

GLENWOOD HIGH SCHOOL UPGRADE

CIVIL ENGINEERING DESIGN REPORT



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ISSUE AUTHORISATION

PROJECT: Glenwood High School Upgrade
Project No: 6393

Rev	Date	Purpose of Issue / Nature of Revision	Prepared by	Reviewed by	Issue Authorise by
A	28/09/21	DRAFT	NKK	KEH	KEH
B	01/11/21	DRAFT	NKK	KEH	KEH
C	09/11/21	FOR APPROVAL	NKK	KEH	KEH
D	09/06/22	Council comments included	KEH	KEH	KEH
E	21/06/22	Council comments included	KEH	KEH	KEH

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Executive Summary

This Civil Engineering Design Report accompanies an Environmental Impact Statement (EIS) pursuant to Part 4 of the Environmental Planning and Assessment Act 1979 (EP&A Act) in support of a State Significant Development Application (SSD - 23512960).

The development is for upgrading works comprising alterations and additions to Glenwood High School at 85 Forman Avenue, Glenwood. The site is legally described as Lot 5227 DP 868693.

The site is roughly rectangular in shape, with a total area of 60,790m² and street frontages to Forman Avenue to the south and Glenwood Drive to the east. Glenwood Reserve adjoins the northern and western boundaries of the school.

This report addresses the relevant Secretary's Environmental Assessment Requirements (SEARs), specifically:

Items 15 and 17 of the SEARs advice is as follows:

15. Stormwater Drainage

- Provide:
 - a preliminary stormwater management plan for the development that:
 - is prepared by a suitably qualified person in consultation with Council and any other relevant drainage authority.
 - details the proposed drainage design for the site including on-site detention facilities, water quality measures and the nominated discharge point.
 - demonstrates compliance with Council or other drainage authority requirements.
 - stormwater plans detailing the proposed methods of drainage without impacting on the downstream properties.
- Where drainage infrastructure works are required that would be handed over to Council, provide full hydraulic details and detailed plans and specifications of proposed works that have been prepared in consultation with Council and comply with Council's relevant standards.

Refer to **Section 6.1** for Onsite Stormwater Detention and stormwater management details. Refer to **Section 7.1** for water quality details.

17. Soil and Water

- Provide:
 - an assessment of potential impacts on surface and groundwater (quality and quantity), soil, related infrastructure, and watercourse(s) where relevant.
 - details of measures and procedures to minimise and manage the generation and off-site transmission of sediment, dust, and fine particles.
 - an assessment of salinity and acid sulphate soil impacts, including a Salinity Management Plan and/or Acid Sulphate Soils Management Plan, where relevant.

Relevant Policies and Guidelines:

- Managing Urban Stormwater - Soils and Construction Volume 1 (Landcom, 2004).
- Acid Sulfate Soil Manual, (NSW Acid Sulfate Soil Management Advisory Committee, 1998).
- Acid Sulfate Soils Assessment Guidelines (DoP, 2008).
- Managing Urban Stormwater: Soils and Construction Volume 1 (Landcom 2004) and Volume 2 (A. Installation of Services; B. Waste Landfills; C. Unsealed Roads; D. Main Roads; E. Mines and Quarries) (DECC, 2008).

Refer to **Section 7.3** for erosion and sediment control details. This report does not cover acid sulphate soil or ground water management.

Refer to the flood study report which addresses SEARs Item 16.

This report covers:

- Onsite Stormwater Detention (OSD)
- Water Sensitive Urban Design
- Stormwater Overland Flow
- Ground conditions
- Erosion and Sediment control

This report has been revised to address Blacktown Council's correspondence dated 21 March 2021 and 13 May 2022.

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1 Introduction

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The development is for upgrading works comprising alterations and additions to Glenwood High School at 85 Forman Avenue, Glenwood. The site is legally described as Lot 5227 DP 868693.

The school campus site is roughly rectangular in shape and has street frontages to Forman Avenue to the south and Glenwood Drive to the east. Glenwood Reserve adjoins the northern and western boundaries of the school.

This report addresses the relevant Secretary's Environmental Assessment Requirements (SEARs). Further, this report has been revised to address Blacktown Council's correspondence dated 21 March 2021 and 13 May 2022.

2 The Proposal

The proposed development seeks to upgrade Glenwood High School. The upgrade consists of the following alterations and additions:

- Construction of a new three-storey building at the north-eastern portion of the site facing Glenwood Park Drive which will accommodate new learning spaces (**Figure 1**),
- Construction of one storey performance pavilion,
- Refurbishment of existing Building Block A (ground floor only) to provide one new support unit within the space of an existing general learning space,
- Refurbishment of Building Block D (ground floor only) to provide an additional office space and storeroom,
- Refurbishment of Building Block E to re-purpose it on the ground floor for computer learning spaces, staff, and administration spaces as well as upgrades to the library on the first floor,
- Refurbishment of Building Block J to re-purpose it from visual arts and performing arts to learning spaces and workshops for food tech and woods/metal unit,
- Demolition of existing botany room and construction of a new single storey pavilion comprising of interview rooms and end-of trip facilities,
- The proposed development will also involve ancillary works at the site associated with the proposed upgrades, and
- An End of Trip Facility will be built (replacing the existing Botany Room) to the north of the existing Building DE.



Figure 1: Design Plan L3 (Source: PTW Architects)



Figure 2: Southwest Axonometric View (Source: PTW Architects)

3 The Site

Glenwood High School is located at 85 Forman Avenue, Glenwood. An existing childcare centre is also located within the site. The site is located in the Blacktown Local Government Area (LGA) in the suburb of Glenwood. It is situated within a well-established residential area approximately 4.7km northeast of Blacktown Train Station.

The site is bound by residential development and Forman Avenue to the south; Glenwood Reserve to the north and west with residential development beyond; and Glenwood Park Drive to the east, with a drainage channel and residential development beyond. Refer to **Figure 3** and **Figure 4** overleaf.

Bus stops are located on Forman Avenue and Glenwood Park Drive for public bus services. A dedicated school bus pull-in loop road is provided on the school's frontage to Glenwood Park Drive. Bella Vista Metro station is approximately 600m to the east of the site.

A dedicated school student car drop off/pick up facility is provided along Forman Avenue. This takes the form of a slip lane and kerbside lane parking. The combined pick up / drop off facility is approximately 180 metres long.

Glenwood High School is located approximately 520m south of Parklea Public School, 1.5km to the southwest of Bella Vista Public School, and 3.5km to the east of Quakers Hill High School.

The built form and land use character surrounding the site is predominantly low scale, 1-2 storey dwelling houses. The site has a total area of 60,790m². The site is legally described as Lot 5227 in Deposited Plan 868693.



Figure 3: Local Context Map (Source: Metromaps 2021 with Architectus overlay)



Figure 4: Site Context Map (Source: Metromaps with Architectus overlay)

4 Development on the existing site

Glenwood High School is a co-educational high school and includes the following existing buildings and facilities:

- Ten (10) existing buildings comprising:
 - Building A and B: double storey classroom building,
 - Building C: double storey classroom building with a fitness laboratory on the ground floor,
 - Building D: double storey building with administration and staff facilities on the ground floor and classrooms on the first floor,
 - Building E: double storey building with classrooms and science laboratories on the ground floor and main library on the first floor,
 - Building F: staff building,
 - Building G, H and J: single storey classroom buildings (Block J contains school canteen); o Building K: single storey gymnasium, and
- There is an existing single storey childcare centre (known as Building L) at the southwestern corner of the site,

- Nineteen (19) single-storey demountable buildings, seventeen (17) of which comprise general learning spaces and two (2) which comprise of staff rooms,
- At-grade carpark accessed from two separate vehicular access points on Forman Avenue for high school staff. Refer to traffic engineer for detail,
- Three (3) support learning units,
- Existing on site bicycle parking racks are provided in the south east corner of the school near the staff parking facility,
- Outdoor spaces comprising:
 - Quadrangle space between Buildings C, B and E,
 - Playing Field at the north-western corner of the site,
 - Games Court to the east of the playing field,
 - Covered outdoor space adjacent to the canteen, and
 - Grassed open play area in the centre of the site.
- There are three (3) pedestrian access points to the school, including:
 - One access point from Glenwood Park Drive and
 - Two access points from Forman Avenue.
- The primary drop-off and pick-up area is located at Forman Avenue.

Existing services have been investigated through site drawings and survey. Where services clash with the proposed development they will need to be relocated, diverted, or removed. Redundant services will be capped off and/or removed.

Whilst attempts have been made to identify all services which will be impacted, there is still the possibility that unknown services are encountered during any future demolition or construction. This is due to some services being untraceable due their type, such as optical fibres in plastic pipes without a tracer wire or ceramic pipes; not being able to see the service due to depth of cover (outside the range of the service detector).

4.1 Existing Stormwater

Existing stormwater throughout the site consists of stormwater lines connecting to downpipes for most of the buildings, and surface pits to collect stormwater overland flow in impervious areas. Council stormwater infrastructure is located in Glenwood Park Drive and Forman Avenue (Refer **Figure 5**).

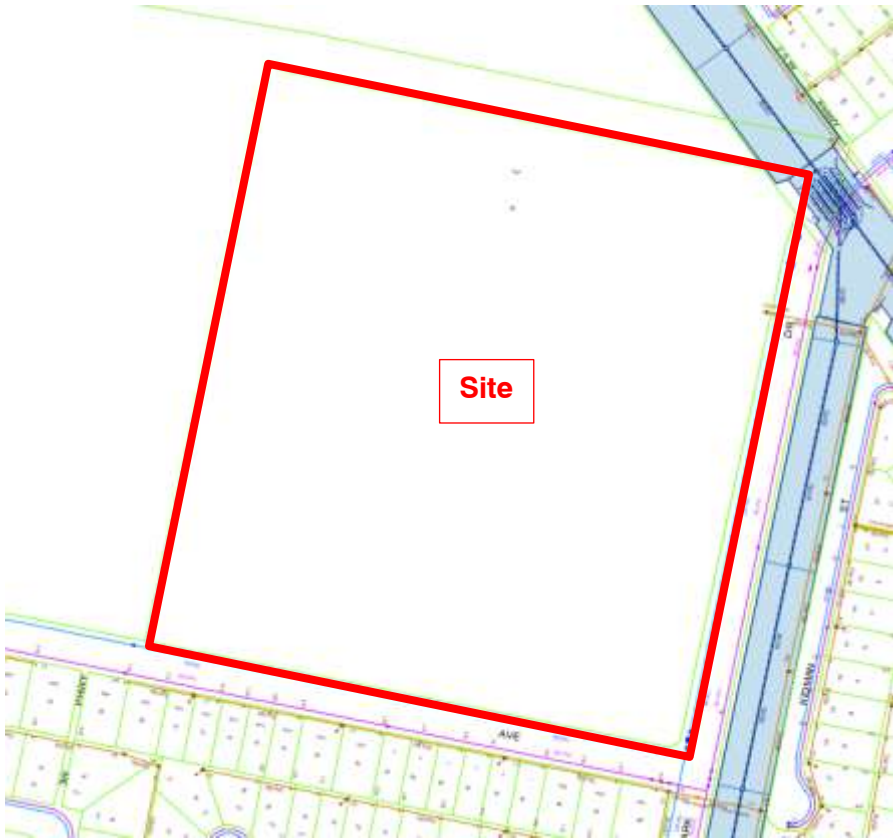


Figure 5: Stormwater Infrastructure (Source: Dial Before You Dig)

4.2 Geotechnical Assessment

A Geotechnical Investigation has been undertaken by Douglas Partners (94626.00 R.001.Rev0). The report identifies the following soil profile on the site as shown in **Table 1**.

A bulk earthworks plan, showing extent of batters, & depth of cut and fill is provided in **Appendix F**.

Table 1: Site Soil Profile

Type	Depth
Silty Clay Topsoil	To 0.1m - 0.2m
Silty Clay or Sandy Silt Fill	To 0.1m – 0.9m
Natural Soil	To 0.5m – 4.6m
Very low and low strength, moderated weathered siltstone	To 1.8m
Low and medium strength, moderately to highly weathered siltstone	To 3.0m
High strength, unbroken siltstone	To 4.9m – 5.1m

4.3 Soil Contamination

The site is not identified as being contaminated by Acid Sulphate Soils as per NSW Government SEED Mapping. Douglas Partners Detailed Site Investigation (R.002.Rev0) report for contamination outlined that the potential for contamination exists at the site. These locations are identified in **Figure 6**.

PAEC#	Identified from	Description
1	Site Inspection	Refurbished Demountable Structures may contain remnant asbestos
2	1947 – Present Aerials and Site History Review	Fill placed across the site for the formation of site levels and the backfilling of the creek in the north-east corner of the site
3	1947 – Present Aerials Site History Review	Previous Agricultural Activities

Figure 6: Potential Areas of Environmental Concern on site

5 Stormwater Design

The stormwater design must be in accordance with Australian Standards, Blacktown City Council's Engineering Guide 2005 for Development Chapter 4 Drainage Design, Australian Rainfall and Runoff (2019), and School Infrastructure NSW's Educational Facilities Standards & Guidelines (hereafter EFSG) section DG95 Stormwater.

In general, all new roof stormwater will be collected in roof gutters and downpipes and conveyed to the in-ground pipe system to the rainwater reuse tank. A primary in-ground piped stormwater and subsoil drainage system will collect and dispose of stormwater running onto and off the developed site. Surface stormwater will be collected in pits. A secondary stormwater drainage overland flow system will safely and effectively dispose of stormwater in the event of partial or complete blockage of the primary system.

