Bungendore High School

Stormwater Drainage Design Report (Including Water Sensitive Urban Design)

Project: Bungendore High School

Prepared for: Hindmarsh Construction

Reference: 5555
Revision: 01
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Document prepared by:

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Contents

1.0 Introduction

1.1 Preface

M+G Consulting has been commissioned by Hindmarsh Construction to prepare a Stormwater Drainage Design Report (including Water Sensitive Urban Design) and associated civil engineering design drawings for the proposed new high school in Bungendore, NSW.

The proposed works include the construction of new buildings, car parking, sporting courts and other associated school facilities. The details of the works involved are shown on the architectural drawings by TKD architects (refer Appendix A).

The following engineering works form part of the proposed development:

- Earthworks for building platforms, associated pathways, parking facilities, OSD tanks, including the clearing of existing vegetation demolishing existing roadways (Majara Street).
- Construction of new school facilities.
- New stormwater drainage and water sensitive urban design (WSUD) for the works to comply with the design requirements contained in the Queanbeyan-Palerang Regional Council's documents:

    - *Development Design Specification D5 – Stormwater Drainage Design Version 1 – January 2019; and*
    - *Development Design Specification D7 – Erosion Control and Stormwater Management Version 1 – December 2018.*

A stormwater management strategy has been detailed in this report to be implemented during the construction stage (short term) and after the completion of construction works (long term) for the proposed development. This report explores the stormwater management strategy by discussing the following key considerations:

- Sediment and erosion control: to manage stormwater runoff and prevent detriment to receiving waters downstream;
- Stormwater quantity control: to manage post-development flows in accordance with the relevant guidelines listed in this report; and
- Stormwater quality control: to manage pollutant levels in post-development runoff as part of the Water Sensitive Urban Design (WSUD) requirements for the development.

The following information and documents were utilised in this investigation:

- Concept Civil Engineering Drawings by M+G;
- Concept Architectural Plans by TKD Architects;
- Australian Standard AS/NZS 3500.3-2015 Plumbing and Drainage: *Part 3 Stormwater Drainage*;
- Survey Plans by Project Surveyors Ref #B04901 – Detail Survey Sheets 1 to 7 dated May 2021.
- *QPRC Development Design Specification D5 – Stormwater Drainage Design Version 1 – January 2019;*
- *QPRC Development Design Specification D7 – Erosion Control and Stormwater Management Version 1 – December 2018;*
- Stormwater NSW – *Guidelines for the maintenance of stormwater treatment measures* (2020);
- NSW Government Local Land Services Greater Sydney – *NSW Music Modelling Guidelines* (2015);
- Landcom - *Managing Urban Stormwater: Soils and Construction 4th Edition* (2004);
- Landcom – *Soils and Construction* – Volume 1, Chapter 5;
- *"Australian Runoff Quality – A Guide to Water Sensitive Urban Design",* Engineers Australia (2006);
- *"Australian Rainfall and Runoff – A Guide to Flood Estimation",* Institute of Engineers, Australia (2016);
- Sydney Catchment Management Authority – *DRAFT NSW MUSIC Modelling Guidelines* (August 2010);
- Water by Design – *Bioretention Technical Design Guidelines Version 1.1*, October 2014; and
- NSW Government Water Quality and River Flow Environmental Objectives;

To prevent any adverse effects on receiving environments, the stormwater management strategy has been designed to safely attenuate flows throughout the site. The proposed strategy will ensure that flows discharging from the site are within the acceptable limits outlined in the relevant guidelines whilst also reducing pollutant levels present in post-development runoff via proposed water treatment elements.

1.2 General Instructions

The information contained in this report is to be read in conjunction with documentation, such as engineering drawings, plans, specifications and the like, that is issued relating to the project.

The contractor is to ensure that all soil and water management works, including sediment and erosion control, shall be completed as per the instructions outlined in this report and constructed in accordance with the guidelines contained in the document "*Managing Urban Stormwater – Soils and Construction*, 4th Edition (2004)" by Landcom.

2.0 Existing Site

The site is located along the current Majara Street, Bungendore, between Turallo Terrace to the North and Gibraltar Street to the South. It is bound by Mick Sherd Oval to the west and the existing QPRC Building (Bungendore Customer Centre) to the east. Both the existing oval and council building will be re-developed / re-purposed as part of the proposed works for the new high school.

Fig. 1 - Aerial Photo of Existing Site (Source: Google Maps)

The proposed works include the construction of new buildings, car parking, sporting courts and other associated school facilities.

3.0 Construction Soil and Water Management

3.1 General

Prior to any earthworks commencing on site, soil and water management control measures will need to be put in place generally in accordance with *Managing Urban Stormwater – Soils and Construction*, 4th Edition (2004) by Landcom.

The contractor will be responsible to attain all necessary licenses, permits or approvals prior to the commencement of the works.

The contractor will be responsible for the implementation and maintenance of the Erosion and Sediment Control measure used during construction of the works.

The temporary measures contained in this report are to be implemented and maintained throughout the construction phase of the project, until such a time when permanent measures can be put in place.

Soil and water management requirements are not limited to the advice contained in this report and as such this document outlines the minimum requirements that are to be implemented by the contractor. The final design and implementation of all maintenance works is the sole responsibility of the contractor.

Further assessment of the permanent stormwater management controls outlined in this report are required. This may require some revision to the measures, which is to be confirmed during the detailed design stage of the project.

3.2 During wet weather construction

Soil and water management measures are to be incorporated into the construction works during wet weather construction works. These include, but are not limited, to:

- All plant and equipment are to be relocated away from edges of batters and edges of excavations.
- Construct temporary earth V-drains to direct surface water away from top of batters, edges of excavations batters and temporary shoring
- Inspect all batters and temporary shoring and undertake remedial works as required.
- Inspect all erosion and sediment control measures and repair as necessary.

- Check to ensure that sufficient supply of flocculant is on site for water treatment prior to discharge from site.
- Ensure all vehicle access tracks are in good condition. Undertake repairs and top with gravel/ballast as required.

4.0 Stormwater Design

4.1 Requirements and Guidelines

The concept stormwater drainage plan for the proposed development, including WSUD elements, have been designed in accordance with the following Control Plans, Australian Standards, Reports and Guidelines:

- *QPRC Development Design Specification D5 – Stormwater Drainage Design Version 1 – January 2019;*
- *QPRC Development Design Specification D7 – Erosion Control and Stormwater Management Version 1 – December 2018;*
- Australian Standard AS/NZS 3500.3-2015 Plumbing and Drainage: *Part 3 Stormwater Drainage;* and
- Australian Runoff Quality – *A Guide to Water Sensitive Urban Design"*, Engineers Australia (2006).

4.2 Stormwater Design Objectives

The objective of the Stormwater Management Plan outlined below is to:

- Prevent or minimise adverse social and environmental impacts from stormwater runoff originating from the proposed development.
- Achieve acceptable levels of stormwater runoff quality and quantity.

The Stormwater Management Plan aims to identify Stormwater Quantity and Quality Best Management Practice for the site and demonstrate that water quantity and quality impacts will be minimised in receiving waters.

The Stormwater Management Plan examines the site in two sections - the operational phase and the construction phase. The operational phase addresses the treatment of contaminated runoff from the developed site by a combination of manufactured products and natural methods before discharging into receiving waters, whilst the construction phase of the Stormwater Management Plan addresses erosion and sediment control to prevent contamination of water sources by stormwater runoff during construction of the site.

5.0 Stormwater Quantity Control

5.1 Introduction

An analysis on the effect of the upstream contributing areas and overland flow paths was conducted. The objective of this analysis was to ensure that any adverse effect on stormwater discharge from the proposed development was mitigated and post-development flow rates were attenuated to be less than or equal to pre-development flows.

"DRAINS" software by Watercom Pty Ltd was used to assess the performance of the proposed stormwater drainage system. A Horton ILSAX model was used to assess the design performance.

The site drains to an existing headwall that discharges towards Turallo Creek / McMahon Lake. As part of the proposed works, the existing discharge point will be extended north of the future Abbeyfield site as shown on the M+G stormwater drainage drawings

5.2 Stormwater Drainage Design Parameters

The table below provides a summary of all the parameters used and assumptions made in our assessment on the proposed stormwater drainage system:

Parameter	Assumption or Information Source
Rainfall Intensity	BOM IFD
Flow velocity estimates	DRAINS outputs
Manning's 'n' roughness values	DRAINS default values
Flow contraction and expansion coefficients	
Structure hydraulic head loss coefficients	
Other hydraulic head losses	

Table 1 - Parameters and Assumptions in DRAINS Model

5.2 Proposed Drainage System

The proposed stormwater drainage system for the development has been designed to capture runoff from impermeable surfaces including roofs and pavements.

New in-ground stormwater drainage lines to drain the new development are proposed to route to an OSD tank. A series of bio-retention swales have been incorporated adjacent to the school plaza, as a means of further improving the stormwater quality outcomes and to maintain the existing overland flow regimes via a series of drainage "slots" integrated between adjacent swales (refer Appendix B for further information).

