Stormwater Management Report

Proposed Family Tavern at Lot 1 DP 1215257 Muir Street Medowie NSW 2318

for

Port Stephens City Council

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MPC Ref: 200047 [2]
10th September 2020

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Contents

Appendices

1. Background Information

1.1 Basis of Report

This report has been prepared by MPC Consulting Engineers ('MPC') to address the Stormwater Management system for the proposed development at Lot 1 DP 1215257 Muir Street Medowie NSW 2318.

This report is to be read in conjunction with the results of developed DRAINS models and MUSIC models for clarity.

1.2 Preamble

The site is located at Lot 1 DP 1215257 Muir Street Medowie NSW 2318.

Catchment area for the proposed development is calculated based on the detailed survey drawings carried out by RPS, which are attached in **Appendix A** of this report.

2. Site and Catchment Details

2.1 Existing Catchment

The existing catchment mainly consists of grass prairie. The site falls from east to west, with an average slope of 6.0%. Aerial view of the existing site taken from Google earth is shown in Figure 1.

Figure 1: Aerial View of the Existing Site (Google Earth Image)

Catchment parameters associated with the existing site, which used for the analysis are listed in Table 1 below.

Table 1: Site Catchment Parameters

Total catchment area	2008 m^2
Catchment length	70 m
Average site slope	6.0%
Surface roughness	0.2

2.2 The Proposed Development

Architectural drawings by EJE Architecture have been provided to MPC. Figure 2 shows the site layout for the proposed development. Architectural plans are included in **Appendix B** of this report.

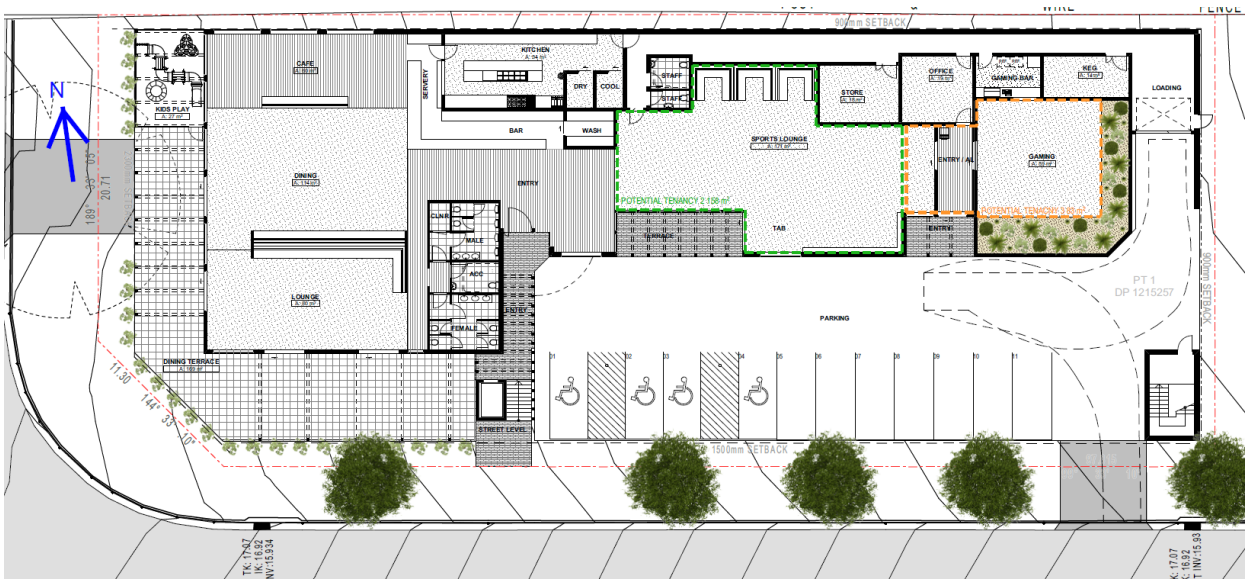


Figure 2: Proposed Site Layout

The total project site area is about 2008 m^2, and the discharge from the developed area will be managed by on-site detention system as documented in the stormwater drawings (see **Appendix C**). Controlled discharge from the site will be directed to the existing kerb inlet pit located in front of the site at the corner of Muir street and Peppertree road. A summary of the site catchment area and fraction impervious used for the stormwater modelling are shown in Table 2.

Table 2: Site Catchment Area Summary

Total catchment area	2008 m^2
% Impervious	100%

3. Stormwater and Environmental Management Philosophy

In preparing this Stormwater Management Plan, we have consulted with Port Stephens Councils Development Control plan in relation to stormwater. The requirements to be addressed are as follows:

- Ensure that the rate of rainwater runoff from roofs and paved areas from the pre-developed site is not increased for the developed condition for all storms up to and including the 1 in 100 years ARI event.
- Provide allowances for future rainwater re-use where appropriate. Proprietary first flush devices would be proposed prior to rainwater entering the water re-use tank.
- To ensure Water Quality outcomes are achieved, the site drainage system will be incorporated with pollution control measures designed to remove site generated pollutants in accordance with DCP.
- Ensure that overland flow in the event of a choked or blocked piped system does not impact on neighbouring properties or other buildings on the site.
- Institute appropriate erosion protection and soil stabilisation measures in association with the proposed site works. Such measures are to be designed in accordance with the requirements of the Managing Urban Stormwater: Soils and Construction 4th Edition – Vol.1 (the “Blue Book”) published by Landcom, 2004

4. Proposed Stormwater Management Facilities

The proposed stormwater management plan is shown in **Appendix C**. The principal stormwater management components, and their functions are listed below.

- The proposed works consist of mixed-use development comprises a two-storey building with car parking facilities located in the basement and the ground floor level. The proposed stormwater system is designed to cater for the roof, hardstand and landscaped areas.
- Rainwater from the roof of the building will be directed through a first flush device before being stored in a water re-use tank.
- On-site detention tank will be located at the basement car park to control the discharge from the developed site prior to connecting into the existing council drainage system.
- The developed site will be provided with a proprietary pollution control device (Ecosol Storm Pit - Class 2), in conjunction with first-flush devices, drop-in filter baskets for stormwater pits with RFM pillows ensuring the relevant water quality targets are achieved.

Water quality requirements have been addressed in Section 4.5 of this report.

4.1 Design Storm Events

Stormwater system for the proposed development will be designed and assessed for a 10 ARI minor event and a 100 ARI major event.

4.2 Stormwater Analysis Procedure

Pre-developed and post-developed site conditions are modelled using DRAINS software package according to ARR 2019 procedures.

The site catchment is modelled in DRAINS software to assess generated stormwater from the site. Pit IDs, pipe diameters, surface levels, and invert levels are shown in SK01 included in **Appendix D**.

Pit surface levels and invert levels are calculated based on the existing detailed survey included in **Appendix A** of this report.

4.3 Site Soil Type

Previous engineering work carried out in this area indicated the presence of clay soils with slow infiltration rates. Therefore, Type 3 (or C) soil has been adopted for the analysis (Refer SK02 included in **Appendix D**). Input properties for the ILSAX hydrological model are shown in Figure 3 below.

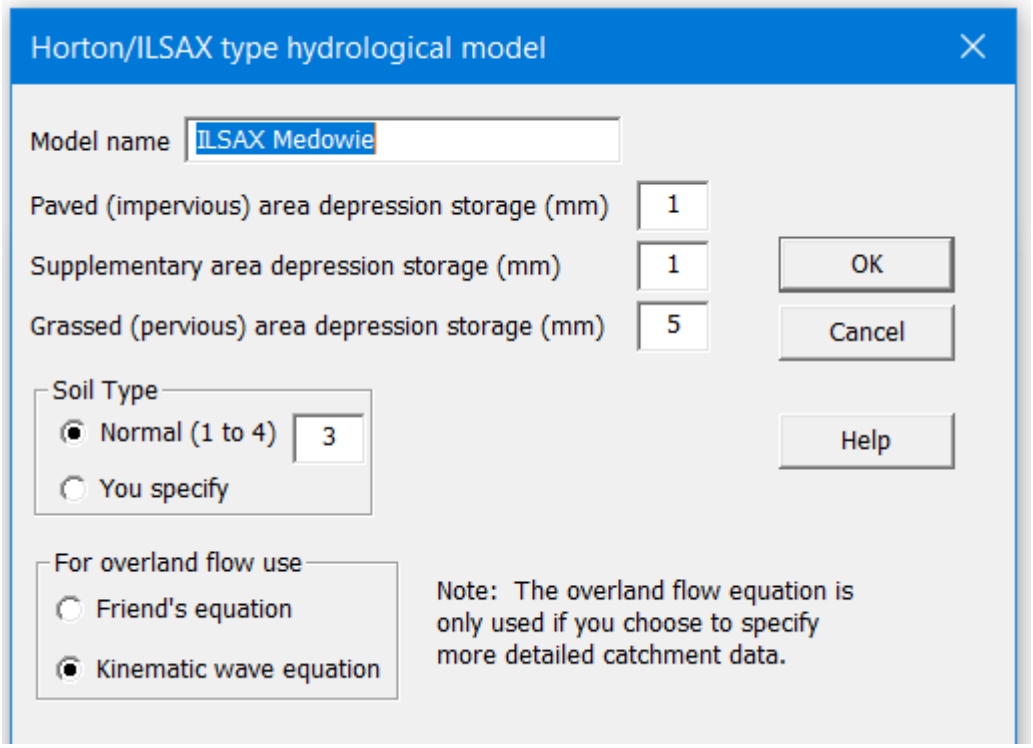


Figure 3: Input values for DRAINS-ILSAX Model

4.4 Detention Volume Requirement for the Current Development

4.2.1 Pre-developed site flows

The pre-developed site has been modelled in DRAINS software. Calculated pre-developed flows are listed in Table 3 below.

Table 3: Pre-Developed Flows from Site

	Flow (l/s)
Minor Event (10 ARI)	53
Major Event (100 ARI)	120

4.2.2 Post-developed site flows

Stormwater from the developed site will be managed by an on-site detention tank located in the basement car park level, and the controlled discharge from the detention tank will be released to the existing council

pit (KIP01). A schematic arrangement of the proposed detention tank and pipe system is shown in Figure 4 below.

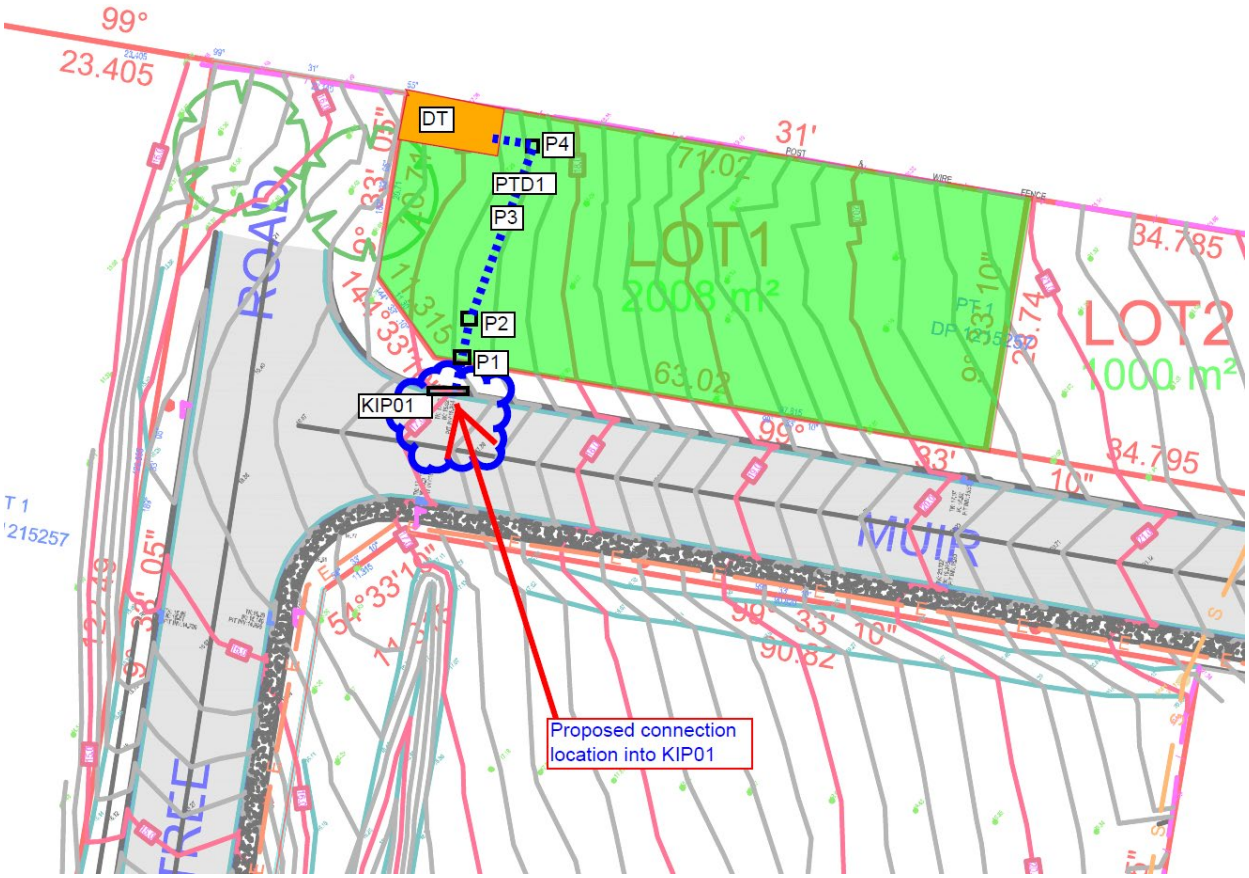


Figure 4: Schematic Representation of the Proposed Stormwater Conveying System

Calculated posed developed site flows and detention volume requirements are summarised in Table 4 below.

Table 4: Post-Developed Flows and Detention Volumes

	Detention Volume Requirement (m^3)	Controlled Outflow (l/s)
Minor Event (10 ARI)	26	48 < 53 (∴ok)
Major Event (100 ARI)	32	97 < 120 (∴ok)

A detention tank containing 46 m^3 volume will be constructed in the basement level car park as shown in MPC stormwater management drawings which are included in **Appendix C** of this report.

Detention tank details are shown in the drawing C05 attached in **Appendix C**.

4.5 Water Quality

It is our intention to comply with the Protection of the Environment Operations Act 1997, including water quality exiting the site during construction and operation.

Stormwater quality is evaluated as per the requirements from the Port Stephens DCP. Water quality is evaluated to achieve NorBE or Council's water quality stripping targets; whichever achieves the better water quality outcomes.

MUSIC models are developed to simulate the pre and post developed site conditions.

4.5.1 Pre-developed pollutant loads

Pre-developed site is modelled as a 100% pervious area within a mixed-use development. Calculated pollutant loads are shown in Figure 5.

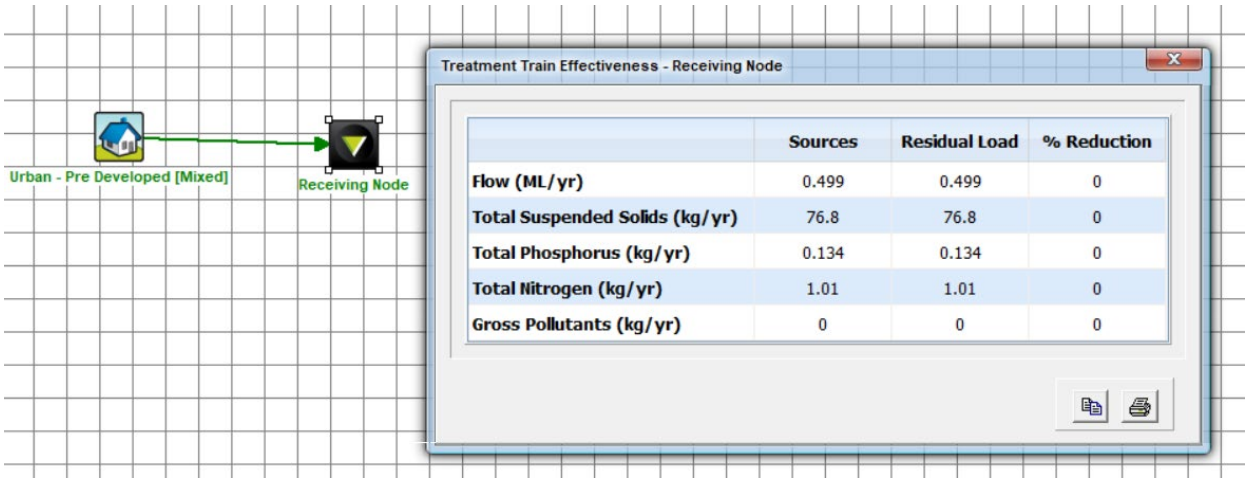


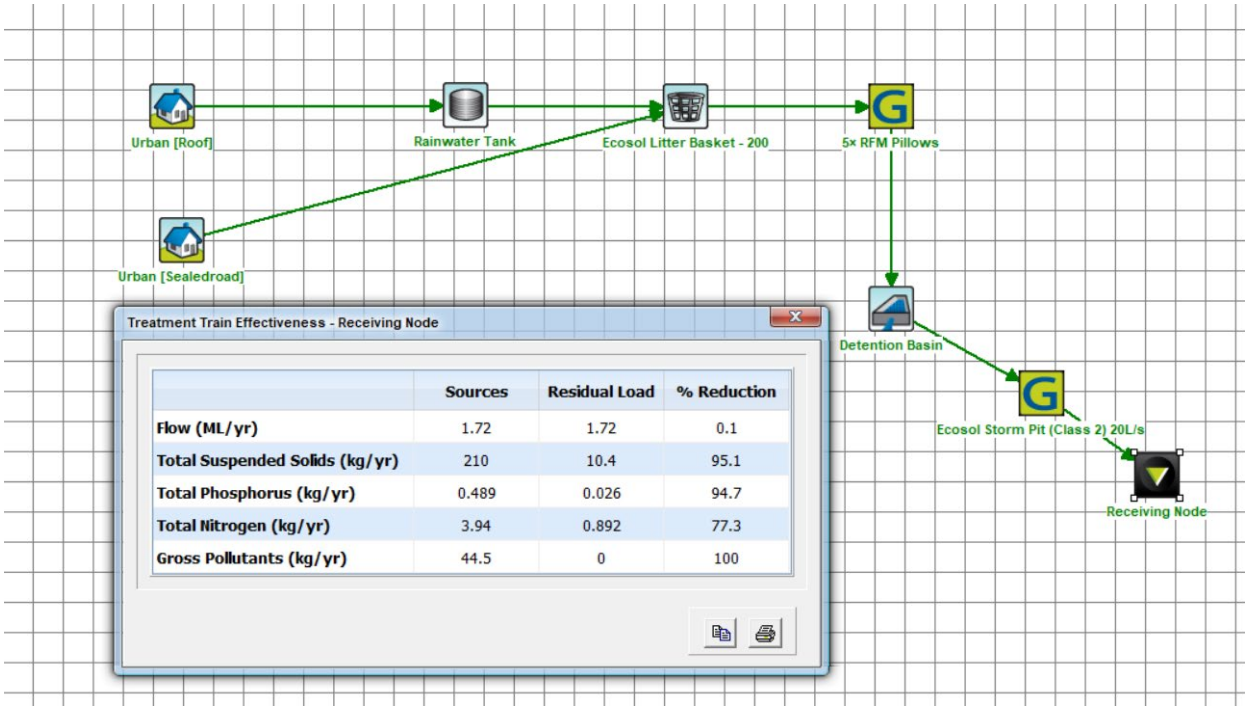
Figure 5: Pre-developed Pollutant Loads – MUSIC Model

4.5.2 Post-developed pollutant loads

Water quality measures for the site have been modelled using MUSIC software and include the following:

- Rainwater from the roof of the building will be directed through a first flush device before being stored in a water re-use tank:
- Stormwater from impervious areas will be directed through litter baskets and Reactive Filter Media (RFM) pillows prior to discharge into the detention tank.
- Proprietary "Ecosol Storm Pit (Class 2)" pollution control treatment device has been specified on the stormwater Management Plans.

Generated pollutant loads and treatment train effectiveness values from the post-developed MUSIC model are shown in Figure 6.



	Sources	Residual Load	% Reduction
Flow (ML/yr)	1.72	1.72	0.1
Total Suspended Solids (kg/yr)	210	10.4	95.1
Total Phosphorus (kg/yr)	0.489	0.026	94.7
Total Nitrogen (kg/yr)	3.94	0.892	77.3
Gross Pollutants (kg/yr)	44.5	0	100

Figure 6: Post-developed Pollutant Loads and Treatment Train Effectiveness – MUSIC Model

The stormwater quality devices and systems have been specified on the stormwater plans which collectively achieve water quality stripping targets for sensitive catchments stated in the Council DCP. Pollutant Load reductions are listed below:

- Total Suspended Solids – 95.1% reduction > 85% (∴ok)
- Total Phosphorous – 94.7% reduction > 65% (∴ok)
- Total Nitrogen – 77.3% reduction > 50% (∴ok)
- Gross Pollutants – 100% reduction > 90% (∴ok)

All the pollutant removal efficiencies are greater than the council water quality stripping targets. Therefore, complying with the Port Stephens DCP.

Pre and post developed pollutant loads are compared in Table 5.

Table 5: Pre and post developed Pollutant Loads

	Pre-Developed Residual Load (kg/yr)	Post-Developed Residual Load (kg/yr)	Comments
Total Suspended Solids	76.8	10.4	Post-dev TS < Pre-dev TS (∴ok) Beneficial effect
Total Phosphorous	0.134	0.026	Post-dev TP < Pre-dev TP (∴ok) Beneficial effect
Total Nitrogen	1.01	0.892	Post-dev TN < Pre-dev TN (∴ok) Beneficial effect
Gross Pollutants	0	0	Post-dev GP = Pre-dev GP (∴ok) Neutral effect

Post-developed MUSIC model confirms that the generated pollutant loads will be kept under the pre-developed conditions providing beneficial effects to the catchment (therefore satisfy NorBE criteria).

MUSIC model analysis shows that the post-developed site will achieve water quality targets as per NorBE and Council's water quality stripping targets resulting in better water quality outcomes.

MUSIC-link reports are attached in **Appendix E** of this report.

4.6 Maintenance of Stormwater Management Facilities

Maintenance of concrete pits, pipes and paved flow paths will be minimal as they are generally self-cleansing, and hence only involve very occasional cleaning. Regular inspections of control systems should be carried out to ensure satisfactory performance of the drainage systems proposed. Sediment/pollution control pits and proprietary pollution control devices will be provided before entering irrigation and detention facilities. Proprietary tanks or pollution control chambers/stormwater pit inserts will also be accessible for cleaning and maintenance. Maintenance should occur on a 3-month basis or after a major storm event.

5. Construction Phase Erosion and Sediment Controls

The construction phase approach adopted for this site will incorporate the principles recommended by the NSW Department of Housing, namely:

- Plan for erosion and sediment control concurrently with engineering design and in advance of earthworks proper assessment of site constraints and integration of the various needs;
- Minimise the area of soil exposure;
- Conserve the topsoil where possible:
- Control water flow from the top of the development area, through the works and out the bottom of the site, for example,
    - divert clean runoff above denuded areas
    - minimise slope gradient and length
    - keep runoff at non-erodible velocities
    - trap soil and water pollutants
- Rehabilitate disturbed lands quickly.

A preliminary design of erosion and sediment controls for the overall site development is shown in Sedimentation and Erosion Control Plan (**Appendix C**). Controls will be provided on the site prior to and during all earthworks in accordance with EPA Site Work Practices. Features of the construction phase erosion and sediment controls adopted for this site include:

- Prevention of sediment and polluted runoff water from entering the existing council stormwater system. This procedure involves the provision of silt fences, catch drains and sediment traps.
- Control of actual and potential soil erosion – grassing and stabilisation of embankments and drainage outlets where required.
- Stabilised stockpile areas to prevent wind and water erosion.
- Scour protection at discharge locations.
- Stabilised site access to provide a firm base for vehicle entry/exit and to prevent the main access from becoming a source of sediment.