Pipes and pits will need to be designed to satisfy the minimum provisions of AS 3500.2. The in-ground piped drainage system will be designed to convey, at least, the 5% Annual Exceedance Probability (AEP) flows. Where pipe capacity is exceeded i.e., greater than 5% AEP, stormwater will be conveyed as overland flow. Overland flow paths are to be designed to convey at the minimum 1% AEP stormwater flows with a velocity x depth product to be less than 0.4m²/s, in accordance with NSW Floodplain Management Manual (2001). Scour protection will be provided for pipe outlets and overflows. Refer to **Appendix C** for the stormwater management plan.

5.1 Onsite Stormwater Detention (OSD)

As per the Blacktown City Council Engineering Guide for Development, the High School is located in a Hawkesbury River sub-catchment area that requires permanent OSD (Refer **Figure 7** overleaf).

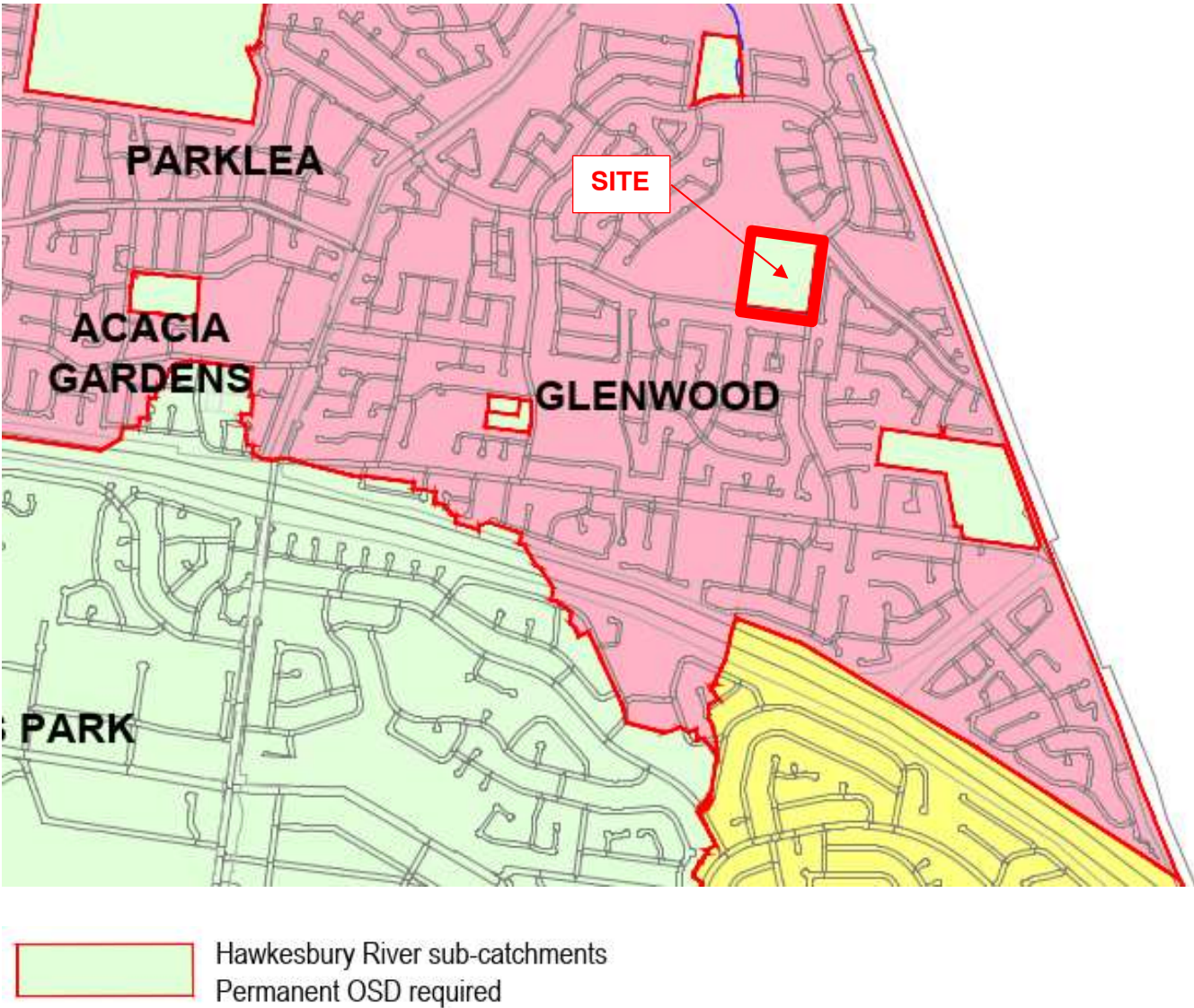


Figure 7: Blacktown OSD Catchment Areas (Source: Blacktown City Council Engineering Guide for Development)

OSD calculations indicate that a total OSD storage area of **288m²** is required to adequately manage the stormwater runoff from the site. The onsite detention calculation sheet in **Appendix B** demonstrates the sizing calculations undertaken in accordance with Blacktown City Council OSD Deemed to Comply Tool - Developer's Edition v2.2.0.

The OSD systems are to be located at the lowest point of their catchment area to ensure all surface flows will be directed to the OSD, even in the event of a pipe system failure. OSD is to be located away from any natural watercourses and Overland Flow Paths (OLFP) from catchments external to the site and are not to be inundated by a natural watercourse or externally sourced OLFP in any events up to and including the 1% AEP storm event.

The Blacktown City Council notes the preference of above ground, open, absorption OSD systems. Ponding water level height for an open OSD area above ground is to be a maximum of 200mm to prevent the risk of drowning, as required by NSW School's Infrastructure requirements. An approximately area required for an open basin would be 6000m². Consequently, an underground OSD tank system has been chosen in the design to allow for a larger depth of water to be captured in the detention method. The underground detention tank will be in an area where it can be readily accessed for inspections and maintenance. As much as possible of the development site area will drain through the OSD system(s). All systems shall use a minimum of two orifice plates to control flows. The 50% AEP orifice shall be designed to convey a maximum of **3.3 L/s**. The 1% AEP orifice shall be designed to convey a maximum of **85 L/s**. The minimum volume up to the 50% AEP weir level must equal 300m³/ha. The minimum volume up to the 1% AEP weir level must equal 455 m³/ha. Refer to **Appendix C** for the stormwater management plan.

6 Flooding

As per the Blacktown City Council Engineering Guide for Development 2005, the site is not identified as flood prone (**Figure 8**). However, in consultation with Council, a flood study is required to be undertaken to determine any flood impacts. Consequently, a flood study has been undertaken separately to this report with results presented in the Civil Engineering Flood Study Report by enstruct.

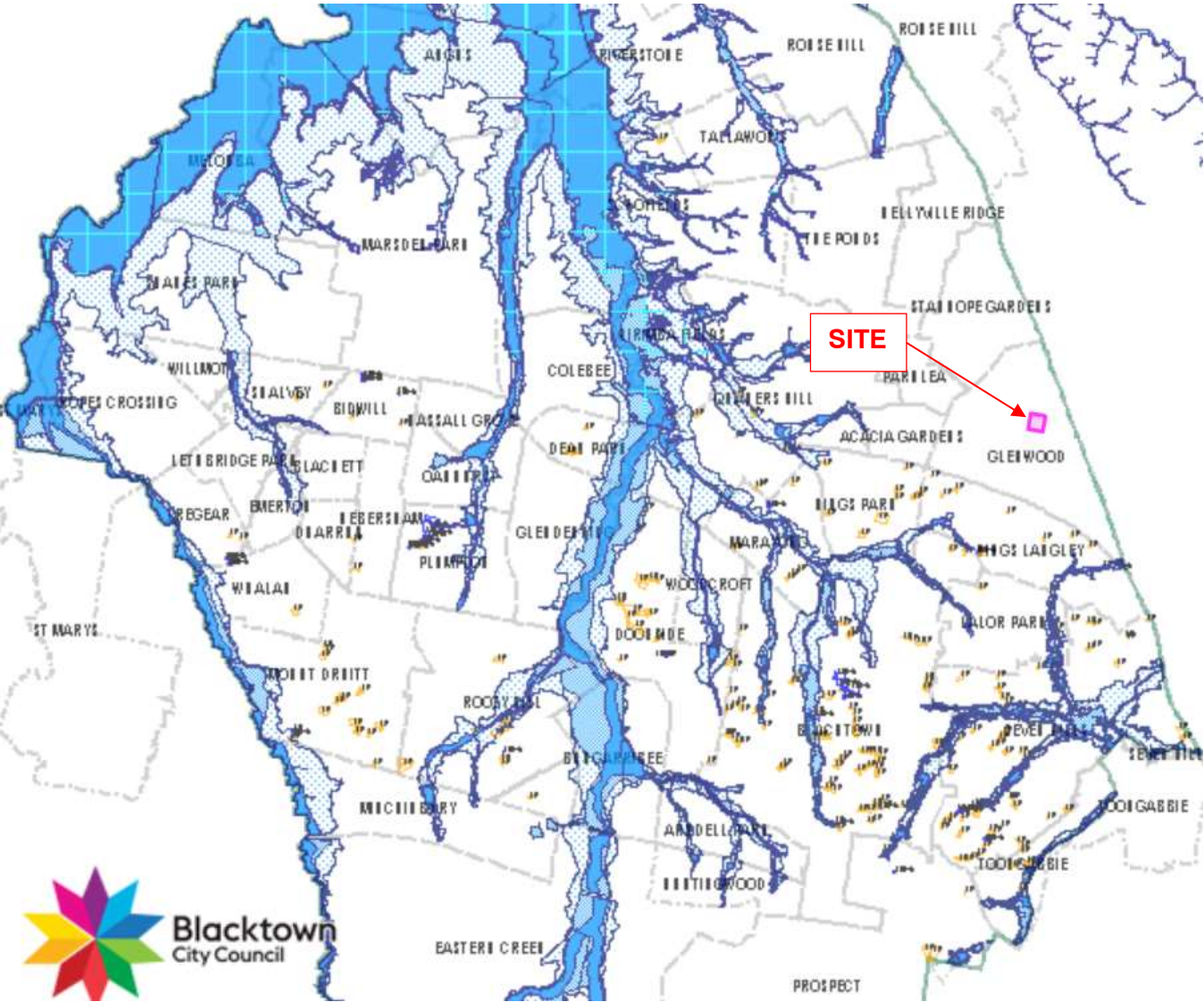


Figure 8: Blacktown Flood Extents (Source: Blacktown City Council Engineering Guide for Development)

6.1 Stormwater Quality

Stormwater quality will be managed using various Water Sensitive Urban Design (WSUD) strategies which will treat the water to meet pollutant reduction targets set out in the Blacktown City Council's Stormwater Management report (Table 2). Refer to Appendix C for the stormwater management plan.

Table 2: Required Pollutant Reduction Targets

Pollutant	Stormwater Reduction Target
Total Suspended Solids	85% reduction in the post development mean annual load
Total Phosphorous	65% reduction in the post development mean annual load
Total Nitrogen	45% reduction in the post development mean annual load
Gross Pollutants	90% reduction in the post development mean annual load

The safety to the school population needs to be considered when designing WSUD measures. Therefore, physical (in lieu of natural removal) pollutant removal devices will be incorporated to remove gross pollutants, suspended solids, and reduce nutrient runoff including nitrogen and phosphorous. The pollution control devices will require ongoing maintenance and at least a yearly inspection and maintenance.

It is proposed that a series of pollution control devices will need to be provided to remove contamination from stormwater runoff to the required level prior to discharge. The devices will include:

- Litter screens in all stormwater pits
- Trash screen in detention tank
- End of line treatment device (Ocean Protect StormFilter Cartridges) to remove nitrogen and phosphorus contaminants etc. prior to discharge to the Council stormwater system.

A physical removal treatment train system is preferred to an above ground system as it will be able to achieve pollutant reductions required, is easily maintained, and does not pose a safety risk to the school population.

Pollutant removal rates as required by Council are to be in accordance with best practice. WSUD is also to be designed in accordance with:

- The EPA's manual on Managing Urban Stormwater (Treatment Techniques)
- Stormwater Treatment Devices User Guide (NSW Supply) – Government Contract No.019, July 1999, Department of Public Works and Services
- The relevant Australian Standards for pollution control devices.

6.1.1 MUSIC Model

A water quality analysis has been undertaken by enstruct to develop the WSUD strategy for the proposed development, and to assess its ability at meeting Blacktown City Council water quality targets. The water quality modelling for this study was undertaken using the industry standard software model MUSIC (Model for Urban Stormwater Improvement Conceptualisation) Version 6.3.0. The MUSIC model layout representing the proposed WSUD strategy for the development and results are shown in Figure 9.

The analysis indicates that **thirteen (13)** 690mm ZPG StormFilter cartridges, with a treatment flow rate of 0.9L/s each, and **five (5)** Ocean Guard litter pit inserts, incorporated into the in-ground stormwater system will treat the stormwater to meet Council requirements, prior to site discharge.

Refer to Appendix D for MUSIC inputs. Refer to Appendix G for information on rainwater reuse including treatment using UV etc.