The proposed stormwater management system for the development includes:

- Pit and pipe drainage network to collect run off from the storm events;
- 11 x OceanProtect OceanGuard Pit inserts (trash baskets) installed in inlet pits (as shown on plans) to improve water quality;
- A series of swales along the school plaza incorporating bio-retention plant species
- 1 x OSD tank fitted with an OceanProtect StormFilter Chamber with 12 x 690 'PSorb' filtration cartridges

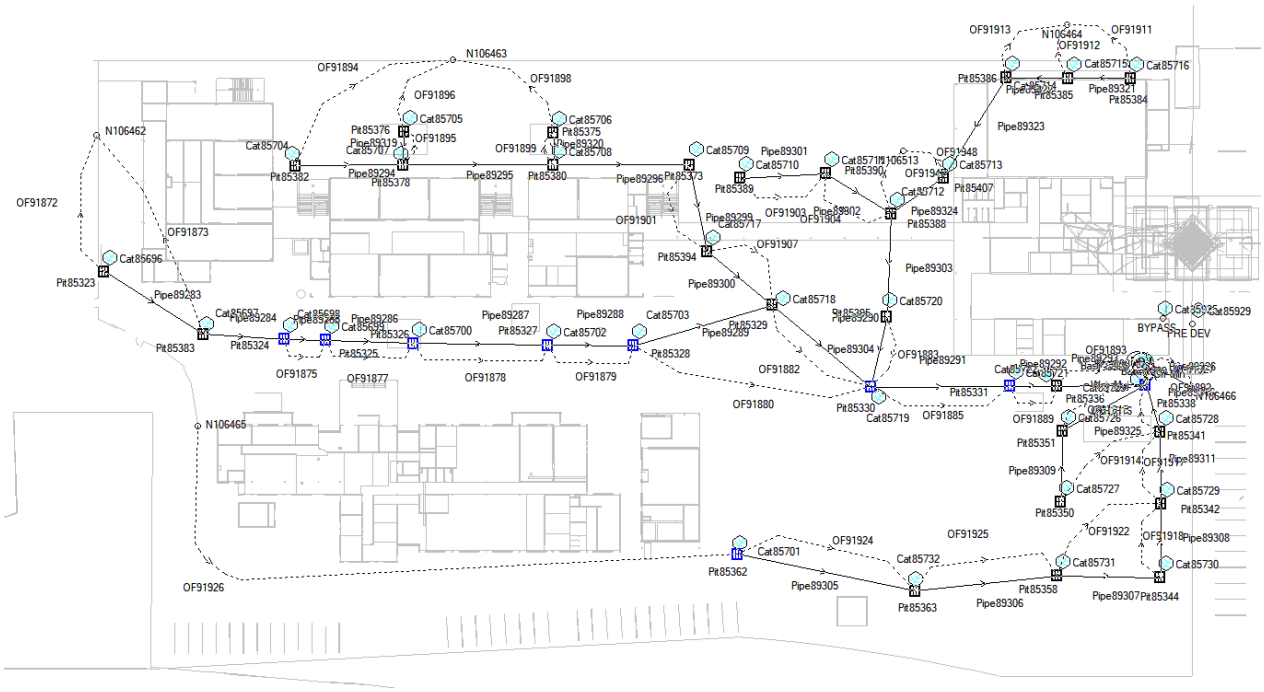


Fig. 2 - DRAINS snapshot BHS

5.3 On-Site Stormwater Detention Requirements

The Queanbeyan-Palerang Regional Council is the responsible body for determining the onsite stormwater detention (OSD) permissible site discharges and site storage required. As specified in their document *D5 – Stormwater Drainage Design*:

D5.15.2.

"Peak discharge rate for the existing development for AEPs of 20% and 1% not to be exceeded".

The OSD tank have been designed using DRAINS and incorporate some features listed below to satisfy the above requirements:

- 1 x primary storage chamber with an orifice outlet (designed for the 20% AEP); and
- 1 x overflow chamber (designed for storms in excess of the 20% AEP).

The OSD tank has been designed so that there are no overflows for all storm events up to and including the 1% AEP, whilst attenuating the post-development flows to the pre-existing conditions.

A total OSD volume of 130m^3 is required to satisfy the above requirements (refer to Appendix C for the Pre & Pos-Development flow rates from the *DRAINS* outputs).

A total of 90kL in rainwater tank storage is provided throughout the school site. The OSD tank design adopts a 50% credit of rainwater tank storage towards the OSD requirements. This brings the total required underground tank volume to 85m^3.

The pre & post-development site discharge flows for the site have been summarised in the table below:

STORM EVENT (AEP)	PRE-DEV FLOW RATES Q (m^3/s) Area 1	POST-DEV FLOW RATES Q (m^3/s) Area 1
20%	0.203	0.182
1%	0.656	0.515

NOTE: The above post-dev flow rates are inclusive of areas bypassing the OSD tank.

Table 2 - Pre & Post-Development Flow Rates

5.4 Overland flow regimes

To maintain the existing overland flow regimes along the existing Majara Street (along the location of the proposed school plaza), a series of bio-retention swales are incorporated as part of the landscaping design.

These swales are linked with overflow "drainage slots" in the pavements which traverse the line of the swales. This allows for the overflows between adjacent swales to be facilitated without burdening pedestrians along the school plaza. Once the swales reach the downstream point just east of the proposed school common, there is sufficient fall available in the pavements themselves to facilitate the existing overland flow regimes.

Details of the overflow drainage slots are provided in Context Landscape Architecture's documentation.

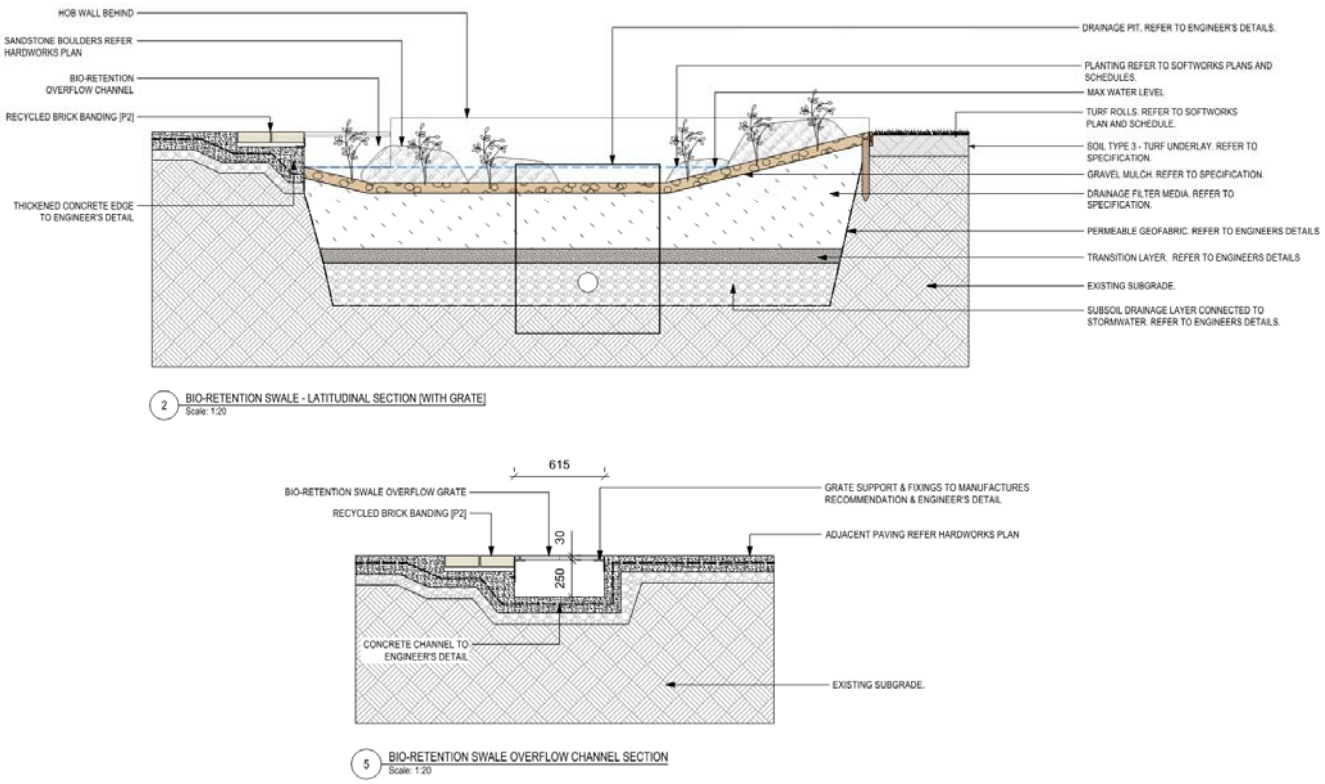


Fig. 3 – Bio-retention Swale and Overflow Drainage Slot details

6.0 Stormwater Quality Control

6.1 Introduction

The pollutant reduction targets specified by the DPRC D7 – Erosion Control and Stormwater Management are outlined in the table below:

Pollutant Type	Pollutant Reduction Target - Mean Annual Loads (Table D7.2)	Design Reduction (Ref Section 6.10)
Total Suspended Solids (TSS)	80%	88%
Total Phosphorus (TP)	65%	72.1%
Total Nitrogen (TN)	65%	50.5%
Gross Pollutants (GP)	100%	94.5%

Table 3 - Pollutant Reduction Targets

We note that the nitrogen and gross pollutant reductions fall slightly short of the targets specified. However, these reductions are considered to be still in-line with the industry norms and standard practices.

6.2 Stormwater Quality Control Measures

To achieve the required pollutant reductions to satisfy The QPRC requirements the following measures are to be implemented into the stormwater drainage works.

- 11 x OceanProtect OceanGuard Pit inserts (trash baskets) installed in inlet pits (as shown on plans) to improve water quality;
- A series of swales along the school plaza incorporating bio-retention plant species; and
- 1 x OSD tank fitted with an OceanProtect StormFilter Chamber with 12 x 690 'PSorb' filtration cartridges.

Details of these measures are shown on the M+G Stormwater Drainage Plans (Appendix B) and further information can be found in this report.

6.3 MUSIC Modelling

"MUSIC" software by eWater Pty Ltd was used to assess the performance of the bioretention basins in achieving the pollution reduction targets outlined in the Deferred Commencement Consent. The Music Template with a 6-minute time step was adopted in the design of the WSUD elements.

6.4 Bio-retention Swales

The proposed stormwater management strategy has adopted a series of bio-retention swales that will be integrated into the drainage network to treat runoff from impervious surfaces. These systems will be aimed at reducing the pollutants present in these flows to the nominated targets outlined in section 6.1 of this report (ref Table 3).

Stormwater is routed to the bio-retention swales via falls in the pavements. The water is then filtered through a vegetated and biologically active media layer and is collected in slotted subsoil drainage pipes below the garden beds. The treated runoff collected in these drainage pipes then drain to the OSD tank.

The benefits of these bio-retention swales include:

- Effective removal of fine and soluble pollutants;
- Effective removal of sediment and heavy metals;
- Effective removal of nutrients (Phosphorus & Nitrogen) and bacteria;
- Reduction in impervious areas for the proposed development site;
- Living plants provide an ecosystem for wildlife; and
- Basin volumes assist in the management of stormwater quantity control.

The vegetation incorporated into these basins for the treatment of stormwater are to be core functional bioretention plant species. A list of acceptable species can be found in table 19 of the document by Water by Design – Bioretention Technical Design Guidelines Version 1.1, October 2014. The selection of plant species is to be approved by the design engineer prior to construction.

Based on the results obtained by analysis in MUSIC, we anticipate that bio-retention swales with a combined total length of approx. 85m will be required to sufficiently treat the stormwater to the pollutant reduction targets nominated in the QPRC D7 document.

