE FRICTION HEAD LOSS	PIPE U/S I.L	PIPE D/S I.L	PIPE U/S H.G.L	PIPE D/S H.G.L	W.S.E	GRATE LEVEL	FREEBOARD	STRUCTURE No
			min	mm/h			ha	ha	m3/s	m3/s	m3/s	%	%	m	m	m/s	m²/s		m3/s	m3/s		min	mm/hr	ha	m3/s	m3/s	m/s	m	%	mm		m3/s	m/s	m	m/s																
10	3/SW01	SW01	5.0	173.0	100	0.90	0.053	0.048	0.023	0.023	0.000	2.17	0.00	0.000	0.035	0.00	0.00	FIELD INLET TYPE 1	0.023	0.000		5.00	173	0.048	0.023	0.023	0.32	1.27	0.55	300	uPVC	0.085	1.20	0.107	1.02	Ku,Kw>0 - Missouri/Hare Charts	G2	1.17	0.005	9.70	0.052		0.052	1.25	0.01	3.87	3.87	0.00	0.00	4.04	4.97	0.93	3/SW01
100				258.0		0.90		0.048	0.034	0.034	0.000			0.000	0.079	0.00	0.00	600x900	0.034	0.000			258	0.048	0.034	0.034	0.48					0.133	1.14				G2	1.39	0.012	9.70	0.116		0.116	1.31	0.01					4.13		0.84	
10	2/SW01	SW01	0.0	0.0	0	0.00	0.000	0.000	0.000	0.000	0.000	0.00	0.00	0.000	0.000	0.00	0.00	ACCESS CHAMBER	0.000	0.000		5.01	173	0.048	0.023	0.023	0.32	24.19	0.50	300	uPVC	0.081	1.14	0.109	0.98	Ku,Kw>0 - Missouri/Hare Charts	T10	1.05	0.005	2.09	0.011	2.66	0.014	0.01	0.01	3.72	3.60	0.00	0.00	3.92	4.65	0.73	2/SW01
100				0.0		0.00		0.000	0.000	0.000	0.000			0.000	0.000	0.00	0.00	900mm DIA	0.000	0.000			258	0.048	0.034	0.034	0.48					0.136	1.19				T10	1.11	0.012	2.09	0.025	2.66	0.032	0.04	0.02					3.94		0.71	
10	1/SW01	SW01	0.0	0.0	0	0.00	0.000	0.000	0.000	0.000	0.000	0.00	0.00	0.000	0.000	0.00	0.00	EXISTING PIT	0.000	0.000		0.00	0	0.000	0.000	0.000	0.00	0.00	0.00			0.000	0.00	0.000	0.00			0.00	0.000	0.00	0.000		0.000	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1/SW01
100				0.0		0.00		0.000	0.000	0.000	0.000			0.000	0.000	0.00	0.00		0.000	0.000			0	0.000	0.000	0.000	0.00					0.000	0.00	0.000	0.00			0.00	0.000	0.00	0.000		0.000	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	

0 10 20 30 40m
SCALE 1:400 @A1

Rev.	Date	Description	Des.	Verif.	Appd.
B	15/07/2020	RE-ISSUE FOR APPROVAL	CK	PM	TD
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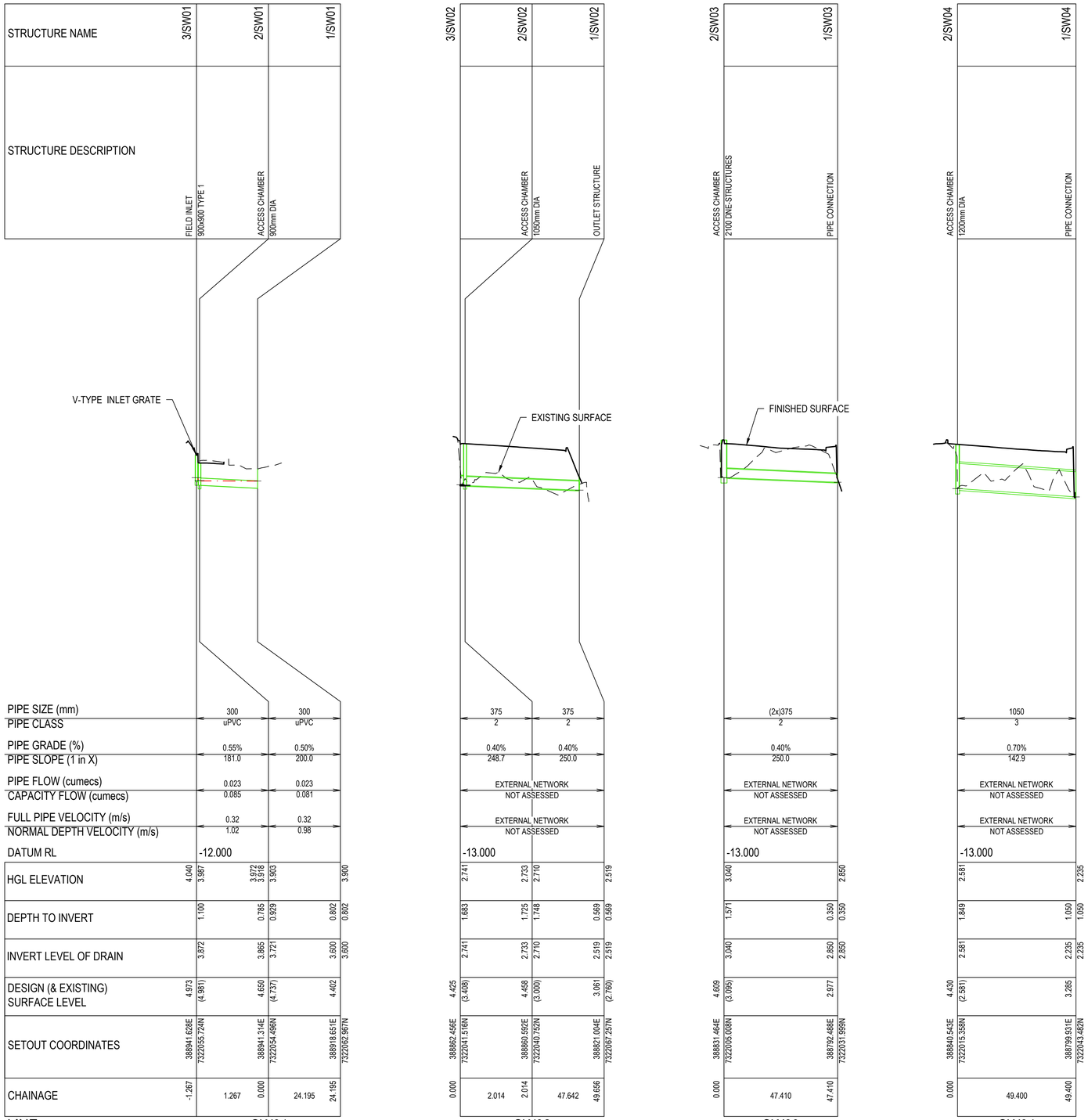
Designed	GM/CK	Date 15/07/2020
Verified	CGF/PM	Date 15/07/2020
Approved	T.DOYLE	RPEQ. 10283 Date 15/07/2020

Client: GLADSTONE REGIONAL COUNCIL
Project: AGNES STREET AND JEFFERY COURT
AGNES WATER
PARKING DETAIL DESIGN
Title: STORMWATER CATCHMENT AND CALCULATIONS PLAN

Status: FOR APPROVAL
FOR CONSTRUCTION PURPOSES WHEN STAMPED

Datum	GRID	Scale	Size
AHD	MGA-56	AS SHOWN	A1

Drawing Number: R2018073-CI-0122
Revision: B



LONGITUDINAL SECTIONS

SCALE A1 - 1:1000(H) 1:100(V)
A3 - 1:2000(H) 1:200(V)

NOTE:
REFER TO DWG R2018073-CI-0103 FOR STORMWATER LINE 5 DETAILS

SERVICE LOCATIONS

It is the responsibility of the Foreman to contact the relevant service authorities to ascertain the exact location of services prior to construction.

H: 0 20 40 60 80 100m
V: 0 2 4 6 8 10m
SCALE: H:1:1000 V:1:100 @A1

Rev.	Date	Description	Des.	Verif.	Appd.
B	15/07/2020	RE-ISSUE FOR APPROVAL	CK	PM	TD
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1	1/05/2019	PRELIMINARY - FOR APPROVAL	GM	CGF	CGF

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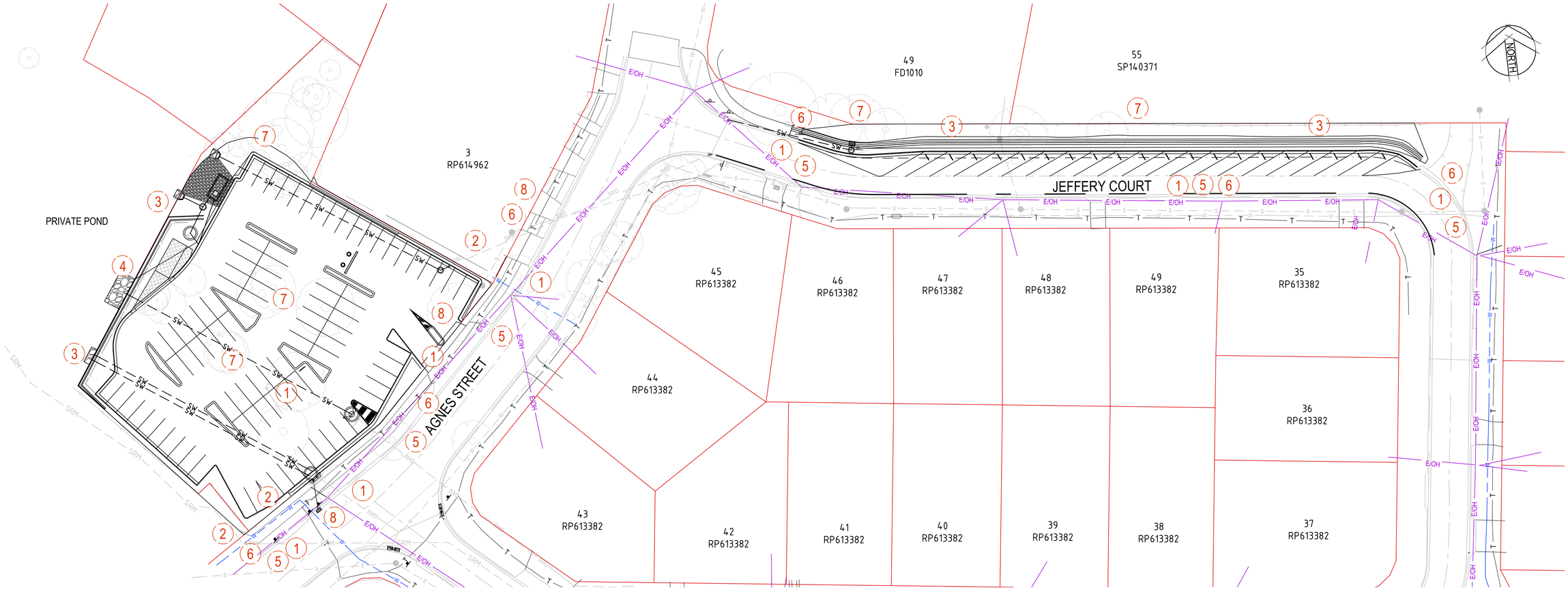
Designed	GM/CK	Date 15/07/2020
Verified	CGF/PM	Date 15/07/2020
Approved	RPEQ. 10283 T.DOYLE	Date 15/07/2020

Client: GLADSTONE REGIONAL COUNCIL
Project: AGNES STREET AND JEFFERY COURT
AGNES WATER
PARKING DETAIL DESIGN
Title: STORMWATER LONGITUDINAL SECTIONS

Status: FOR APPROVAL
FOR CONSTRUCTION PURPOSES WHEN STAMPED

Datum	GRID	Scale	Size
AHD	MGA-56	AS SHOWN	A1

Drawing Number: R2018073-CI-0123
Revision: B



PLAN
SCALE 1:400 @ A1

GENERAL NOTE:

UNDER THE QUEENSLAND WORKPLACE HEALTH AND SAFETY ACT 1995, THE WORKPLACE HEALTH AND SAFETY REGULATION AND OTHER LEGISLATION AND GUIDELINES, THE PRINCIPAL CONTRACTOR HAS SPECIFIC OBLIGATIONS IN RELATION TO THE SAFE OPERATION OF THE SITE OF THE WORKS. TO ASSIST THE PRINCIPAL CONTRACTOR IN COMPLYING WITH THESE OBLIGATIONS, THE PROJECT DESIGNERS HAVE IDENTIFIED, BY DRAWING NOTES, OR THROUGH ADVICE AT PRE-CONSTRUCTION WORKSHOPS, AREAS WHERE POTENTIAL HAZARDS MAY ARISE. THESE NOTES OR ADVICE SHALL NOT NECESSARILY BE CONSIDERED TO BE COMPLETE AND ARE BASED UPON THE DESIGNERS' UNDERSTANDING OF THE SAFETY RISKS ASSOCIATED WITH THE WORKS. THESE NOTES OR ADVICE SHALL NOT RELIEVE THE PRINCIPAL CONTRACTOR OF HIS OBLIGATIONS UNDER THE RELEVANT LEGISLATION AND GUIDELINES AND THE PRINCIPAL CONTRACTOR SHALL REMAIN RESPONSIBLE FOR THE PREPARATION OF AN APPROPRIATE SAFETY PLAN FOR THE SITE.