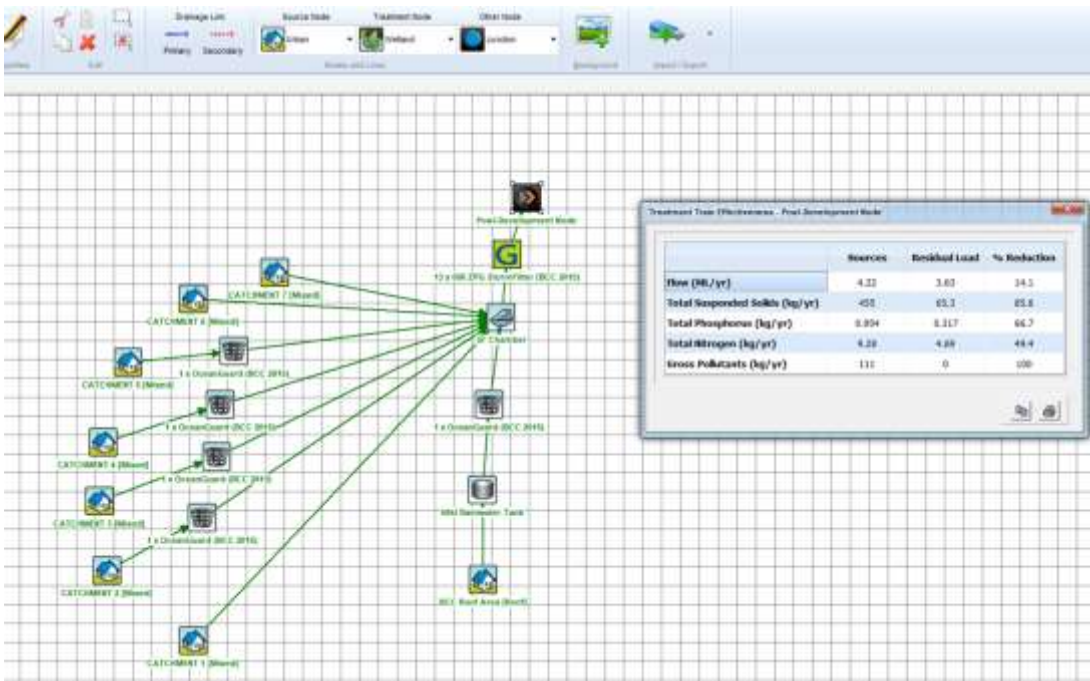


Figure 9: MUSIC Model and Pollutant Reduction Loads

6.1.2 Ocean Guard Pit Inserts

Pit inserts, also known as litter baskets, are considered as an at-source primary treatment solution. Litter baskets are an efficient and cost-effective pre-screening primary treatment system that captures and retains gross pollutants at drainage entry points. Pit inserts, consisting of a capture basket and a filter mesh liner, are usually fitted below the road invert or surface of the pit and hence are visually unobtrusive. 200 micron OceanGuards are to be provided

Cleaning of the pit inserts is undertaken either manually or using a small vacuum truck.

6.1.3 StormFilter Cartridges

StormFilter Cartridges are an effective method of removing contamination from stormwater before site discharge. The stormwater passes through the filtration media in the cartridge centre tube. As the water rises, a check valve will engage and allow the filtered water to exit the cartridge and move towards discharge from the tank. **Figure 10** shows the general detail of a StormFilter cartridge.

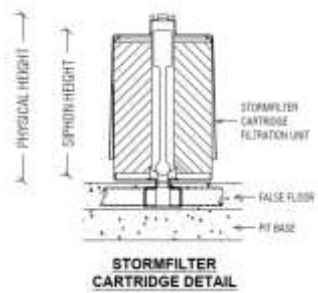


Figure 10: StormFilter Cartridge Detail

6.1.4 Rainwater Tank and Rainwater Treatment

Richard Crooks have designed the rainwater tank treatment process. Refer to excerpt below which is from the hydraulic report on re-use treatment.

A non-potable cold-water pressure pump system complete with filtration and UV disinfection shall be provided by Aline Pumps to achieve delivery pressures to transport the recycled water from the recycled water tank and reticulate throughout the building.

Further, Richard Crooks has sized the tank required to meet 80% non-potable water (flushing toilets and irrigation) demand, however the tank has been oversized by 10% as requested by Council.

Richard Crooks reuse calculations provided in **Appendix G**.

6.2 Overland Flow

If the piped in-ground stormwater system fails due to blockage or other obstruction, stormwater flows will be required to be conveyed as overland flow. The overland flow is to be directed away from buildings and towards the sites' northern and eastern boundaries. Overland flow paths will be sized to accommodate the 1% AEP storm flows.

6.3 Erosion and Sediment Control

During construction and while the site is disturbed, erosion prevention and sediment control measures will be required. Erosion prevention generally involves managing stormwater by diverting overland flow around construction areas as well as collecting stormwater within the construction zone and directing to sediment control devices. Devices incorporated is the design include siltation fences, hay bales, grass lined swales, and water flow dissipation and discharge control devices such as sand bags, pollution mattresses, and basins.

Erosion prevention and sediment removal strategies need to be inspected regularly during service and construction works, cleaned, and maintained after storm events, and modified to suit construction work progress, decanting, and demolition.

Erosion and sediment control is to be provided in accordance with the "Blue Book" Part 1 [Landcom (2004) Managing Urban Stormwater: Soils and Construction, 4th edition]. Refer to **Appendix E** for the erosion and sediment control plan.

7 Conclusion

A total OSD storage area of 288m² is required to adequately manage the stormwater runoff from the site to below the required PSD.

All systems shall use a minimum of two orifice plates to control flows. The 50% AEP orifice shall be designed to convey a maximum of 3.3 L/s. The 1% AEP orifice shall be designed to convey a maximum of 85 L/s. The minimum volume up to the 50% AEP weir level must equal 300m³/ha. The minimum volume up to the 1 % AEP weir level must equal 455 m³/ha.

A flood study has been undertaken separately to this report with results presented in the Civil Engineering Flood Study Report by enstruct. In the event of pit and pipe blockage, overland flow paths are to be constructed to accommodate the 1% AEP storm flows and direct stormwater safety to the northern and eastern site boundaries.

MUSIC analysis indicates that thirteen (13) 690mm TPZ StormFilter cartridges, with a treatment flow rate of 0.9L/s each, and with Ocean Guard litter pit inserts, incorporated into the in-ground stormwater system will treat the stormwater to meet Council requirements, prior to site discharge.

During construction and while the site is disturbed, erosion prevention and sediment control measures will be required in accordance with the “Blue Book” Part 1 [Landcom (2004) Managing Urban Stormwater: Soils and Construction, 4th edition].

This report has been revised to address Blacktown Council’s correspondence dated 21 March 2021 and 13 May 2022.

APPENDIX A

COUNCIL TRACKING SPREADSHEET AND OSD
CORRESPONDENCE

RE: Issue with S3QM tool



Tony Merrilees <Tony.Merrilees@blacktown.nsw.gov.au>

To Prawal Adhikari

Cc Mark Liebman

↩ Reply

↩ Reply All

➔ Forward

⋮

Tue 1/06/2021 11:38 AM

Cc: Mark Liebman <Mark.Liebman@blacktown.nsw.gov.au>

Subject: RE: Issue with S3QM tool

Hi Prawal

The issue here is the complex relationship between the State Government (who operate the public schools) and Local Government. This relationship changes over time and consequently S3QM cannot provide a definite response at this time.

This site will require permanent OSD, water conservation and water quality for the extent of new works. Please refer to Council's WSUD developer handbook available on-line to assist.

I have attached the latest OSD spreadsheet in lieu of S3QM. Please ensure you press ENTER after every line including drop downs.

Water quality will be assessed using MUSIC. The Blacktown nodes can be found on MUSIC-Link

I am unsure of the extent of works but if they include new toilet blocks or landscape areas they will have a water conservation target of 80% reuse.

Hope that helps.



12	From an emergency response perspective, EES recommends that a site-specific emergency response plan (ERP) is prepared. The preparation and implementation of an ERP will help ensure the safety of students, teachers, parents, and other members of the school community. The ERP is to consider the following emergency management issues: 1. Access to school through Shaun Street, Chelsea Terrace and Honeyeater Terrace will be cut during frequent and major flood events. This would require the ERP to consider strategies including safety signs to prevent driving in floodwater and ensure the safety of the school community. 2. Isolation and above floor flooding would occur during a significant event such as the PMF event. EES highlights that, proposed shelter in place to higher levels within the building (the proposed development) should not be adopted. Rather, the ERP should adopt safe evacuation from this building to adjacent buildings within the school site that are not impacted by flooding. This would ensure that students and users of the development will not be subject to above floor inundation or isolation for any period.	Refer to flood evacuation plan now produced
13	The drainage system for the proposed development including OSD, RWT (i.e. water conservation), Stormfilter System (i.e. water quality), and flooding are to be designed in accordance with Council's WSUD Developer Handbook 2020, Engineering Guide for Development 2005 and Council's WSUD Standard Drawings.	OSD and Rainwater tanks updated in the MUSIC model, in accordance with BCC WSUD developer handbook 2020 and BCC Engineering guide for development 2005. MUSIC model has been provided for review. Refer to report section 6.1.4 for rainwater tank information
14	A rainwater tank is required to meet the water conservation targets under Part J for the development. A minimum of 80% of non-potable water demand for the development is to be met through the reuse of rainwater. Non-potable water demand is to include landscape watering and toilet/urinal flushing. MUSIC is generally used to assess the performance of the rainwater tank using the node water balance and an electronic copy of the MUSIC model needs to be provided to Council for assessment.	MUSIC model has been revised to include rainwater reuse in line with the number of toilets provided as part of the proposed development. MUSIC model has been provided for review. Refer to report section 6.1.4 for rainwater tank information
15	Rename "Enviropods" to "OceanGuard" on the report and plans.	Enviropods renamed to Oceanguards in report and drawings. Detail on CV-0212 revised. Refer to report section 6.1.2 for revised information
16	All OceanGuards are to be clearly notated as "200 micron OceanGuards".	Detail on CV-0212 revised to be 200micron Oceanguards. Refer to report section 6.1.2 for revised information
17	Provide OSD catchment plan demonstrating which areas drain to the OSD and areas bypassing.	Catchment plan drawing, CV-0200, added, showing catchment areas
18	Provide a MUSIC catchment plan that shows both the land use and the areas contributing to each specific device. To make this more understandable it may be easier in many cases to split these into two separate plans. Include all bypassing catchments. Ensure that a minimum fraction impervious of 90% is adopted for land-use in the MUSIC model.	Catchment plan drawing, CV-0200, added, showing catchment areas. This plan is identical to the MUSIC model. Fraction impervious noted on the plan
19	The 1% AEP flows from the site are to be directed to the OSD. Demonstrate how the surface flows in excess of the pipe capacity are directed to the OSD system.	The 1% AEP flows are piped to the OSD tank. DRAINS model provided for review. Catchment plan drawing, CV-0200, added, showing catchment areas draining to the OSD system
20	All pits deeper than 1.2 m must provide step irons at 300 cts.	Pit step detail added to drawing CV-0212
21	The OSD Deemed to Comply Tool Spreadsheet levels do not match the OSD design and also includes incorrect design details for the proposed Filter Cartridges. The spreadsheet is to be amended to include correct Design Filter Cartridge Flow and Filter Cartridges flow with 1% AEP HED and ensure the levels match the design.	OSD and plans changed to suit deemed to comply requirements. Refer to the report in Appendix B for the OSD deemed to comply tool spreadsheet
22	The MUSIC model includes total development area of 4000 m2 whereas the OSD Deemed to Comply Tool Spreadsheet includes 6500 m2. Provide details of the proposed development area and amend both OSD spreadsheet and MUSIC model accordingly.	Catchment in MUSIC revised. MUSIC catchment replicates the areas shown in drawing CV-0200. Refer to the report in Appendix B for the revised OSD deemed to comply tool spreadsheet
23	Show how the roof water gets to the rainwater tank. Provide a separate system for roof water and surface drainage. Pits between the roof lines (i.e. charged pipes) are to be sealed.	Downpipe locations shown on drawing CV-0201. Downpipes are collected and discharged into the rainwater tank. The pipes from the roof are separate to the in-ground stormwater system
24	Provide details of the rainwater tank including pre-treatment, volumes, sections, dimensions etc.	Rainwater tank volume added to CV-0201 and the civil report. Pretreatment information referenced in the civil report - refer section 6.1.4. Hydraulic report added to the Appendix G of the civil report.
25	The 375 mm diameter outlet to the existing stormwater Pit 1 is to be RCP.	375mm dia pipe noted on RCP on drawing CV-0201
26	Provide levels of the existing street Pit 1 and confirm the connection level to this pit.	Existing pit 1 and connecting pipe level information added to drawing CV-0201
27	It is unclear whether Pits 18 and 27 are treating surface flows and all or only part of the upstream pipe flows as well. Provide detail for Pit 18 and 27 showing all invert levels for all pipes.	Catchment plan CV-0200 now included. Pits grate size and type upgraded to suit catchment plan. Refer to pit size schedule on CV-0001
28	OceanGuards should treat a maximum of 1000 m2 of non-roof areas and 1500m2 of roof areas. All OceanGuards are to be clearly notated as "200 micron OceanGuards".	Catchment plan CV-0200 now included. Oceanguard detail noted on drawing CV-0212 as 200microns. Refer to report section 6.1.2 for Oceanguard reference and correct 200micron notation
29	OceanGuards treating only surface flows require a minimum clear depth of 500 mm below the grate to any inlet or outlet pipe obvert. OceanGuards treating surface flows and upstream pipe flows require a minimum clear depth of 500 mm from the invert of the upstream pipes to be treated, to the obvert of the outlet pipe. Where these pits are treating upstream pipe flows the inverts of all pipes in and out of the pit are to be shown.	Pipe invert and pit levels provided onto drawing CV-0201 which indicates the oceanguard pit baskets are above the connecting pipes.
30	Where OceanGuards (Enviropods) are designed to treat upstream pipe flows, the invert levels on all pipes discharging to and from the pit are to be clearly shown. Provide a minimum clear depth of 500 mm from the invert of the upstream pipes to be treated to the outlet pipe obvert.	Pipe invert and pit levels provided onto drawing CV-0201 which indicates the oceanguard pit baskets are above the connecting pipes.
31	Provide a pit detail with an Oceanguard fitted.	Oceanguard detail now provided on drawing CV-0212. Refer to report section 6.1.2 for more details on the oceanguard
32	Review the pit size as 600 * 600 mm pits are limited to 600 mm maximum depth and 600 * 900 mm pits are limited to 900 mm depth. Pits greater than 900 mm depth are all to be minimum 900 * 900 mm. All pits within the proposed development must comply with these requirements.	Pit sizes as noted in the pit schedule on drawing CV-0001 are now noted as 900x900
33	Charge line cleanout pits are to be provided at the low point of all charge line systems for the rainwater tanks to facilitate cleaning of the system.	The base of all downpipes have cleanout ability as per SINSW requirements. SINSW downpipe requirements are shown on drawing CV-0211
34	The 450 mm diameter inlet pipe into the Stormfilter chamber is smaller than the 375 mm diameter outlet pipe from the OSD tank discharging to Councils existing drainage system. Provide details to ensure that the overflow from the OSD tank can surcharge safely to the street and away from any class rooms and does not impact adjacent properties.	These pipe sizes are correct. Pipe decreases as we are slowing the water flows from the property as required by BCC Engineering guide for development 2005. DRAINS model provided for review. Should the tank block, discharge is directly to the street. Maximum flow rate will be dependant on tank in flow rate.
35	The design levels in the OSD tank do not match the S3QM Certificate Results or the OSD Deemed to Comply Tool Spreadsheet. Ensure consistency between the design.	OSD tank design shown on drawing CV-0212 revised to meet the OSD Deemed to comply Tool Spreadsheet. Spreadsheet provided for review. Refer to Appendix B for the OSD Deemed to Comply Tool Spreadsheet