6. Summary

This Stormwater Management Plan has been prepared by the MPC Consulting Engineers for the proposed mixed-use development at Lot 1 DP 1215257 Muir street Medowie evaluating the impact of the proposed development based on the stormwater quality and quantity addressing the requirements of Port Stephens Council DCP.

For further information about this stormwater management plan, please contact the undersigned.

Signed:

Prepared by

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RAJEEV BATUWITAGE
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Structural/Civil Engineer

Date: 10/09/2020

Reviewed by

……

PETER MARCH
BE (Civil)(Hons), MIEAust, CPEng NPER
Director, Senior Engineer

Date: 10/09/2020

Appendix A

Survey Data

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9. LEVELS ARE BASED ON AUSTRALIAN HEIGHT DATUM (AHD) USING PM 12018 WITH RL OF 9.025m LOCATED AT COFFS HARBOUR.

10. ORIGIN OF CO-ORDINATES PM 12018 WITH MGA CO-ORDINATE VALUES OF E 510328.022 N 6648343.587

11. CONTOURS ARE AN INDICATION OF LANDFORM AND SHOULD NOT BE TAKEN IN PREFERENCE TO SPOT LEVELS SHOWN.

12. CONTOUR INTERVAL 0.25m.

Photograph 1

Photograph 2

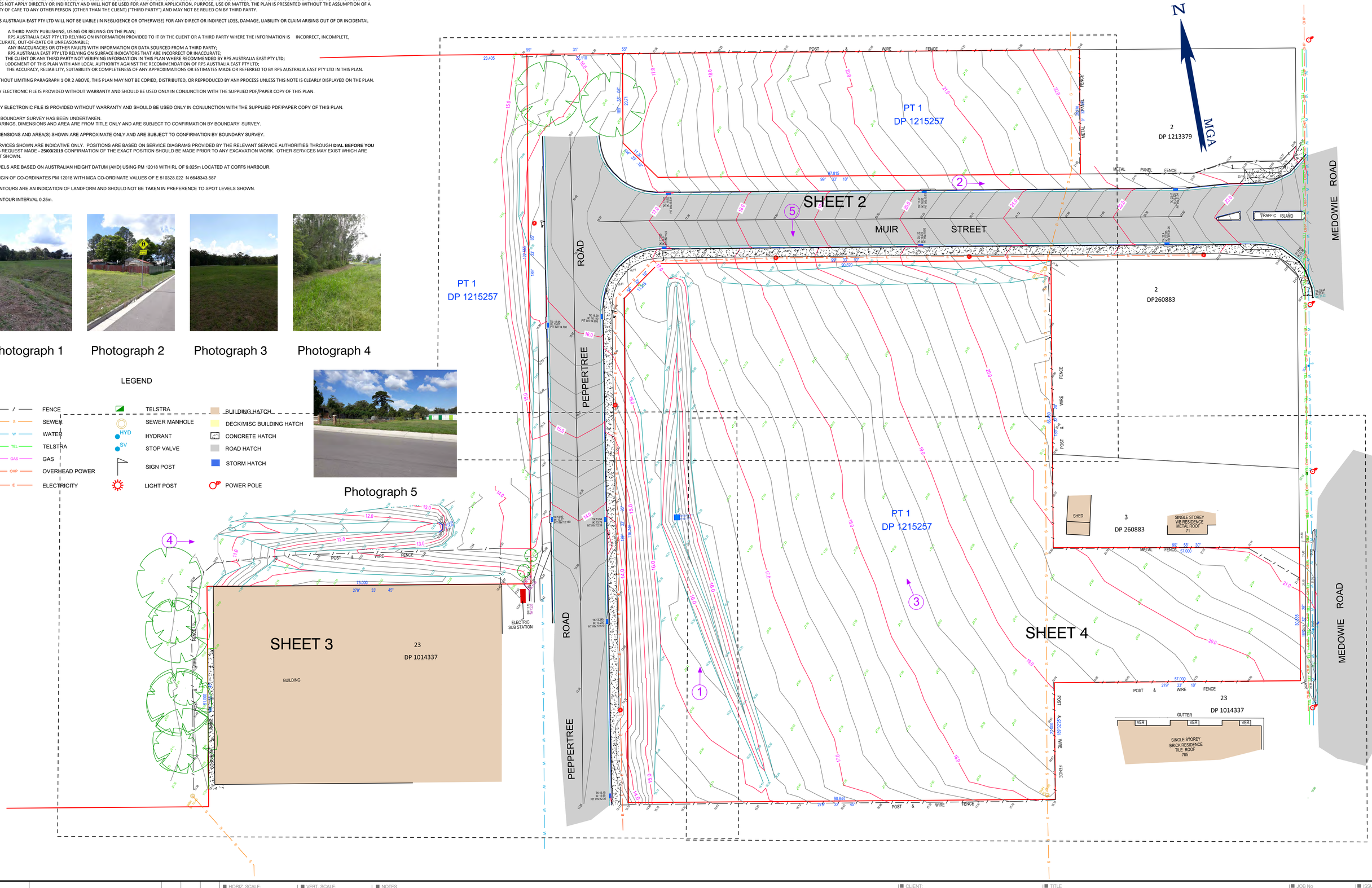
Photograph 3

Photograph 4

LEGEND

FENCE	TELSTRA	BUILDING HATCH	
SEWER	SEWER MANHOLE	DECK/MISC BUILDING HATCH	
WATER	HYDRANT	CONCRETE HATCH	
TELSTRA	STOP VALVE	ROAD HATCH	
GAS	SIGN POST	STORM HATCH	
OVERHEAD POWER	LIGHT POST	POWER POLE	
ELECTRICITY			

Photograph 5



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DRAWN: DA | DATE OF PLAN: 25-03-2019
CHECKED: DA | DATE LAST SAVED: 02.04.2019
APPROVED: DSR | DATE APPROVED: 25-03-2019

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PT 1 DP 1215257, Medowie

DRAWING No: 143433 - Medowie Rd, Medowie - Detail Plan.dwg

JOB No: 143433 | ISSUE: B
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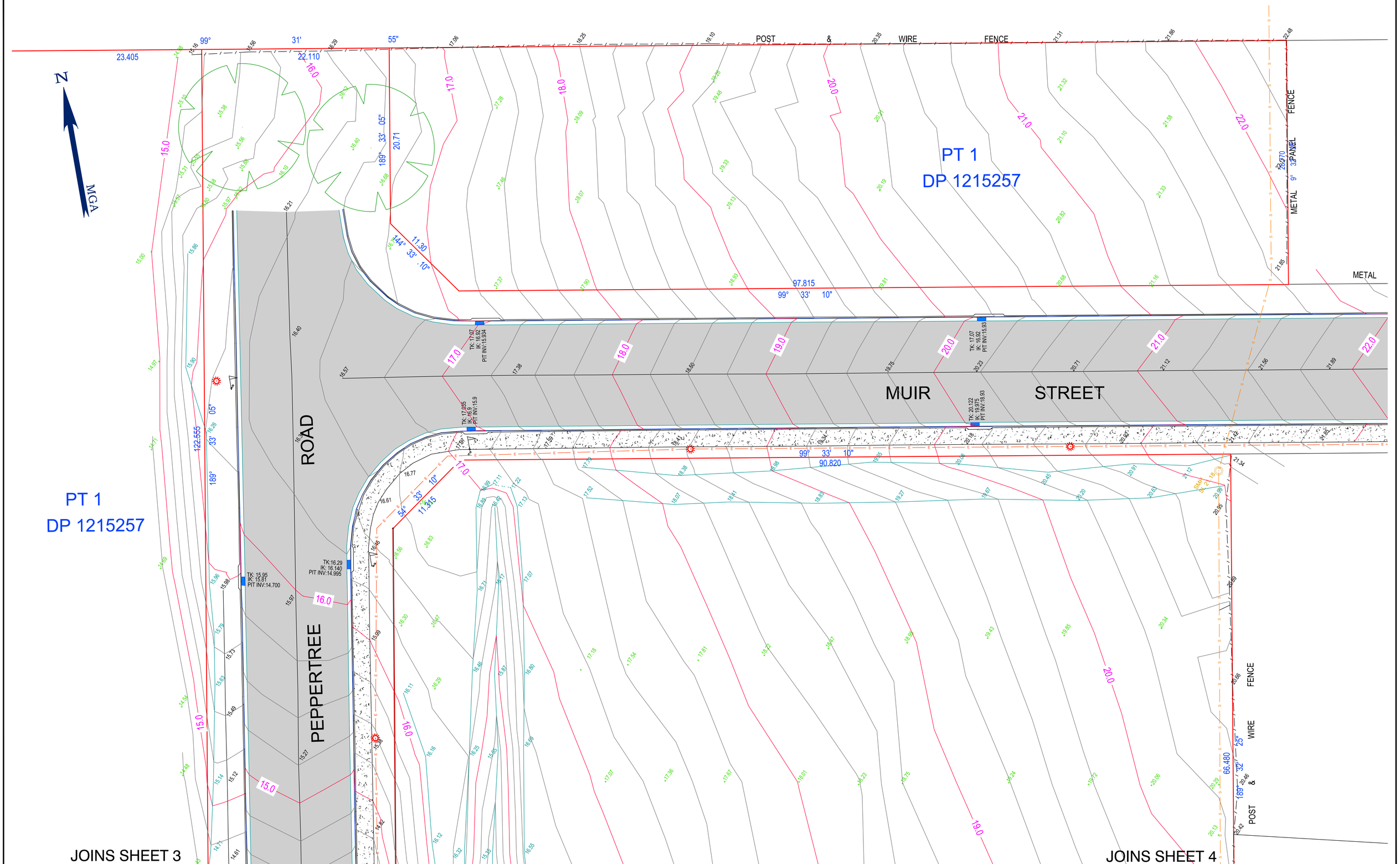

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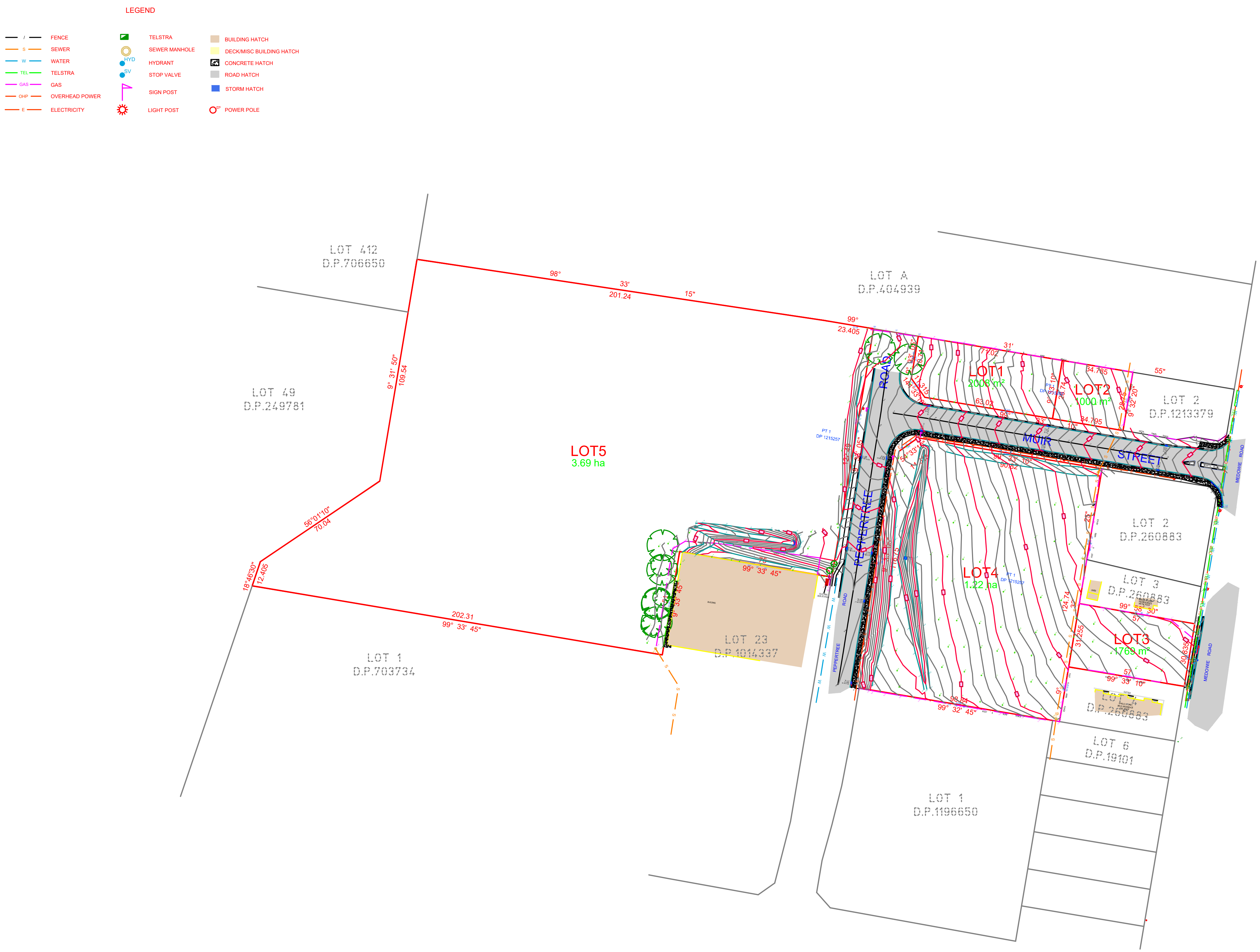
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SEWER
WATER
TELSTRA
GAS
OVERHEAD POWER
ELECTRICITY
TELSTRA
SEWER MANHOLE
HYDRANT
STOP VALVE
SIGN POST
LIGHT POST
BUILDING HATCH
DECK/MISC BUILDING HATCH
CONCRETE HATCH
ROAD HATCH
STORM HATCH
POWER POLE
LOT 412
D.P.706650
LOT A
D.P.404939
LOT 49
D.P.249781
LOT5
3.69 ha
LOT 1
D.P.703734
LOT 23
D.P.1014337
LOT1
2008 m²
LOT2
1000 m²
LOT 2
D.P.1213379
MUIR
STREET
PEPPERTREE
ROAD
LOT 2
D.P.260883
LOT 3
D.P.260883
LOT4
1.22 ha
LOT3
1760 m²
LOT 4
D.P.260883
LOT 6
D.P.19101
LOT 1
D.P.1196650
MEDOWIE ROAD
98° 33' 15"
201.24
99°
23.405
9° 31' 50"
109.54
56°01'10"
70.04
18°46'20"
12.405
202.31
99° 33' 45"
99° 33' 45"
98.84
99° 32' 45"
99° 33' 10"
99° 58' 30"

Appendix B

Architectural Drawings

MEDOWIE
FAMILY TAVERN

ARCHITECTURAL DRAWING SCHEDULE

ID	DRAWING	REV	SCALE	PAGE
A00	COVER SHEET	E	NTS	A3
A01	SITE PLAN/ROOF PLAN	G	1:200	A3
A02	SITE ANALYSIS PLAN	E	1:200	A3
A03	BASEMENT LEVEL	H	1:200	A3
A04	GROUND FLOOR	I	1:200	A3
A05	ELEVATIONS	G	1:200	A3
A06	3D PERSPECTIVES PAGE 1	E	NTS	A3
A07	3D PERSPECTIVES PAGE 2	E	NTS	A3
A08	SCHEDULE OF MATERIALS & FINISHES	E	NTS	A3
A09	NOTIFICATION PLAN	E	VARIOUS	A3

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ACN 002 912 843 | **ABN** 82 644 649 849
Nominated Architect - Bernard Collins | NSW Architects Registration No.4438
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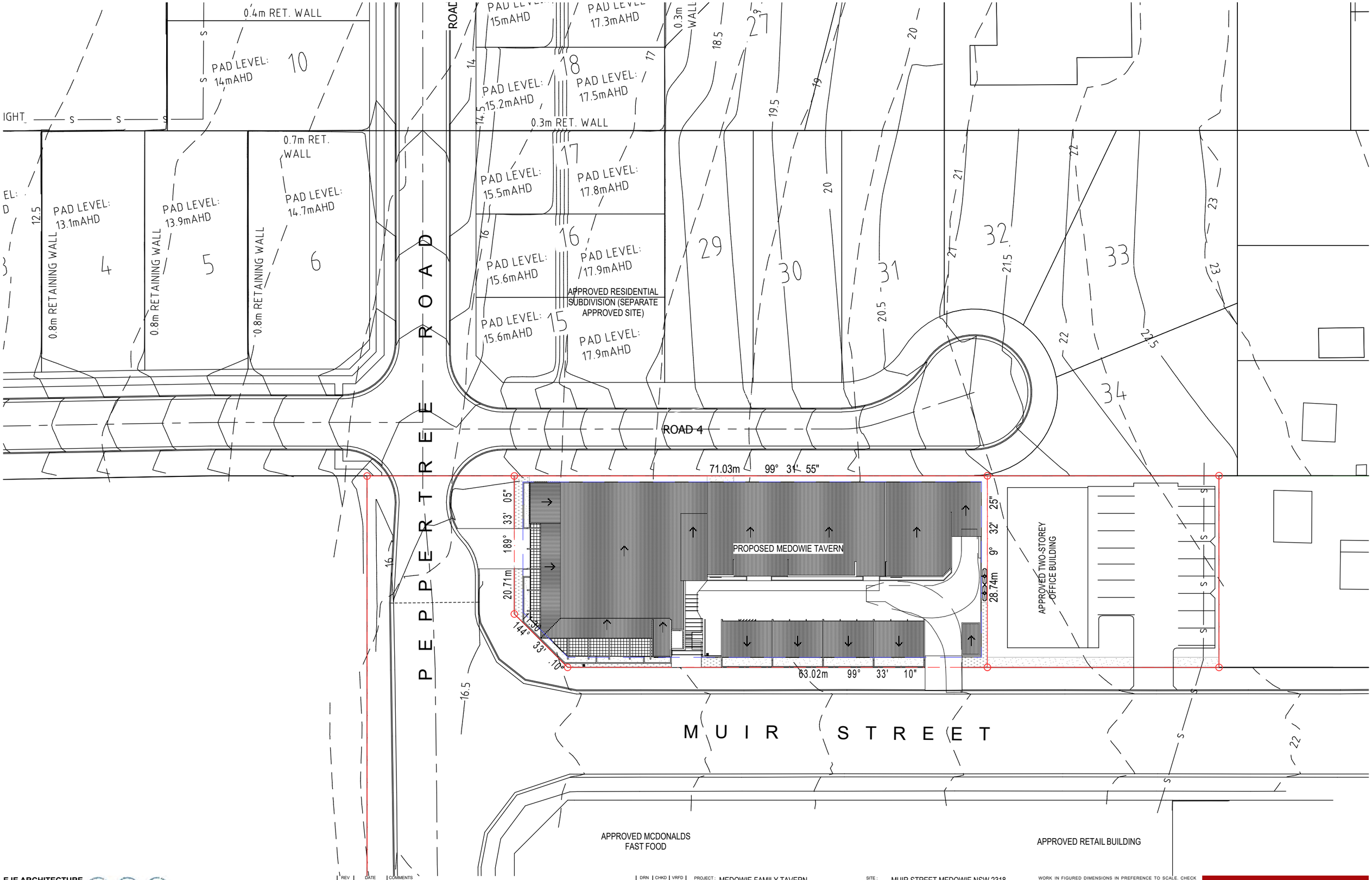
FILE NAME: 13003-DA_A.pln

PRINTED ON: 7/08/2020

EJE architecture



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MAVID GROUP

0 10mm 50mm 100mm ON ORIGINAL A3

REV	DATE	COMMENTS
A	19/02/2020	FINAL COORDINATION ISSUE
B	21/02/2020	AMENDED COORDINATION ISSUE
C	21/02/2020	INTERNAL ISSUE FOR QA
D	21/02/2020	ISSUED FOR DA
E	24/02/2020	REVISED DA ISSUE
F	28/07/2020	REVISED DA ISSUE
G	29/07/2020	ISSUED FOR DA

DRN	CHKD	VRFD
RIW	RIW	RIW
RIW	RIW	RIW
RIW	RIW	
RIW	RIW	DJW
RIW	RIW	RIW
RIW	RIW	RIW
RIW	RIW	DJW

PROJECT : MEDOWIE FAMILY TAVERN

CLIENT : MAVID GROUP
81 MUSTANG DRIVE, RUTHERFORD
NSW, POSTCODE

SITE : MUIR STREET MEDOWIE NSW 2318
AUSTRALIA

DRAWING : SITE PLAN/ROOF PLAN

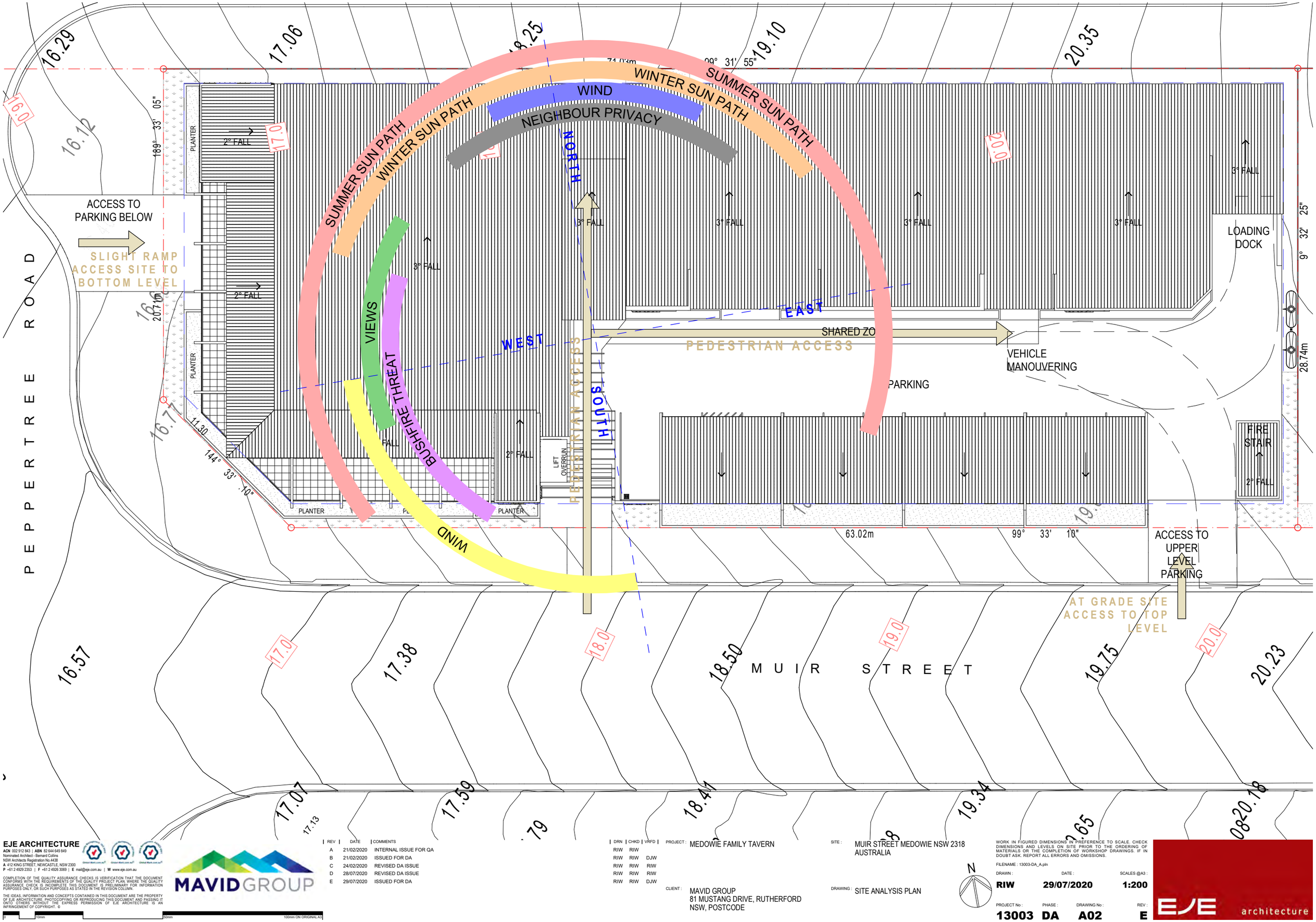
WORK IN FIGURED DIMENSIONS IN PREFERENCE TO SCALE. CHECK DIMENSIONS AND LEVELS ON SITE PRIOR TO THE ORDERING OF MATERIALS OR THE COMPLETION OF WORKSHOP DRAWINGS. IF IN DOUBT ASK. REPORT ALL ERRORS AND OMISSIONS.