ITEM	POTENTIAL HAZARD	POSSIBLE PREVENTATIVE ACTION
1	OVERHEAD ELECTRIC POWER HAZARD	OVERHEAD POWER LINES. POTENTIAL FOR INTERFERENCE WITH MOBILE PLANT AND PERSONNEL. WORKS ON OR NEAR ENERGISED ELECTRICAL INSTALLATIONS OR SERVICES ARE DEFINED AS HIGH RISK CONSTRUCTION WORK. CONTRACTOR MUST PREPARE A SAFE WORK METHOD STATEMENT (SWMS) BEFORE COMMENCING WORKS
2	HIGH PRESSURE WATER MAIN HAZARD	WARNING SIGNS AND MARKERS SHALL BE ERECTED ADVISING OF THE PRESENCE OF UNDERGROUND HIGH PRESSURE WATER MAINS. THE LOCATION OF THE MAINS SHALL BE IDENTIFIED AND MARKED BY THE SUPPLY AUTHORITY PRIOR TO THE COMMENCEMENT OF EXCAVATION. A REPRESENTATIVE OF THE SUPPLY AUTHORITY SHALL REMAIN ON-SITE DURING EXCAVATION WORK, IF REQUIRED.
3	POTENTIAL FALL HAZARD	THE POTENTIAL FOR PERSONAL INJURY DUE TO FALLS FROM HEIGHT MAY EXIST ON THIS SITE. WHERE ACTIVITIES ARE TO BE UNDERTAKEN IN SITUATIONS WHERE A FALL HAZARD EXISTS, APPROPRIATE SIGNAGE, BARRIERS AND OTHER SAFETY MEASURES, AS REQUIRED, SHALL BE ERECTED. ALL REQUIRED PERSONAL SAFETY EQUIPMENT SHALL BE WORN.
4	POTENTIAL DROWNING HAZARD	THE POTENTIAL FOR PERSONAL INJURY OR DROWNING DUE TO FALLS INTO WATER MAY EXIST ON THIS SITE. WHERE ACTIVITIES ARE TO BE UNDERTAKEN IN SITUATIONS WHERE A FALL HAZARD INTO WATER EXISTS, APPROPRIATE SIGNAGE, BARRIERS AND OTHER SAFETY MEASURES, AS REQUIRED, SHALL BE ERECTED. ALL REQUIRED PERSONAL SAFETY EQUIPMENT, SUCH AS LIFE JACKETS, SHALL BE WORN.
5	POTENTIAL VEHICLE HAZARD	SITE PERSONNEL SHALL BE ADVISED OF THE POTENTIAL HAZARDS AND APPROPRIATE PROCEDURES FOR WORKING ADJACENT TO OPERATING PUBLIC ROADS OR SITE HAUL ROADS. APPROPRIATE SAFETY CLOTHING SHALL BE WORN AND THE REQUIRED SIGNAGE SHALL BE ERECTED. THE WORK SHALL BE UNDERTAKEN IN A MANNER WHICH DOES NOT COMPROMISE THE SAFETY OF VEHICLES AND THEIR OCCUPANTS OR OF SITE PERSONNEL. TRAFFIC MANAGEMENT PLANS (TMP) AND GUIDANCE SCHEMES (TGS) SHOULD BE COMPLETED AND APPROVED PRIOR TO WORK.
6	POTENTIAL PEDESTRIAN HAZARD	WHERE WORK IS TO BE UNDERTAKEN WITHIN OR ADJACENT TO AREAS TO WHICH THE PUBLIC HAS PEDESTRIAN ACCESS, APPROPRIATE BARRICADES AND SIGNAGE SHALL BE ERECTED. THE WORK SHALL BE UNDERTAKEN IN A MANNER WHICH DOES NOT COMPROMISE THE SAFETY OF THE PUBLIC OR OF SITE PERSONNEL. TRAFFIC MANAGEMENT PLANS (TMP) AND GUIDANCE SCHEMES (TGS) SHOULD BE COMPLETED AND APPROVED PRIOR TO WORK.
7	POTENTIAL TREE HAZARD	WHEN TREE CLEARING WORK IS TO BE UNDERTAKEN, THE APPROPRIATE WORK PROCEDURES ARE TO BE IMPLEMENTED. APPROPRIATE SIGNAGE, BARRIERS AND OTHER SAFETY MEASURES, AS REQUIRED, SHALL BE ERECTED. THE WORK SHALL BE UNDERTAKEN IN A MANNER WHICH DOES NOT COMPROMISE THE SAFETY OF THE PUBLIC OR OF SITE PERSONNEL.
8	UNDERGROUND OPTIC FIBRE HAZARD	WARNING SIGNS AND MARKERS SHALL BE ERECTED ADVISING OF THE PRESENCE OF OPTIC FIBRE CABLES. THE CABLE LOCATION SHALL BE IDENTIFIED AND MARKED BY THE SUPPLY AUTHORITY PRIOR TO THE COMMENCEMENT OF EXCAVATION. A REPRESENTATIVE OF THE SUPPLY AUTHORITY SHALL REMAIN ON-SITE DURING EXCAVATION WORK, IF REQUIRED.

0 10 20 30 40m
SCALE 1:400 @A1

SERVICE LOCATIONS

It is the responsibility of the Foreman to contact the relevant service authorities to ascertain the exact location of services prior to construction.

DIAL BEFORE YOU DIG

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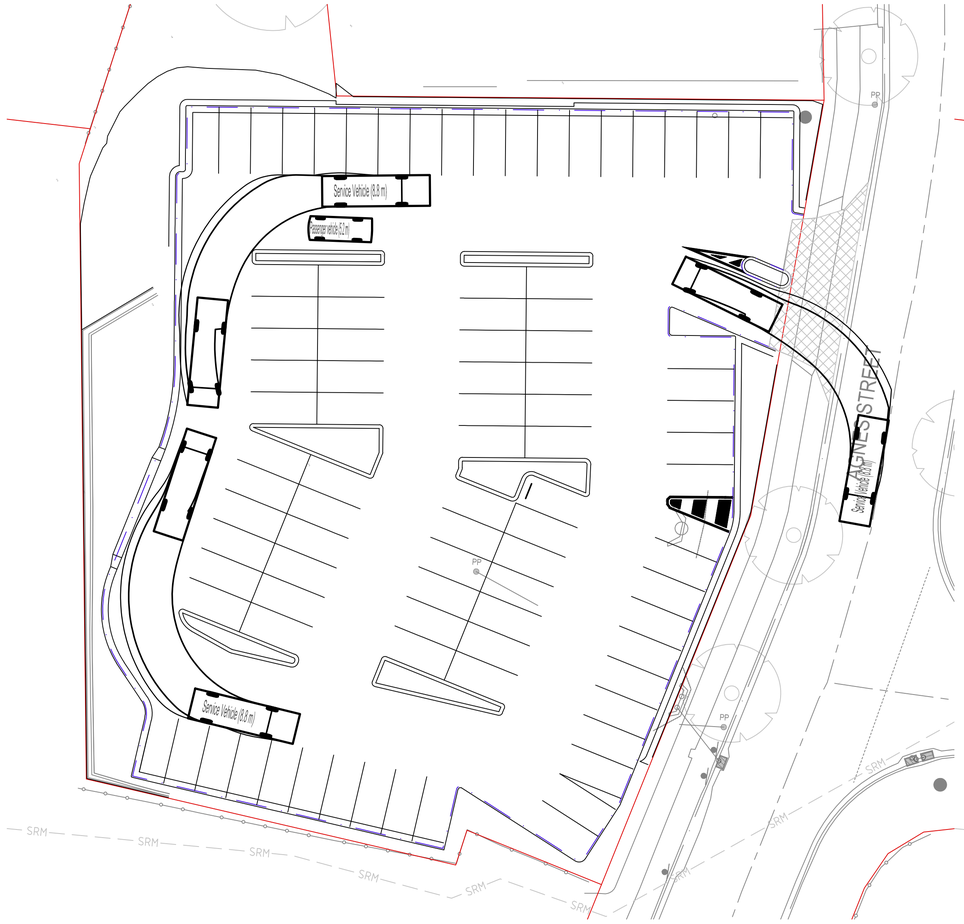
Designed	GM/CK	Date 15/07/2020
Verified	CGF/PM	Date 15/07/2020
Approved	T.DOYLE	RPEQ. 10283 Date 15/07/2020

Client: GLADSTONE REGIONAL COUNCIL
Project: AGNES STREET AND JEFFERY COURT
AGNES WATER
PARKING DETAIL DESIGN
Title: SAFETY IN DESIGN PLAN

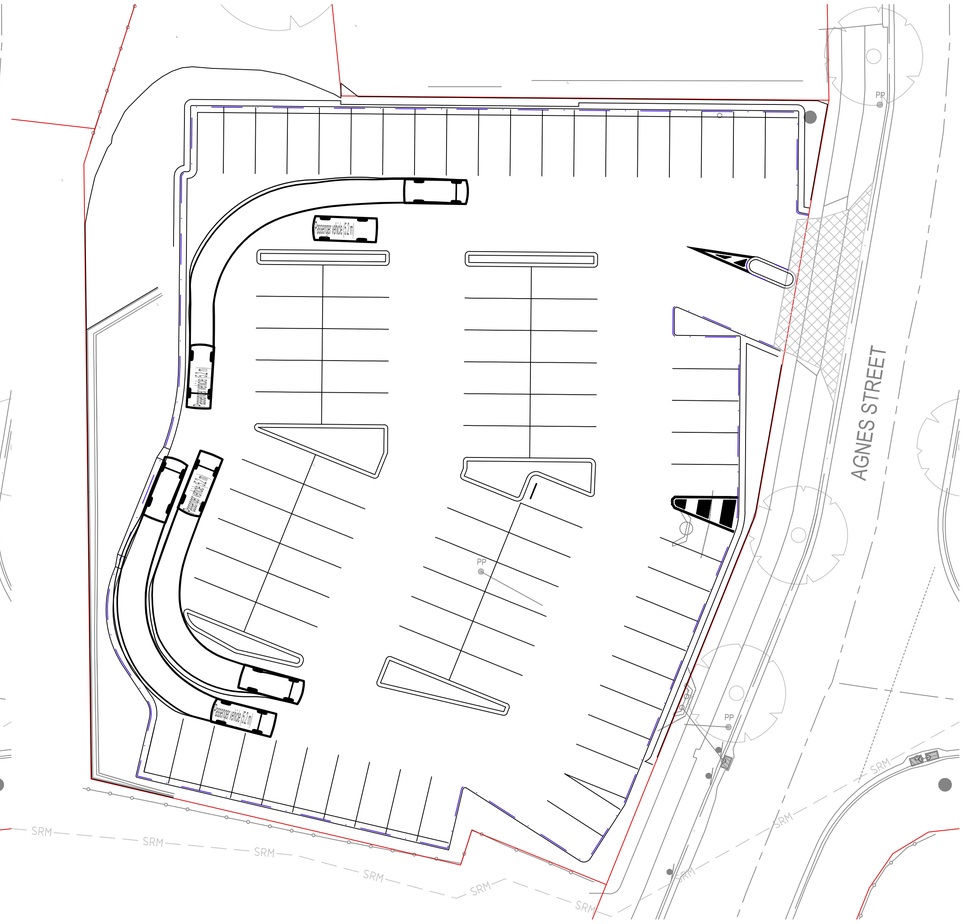
Status: FOR APPROVAL
FOR CONSTRUCTION PURPOSES WHEN STAMPED

Datum	GRID	Scale	Size
AHD	MGA-56	AS SHOWN	A1

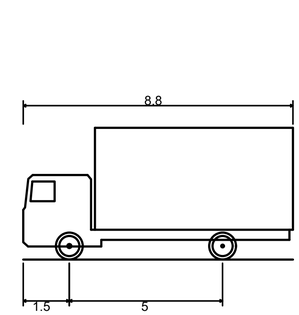
Drawing Number: R2018073-CI-0130
Revision: B



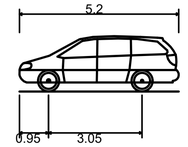
AGNES STREET - SERVICE VEHICLE
SCALE 1:250 @ A1



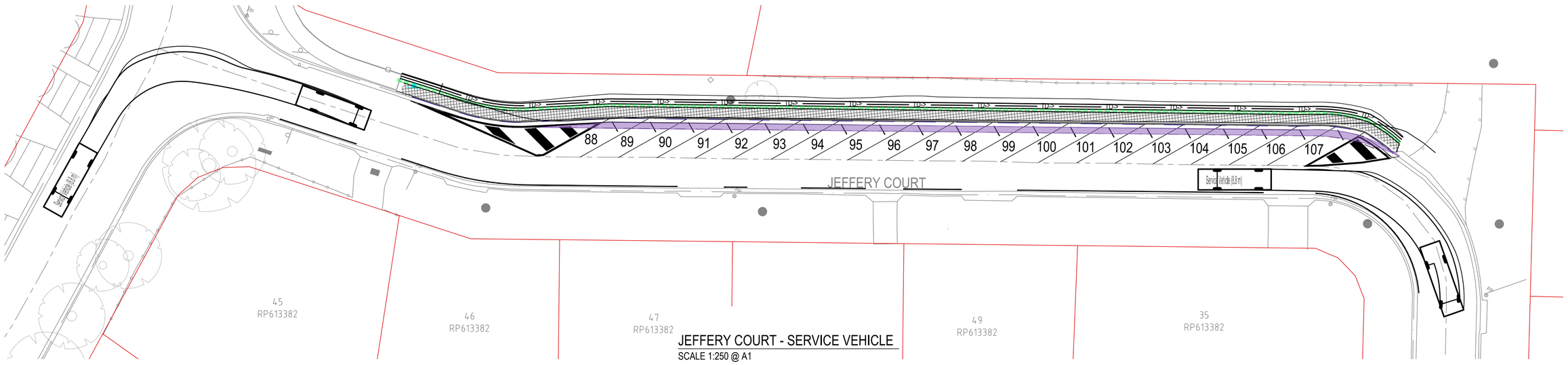
AGNES STREET - PRIVATE CAR
SCALE 1:250 @ A1



Service Vehicle (8.8 m)	
Overall Length	8.800m
Overall Width	2.500m
Overall Body Height	4.300m
Min Body Ground Clearance	0.427m
Track Width	2.500m
Lock-to-lock time	4.00s
Curb to Curb Turning Radius	12.500m



Passenger vehicle (5.2 m)	
Overall Length	5.200m
Overall Width	1.940m
Overall Body Height	1.804m
Min Body Ground Clearance	0.295m
Track Width	1.840m
Lock-to-lock time	4.00s
Curb to Curb Turning Radius	6.300m



JEFFERY COURT - SERVICE VEHICLE
SCALE 1:250 @ A1

0 5 10m
SCALE 1:250 @A1

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GLADSTONE REGIONAL COUNCIL

AGNES STREET AND JEFFERY COURT
TURN PATH ASSESSMENT

Datum	Date	Scale	Size
AHD	5/1/2019	AS SHOWN	A1

Drawing Number	Revision
R2018073-SK-04	2

GENERAL

G1 THESE DRAWINGS SHALL BE READ IN CONJUNCTION WITH ALL ARCHITECTURAL AND OTHER CONSULTANTS' DRAWINGS AND SPECIFICATIONS AND WITH SUCH OTHER WRITTEN INSTRUCTIONS AS MAY BE ISSUED DURING THE COURSE OF THE CONTRACT. ANY DISCREPANCIES OR OMISSIONS SHALL BE IMMEDIATELY REFERRED TO THE SUPERINTENDENT FOR RESOLUTION.