36	Rename 100 year ARI to 1% AEP on all notes and plans.	Civil report has replaced the 100Yr ARI with 1% AEP terminology . Drawing CV-0213
37	Rename 1.5 year ARI to 50% AEP on all notes and plans.	Civil report has replaced the 100Yr ARI with 1% AEP terminology. Drawing CV-0213
38	Provide more details for the Stormfilter tank and how the overflow chamber will work.	Drawing CV-0213 shows calculations and configuration of the OSD tank which meets the requirements of BCC Engineering guide for development 2005
39	Confined space entry warning signs are to be detailed on the drainage plans adjacent to all entries into the Stormfilter Chamber in accordance with Council's Engineering Guide for Development 2005.	Signs added to drawing CV-0213
40	Provide a minimum 2% slope in the OSD storage. For larger tanks this can be in the form of a 2% cross-slope to a central "V" drain with 2% longitudinal slope along the "V" drain. Reassess tank dimensions to achieve the minimum storage volumes.	Note added to drawing CV-0213 indicating V drain dn 2% tank fall
41	There are insufficient access grates for the below ground detention tanks. Access grates to the below ground detention tank must be a minimum 900 mm by 900 mm and are positioned such that the maximum distance from any point in the tank to the nearest grate is not greater than 4 m.	Additional grades added to Drawings CV-0213 and CV-0201 which meet BCC requirements for access
42	The orifice within the Discharge Control Pit is to be protected by a suitable screen. Provide Maximesh Rh3030 for orifice diameters 150 mm or less with a minimum area of 50 times the orifice area and Weldlok F40/203 for orifices 150 mm diameter or more with a minimum area of 20 times the orifice area.	Trash screen detail added to drawing CV-0212
43	On the tank plan view, provide separate dimensions for the OSD tank and Stormfilter Chamber.	Dimensions added to drawing Drawing CV-0213 indicating chamber sizes
44	Provide a sealed impermeable baffle, or hood set 250 mm upstream of the Stormfilter weir and extending from the sealed underside of the tank to 400 mm below the top of the weir for the 690 mm Stormfilter cartridge to, to contain floatables including oil. The Stormfilter weir level is to be set 770 mm above the false floor.	Drawing CV-0213 shows calculations and configuration of the OSD tank which meets the requirements of BCC Engineering guide for development 2005. Drawing CV-0213 now shows the baffle as required for the stormwater tank
45	The minimum length of the Stormfilter weir (L) is to be increased to provide a maximum velocity of 0.4 m/s under the baffle during peak flow (i.e. $L > Q100 / (0.4 \times 0.25)$, or $L > 10 \times Q100$ in m, where Q100 is in m3/s). Provide calculations.	Weir calculations added to drawing CV-0213. Weir size corrected to suit calculations
57	The MUSIC model breakdown is incorrect and includes only one node representing the proposed development. The model is to be amended to include appropriate nodes representing the proposed land-use draining to the specific water quality devices. The MUSIC model is to include the total proposed development area (including bypass areas). The MUSIC model is to be in accordance with Council's WSUD Developer Handbook 2020.	MUSIC model has been revised with corrected catchment to suit drawing CV-0200
58	The proposed water quality system is to meet the required post development pollutant reduction targets indicated under Part J of Councils DCP.	MUSIC model has been revised and provided for review. The civil report indicates the efficiency of the proposed water quality system. Refer to section 6.1.4 for the rainwater tank including rainwater treatment
59	A Rainwater tank is required to meet the water conservation targets under Part J for the development. A minimum of 80% of non-potable water demand for the development is to be met through the reuse of rainwater. Non-potable water demand is to include landscape watering and toilet/urinal flushing.	MUSIC model has been revised to include rainwater reuse in line with the number of toilets provided as part of the proposed development. MUSIC model has been provided for review. Refer to report section 6.1.4 for rainwater tank information. Hydraulic report provided in Appendix for information on reuse
60	MUSIC is generally used to assess the performance of the rainwater tank using the node water balance and an electronic copy of the MUSIC model needs to be provided to Council for assessment.	MUSIC model has been revised and has been provided for Council review
61	Allow for a minimum usage rate of 0.06 kL/day/toilet or urinal and a minimum of 0.4 kL/m2/ year for landscape watering (excluding turfed areas).	Reuse rate has been included in the MUSIC model. MUSIC model has been provided for review. Refer section 6.1.4 and Appendix G for hydraulic information on rainwater reuse
62	Allow for a 10% loss in rainwater tank size volume in MUSIC to that shown on the design plans. e.g. where a 50kL tank is modelled, construct a 55kL tank.	Rainwater tank size has been corrected to be 55kL. Refer to Section 6.1.4 of the civil report and also refer to information shown on drawing CV-0201.
63	Ensure that the areas draining to surface inlet pits with OceanGuards match the engineering plans.	Drawing CV-0201 updated with surface inlet pits collecting surface flows, which matches the catchment plan drawing CV-0200. Litter baskets noted in the pit schedule on drawing drawing CV-0001. Oceanguard detail provided on drawing CV-0212
64	Ensure that Blacktown Council's specific MUSIC modes are used for the total development area draining to the devices.	MUSIC model updated with BCC specific nodes for analysis. MUSIC model provided for review
65	The minimum Stormfilter chamber area is to be No. of Cartridges x 0.177 m2/cartridge excluding the area of the weir.	Stormfilter chamber size revised with weir dimensions shown on drawing CV-0213
66	Ocean Protect has advised that the maximum storage permitted below the Stormfilter weir to ensure effective operation of the filter cartridges is limited to an equivalent volume derived from 2.0 mm of rainfall (20 m3/Ha) without losses, falling over the site area that drains to the Stormfilter chamber (ignoring any bypass area).	Stormfilter chamber size revised with weir dimensions shown on drawing CV-0213
67	When calculating the area of detention for Stormfilters, the design area for MUSIC is the area of the cartridge bay, less the area of the weir, less 0.177 m2 per cartridge. The detention depth is the height of the Stormfilter weir above the filter false floor (i.e. the cartridge height plus 80 mm) and the low flow pipe diameter is determined from the combined cartridge flow at the Stormfilter weir height assessed as orifice flow. A spreadsheet is available from Ocean Protect.	Cartridge bay has been sized correctly using Oceaprotects spreadsheet with dimensions added to drawing CV-0213
68	The area above the on-site detention storage itself and the catchment areas draining to it are considered as bypass where they do not enter the Stormfilter chamber.	Catchment plan drawing CV-0200 added to the drawing set showing pit and pipe catchments. There is no intended bypass from the proposed development
69	Resubmit all models and OSD Deemed to Comply Tool spreadsheet electronically for Council assessment.	OSD deemed to comply tool spreadsheet has been updated and is submitted on the onedrive link for review. Refer to the civil report Appendix B for submitted spreadsheet
71	Clearly show details of all pits including surface levels and invert levels.	Drawing 0201 now shows stormwater pipe inverts and pit levels
72	Provide more details for the Stormfilter tank such as false floor level and thickness, impermeable battle distance upstream of Stormfilter weir etc.	Drawing 0213 has been updated with 100mm false floor, baffle distance, and operation with a sealed lid
73	Provide details of how the overflow chamber will operate with the sealed lid. A rainwater tank is required to meet the water conservation targets under Part J for the development. A minimum of 80% of non-potable water demand for the development is to be met through the reuse of rainwater. Non-potable water demand is to include landscape watering and toilet/urinal flushing.	A rainwater tank is being provided refer Appendix D for compliance with Part J. Also refer to MUSIC model provided for assessment
74	MUSIC is generally used to assess the performance of the rainwater tank using the node water balance and an electronic copy of the MUSIC model needs to be provided to Council for assessment. Can we get confirmation in the Civil Report or Appendix G of the report that the larger rainwater tank of 55kL provides for 80% of the non-potable water demand of the development? Notwithstanding, it's hard to tell how even the 55kL can cater for 80% of the demand whilst allowing a 10% loss in rainwater tank size volume in MUSIC to that shown on the design plans	Refer Appendix G for water reuse efficiency
75	Check drawing 0201 (A) is correct because it seems some notations have been cut off at the top of the page	Redundant leader removed
76	Confirm whether OceanGuards treats a maximum of 1000 m2 of non-roof areas and 1500m2 of roof areas;	All roof areas, as shown on 0201 are directed to the RWT for cleaning and reuse. It is confirmed that non roof area draining to pits have an area no greater than 1000m2. Refer catchment plan 0200
77	The targets indicated in Section 6.1 of the Civil Report seem to be missing the 90% target for total hydrocarbons that is required under Part J of Council's DCP	No hydrocarbons are specifically targeted as none are being produced i.e. no additional parking is being provided on the site, from which, it is not possible to reduce hydrocarbons by 90%
78	CV-0001 seems to be missing some numbers between 1 and 42	Only proposed pits or existing pits with changes are shown in the schedule - existing pits are numbered in plan however if no changes are proposed they are not in the schedule

APPENDIX B

BLACKTOWN CITY COUNCIL ONSITE
STORMWATER DETENTION OSD Deemed to
Comply Tool - Developer's Edition v2.2.0
SPREADSHEET

B2																			
Glenwc																			
																		Ref: 26/05/2022	
<u>Site:</u>																			
Address		Glenwood Park Drive and Forman Avenue																	
Site Area		6030 m²																	
Site Area NOT Draining to OSD		0 m²																	
Bypass		0%																	
<u>Reduced Levels (AHD):</u>																			
② RL of soffit (top) of tank		59.600																	
① Average RL of the base of the OSD Tank		57.950																	
③ RL of Emergency Overflow Weir		59.428																	
RL of 50% AEP Overflow Weir		58.925																	
⑤ RL of 50% AEP Orifice Center Line		58.000																	
⑥ RL of 1% AEP Orifice Center Line		57.800																	
⑦ RL of Invert of Discharge to Downstream Pit		57.570																	
⑧ RL of Obvert of pit outlet pipe		57.920																	
Minimum RL of Garage Floor		59.700																	
Minimum RL of Habitable Floor		59.800																	
<u>OSD Volume:</u>																			
Required Storage BELOW the 50% AEP Overflow Weir		190.049																	
Required Storage BELOW Emergency Overflow Weir		288.241																	
<u>Discharge Details:</u>																			
Using Filter Cartridges to manage Water Quality		Yes																	
Discharge Location		Drainage Pit																	
Length of Emergency Overflow Weir		3.500																	
Maximum 50% AEP Site Discharge		24.120																	
Maximum 50% AEP Orifice Discharge		3.320																	
Maximum 1% AEP Site Discharge		114.570																	
Maximum 1% AEP Orifice Discharge		85.050																	
Total Filter Cartridges Design Flows		20.800																	
Total Filter Cartridges 1% AEP Flows		29.520																	
<u>Orifice Details:</u>																			
Number of 50% AEP Orifices		1.000																	
Number of 1% AEP Orifices		1.000																	
50% AEP Orifice Diameter (mm)		40.500																	
1% AEP Orifice Diameter (mm)		177.500																	
<u>Notifications:</u>																			
Due to the 1% AEP orifice being drowned by 16.58%, 5.06% of storage volume has been added.																			
Access grates to be provided such that the maximum reach from any point in the tank to the nearest grate is 4m.																			