FILENAME : 13003-DA_A.pln

DRAWN :	DATE :	SCALES @A3 :
RIW	29/07/2020	1:500

PROJECT No :	PHASE :	DRAWING No :	REV :
13003	DA	A01	G

EJE architecture



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0 10mm 50mm 100mm ON ORIGINAL A3

MAVID GROUP

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DRN	CHKD	VRFD
RIW	RIW	
RIW	RIW	DJW
RIW	RIW	RIW
RIW	RIW	RIW
RIW	RIW	DJW

PROJECT : MEDOWIE FAMILY TAVERN

SITE : MUIR STREET MEDOWIE NSW 2318 AUSTRALIA

CLIENT : MAVID GROUP
81 MUSTANG DRIVE, RUTHERFORD
NSW, POSTCODE

DRAWING : SITE ANALYSIS PLAN

WORK IN FIGURED DIMENSIONS IN PREFERENCE TO SCALE. CHECK DIMENSIONS AND LEVELS ON SITE PRIOR TO THE ORDERING OF MATERIALS OR THE COMPLETION OF WORKSHOP DRAWINGS. IF IN DOUBT ASK. REPORT ALL ERRORS AND OMISSIONS.

FILENAME : 13003-DA_A.pln

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PROJECT No :	PHASE :	DRAWING No :	REV :
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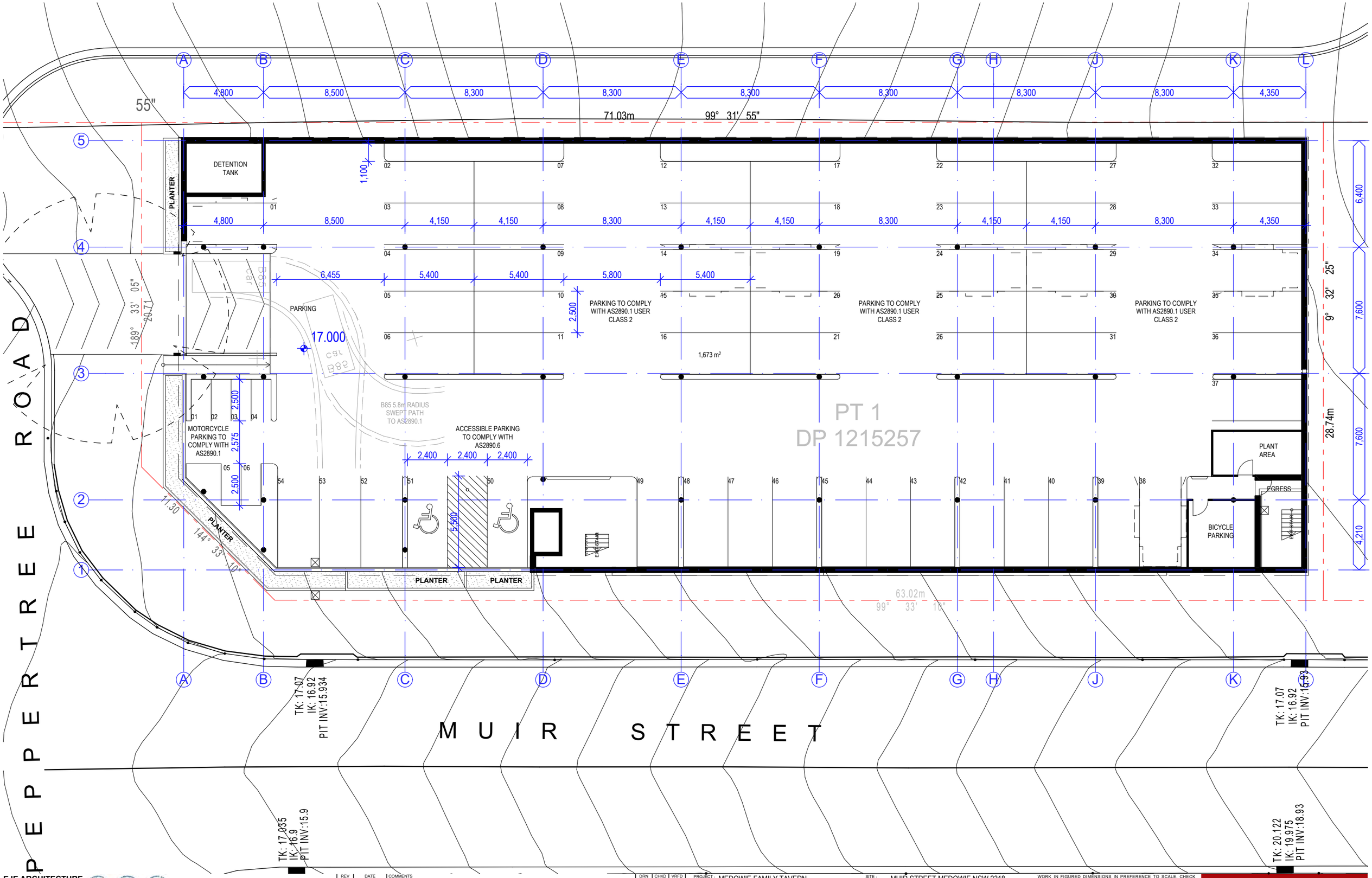
EJE architecture



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0 10mm 50mm 100mm ON ORIGINAL A3

MAVID GROUP

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DRN	CHKD	VRFD
RIW	RIW	RIW
RIW	RIW	RIW
RIW	RIW	RIW
RIW	RIW	
RIW	RIW	DJW
RIW	RIW	RIW
RIW	RIW	RIW
RIW	RIW	DJW

PROJECT : MEDOWIE FAMILY TAVERN

SITE : MUIR STREET MEDOWIE NSW 2318 AUSTRALIA

CLIENT : MAVID GROUP
81 MUSTANG DRIVE, RUTHERFORD
NSW, POSTCODE

DRAWING : BASEMENT LEVEL

N

WORK IN FIGURED DIMENSIONS IN PREFERENCE TO SCALE. CHECK DIMENSIONS AND LEVELS ON SITE PRIOR TO THE ORDERING OF MATERIALS OR THE COMPLETION OF WORKSHOP DRAWINGS. IF IN DOUBT ASK. REPORT ALL ERRORS AND OMISSIONS.

FILENAME : 13003-DA_A.pln

DRAWN :	DATE :	SCALES @A3 :
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PROJECT No :	PHASE :	DRAWING No :	REV :
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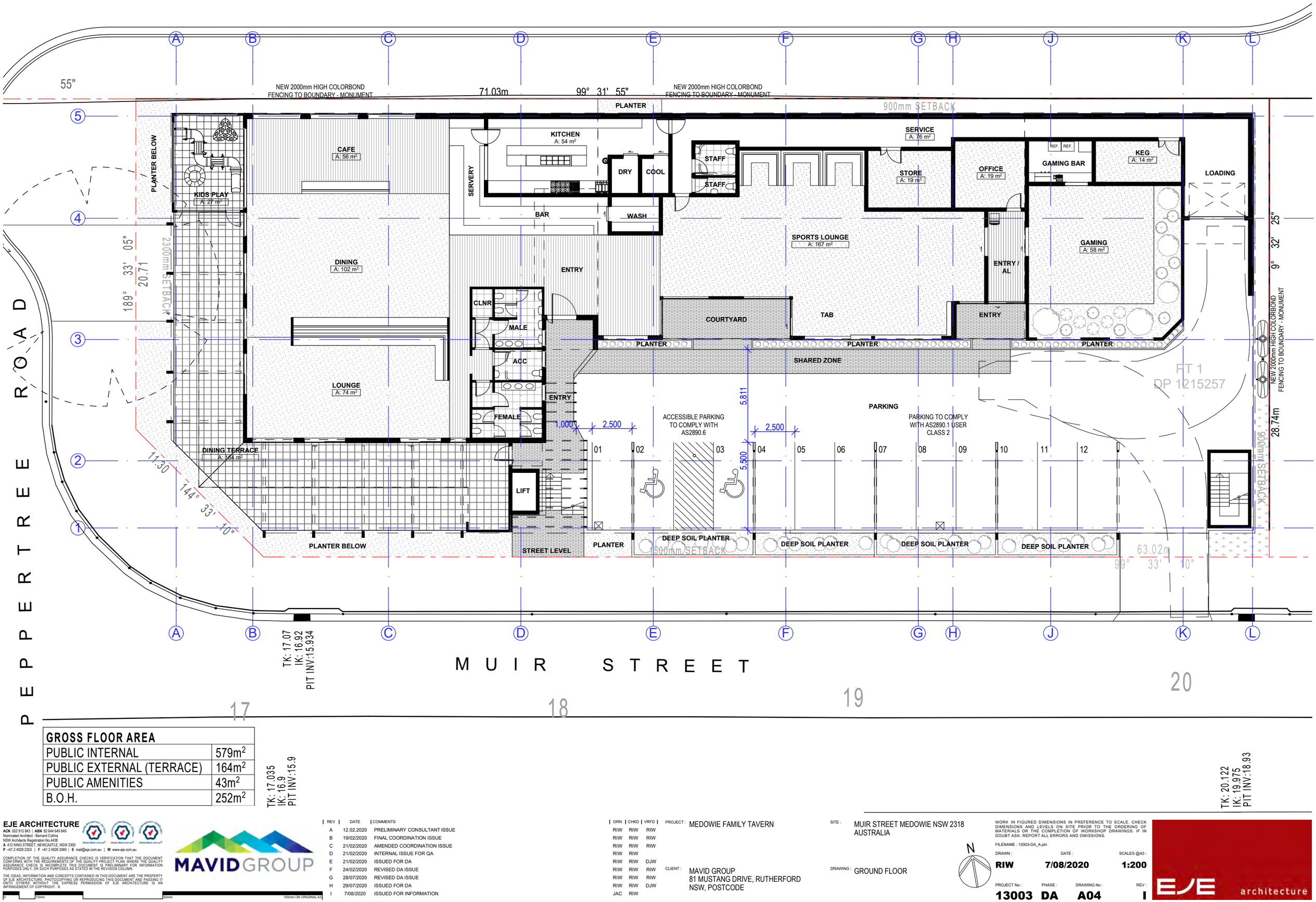
EJE architecture



GROSS FLOOR AREA	
PUBLIC INTERNAL	579m²
PUBLIC EXTERNAL (TERRACE)	164m²
PUBLIC AMENITIES	43m²
B.O.H.	252m²

EJE ARCHITECTURE
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H	29/07/2020	ISSUED FOR DA
I	7/08/2020	ISSUED FOR INFORMATION

DRN	CHKD	VRFD
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RIW	RIW	RIW
RIW	RIW	RIW
RIW	RIW	
RIW	RIW	DJW
RIW	RIW	RIW
RIW	RIW	RIW
RIW	RIW	DJW
JAC	RIW	

PROJECT : MEDOWIE FAMILY TAVERN

CLIENT : MAVID GROUP
81 MUSTANG DRIVE, RUTHERFORD
NSW, POSTCODE

SITE : MUIR STREET MEDOWIE NSW 2318
AUSTRALIA

DRAWING : GROUND FLOOR

N

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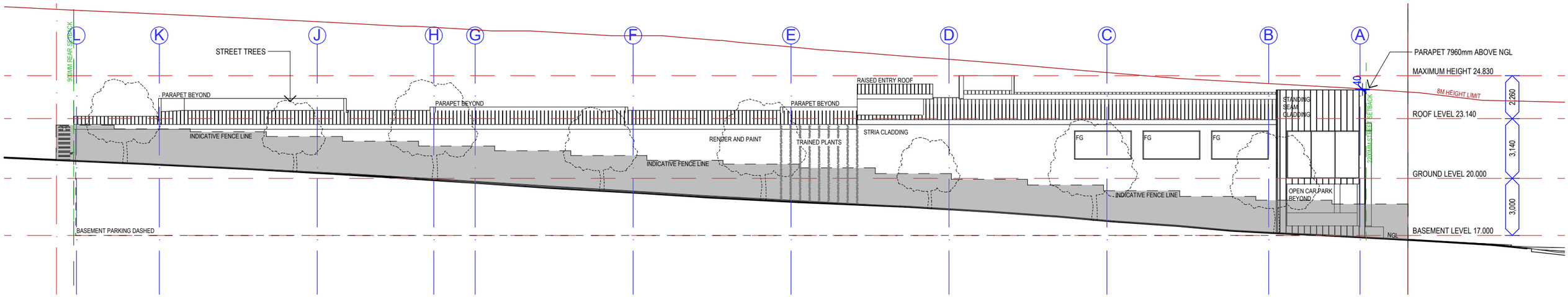
FILENAME : 13003-DA_A.pln

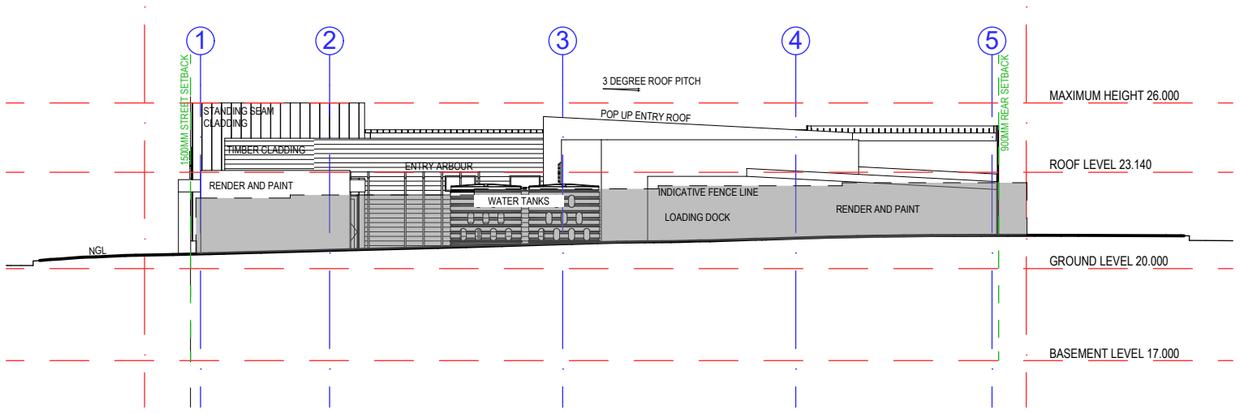
DRAWN :	DATE :	SCALES @A3 :
RIW	7/08/2020	1:200

PROJECT No :	PHASE :	DRAWING No :	REV :
13003	DA	A04	I

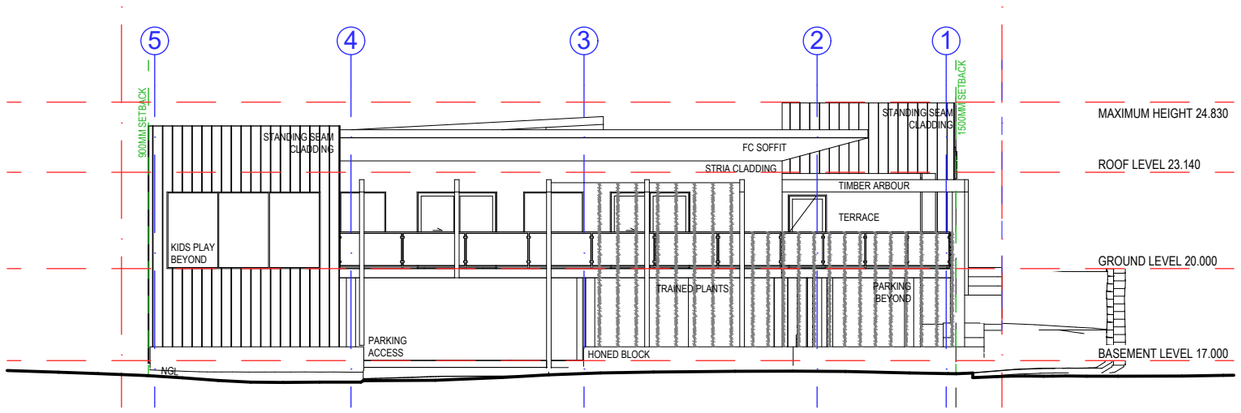
EJE architecture



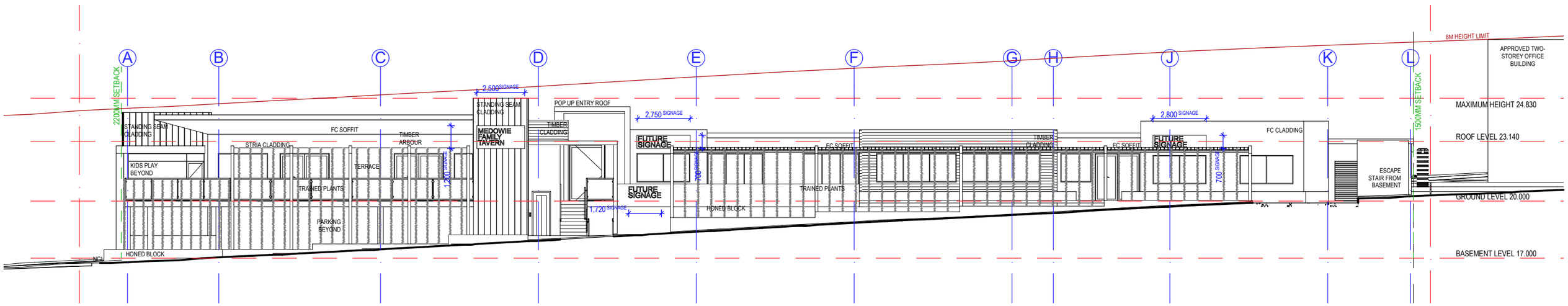
E01 NORTH ELEVATION 1:200



E02 EAST ELEVATION 1:200



E03 WEST ELEVATION 1:200



E04 SOUTH ELEVATION 1:200

#LayID

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DRN	CHKD	VRFD
RIW	RIW	RIW
RIW	RIW	RIW
RIW	RIW	
RIW	RIW	DJW
RIW	RIW	RIW
RIW	RIW	RIW
RIW	RIW	DJW

PROJECT : MEDOWIE FAMILY TAVERN

CLIENT : MAVID GROUP
81 MUSTANG DRIVE, RUTHERFORD
NSW, POSTCODE

SITE : MUIR STREET MEDOWIE NSW 2318
AUSTRALIA

DRAWING : ELEVATIONS

WORK IN FIGURED DIMENSIONS IN PREFERENCE TO SCALE. CHECK DIMENSIONS AND LEVELS ON SITE PRIOR TO THE ORDERING OF MATERIALS OR THE COMPLETION OF WORKSHOP DRAWINGS. IF IN DOUBT ASK. REPORT ALL ERRORS AND OMISSIONS.

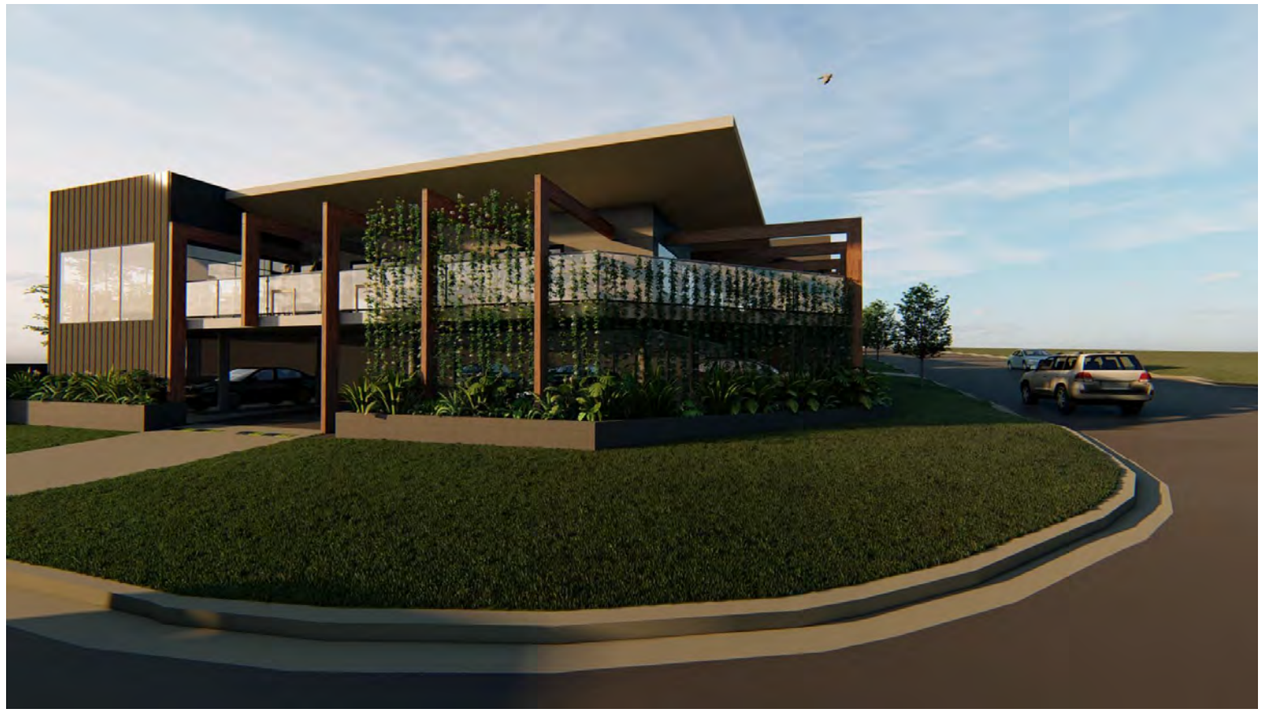
FILENAME : 13003-DA_A.pln

DRAWN :	DATE :	SCALES @A3 :
RIW	29/07/2020	1:200

PROJECT No :	PHASE :	DRAWING No :	REV :
13003	DA	A05	G

EJE architecture

VIEW FROM WEST TOWARD KIDS PLAY AND CAR PARK



WESTERN ELEVATION

VIEW OF CORNER

ENTRY VIEWED FROM SOUTH

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0 10mm 50mm 100mm ON ORIGINAL A3

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DRN	CHKD	VRFD
RIW	RIW	
RIW	RIW	DJW
RIW	RIW	RIW
RIW	RIW	RIW
RIW	RIW	DJW

PROJECT : MEDOWIE FAMILY TAVERN

CLIENT : MAVID GROUP
81 MUSTANG DRIVE, RUTHERFORD
NSW, POSTCODE

SITE : MUIR STREET MEDOWIE NSW 2318
AUSTRALIA

DRAWING : 3D PERSPECTIVES PAGE 1

WORK IN FIGURED DIMENSIONS IN PREFERENCE TO SCALE. CHECK DIMENSIONS AND LEVELS ON SITE PRIOR TO THE ORDERING OF MATERIALS OR THE COMPLETION OF WORKSHOP DRAWINGS. IF IN DOUBT ASK. REPORT ALL ERRORS AND OMISSIONS.

FILENAME : 13003-DA_A.pln

DRAWN : RIW
DATE : 29/07/2020
SCALES @A3 :

PROJECT No : 13003
PHASE : DA
DRAWING No : A06
REV : E

EJE architecture

ENTRY SEQUENCE

UPPER CAR PARK VIEW

DRONE VIEW

NORTHERN BOUNDARY VIEW

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DRN	CHKD	VRFD
RIW	RIW	
RIW	RIW	DJW
RIW	RIW	RIW
RIW	RIW	RIW
RIW	RIW	DJW

PROJECT : MEDOWIE FAMILY TAVERN

CLIENT : MAVID GROUP
81 MUSTANG DRIVE, RUTHERFORD
NSW, POSTCODE

SITE : MUIR STREET MEDOWIE NSW 2318
AUSTRALIA

DRAWING : 3D PERSPECTIVES PAGE 2

WORK IN FIGURED DIMENSIONS IN PREFERENCE TO SCALE. CHECK DIMENSIONS AND LEVELS ON SITE PRIOR TO THE ORDERING OF MATERIALS OR THE COMPLETION OF WORKSHOP DRAWINGS. IF IN DOUBT ASK. REPORT ALL ERRORS AND OMISSIONS.