G2 THE INFORMATION CONTAINED ON THESE DRAWINGS IS FOR STRUCTURAL ENGINEERING PURPOSES ONLY. IN ALL OTHER MATTERS, THE APPROVED ARCHITECTS' DRAWINGS SHALL TAKE PRECEDENCE. ALL DISCREPANCIES THAT COULD RESULT IN CHANGES TO THE STRUCTURAL DETAILS SHALL BE REFERRED TO THE ENGINEER PRIOR TO PROCEEDING WITH CONSTRUCTION.
IF IN DOUBT - ASK.

G3 CONSTRUCTION FROM THESE DRAWINGS AND ASSOCIATED CONSULTANTS' DRAWINGS SHALL NOT COMMENCE UNTIL APPROVED BY THE LOCAL AUTHORITIES.

G4 ALL MATERIALS AND WORKMANSHIP SHALL BE IN ACCORDANCE WITH THE RELEVANT AND CURRENT AUSTRALIAN STANDARDS, THE BUILDING CODE OF AUSTRALIA AND WITH THE BY-LAWS AND ORDINANCES OF THE RELEVANT BUILDING AUTHORITIES.

G5 ALL DIMENSIONS SHALL BE VERIFIED BY THE BUILDER ON SITE BEFORE FABRICATION AND CONSTRUCTION. ENGINEERS' DRAWINGS SHALL NOT BE SCALED FOR DIMENSIONS.

G6 UNLESS NOTED OTHERWISE ALL LEVELS ARE IN METRES AND ALL DIMENSIONS ARE IN MILLIMETRES.

G7 DURING CONSTRUCTION THE STRUCTURE SHALL BE MAINTAINED IN A STABLE CONDITION AND NO PART SHALL BE OVERSTRESSED. TEMPORARY BRACING SHALL BE PROVIDED BY THE BUILDER TO KEEP THE WORKS AND EXCAVATIONS STABLE AT ALL TIMES.

G8 THE BUILDER SHALL GIVE A MINIMUM OF 24 HOURS NOTICE FOR ALL ENGINEERING INSPECTIONS.

DESIGN LOADS

IMPOSED LOAD = 2.5kPa
DEAD LOAD = 5.0kPa

SAFETY RISKS AND HAZARDS

R1 CONSTRUCTION ACTIVITY CAN BE HAZARDOUS. POTENTIAL SAFETY HAZARDS CONSIDERED BY THE DESIGNERS TO HAVE A HIGHER RISK THAN NORMAL CONSTRUCTION ACTIVITY ARE IDENTIFIED WITH APPROPRIATE NOTES ON THESE DRAWINGS. IT SHOULD BE NOTED THAT DESIGNERS EMPLOYED BY CARDNO ARE DESIGNERS AND THEREFORE HAVE A LOWER LEVEL OF UNDERSTANDING OF THE RISKS INVOLVED IN CONSTRUCTION COMPARED TO THAT OF A COMPETENT CONTRACTOR. IT IS THEREFORE ESSENTIAL THAT AN ADEQUATE SAFETY PLAN IS PREPARED BY THE CONTRACTOR FOR THE WORKS. CARDNO MAY NOT BE AWARE OF ALL SAFETY RISKS AND HAZARDS INVOLVED IN THIS PROJECT AND THE ABSENCE OF COMMENT DOES NOT IMPLY THAT THERE ARE NO RISKS OR HAZARDS INVOLVED IN THIS PROJECT.

FORMWORK

CF1 THE DESIGN, CONSTRUCTION AND PERFORMANCE OF THE FORMWORK AND FALSEWORK IS THE RESPONSIBILITY OF THE BUILDER.

CF2 DESIGN AND CONSTRUCTION AND STRIPPING TIMES SHALL COMPLY WITH AS 3610 AND AS 3600 UNLESS OTHERWISE APPROVED BY THE ENGINEER.

CF3 DURING CONSTRUCTION, SUPPORT PROPPING SHALL BE PROVIDED WHERE LOADS FROM STACKED MATERIALS, FORMWORK AND OTHER SUPPORTED SLABS INDUCE LOADS IN A SLAB OR BEAM WHICH EXCEED THE DESIGN LOAD FOR STRENGTH OR SERVICEABILITY AT THAT AGE ONCE THE NOMINATED 28 DAY STRENGTH HAS BEEN ATTAINED, THESE LOADS SHALL NOT EXCEED THE DESIGN SUPERIMPOSED LOADS SET OUT IN THE GENERAL NOTES.

CF4 THE FORMWORK SHALL BE DESIGNED TO RELY ON NO RESTRAINT OR SUPPORT FROM THE PERMANENT STRUCTURE WITHOUT PRIOR APPROVAL FROM THE PROJECT DESIGN ENGINEER.

CF5 FORMWORK SHALL BE DESIGNED TO ACCOMMODATE MOVEMENTS AND LOAD REDISTRIBUTION DUE TO POST-TENSIONING.

CF6 WHERE NECESSARY SPECIAL REQUIREMENTS FOR SEQUENCE OF CONCRETE PLACEMENT AND STRIPPING ARE SET OUT ON DRAWINGS.

CF7 DESIGN INFORMATION CONCERNING THE FOUNDATION FORMWORK SHALL BE DETERMINED FROM THE CONDITIONS EXISTING ON SITE AT THE TIME OF CONSTRUCTION. REFER ALSO TO THE GEOTECHNICAL REPORT WHERE AVAILABLE.

REINFORCEMENT

R1 ALL REINFORCING BARS SHALL BE GRADE D500N TO AS 4671 UNLESS NOTED OTHERWISE. ALL MESH SHALL BE GRADE 500L TO AS 4671 AND SHALL BE SUPPLIED IN FLAT SHEETS. REINFORCEMENT NOTATION SHALL BE AS FOLLOWS IN THE FOLLOWING ORDER

NUMBER OF BARS IN GROUP (IF NOMINATED)
BAR GRADE AND TYPE
17/N20-250
SPACING IN mm
NOMINAL BAR SIZE

THE FIGURES FOLLOWING THE FABRIC SYMBOLS RL, SL, L , TM IS THE REFERENCE NUMBER FOR FABRIC TO A AS 4671.

R2 REINFORCEMENT IS REPRESENTED DIAGRAMMATICALLY AND NOT NECESSARILY IN TRUE PROJECTION.

R3 SPLICES IN REINFORCEMENT SHALL BE MADE ONLY IN POSITIONS SHOWN OR OTHERWISE APPROVED IN WRITING BY THE ENGINEER. LAPS SHALL BE IN ACCORDANCE WITH AS 3600 AND NOT LESS THAN THE DEVELOPMENT LENGTH FOR EACH BAR, AS SHOWN IN THE TABLE BELOW.

SPLICE SCHEDULE			
BAR DIA.	LENGTH	BAR DIA.	LENGTH
N10	350	N28	1100
N12	400	N32	1400
N16	500	N36	1700
N20	650	N40	2000
N24	800		

R4 WELDING OF REINFORCEMENT SHALL NOT BE PERMITTED UNLESS SHOWN ON THE STRUCTURAL DRAWINGS OR APPROVED BY THE ENGINEER.

R5 SLAB MESH SHALL BE LAPPED BY TWO TRANSVERSE WIRES PLUS 25mm. BUNDLED BARS SHALL BE TIED TOGETHER AT 30 BAR DIAMETER CENTRES WITH 3 WRAPS OF THE WIRE.

R6 WHERE TRANSVERSE TIE BARS ARE NOT SHOWN PROVIDE N12-300 SPLICED WHERE NECESSARY AND LAP WITH MAIN BARS 400mm UNLESS NOTED OTHERWISE.

R7 JOGGLES TO BARS SHALL COMPRISE A LENGTH OF 12 BAR DIAMETERS BETWEEN BEGINNING AND END OF AN OFFSET OF 1 BAR DIAMETER.

R8 REINFORCEMENT IS TO BE SUPPORTED IN ITS CORRECT POSITION WITHIN THE TOLERANCES OF AS 3600 BY APPROVED BAR CHAIRS, SPACES OR SUPPORT BARS.

R9 ALL ANGLED SLAB EDGES TO THE REINFORCEMENT MAT SHALL BE TRIMMED WITH DISTRIBUTION REINFORCEMENT (TOP AND BOTTOM LAYERS, LAP 500 AND COG CORNERS).

R10 AT A SIMPLE OR END SUPPORT OF A SLAB ON A MASONRY WALL, ALL BOTTOM SLAB REINFORCEMENT SHALL EXTEND OVER THE MASONRY WALL BY A LENGTH OF 75mm FOR N12 BARS AND 95mm FOR N16 BARS. IF THIS CANNOT BE ACHIEVED DUE TO COVER REQUIREMENTS THEN THE BARS SHALL BE COGGED. FOR FABRIC THE LAST WELDED CROSS ROD SHALL BE LOCATED OVER THE WALL AND 50mm MINIMUM BEYOND THE FACE OF THE WALL.

R11 ALL REINFORCEMENT SHALL BE FIRMLY SUPPORTED ON MILD STEEL PLASTIC TIPPED CHAIRS, PLASTIC CHAIRS OR CONCRETE CHAIRS AT NOT GREATER THAN 1 METRE CENTRES BOTH WAYS, AND 800 EACH WAY FOR FABRIC. WHEN POURED ON GROUND AS FORMWORK, PROVIDE PLATES UNDER ALL BAR CHAIRS. PLASTIC TIPPED STEEL CHAIRS SHALL NOT BE USED ON EXPOSED FACES IN EXPOSURE CLASSIFICATION B1, B2 AND C, ONLY PLASTIC OR CONCRETE CHAIRS.

R12 SITE BENDING OF REINFORCEMENT SHALL BE AVOIDED IF POSSIBLE. WHERE SITE BENDING IS UNAVOIDABLE IT SHALL BE CARRIED OUT COLD, WITHOUT THE APPLICATION OF HEAT, AND IN ACCORDANCE WITH THE PRACTICE NOTE RPN1 OF THE STEEL REINFORCEMENT INSTITUTE OF AUSTRALIA.

R13 THE STRUCTURAL ENGINEER SHALL BE GIVEN A MINIMUM OF 24 HOURS NOTICE FOR REINFORCEMENT INSPECTION AND CONCRETE SHALL NOT BE DELIVERED UNTIL FINAL APPROVAL HAS BEEN OBTAINED FROM THE STRUCTURAL ENGINEER.

CONCRETE

C1 ALL WORKMANSHIP AND MATERIALS SHALL BE IN ACCORDANCE WITH AS 3600, AS 1379 AND AS 3610 CURRENT EDITIONS WITH AMENDMENTS, EXCEPT WHERE VARIED BY THE CONTRACT DOCUMENTS.

C2 CONCRETE QUALITY:
ALL CEMENT TO BE TYPE SL, SHRINKAGE LIMITED CEMENT IN ACCORDANCE WITH AS 3972, EXCEPT THAT THE MAXIMUM SHRINKAGE OF THE CEMENT IN THE MORTAR TEST SAMPLE IN ACCORDANCE WITH AS 2350 SHALL BE LESS THAN 600 MICROSTRAIN.

ELEMENT	STRENGTH GRADE	SLUMP (mm)
ROOF PANELS	N40	80
WALLS	N40	80
BASE SLAB	N40	80

C3 ALL CONCRETE IN SLABS AND BEAMS TO BE PROPORTIONED TO LIMIT DRYING SHRINKAGE TO 650 MICROSTRAIN AT 56 DAYS.

C4 NO ADMIXTURES OTHER THAN LOW RANGE WRA SHALL BE USED IN CONCRETE UNLESS APPROVED IN WRITING.

C5 CLEAR CONCRETE COVER TO ALL REINFORCEMENT SHALL BE AS FOLLOWS UNLESS NOTED OTHERWISE. COVER MAY NEED TO BE INCREASED FOR FIRE RATING.

EXPOSURE CLASS TO AS 3600	CAST AGAINST GROUND	CAST IN FORMS AND EXPOSED	CAST IN FORMS AND NOT EXPOSED
ROOF PANELS	-	50mm	50mm
WALLS	-	-	50mm
BASE SLAB	70mm	-	50mm

NOTE: WHERE CONCRETE IS POURED ON A VAPOUR PROOF MEMBRANE 0.2mm MINIMUM THICKNESS, THE COVER TO CONCRETE CAST AGAINST GROUND MAY BE REDUCED BY 10mm.
S40 CONCRETE WILL HAVE MINIMUM 470kg CEMENT PER CUBIC METRE WITH MAXIMUM WATER CEMENT RATIO OF 0.45 SUITABLE FOR DURABILITY EXPOSURE CLASSIFICATION C OR N50
S50 CONCRETE WILL HAVE MINIMUM 550kg CEMENT PER CUBIC METER, WITH A MAXIMUM WATER CEMENT RATIO OF 0.40.

C6 CONCRETE SIZES SHOWN DO NOT INCLUDE THICKNESS' OF APPLIED FINISHES. NO FINISH WHICH DECREASES COVER IS ALLOWED WITHOUT THE WRITTEN APPROVAL OF THE ENGINEER.