6.5 Ocean Protect StormFilter

The Ocean Protect StormFilter® is an underground stormwater treatment devise comprised of one or more structures that house rechargeable, media-filled cartridges that trap particulates and absorb pollutants from stormwater run-off such as total suspended solids, hydrocarbons, nutrients, metals and other common pollutants (Ocean Protect – StormFilter Technical Design Guide, March 2019).

The use of the 12 x 690 cartridge systems filled with PhosphoSorb™ media is proposed to be incorporated into the OSD tank to specifically target nutrient removal of Phosphorous and Nitrogen.

6.6 Ocean Protect OceanGuard

The Ocean Protect OceanGuard technology is a gully pit basket designed to fit within new and existing stormwater pits targeting pollution in stormwater runoff. The system is offered with a choice of filtration bag liners, designed to removed gross pollutants, total suspended solids and attached pollutants.

The filtration bag, filtration cage and flow diverter work together to maximise the flow treated, pollutant capture, hydraulic efficiency and ultimately retaining captured pollutants dry. OceanGuard pit inserts are highly effective, easy to install and simple to maintain.

(Ocean Protect – OceanGuard Technical Design Guide, March 2019).

6.7 Rainwater Tanks

Rainwater tanks serve to benefit the stormwater drainage design through harvesting and re-use. The re-use of stored rainwater from roofed surfaces reduces the demand of potable water and provide assists in water conservation, whilst the storage provided within these tanks assists in the restoration of flow regimes towards the pre-development conditions.

Rainwater tanks also assist in the removal of contaminants such as Suspended Solids, Phosphorous and Nitrogen. Note that for the purposes of the water quality assessment, the rainwater tanks have not been considered as part of the treatment train (conservatively).

6.8 Catchment Breakdown

Details of the catchments draining to the individual treatment nodes have been summarized in the table below:

CATCHMENT	AREA (ha)	IMPERVIOUSNESS RATIO (%)	PERVIOUSNESS RATIO (%)
School Plaza to Bio Swale	0.474	55	45
Carpark	0.323	90	10
Sports Courts + Surrounding Areas	0.302	65	35
School Common + Western Pavements	0.204	35	65
School Plaza to SF	0.030	60	40
Building Roofs	0.557	100	0
Bypass Areas	0.195	30	70

Table 4 - Catchment Breakdown for treatment nodes in MUSIC

6.9 Treatment Train

The figure below depicts the treatment train used to assess the performance of the various stormwater treatment devices for WSUD.

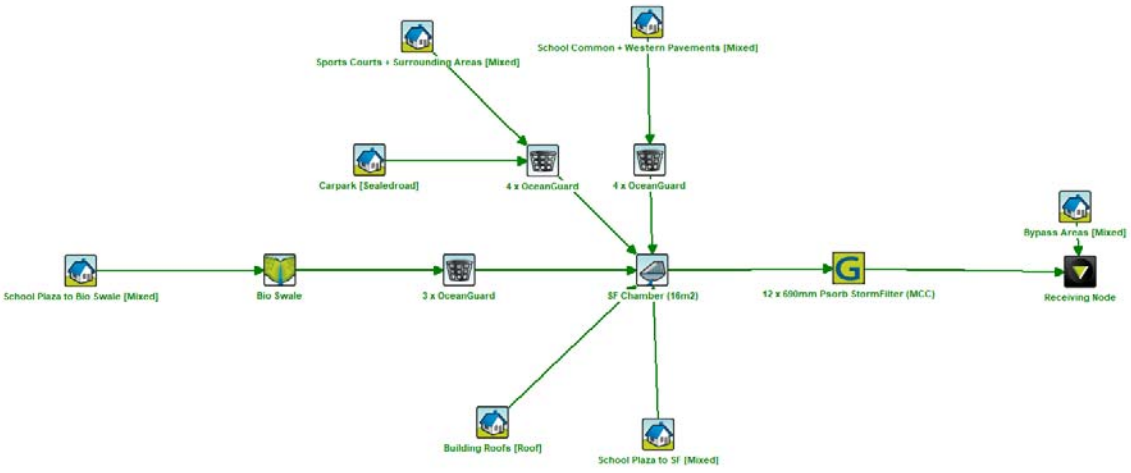
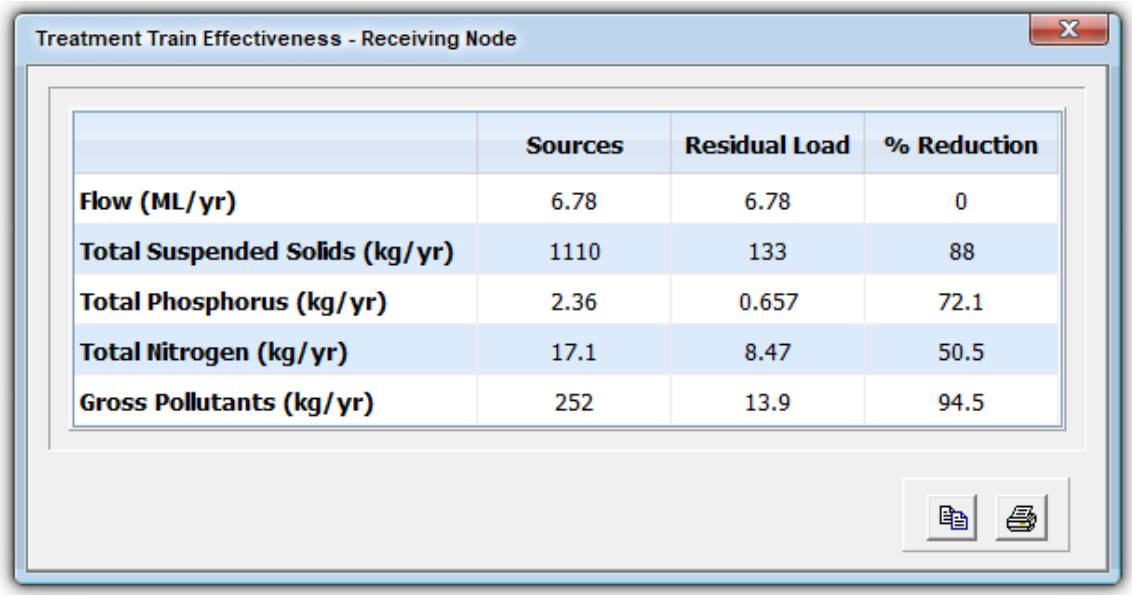


Fig. 4 - MUSIC Treatment Train

6.10 Results

The outputs obtained from the MUSIC modelling can be seen on the following page with a screenshot of the treatment train effectiveness at the receiving node. The pollutant loads that are shown in the results are expressed in ML/yr and the reduction rate is shown as a percentage in comparison to the untreated flows. These reductions can be compared to the reduction targets that were previously summarised on Table 3.



	Sources	Residual Load	% Reduction
Flow (ML/yr)	6.78	6.78	0
Total Suspended Solids (kg/yr)	1110	133	88
Total Phosphorus (kg/yr)	2.36	0.657	72.1
Total Nitrogen (kg/yr)	17.1	8.47	50.5
Gross Pollutants (kg/yr)	252	13.9	94.5

Fig. 5 - MUSIC Treatment Train Effectiveness Results

It can be seen from the MUSIC results shown above that integration of these stormwater treatment devices will ensure that the stormwater quality that is discharged from the site will not have an adverse effect on the water quality of the downstream receiving waters.

7.0 Maintenance Schedule

7.1 Construction soil and water management

The following inspection frequency and corrective action, to be undertaken by the main contractor, for the soil and water management measures during the construction works and during periods of wet weather is recommended to ensure that the system remains functional for the various ARI storm events that have been considered:

Construction Soil and Water Management Maintenance Schedule			
Maintenance Action	**Maintenance Requirements**	**Frequency**	**Responsibility**
Sediment Fences			
Sediment build-up	Remove any excessive silt/sediment/debris build-up	Weekly or after significant rainfall event	Main Contractor
Damage	Repair and/or replace damaged fences	Weekly or after significant rainfall event	Main Contractor
Mesh and Gravel Inlet Filters			
Sediment build-up	Remove any excessive silt/sediment/debris build-up. Ensure filters are positioned around pit inlets	Weekly or after significant rainfall event	Main Contractor
Geotextile and Straw Bale Filters			
Sediment build-up	Remove any excessive silt/sediment/debris build-up. Ensure filters are positioned around pit inlets	Weekly or after significant rainfall event	Main Contractor
Stabilised Site Entry and Roadways			
Sediment build-up/Debris/Mud	Clean site entry grate and remove all debris build-up. Replace water in tyre wash bay. Clean and sweep roads.	Daily and after rainfall events	Main Contractor
Sediment Pond			
Sediment Build-up	Remove any excessive silt/sediment/debris build-up. Ensure filters are positioned around pit inlets	Every 2 months	Main Contractor
Flocculation and Water Testing	Ensure water in sediment pond is flocculated and water quality tested prior to discharging from site	After and during rainfall events	Main Contractor

7.2 Stormwater and water quality

The following indicative maintenance schedule is proposed to ensure that the pollution control devices and stormwater drainage system remains functional for the various ARI storm events that have been considered:

Stormwater and Water Quality Maintenance Schedule			
Maintenance Action	**Maintenance Requirements**	**Frequency**	**Responsibility**
Stormwater Drainage System			
Inside of Pits	Remove grate and inspect condition of pit. Repair and replace as required. Remove any silt/sediment/debris build-up	Every 6 months	Maintenance Contractor
Outside of Pits	Clean grate and remove any silt/sediment/debris build-up	Every 4 months or after significant rainfall event	Maintenance Contractor
OSD Tanks			
Inside of Tank/Chambers	Remove grate and inspect internal condition of tank, including orifice plates and non-return valves. Repair and replace as required. Remove any silt/sediment/debris build-up	Every 6 months or after significant rainfall event	Maintenance Contractor
Stormwater Drainage System			
General inspection of pipes	Condition inspection stormwater pipes. Undertake any repairs as necessary	Every 6 months	Maintenance Contractor
Bio-Retention Basins			
All maintenance requirements for bio-retention basins and the frequency of these works should be carried out in accordance with *Stormwater NSW – GUIDELINES FOR THE MAINTENANCE OF STORMWATER TREATMENT MEASURES, January 2020.* Refer Appendix D for further details.			Maintenance Contractor
Ocean Protect StormFilter			
All maintenance requirements for StormFilter® cartridges and the frequency of these works should be carried out in accordance with *Stormwater NSW – GUIDELINES FOR THE MAINTENANCE OF STORMWATER TREATMENT MEASURES – Cleaning Specifications V2, January 2022 and the manufacturers specifications.* Refer Appendix E for further details.			Maintenance Contractor
Ocean Protect OceanGuard			
All maintenance requirements for OceanGuard pit inserts and the frequency of these works should be carried out in accordance with *Stormwater NSW – GUIDELINES FOR THE MAINTENANCE OF STORMWATER TREATMENT MEASURES – Cleaning Specifications V2, January 2022 and the manufacturers specifications.* Refer Appendix F for further details.			Maintenance Contractor
Landscaped Areas			
Erosion/loss of vegetation	Inspect turfed and landscaped for areas of exposed earth/rutting. Install mulch/turf/planting as required to rectify.	Every 6 months or after significant rainfall event	Maintenance Contractor
Weed Control	Remove weeds from root-ball. And replace effected areas with mulch/turf/planting as required to rectify	Every month	Maintenance Contractor

8.0 Conclusion

An in-depth assessment has been made to consider the overall impact of the proposed high school development on the existing infrastructure and natural environments in the vicinity of the site. The details and recommendations contained on this report, if followed, provides strategies and practices for the control of Soil and Water Management during and after the construction works.