Print Summary

Back to OSD Tool

OSD Tool

Summary Page

APPENDIX C

STORMWATER MANAGEMENT PLANS

BOUNDARY AND EASEMENT NOTE

The property boundary and easement locations shown on enstruct drawing's have been based from information received from: CMS SURVEYORS PTY LTD

enstruct makes no guarantees that the boundary or easement information shown is correct. enstruct will accept no liabilities for boundary inaccuracies. The contractor/builder is advised to check/confirm all boundaries in relation to all proposed work prior to the commencement of construction. Boundary inaccuracies found are to be reported to the superintendent prior to construction starting.

CONCRETE FINISHING NOTES

- 1. All exposed concrete pavements are to be broomed finished.
- 2. All edges of the concrete pavement including keyed and dowelled joints are to be finished with an edging tool.
- 3. Concrete pavements with grades greater than 10 % shall be heavily broomed finished.
- 4. Carborundum to be added to all stair treads and ramped crossings U.N.O.
- 5. All concrete to be coloured in accordance with EFSG requirements.

CIVIL SAFETY IN DESIGN

enstruct (NSW) Pty Ltd operates under Safe Work Australia's code of Conduct for the Safe Design of Structures. These drawings shall be read in conjunction with the enstruct Transfer of Information Letter and Civil risk and Solutions Register. Under the Code of Conduct it is the Client's responsibility to provide a copy of the Civil Risk and Solutions Register to the Principal Contractor.

It is the Principal Contractor's responsibility to review the hazards and risks identified during the design process to ensure a safe workplace is maintained for the construction, maintenance and eventual demolition of the civil infrastructure.

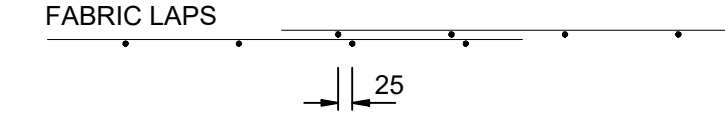
DBYD SERVICES NOTE

"Public Service Utility information shown on plan has been compiled from information received from Dial Before You Dig inquiry, reference Number 21546958, which was obtained on 05/03/2021. Unless specifically shown otherwise, this location and depth of services shown on this plan have not been verified.

The location of services shown on this drawing have been plotted as accurately as possible from diagrams provided by service authorities and should be confirmed by site inspection."

REINFORCEMENT NOTES

- 1. Fix reinforcement as shown on drawings. The type and grade is indicated by a symbol as shown below. On the drawings this is followed by a numeral which indicates the size in millimetres of the reinforcement.
 - N. Hot rolled ribbed bar grade D500N
 - R. Plain round bar grade R250N
 - SL Square mesh grade 500L
 - RL Rectangular mesh grade 500L
- 2. Provide bar supports or spacers to give the following concrete cover to all reinforcement unless otherwise noted on drawings.
 - Footings - 50 top, 50 bottom, 50 sides.
 - Walls
 - 40 generally.
 - 40 when cast in forms but later exposed to weather or ground.
 - 50 when cast directly in contact with ground.
- 3. Cover to reinforcement ends to be 50 mm u.n.o.
- 4. Provide N12-450 support bars to top reinforcement as required, Lap 500 U.N.O.
- 5. Maintain cover to all pipes, conduits, reglets, drip grooves etc
- 6. All cogs to be standard cogs unless noted otherwise.
- 7. Fabric end and side laps are to be placed strictly in accordance with the manufacturers requirements to achieve a full tensile lap. Fabric shall be laid so that there is a maximum of 3 layers at any location.



- 8. Laps in reinforcement shall be made only where shown on the drawings unless otherwise approved. Lap lengths as per table below.

GENERAL NOTES

- 1. Contractor must verify all dimensions and existing levels on site prior to commencement of works. Any discrepancies to be reported to the Engineer
- 2. Strip all topsoil from the construction area. All stripped topsoil shall be disposed of off-site unless directed otherwise.
- 3. Make smooth connection with all existing works.
- 4. Compact subgrade under buildings and pavements to minimum 98% standard maximum dry density in accordance with AS 1289 5.1.1. Compaction under buildings to extend 2m minimum beyond building footprint.
- 5. All work on public property, property which is to become public property, or any work which is to come under the control of the Statutory Authority; the Contractor is to ensure that the drawings used for construction have been approved by all relevant authorities prior to commencement site.
- 6. All work on public property, property which is to become public property, or any work which is to come under the control of the Statutory Authority is to be carried out in accordance with the requirements of the relevant Authority. The Contractor shall obtain these requirements from the Authority. Where the requirements of the Authority are different to the drawings and specifications, the requirements of the Authority shall be applicable.
- 7. For all temporary batters refer to geotechnical recommendations.

REFERENCE DRAWINGS

- 1. These drawings have been based from, and to be read in conjunction with the following Consultants drawings. Any conflict to the drawings must be notified immediately to the Engineer.

Consultant	Dwg Title	Dwg No	Rev	Date
------------	-----------	--------	-----	------

CONCRETE NOTES

EXPOSURE CLASSIFICATION : External :B2

CONCRETE

Place concrete of the following characteristic compressive strength f_c as defined in AS 1379.

Location	AS 1379 f _c MPa at 28 days	Specified Slump	Nominal Agg. Size
Kerbs and Paths	N20	80	20
Pavements	SF32	80	20
Retaining wall footing	S40	80	20

- 1. Use Type 'GP' cement, unless otherwise specified.
- 2. All concrete shall be subject to project assessment and testing to AS 1379.
- 3. Consolidate by mechanical vibration. Cure all concrete surfaces as directed in the Specification.
- 4. Unless shown on the drawings, the location of all construction joints shall be submitted to Engineer for review.
- 5. No holes or chases shall be made in the slab without the approval of the Engineer.
- 6. Conduits and pipes are to be fixed to the underside of the top reinforcement layer.
- 7. Slurry used to lubricate concrete pump lines is not to be used in any structural members.
- 8. All slabs cast on ground require sand blinding with a Concrete Underlay

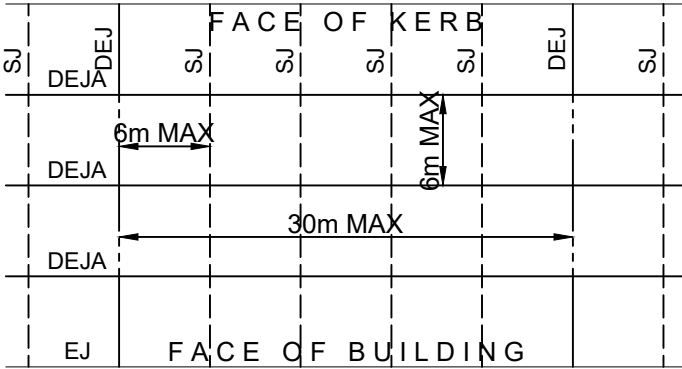
FORMWORK

- 1. The design, certification, construction and performance of the formwork, falsework and backpropping shall be the responsibility of the contractor. Proposed method of installation and removal of formwork is to be submitted to the superintendent for comment prior to work being carried out.

JOINTING NOTES

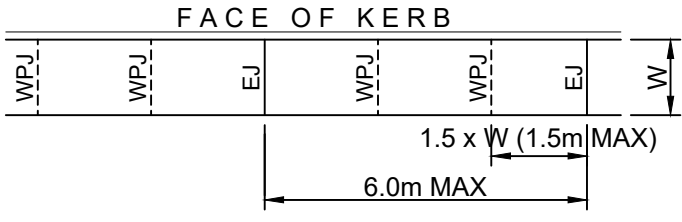
Vehicular Pavement Jointing

- 1. All vehicular pavements to be jointed as shown on drawings.
- 2. Keyed construction joints should generally be located at a maximum of 6m centres.
- 3. Sawn joints should generally be located at a maximum of 6m centres or 1.5 x the spacing of keyed joints, where key joint spacing is less than 4m, with dowelled expansion joints at maximum of 30m centres.
- 4. Provide 10mm wide full depth expansion joints between buildings and all concrete or unit pavers.
- 5. The timing of the saw cut is to be confirmed by the contractor on site. Site conditions will determine how many hours after the concrete pour before the saw cuts are commenced. Refer to the specification for weather conditions and temperatures required.
- 6. Vehicular pavement jointing as follows.



Pedestrian Footpath Jointing

- 1. Expansion joints are to be located where possible at tangent points of curves and elsewhere at max 6.0m centres.
- 2. Weakened plane joints are to be located at a max 1.5 x width of the pavement.
- 3. Where possible joints should be located to match kerbing and / or adjacent pavement joints.
- 4. All pedestrian footpath jointings as follows (uno).



PIT SCHEDULE

Note: Grate size does not necessarily reflect pit size, refer pit type details, shown on detail sheets - CV0212 Final internal pit dimensions are to comply with AS3500

Type	Description	Size	Class	Size	Number	Water Quality
A	Surface inlet pit	900 x 900	B	Galvanised mild steel grate hinged to frame	13,16,17,18	200 Micron Oceanguard
A	Junction Pit	900 x 900	B	Cast Iron with concrete infill	N/a	
B	OSD Tank Access	900 x 900	B	Galvanised mild steel grate hinged to frame	2	
		900 x 900	B	Cast Iron with concrete infill		
-	Existing pit to remain				1,22,23,24,33,36	
-	Existing pit to be demolished				30,31,32,34,35	

SURVEY AND SERVICES INFORMATION

SURVEY

Origin of levels : SSM 101817
Datum of levels : A.H.D. AUSTRALIAN HEIGHT DATUM
Coordinate system : MGA
Survey prepared by : CMS SURVEYORS PTY LIMITED
Setout Points : CONTACT THE SURVEYOR

enstruct does not guarantee that the survey information shown on these drawings is accurate and will accept no liability for any inaccuracies in the survey information provided to us from any cause whatsoever.

UNDERGROUND SERVICES - WARNING

The locations of underground services shown on enstruct drawings have been plotted from diagrams provided by service authorities. This information has been prepared solely for the authorities own use and may not necessarily be updated or accurate.

The position of services as recorded by the authority at the time of installation may not reflect changes in the physical environment subsequent to installation.

enstruct does not guarantee that the services information shown on these drawings shows more than the presence or absence of services, and will accept no liability for inaccuracies in the services information shown from any cause whatsoever.

The Contractor must confirm the exact location and extent of services prior to construction and notify any conflict with the drawings immediately to the Engineer/Superintendent.

The contractor is to get approval from the relevant state survey department, to remove/adjust any survey mark. This includes but is not limited to; State Survey Marks (SSM), Permanent Marks (PM), cadastral reference marks or any other survey mark which is to be removed or adjusted in any way.

enstruct plans do not indicate the presence of any survey mark. The contractor is to undertake their own search.

STORMWATER DRAINAGE NOTES

- 1 Stormwater Design Criteria :
 - (A) Average exceedance probability - 1% AEP for roof drainage to first external pit 5% AEP for paved and landscaped areas
 - (B) Rainfall intensities - Time of concentration: 5 minutes 1% AEP = 276 mm/hr 5% AEP = 176 mm/hr
 - (C) Rainfall losses - Impervious areas: IL= 1.5 mm , CL= 0 mm/hr Pervious areas: IL= 20.3 mm , CL= 1.0 mm/hr

- 2. Pipes 225 dia and larger to be reinforced concrete Class "2" approved spigot and socket with rubber ring joints U.N.O.
- 3. Pipes up to 150 dia may be sewer grade uPVC with solvent welded joints, subject to approval by the engineer
- 4. Equivalent strength FRP pipes may be used subject to approval.
- 5. Precast pits may be used external to the building subject to approval by engineer
- 6. Enlargers, connections and junctions to be manufactured fittings where pipes are less than 300 dia.
- 7. Where subsoil drains pass under floor slabs and vehicular pavements, unslotted uPVC sewer grade pipe is to be used.
- 8. Grates and covers shall conform with AS 3996-2006, and AS 1428.1 for access requirements.
- 9. Pipes are to be installed in accordance with AS 3725. All bedding to be type H2 U.N.O.
- 10. Care is to be taken with invert levels of stormwater lines. Grades shown are not to be reduced without approval.
- 11. All stormwater pipes to be 225 dia at 1.0% min fall U.N.O.
- 12. Subsoil drains to be slotted flexible uPVC U.N.O.
- 13. Adopt invert levels for pipe installation (grades shown are only nominal).