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DRAWN : **RIW**
DATE : **29/07/2020**
SCALES @A3 :

PROJECT No : **13003**
PHASE : **DA**
DRAWING No : **A07**
REV : **E**

EJE architecture

COLORBOND STANDING SEAM CLADDING

JAMES HARDIE STRIA CLADDING

BLACKBUTT TIMBER CLADDING

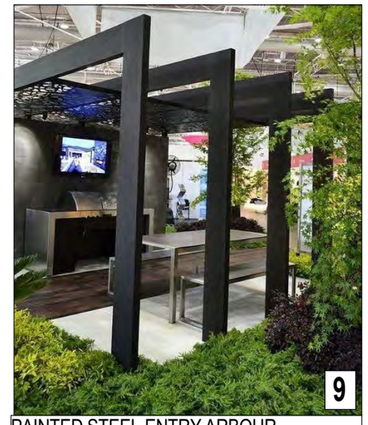
BLACKBUTT TIMBER ARBOUR

TRAINED TRELLIS PLANTING

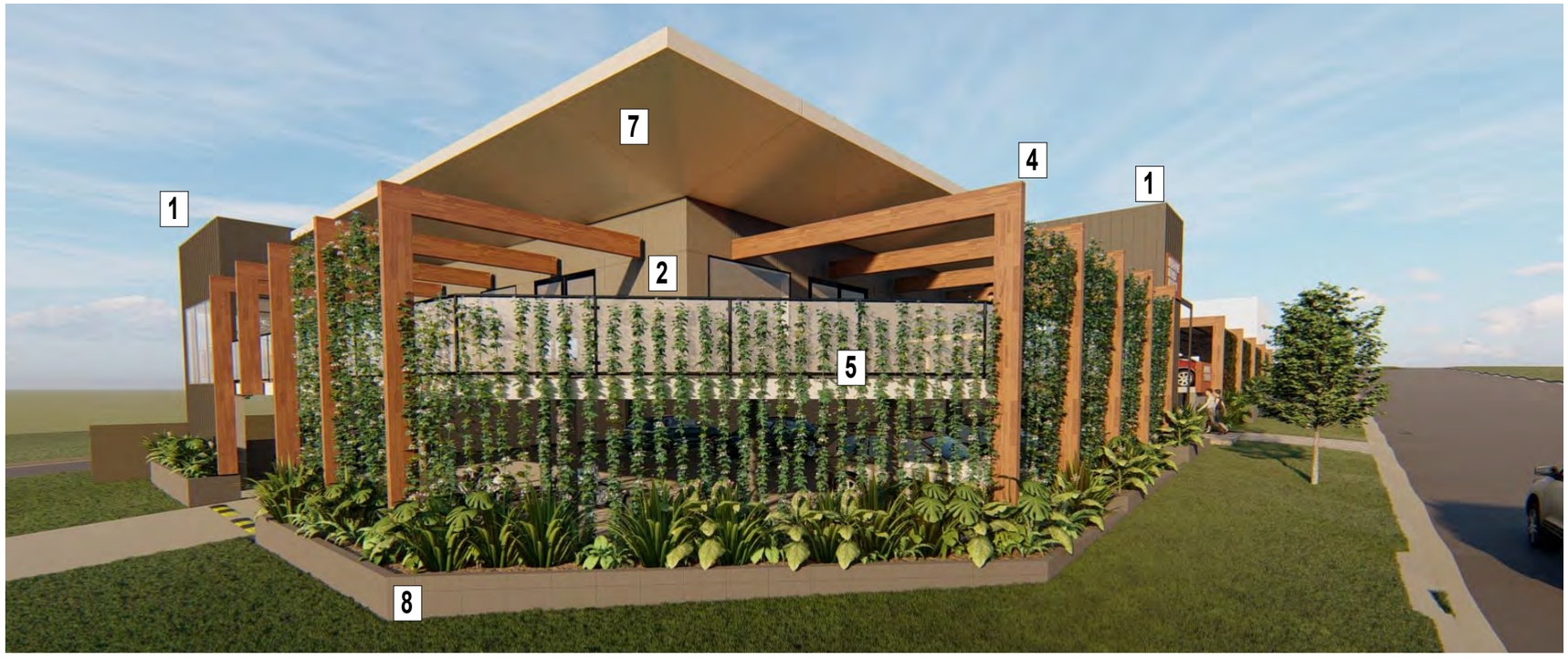
CORTEN STEEL HIGHLIGHTS

PAINTED EXPRESSED CFC SOFFIT

DARK HONED BLOCKWORK



PAINTED STEEL ENTRY ARBOUR



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0 70mm 50mm 100mm ON ORIGINAL A3

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RIW	RIW	DJW
RIW	RIW	RIW
RIW	RIW	RIW
RIW	RIW	DJW

PROJECT : MEDOWIE FAMILY TAVERN

CLIENT : MAVID GROUP
81 MUSTANG DRIVE, RUTHERFORD
NSW, POSTCODE

SITE : MUIR STREET MEDOWIE NSW 2318
AUSTRALIA

DRAWING : SCHEDULE OF MATERIALS & FINISHES

WORK IN FIGURED DIMENSIONS IN PREFERENCE TO SCALE. CHECK DIMENSIONS AND LEVELS ON SITE PRIOR TO THE ORDERING OF MATERIALS OR THE COMPLETION OF WORKSHOP DRAWINGS. IF IN DOUBT ASK. REPORT ALL ERRORS AND OMISSIONS.

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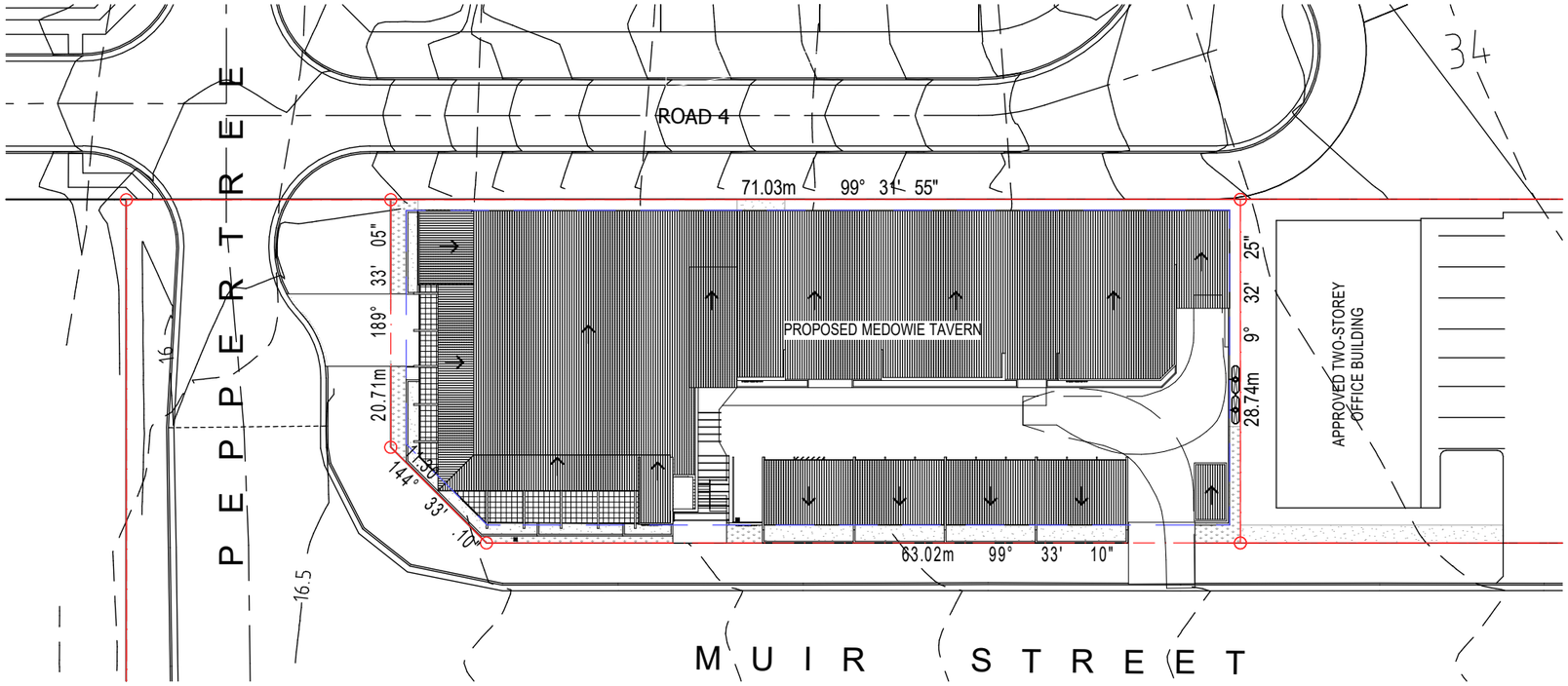
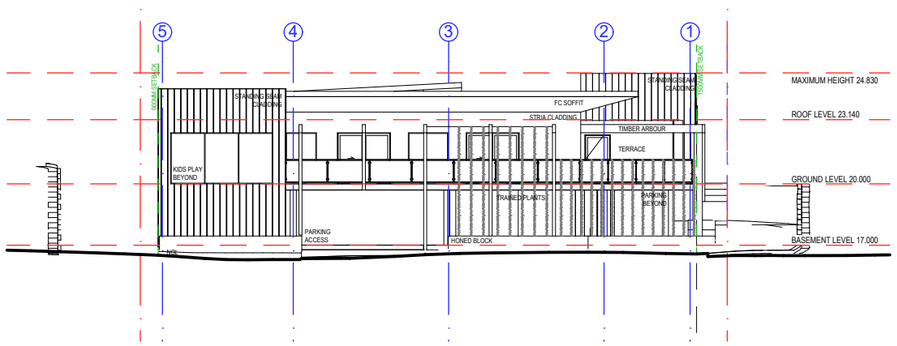
DRAWN :	DATE :	SCALES @A3 :
RIW	29/07/2020	NTS

PROJECT No :	PHASE :	DRAWING No :	REV :
13003	DA	A08	E

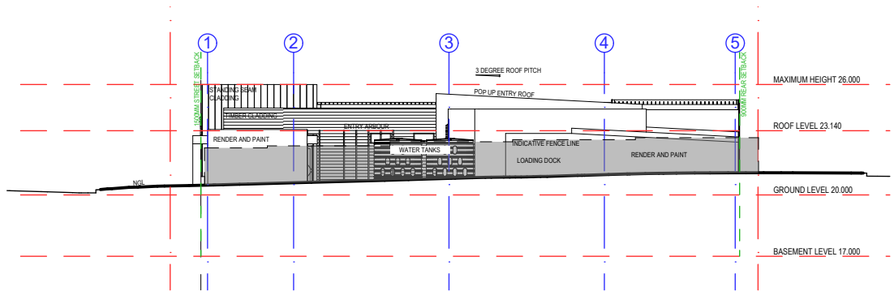
EJE architecture



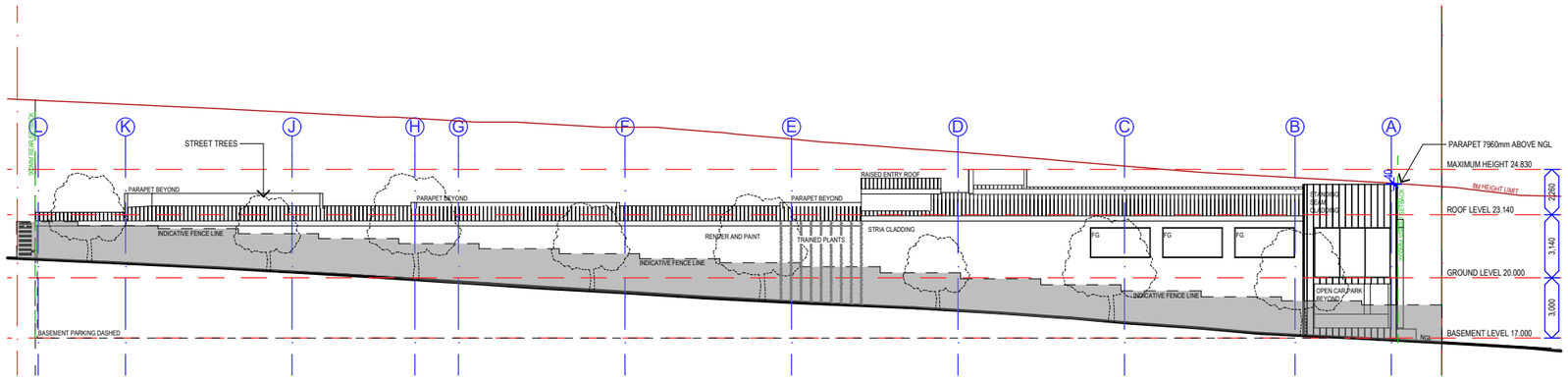
SITE PLAN 1:500



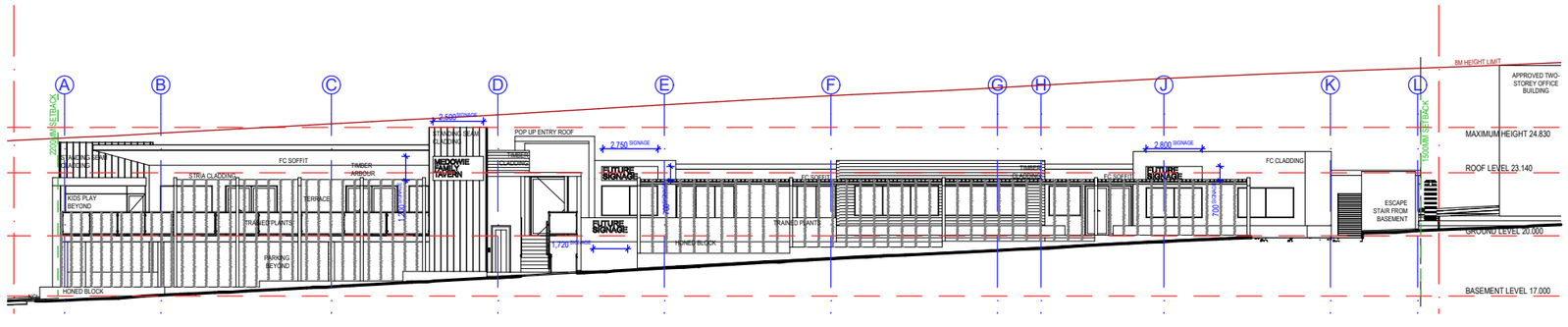
WEST ELEVATION 1:300



EAST ELEVATION 1:300



NORTH ELEVATION 1:300



SOUTH ELEVATION 1:300

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0 10mm 50mm 100mm ON ORIGINAL A3

MAVID GROUP

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DRN	CHKD	VRFD
RIW	RIW	
RIW	RIW	DJW
RIW	RIW	RIW
RIW	RIW	RIW
RIW	RIW	DJW

PROJECT : MEDOWIE FAMILY TAVERN

CLIENT : MAVID GROUP
81 MUSTANG DRIVE, RUTHERFORD
NSW, POSTCODE

SITE : MUIR STREET MEDOWIE NSW 2318
AUSTRALIA

DRAWING : NOTIFICATION PLAN

WORK IN FIGURED DIMENSIONS IN PREFERENCE TO SCALE. CHECK DIMENSIONS AND LEVELS ON SITE PRIOR TO THE ORDERING OF MATERIALS OR THE COMPLETION OF WORKSHOP DRAWINGS. IF IN DOUBT ASK. REPORT ALL ERRORS AND OMISSIONS.

FILENAME : 13003-DA_A.pln

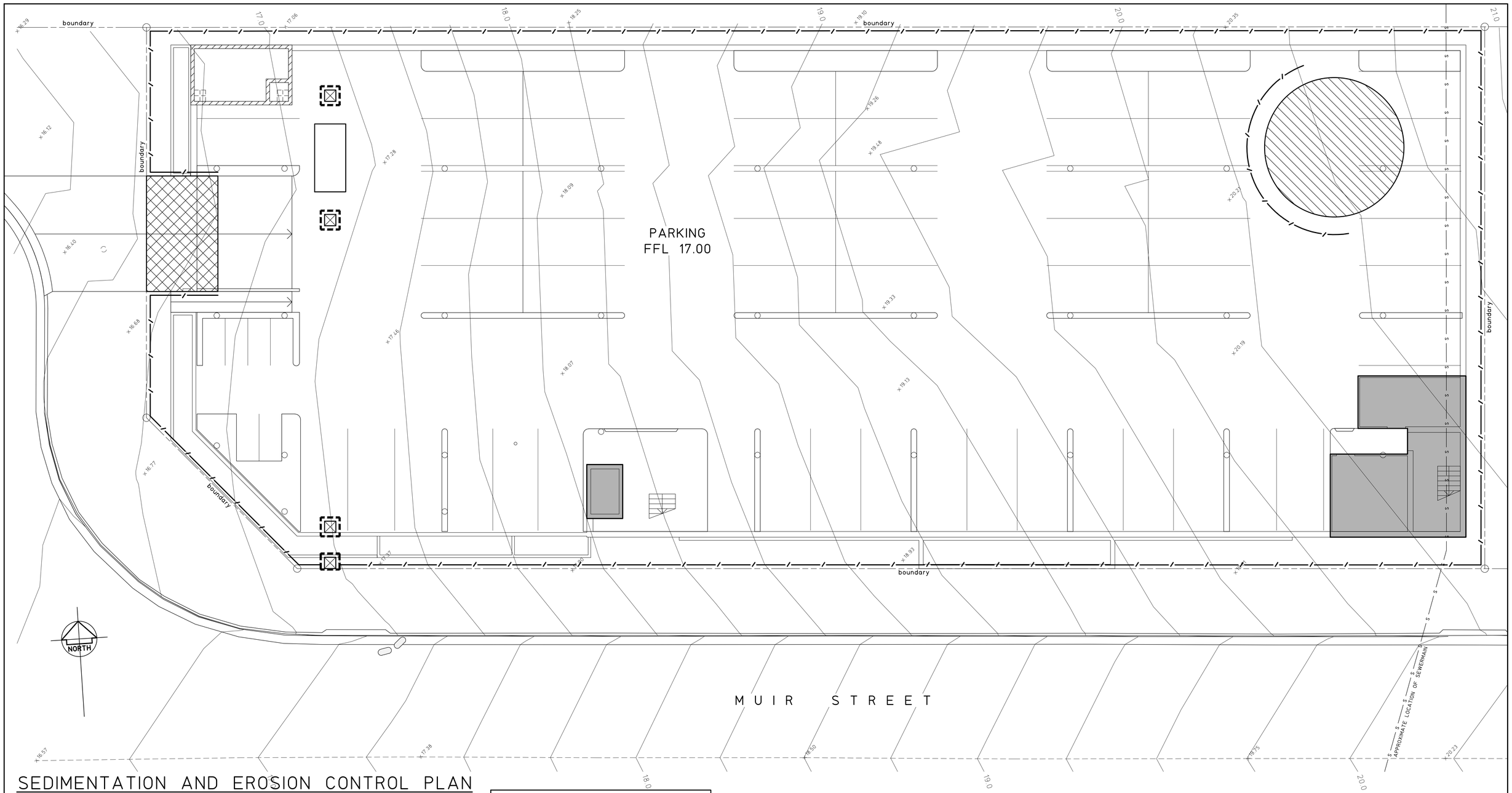
DRAWN :	DATE :	SCALES @A3 :
RIW	29/07/2020	NOTED

PROJECT No :	PHASE :	DRAWING No :	REV :
13003	DA	A09	E

EJE architecture

Appendix C

Stormwater and Sediment Control Plans



SEDIMENTATION AND EROSION CONTROL PLAN

SCALE 1:100

SEDIMENTATION AND EROSION CONTROL NOTES

1. SELECTIVE CLEARING OF VEGETATION TO BE RESTRICTED TO NOMINATED AREAS WITH CLEARED VEGETATION WINDROWED ON THE CONTOUR.
2. ALL EROSION AND SEDIMENT CONTROL MEASURES TO BE INSTALLED PRIOR TO SITE DISTURBANCE.
3. TOPSOIL FROM ALL AREAS THAT WILL BE DISTURBED TO BE STRIPPED AND STOCKPILED AT THE NOMINATED SITE.
4. NO MORE THAN 150m OF TRENCH TO BE OPEN AT ANY ONE TIME.
5. CUT AND FILL BATTER GRADIENTS OF 1:2 (MAXIMUM).
6. A STRIP OF TURF 450mm WIDE IS TO BE PLACED IMMEDIATELY BEHIND THE KERB ON ALL NEW ROAD TO ACT AS A FILTER TRAP. REFER TO DETAIL SD6-13.
7. ALL SEDIMENT CONTROL STRUCTURES TO BE INSPECTED BY SITE SUPERVISOR AFTER EACH RAINFALL EVENT FOR STRUCTURAL DAMAGE AND ALL TRAPPED SEDIMENT TO BE REMOVED TO A NOMINATED STOCKPILE SITE.
8. THE PROJECT MANAGER TO INFORM ALL CONTRACTORS AND SUB-CONTRACTORS OF THEIR OBLIGATIONS UNDER THE EROSION AND SEDIMENT CONTROL PLAN.
9. NO DISTURBED AREA IS TO REMAIN DENUDED LONGER THAN 14 DAYS.
10. ALL FILLS ARE TO BE LEFT WITH A LIP AT THE TOP OF THE SLOPE AT THE END OF EACH DAY'S OPERATION.
11. THE CONTRACTOR MUST ENSURE THE SUITABILITY AND INTEGRITY OF ALL WORKS AT THE END OF EACH DAY'S WORK.
12. ORANGE BARRIER TAPE TO BE AFFIXED TO TOP OF SEDIMENT CONTROL BARRIER TO IDENTIFY WORK AREA.
13. ALL SEDIMENTATION & EROSION CONTROL MEASURES ARE TO STRICTLY COMPLY WITH THE GUIDELINES DETAILED IN THE DEPARTMENT OF HOUSING PUBLICATION, "MANAGING URBAN STORMWATER - SOILS AND CONSTRUCTION", 4TH EDITION.
14. WATER TRUCKS TO BE USED AS REQUIRED TO PREVENT WIND EROSION.
15. SUBGRADE MATERIAL TO BE CONSTRUCTED IMMEDIATELY FOLLOWING FILL.

LEGEND

- DENOTES ALLOWABLE AREA FOR TEMPORARY STOCKPILING OF CUT SOIL MATERIAL, REFER TO DETAIL SD4-1
- DENOTES SEDIMENT FENCE, REFER TO DETAIL SD6-8
- DENOTES MESH AND GRAVEL INLET FILTER, REFER TO DETAIL SD6-11
- DENOTES GEOTEXTILE INLET FILTER, REFER TO DETAIL SD6-12
- DENOTES STABILISED SITE ACCESS, REFER TO DETAIL SD6-14

NOT FOR CONSTRUCTION

ISSUE	REASON FOR ISSUE	DATE
2	REVISED DEVELOPMENT APPLICATION	10.9.20
1	REVISED DEVELOPMENT APPLICATION	30.7.20
0	DEVELOPMENT APPLICATION	26.2.20

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A.C.N. 098 542 575

CLIENT
MAVID GROUP

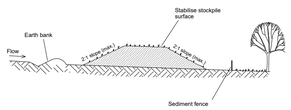
TITLE
SEDIMENTATION AND EROSION CONTROL PLAN

PROJECT
PROPOSED MEDOWIE FAMILY TAVERN AT; LOT 1, DP 1215257, MUIR STREET, MEDOWIE

DO NOT SCALE DRAWING

DRAWN	ENGINEER	No in SET	SHEET
L.C.	P.M.	7	A1
SCALES	JOB No	DRAWING No	ISSUE
1:100	200047	C01	2

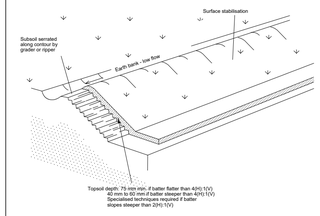
FULL SIZE ON ORIGINAL 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 cm



Construction Notes

1. Place stockpiles more than 2 (preferably 5) metres from existing vegetation, concentrated water flow, roads and hazard areas.
2. Construct on the contour as low, flat, elongated mounds.
3. Where there is sufficient area, topsoil stockpiles shall be less than 2 metres in height.
4. Where they are to be in place for more than 10 days, stabilise following the approved ESCP or SWMP to reduce the C-factor to less than 0.10.
5. Construct earth banks (Standard Drawing 5-5) on the upslope side to divert water around stockpiles and sediment fences (Standard Drawing 6-8) 1 to 2 metres downslope.