Prepared by

Nicholas Nishijima

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Authorised By

Simon Matthews

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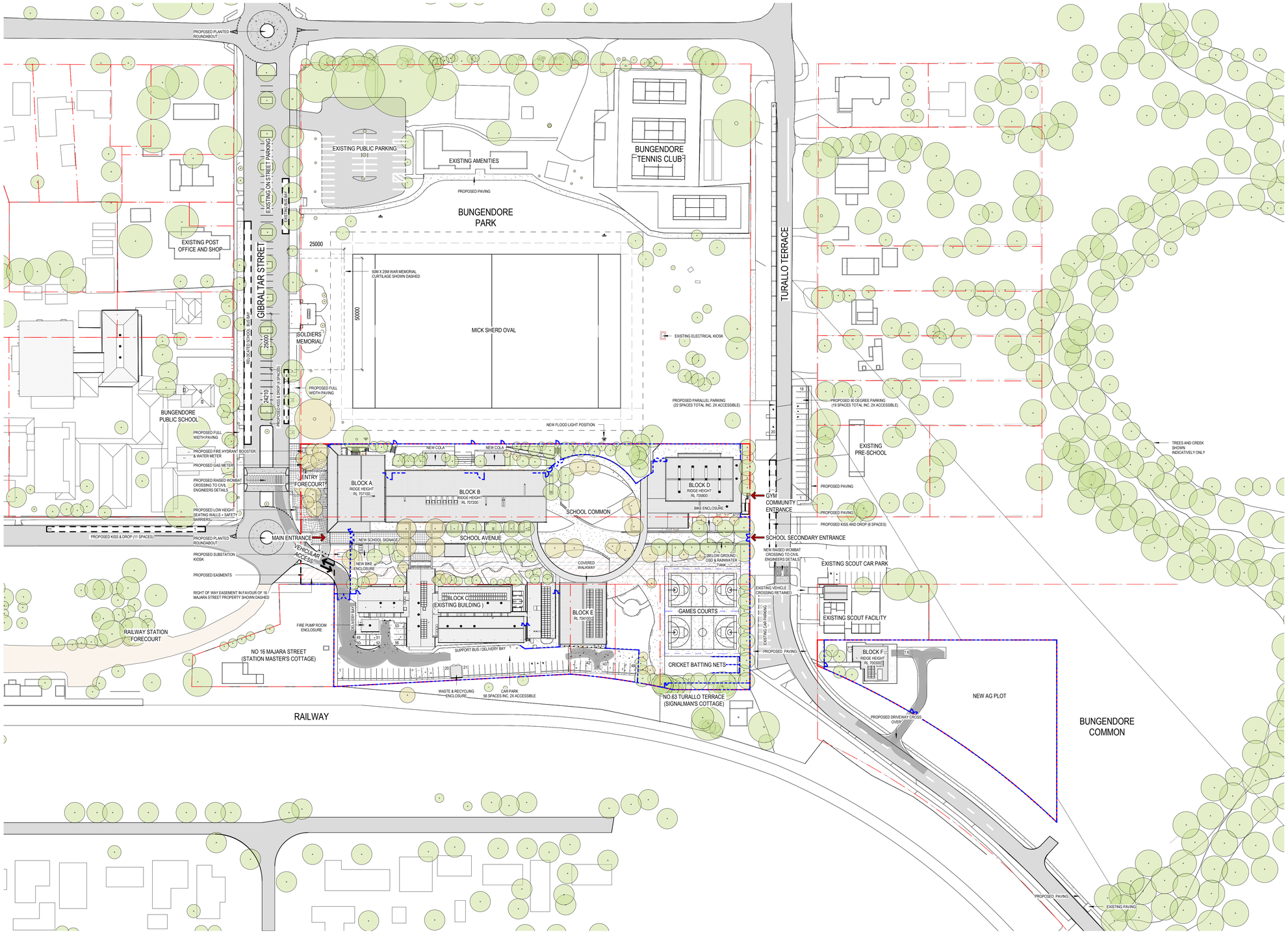
Appendix A – Proposed Site Plan (TKD Architects)

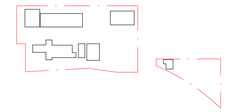


LEGEND

- SITE BOUNDARY
- ALLOTMENT BOUNDARY
- FENCE LINE*

* REFER TO LANDSCAPE ARCHITECTS DRAWINGS FOR FENCE TYPES

KEY



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NSW Nominated Architects: Robert Denton Reg. No. 5782, Alex Kibble Reg. No. 6015
Do not scale drawings. Verify all dimensions on site. Notify architect of all discrepancies

Rev	Date	Description	Chkd	Auth.
A	08.09.21	Issue For SSDA	RS	RS
B	26.07.22	Issued for RtS	RS	RS
C	09.09.22	Issued for RtS	RS	RS
D	18.11.22	Issued for RtS	RS	RS
E	21.11.22	Issued for RtS	RS	RS

Project
New High School in Bungendore

MAJARA STREET,
BUNGENDORE NSW 2621

Drawing Title
PROPOSED SITE PLAN

Proj. Dir	Proj. Arch	Drawn	Sheet
RD	RS	JL	B1
Job No.	Status	Date	Scale
200096	DD	04.07.22	1 : 750

Drawing No. AR DA HS -1010
Revision E

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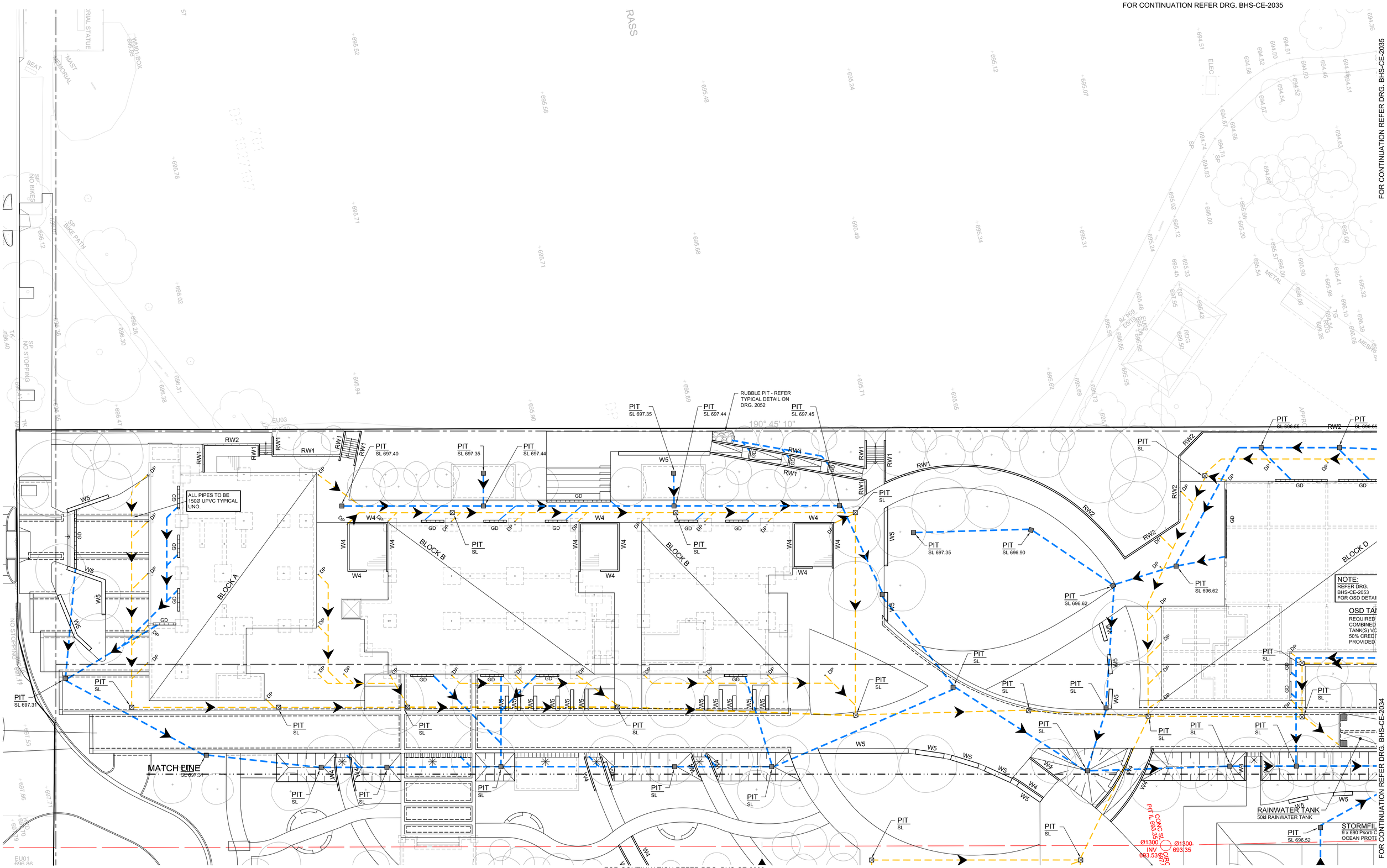
Appendix B – M+G BHS Stormwater Plan

FOR CONTINUATION REFER DRG. BHS-CE-2035

FOR CONTINUATION REFER DRG. BHS-CE-2035



FOR CONTINUATION REFER DRG. BHS-CE-2032

FOR CONTINUATION REFER DRG. BHS-CE-2034

STORMWATER DRAINAGE PLAN

SCALE 1:200

NOTE:

FOR DRAINAGE LEGEND REFER DRG. BHS-CE-2030.