MASONRY NOTES

- 1. Temporary bracing shall be provided by the contractor to keep the masonry stable at all times.
- 2. Masonry to be in accordance with AS 3700
- 3. Masonry units shall comply with AS/NZS 4455 and as follows:

Type of masonry unit	Characteristic unconfined compressive strength (f _{cu})	Characteristic lateral modulus of rupture (f _{ut})
Clay & Calcium silicate	15 MPa	0.8 MPa
Concrete (used in non-loadbearing internal walls)	4.5 MPa (hollow units) 3.0 MPa (solid or cored units)	0.8 MPa
Concrete (used in unreinforced loadbearing walls, reinforced masonry and non-loadbearing external walls)	15 MPa (hollow units) 10 MPa (solid or cored units)	0.8 MPa

- 4. Mortar shall consist of the following:

M3 for general applications
1 part Type GP cement: 5 parts sand plus water thickener

M4 for elements in interior environments subject to saline wetting and drying; below a damp-proof course or in contact with ground in aggressive soils; in severe marine environments; in saline or contaminated water including tidal splash zones; and within 1km of an industry producing chemical pollutants.
1 part Type GP cement: 4 parts sand plus water thickener

- 5. Other than what is allowed in the specification no chasing or rebates may be made in masonry walls without written approval.
- 6. The contractor shall provide records that demonstrate all masonry bed joint reinforcement, masonry ties and masonry wall stiffeners have been installed in accordance with the drawings and specification.
- 7. All load bearing concrete masonry walls shall have all cores filled with grout UNO. Core filling grout shall be thoroughly compacted. Grout to be in accordance with AS3700 and as follows:

Location	f _{cg} MPa	Specified Slump	Maximum Agg. Size
Grout	20	230	10

- 8. All core filled blockwalls shall be constructed with "Double U" blocks
- 9. In core filled blockwalls cleanout openings shall be provided at the bottom of each core and shall be cleaned of mortar protrusions before grouting.
- 10. All core filled block walls shall have all cores filled with grout UNO. Core filling grout to be in accordance with note 9.
- 11. Cover to reinforcement to be 50mm to face of block UNO.
- 12. Provide bed joint reinforcement as follows
 - M.E.T. galvanized masonry reo where M3 mortar is used (supplied by DUNSTONE MAZE in NSW)
 - Ancon CCL stainless steel where M4 mortar is used and locate as follows
 - in 2 bed joints below and above head and sill flashings to openings
 - in 2 bed joints below and above openings
 - in third bed joint above bottom of wall
 - in second bed joint below top of wall

SITEWORKS NOTES

- 1. All basecourse material to comply with RMS specification No 3051 and compacted to minimum 98% modified dry density in accordance with AS 1289 5.2.1.
- 2. All trench backfill material shall be compacted to the same density as the adjacent material.
- 3. All service trenches under vehicular pavements shall be backfilled with an approved select material and compacted to a minimum 98% standard maximum dry density in accordance with AS 1289 5.1.1

F	04/04/22	ISSUE FOR APPROVAL	BEJ	KEH
E	24/11/21	100% SD	CBH	KEH
D	28/10/21	95% SD	CBH	KEH
C	19/10/21	DRAFT 95% SD	PAD	KEH
B	17/09/21	50% SD	KEH	KEH
A	23/07/21	95% CONCEPT DESIGN	BEJ	KEH
rev	date	description	dm	ch/k

G	27/05/22	ISSUE FOR APPROVAL	PAD	KEH
rev	date	description	dm	ch'k



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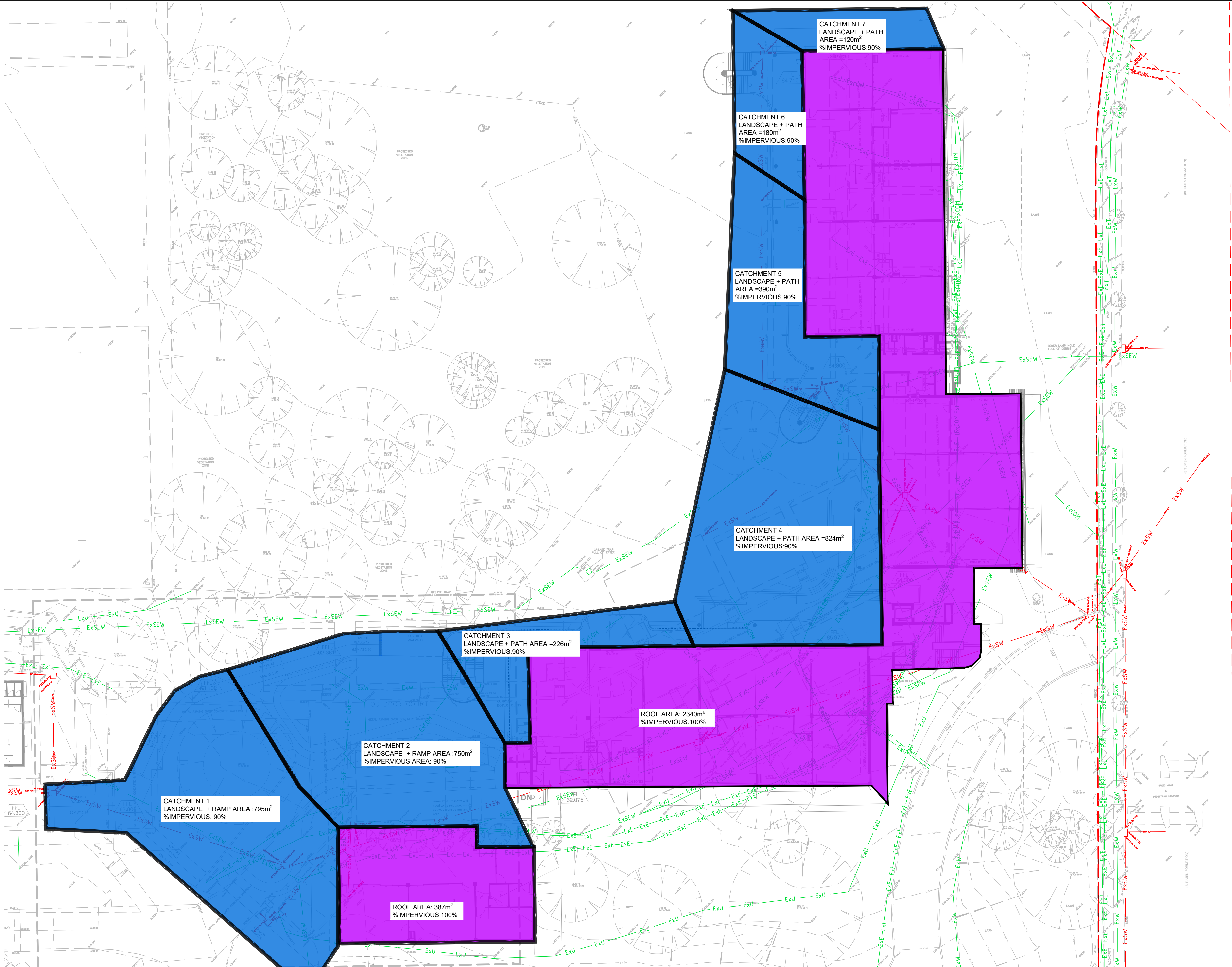
project
GLENWOOD HIGH SCHOOL

drawing title
NOTES SHEET

status			
scale at A1	drawn by NKK	checked KEH	
project no. 6393	drawing no. CV-0001		rev. G

SITeworks LEGEND

- ROOF CATCHMENT AREA
- MIXED USE LAND CATCHMENT AREA



B	27/05/22	ISSUE FOR APPROVAL	PAD	KEH	
A	04/04/22	ISSUE FOR APPROVAL	BEJ	KEH	
rev	date	description	drm	ch/k	

rev	date	description	drm	ch/k	

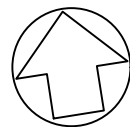


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project
GLENWOOD HIGH SCHOOL

drawing title
STORMWATER
CATCHMENT PLAN

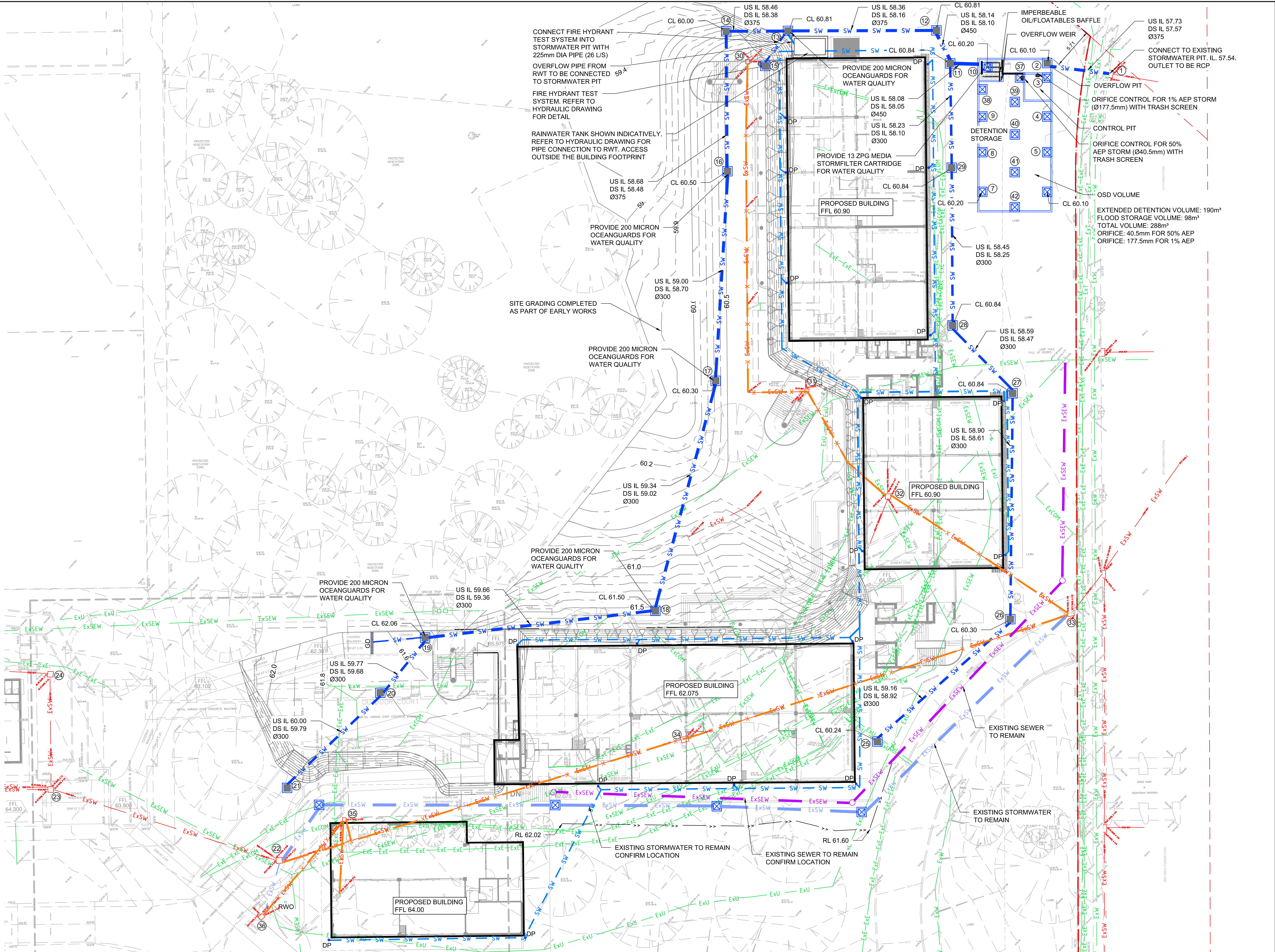
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project no. 6393	drawing no. CV-0200	rev. B	

SITeworks LEGEND

- Site Boundary
- SW SW Stormwater pit, flow direction and line
- SS IO Inspection opening/flushing point with subsoil drainage line (100 dia)
- DP Downpipe with Roof Water line as per Architect/Hydraulic Engineer
- ExSEW Existing sewer line
- ExE-ExE Existing electrical line
- ExSW Existing stormwater line
- ExT Existing telstra line
- ExCOM Existing comms line
- Proposed building outline
- X Existing stormwater to be made redundant as part of early works
- ExSW Existing stormwater to remain
- ExSEW Existing sewer to remain

General Notes

- Refer to Architect/hydraulics drawings for the location of the downpipes.
- All existing services (sewer, electrical, communication etc) to be diverted or made redundant as per service engineer detail
- All external ground levels are to fall away from the building entries, this includes plinths, gardens and paved areas.
- All pits deeper than 1.2m must provide step irons at 300mm center



E	24/11/21	100% SD	NKK	KEH
D	28/10/21	95% SD	CBH	KEH
C	19/10/21	DRAFT 95% SD	PAD	KEH
B	17/09/21	50% SD	KEH	KEH
A	23/07/21	95% CONCEPT DESIGN	BEJ	KEH
P1	31/05/21	ISSUE FOR REVIEW	PAD	KEH
rev	date	description	dm	ch/k

I	21/06/22	ISSUE FOR APPROVAL	KEH	KEH
H	27/05/22	ISSUE FOR APPROVAL	PAD	KEH
G	04/04/22	ISSUE FOR APPROVAL	BEJ	KEH
F	07/12/21	100% SD	CBH	KEH
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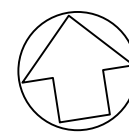