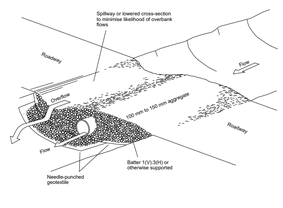
STOCKPILES SD 4-1



Construction Notes

1. Scarify the ground surface along the line of the contour to a depth of 50 mm to 100 mm to break up any hardsetting surfaces and to provide a good bond between the respread material and subsoil.
2. Add soil ameliorants as required by the ESCP or SWMP.
3. Rip to a depth of 300 mm if compacted layers occur.
4. Where possible, replace topsoil to a depth of 40 to 60 mm on lands where the slope exceeds 4(H):1(V) and to at least 75 mm on lower gradients.

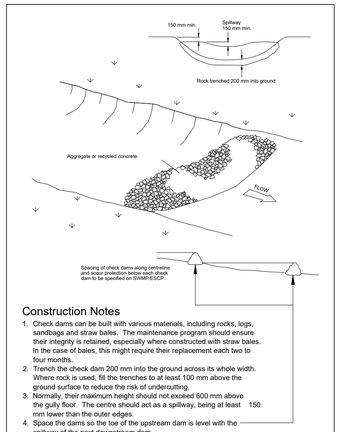
REPLACING TOPSOIL SD 4-2



Construction Notes

1. Prohibit all traffic until the access way is constructed.
2. Strip any topsoil and place a needle-punched textile over the base of the crossing.
3. Place clean, rigid, non polluting aggregate or gravel in the 100 mm to 150 mm size class over the fabric to a minimum depth of 200 mm.
4. Provide a 3-metre wide carriageway with sufficient length of culvert pipe to allow less than a 3(H): 1 (V) slope on side batters.
5. Install a lower section to act as an emergency spillway in greater than
6. Ensure that culvert outlets extend beyond the toe of fill embankments.

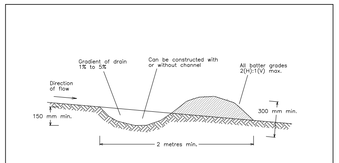
TEMPORARY WATERWAY CROSSING SD 5-1



Construction Notes

1. Check dams can be built with various materials, including rocks, logs, sandbags and straw bales. The maintenance program should ensure their integrity is retained, especially where constructed with straw bales. In the case of bales, this might require their replacement each two to four months.
2. Trench the check dam 200 mm into the ground across its whole width. Where rock is used, fill the trenches to at least 100 mm above the ground surface to reduce the risk of undercutting.
3. Normally, their maximum height should not exceed 600 mm above the gully floor. The centre should act as a spillway, being at least 150 mm lower than the outer edges.
4. Space the dams so the toe of the upstream dam is level with the spillway of the next downstream dam.

ROCK CHECK DAM SD 5-4

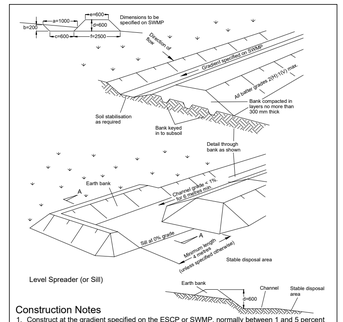


NOTE: Only to be used as temporary bank where maximum upslope length is 80 metres.

Construction Notes

1. Build with gradients between 1 percent and 5 percent.
2. Avoid removing trees and shrubs if possible - work around them.
3. Ensure the structures are free of projections or other irregularities that could impede water flow.
4. Build the drains with circular, parabolic or trapezoidal cross sections, not V shaped.
5. Ensure the banks are properly compacted to prevent failure.
6. Complete permanent or temporary stabilisation within 10 days of construction.

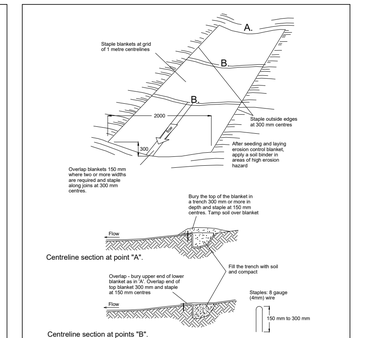
EARTH BANK (LOW FLOW) SD 5-5



Construction Notes

1. Construct at the gradient specified on the ESCP or SWMP, normally between 1 and 5 percent
2. Avoid removing trees and shrubs if possible - work around them.
3. Ensure the structures are free of projections or other irregularities that could impede water flow.
4. Build the drains with circular, parabolic or trapezoidal cross sections, not V-shaped, at the dimensions shown on the SWMP.
5. Ensure the banks are properly compacted to prevent failure.
6. Complete permanent or temporary stabilisation within 10 days of construction following Table 5.2 in Landcom (2004).
7. Where discharging to erodible lands, ensure they outlet through a properly constructed level spreader.
8. Construct the level spreader at the gradient specified on the ESCP or SWMP, normally less than 1 percent or level.
9. Where possible, ensure they discharge waters onto either stabilised or undisturbed disposal sites within the same subcatchment area from which the water originated. Approval might be required to discharge into other subcatchments.

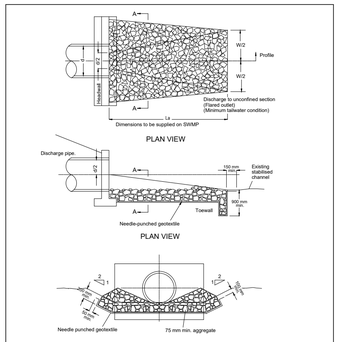
EARTH BANK (HIGH FLOWS) SD 5-6



Construction Notes

1. Remove any rocks, clods, sticks or grass from the surface before laying matting
2. Ensure that topsoil is at least 75 mm deep.
3. Complete fertilising and seeding before laying the matting.
4. Ensure fabric will be continuously in contact with the soil by grading the surface carefully first.
5. Lay the fabric in "shingle-fashion", with the end of each upstream roll overlapping those downstream. Ensure each roll is anchored properly at its upslope end.
6. Ensure that the full width of flow in the channel is covered by the matting up to the design storm event, usually in the 10-year ARI time of concentration storm event.
7. Divert water from the structure until vegetation is stabilised properly.

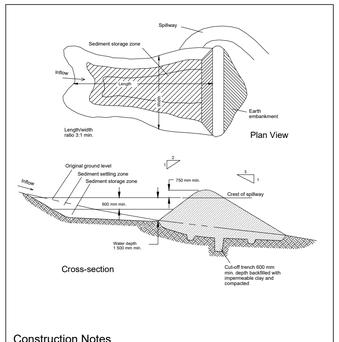
RECP : CONCENTRATED FLOW SD 5-7



Construction Notes

1. Compact the subgrade fill to the density of the surrounding undisturbed material.
2. Prepare a smooth, even foundation for the structure that will ensure that the needle-punched geotextile does not sustain serious damage when covered with rock.
3. Should any minor damage to the geotextile occur, repair it before spreading any aggregate. For repairs, patch one piece of fabric over the damage, making sure that all joints and patches overlap more than 300 mm.
4. Lay rock following the drawing, according to Table 5.2 of Landcom (2004) and with a minimum diameter of 75 mm.
5. Ensure that any concrete or riprap used for the energy dissipater or the outlet protection conforms to the grading limits specified on the SWMP.

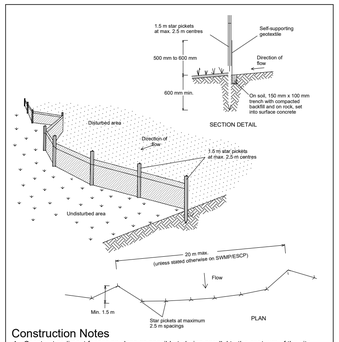
ENERGY DISSIPATER SD 5-8



Construction Notes

1. Remove all vegetation and topsoil from under the dam wall and from within the storage area.
2. Construct a cut-off trench 500 mm deep and 1,200 mm wide along the centreline of the embankment extending to a point on the gully wall level with the riser crest.
3. Maintain the trench free of water and recompact the materials with equipment as specified in the SWMP to 95 per cent Standard Proctor Density.
4. Select fill following the SWMP that is free of roots, wood, rock, large stone or foreign material.
5. Prepare the site under the embankment by ripping to at least 100 mm to help bond compacted fill to the existing substrate.
6. Spread the fill in 100 mm to 150 mm layers and compact it at optimum moisture content following the SWMP.
7. Construct the emergency spillway.
8. Rehabilitate the structure following the SWMP.

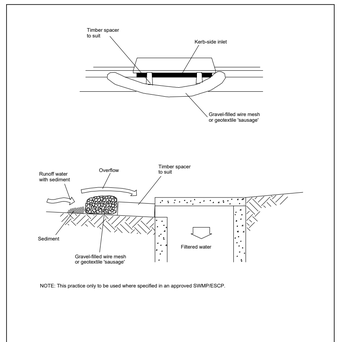
EARTH BASIN - WET
(APPLIES TO 'TYPE D' AND 'TYPE F' SOILS ONLY) SD 6-4



Construction Notes

1. Construct sediment fences as close as possible to being parallel to the contours of the site, but with small returns as shown in the drawing to limit the catchment area of any one section. The catchment area should be small enough to limit water flow if concentrated at one point to 50 litres per second in the design storm event, usually the 10-year event.
2. Cut a 150-mm deep trench along the upslope line of the fence for the bottom of the fabric to be entrenched.
3. Drive 1.5 metre long star pickets into ground at 2.5 metre intervals (max) at the downslope edge of the trench. Ensure any star pickets are fitted with safety caps.
4. Fix self-supporting geotextile to the upslope side of the posts ensuring it goes to the base of the trench. Fix the geotextile with wire ties or as recommended by the manufacturer. Only use geotextile specifically produced for sediment fencing. The use of shade cloth for this purpose is not satisfactory.
5. Join sections of fabric at a support post with a 150-mm overlap.
6. Backfill the trench over the base of the fabric and compact it thoroughly over the geotextile.

SEDIMENT FENCE SD 6-8

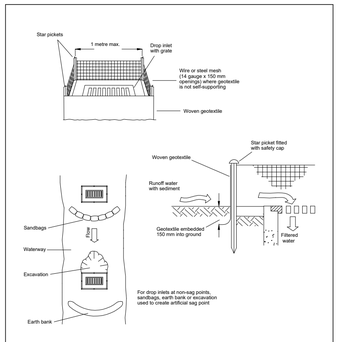


NOTE: This practice only to be used where specified in an approved SWMP/ESCP.

Construction Notes

1. Install filters to kerb inlets only at sag points.
2. Fabricate a sleeve made from geotextile or wire mesh longer than the length of the inlet pit and fill it with 25 mm to 50 mm gravel.
3. Form an elliptical cross-section about 150 mm high x 400 mm wide.
4. Place the filter at the opening leaving at least a 100-mm space between it and the kerb inlet. Maintain the opening with spacer blocks.
5. Form a seal with the kerb to prevent sediment bypassing the filter.
6. Sandbags filled with gravel can substitute for the mesh or geotextile providing they are placed so that they firmly abut each other and sediment-laden waters cannot pass between.

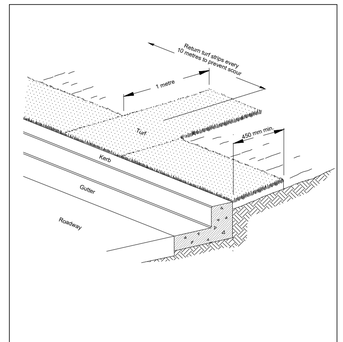
MESH AND GRAVEL INLET FILTER SD 6-11



Construction Notes

1. Fabricate a sediment barrier made from geotextile or straw bales.
2. Follow Standard Drawing 6-8 for installation procedures for the straw bales or geofabric. Reduce the picket spacing to 1 metre centres.
3. In waterways, artificial sag points can be created with sandbags or earth banks as shown in the drawing.
4. Do not cover the inlet with geotextile unless the design is adequate to allow for all waters to bypass it.

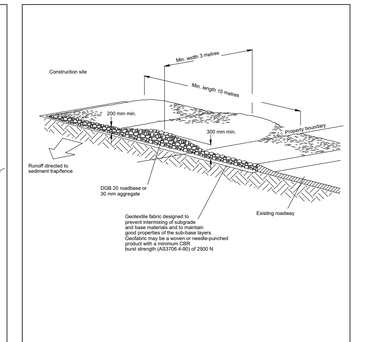
GEOTEXTILE INLET FILTER SD 6-12



Construction Notes

1. Install a 450 mm minimum wide roll of turf on the footpath next to the kerb and at the same level as the top of the kerb.
2. Lay 1.4 metre long turf strips normal to the kerb every 10 metres.
3. Rehabilitate disturbed soil behind the turf strip following the ESCP/SWMP.

KERBSIDE TURF STRIP SD 6-13



Construction Notes

1. Strip the topsoil, level the site and compact the subgrade.
2. Cover the area with needle-punched geotextile.
3. Construct a 200 mm thick pad over the geotextile using road base or 30 mm aggregate.
4. Ensure the structure is at least 15 metres long or to building alignment and at least 3 metres wide.
5. Where a sediment fence joins onto the stabilised access, construct a hump in the stabilised access to divert water to the sediment fence

STABILISED SITE ACCESS SD 6-14

SEDIMENTATION AND EROSION CONTROL DETAILS

NOT FOR CONSTRUCTION

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1	REVISED DEVELOPMENT APPLICATION	10.9.20
0	DEVELOPMENT APPLICATION	26.2.20

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CLIENT
MAVID GROUP

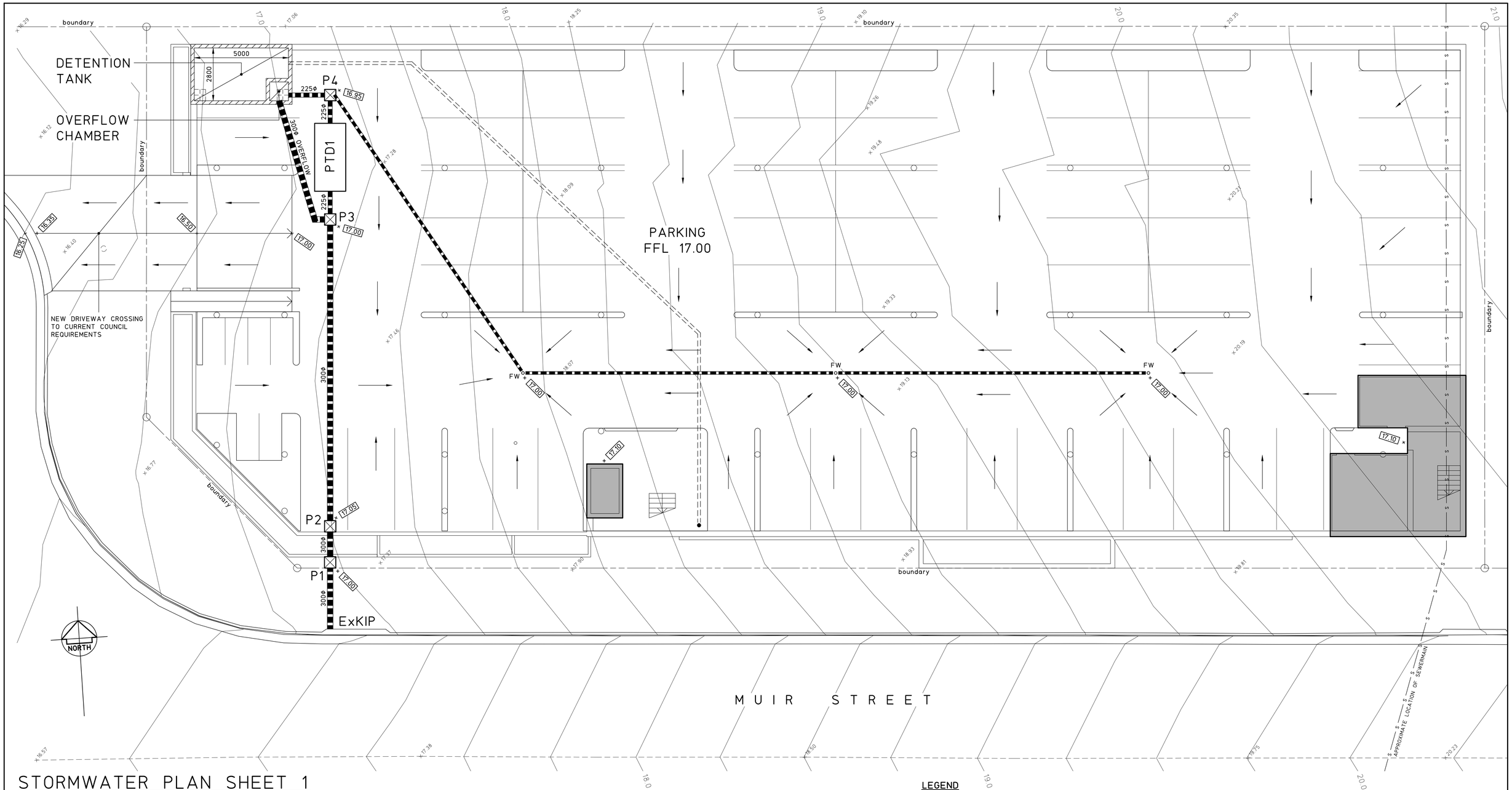
TITLE
SEDIMENTATION AND EROSION CONTROL DETAILS

PROJECT
PROPOSED MEDOWIE FAMILY TAVERN AT; LOT 1, DP 1215257, MUIR STREET, MEDOWIE

DO NOT SCALE DRAWING

DRAWN	ENGINEER	No in SET	SHEET
L.C.	P.M.	7	A1
SCALES	JOB No	DRAWING No	ISSUE
N.T.S	200047	C02	1

FULL SIZE ON ORIGINAL 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 cm



STORMWATER PLAN SHEET 1

SCALE 1:100

PIT SCHEDULE

PIT No.	SIZE	TYPE	SURFACE LEVEL S.L.	INVERT LEVEL I.L.
P1	600x600	SEALED MANHOLE	17.00	16.00
P2	600x600	SEALED MANHOLE	17.05	16.05
P3	600x600	SEALED MANHOLE	17.00	16.20
P4	600x600	SEALED MANHOLE	16.95	16.23
ExKIP	EXISTING KERB INLET PIT		16.92	15.93

NOT FOR CONSTRUCTION

STORMWATER NOTES

1. ALL WORKS TO BE IN ACCORDANCE WITH AS3500.3.
2. ALL PIPES TO HAVE A 1% MINIMUM FALL U.N.O.
3. ALL DOWNPIPES (DP) TO BE SPECIFIED BY ARCHITECT. FOR EXACT LOCATION OF DOWNPIPES, REFER TO ARCHITECTURAL DRAWINGS.
4. ALL PIPES TO BE UPVC U.N.O
5. ALL UPVC PIPES TO BE SEWER GRADE AND TO AS1260.
6. ALL REINFORCED CONCRETE PIPES (RCP) TO BE SPIGOT AND SOCKET TYPE WITH RUBBER RINGS CLASS 2 TO AS4058.
7. PITS TO BE C&D REINFORCED PRE-CAST CONCRETE PITS OR EQUIVALENT PROPRIETARY PITS.
8. ALL LIDS AND GRATES TO BE PROPRIETARY HEAVY DUTY IN AREAS OF VEHICULAR TRAFFIC, LIGHT DUTY ELSEWHERE, IN ACCORDANCE WITH AS3996.
9. MINIMUM COVER TO STORMWATER PIPES TO BE AS FOLLOW U.N.O:
   TRAFFICABLE AREAS - 450mm, LANDSCAPED AREAS - 300mm.
   PIPES TO BE CONCRETE ENCASED IF MINIMUM COVERS CANNOT BE OBTAINED IN TRAFFICABLE AREAS, REFER TO CLAUSE 3.8 AS3500.3. ALTERNATIVELY USE UPVC SEWER GRADE PIPES UNDER ROAD AND BUILDINGS.
10. PROVIDE 100Φ AG DRAINS IN FILTER SOCKS TO ALL LANDSCAPED AREAS, PLANTER BEDS AND STORMWATER PIPE TRENCHES. ALL AG DRAINS TO BE BEDDED IN COARSE AGGREGATE AND TO BE CONNECTED TO STORMWATER SYSTEM.
11. ALL PITS, DETENTION TANKS AND PROPRIETARY POLLUTION CONTROL DEVICES TO BE CLEANED OF SEDIMENT AT 3 MONTH MAXIMUM INTERVALS.
12. ALL EXISTING SERVICES TO BE LOCATED PRIOR TO COMMENCEMENT OF WORK.
13. ANY FOOTPATHS, KERB AND GUTTER OR ROADWAY DISTURBED BY WORKS TO BE REINSTATED TO CURRENT COUNCIL REQUIREMENTS.
14. PROVIDE ACCESS LADDER TO TANK AS REQUIRED, REFER TO AS1657.

LEGEND

- DENOTES STORMWATER PIPE
- DENOTES 150Φ SUSPENDED STORMWATER PIPE TO HYDRAULIC ENGINEERS SPECIFICATIONS
- DENOTES EXISTING CONTOUR
- x 2.24 — DENOTES EXISTING LEVELS
- x 4.00 — DENOTES DESIGN SPOT LEVELS
- K1 — DENOTES 120 HIGH KERB U.N.O.
- FW — DENOTES FLOOR WASTE
- T1 — DENOTES 4000 LITRE SLIMLINE WATER STORAGE TANK STORING ROOF RAINWATER TO MANUFACTURERS SPECIFICATION. TANK SHALL BE FITTED WITH A FIRST FLUSH SYSTEM, PUMP TO SUPPLY TOILETS AND LAUNDRY AND A DIVERSION SWITCH TO MAINS SUPPLY ON TANK BEING EMPTY. BACK FLOW PREVENTION TO MAINS WATER SHALL BE PROVIDED. TANK TO OVERFLOW TO STORMWATER SYSTEM.
- PTD1 — DENOTES ECOSOL STORM PIT CLASS 2 (20 L/s), POLLUTION TREATMENT SYSTEM TO MANUFACTURERS SPECIFICATIONS
- DENOTES 600x600 SEALED MANHOLE
- DENOTES 600x600 MANHOLE PIT LID
- DENOTES DIRECTION OF SURFACE FLOWS

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CLIENT: MAVID GROUP

TITLE: STORMWATER PLAN SHEET 1

PROJECT: PROPOSED MEDOWIE FAMILY TAVERN AT; LOT 1, DP 1215257, MUIR STREET, MEDOWIE

DO NOT SCALE DRAWING

DRAWN	ENGINEER	No in SET	SHEET
L.C.	P.M.	7	A1
SCALES	JOB No	DRAWING No	ISSUE
1:100	200047	C03	3

FULL SIZE ON ORIGINAL 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 cm

STORMWATER PLAN SHEET 2

SCALE 1:100

PIT SCHEDULE

PIT No.	SIZE	TYPE	SURFACE LEVEL S.L.	INVERT LEVEL I.L.
P5	600x600	GRATED PIT	19.70	TO SUIT SUSPENDED SLAB
P6	600x600	GRATED PIT	19.70	TO SUIT SUSPENDED SLAB

STORMWATER NOTES
1. REFER TO DRAWING C03 FOR STORMWATER NOTES AND LEGEND.