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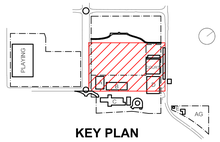

KEY PLAN

Do not scale drawings. Verify all dimensions on site.

Rev	Date	Description	Chkd	Auth.
B	16,04,21	SCHEMATIC DESIGN		
C	30,04,21	SCHEMATIC DESIGN		
D	07,05,21	SCHEMATIC DESIGN		
E	12,05,21	SCHEMATIC DESIGN		
F	24,11,21	50% DD ISSUE		
G	10,12,21	ISSUED FOR DD		
H	21,12,21	ISSUED FOR DD		
I	14,02,22	GENERALLY REVISED		
J	14,07,22	ISSUED FOR RTS REVISED DESIGN		
K	30,09,22	RTS REVISED DD ISSUE		
L	23,11,22	ISSUED FOR RTS		

Project
New High School in Bungendore

MAJARA STREET,
BUNGENDORE NSW 2621

Drawing Title
STORMWATER DRAINAGE PLAN
SHEET 1

Designed	Reviewed	Drawn	Sheet
MW	SCM	MW	B1

Job No.	Status	Date	Scale
5555	SSDA	OCT '21	1:200

Drawing No. BHS-CE-2031

Revision L

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(PO Box 1656, NSW 2059)

FOR CONTINUATION REFER DRG. BHS-CE-2031

PART STORMWATER DRAINAGE PLAN

SCALE 1:200

NOTE:

FOR DRAINAGE LEGEND REFER DRG. BHS-CE-2030.

✳ DENOTES GRATED CONCRETE DRAINAGE CHANNEL. REFER TYPICAL DETAILS ON DRG. 2091.

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Context
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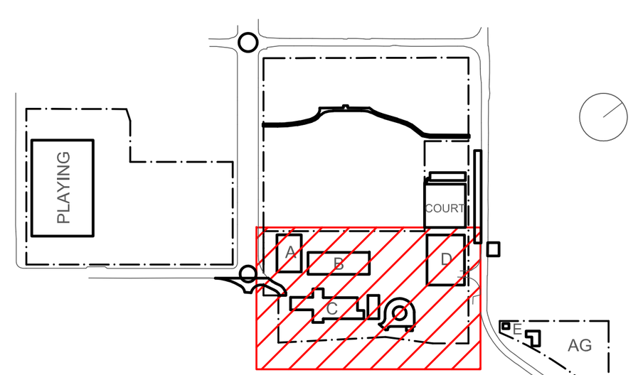

KEY PLAN

Do not scale drawings. Verify all dimensions on site.

Rev	Date	Description	Chkd	Auth.
C	30.04.21	SCHEMATIC DESIGN		
D	07.05.21	SCHEMATIC DESIGN		
E	12.05.21	SCHEMATIC DESIGN		
F	11.06.21	SCHEMATIC DESIGN		
G	24.11.21	50% DD ISSUE		
H	10.12.21	ISSUED FOR DD		
I	21.12.21	ISSUED FOR DD		
J	14.02.22	GENERALLY REVISED		
K	14.07.22	ISSUED FOR RTS REVISED DESIGN		
L	30.09.22	RTS REVISED DD ISSUE		
M	23.11.22	ISSUED FOR RTS		

Project
New High School in Bungendore

MAJARA STREET,
BUNGENDORE NSW 2621

Drawing Title STORMWATER DRAINAGE PLAN SHEET 2

Designed	Reviewed	Drawn	Sheet
MW	SCM	MW	B1

Job No.	Status	Date	Scale
5555	SSDA	OCT '21	1:200

Drawing No. BHS-CE-2032 Revision M

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FOR CONTINUATION REFER DRG. BHS-CE-2031 & BHS-CE-2035

FOR CONTINUATION REFER DRG. BHS-CE-2031 & BHS-CE-2032

MATCH LINE

NEW SCOUT STORAGE SHED

STORMFILTER CHAMBER
9 x 690 Psorb CARTRIDGES BY OCEAN PROTECT

GAMES COURTS

CRICKET NETS

BLOCK F

EXISTING Ø1350 RCP

EXISTING EXPOSED SECTION OF PIPE TO BE PROVIDED WITH 300 MIN. EARTH COVER

EXISTING HEADWALL

EXIST. IL 692.1

Ø1300 RCP

PROVIDE 300 MIN. EARTH COVER TO PIPE

IL 691.54 (TBC ON SITE)

NEW HEADWALL (LOCATION TO BE CONFIRMED ON SITE)

ORIGINAL LEVEE ALIGNMENT

EXTENT OF BATTER TO BE CONFIRMED ON SITE

EXTENDED LEVEE ALIGNMENT (BY OTHERS)

ROCK OUTLET PAD

SCOUR PROTECTION/ LEVEL SPREADER

BIORETENTION SWALE

LEVEL SPREADER SWALE OVERFLOW

ROCK OUTLET PAD

SCOUR PROTECTION/ LEVEL SPREADER

10° 45' 10"
137.085

100° 39'
25.0

57.15
107.15

43° 56' 15" - 128.18
ARC 128.89
RAD 353.7

100° 39'
81.75

PART STORMWATER DRAINAGE PLAN

SCALE 1:200

NOTE:

FOR DRAINAGE LEGEND REFER DRG. BHS-CE-2030.

KEY PLAN

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J	30.09.22	RTS REVISED DD ISSUE		
K	23.11.22	ISSUED FOR RTS		