C7 FOR CHAMFERS, DRIP GROOVES, REGLETS, ETC. REFER TO ARCHITECT'S DETAILS, MAINTAIN COVER TO REINFORCEMENT AT THESE DETAILS. IF NOT SPECIFIED BY ARCHITECT ALL EXPOSED EDGES SHALL HAVE 20mm CHAMFERS AND DRIP GROOVES.

C8 NO HOLES, CHASES, BLOCKOUTS, DUCTS OR EMBEDMENT OF PIPES OTHER THAN THOSE SHOWN ON THE STRUCTURAL DRAWINGS SHALL BE MADE IN CONCRETE MEMBERS WITHOUT THE PRIOR WRITTEN APPROVAL OF THE ENGINEER.

C9 CONSTRUCTION JOINTS WHERE NOT SHOWN SHALL BE LOCATED TO THE APPROVAL OF THE ENGINEER.

C10 FOR CONCRETE FINISHES REFER TO ARCHITECTS SPECIFICATION WHERE NOT SPECIFIED, FORMED FINISHES SHALL BE CLASS 2 TO AS 3610 AND UNFORMED SURFACES SHALL BE A STEEL TROWELLED FINISH.

C11 THE FINISHED CONCRETE SHALL BE MECHANICALLY VIBRATED TO ACHIEVE A DENSE HOMOGENEOUS MASS, COMPLETELY FILLING THE FORMWORK THOROUGHLY EMBEDDING THE REINFORCEMENT AND FREE OF STONE POCKETS. ALL CONCRETE INCLUDING SLABS ON GROUND AND FOOTING SHALL BE COMPACTED WITH MECHANICAL VIBRATORS.

C12 CURING OF ALL CONCRETE IS TO BE ACHIEVED BY KEEPING SURFACES CONTINUOUSLY WET FOR A PERIOD OF THREE DAYS, AND THE PREVENTION OF LOSS OF MOISTURE FOR A TOTAL OF 7 DAYS FOLLOWED BY A GRADUAL DRYING OUT. APPROVED SPRAYED ON CURING COMPOUNDS THAT COMPLY WITH AS 3799 MAY BE USED WHERE FLOOR FINISHES WILL NOT BE AFFECTED (REFER MANUFACTURERS SPECIFICATION). POLYTHENE SHEETING OR WET HESSIAN MAY BE USED IF PROTECTED FROM WIND AND TRAFFIC.

C13 CONSTRUCTION SUPPORT PROPPING IS TO BE LEFT IN PLACE WHERE NEEDED TO AVOID OVER STRESSING THE STRUCTURE DUE TO CONSTRUCTION LOADING.

C14 REPAIRS TO CONCRETE SHALL NOT BE ATTEMPTED WITHOUT THE PERMISSION OF THE ENGINEER.

C15 CAST-IN FIXINGS, BOLTS ETC. SHALL NOT BE ALTERED WITHOUT THE PERMISSION OF THE ENGINEER.

PRECAST CONCRETE PANELS

PC1 ALL WORKMANSHIP AND MATERIALS SHALL CONFORM WITH CURRENT EDITIONS OF AS3600 AND AS3850 EXCEPT WHERE VARIED BY THE CONTRACT DOCUMENTS AND SPECIFICATIONS.

PC2 ALL PRECAST PANELS ARE TO BE N50 CONCRETE U.N.O.

PC3 PRIOR TO COMMENCEMENT THE CONTRACTOR SHALL CONFIRM ADEQUATE SITE CONDITIONS TO ALLOW ERECTION AND INSTALLATION OF PRECAST PANELS. NOTIFY ENGINEER IF INSUFFICIENT ACCESS / SITE CLEARANCES.

PC4 ALL FERRULES ARE TO BE TCM 20 INSERT TOGETHER WITH Gr 8.8/S BOLTS ALL HOT DIP GALVANISED U.N.O. N12 CROSS BARS TO BE LOCATED BEHIND VERTICAL REINFORCEMENT.

PC5 ALL LIFTING INSERTS ARE TO COMPLY WITH AS 3850 AND BE DESIGNED, MANUFACTURED AND INSTALLED TO ACHIEVE A MINIMUM GUARANTEED FACTOR OF SAFETY OF 2.5 AGAINST FAILURE OF THE ANCHOR, THE CONCRETE OR ANY REINFORCEMENT TO WHICH THE ANCHOR RELIES UPON FOR ANCHORAGE. LIFTING CLUTCHES SHALL HAVE A MINIMUM FACTOR OF SAFETY OF 5 AGAINST FAILURE.

PC6 ALL LIFTING INSERTS AND CLUTCHES SHALL BE PERMANENTLY MARKED WITH THE NOMINAL CAPACITY OF THE ANCHOR AND THE MANUFACTURER'S IDENTIFICATION MARK WHICH ARE TO BE VISIBLE WHEN THE ANCHOR IS PLACED IN CONCRETE.

PC7 THE PRECAST CONCRETE MANUFACTURER SHALL PROVIDE MANUFACTURER'S COMPLIANCE AND TEST CERTIFICATION BY A NATA ACCREDITED TESTING AUTHORITY OF THE PROPOSED LIFTING INSERTS AND CLUTCHES.

PC8 ALL TEMPORARY BRACING INSERTS ARE TO COMPLY WITH AS 3850 AND SHALL BE CAST IN WHERE POSSIBLE. ACCEPTABLE ALTERNATIVES ARE MECHANICAL FIXINGS SUCH AS UNDERCUT INSERTS OR DRILLED THROUGH FIXINGS IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS. CHEMICAL ANCHORS SHALL NOT BE USED UNLESS EACH INSERT IS PROOF LOAD TESTED TO THE REQUIRED CAPACITY.

PC9 PRIOR TO LIFTING OF ANY PRECAST CONCRETE ELEMENT THE PRECAST CONCRETE MANUFACTURER'S ENGINEER SHALL VERIFY THAT EACH PRECAST CONCRETE ELEMENT HAS BEEN CONSTRUCTED IN ACCORDANCE WITH THE DESIGN FOR ERECTION AND THAT THE CONCRETE HAS REACHED THE REQUIRED STRENGTH FOR LIFTING.

PC10 PRECAST PANELS AS DRAWN HAVE BEEN DESIGNED FOR 'IN SERVICE' CONDITIONS ONLY. THE PRECAST PANEL MANUFACTURER IS RESPONSIBLE FOR THE DESIGN AND DOCUMENTATION OF PANELS FOR FABRICATION, LIFTING, SHAPE, TRANSPORTATION AND ALL ASPECTS OF THE ERECTION PROCESS.

FOUNDATIONS

F1 THE DESIGN OF THIS STRUCTURE HAS BEEN BASED ON THE FOUNDATIONS HAVING A MINIMUM BEARING CAPACITY OF 100kPa.

F2 NATURAL FOUNDATION AND FILL TO BE GRUBBED OUT AND FREE FROM ORGANIC MATTER AND DEBRIS, AND COMPACTED TO A MINIMUM FOR 98% SRDD. FILL TO SLABS AND FOOTINGS SHALL BE AN APPROVED NON-PLASTIC MATERIAL, COMPACTED TO 98% SRDD.

F3 ALL EARTHWORKS SHALL BE IN ACCORDANCE WITH AS3798-2007 "GUIDELINES ON EARTHWORKS FOR COMMERCIAL AND RESIDENTIAL DEVELOPMENTS".

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Verified	ML	Date 15/07/2020
Approved	T.DOYLE	RPEQ. 10283 Date 15/07/2020

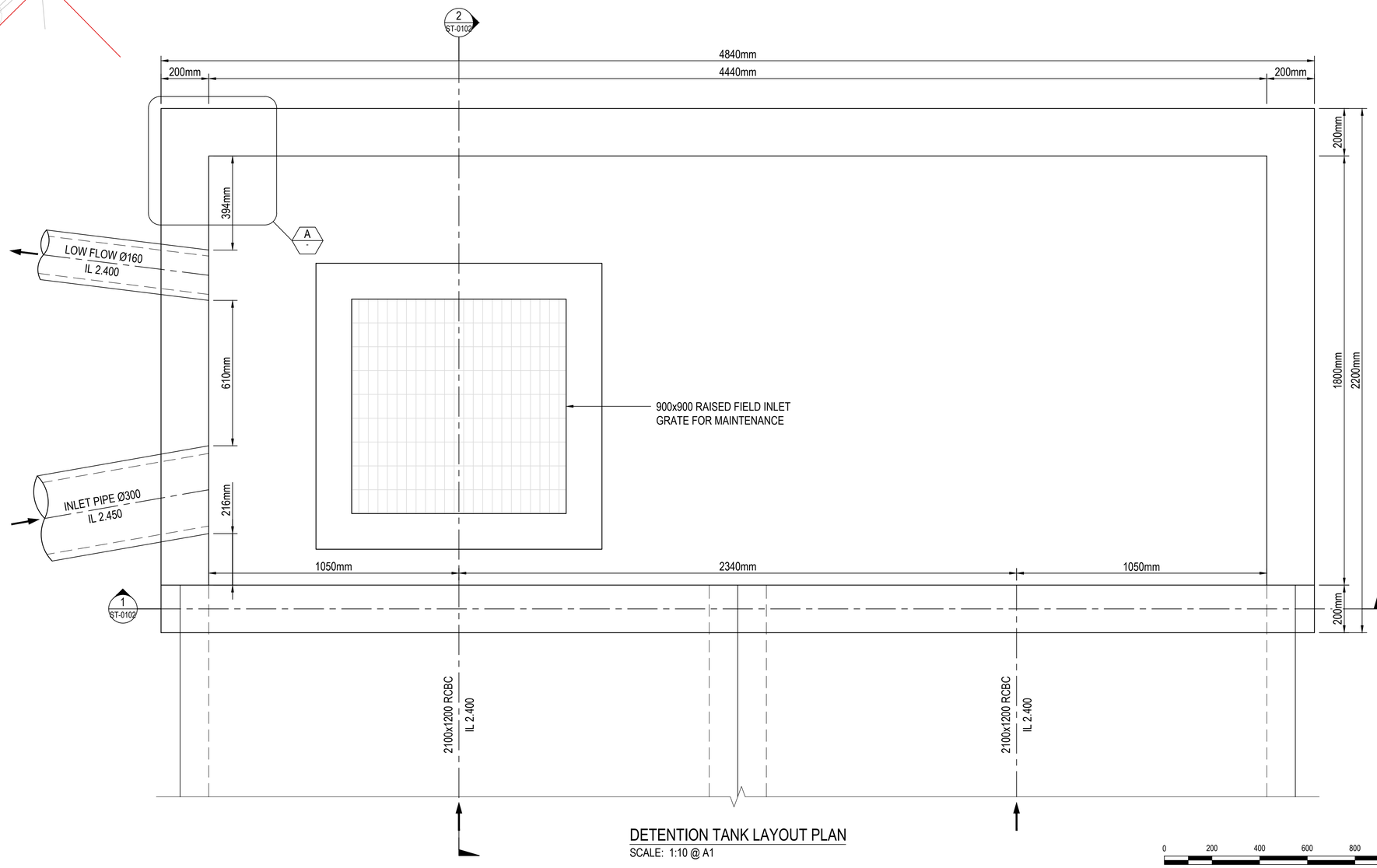
Client: GLADSTONE REGIONAL COUNCIL
Project: AGNES STREET AND JEFFERY COURT
AGNES WATER
PARKING DETAIL DESIGN
Title: STRUCTURAL NOTES

Status: FOR APPROVAL
FOR CONSTRUCTION PURPOSES WHEN STAMPED

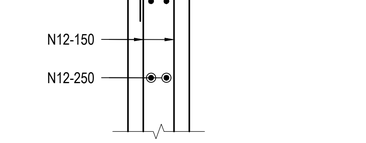
Datum	GRID	Scale	Size
AHD	MGA-56	AS SHOWN	A1

Drawing Number: R2018073-ST-0100
Revision: 1

KEY PLAN
SCALE: 1:500 @ A1



DETENTION TANK LAYOUT PLAN
SCALE: 1:10 @ A1



DETAIL A
SCALE 1:10 @ A1

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SCALE 1:10 @A1
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SCALE 1:500 @A1

FOR GENERAL NOTES REFER DRG. R2018073-ST-0100

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	T.DOYLE	15/07/2020

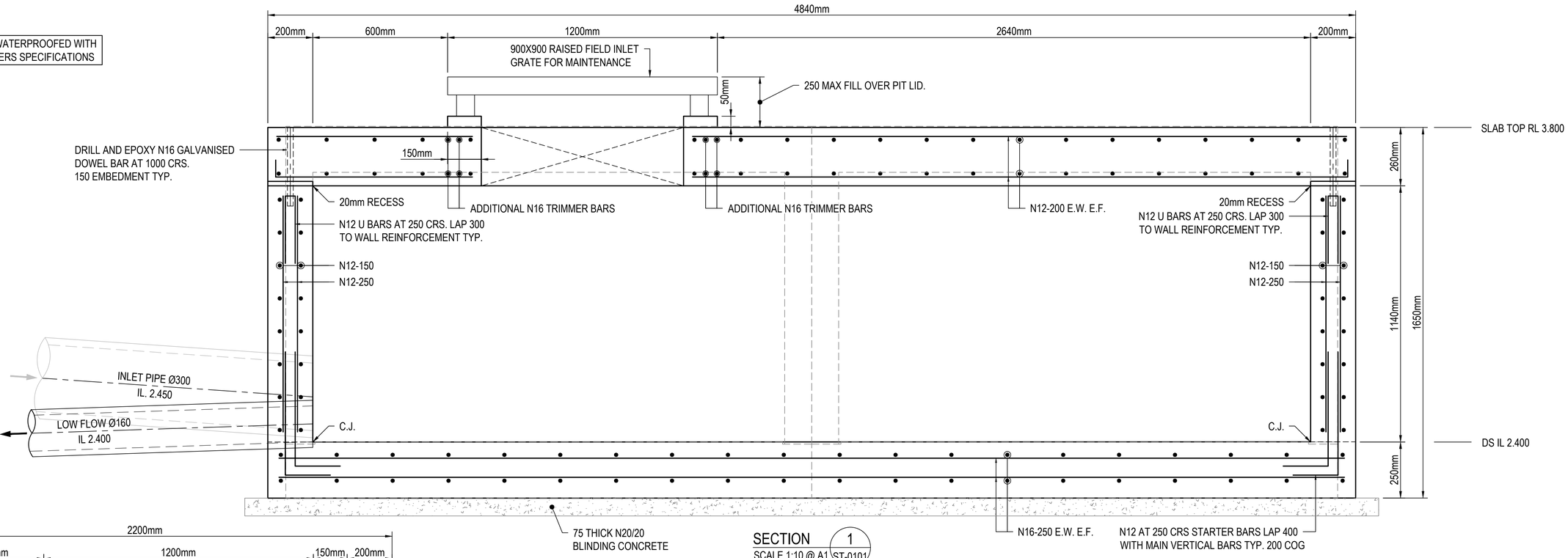
Client: GLADSTONE REGIONAL COUNCIL
Project: AGNES STREET AND JEFFERY COURT
AGNES WATER
PARKING DETAIL DESIGN
Title: DETENTION TANK LAYOUT