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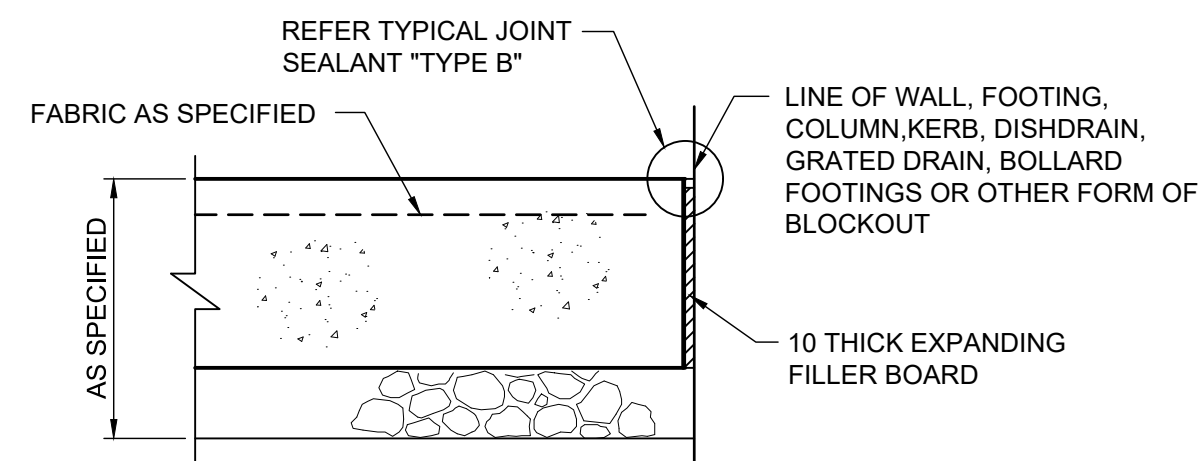
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project
GLENWOOD HIGH SCHOOL

drawing title
SITeworks PLAN

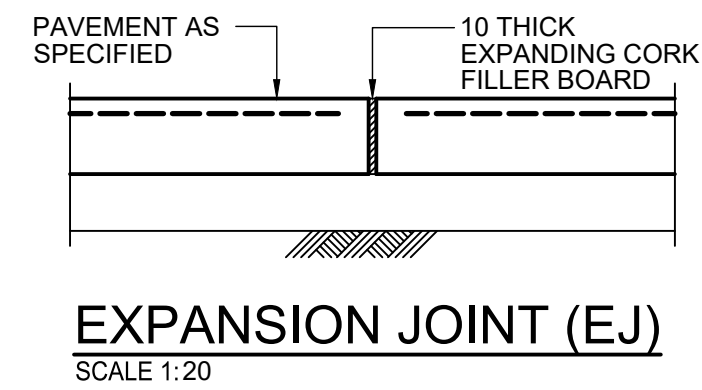
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project no. 6393	drawing no. CV-0201			



TYPICAL ISOLATION JOINT DETAIL (IJ)

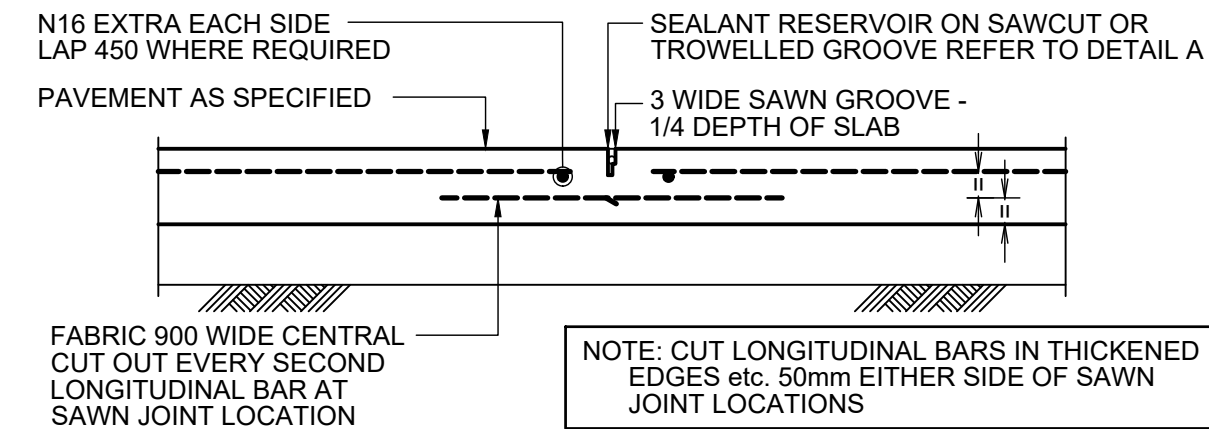
SCALE 1:10

SHOWN AS 'IJ' ON PLAN AND TO ALSO BE
CONSTRUCTED IN LOCATIONS WHERE
CONCRETE PAVEMENTS ABUT FORMS OF
BLOCKOUT AS SPECIFIED BY THIS ISOLATION
JOINT DETAIL UNLESS NOTIFIED OTHERWISE.



EXPANSION JOINT (EJ)

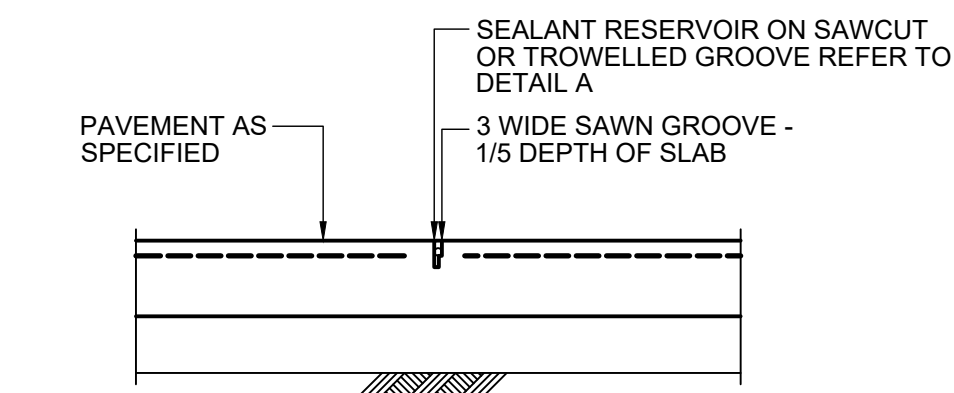
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SAWN CONTROL JOINT (SJ)

SCALE 1:20

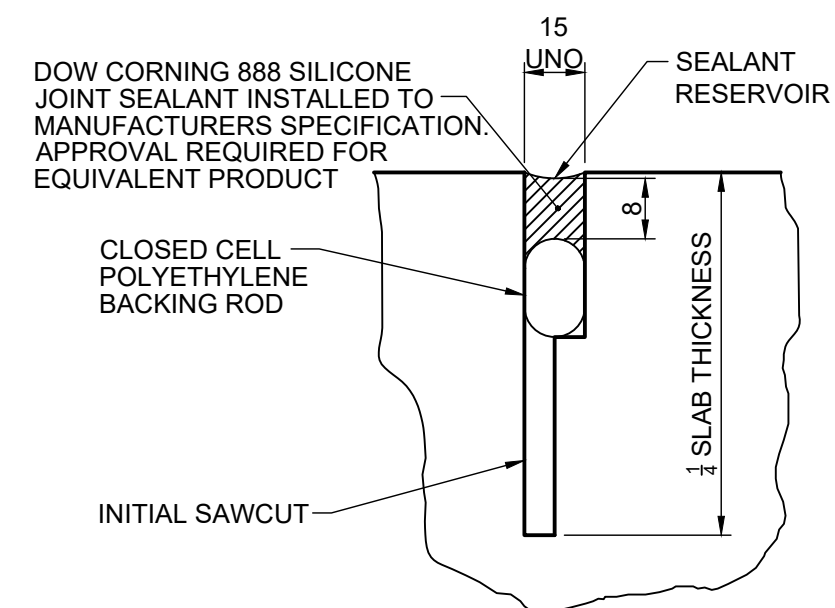
NOTE:REFER TO JOINTING NOTES,
POINT 5 FOR TIMING OF SAW CUTS.



WEAKENED PLANE JOINT (WPJ)

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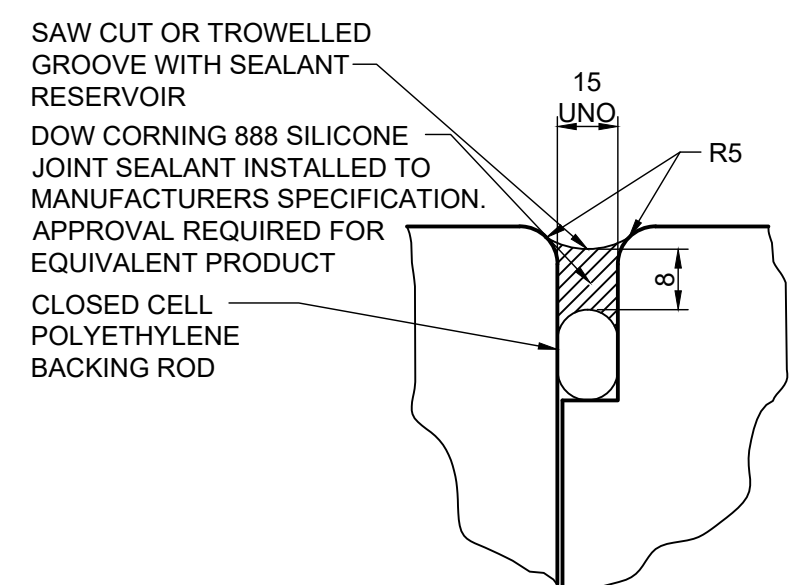
NOTE:REFER TO JOINTING NOTES,
POINT 5 FOR TIMING OF SAW CUTS.



DETAIL A

NTS

NOTE:REFER TO JOINTING NOTES,
POINT 5 FOR TIMING OF SAW CUTS.



DETAIL B

NTS

E	24/11/21	100% SD		CBH	KEH
D	28/10/21	95% SD		CBH	KEH
C	19/10/21	DRAFT 95% SD		PAD	KEH
B	17/09/21	50% SD		KEH	KEH
A	23/07/21	95% CONCEPT DESIGN		BEJ	KEH
rev	date	description		dwn	ch/k

rev	date	description	drn	ch'k



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project

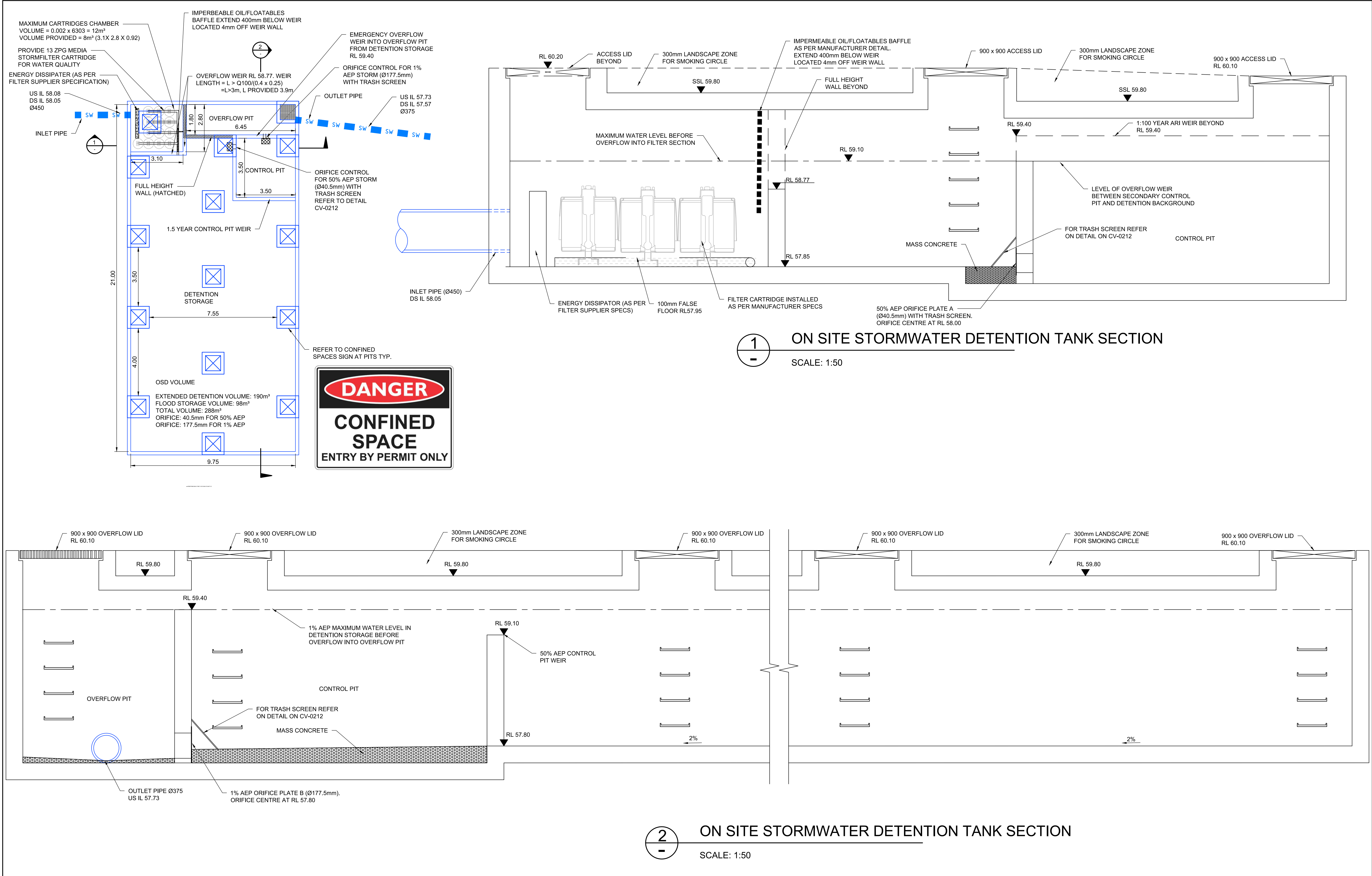
GLENWOOD HIGH SCHOOL

drawing title

DETAILS SHEET 2

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AS SHOWN	CBH	KEH	
project no.		drawing no.	rev.
6393		CV-0211	E