Project
New High School in Bungendore

MAJARA STREET,
BUNGENDORE NSW 2621

Drawing Title
STORMWATER DRAINAGE PLAN
SHEET 3

Designed	Reviewed	Drawn	Sheet
MW	SCM	MW	B1

Job No.	Status	Date	Scale
5555	SSDA	OCT '21	1:200

Drawing No. BHS-CE-2034

Revision K

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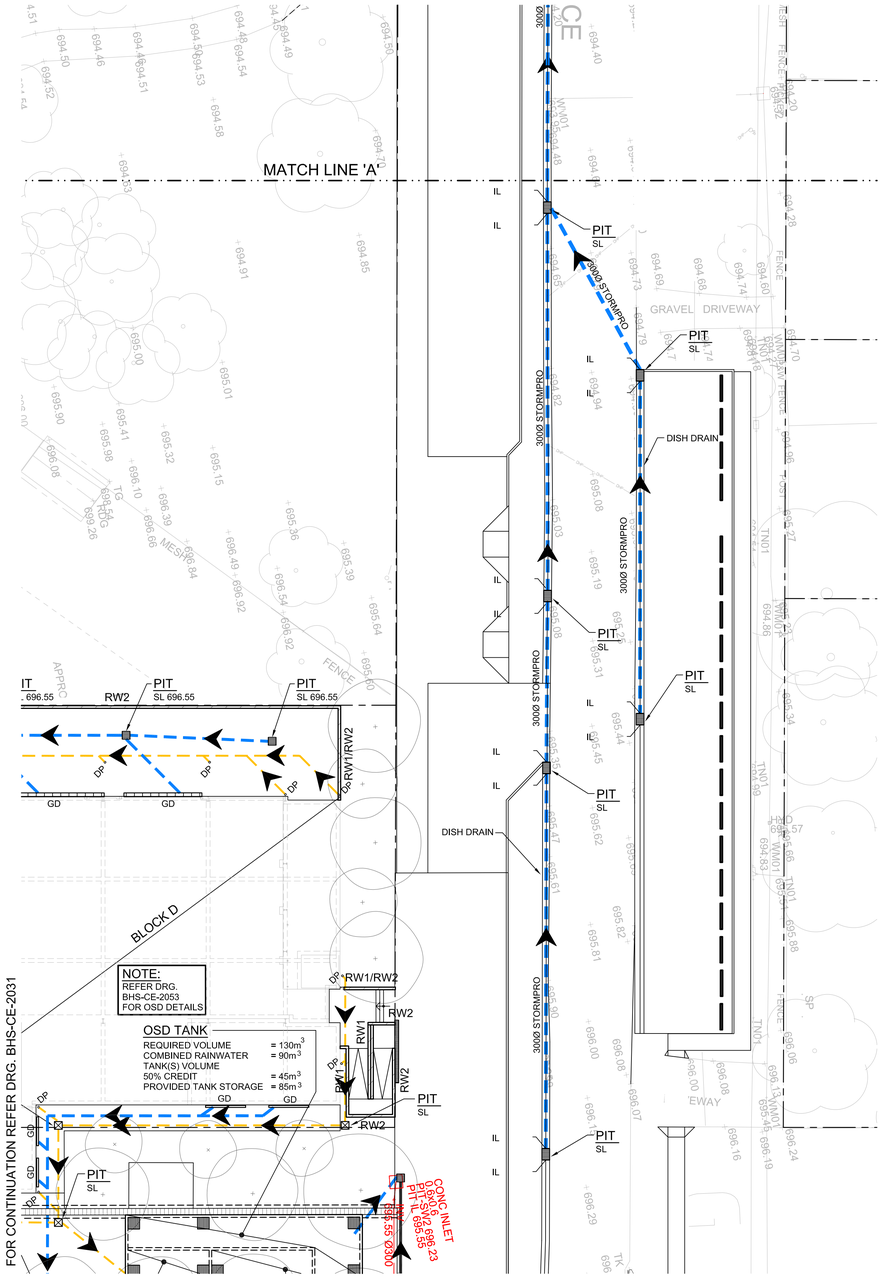
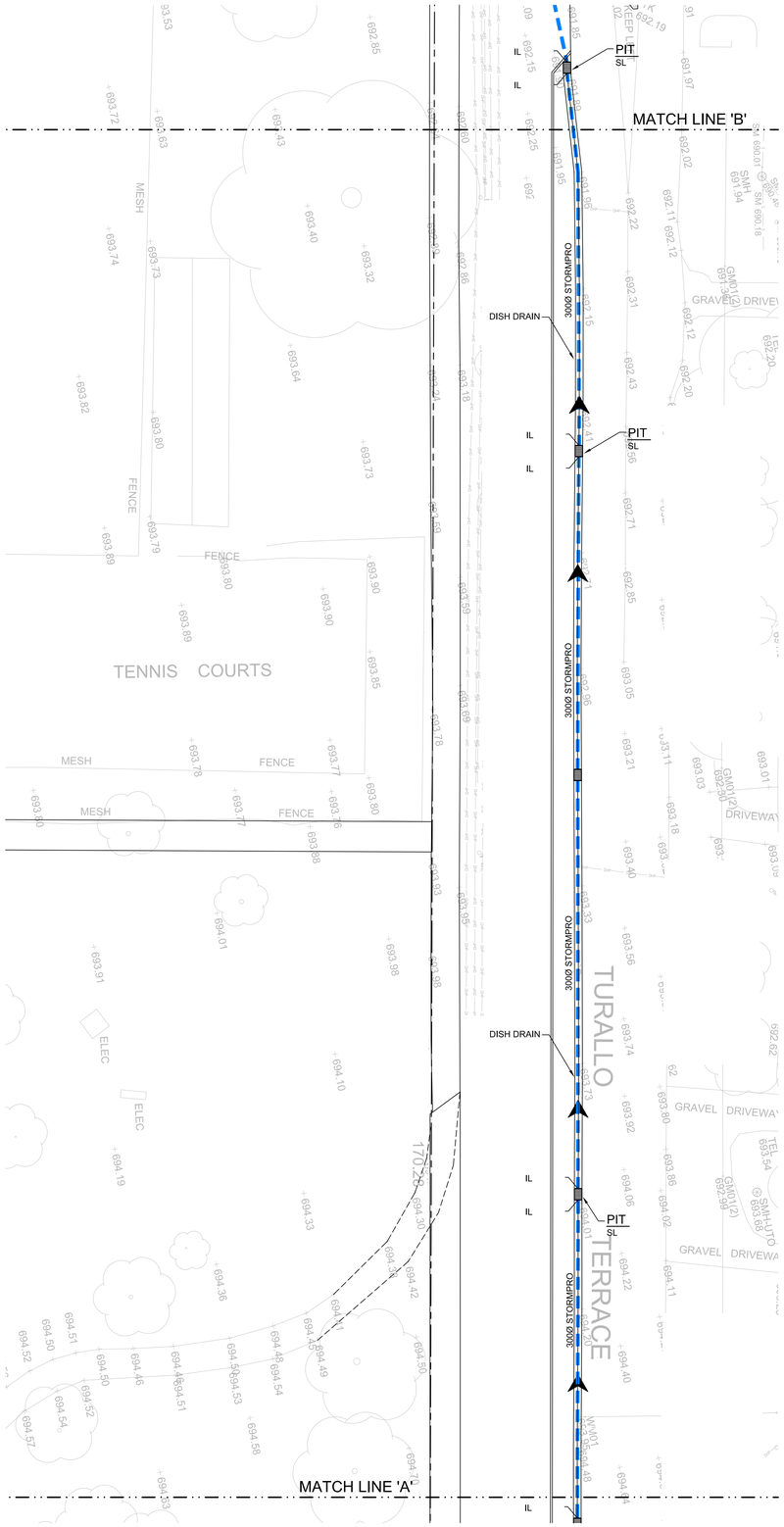
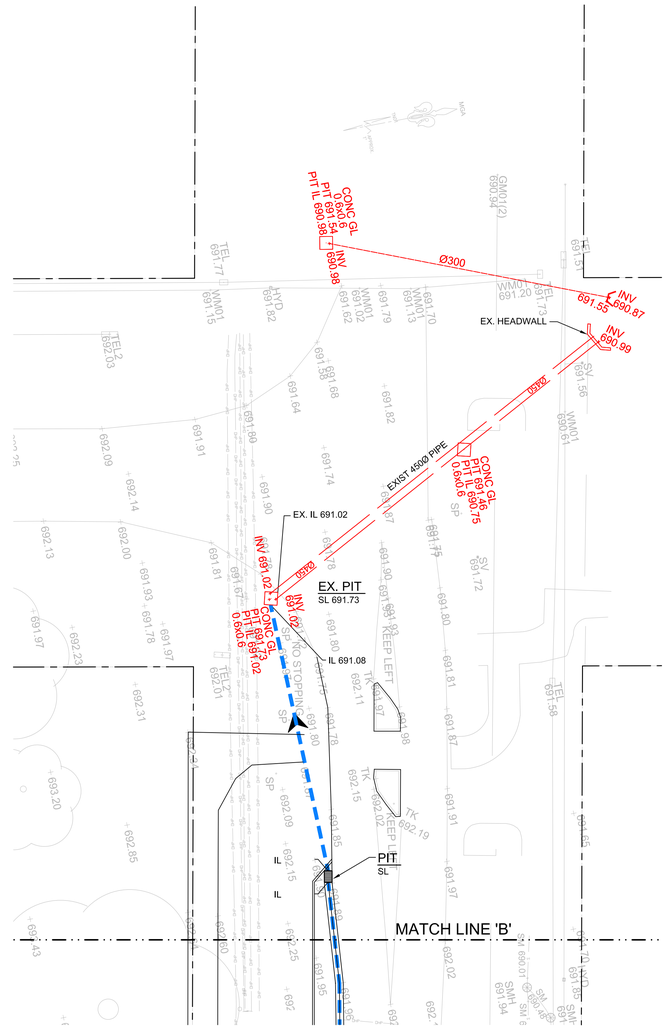
Member of AUSTRALIAN STEEL INSTITUTE



FOR CONTINUATION REFER DRG. BHS-CE-2031 & BHS-CE-2034

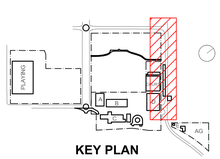




STORMWATER DRAINAGE PLAN

SCALE 1:200

NOTE:
FOR DRAINAGE LEGEND REFER DRG. BHS-CE-2030.



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D	15.02.22	GENERALLY REVISED		
E	14.07.22	ISSUED FOR RTS REVISED DESIGN		
F	27.07.22	ISSUED FOR RTS REVISED DESIGN		
G	30.09.22	RTS REVISED DD ISSUE		
H	23.11.22	ISSUED FOR RTS		

Project
New High School in Bungendore

MAJARA STREET,
BUNGENDORE NSW 2621

Drawing Title STORMWATER DRAINAGE PLAN
SHEET 4

Designed	Reviewed	Drawn	Sheet
MW	SCM	MW	B1

Job No.	Status	Date	Scale
5555	SSDA	OCT '21	1:200

Drawing No. BHS-CE-2035

Revision H

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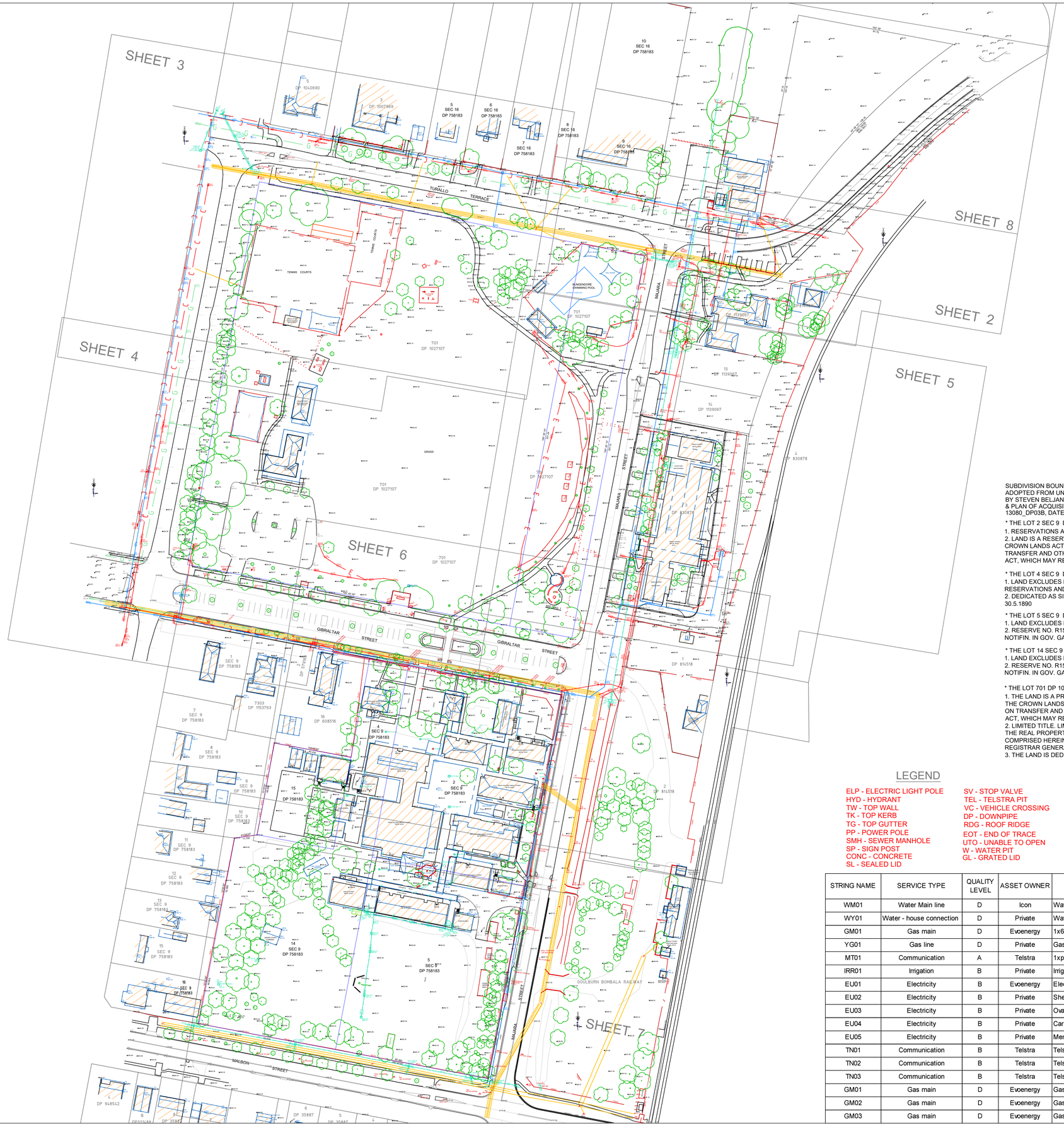
Appendix C – Site Survey