Status: FOR APPROVAL
FOR CONSTRUCTION PURPOSES WHEN STAMPED

Datum	GRID	Scale	Size
AHD	MGA-56	AS SHOWN	A1

Drawing Number: R2018073-ST-0101
Revision: 1

ALL CONCRETE JOINTS ARE TO BE WATERPROOFED WITH KUNISEAL C-31DS TO MANUFACTURERS SPECIFICATIONS



SECTION 1
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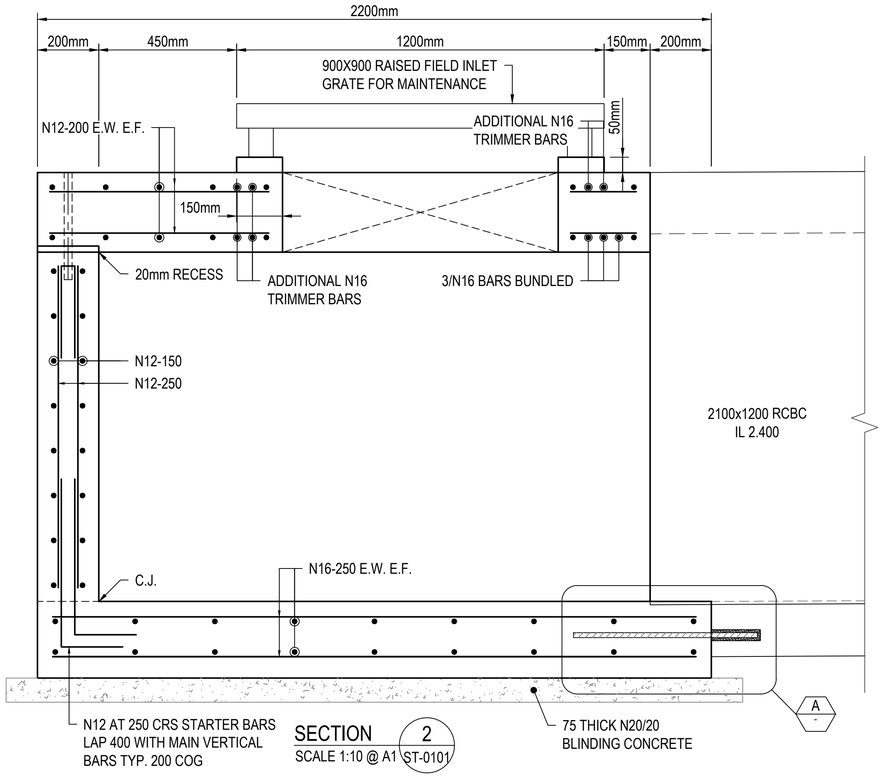
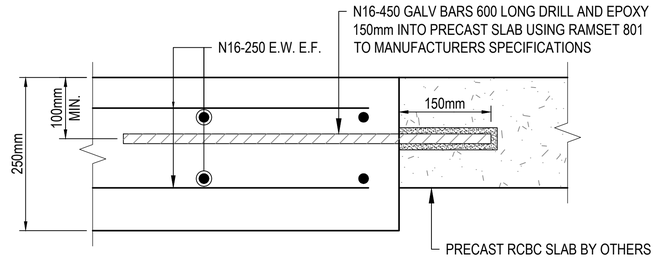
COMPACTED SUBGRADE TO HAVE A MINIMUM BEARING CAPACITY OF 100kPa



SECTION 2
SCALE 1:10 @ A1 ST-0101



DETAIL A
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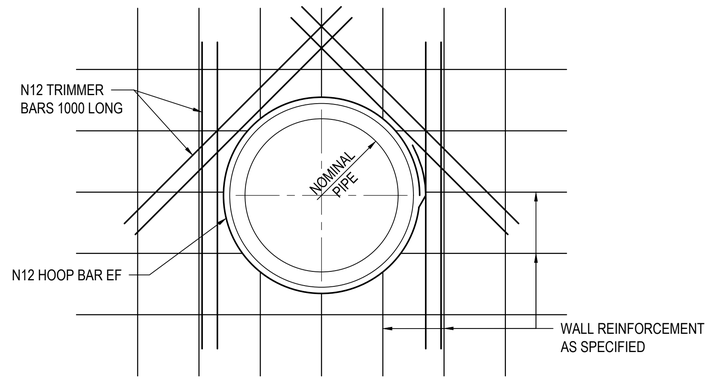

TYPICAL WALL PENETRATION
SCALE 1:10 @ A1

FOR GENERAL NOTES REFER DRG. R2018073-ST-0100

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SCALE 1:10 @A1
0 500 1000 1500 2000mm
SCALE 1:20 @A1

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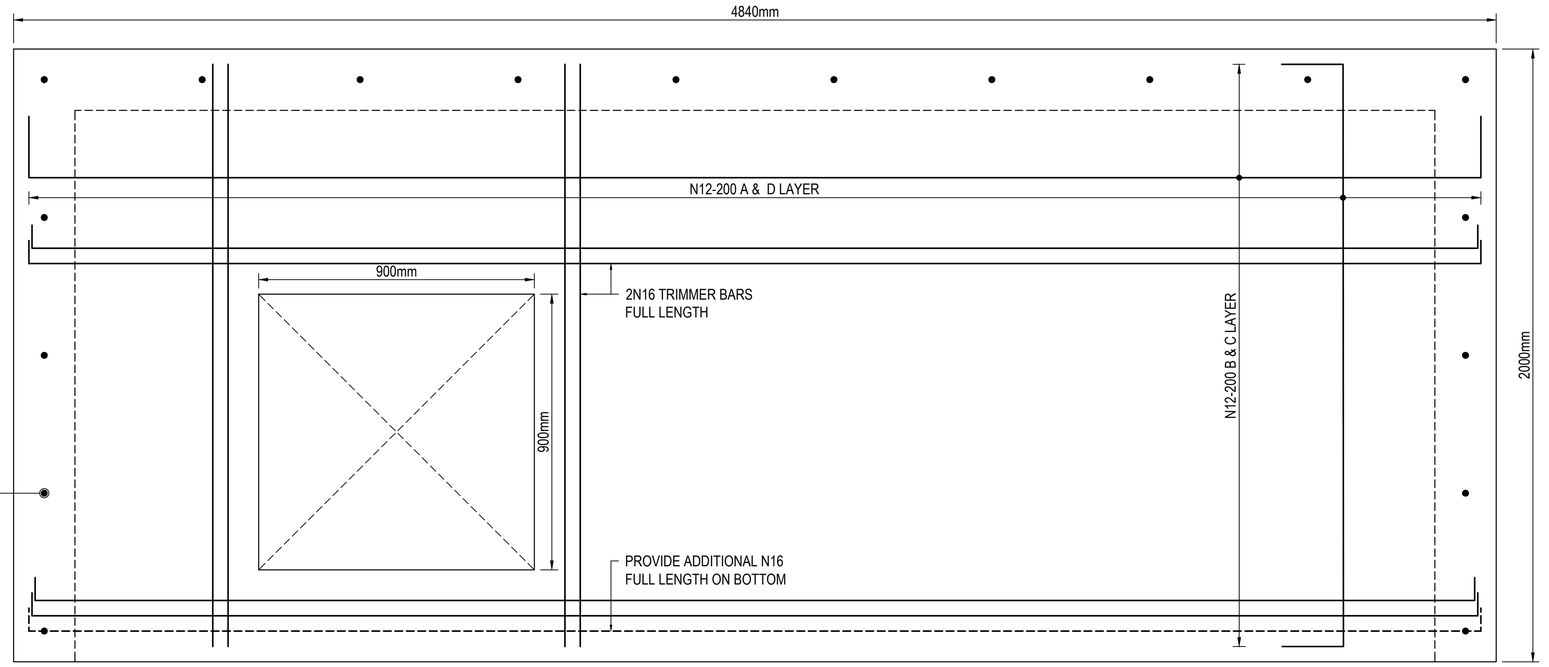
Verified	ML	Date 15/07/2020
Approved	RPEQ. 10283	Date 15/07/2020
	T.DOYLE	

Client: GLADSTONE REGIONAL COUNCIL
Project: AGNES STREET AND JEFFERY COURT AGNES WATER PARKING DETAIL DESIGN
Title: DETENTION TANK SECTIONS AND DETAILS
Status: FOR APPROVAL FOR CONSTRUCTION PURPOSES WHEN STAMPED
Datum: AHD | GRID: MGA-56 | Scale: AS SHOWN | Size: A1
Drawing Number: R2018073-ST-0102
Revision: 1

B - SECOND LAYER
C - THIRD LAYER
A - FIRST LAYER
D - LAST LAYER

ROOF BAR LAYING SEQUENCE
SCALE N.T.S.

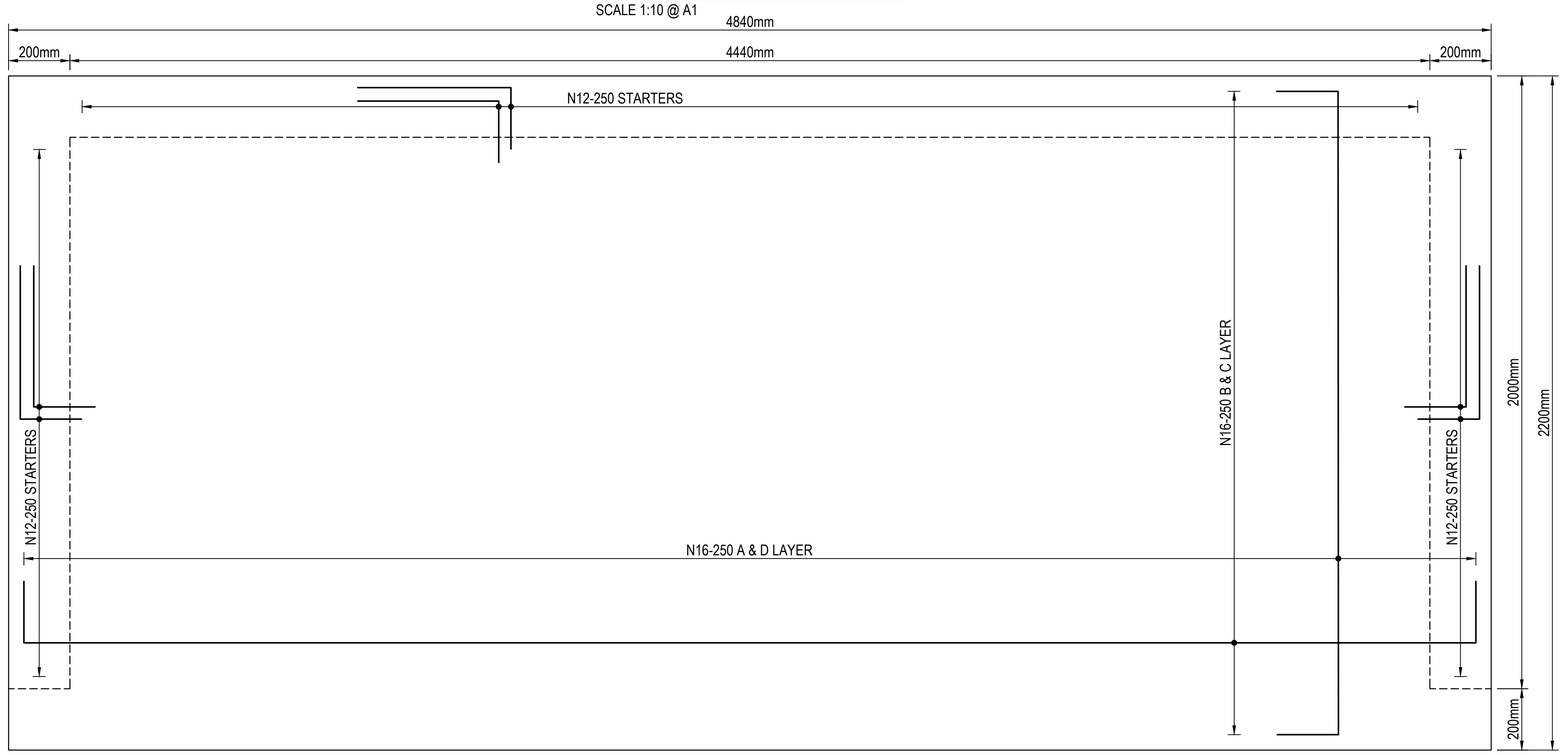


ROOF SLAB REINFORCEMENT PLAN
SCALE 1:10 @ A1

LIFTING DESIGN AND CERTIFICATION TO BE COMPLETED BY THE CONTRACTOR. LIFTING LOCATIONS TO BE CONFIRMED BY CONTRACTOR

A - FIRST LAYER
D - LAST LAYER
B - SECOND LAYER
C - THIRD LAYER

BASE BAR LAYING SEQUENCE
SCALE N.T.S.