NOTE
SETOUT AND ALIGNMENT OF WALLS TO BOUNDARY TO ARCHITECTS DETAILS TYPICAL

NOTE
ALL SETOUT, DIMENSIONS AND RL's TO ARCHITECTS SPECIFICATION & DETAILS

NOTE
DRIVEWAY GRADES TO CURRENT COUNCIL REQUIREMENTS. BUILDER TO CONFIRM GRADES PRIOR TO CONSTRUCTION OF DRIVEWAY

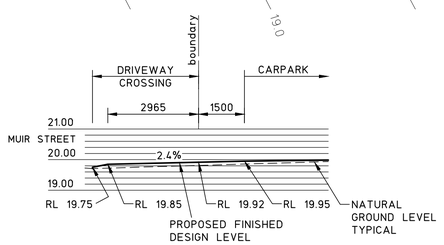
NOTE
ALL DOWNPIPES FROM DEVELOPMENT TO CONNECT TO ABOVE GROUND WATER STORAGE TANKS TYPICAL

NOTE
PROVIDE ECOSOL LITTER BASKETS IN ALL PITS WITH RFM PILLOWS IN EACH BASKET TYPICAL

NOTE
BUILDER TO PROVIDE ADEQUATE SHORING IN ORDER TO MAINTAIN STABILITY OF EXISTING NEIGHBOURING STRUCTURES AND FENCES DURING EXCAVATION WORKS TYPICAL

NOTE
ALL STRIP DRAINS AND AG LINES BEHIND RETAINING WALLS (RW1) AND KERBS (K1) TO CONNECT TO STORMWATER SYSTEM TYPICAL

NOTE
ALL PITS TO HAVE ECOSOL LITTER BASKETS WITH REACIVE FILTER MEDIA PILLOWS TO MANUFACTURERS SPECIFICATIONS



SECTION 1 –
SCALE 1:100 HORIZ.
1:100 VERT.

NOT FOR CONSTRUCTION

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CLIENT
MAVID GROUP

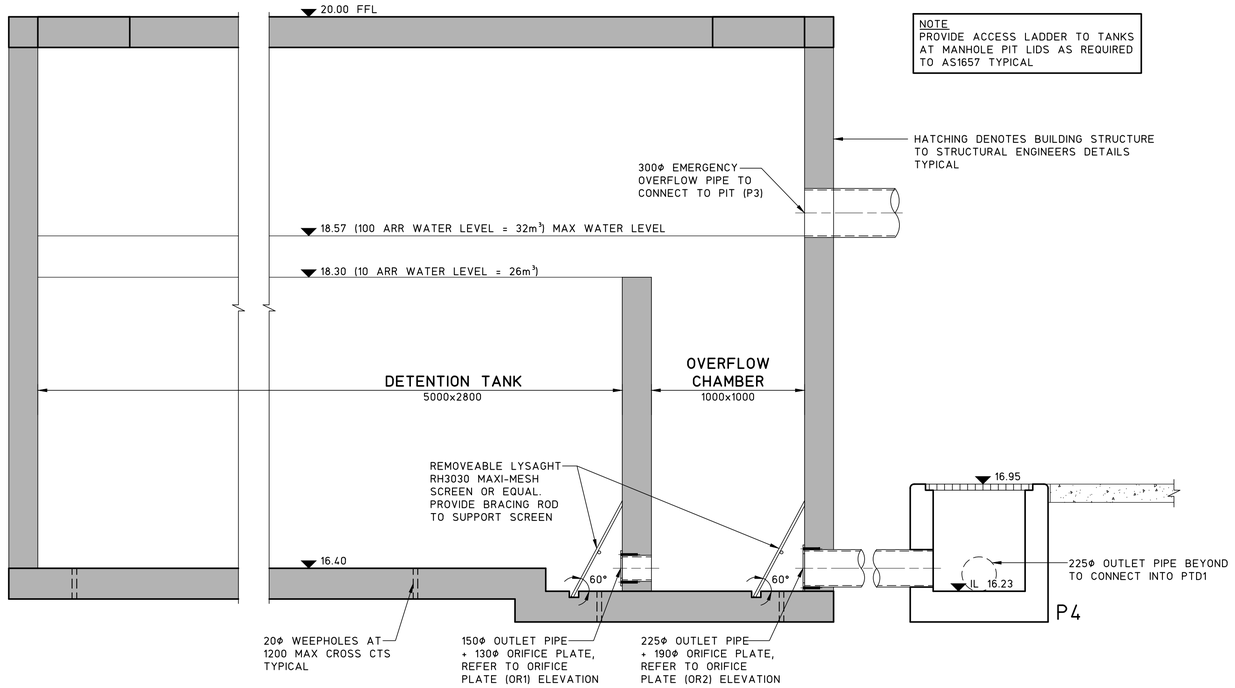
TITLE
STORMWATER PLAN
SHEET 2 AND SECTION

PROJECT
PROPOSED MEDOWIE FAMILY TAVERN AT;
LOT 1, DP 1215257,
MUIR STREET,
MEDOWIE

DO NOT SCALE DRAWING

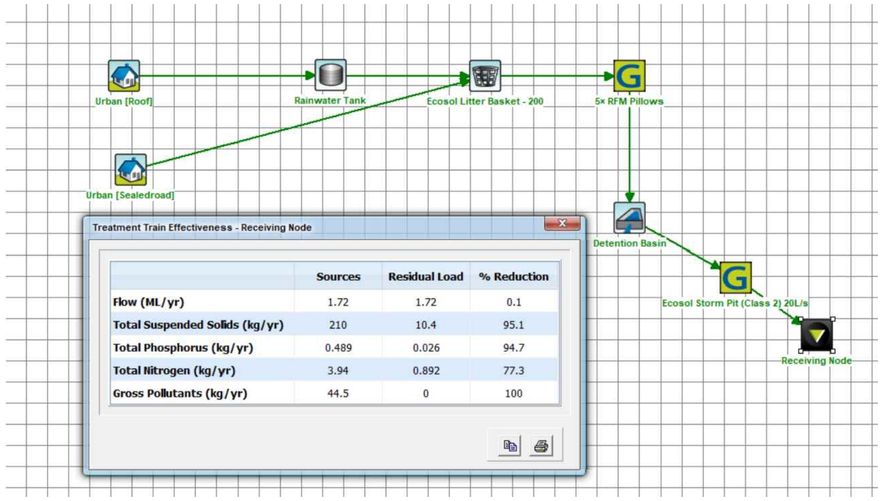
DRAWN	ENGINEER	No in SET	SHEET
L.C.	P.M.	7	A1
SCALES	JOB No	DRAWING No	ISSUE
1:100	200047	C04	3

FULL SIZE ON ORIGINAL 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 cm

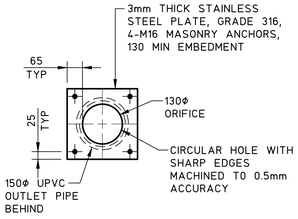


TYPICAL DETENTION AND OVERFLOW CHAMBER SECTION

SCALE 1:20

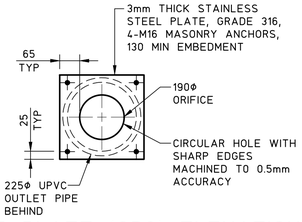


	Sources	Residual Load	% Reduction
Flow (ML/yr)	1.72	1.72	0.1
Total Suspended Solids (kg/yr)	210	10.4	95.1
Total Phosphorus (kg/yr)	0.489	0.026	94.7
Total Nitrogen (kg/yr)	3.94	0.892	77.3
Gross Pollutants (kg/yr)	44.5	0	100



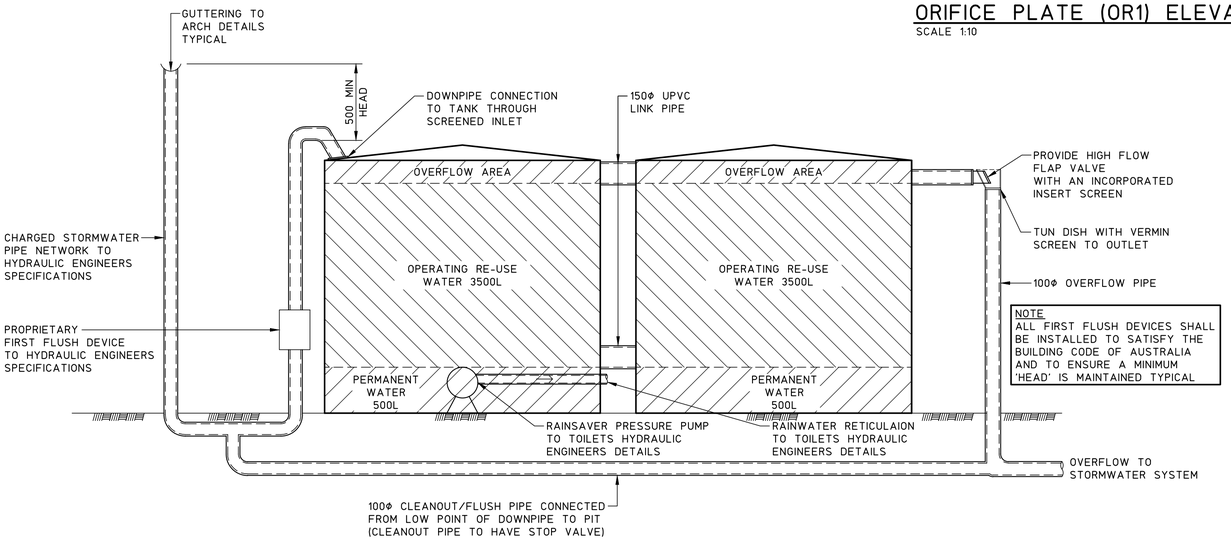
ORIFICE PLATE (OR1) ELEVATION

SCALE 1:10



ORIFICE PLATE (OR2) ELEVATION

SCALE 1:10



TYPICAL RAIN WATER TANK (T1) DETAIL

SCALE 1:20

NOT FOR CONSTRUCTION

ISSUE	REASON FOR ISSUE	DATE
3	REVISED DEVELOPMENT APPLICATION	10.9.20
2	REVISED DEVELOPMENT APPLICATION	30.7.20
1	DEVELOPMENT APPLICATION	26.2.20
0	PRELIMINARY	24.2.20

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Web: www.mpceng.com.au
A.C.N. 098 542 575

CLIENT
MAVID GROUP

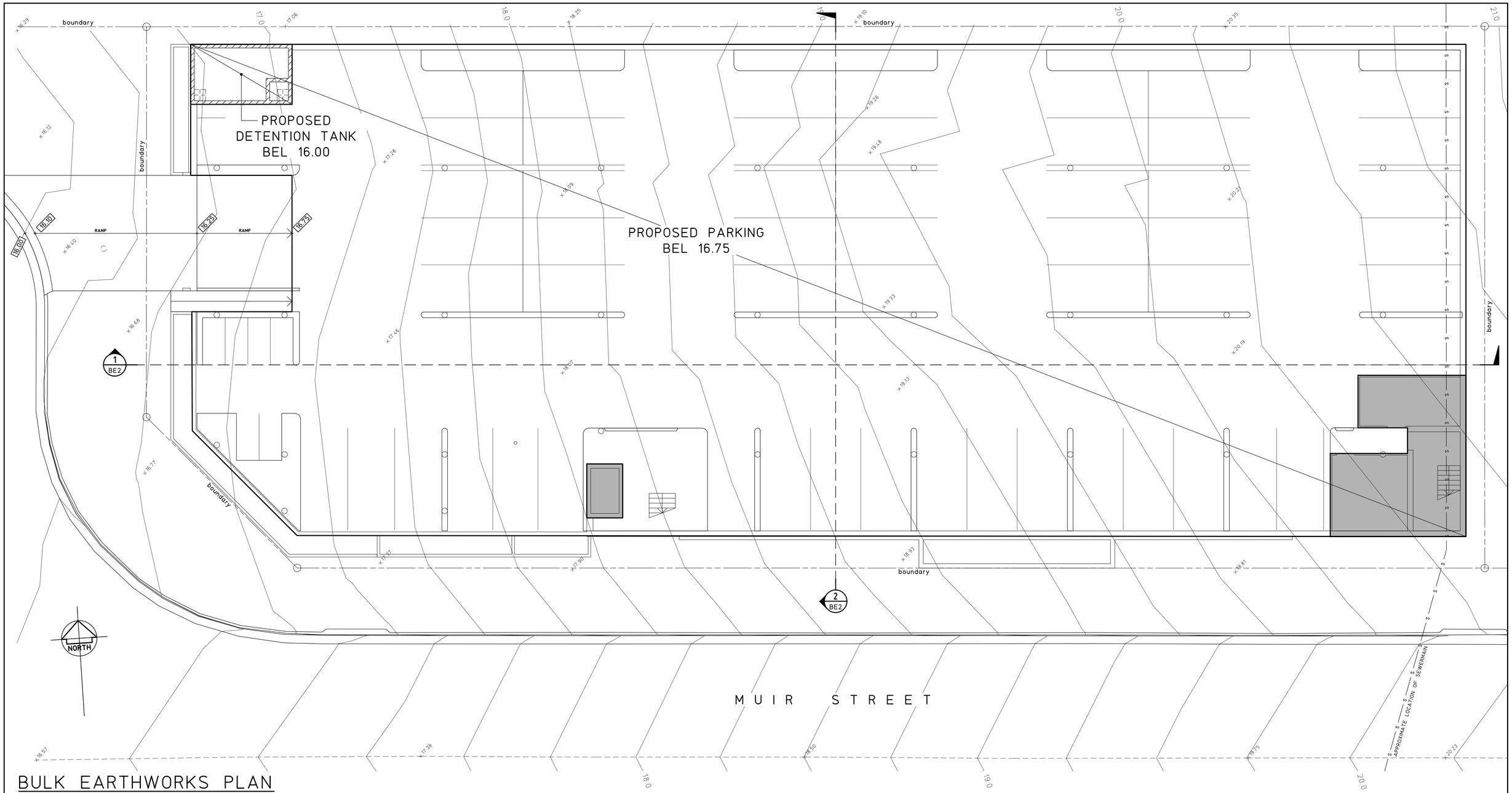
TITLE
STORMWATER DETAILS

PROJECT
PROPOSED MEDOWIE FAMILY TAVERN AT;
LOT 1, DP 1215257,
MUIR STREET,
MEDOWIE

DO NOT SCALE DRAWING

DRAWN	ENGINEER	No in SET	SHEET
L.C.	P.M.	7	A1
SCALES	JOB No	DRAWING No	ISSUE
1:20, 10	200047	C05	3

FULL SIZE ON ORIGINAL 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 cm



BULK EARTHWORKS PLAN

SCALE 1:100

SITE PREPARATION NOTES
1. REMOVE TOPSOIL AND ALL OTHER DELETERIOUS MATERIALS.
2. FOOTINGS TO BE FOUNDED ON FIRM NATURAL CUT GROUND, NOT FILL.
3. ANY SOFT AREAS ENCOUNTERED TO BE REMOVED AND REPLACED WITH COMPACTED FILL.
4. ANY FILL MUST BE PLACED IN 150mm MAXIMUM LAYERS AND COMPACTED TO A RELATIVE DRY DENSITY OF 98% TO AS 1289.5.1.1. BUILDING CONTRACTOR TO PROVIDE COMPACTION TEST RESULTS TO MPC FOR REVIEW PRIOR TO POURING CONCRETE.

SUB-GRADE PREPARATION
1. REMOVE TOPSOIL AND ALL OTHER DELETERIOUS MATERIALS.
2. PROOF ROLL NATURAL SURFACE WITH A ROLLER OF AT LEAST 10 TONNE STATIC WEIGHT.
3. REMOVE ANY SOFT AREAS.
4. BUILDING PLATFORM AND EXTERNAL PAVING AREAS COMPACTION IS TO BE CARRIED OUT BY ROLLING AT OPTIMUM MOISTURE CONTENT TO OBTAIN A DENSITY EQUIVALENT OF **100%** DRY DENSITY STANDARD IN ACCORDANCE WITH AS1289 E1.1.
5. TESTING OF THE SUBGRADE SHALL BE CARRIED OUT BY AN APPROVED NATA REGISTERED LABORATORY.

LEGEND

x 16.75	DENOTES PROPOSED SUB-GRADE LEVEL
+ 17.38	DENOTES EXISTING LEVELS
10.990	DENOTES DESIGN SUB-GRADE CONTOUR
6.00	DENOTES EXISTING CONTOURS
BEL	DENOTES PROPOSED SUB-GRADE LEVEL UNDER BUILDING (BULK EARTHWORKS LEVEL)

NOTE
ALL EXISTING TOPSOIL, UNCONTROLLED FILL, VEGETATION OR OTHER POTENTIALLY DELETERIOUS MATERIAL SHOULD BE REMOVED TO SPOIL OR STOCKPILED FOR REUSE AS LANDSCAPING MATERIALS ONLY.
ANY UNDERLYING VERY STIFF CLAYS AND WEATHERED ROCK SHOULD BE CAREFULLY STRIPPED AS NECESSARY AND STOCKPILED FOR REUSE AS GENERAL SITE FILL TYPICAL

NOT FOR CONSTRUCTION

ISSUE	REASON FOR ISSUE	DATE
1	REVISED DEVELOPMENT APPLICATION	10.9.20
0	DEVELOPMENT APPLICATION	26.2.20

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CLIENT
MAVID GROUP

TITLE
BULK EARTHWWORKS PLAN

PROJECT
PROPOSED MEDOWIE FAMILY TAVERN AT;
LOT 1, DP 1215257,
MUIR STREET,
MEDOWIE

DO NOT SCALE DRAWING

DRAWN	ENGINEER	No in SET	SHEET
L.C.	P.M.	7	A1
SCALES	JOB No	DRAWING No	ISSUE
1:100	200047	C06	1

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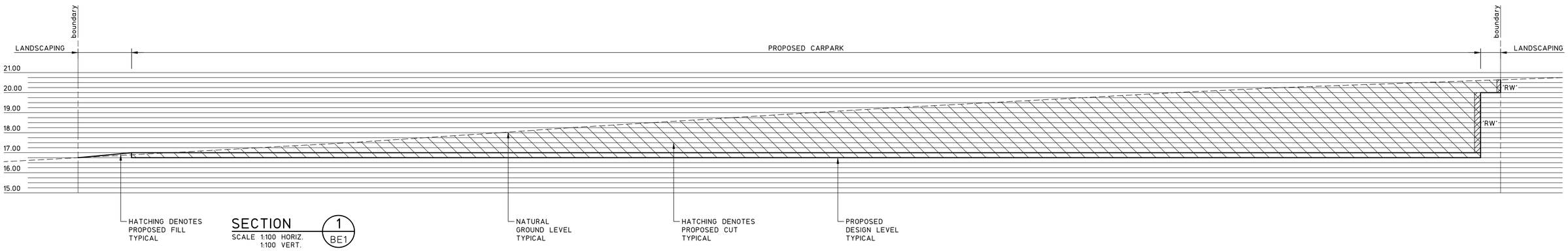
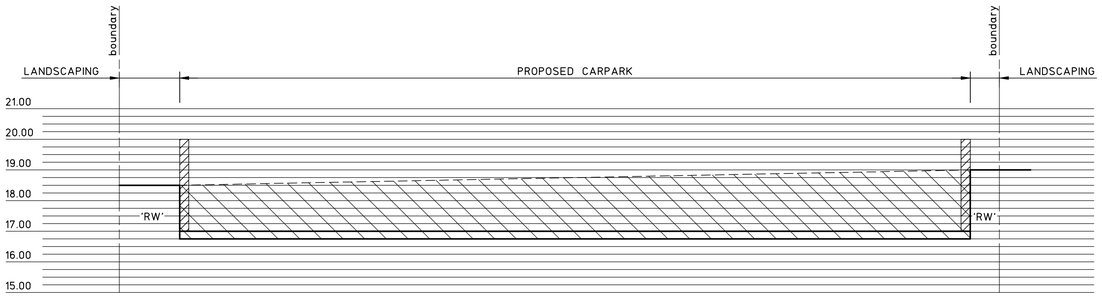


SECTION 1 BE1
SCALE 1:100 HORIZ.
1:100 VERT.



SECTION 2 BE1
SCALE 1:100 HORIZ.
1:100 VERT.

NOT FOR CONSTRUCTION

ISSUE	REASON FOR ISSUE	DATE
1	REVISED DEVELOPMENT APPLICATION	10.9.20
0	DEVELOPMENT APPLICATION	26.2.20

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Web: www.mpceng.com.au
A.C.N. 098 542 575

CLIENT
MAVID GROUP

TITLE
BULK EARTHWWORKS SECTIONS

PROJECT
PROPOSED MEDOWIE FAMILY TAVERN AT;
LOT 1, DP 1215257,
MUIR STREET,
MEDOWIE

DO NOT SCALE DRAWING

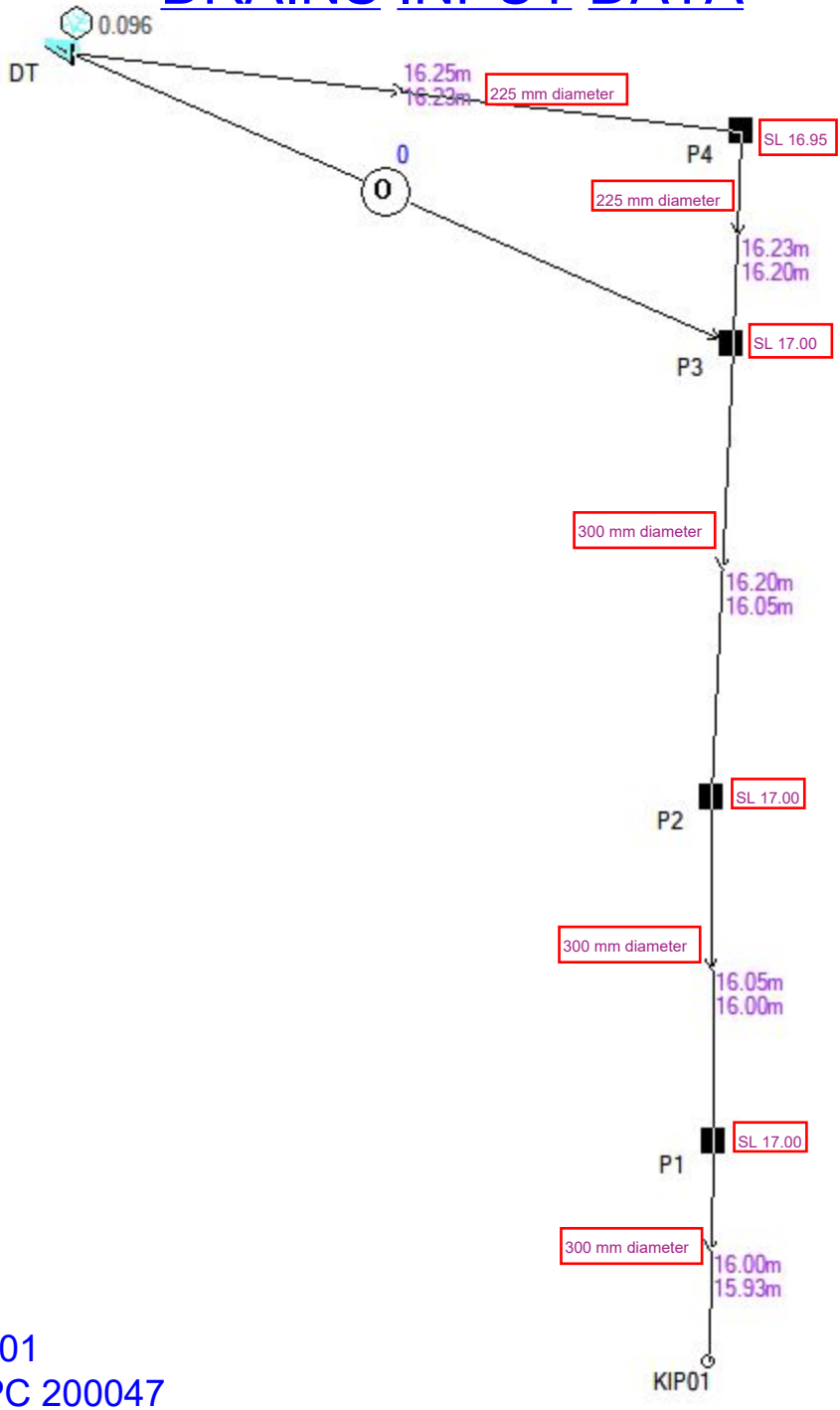
DRAWN	ENGINEER	No in SET	SHEET
L.C.	P.M.	7	A1
SCALES	JOB No	DRAWING No	ISSUE
1:100	200047	C07	1

FULL SIZE ON ORIGINAL 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 cm

Appendix D

DRAINS Input Data

DRAINS INPUT DATA



SK01
MPC 200047

Appendix E

MUSIC-Link Reports

PORT STEPHENS COUNCIL

Port Stephens Hydrologic Soil Group Mapping

Hydrologic Soil Group Map - Sheet HSG_004B

Hydrologic Soil Group

- A
- B
- C
- D
- Not Assessed
- Water

Cadastre

Cadastre 24/01/2017 © Land and Property Information (LPI)

NOTES

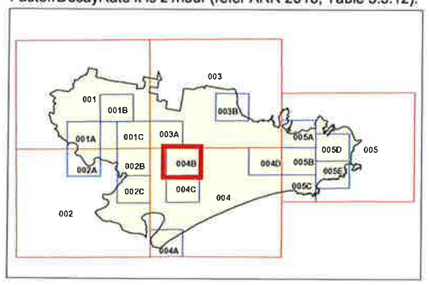
This map provides an estimation of Hydrologic Groups of Soils in NSW according to the four class system. The map was released by the NSW Government 11 October 2016. The map uses the best available soils mapping coverage and was derived by linking a Hydrologic Group class to a particular Great Soil Group.