SUBDIVISION BOUNDARIES OVER SPORTS FIELD AND SCOUT HALL ADOPTED FROM UNREGISTERED PLAN OF ACQISITION PREPARED BY STEVEN BELJANSKI, REFERENCE 13080_DP02B, DATED 28/07/21 & PLAN OF ACQUISITION BY STEVEN BELJANSKI, REFERENCE 13080_DP03B, DATED 20/08/21

* THE LOT 2 SEC 9 DP 758183 TITLE NOTES
1. RESERVATIONS AND CONDITIONS IN THE CROWN GRANT(S)
2. LAND IS A RESERVE WITHIN THE MEANING OF PART 5 OF THE CROWN LANDS ACT 1989 AND THERE ARE RESTRICTIONS ON TRANSFER AND OTHER DEALINGS IN THE LAND UNDER THAT ACT, WHICH MAY REQUIRE CONSENT OF THE MINISTER

* THE LOT 4 SEC 9 DP 758183 TITLE NOTES
1. LAND EXCLUDES MINERALS AND IS SUBJECT TO RESERVATIONS AND CONDITIONS IN FAVOUR OF THE CROWN
2. DEDICATED AS SITE FOR SCHOOL OF ARTS BY GOV. GAZ. 30.5.1890

* THE LOT 5 SEC 9 DP 758183 TITLE NOTES
1. LAND EXCLUDES MINERALS - SEE MEMORANDUM S700000A
2. RESERVE NO. R15432 FOR PUBLIC SCHOOL PURPOSES VIDE NOTIFIN. IN GOV. GAZ. DATED 2.4.1892 FOLIO 2745

* THE LOT 14 SEC 9 DP 758183 TITLE NOTES
1. LAND EXCLUDES MINERALS - SEE MEMORANDUM S700000A
2. RESERVE NO. R15432 FOR PUBLIC SCHOOL PURPOSES VIDE NOTIFIN. IN GOV. GAZ. DATED 26.9.1975 FOLIO 3957

* THE LOT 701 DP 1027107 TITLE NOTES
1. THE LAND IS A PRESERVE WITHIN THE MEANING OF PART 5 OF THE CROWN LANDS ACT 1989 AND THERE ARE RESTRICTIONS ON TRANSFER AND OTHER DEALINGS IN THE LAND UNDER THAT ACT, WHICH MAY REQUIRE CONSENT OF THE MINISTER
2. LIMITED TITLE. LIMITATION PURSUANT TO SECTION 28T(4) OF THE REAL PROPERTY ACT, 1900. THE BOUNDARIES OF THE LAND COMPRISED HEREIN HAVE NOT BEEN INVESTIGATED BY THE REGISTRAR GENERAL.
3. THE LAND IS DEDICATED FOR A PUBLIC PURPOSE.

LEGEND

ELP - ELECTRIC LIGHT POLE
HYD - HYDRANT
TW - TOP WALL
TK - TOP KERB
TG - TOP GUTTER
PP - POWER POLE
SMH - SEWER MANHOLE
SP - SIGN POST
CONC - CONCRETE
SL - SEALED LID

SV - STOP VALVE
TEL - TELSTRA PIT
VC - VEHICLE CROSSING
DP - DOWNPIPE
RDG - ROOF RIDGE
EOT - END OF TRACE
UTO - UNABLE TO OPEN
W - WATER PIT
GL - GRATED LID

C - COMMUNICATION
W - WATER LINE
G - GAS LINE
E - ELECTRICITY
SW - STORMWATER PIPE
OHP - OVERHEAD POWER

STRING NAME	SERVICE TYPE	QUALITY LEVEL	ASSET OWNER	COMMENT
WM01	Water Main line	D	Icon	Water main approx depth of .4 to 1.2
WY01	Water - house connection	D	Private	Water service school feed approx 0.4m deep
GM01	Gas main	D	Evoenergy	1x63mm pe main approx 0.7m deep
YG01	Gas line	D	Private	Gas service school feed approx 0.5m deep
MT01	Communication	A	Telstra	1xp50mm conduit approx 0.4m deep empty conduit
IRR01	Irrigation	B	Private	Irrigation line located approx 0.3m deep
EU01	Electricity	B	Evoenergy	Electric line approx depth of .5 to 1.0
EU02	Electricity	B	Private	Shelter lights Electric line approx depth of 3 to .8
EU03	Electricity	B	Private	Oval flood lights electric line approx depth of .6 to 1.0
EU04	Electricity	B	Private	Car park light poles approx depth of .4 to .8
EU05	Electricity	B	Private	Memorial Electric line Approx depth of .3 to .7
TN01	Communication	B	Telstra	Telstra mains cables approx depth of .3 to 1.1
TN02	Communication	B	Telstra	Telstra line approx depth of .3 to .7
TN03	Communication	B	Telstra	Telstra / optic fibre approx depth of .3 to .9
GM01	Gas main	D	Evoenergy	Gas main approx depth of .3 to .9
GM02	Gas main	D	Evoenergy	Gas main approx depth of .3 to 1.0
GM03	Gas main	D	Evoenergy	Gas main approx depth of .3 to 1.0

NOTES :

* BOUNDARIES HAVE NOT BEEN DEFINED BY SURVEY AND ARE DIAGRAMMATIC ONLY
* LAND DIMENSIONS AND AREAS HAVE BEEN COMPILED FROM PLANS OBTAINED FROM NSW LRS
* BEARINGS RELATE TO MGA NORTH ORIGINATING FROM SCIMS MARKS
* LEVEL DATUM IS AHD ORIGINATING FROM PM40278 RL 696.187
* THE EXISTENCE OF UNDERGROUND SERVICES HAS BEEN ESTABLISHED IN AGREED SCOPE.
* EXISTENCE OF SERVICES MUST BE VERIFIED BY CONTACTING DIAL BEFORE YOU DIG (DBYD) 1100.COM.AU CRITICAL SERVICES MUST BE EXPOSED AND LOCATED.
* NEIGHBOURING HOUSES , WINDOWS AND ROOF POSITIONS ARE APPROXIMATELY ONLY.
* FLOOR LEVELS GENERALLY SURVEYED AT DOOR THRESHOLDS. INTERNAL ROOMS NOT SURVEYED.
* CONTOURS SHOWN ARE INDICATIVE OF LAND FORM. SPOT LEVELS SHOULD TAKE PRECEDENCE.
* REFER TO FACE OF PLAN FOR SUBJECT TITLE NOTATIONS.
* THIS TITLEBLOCK IS AN INTEGRAL PART OF THIS DRAWING AND SHOULD NOT BE REMOVED.

LOCATING QUALITY LEVELS PURSUANT TO AS5488-2013

QL-A QUALITY LEVEL A. VISUALISATION / CONFIRMATION OF A SERVICE, POSITION AND DEPTH, BY NON DESTRUCTIVE DIGGING METHODS OR POINTS OF ENTRY TO PITS OR

QL-B QUALITY LEVEL B. LOCATING OF SERVICES USING RADIO DETECTION METHODS OR GROUND PENETRATION RADAR. ACCEPTABLE RANGE OF ACCURACY FOR QUALITY B IS 300mm FOR POSITION AND 500mm IN DEPTH.

QL-C QUALITY LEVEL C. SERVICES MARKED OUT USING ONLY SURFACE FEATURES THAT HAVE BEEN MEASURED IN THE FIELD. THIS INCLUDES HYDRANTS, GAS MARKERS, PITS LIDS ETC. NO INDICATION OF SERVICE LOCATION OR DEPTH CAN BE OBTAINED FROM QUALITY LEVEL C.

QL-D QUALITY LEVEL D. SERVICES MARKED UP USING DBYD PLANS ONLY. NO INDICATION OF SERVICE CONFIRMATION CAN BE GIVEN.

UNDERGROUND SERVICES ALONG HILL ROAD WERE DETECTED BY ASTREA PTY LTD ON 16.03.2021
SURVEY INFORMATION ABOUT SERVICES SHOULD BE READ TOGETHER WITH ASTREA REPORT: ASTREA-BUN-1.PDF, ASTREA-BUN-2.PDF,

DIAL BEFORE YOU DIG www.1100.com.au

O	BOUNDARIES UPDATED	04.08.2022
N	BOUNDARIES UPDATED	28.07.2022
M	TREES & BOUNDARIES UPDATED	22.07.2022
L	EXTRA DETAIL ADDED	24.06.2022
K	UGS BETWEEN SCOUT SHED, MISSING TREES, EXTRA DETAILS ADDED	06.06.2022
J	ADJOINING BUILDINGS ADDED	08.07.2021
REV	AMENDMENTS	DATE

SHEET 1 0F 8 - DETAIL SURVEY

CLIENT : HINDMARSH

JOB REF. : B04901-BUN-REV 0
DRAWING No. B04901-BUN-REV 0-1
SURVEYOR: BC
CHECKED: NM
REGISTERED LAND SURVEYOR
DATE: 30/03/2021
DATUM: A.H.D.
ORIGIN: PM40278 RL 696.187
REFERENCE SYSTEM: GDA 2020

PLAN OF: BUNGENDORE HIGH SCHOOL
300 Lanyon Drive ACT

SHOWING: GENERAL DETAIL AND SITE LEVELS

PURPOSE: ARCHITECTURAL DESIGN COUNCIL SUBMISSION

ABN 20 068 433 974

BELLA VISTA
PO Box 7419 BAULKHAM HILLS NSW 2153
SUITE 405, LEVEL 4 14 LEXINGTON DRIVE,
BELLA VISTA NSW 2153
PHONE : 9056 1900
email: office@projectsurveyors.com.au

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Appendix D – Bioretention Swale Maintenance

5.11 Bio-Filtration/Bio Retention/ Raingardens

5.11.1 Key Considerations for Inspections, Regular Maintenance and Comprehensive Maintenance

Inspections	Key considerations
Inspection frequency	• Bioretention treatments should be inspected regularly after completion of seeding/planting until the vegetation is established. In the first year of operation inspections should occur on a monthly basis and following significant storm events to evaluate an appropriate inspection frequency for a particular site. • Typically an average inspection frequency of 1 to 2 months following stabilisation of vegetation would be appropriate. The inspections could coincide with a regular maintenance activity (e.g. grass cutting, weeding, litter removal, etc). • Quarterly inspections are recommended for established systems.
Inspection tasks	*Vegetation/Grass* • The most important maintenance consideration for bioretention measures is preserving vegetation cover (>80%). • Plants should be inspected monthly during the first year of establishment and then quarterly. Any dead or unhealthy plants should be scheduled for either treatment or removal/replacement. • Grass should be inspected regularly during the first year to identify areas of poor growth that require maintenance. • Weed growth should be inspected monthly during the first year to identify appropriate maintenance methods for preventing or controlling the growth. *Filter media* • Media within bioretention measures should be inspected visually for any signs of erosion or formation of rills or blockages. • The inlet(s) to a bioretention measure should be inspected, preferably during wet weather, to confirm that flow is being dispersed evenly at these locations. The remainder of the measure should be inspected to confirm that flow is not being channelised forming erosion rills, or bypassing, or overtopping. • The side slopes should be inspected for erosion, particularly at locations where concentrated flows enter laterally into the bioretention measure. • Sediment deposits should be monitored and removed where concentrations occur. *Miscellaneous* • In many systems, there is an underflow or filtrate collection system, commonly a slotted pipe. Annually this should be inspected or rodded or jetted to ensure there are no blockages. • Mulch should be inspected to determine the presence of any significant voids and to determine an appropriate interval for topping up the mulch layer. • Litter, rocks/sediment and organic debris should be identified and removed.