BASE SLAB REINFORCEMENT PLAN
SCALE 1:10 @ A1

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0 200 400 600 800 1000mm
SCALE 1:10 @A1

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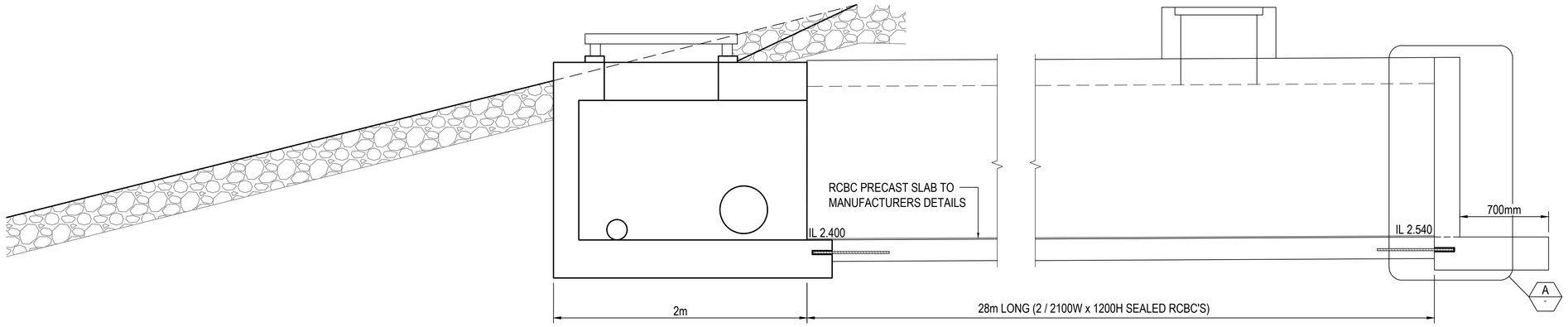
Verified	ML	15/07/2020
Approved	RPEQ. 10283	15/07/2020
	T.DOYLE	

Client: GLADSTONE REGIONAL COUNCIL
Project: AGNES STREET AND JEFFERY COURT
AGNES WATER
PARKING DETAIL DESIGN
Title: DETENTION TANK ROOF AND BASE SLAB PLAN

Status: FOR APPROVAL
FOR CONSTRUCTION PURPOSES WHEN STAMPED

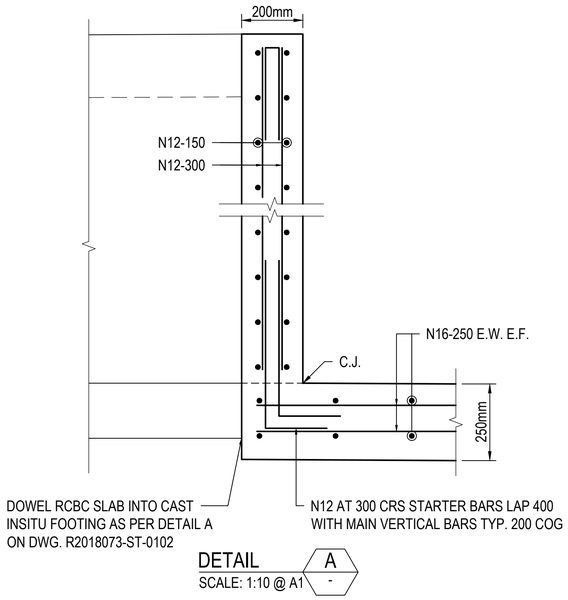
Datum	GRID	Scale	Size
AHD	MGA-56	AS SHOWN	A1

Drawing Number: R2018073-ST-0103
Revision: 1



DETENTION TANK AND RCBC LAYOUT PLAN

SCALE: 1:10 @ A1



DETAIL A

SCALE: 1:10 @ A1

FOR GENERAL NOTES REFER DRG. R2018073-ST-0100

0 200 400 600 800 1000mm

SCALE 1:10 @A1

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Approved	T.DOYLE	RPEQ. 10283 Date 15/07/2020

Client: GLADSTONE REGIONAL COUNCIL

Project: AGNES STREET AND JEFFERY COURT
AGNES WATER
PARKING DETAIL DESIGN

Title: DETENTION TANK RCBC EASTERN END WALL

Status: FOR APPROVAL
FOR CONSTRUCTION PURPOSES WHEN STAMPED

Datum	GRID	Scale	Size
AHD	MGA-56	AS SHOWN	A1

Drawing Number: R2018073-ST-0104

Revision: 1

Appendix C Relevant Key Extracts from Flood Report

Technical Memorandum

Title	**Agnes Street Carpark** **Stormwater Modelling and Assessment**		
Client	Gladstone Regional Council	**Project No**	R2020043
Date	14/07/2020	**Status**	Final
Author	Michael Koi	**Discipline**	Water and Environment
Approved	Saul Martinez	**Office**	Brisbane

Cardno has been commissioned by Gladstone Regional Council (GRC) to carry out stormwater modelling and assessment to determine the size of stormwater infrastructures required to accommodate a fully developed upstream contributing catchments, as part of the proposed carpark development at Agnes Street in Agnes Water (subject site). Currently, there are three stormwater network lines that discharge stormwater onto the proposed carpark area. As part of the carpark development, these existing stormwater network lines will be extended under the proposed carpark with individual outlet being provided at the downstream of the carpark. The proposed carpark layout plan is attached to the back of this technical memorandum.

In Item 8 of its Information Request (IR), dated 16th March 2020, Council has requested that the proposed extension section of these stormwater infrastructures (i.e. under the carpark) will need to be adequately sized to have the capacity to accommodate a fully developed upstream catchments. Figure A below shows the locality and exact location of the proposed carpark at Agnes Street in Agnes Water.

Figure A - Site Location

In order to determine the appropriate size of the stormwater infrastructures required to be provided under the proposed carpark, hydrological modelling using the XP-RAFTS program and hydraulic modelling using the TUFLOW program have been carried out as part of this study. The hydrological modelling has been carried out based on the 2019 Australian Rainfall and Runoff methodology (2019 ARR).

This technical memorandum has been prepared to address Item 8 of Council's IR and summarises key modelling parameters adopted and modelling outcomes as part of this study.

1.0 Hydrological Modelling

As discussed above, hydrological analysis of the catchments contributing to the site and the existing waterway downstream was undertaken using XP-RAFTS runoff routing software. This analysis provided estimates of the design runoff hydrographs for use as input into the hydraulic model. Hydrological modelling has been carried out based on the 2019 ARR methodology for this study. In accordance with the 2019 ARR methodology, design rainfall data for the site has been obtained from the ARR Data Hub and the Bureau of Meteorology database for *Latitude -24.2088 and Longitude 151.9051*.

1.1 Model Catchment Scenario

The hydrological model was built to account for the ultimate land use scenario as shown in the current Gladstone Regional Council Planning Scheme land use zone mapping.

1.2 Model Setup

1.2.1 Catchments

The hydrological model domain adopted covers an area of approximately 192 hectares, and includes all upstream catchments that contribute to the existing waterway downstream of the proposed carpark, which ultimately discharges into the Coral Sea at Agnes Water Beach. The contributing catchment has been sub-divided into 23 sub-catchments in the XP-RAFTS model. Catchment boundaries were delineated based on the 1m LiDAR data provided by GRC database in combination with the latest aerial imagery available. The catchment parameters applied in the XP-RAFTS model for the individual sub-catchment are shown in Table 1-1. Sub-catchment boundaries and routing adopted in the hydrological model for this study are shown in Figure A1.

Table 1-1 Hydrological Model Catchment Parameters Adopted adopted

Catchment ID	Total Area (ha)	Average Slope (%)	Pervious Area (ha)	Impervious Area (ha)	Fraction Impervious
C01	18.60	0.79	13.203	5.393	0.29
C02	18.27	0.82	8.406	9.868	0.54
C03	21.03	0.81	6.730	14.301	0.68
C04	12.97	5.72	6.484	6.484	0.50
C05	5.04	1.65	2.168	2.874	0.57
C06	1.23	1.48	0.432	0.802	0.65
C07	1.44	2.82	0.173	1.267	0.88
C08	3.46	1.27	0.484	2.974	0.86
C09	4.28	8.43	1.284	2.996	0.70
C10	10.25	3.51	6.046	4.202	0.41
C11	10.29	5.24	4.732	5.555	0.54
C12	2.68	2.34	0.698	1.986	0.74
C13	7.99	7.47	1.598	6.393	0.80
C14	7.17	7.64	3.368	3.798	0.53
C15	8.53	5.40	1.877	6.654	0.78
C16	0.56	0.55	0.373	0.184	0.33
C17	2.45	3.39	0.417	2.035	0.83
C18	5.23	10.49	1.937	3.298	0.63
C19	12.57	9.66	6.413	6.162	0.49
C20	7.35	14.67	4.261	3.086	0.42
C21	12.14	10.95	5.583	6.554	0.54
C22	11.74	8.03	4.814	6.927	0.59
C23	6.95	0.76	2.639	4.306	0.62

1.2.2 Fraction Impervious

For the purpose of this assessment, fraction impervious was calculated based on land use and assumed fraction impervious values were based on Table 4.5.1 in QUDM 2016, as shown below in Table 1-2. As more than one land use may exist within a sub-catchment, fraction impervious for each sub-catchment was calculated as the area-weighted average fraction impervious.

Table 1-2 Land Use and Adopted Fraction Impervious

Land Use	Fraction Impervious (%)
Rural	10
Mixed Use/Community Facilities/Centre/Commercial/Industry	90
Open space (environmental management and conservation)	0
Medium Density Residential/Emerging Communities	75
Low Density Residential	40
Special Purpose	20
Low-Medium Density Residential	55
Roads	90

1.2.3 Area of interest

One area of interest was identified for the purpose of this assessment, this being the immediately downstream area of the proposed carpark. The hydrological model was assessed at this location to determine the critical storm combinations for input into the hydraulic model.

1.2.4 Losses

A conservative approach has been adopted for the purpose of this assessment, assuming that rainfall losses are not significant for the contributing catchment. This represents a conservative approach. Initial and continuing losses were applied to the hydrological model for the pervious portion and impervious portion of a catchment as follow:

- Pervious catchment area: IL 15 mm, CL 2.5 mm/h
- Impervious catchment area: IL 0 mm, CL 0 mm/h

1.2.5 Roughness

The following Manning's n values were adopted for each catchment in the hydrological model:

- Catchment Pervious Area: n= 0.05
- Catchment Impervious Area: n= 0.025

1.2.6 Lag Time

Lag time was estimated for the travel time of catchment flow from one catchment to the next downstream catchment using flow travel time estimation method suggested in QUDM. The following values in Table 1-3 were applied to the hydrological model.

Table 1-3 Catchment Lag Time Adopted adopted

Routing ID	Upstream Catchment	Downstream Catchment	Lag Time (min)
02_L	C02	C01	19
03_L	C03	C02	21
04_L	C04	C02	20
05_L	C05	C02	27
06_L	C06	C05	15
07_L	C07	C06	9
08_L	C08	C06	9
09_L	C09	C06	18
10_L	C10	C09	6
11_L	C11	C10	6
12_L	C12	C09	7
13_L	C13	C06	10
14_L	C14	C13	8
15_L	C15	C13	9
16_L	C16	C06	9
17_L	C17	C16	9
18_L	C18	C17	8
19_L	C19	C18	8
20_L	C20	C19	6
21_L	C21	C16	12
22_L	C22	C16	13
23_L	C23	C05	11

1.3 Model Runs

The hydrological model was assessed for a range of events, durations and temporal patterns, covering all combinations of the following:

- Events (AEP): 1%, 2%, 5%, 10%, 20% and 50%
- Duration (minutes): 10 to 1,440
- Temporal Pattern: 1 to 10

1.4 Model Validation

The peak discharges simulated by the XP-RAFTS model were validated at few selected locations using the Rational Method, which is a simple technique used to estimate peak flow of catchments. The validation process was undertaken for the 1% AEP, 5% AEP, 10% AEP and 50% AEP events to ensure that the hydrological models produce flows consistent with other flood estimation techniques, and the hydrological model's integrity for subsequent hydraulic assessment. The results of the validation process are shown in Tables 1-4.

Table 1-4 Hydrological Model Results Comparison with Rational Method

Event	Catchment Outlet	Local/Total Flow	Rational Method Peak Flow (m^3/s)	XPRAFTS Peak Flow (m^3/s)[1]	Approx. Difference (%)
1% AEP	C12	Local	1.919	1.520	-21
	C13	Total	15.038	11.330	-25
	C23	Local	4.025	3.170	-21
5% AEP	C12	Local	1.324	1.170	-12
	C13	Total	10.390	8.460	-19
	C23	Local	2.785	2.490	-11
10% AEP	C12	Local	1.112	1.030	-7
	C13	Total	8.729	7.350	-16
	C23	Local	2.339	2.190	-6
50% AEP	C12	Local	0.618	0.670	8
	C13	Total	4.858	4.620	-5
	C23	Local	1.303	1.380	6

1. XPRAFTS peak flow results are based on the critical duration and temporal pattern identified for the catchment.

The results of the hydrological model indicate that the peak flows produced by XP-RAFTS are generally consistent (i.e. majority of the peak flows estimated are within 25%) with those estimated by Rational Method calculations. The hydrological model generally produces flows lower than those predicted by the Rational Method, which is likely due to the limitation of the Rational Method estimation to account for catchment attenuation effects as well as a hydrological model, like XP-RAFTS. Hydrological program like XP-RAFTS is able to 'dampen' the peak flows and allowing for temporary storage in its calculations such that lower peak flows may be produced. Therefore, the XP-RAFTS model is considered appropriate for the purpose of this study and application in the subsequent hydraulic modelling.

The parameters used in the Rational Method calculations are shown in Table 1-5. The time of concentration was calculated using the Argue flow travel time estimation method (Figure 4.5, QUDM 2016).

Table 1-5 Rational Method Parameters Adopted

Catchment Outlet	Loc/Tot	Area (ha)	Fraction Impervious	C_{10}[1]	C_{100}	Flow path length (m)	Fall (m)	Time of Concentration (min)	I100 (mm/hr)
C13	Total	23.69	0.71	0.828	0.994	900.0	48.00	11	230.0
C23	Local	6.95	0.62	0.805	0.966	580.9	4.40	13	216.0

1. 10-year discharge coefficient taken based on a 10 year, 1-hour rainfall intensity for the respective catchment centroid.