Group A— soils having high infiltration rates, even when thoroughly wetted and consisting chiefly of deep, well to excessively-drained sands or gravels.These soils have a high rate of water transmission. For design purposes, it is assumed that the Antecedent Moisture Condition is "Rather wet" (refer to Australian Rainfall and Runoff (ARR) 2016, Table 5.3.11) and the Horton Maximum (Initial) Infiltration Rate is 83.6 mm/hr, the Minimum (Final) Infiltration Rate is 25 mm/hr and the Shape Factor/Decay Rate k is 2 /hour (refer ARR 2016, Table 5.3.12).

Group B— soils having moderate infiltration rates when thoroughly wetted and consisting chiefly of moderately deep to deep, moderately fine to moderately coarse textures. These soils have a moderate rate of water transmission. For design purposes, it is assumed that the Antecedent Moisture Condition is "Rather wet" (refer to ARR 2016, Table 5.3.11) and the Horton Maximum (Initial) Infiltration Rate is 66.3 mm/hr, the Minimum (Final) Infiltration Rate is 13 mm/hr and the Shape Factor/Decay Rate k is 2 /hour (refer ARR 2016, Table 5.3.12).

Group C— soils having slow infiltration rates when thoroughly wetted and consisting chiefly of soils with a layer that impedes downward movement of water, or soils with moderately fine to fine texture. These soils have a slow rate of transmission. For design purposes, it is assumed that the Antecedent Moisture Condition is "Rather wet" (refer to ARR 2016, Table 5.3.11) and the Horton Maximum (Initial) Infiltration Rate is 33.7 mm/hr, the Minimum (Final) Infiltration Rate is 6 mm/hr and the Shape Factor/Decay Rate k is 2 /hour (refer ARR 2016, Table 5.3.12).

Group D— soils having very slow infiltration rates when thoroughly wetted and consisting chiefly of clay soils with a high swelling potential, soils with a high water table, soils with a clay layer, and shallow soils over nearly impervious material. These soils have a very slow rate of transmission. For stormwater design purposes, it is assumed that the Antecedent Moisture Condition is "Rather wet" (refer to ARR 2016, Table 5.3.11) and the Horton Maximum (Initial) Infiltration Rate is 7.4 mm/hr, the Minimum (Final) Infiltration Rate is 3 mm/hr and the Shape Factor/DecayRate k is 2 /hour (refer ARR 2016, Table 5.3.12).



N

GDA 1994
MGA Zone 56

0 400 metres

Scale: 1:20000 A3

Map identification number :
HSG_004B_020_20170124

SOIL TYPE C

MEDOWIE

SK02
MPC 200047

MUSIC-*link* Report

Project Details		Company Details	
Project:	Proposed Family Tavern at Muir Street Medowie	**Company:**	MPC Consulting Engineers
Report Export Date:	9/09/2020	**Contact:**	Peter March
Catchment Name:	200047 - MPC MUSIC Model - Medowie Taven_Stormpit_08.09.2020_	**Address:**	Suite 3, Level 1, 16 Telford Street, Newcastle East NSW 2300
Catchment Area:	0.175ha	**Phone:**	0249275566
Impervious Area*:	100%	**Email:**	peterm@mpceng.com.au
Rainfall Station:	WILLIAMTOWN RAAF - Station 061078 - Zone B		
Modelling Time-step:	6 Minutes		
Modelling Period:	1/01/1998 - 31/12/2007 11:54:00 PM		
Mean Annual Rainfall:	1125mm		
Evapotranspiration:	1394mm		
MUSIC Version:	6.3.0		
MUSIC-link data Version:	6.33		
Study Area:	Williamtown		
Scenario:	Sensitive Catchment - Clay soils		

* takes into account area from all source nodes that link to the chosen reporting node, excluding Import Data Nodes

Treatment Train Effectiveness		Treatment Nodes		Source Nodes	
Node: Receiving Node	**Reduction**	**Node Type**	**Number**	**Node Type**	**Number**
Flow	0.102%	Rain Water Tank Node	1	Urban Source Node	2
TSS	95.1%	Detention Basin Node	1		
TP	94.7%	Generic Node	2		
TN	77.3%	GPT Node	1		
GP	100%				

Comments

200047 MPC MUSIC Model - Developed

Passing Parameters

Node Type	Node Name	Parameter	Min	Max	Actual
Detention	Detention Basin	% Reuse Demand Met	None	None	0
GPT	Ecosol Litter Basket - 200	Hi-flow bypass rate (cum/sec)	None	99	0.05
Rain	Rainwater Tank	% Reuse Demand Met	None	None	0
Receiving	Receiving Node	% Load Reduction	None	None	0.102
Receiving	Receiving Node	GP % Load Reduction	90	None	100
Receiving	Receiving Node	TN % Load Reduction	45	None	77.3
Receiving	Receiving Node	TP % Load Reduction	60	None	94.7
Receiving	Receiving Node	TSS % Load Reduction	90	None	95.1
Urban	Urban	Area Impervious (ha)	None	None	0.123
Urban	Urban	Area Impervious (ha)	None	None	0.052
Urban	Urban	Area Pervious (ha)	None	None	0
Urban	Urban	Area Pervious (ha)	None	None	0
Urban	Urban	Total Area (ha)	None	None	0.123
Urban	Urban	Total Area (ha)	None	None	0.052

Only certain parameters are reported when they pass validation

MUSIC-*link* Report

Project Details		Company Details	
Project:	Proposed Family Tavern at Muir Street Medowie	**Company:**	MPC Consulting Engineers
Report Export Date:	9/09/2020	**Contact:**	Peter March
Catchment Name:	200047 - Pre developed MUSIC Model - Medowie Taven_08.09.2020	**Address:**	Suit 3, Level 1, 16 Telford Street, Newcastle East NSW 2300
Catchment Area:	0.175ha	**Phone:**	0249275566
Impervious Area*:	0%	**Email:**	peterm@mpceng.com.au
Rainfall Station:	WILLIAMTOWN RAAF - Station 061078 - Zone B		
Modelling Time-step:	6 Minutes		
Modelling Period:	1/01/1998 - 31/12/2007 11:54:00 PM		
Mean Annual Rainfall:	1125mm		
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MUSIC Version:	6.3.0		
MUSIC-link data Version:	6.33		
Study Area:	Williamtown		
Scenario:	Sensitive Catchment - Clay soils		

* takes into account area from all source nodes that link to the chosen reporting node, excluding Import Data Nodes

Treatment Train Effectiveness		Treatment Nodes		Source Nodes	
Node: Receiving Node	**Reduction**	**Node Type**	**Number**	**Node Type**	**Number**
Flow	0%			Urban Source Node	1
TSS	0%				
TP	0%				
TN	0%				
GP	0%				

Comments

200047 MPC MUSIC Model - Pre-Developed

Passing Parameters

Node Type	Node Name	Parameter	Min	Max	Actual
Receiving	Receiving Node	% Load Reduction	None	None	0
Urban	Urban - Pre Developed	Area Impervious (ha)	None	None	0
Urban	Urban - Pre Developed	Area Pervious (ha)	None	None	0.175
Urban	Urban - Pre Developed	Total Area (ha)	None	None	0.175

Only certain parameters are reported when they pass validation

Failing Parameters

Node Type	Node Name	Parameter	Min	Max	Actual
Receiving	Receiving Node	GP % Load Reduction	90	None	0
Receiving	Receiving Node	TN % Load Reduction	45	None	0
Receiving	Receiving Node	TP % Load Reduction	60	None	0
Receiving	Receiving Node	TSS % Load Reduction	90	None	0

Only certain parameters are reported when they pass validation

Appendix F

RFM Pillows Specifications

STAR Water Solutions
Stormwater Treatment And Reuse

Water Treatment Using Reactive Filtration Media

With the imperative for Water Sensitive Urban Design, Low Impact Development and Total Water Cycle Management, there has been increasing interest in using filtration systems as a solution for the treatment and reuse of stormwater and low flow industrial waste water runoff. STAR Water Solutions has released a range of Reactive Filter Media that treat polluted stormwater and low flow industrial waste water.

Custom Designed

STAR Reactive Filter Media is custom designed for specific treatment applications using a blend of tailored components in defined proportions that are engineered for specific performance requirements such as contaminant removal, lifespan, hydraulic conductivity, compaction and plant growth. The STAR Reactive Filter Media product range includes Ecomedia ® and Infiltreat ®.

The Ecomedia ® range is custom designed to achieve performance requirements in vegetated applications such as:

- Wetlands
- Rain gardens
- Landscape gardens
- Sports fields, Golf courses
- Fill around permeable pipes
- Roof gardens, Planter boxes
- Swales
- Sand filters
- Leach drains
- Retaining walls
- Building site runoff
- Water harvesting/reuse

The Infiltreat ® range is custom designed to achieve performance requirements in non vegetated applications such as:

- Car park
- Retaining walls
- Building site runoff
- Water harvesting/reuse
- Sand filters
- Detention basins
- Fill around permeable pipes
- Kerb-gully by-pass system
- Sub-surface drainage systems
- Under permeable paving system
- Pavement sub base (structural grade)
- Pavement sub base (non structural grade)

Pollutant Removal Performance

Scientific studies have shown conclusively that STAR Reactive Filter Media can remove pollutants from water to enable harvesting and reuse or be safely discharged into waterways.

A distinctive strength of the media is its ability to remove dissolved contaminants such as nutrients (e.g. nitrogen, phosphorous) metals (e.g. copper, lead, zinc), bacteria (e.g. faecal coliforms) and hydrocarbons (e.g. petroleum) from stormwater. Particulates can be removed by STAR Reactive Filter Media through physical filtration. However, the lifespan of the media is far greater when particulates are removed through primary treatment.

Treatment of dissolved contaminants is achieved by chemical and biological processes created by the selected components in the filter media. These processes include:

- Sorption
- Ion exchange
- Microbial biodegradation
- Precipitation
- Volatilisation
- Phytoremediation

Conclusion

The results from the laboratory and field research indicate that an engineered reactive filtration media can successfully remove substantial quantities of contaminants from water, allowing potential harvesting and reuse.

Typical Treatment Results

Parameter	Inflow Mean value	Outflow Mean value	Percentage Removal
Total Zinc (µg/L)	276	6	97.8 %
Total Lead (µg/L)	133	1	99.2 %
Total Copper (µg/L)	75	5	93.3 %
Total Nitrogen (mg/L)	1.97	1.08	45.2 %
Total Phosphorous (mg/L)	0.264	0.057	78.4 %
PAH (ug/L)	3.7	0.6	83.8 %
Turbidity (ntu)	448	42	90.6 %
Suspended solids (mg/L)	291	50	82.8 %

References

• AWT (1999) Powells Creek East Catchment Stormwater Quality Scheme, Australian Water Technologies.
• http://www.environment.nsw.gov.au/stormwater/usp/grants/s1f0099.htm. Accessed 24 June, 2006.

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STAR Water Solutions
Stormwater Treatment And Reuse

Reactive Filter Media - Product Range

Product Code	Product Type	Description
RENS010	Pavement Infiltreat (non structural grade)	Specifically designed for swale type applications on roads, car parks and railways, Roadside Ecomedia provides a higher drainage performance standard required to treat high levels of first flush contaminated run-off. Treated water can then be either directed to on-site detention, ground water recharge or stored and re-used to irrigate landscaped areas.
RES011	Pavement Infiltreat (structural grade)	Specifically designed for structural applications such as car parks and kerb gully by passes on roadways, Roadside Ecomedia provides structural integrity combined with a high infiltration rate and drainage performance standard required to treat high levels of first flush contaminated run-off. Treated water can then be either directed to on-site detention, ground water recharge or stored and re-used to irrigate landscaped areas.
LGE012	Landscape Garden Ecomedia	Designed for a wide range of landscape applications, Landscape Garden Ecomedia allows for the efficient infiltration and treatment of contaminated water run-off from roads or other impermeable surfaces. The purified water can then be stored and re-used to irrigate landscaped areas. A wide range of plant species can be grown in Landscape Garden Ecomedia that can also take up stored water by natural capillary action.
RWE013	Retaining Wall Ecomedia	A free draining structured media with high hydraulic conductivity, Retaining Wall Ecomedia is engineered to be used in conjunction with Drainage Cell for all retaining wall applications. Contaminated water is purified through the media and directed away from retaining walls by the drainage cell and can be stored in drainage tanks for re-use or for recharging depleted ground water reserves.
RGES014	Roof Garden Ecomedia (Standard Weight)	Designed for use on concrete structures that can bare a standard weight soil, Roof Garden Ecomedia (Standard Weight) has a dry weight density of approximately 1,525 Kg's per cubic metre. It is a free draining mix in which a wide range of plant species can be grown and contaminated surface water run-off from impermeable paving or roofing can be bio-remediated. Contamination is eliminated in the process and water is safe for recycling.
RGEL014	Roof Garden Ecomedia (Light Weight)	Designed for use on structures that require a lightweight planting media, Roof Garden Ecomedia (lightweight) has a dry weight density of approximately 660 Kg's per cubic metre. It also has a free draining structure in which a wide range of plant species can be grown and contaminated surface run-off can be bio-remediated.
PBE015	Planter Box Ecomedia	Specifically designed for growing in confined spaces or in areas of high wind turbulence, Planter Box Ecomedia is suitable for either light weight or standard weight structures and has a dry weight density of approximately 660 Kgs per cubic metre. Holding good humidity levels, it has a free draining structure which bio-remediates contaminated surface run-off from impervious paving and is suitable for a wide range of both indoor and outdoor plants.
SFES016	Sports Field Ecomedia (Standard Formulation)	Specifically designed for a wide range of playing field applications, Sporting Field Ecomedia also provides superior drainage performance and maintenance characteristics. Allowing all weather usage, it ensures better nutrient management, which saves on fertiliser cost and protects surrounding environments from nutrient and pesticide run-off and leaching.
SFEH017	Sports Field Ecomedia (High Performance)	Designed for use on high traffic playing fields, Sporting Field Ecomedia (High Performance) also provides superior drainage performance, low compaction characteristics, effective hydraulic conductivity and bulk density and better maintenance characteristics. The high wearing characteristics provide cost saving benefits and minimise the risk of injuries.
GCE018	Golf Course Ecomedia	Specifically designed for golf course application this mix provides superior drainage performance, low compaction characteristics, good hydraulic conductivity, bulk density and improved Turf recovery. The mix also ensures better nutrient management, saving on fertiliser cost and protects surrounding environments from nutrient and pesticide run-off and leaching.
RTE019	Race Track Ecomedia	Designed for high impact performance and to treat accumulated toxins, Race Track Ecomedia is a free draining media which in conjunction with drainage cell systems provides a better water management solution than conventionally used systems. Nutrient run-off can also be effectively managed and retained water can be re-used for irrigation.
LDE020	Leach Drain Ecomedia	Designed as a free draining biochemical media to treat effluent and drain water, Leach Drain Ecomedia bio-remediates accumulated toxins contained in run-off. The water is can then be passed through drainage cell systems for re-use.

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Appendix G

Ecosol Storm Pit Specifications

Ecosol™ Storm Pit (Class 2)
Technical Specification

environmentally engineered
for a better future

URBAN
ASSET SOLUTIONS

CONTENTS

URBAN ASSET SOLUTIONS

1.0 Introduction

Increasingly stringent environmental best management practice requires planners and developers to apply a fit-for-purpose treatment train approach to stormwater treatment to achieve today's water quality objectives (WQO's).

An integral element to any good WSUD is primary and secondary treatment of stormwater flows to remove coarse sediment and gross pollutants prior to tertiary treatment.

The Ecosol™ Storm Pit (Class 2) is a modern, fully self contained stormwater treatment system that provides primary and secondary treatment of stormwater pollutants within the one compact device.

Ecosol™ Storm Pit (Class 2) Typical Configuration

Ecosol™ Storm Pit (Class 2) Typical Configuration

In particular it is designed to remove, at pre-determined treatable flows, particulate, dissolved and in some cases colloidally bound contaminants such as:

- suspended solids;
- heavy metals;
- oil & grease;
- hydrocarbons;
- nitrogen; and
- phosphorous.

The Ecosol™ Storm Pit (Class 2) is an all-in-one primary and secondary filtration system that helps overcome the need for multiple treatment measures on small catchments. It has been designed specifically to meet today's stringent water quality targets. In developing this innovative stormwater treatment system careful consideration has been given to durability, longevity, cost and maintainability. Key commercial technical features include:

- widely available chemically conditioned filtration medias;
- a system capable of achieving low pollutant discharge levels;
- low visual impact and energy footprint;
- designed hydraulics with proven performance and longevity;
- scalable design; and
- cost effective maintenance regime.

This technical manual describes the operation and performance characteristics of the system.

URBAN ASSET SOLUTIONS

2.0 How the Ecosol™ Storm Pit (Class 2) Works

The Ecosol™ Storm Pit (Class 2) is an all-in-one primary and secondary filtration system that helps overcome the need for multiple treatment measures on small catchments.

The system is ideally suited for smaller catchments such as commercial car park applications with inlet flows ranging from 10 – 110L/s. It provides a compact, cost efficient treatment solution specifically targeting suspended solids, heavy metals, phosphorous and nitrogen including free floating oils and grease. Housed in a pre-cast concrete pit, the unit consists of a primary treatment inlet litter basket designed to capture and retain all particles larger than 200 micron and then incorporates a series of internal baffles for retention of hydrocarbons in a spill situation and the retention of particles (> 93 micron). It also includes a unique patented multi barrier media filter for secondary treatment.

Stormwater flows enter the primary treatment chamber where pre-screening occurs via the primary filtration basket. Filtered stormwater then enters the sump (also known as the detention bay) consisting of a series of flow dissipating baffles where oils and floatables rise and settling material drops out of the flow by gravitational separation. This pre-treatment of incoming stormwater flows, significantly enhances the performance and operational life of the multi barrier filter bed as only a fraction of the finer particles <93 micron are released into the secondary treatment chamber at predetermined flows.

Flows from this primary treatment chamber are then diverted to the secondary treatment chamber where it then passes up through the multi-barrier filter bed for removal of particulate, dissolved and colloidally bound contaminants. The treated stormwater then discharges through the outlet pipe to the drainage network.

Ecosol™ Storm Pit- Class 2 (20L/s) Typical Configuration

2.0 How the Ecosol™ Storm Pit (Class 2) Works continued

The multi barrier media bed comprises of the following three filtration media's:

- Porous Polypropylene –designed to remove fine solids, oil & grease, and particulate bound contaminants aiming to protect and increase the lifespan and performance of the secondary filter media;
- Chemically conditioned Clinoptilolite – designed to remove mainly positively charged dissolved contaminants and in some cases colloidally bound contaminants. In particular heavy metals such as mercury, cadmium, chromium, nickel, zinc, copper, lead and nutrients such as ammonium nitrogen;
- Laterite – designed to remove negatively charged dissolved contaminants. In particular heavy metals such as arsenic and nutrients such as nitrate nitrogen and phosphate. In addition this layer functions as a final polishing step to achieve stringent discharged limits in regard to heavy metal concentrations.

One of the great advantages of the Ecosol™ Storm Pit (class 2) multi-barrier filter bed is its flexibility. A tailored filter bed arrangement with specific layer characteristics can be provided to accommodate site specific requirements. For example, if there is a need to target the removal of copper, zinc and/or lead then the Clinoptilolite layer can be designed thicker than the other two layers. Alternatively, if arsenic or phosphorous is a key focus then a thicker laterite layer can be incorporated. This tailored solution achieves higher performance and ensures a longer filter media bed operational life.

Images of a typical Ecosol™ Storm Pit (Class 2) components

3.0 Ecosol™ Storm Pit (Class 2) Credentials and Case Studies

Urban Asset Solutions Pty Ltd has always sought pro-actively to validate its products through independent laboratory and extensive field testing. The test results have been verified, where appropriate, by computer simulation and industry peers.

The multi-barrier filter bed as well as its three specific filter materials have been trialled in water, wastewater, and stormwater treatment applications around the world. The results obtained have been published in peer review journals and international conference proceeding's. This section summarises the findings of these studies.

Otsu, Shiga-Japan Trial

A stormwater treatment device packed with Porous Polypropylene media was trialled in Otsu, Shiga-Japan along the roadway of route 165 between October 2000 and January 2001 (Saburo Matsui et al., 2003). Eight rainfall events were monitored with the total rainfall and maximum intensity ranging from 7mm to 51mm and from 2mm/hr to 10mm/hr, respectively. The mean removal efficiency for pollutants studied was 92.3% for Total Suspended Solids (TSS), 71.9% for Chemical Oxygen Demand (COD), and 43.6% for Total Phosphorous (TP) and above 70% and 60% for the heavy metals and Polycyclic Hydrocarbons (PAHs), respectively.

Wastewater Trials

Clinoptilolite's high selectivity for NH_4-N is very well known in municipal and agricultural wastewater treatment. Examples of the application of Clinoptilolite in wastewater include:

- A 27 ML/d capacity plant at Lake Tahoe, California, used several hundred tonnes of Clinoptilolite from the Hector deposit (Butterfield and Borgending 1981),
- Wastewater plants with capacities of 45 and 245 ML/d in Virginia, USA (Gunn 1979).
- Pig farm wastewater with 10,000 pigs (150 m^3/d) was treated in a cascade multi-step system using mechanical, chemical, and biological processes (Zubaly et al., 1991). Large suspended particles were first removed by grating the sewage. Suspended particles, colloids and dissolved organic and inorganic species not removed by the grate were then passed through a channel (six 20m sections separated by barrages). Approximately 20m^3 of Clinoptilolite from the Tokaj Hills deposit in Hungary were placed in each section. The Clinoptilolite filter removed 100% of oils and fats, 98% of suspended solids and 95% of dissolved organic and inorganic impurities from the wastewater. The Clinoptilolite filters successively removed these impurities for two years. The exhausted Clinoptilolite was then used as a fertiliser.

Several studies that illustrate the effective use of Clinoptilolite for the removal of NH4-N have been published in the last 20 years (Hankins et al., 2004; Sprynskyy et al., 2005; Aiyuk et al., 2004).

3.0 Ecosol™ Storm Pit (Class 2)Credentials and Case Studies continued

Clinoptilolite has been used as a natural ion exchanger for the removal of radioactive cations such as Cs^{+} and Sr^{2+} and heavy metal cations such as Cu^{2+}, Cd^{2+}, Zn^{2+}, Ni^{2+}, Pb^{2+}, Hg^{2+}, Cr^{3+}, and Mn^{2+}. Examples of full scale applications using zeolites such as Clinoptilolite for the removal of Cs^{+} and Sr^{2+} from radioactive wastes are (Mercer and Ames, 1978):

- Hanford Nuclear Lab., Washington, USA;
- Idaho National Engineering Laboratory, Idaho, USA;
- Savannah River Plant, Aiken, South Carolina, USA; and
- British Nuclear Fuels, Sellafield, USA.