Maintenance—Regular	Key considerations
Key design elements to consider for maintenance	• Inspection of openings at the end of perforated pipes needs to be part of the initial design. This allows maintenance workers to check sediment build-up and water ponding during dry weather. • Ensure access is available for the equipment required for maintenance. • Provide pre-treatment measures to remove litter, organic debris and coarse sediment. Especially for large solutions. • Provide raised edge strips around the bioretention measure to reduce edge trimming requirements. • Use only grasses and vegetation suitable for the local soil and climatic conditions. Ensure that grass/vegetation is able to withstand flow velocities under design storm event conditions and high flow bypass. Consider providing a subsurface reservoir of water under drainage layer to support plants during dry spells. • Sub-soil drainage pipes in bioretention basins/rain gardens should not be surrounded by a geotextile sock to minimise the potential for clogging within the pipe. The sock itself blocks and causes more problems than in solves. • Provide some redundancy in subsoil drainage to avoid rebuilding. • Consider check dams along bioretention swales with a gradient of less than 4% to minimise the potential for erosion. • Provide side slopes less than 4(H):1(V) to make mowing easier. • Sometimes, these systems should not be commissioned during construction periods or while site surfaces are being stabilised, and where high sediment loads are expected.
Maintenance costs	• The maintenance cost for mature systems is approximately similar to swales—$2.50/m^2 for grassed systems and $1.50/m^2 for vegetated systems using native vegetation (Fletcher et al., 2003). Similar to grassed swales, maintenance costs during the initial two-year vegetation establishment period (estimated at $9.00/m^2/yr) may be higher than vegetated systems. But this relates only to removal of litter and vegetation management. • If doing hydraulic conductivity testing, allow $2,000–4,000/yr
Maintenance frequency	• Evaluation of an appropriate maintenance frequency can be determined in the first year of operation by observing: — vegetation cover; — decomposition rate of mulch; — damage to vegetation; — erosion; — the presence of erosion rills; — volume of litter; — organic debris and sediment; and — weed growth. It is likely that as vegetation becomes established and/or the catchment is re-developed/stabilised, that maintenance frequency will reduce. • Requirements for plant and soil maintenance should be assessed during regular inspections. The maintenance frequency is likely to be more regular during the one to two year period following construction. • The maintenance frequency after stabilisation would primarily be dependent on aesthetics and seasonal influences, with grass cutting and weeding required either fortnightly or monthly (depending on the species) during spring and summer. Less frequent grass cutting and weeding (typically every 2 to 3 months), would be required during autumn and winter where other factors (e.g. aesthetics, litter removal, erosion, vegetation damage) may control the maintenance frequency. In some climates grass cutting may not be required during autumn and winter for some species of grass.

Maintenance tasks	• During the initial 1–2 year establishment period for a bioretention measure, regular watering, mulching, weeding, soil treatment, removal and replacement of dead/diseased vegetation • Pre-treatment measures should be cleaned to minimise the potential for the bioretention measure to be excessively loaded with sediment, litter and organic debris. • Diseased or poorly growing vegetation should be inspected by a horticulturalist (or similarly qualified individual) to establish a treatment approach or provide recommendations on suitable replacement species. • Mulching should be undertaken periodically to fill in voids observed • The species of vegetation selected for the bioretention measure should be appropriate for the local environmental conditions and should not require additional watering or improved drainage to maintain the plants once established. During extended dry periods, plants may benefit from the addition of water crystals or gels. • Weeds should be removed manually by hand if the weed coverage is localised. If the weed is more widespread options include spot spraying of herbicides approved for use within an aquatic environments is recommended. • Removal of sediment from the forebay manually or with a machine will be required. • Accumulated sediment on the filter media may require manual removal using rakes and shovels. • Flow spreaders (level spreaders, check dams or benches), if present within the bioretention measures, should be cleared of any debris. Accumulated sediment within these controls, if present, should be removed. Structural integrity of the flow spreaders should be inspected and repaired if defects are found. • Matter such as grass clippings, organics debris and sediments removed from bioretention measures should be managed to prevent pollution to waterways further downstream. Clippings and organic debris should be composted in a designated area outside the bioretention measure. • Minimise the load of grass clippings that could enter downstream waterways during maintenance. • If blockages are suspected, a test of hydraulic conductivity using the FAWB method should be undertaken to ensure infiltration stays within an acceptable range (typically 100 mm/hr to 500 mm/hr). Low infiltration may require removal and replacement of the top 50 mm to 100 mm of filter media. The infiltration rate will be on the *Data Sheet*.

Maintenance—Annual/Comprehensive	**Key considerations**
Cleaning/maintenance methods	• Budget and plan for an annual cleaning. • Ensure mowers with catchers to cut grass in open grassed areas within the bioretention measure are used, and line and edge trimmers in other areas. • Remove concentrated areas of loose sediment, litter and organic debris via suction truck where suitable access is available. • Manually remove weeds and deposited matter using rakes, spades, shovels, hoes and pitchforks. • Use high-pressure jets or hoses to flush sub-soil systems. • Remove concentrated deposits of organic debris and sediment using portable vacuum/mulching units. • A vehicle to transport organic waste from the site is necessary. • Sub-soil drainage lines (if provided) should be flushed through inspection/flushing points if available. • Mulching typically would need to be topped up on an annual cycle prior to warmer months, with mulch replaced every 2 to 3 years during dry periods.

Appendix E – Ocean Protect StormFilter Maintenance

StormFilter Cleaning Spec

Monitoring:

- Remove the lids or manholes to access the device. View chamber with the cartridges.
- If there is water ponded in the device more than 100mm, it needs to be cleaned.
- If there is sediment in the device that has an averaged depth of 50mm or more, it's time to be cleaned. Use a ***Survey Staff*** to measure the depth from ground to pollution. Make sure the staff is clean and dry, push it into the sediment until it hits the concrete base. Refer to Data Sheet
- If any cartridges are not in their correct place, this triggers a clean.

Regular Cleaning:

- Open the lid/s. Use the ***Survey Staff*** and ***Data Sheet*** to measure and record the volume of pollution.
- **Decant water** to a suitable grassed area nearby, or suck into the suction truck and take all water to the Council depot for decanting/discharge, or to another agreed location. If baseflow present, put into low flow bypass before cleaning.
- Take a photo before you start cleaning. Then enter device and remove the cartridges (confined space access required) to get to the floor with the suction hose. Take another photo.
- Suck pollution from the chamber (via **sucker truck**).
- Fix any damaged manifolds, jet the treated water underslab piping to flush any sediments through.
- Replace any moved cartridges,
- Replace lid/s, then recycle or dispose of waste. Clean up any litter in a 10m radius.

Annual or Comprehensive Clean: (once per year)

- Open the lid/s. Use the ***Survey Staff*** and ***Data Sheet*** to measure and record the volume of pollution.
- **Decant water** to a suitable grassed area nearby, or suck into the suction truck and take all water to the Council depot for decanting/discharge, or to another agreed location. If baseflow present, put into low flow bypass before cleaning.
- Take a photo before you start cleaning. Then enter device and remove the cartridges (confined space access required). Cartridges can be heavy. Take another photo. Inspect the inlets and outlets and anything else in the chamber. Clean as necessary.
- Suck pollution from the chamber (via **sucker truck**). Fix any damaged manifolds, jet the treated water underslab piping to flush any sediments through. Replace any moved cartridges, then fill them with media, put the hoods back on. Or Ocean Protect to do a "Swap & Go" service for you.
- Replace lid/s, then recycle or dispose of waste. Clean up any litter in a 10m radius. Also grease any gatic lids. For a more comprehensive version, see the Ocean Protect website at www.oceanprotect.com.au

Appendix F – Ocean Protect OceanGuard Maintenance

OceanGuard – Pit Trap

Monitoring:

- Pit traps are monitored visually.
- If the basket appears to be half full or more, then it's time for a clean.
- If the basket is blocked or blinded, it's time for a clean.

Regular Cleaning:

- These pit traps are commonly in trafficable areas, so appropriate traffic management always needs to be considered.
- Open the grate.
- Take a photo before you start suction cleaning or remove the bag.
- Suck pollution from the bag (via **sucker truck**), or manually lift out the bag (with or without lifting tools) and empty pollution into a bag or other container for transport. (Note that dry pollution in the back of a ute or similar tends to blow away unless covered.
- When empty take another photo, and then replace the grate.
- Clean all other OceanGuards in the area, the dispose of waste. Clean up any litter in a 10m radius of the pit trap.

Annual or Comprehensive Clean: (once per year)

- As per above, plus….
- If the OceanGuard is on a lintel inlet, then additionally clean any sediment or pollution that is within the lintel.
- Inspect the "black rubber" surrounds. These should all be directing water into the bag. If not, then these should be adjusted or replaced so that they do.
- Periodically the bags may get torn by sharp objects or damaged during cleaning. If this occurs, contact ***Ocean Protect*** for supply of a new bag.

NOTE: bags come in many sizes, including custom. Bags also come in several apertures of netting, from 100 micron to 5mm. It is recommended to generally use the coarser meshes to reduce blinding and bypassing. (This is a primary treatment)

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