1.5 Model Results

1.5.1 Critical Durations and Temporal Patterns Adopted

Statistical analysis of the ensemble results at the area of interest (refer Section 1.2.3) identified the storms shown in Table 1-6 as critical. The adopted storm duration is defined as the storm with temporal pattern that is producing peak flow that is one above the median result for that particular storm duration. The critical storm of each AEP event was then selected, based on the storm duration that produces the highest catchment peak flow. This analysis is required to reduce the number of storms to be assessed in the hydraulic modelling, whilst ensuring that the worst-case scenario around the point of interest is considered. This assessment was only undertaken for the point of interest for this study, which is the immediate downstream area of the proposed carpark.

Table 1-6 Critical Storm Events at Point of Interest Adopted

Event	Outlet of Catch C06 (D/S of Carpark)	
	Duration (min)	ARR2019 Temporal Pattern
1% AEP	30	10
2% AEP	30	6
5% AEP	30	9
10% AEP	30	9
20% AEP	30	9
50% AEP	30	6

The flow hydrographs for each critical storm combination event was then extracted for input as catchment inflows in the hydraulic model.

2.0 Hydraulic Modelling

Hydraulic modelling of the catchment adopted for this study was undertaken using the TUFLOW software package (Build 2020-01-AA-iSP-w64) and its linked 1D-2D modelling capabilities. TUFLOW is a suite of advanced numerical engines and supporting tools used to simulate free-surface water flow for urban waterways, rivers, floodplains, estuaries and coastlines. TUFLOW is widely adopted in the industry as a suitable package to solve hydrodynamic processes.

The hydraulic model was developed based on the existing TUFLOW model for the Agnes Water catchment provided by Council. The existing Agnes Water regional model was developed by Engeny in 2015 as part of the Agnes Water Flood Mitigation Project. The existing Agnes Water regional model is deemed too coarse for the purpose of this study as it only includes major trunk stormwater system (i.e. the local stormwater system that currently discharge onto the proposed carpark area are omitted in the existing model). Further, the catchment inflows adopted in the existing Agnes Water hydraulic model is based on the hydrology derived using the 1987 ARR methodology.

2.1 Model Setup

2.1.1 Extent

The hydraulic model extent adopted for this study is shown in Figure A2.

2.1.2 Grid size and time step

The hydraulic model adopted a grid cell size of 2 metres, a 2D timestep of 0.5 seconds and a 1D timestep of 0.1 seconds. The adopted grid cell size provides an appropriate level of detail to represent the roads in the vicinity of the proposed carpark, main overland flow paths and waterways for this assessment whilst maintaining reasonable model simulation times.

2.1.3 Topography

A base layer for the topography in the TUFLOW model was derived from the 1 m LiDAR data provided by GRC. The DEM defines the topography of the catchment and has been used in the hydrological analysis to delineate the catchment / sub-catchments and reaches.

Surveyed data of the existing waterway downstream of the proposed carpark provided by GRC was then incorporated into the TUFLOW model to provide better surface representation of the waterway. The provided detailed survey data of the proposed carparking area was also incorporated into the TUFLOW model. The adopted existing surface elevations for the TUFLOW model are shown in Figure A2.

2.1.4 Inflows

The design rainfall hydrographs generated by the hydrological model were applied to the hydraulic model as catchment inflows within the model extent. Inflows for catchments that drain to underground stormwater network via stormwater pits along Agnes Street and Jefferey Court were applied directly to the base of the stormwater network, assuming that pipe capacity is the constraint of the system not the surface pit. This approach will allow the assessment to determine the ultimate pipe capacity required.

2.1.5 Model Boundary Condition

Tailwater condition was set to 1.18mAHD for all AEP events modelled, which is equivalent to the MHWS (Mean High Water Springs). This is similar to the tailwater condition adopted in the existing Council model. The model boundary was set at Coral Sea and the exact location of the model boundary adopted is shown in Figure A2.

2.1.6 Roughness

Manning's n roughness values applied in the hydraulic models are based on land use type as shown below in Table 2-1. Figure A3 displays the extent of each material layer used in the TUFLOW model domain.

Table 2-1 Land Use and Adopted Manning's n Roughness Values

Land Use	Manning's n Value
Road/Carpark	0.02
Open Space (Field, Park, Water Body, etc.)	0.03
Rural Residential	0.06
Vegetated Bush	0.08
Heavily Vegetated	0.12
Building	0.20
Urban Residential	0.12

2.1.7 Hydraulic Structures

Stormwater and drainage infrastructure within the model extent are represented in the hydraulic model as 1D elements linked to the 2D domain via 1D-2D connections. The major trunk stormwater infrastructure adopted in the existing Council's model were included in the hydraulic model. Minor stormwater systems that currently discharge onto the proposed carpark area have been added to the hydraulic model based on the survey data of the site area, GIS data provided by GRC and data shown on GRC's Online Mapping System. Stormwater infrastructure were represented as 1D component in the TUFLOW model. The stormwater infrastructure adopted in the hydraulic model are shown in Figure A2.

The waterway crossings and bridges (i.e. along the waterway) downstream of the proposed carpark adopted in the existing Council model were also included in the hydraulic model.

It should be noted that no changes were made to the setup and delineation of the 1D network, waterway crossings and bridges adopted in the existing Council model, as these structures were deemed workable and amendments to modify the network to best practice is considered outside the scope of this study.

2.2 Model Runs

The developed/updated hydraulic model was used to simulate critical duration and temporal pattern combination adopted for each AEP event, as identified in the hydrological analysis (refer to Table 1-6) modelling.

A total of three scenarios have been assessed as part of this study, namely:

- Existing Case – this is the existing case without the development of the carpark at Agnes Street and no stormwater network upgrades were considered;
- Developed Case – this is the case where the existing case model was updated with the proposed carpark design surface elevation, proposed Jefferey Court road upgrade design and the extension of three stormwater lines that currently discharge onto the carpark area were incorporated. However, no stormwater network upgrades to these networks were considered; and,
- Mitigated Case – similar to the developed case but some upgrades to the existing stormwater networks that discharge onto the proposed carpark area were considered.

Developed Case Scenario

For the Developed Case scenario, the proposed design surface elevation of the carpark and Jefferey Court were incorporated into the Existing Case model. The existing stormwater line that discharges near the proposed carpark's eastern corner (i.e. near Agnes Street) was extended (i.e. line SW02 of 1x375mm diameter pipe) under the proposed carpark and discharges to the downstream of the carpark near the carpark's northern corner. The existing stormwater line that discharges onto the proposed carpark area near the intersection between Agnes Street and Jefferey Court was extended (i.e. line SW03 of 2x375mm diameter pipe) under the proposed carpark and discharges to the downstream of the carpark near the carpark's north-west corner. The existing stormwater line that discharges onto the proposed carpark area between line SW02 and line SW03 was extended (i.e. line SW04 of 1x1,050mm diameter pipe) under the proposed carpark and discharges to the downstream of the carpark near the middle of the carpark's northern boundary (i.e. between outlet of SW02 and SW03). Refer to Figure A4 for exact location of each of these extended stormwater network line as adopted in the hydraulic model for the Developed Case scenario. Further, the proposed carpark's stormwater system was also incorporated into the hydraulic model and Manning's roughness value of 0.02 has been applied to the proposed carpark area.

Mitigated Case Scenario

For the Mitigated Case scenario, few iterations of modelling have been carried out as part of this study to determine the appropriate pipe sizes required for each of the three stormwater network lines that discharge through the carpark into the downstream waterway. Initial modelling indicated that flooding of Agnes Street and the proposed carpark area are mainly caused by the lack of pipe capacity of the existing underground stormwater networks at Jefferey Court and Agnes Street as well as the existing culvert crossings near the intersection between Agnes Street and Springs Road and between Captain Cook Drive and Springs Road.

As the main objective of this study is to determine the appropriate pipe sizes required to accommodate the anticipated fully developed contributing catchment flow for the three existing stormwater lines (i.e. that currently discharge onto the proposed carpark area), the modelling of this scenario have assumed that the existing culvert crossings near the intersection between Agnes Street and Springs Road and on Captain Cook Drive near the intersection with Springs Road have been upgraded to the required sizes. This is done through a simplified approach by applying the inflows of catchment C13, C15 and C17 directly onto the existing drainage channel to the west of Agnes Street that discharges into the waterway downstream of the proposed carpark (i.e. near the carpark's western corner). For stormwater pipes with pit system, catchment inflow was applied to the base of the pit assuming that the stormwater pipe capacity is the network limiting factor. This ensure that maximum catchment flow is applied to the individual underground stormwater network.

The adopted upgrade sizes of the three stormwater lines that discharge through the carpark are shown in Figure A5 and Figure A5.

Modelling results of the three scenarios adopted for this study are discussed below.

2.3 Model Results

2.3.1 Existing Case

The modelling results show that with the upstream contributing catchment being fully developed, Agnes Street is estimated to be inundated by floodwater in event more frequent than the 50% AEP event. Inundation of Agnes Street is mainly caused by the lack of pipe capacity of the existing stormwater infrastructure of the vicinity area. One source of flooding at Agnes Street is estimated to be caused by the lack of conveyance capacity of the existing 1x1,050mm diameter pipe that runs along Jefferey Court, resulting floodwater to overtop the pipe inlet onto Jefferey Court, east of the proposed carpark. Floodwater then flow towards the sag at Agnes Street near the intersection with Jefferey Court then overtop Agnes Street onto the proposed carpark area. Inundation of Agnes Street is also contributed by the lack of culvert crossing capacity near the intersection between Agnes Street and Springs Road, resulting in floodwater overtopping the existing carpark and flow downstream along Agnes Street towards the proposed carpark area. Inundation of Captain Cook Drive as a result of lack of culvert crossing capacity also estimated to contribute to the flooding on Agnes Street. Table 2-2 shows the peak flood level estimated at the existing waterway immediately downstream of the proposed carpark area (refer to Figure A4 for exact reporting location) and the peak flood level estimated in the 2015 Engeny Study for Reporting Point 11 (refer to Figure 6.1 of Engeny report for exact location) as presented in Table 6.3 of the 2015 Engeny Study.

Table 2-2 Comparison of Estimated Peak Flood Level Current Study and Previous Study

Reporting Location	AEP	Estimated Peak Flood Level (mAHD)		Difference (m)
		Current Study	2015 Engeny Study	
Existing Waterway Immediately Downstream of Proposed Carpark Area	1%	4.73	4.78	-0.05
	2%	4.60	4.64	-0.04
	5%	4.50	4.53	-0.03
	10%	4.41	4.39	0.02
	20%	4.28	4.29	-0.01
	50%	3.97	N/A	N/A

The results above show that the peak flood levels estimated at the existing waterway immediately downstream of the proposed carpark area for all the AEP events modelled are within 50mm of those estimated in the 2015 Engeny report. It should be noted that the hydrology adopted in this study is based on the 2019 ARR methodology, hence it is expected that the results estimated will be different between the two studies. The Existing Case scenario hydraulic modelling results showing the estimated maximum flood level, maximum flood depth and maximum velocity for all the AEP events modelled are shown as Figures E1-E18 attached.

2.3.2 Developed Case

The modelling results show similar flooding conditions of Agnes Street to that estimated for the Existing Case scenario discussed above, whereby Agnes Street will be inundated by floodwater in the event more frequent than the 50% AEP event modelled. The proposed carpark is also estimated to be inundated by floodwater from Agnes Street in the 50% AEP event. The results show that in the 20% AEP event modelled, flooding of the carpark will also be caused by the high water level in the existing waterway downstream. However, flood inundation of Agnes Street is estimated to be generally caused by the lack of stormwater pipe capacity of the surrounding areas, as discussed above for the Existing Case scenario. The modelling results show that the proposed carpark will increase the peak flood level in the downstream waterway by approximately 10mm in the 1% AEP event modelled. Increase in estimated peak flood level in the downstream waterway as high as 40mm is estimated for the 50% AEP event modelled. Table 2-3 shows the estimated peak flood level at the existing waterway immediately downstream of the proposed carpark area (refer to Figure A4 for exact reporting location) for both the Existing Case and Developed Case scenarios.

Table 2-3 Comparison of Estimated Peak Flood Level for the Existing Case and Developed Case

Reporting Location	AEP	Estimated Peak Flood Level (mAHD)		Estimate Afflux (m)
		Existing Case	Developed Case	
Existing Waterway Immediately Downstream of Proposed Carpark Area	1%	4.73	4.74	0.01
	2%	4.60	4.62	0.02
	5%	4.50	4.51	0.01
	10%	4.41	4.43	0.02
	20%	4.28	4.31	0.03
	50%	3.97	4.01	0.04

The modelling results also show that afflux as high as 30mm is estimated within the existing waterway downstream of the proposed carpark in the 1% AEP event modelled. Afflux as high as 22mm is also estimated near Jefferey Court. The Developed Case scenario hydraulic modelling results showing the estimated maximum flood level, maximum flood depth and maximum velocity for all the AEP events modelled are shown as Figures D1-D18 attached. The attached Figures D19-D24 shows the estimated afflux.

2.3.3 Mitigated Case

With the upgrades of the existing stormwater lines that discharge onto the proposed carpark area, the modelling results show that Agnes Street will be flood free for the 50% AEP event modelled (i.e. assuming upgrades to existing stormwater infrastructure near intersection of Springs Road and Agnes Street as well as Captain Cook Drive are also implemented). However, inundation of Agnes Street by floodwater from Captain Cook Drive start to occur in the 20% AEP event modelled. Flood inundation of Agnes Street is also estimated to be contributed by floodwater from the northern section of Jefferey Court in the 20% AEP event modelled. Flooding at the northern section of Jeffery Court is estimated to mainly caused by the high water level in the existing waterway downstream of the proposed carpark area. The modelling results show that under normal condition, catchment flow that contribute to the existing 1x1,050mm diameter and the modelled upgrades of 4x1,200mm diameter pipes will be fully accommodated by these stormwater pipes underground, for all events up to and including the 2% AEP events modelled. The results however show that floodwater will overtop and inundate Jeffery Court from the east in the 1% AEP event modelled. Given the high water level estimated in the existing waterway immediately downstream of the proposed carpark area, it is recommended that flap gates be provided to all stormwater outlets proposed as part of the carpark development to prevent backflow of floodwater.