University of Munich Trial

A Clinoptilolite cartridge filter was trialled in Garching campus of the Technical University of Munich, in Germany treating the runoff from an eleven years old zinc roof (Athanasiadis et al., 2004). Samples of 24 rain events were examined and zinc was detected in the roof runoff in concentrations up to 25 mg/L, and lead which originated from the tin-solder was present in concentrations up to 84 µg/L. The Clinoptilolite filter was able to remove up to 97% of zinc from the roof runoff.

Academy of Fine Arts, Munich Trial

A technical infiltration system equipped with Clinoptilolite as an artificial barrier material for the treatment of copper roof runoff was installed and monitored in the Academy of Fine Arts in Munich, Germany (Athanaiadis et al., 2007). During the 2yr sampling period, 30 rain events were examined. The technical infiltration system was able to reduce the copper concentration from the roof runoff by a factor up to 96%.

THE UNIVERSITY of ADELAIDE

University of Adelaide Trial

Urban Asset Solutions Pty Ltd has always sought pro-actively to validate all its products' performance through extensive independent laboratory and field testing. In May 2014 Ecosol commissioned EngTest the commercial arm of the University of Adelaide, Sim Physics Pty Ltd and GHD to undertake additional laboratory and desktop modelling to further confirm the products performance. Several additional field pilot sites are currently being established with additional product performance technical reports to be peer reviewed and published.

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4.0 Warranty and Life Expectancy

The Ecosol™ Storm Pit (Class 2) has a one-year warranty covering all components and workmanship. Urban Asset Solutions Pty Ltd will rectify any defects that fall within the warranty period. The warranty does not cover damage caused by vandalism and may be invalidated by inappropriate cleaning procedures or where the unit is not cleaned within the recommended frequency. The 200 micron primary treatment filtration basket has a life expectancy of 5 years whilst the stainless steel flow disputing baffles and multi-barrier media bed framework all has a life expectancy of 15 years and the pre-cast concrete pit has an estimated 50- year life span.

5.0 Safety Considerations

The simple, yet effective design of the Ecosol™ Storm Pit (Class 2) reduces OH&S risks as most of the work is undertaken in a controlled factory environment. The unit arrives to site complete and ready for installation reducing significantly on-site time, an important factor given the costs associated with delays that can be caused by inclement weather. The lockable access lids reduce the likelihood of vandalism and are easily removed by hand using readily-available lifters.

6.0 Environmental Impact

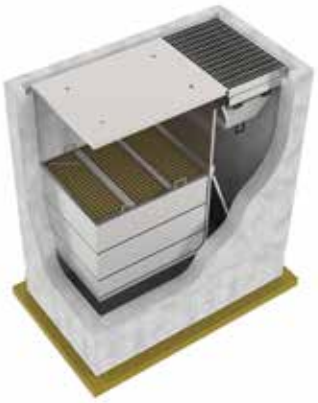
Urban Asset Solutions Pty Ltd is accredited o ISO 14001 (Environment) and undertakes all manufacturing and construction within the requirements of this Standard. Hence, its carbon impact is limited and as the Ecosol™ Storm Pit (Class 2) is housed in a pre-cast pit and is usually located underground it has little or no impact on the environment with the access lids designed to blend in with the surrounds of the site.

7.0 Key Features and Benefits

The Ecosol™ Storm Pit (Class 2) is a fully self-contained system supplied to site ready to install thereby reducing on site construction lead-times and disruption to the general public. The Ecosol™ Storm Pit (Class 2), is designed as a compact total treatment system incorporating primary and secondary treatment within the one underground device. The system has its own unique features and benefits, some of which are listed below:

Ecosol™ Storm Pit (Class 2)	
Key Features	**Benefits**
Hydraulics	• Minimal head/hydraulic loss • Does not affect stormwater inlet capacity • Treats 100% of incoming flows up to the designed TFR
Pollutant Capture and Retention	• All-in-one,cost-efficient primary and secondary filtration system • Retains free floating hydrocarbons • No remobilisation of captured pollutants
Design and Construction	• Arrives on-site complete with all components fitted ensuring easy and safe installation • Simple compact trafficable design with durable, corrosive-resistant materials • Can be retrofitted to most existing stormwater systems • Product is made in-house thereby reducing lead times significantly
Cleaning and Maintenance	• Can be inspected from the surface without removing the access lids • Easily cleaned and maintained either manually or by small eductor truck • Dry storage of gross pollutants helps reduce the risk of toxic fermentation • Pollutants do not need to be handled during cleaning
Environmental Impact	• Effective mini-treatment train system helps achieve water quality objectives • Unit is housed in its own pit underground with little effect on the site aesthetics
Tried and Tested	• Independently tested • Meets all relevant industry standards and guidelines

Figure 1 - Ecosol™ Storm Pit (Class 2) Key Features and Benefits



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8.0 Key Dimensions

The Ecosol™ Storm Pit (Class 2) product range has been designed to help practitioners meet today's stringent water quality objectives. Whether installed at-source, in-line, or end-of-line the system is adaptable to most applications. Table 1 highlights the key dimensions for the range of Ecosol™ Storm Pits (Class 2).

This system is also designed to target gross pollutants, coarse sediment and hydrocarbons however it is also designed to remove, at pre-determined treatable flows, particulate, dissolved and in some cases colloidally bound contaminants such as:

- suspended solids;
- heavy metals;
- nitrogen; and
- phosphorous.

Table 1 highlights the key dimensions for the Ecosol™ Storm Pit (Class 2) product series.

Product Code	Maximum Outlet Pipe Diameters (Assumed 1% Gradient)	Approximate External Unit Dimensions (L x W x D below invert)	Loading classification	Pollutant Holding Capacities		
				Gross Pollutants	Sediment	Hydrocarbons
	(mm)	(mm)		(m^3)	(m^3)	(L)
Storm Pit (Class 2) 10L/s	150mm	2900 x 1350 x 1600	D	0.288	0.560	828
Storm Pit (Class 2) 20L/s	225mm	3600 x 1650 x 1600	D	0.288	0.710	1,408
Storm Pit (Class 2) 40L/s	225mm	4500 x 1950 x 1600	D	0.360	0.828	1,656
Storm Pit (Class 2) 60L/s	300mm	5600 x 2300 x 1600	D	0.432	1.260	2,520
Storm Pit (Class 2) 80L/s	300mm	6500 x 2600 x 1600	D	0.504	1.806	3,612
Storm Pit (Class 2) 110L/s	375mm	7450 x 2950 x 1600	D	0.576	2.208	4,416

Table 1 – Ecosol™ Storm Pit (Class 2) Key Dimensions

Please Note: For optimal performance this system requires a minimum drop from the grated inlet or inlet pipe invert to the outlet pipe invert level of 430mm.

8.0 Key Dimensions continued

The below table provides general information of the typical Ecosol™ Storm Pit (Class 2) multi barrier media bed, replacement material volumes and approximate bed dimensions.

Product Code	Maximum Bed Dimensions (Length xWidth)	Polypropylene		Clinoptilolite		Laterite	
		Volume	Bed Depth	Volume	Bed Depth	Volume	Bed Depth
	(mm)	(m^3)	(mm)	(m^3)	(mm)	(m^3)	(mm)
Storm Pit (Class 2) 10L/s	1100 x 900	0.198	200	0.297	300	0.297	300
Storm Pit (Class 2) 20L/s	1670 x 1200	0.401	200	0.401	200	0.802	400
Storm Pit (Class 2) 40L/s	2670 x 1500	0.801	200	0.801	200	1.602	400
Storm Pit (Class 2) 60L/s	3350 x 1800	1.206	200	1.206	200	2.412	400
Storm Pit (Class 2) 80L/s	3850 x 2100	1.617	200	1.617	200	3.234	400
Storm Pit (Class 2) 110L/s	4600 x 2400	2.208	200	2.208	200	4.416	400

Table 2 – Ecosol™ Storm Pit (Class 2) Key Multi-Barrier Filter Media Dimensions and Volumes.

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9.0 Hydraulic Specification

Treatable Flow Rate (TFR) is defined as the maximum flow rate through the Ecosol™ Storm Pit (Class 2) before flows surcharge and commence by-passing the system untreated. For the purpose of assisting designers we have adopted conservative values and recommend designing the system with an outlet at 1% gradient to achieve optimal capture efficiencies and maximum treatable flow rates. Further each system has been designed specifically to cater for peak flow by-pass conditions in the event that the system is full of contaminants and a significant storm event is occurring. This fail safe by-pass eliminates the risk of potential localised flooding.

9.1 The Ecosol™ Storm Pit (Class 2) Hydraulic Specification

This Ecosol™ Storm Pit (Class 2) is designed to treat stormwater runoff for typical urban catchments of 1.0 - 3.0 Ha based on the product selection and on a 100% impervious catchment area. The system provides both primary and secondary treatment within the one compact underground device thereby reducing the space and cost of downstream tertiary treatment measures.

Product Code	Maximum Outlet Pipe Diameter (Assumed 1% Gradient)	Maximum Treatable Flow Rate (L/s)	Maximum By-Pass Capacity (L/s)
Storm Pit (Class 2) 10L/s	150mm	11	15
Storm Pit (Class 2) 20L/s	225mm	22	45
Storm Pit (Class 2) 40L/s	225mm	44	45
Storm Pit (Class 2) 60L/s	300mm	66	97
Storm Pit (Class 2) 80L/s	300mm	88	97
Storm Pit (Class 2) 110L/s	375mm	121	175

Table3 – Ecosol™ Storm Pit (Class 2) Hydraulic Specification.

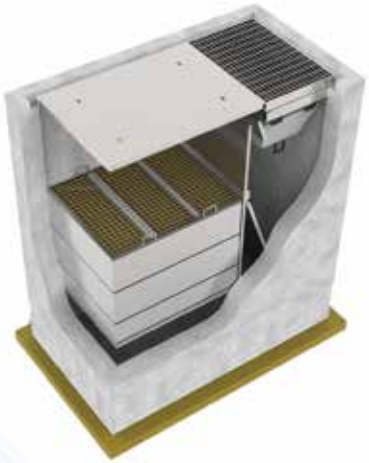
10.0 Collection and Removal Efficiencies

In recent years modern Water Sensitive Urban Design (WSUD) objectives and principles now applied to most urban development's require more onerous water quality objectives (WQO's) specifically targeting the removal of suspended solids, nitrogen, phosphorus and heavy metals.

The Ecosol™ Storm Pit (Class 2) provides engineers with a compact treatment measure that when implemented with other measures such as rain gardens or swales will achieve the necessary Water Quality Objectives. The Ecosol™ Storm Pit (Class 2) is the ideal treatment solution for applications where space is limited.

ECOSOL STORM PIT - CLASS 2 CAPTURE EFFICIENCY PERFORMANCE SUMMARY		
POLLUTANT	CAPTURE EFFICIENCY	DETAILS
Gross Pollutants (GP)	98%	Particulate > 200 micron
Total Suspended Solids (TSS)	72%	Suspended Particulate
Total Phosphorus (TP)	50%	Particulate and dissolved
Total Nitrogen (TN)	43%	Particulate and dissolved
Heavy Metals	32%	Particulate and dissolved
Total Petroleum Hydrocarbon (TPH)	80%	Particulate and dissolved

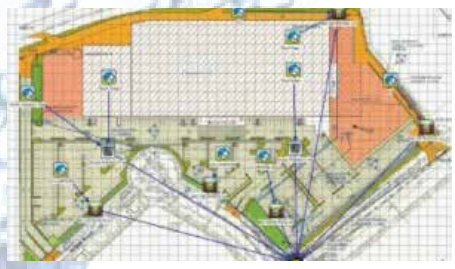
Table 4 – Ecosol™ Storm Pit (Class 2) Pollutant Removal Efficiencies.



1) Typical pollutant removal efficiencies based on results derived from the independently tested Ecosol™ Litter Basket and Ecosol™ Storm Pit (Class 2) published performance data.

2) Independently field tested and evaluated by the University of Adelaide (Eng Test - School of Civil Environmental and Mining Engineering) and Moreton Environmental to the Draft SQIDEP (May 2017 - October 2018).

11.0 MUSIC Modelling Guidelines



These guidelines provide instruction to the creation and application of a treatment node for the Ecosol™ Storm Pit (Class 2) for the Model for Urban Stormwater Improvement Conceptualisation (MUSIC). The Ecosol™ Storm Pit (Class 2) can be modelled in MUSIC using the Gross Pollutant Trap Treatment node to represent the results derived from independent testing by the University of Adelaide (ENGTEST The school of civil, environmental and mining engineering) and extensive testing from a number of Australian and international papers on the Multi-Barrier filter bed (detailed in section 3.0). The guidelines apply to the creation of the treatment node within MUSIC v6.1.

Insert a GPT treatment node into your model by selecting "GPT" under the treatment nodes menu. When the node is created the node properties dialog is displayed. There are several changes that need to be made in this dialog.

- Adjust the text in the Location box to read "Ecosol Storm Pit (Class 2)" plus any other relevant information (Class 2, 10L/s etc.).
- Adjust the low flow bypass to reflect any flow (m3/sec) diverted away from the unit before treatment (usually zero).
- Adjust the high flow bypass to reflect the treatable flow rate (TFR values are detailed in table 3) (m^3/sec) any higher flows will bypass treatment.

NOTES: Can be used to describe assumptions or location of reduction values for authority approvals.

Adjust the transfer function for each pollutant selecting the pollutant and editing (right click on the function point) the input and output values on the graph below to reflect the capture efficiencies (CE) of the treatment device. Table 5 provides the input and output values for the Ecosol™ Storm Pit (Class 2)

Pollutant	Removal Rate (%)	Entered Input Value	Entered Output Value
Total Suspended Solids	72	1000	280
Total Phosphorus	50	1000	500
Total Nitrogen	43	1000	570
Gross Pollutants (>200µm)	98	1000	20
Heavy Metals	32	n/a	n/a
Total Petroleum Hydrocarbons	80	n/a	n/a

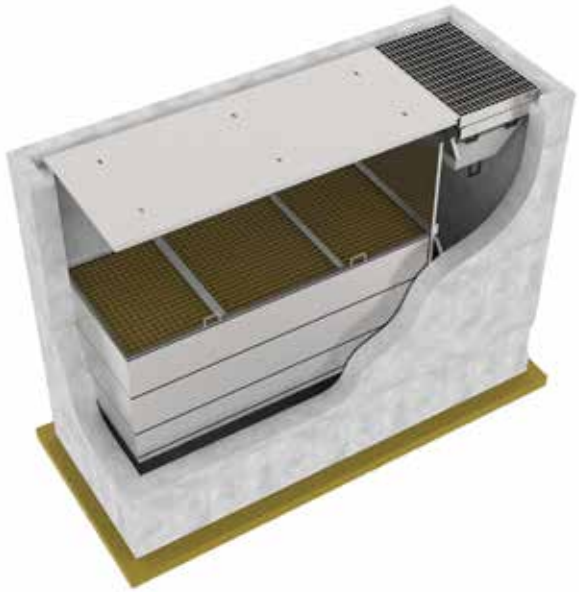
Table 5 - Ecosol™ Storm Pit (Class 2) – MUSIC node input and output values.

12.0 Design Guidelines

To ensure your system is appropriately designed for its intended application and meets local water quality objectives it is essential that the following minimum information is provided:

- Confirm the required treatable flow rate – this is the minimum stormwater run-off volume that must be treated. Typically this is the 1 in 3 month to 1 in 1 year ARI (Refer to section 9.0 for product treatable flow rate data).
- Confirm the proposed location of the unit relevant to other stormwater controls and overall drainage design. It is also important we know the catchment size including percentage of impervious area and hydrology for each proposed Ecosol™ Storm Pit (Class 2) installation.
- Confirm local water quality objectives - Recent state governmental planning policies have established clear stormwater quality bench mark objectives for local and regional councils. Accordingly local and regional council water sensitive urban design objectives have been amended to meet these stormwater pollution reduction targets. It is important we are provided this information specific to your site and local council regulations, this enables us to select the most appropriate Ecosol™ Storm Pit (Class 2) for the site.
- Confirm sediment loads, composition and concentrations of target pollutants generated from the site. This may vary significantly from one site to the next depending on the land use. This data is essential as it allows Urban Asset Solutions Pty Ltd to appropriately size and configure your unit specific to its application. Should this information not be available then typical urban roads mean pollutant concentration levels will be assumed specific to the catchment type and land use.

For further assistance in sizing or specifying a system for your next project please complete the form in Appendix 1 and forward to your local Urban Asset Solutions Pty Ltd representative.



13.0 Cleaning and Maintenance

As with all filtration systems, the Ecosol™ Storm Pit (Class 2) should be monitored and cleaned regularly. The cleaning frequency, and the cost, depends heavily on the surrounding environment, the unit's proximity to a waste facility and the quality and quantity of stormwater run-off conveyed to the system.

Urban Asset Solutions Pty Ltd has a very competitive cleaning service. After each clean we provide a report detailing the volume and type of pollutants removed. We believe that it is in your best interests for Urban Asset Solutions Pty Ltd staff to clean and maintain the unit, not only because we are specialists, but also because proper monitoring and maintenance enhances the unit life significantly.

Should you use another company to clean the unit, or undertake this work yourself, we request that it be conducted according to Urban Asset Solutions Pty Ltd specific ations. Otherwise, you may invalidate your warranty, as damage caused by inappropriate cleaning procedures is not covered. The advantages of using Urban Asset Solutions Pty Ltd to clean and maintain your unit are that you get:

- regular inspections of your unit;
- a comprehensive cleaning service with removal and disposal of all captured pollutants;
- a detailed report provided on completion of each clean;
- trained and experienced staff; and remedial work completed if required.

Table 6 provides a broad guideline about the number of cleans required annually for each treatment element within the Ecosol™ Storm Pit (Class 2).

Product Code	Pollutant Holding Capacicties			Optimal Maintenance Frequency			Optimal Catchment Area
	Gross Pollutants	Sediment	Hydrocarbons	Primary Treatment Chamber		Secondary Treatment Chamber	
	(m^3)	(m^3)	(L)	Litter Basket Clean	Detention Bay Clean	Storm DMT Filter Media Exchange	(Ha)
Storm Pit (Class 2) 10L/s	0.288	0.560	828	2	1	1	1.5
Storm Pit (Class 2) 20L/s	0.288	0.710	1,408	2	1	1	1.5
Storm Pit (Class 2) 40L/s	0.360	0.828	1,656	3	1	1	1.8
Storm Pit (Class 2) 60L/s	0.432	1.206	2,520	3	1	1	2.4
Storm Pit (Class 2) 80L/s	0.504	1.806	3,612	4	1	1	3.0
Storm Pit (Class 2) 110L/s	0.576	2.208	4,416	4	1	1	3.0

Table 6 - Ecosol™ Storm Pit(Class 2) Maintenance Frequencies

14.0 Applications and Configurations

The unit can be installed either at-source or in-line on pipes ranging in diameter from 100mm up to 375mm, usually in small commercial and high-density catchments ranging in size from 1.5 to 3.0Ha. For larger pipe sizes contact your local Urban Asset Solutions Pty Ltd office.

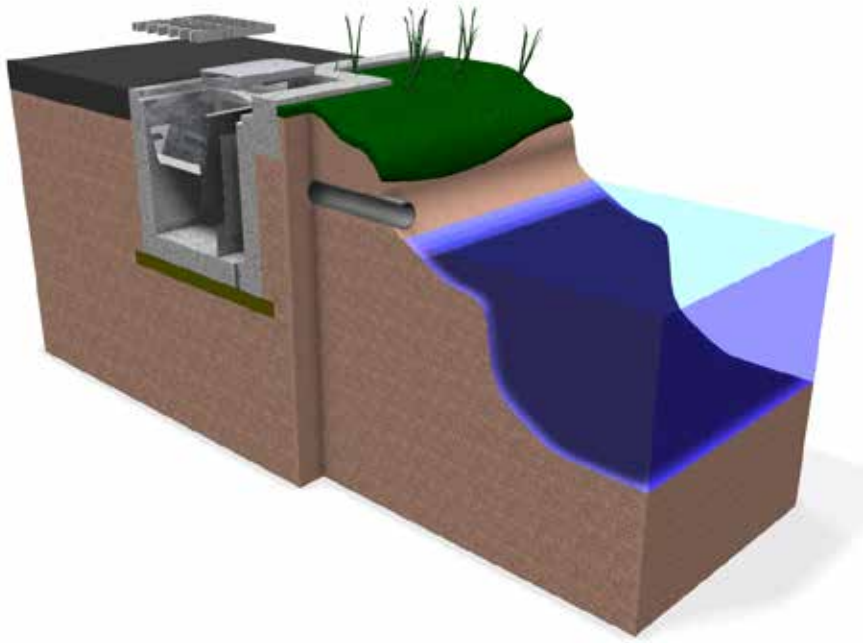
The Ecosol™ Storm Pit (Class 2) is a unique compact at-source or in-line stormwater filtration system designed to carry out multiple treatment processes on stormwater runoff within the one compact underground device. In particular it is designed to remove, at pre-determined treatable flows, particulate, dissolved and in some cases colloidally bound contaminants.

Typically, the Ecosol™ Storm Pit (Class 2) is designed for trafficable loadings and is located in commercial car parks, high rise residential apartment complexes, hardstand areas in shopping centre car parks and industrial estates.

Typical applications include:

- light industrial estates;
- mining and bulk handling facilities;
- Industrial and commercial sites such as car parks and shopping centres commercial wash down bays such as truck stops and council depots; and
- high density housing estates.

This systems is often a preferred choice in developments where site space constraints prohibits the installation of multiple treatment measures. It also provides an efficient solution for pre-screening of stormwater run-off prior to on site detention or rain water harvesting systems.



15.0 Turnkey Services

Urban Asset Solutions Pty Ltd design and estimating staff provide a dedicated management approach towards your project. In addition all staff are capable of liaising with the client, the consulting engineer, the contractor and all other interested third parties to achieve a successful outcome.

Urban Asset Solutions Pty Ltd provides a complete turnkey service from design, manufacture and installation to cleaning and maintenance for its product range and prides itself on providing its client with a cost effective, efficient service.

16.0 Accreditation

Urban Asset Solutions Pty Ltd is accredited to AS/NZS ISO 1400 (Environment) and AS/NZS 9001 (Quality). Our commitment to continuously improving our products and services is demonstrated by our ongoing accreditation for Quality and Environmental Management. Urban Asset Solutions Pty Ltd is also committed to a safe environment for its employees. We are fully third-party accredited to AS/NZS 4801.

17.0 Suppiler and Technical Product Contact Details

For any maintenance or technical product enquiries please contact: Urban Asset Solutions Pty Ltd
Tel: 1300 706 624
Fax: 1300 706 634
Email: info@urbanassetsolutions.com.au

ATLAS CERTIFICATION OHSAS 18001
ATLAS CERTIFICATION AS/NZS 4801
ATLAS CERTIFICATION ISO 9001
ATLAS CERTIFICATION ISO 14001

Appendix 1

Ecosol™ Storm Pit (Class 2) Essential Information Form

To ensure your system is appropriately designed for its intended application and meets local water quality objectives it is essential that the following minimum information is provided:

Customer Details

- Contact Person:
- Company Name:
- Phone:
- Fax:
- Email:

Project and Site Information

- Project Name:
- Project Address:
- Type of Development/Catchment Type:
- Catchment area (ha):
- Impervious area fraction (%):
- Pollutant Removal Targets (%): Site Water Quality Objectives (WQO's)
  - Gross Pollutants (>2000µm)
  - Total Suspended Solids (20 – 2000µm)
  - Total Phosphorus
  - Total Nitrogen
  - Heavy Metals
  - Total Petroleum/ Hydrocarbon
  - Other
- Local Authority:
- Device Location:
- Designed Discharge (Peak ARI Flow Rate) L/s:
- Treatable Flow Rate (L/s):
- Designed Discharge (Peak ARI Flow Rate) L/s:
- Other essential design or site relevant information:

Please forward the above information for your next project to your local Urban Asset Solutions Pty Ltd representative. On receipt Urban Asset Solutions Pty Ltd will model and design the most appropriately sized system to suit your application to assist you achieve the project Water Sensitive Urban design objectives.

Email: info@urbanassetsolutions.com.au
Fax: 1300 706 634

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