The Mitigated Case scenario hydraulic modelling results showing the estimated maximum flood level, maximum flood depth and maximum velocity for all the AEP events modelled are shown as Figures M1-M18 attached. Note that estimated flood affluxes of the Mitigated Case scenario are not assessed against the Existing Case scenario as some assumptions have been made in this study, in particular for the Mitigated Case the existing culvert crossings near the intersection between Agnes Street and Springs Road have been upgraded by applying the catchment inflows that contribute to these culvert crossings directly into the downstream drainage channel. Hence, this does not present a valid comparison between the two scenarios until proper stormwater infrastructure are adopted with catchment inflows applied to the same locations between the two scenarios. The assumptions adopted for this study are to facilitate the preliminary sizing of the three stormwater lines that will be extended under the proposed carpark area.

2.4 Sensitivity Assessment

The TUFLOW model downstream boundary was increased to the HAT (Highest Astronomical Tide) level of 1.97mAHD for the Corral Sea. The Mitigated Case model was then simulated for all AEP events adopted for this study to determine how sensitive the flood level estimated in the vicinity of the proposed carpark area to the increase in water level at the outlet of the model (i.e. Coral Sea). Table 2-4 below shows the estimated peak flood level at the existing waterway immediately downstream of the proposed carpark area (refer to Figure A4 for exact reporting location). The results show that increasing the model boundary tailwater to the HAT level will not have significant impacts on the flood level near the proposed carpark area (i.e. maximum changes in water level of less than 5mm).

Table 2-4 Comparison of Estimated Peak Flood Level for the Mitigated Case and Sensitivity Run

Reporting Location	AEP	Estimated Peak Flood Level (mAHD)	
		Mitigated Case	Sensitivity Case
Existing Waterway Immediately Downstream of Proposed Carpark Area	1%	4.74	4.74
	2%	4.63	4.63
	5%	4.53	4.53
	10%	4.45	4.45
	20%	4.34	4.34
	50%	4.04	4.05

Another sensitivity analysis was also carried out for the 1% AEP event, assuming a tailwater level at the model downstream boundary at the 1% AEP storm surge level of 2.30mAHD, as reported in the 2015 Engeny Study. The results show that the estimated peak flood level at the existing waterway immediately downstream of the proposed carpark area is approximately 6mm higher than that estimated for the Mitigated Case scenario.

Based on the above, it is determined that the flooding at the subject site and its upstream areas are not susceptible to the normal fluctuation of water level at the model outlet (i.e. Coral Sea).

3.0 Conclusion

Cardno was engaged by Gladstone Regional Council to undertake a stormwater modelling and assessment to facilitate the design of the extension of existing stormwater networks as part of the proposed carpark development at Agnes Street in Agnes Water and to address Item 8 of Council's IR dated 16th March 2020. The main objectives of this study are to understand the flooding regime at the proposed carpark area, and to determine the required stormwater pipe sizes to be extended under the proposed carpark. The proposed extension of the stormwater pipes need to have sufficient capacity to accommodate the anticipated fully developed upstream contributing catchment flow to prevent future upgrades of these pipes after the construction of the carpark.

This study involved:

> The development of a hydrological model of the upstream catchment to determine the peak flows contributing to the proposed carpark area and the waterway downstream, based on the 2019 ARR methodology;

> Development of a hydraulic model using the TUFLOW program, based on the existing Council TUFLOW model for Agnes Water that is based on the 2019 ARR hydrology and fit for the purpose of this study;

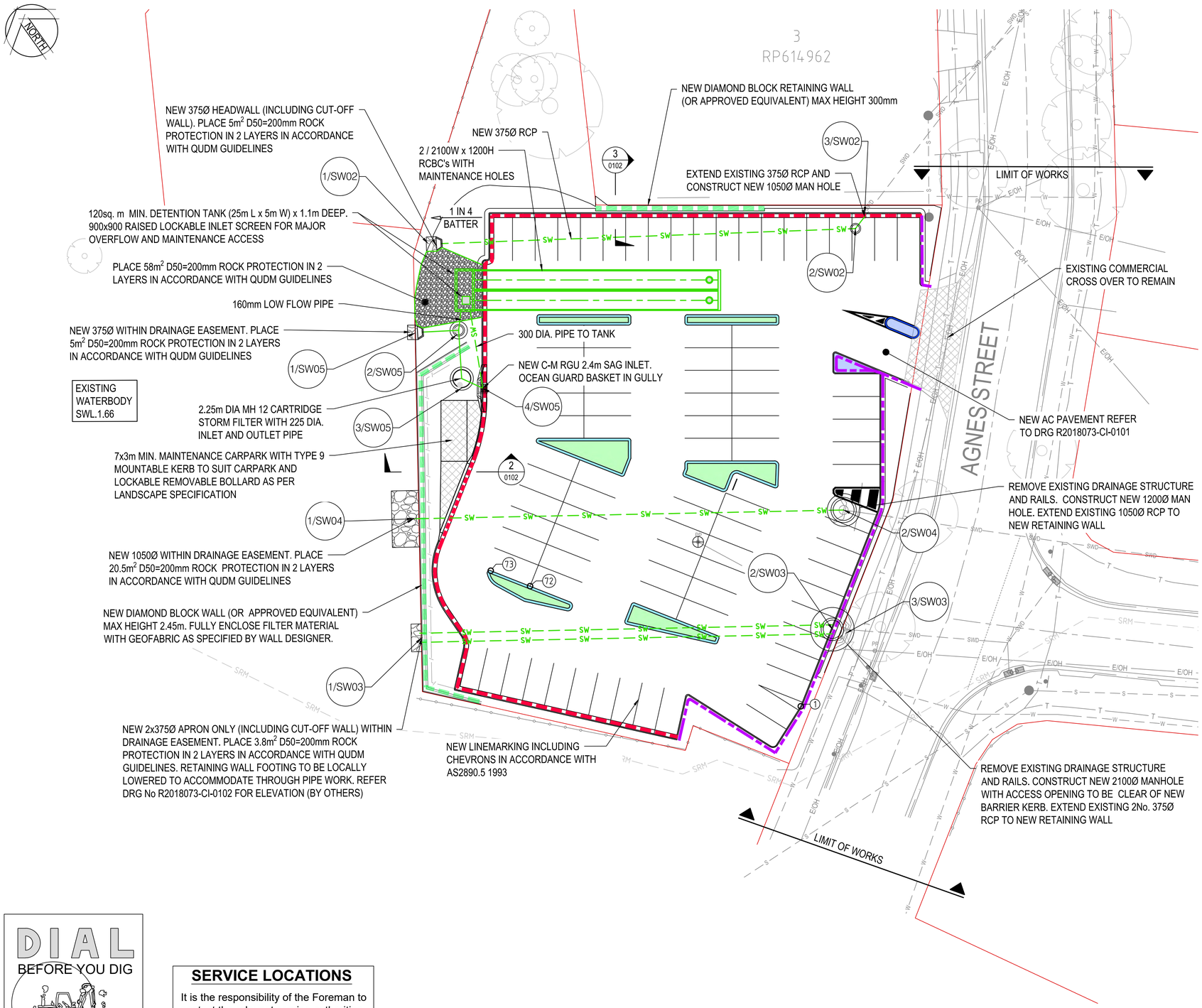
> Analyse the flooding regime at the proposed carpark area; and

> Preliminary sizing of the stormwater pipes that are proposed to be extended as part of the development of the carpark, such that these pipes have sufficient capacity to accommodate the anticipated fully developed upstream contributing catchment flows.

The modelling results have demonstrated that to accommodate the anticipated fully developed upstream contributing catchment flows, the following minimum pipe sizes should be adopted for the three stormwater lines (refer to Figure A5 for exact location) extension, proposed as part of the carpark development:

- For line SW02, 2 x 450mm diameter of pipes are required;
- For line SW03, 3 x 525mm diameter of pipes are required; and
- For line SW04, 1 x 1,050mm diameter of existing pipe extension and separate 4 x 1,200mm diameter of pipes (that runs along Jefferey Court from the same upstream inlet of the existing 1 x 1,050mm diameter pipe) are required. However, the existing 1 x 1,050mm diameter pipe is sufficient if adequate detention storage area is provided at the upstream area of the pipe to attenuate the outflow to match the capacity of the existing 1 x 1,050mm diameter pipe. This is also one of the mitigation options assessed as part of the 2015 Engeny Study. However, further detailed stormwater modelling assessment is required to confirm the detention size and outlet configuration required.

Apart from the lack of pipe capacity, the modelling results also show that high water level in the waterway immediately downstream of the proposed carpark has contributed to flooding of the area. Hence, it is suggested that a more detailed flood mitigation assessment be carried for the entire Agnes Water area to determine the individual stormwater infrastructure deficiency and cause of flooding as well as what mitigation measures are required to improve the overall flood immunity of the area, including Agnes Street. Upgrades assessment of existing stormwater infrastructure other than the three stormwater lines that currently discharge onto the proposed carpark area are considered to be outside the scope of this study.



NOTE:
ALL WORKS SHALL TIE IN NEATLY AND SMOOTHLY HORIZONTALLY AND VERTICALLY TO SURROUNDING SURFACE / PROFILE.

LEGEND

- EXISTING TOP OF BANK
- EXISTING BOTTOM OF BANK
- EXISTING SEWER MAIN AND MANHOLE
- EXISTING OVERHEAD ELECTRICAL CABLE AND POWER POLE
- EXISTING EXISTING WATER MAIN
- EXISTING STORMWATER MAIN
- EXISTING UNDERGROUND TELSTRA CABLE
- RP BOUNDARY
- EXISTING FENCE
- TREE
- NEW TYPE 1 KERB AND CHANNEL
- NEW TYPE 9 KERB AND CHANNEL
- NEW TYPE 3 BARRIER KERB
- NEW TYPE 5 SEMI-MOUNTABLE KERB
- NEW TYPE 10 FLUSH KERB
- NEW DIAMOND BLOCK RETAINING WALL WITH 1.2m WELDMESH FENCE (OR APPROVED EQUIVALENT)
- NEW STORM WATER PIPES
- 1/SW01 NEW STORM WATER STRUCTURE
- NEW CONCRETE ISLANDS
- NEW TYPE A COMMERCIAL DRIVEWAY SLAB
- LANDSCAPING BY OTHERS
- EXISTING POWER POLE TO BE REMOVED AND DISPOSED OF (BY OTHERS)
- NEW FENCE, REFER LANDSCAPE SPECIFICATIONS

DIAL BEFORE YOU DIG

SERVICE LOCATIONS

It is the responsibility of the Foreman to contact the relevant service authorities to ascertain the exact location of services prior to construction.

AGNES STREET PLAN
SCALE 1:250 @ A1

0 5 10 15 20 25m
SCALE 1:250 @A1

Rev.	Date	Description	Des.	Verif.	Appd.
B	15/07/2020	RE-ISSUE FOR APPROVAL	CK	PM	TD
A	11/06/2019	ISSUE FOR CONSTRUCTION	GM	CGF	CH
1	1/05/2019	PRELIMINARY - FOR APPROVAL	GM	CGF	CGF

GLADSTONE REGIONAL COUNCIL

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Web: www.cardno.com.au

Drawn	AW/AE	Date 15/07/2020
Checked	GM/CK	Date 15/07/2020
Designed	GM/CK	Date 15/07/2020
Verified	CGF/PM	Date 15/07/2020
Approved	RPEQ. 10283	Date 15/07/2020
	T.DOYLE	

Client: GLADSTONE REGIONAL COUNCIL
Project: AGNES STREET AND JEFFERY COURT
AGNES WATER
PARKING DETAIL DESIGN
Title: AGNES STREET - CARPARK LAYOUT
Status: FOR APPROVAL
FOR CONSTRUCTION PURPOSES WHEN STAMPED
Datum: AHD | GRID: MGA-56 | Scale: AS SHOWN | Size: A1
Drawing Number: R2018073-CI-0120
Revision: B

Figures

Figure A1 - Catchment Plan

LEGEND

- Subject Site
- Cadastre Boundary
- Catchment Boundary

Agnes Street Carpark Stormwater Assessment

Pre Model: 002
Post Model: D001
Mitigated Model: D008

0 269.5
metres
Scale 1:7,700

N
W E
S

SHEET	A3
Project No:	R2020043
Date:	July 2020
Revision Number:	1
Client Name:	Gladstone Regional Council

Cardno (QLD) Pty Ltd | ABN 57 051 074 992
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Tel: 07 3369 9822 Fax: 07 3369 9722

Cardno Shaping the Future

File Path: O:\004_JOBS\00_WE19\R2020043_AgnesStCarpark\3_Data\2_Analysis\GIS\Fig\SW_Assess_V01

Figure A2 - Existing Case TUFLOW Key Model Features

LEGEND

- Model Downstream Boundary
- Modelled Existing Stormwater Pit
- Modelled Existing Stormwater Pipe
- Subject Site
- Cadastre Boundary
- Model Extent
- Catch Inflow
- Catch Inflow Apllied to Base of Pit

Model Surface Elevation (mAHD)

-1.423

63.91

Agnes Street Carpark Stormwater Assessment

Pre Model: 002
Post Model: D001
Mitigated Model: D008

0 140

metres

Scale 1:4,000

N
W E
S

SHEET	A3
Project No:	R2020043
Date:	July 2020
Revision Number:	1
Client Name:	Gladstone Regional Council

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Figure A3 - TUFLOW Model Manning's n Roughness

LEGEND

- Model Downstream Boundary
- Subject Site
- Cadastre Boundary
- Model Extent

Adopted Manning's Values

- n=0.02
- n=0.03
- n=0.06
- n=0.08
- n=0.10
- n=0.12
- n=0.20
- n=0.12

Agnes Street Carpark Stormwater Assessment

Pre Model: 002
Post Model: D001
Mitigated Model: D008

0 210
metres
Scale 1:6,000

N
W E
S

SHEET	A3
Project No:	R2020043
Date:	July 2020
Revision Number:	1
Client Name:	Gladstone Regional Council

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