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C	19/10/21	DRAFT 95% SD	PAD	KEH
B	17/09/21	50% SD	KEH	KEH
A	23/07/21	95% CONCEPT DESIGN	BEJ	KEH
P1	31/05/21	ISSUE FOR REVIEW	PAD	KEH
rev	date	description	dm	ch/k

H	21/06/22	ISSUE FOR APPROVAL	KEH	KEH
G	27/05/22	ISSUE FOR APPROVAL	PAD	KEH
F	04/04/22	ISSUE FOR APPROVAL	BEJ	KEH
rev	date	description	dm	ch/k



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project	GLENWOOD HIGH SCHOOL
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drawing title	OSD SECTIONS SHEET
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status			
scale at A1	drawn by	checked	
AS SHOWN	NKK	KEH	
project no.		drawing no.	rev.
6393		CV-0213	H

APPENDIX D

MUSIC INPUTS

SYSTEM INPUTS

System Type

Variable Chamber Area

Cartridge Height

690

Number of Cartridges

13

Cartridge Media

Full Flow ZPG

1 - 1000

Variable Detention Area Inputs

Length B (m)

2.8

Width A (m)

3.1

Diameter (m, leave blank if not a manhole)

OSD PLAN VIEW

MUSIC MODEL PROPERTIES

SF Chamber (8.7m²)

13 x 690 Full Flow ZPG StormFilter

OCEAN PROTECT
oceanprotect.com.au | 1300 354 722

Properties of SF Chamber

Location

SF Chamber (8.7m²)

Inlet Properties

Low Flow By-pass (cubic metres per sec)

0.00000

High Flow By-pass (cubic metres per sec)

100.0000

Storage Properties

Surface Area (square metres)

6.4

Extended Detention Depth (metres)

0.77

Permanent Pool Volume (cubic metres)

0.0

Initial Volume (cubic metres)

0.00

Exfiltration Rate (mm/hr)

0.00

Evaporative Loss as % of PET

0.00

Estimate Parameters

Outlet Properties

Equivalent Pipe Diameter (mm)

113

Overflow Weir Width (metres)

2.0

Notional Detention Time (hrs)

87.9E-3

☐ Use Custom Outflow and Storage Relationship

Define Custom Outflow and Storage

Not Defined

Re-use...

Fluxes...

Notes...

More

Cancel

Back

Finish

Properties of StormFilter

Location

13 x 690 Full Flow ZPG StormFilter

Inlet Properties

Low Flow By-pass (cubic metres per sec)

0.00000

High Flow By-pass (cubic metres per sec)

0.02080

STORMFILTER DESIGN TABLE

STORMFILTER TREATMENT CAPACITY VARIES BY NUMBER OF FILTER CARTRIDGES INSTALLED.

THE STANDARD CONFIGURATION IS SHOWN. ACTUAL CONFIGURATION OF THE SPECIFIED STRUCTURE(S) PER CERTIFYING ENGINEER WILL BE SHOWN ON SUBMITTAL DRAWING(S).

FILTER CARTRIDGES SHALL BE MEDIA-FILLED, PASSIVE, SIPHON ACTUATED, RADIAL FLOW, AND SELF-CLEANING. RADIAL MEDIA DEPTH SHALL BE 178mm.

CARTRIDGE NAME / SIPHON HEIGHT (mm)	690	460	310
CARTRIDGE PHYSICAL HEIGHT (mm)	840	600	600
TYPICAL WEIR HEIGHT [H] (mm)	920	690	540
CARTRIDGE FLOW RATE FOR ZPG MEDIA (L/s)	1.6	1.1	0.7
CARTRIDGE FLOW RATE FOR PSORB MEDIA (L/s)	0.9	0.46	0.39

PHYSICAL HEIGHT

SIPHON HEIGHT

STORMFILTER CARTRIDGE DETAIL

MUSIC node calculator

18

StormFilter Flow Calculator - ZPG media

The equation below defines the relationship between the diameter of the orifice plate, the flow rate through the cartridge and head.

$$Q = (0.111d^2 \cdot 0.6h^{0.5}) / 60$$

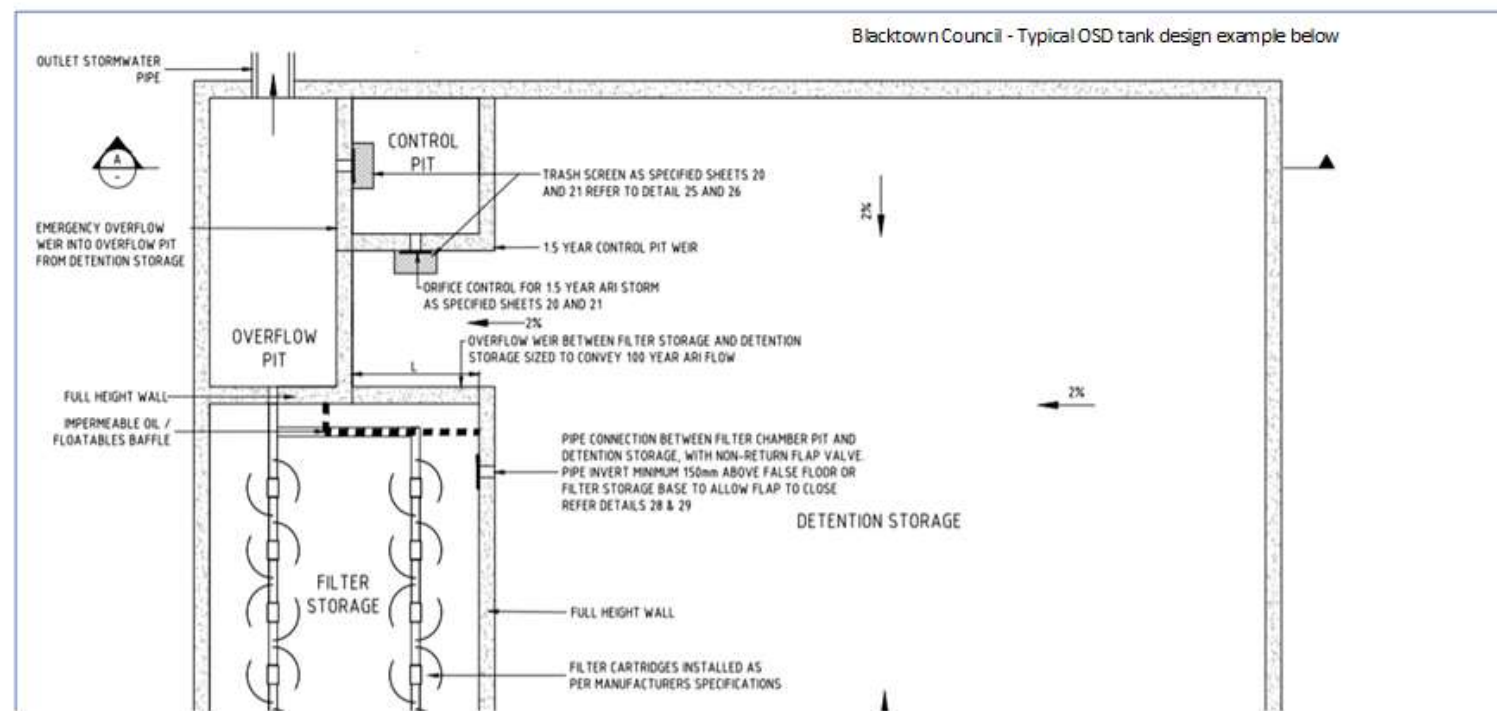
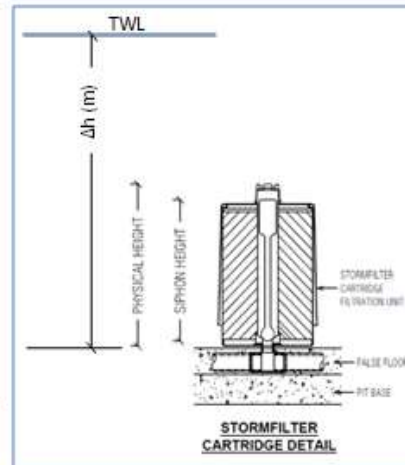
where d = Restrictor Disc Diameter
Δh = head

Cartridge Height (mm) 690
Cartridge Quantity 13
Δh (m) 1.55

Total Q at head 29.52 L/s

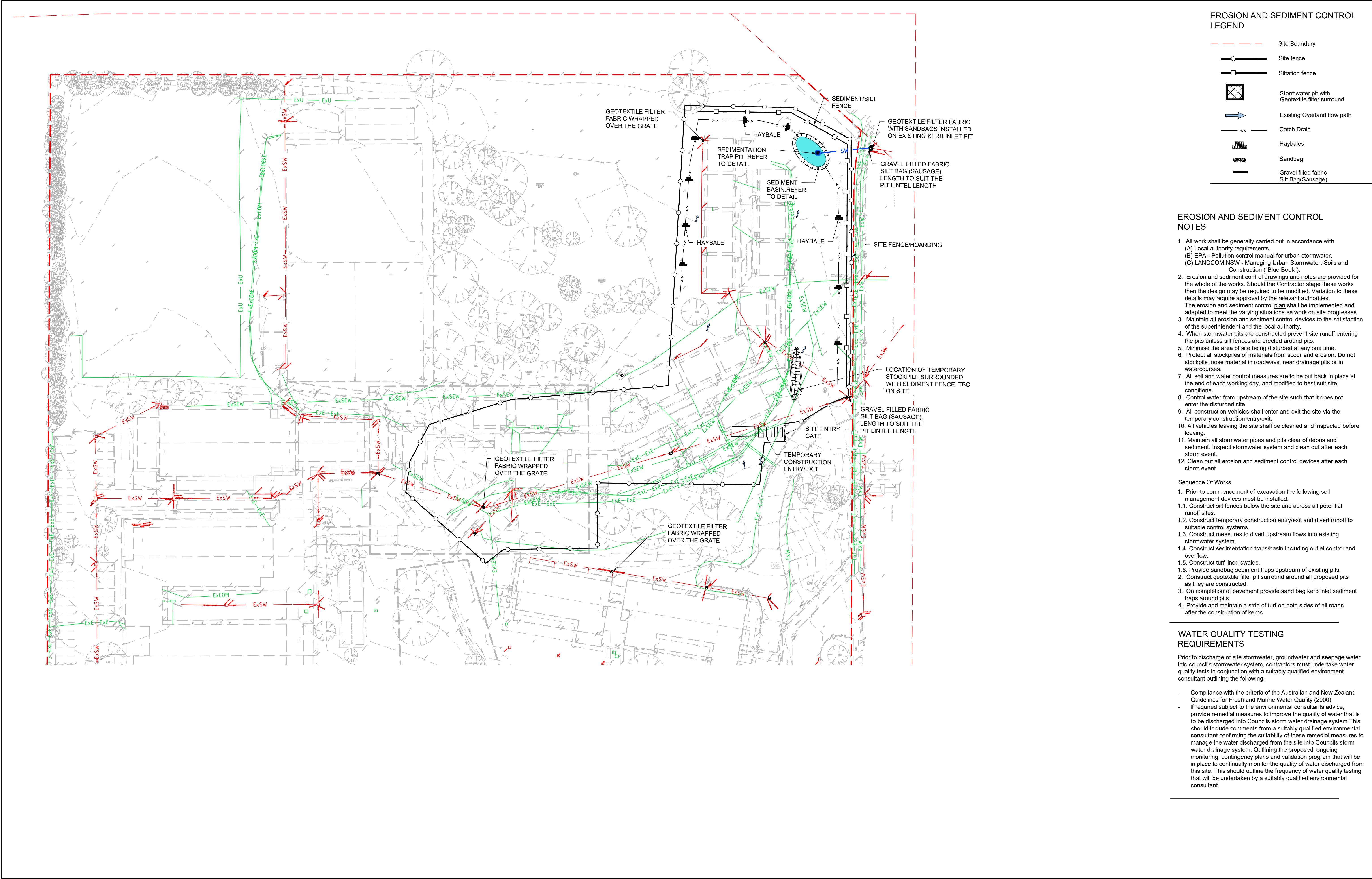


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Revision 1 - 2019



APPENDIX E

EROSION AND SEDIMENT CONTROL PLAN



E	24/11/21	100% SD	CBH	KEH
D	28/10/21	95% SD	CBH	KEH
C	19/10/21	DRAFT 95% SD	PAD	KEH
B	17/09/21	50% SD	KEH	KEH
A	23/07/21	95% CONCEPT DESIGN	BEJ	KEH
rev	date	description	dm	ch/k

rev	date	description	dm	ch/k
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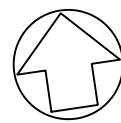


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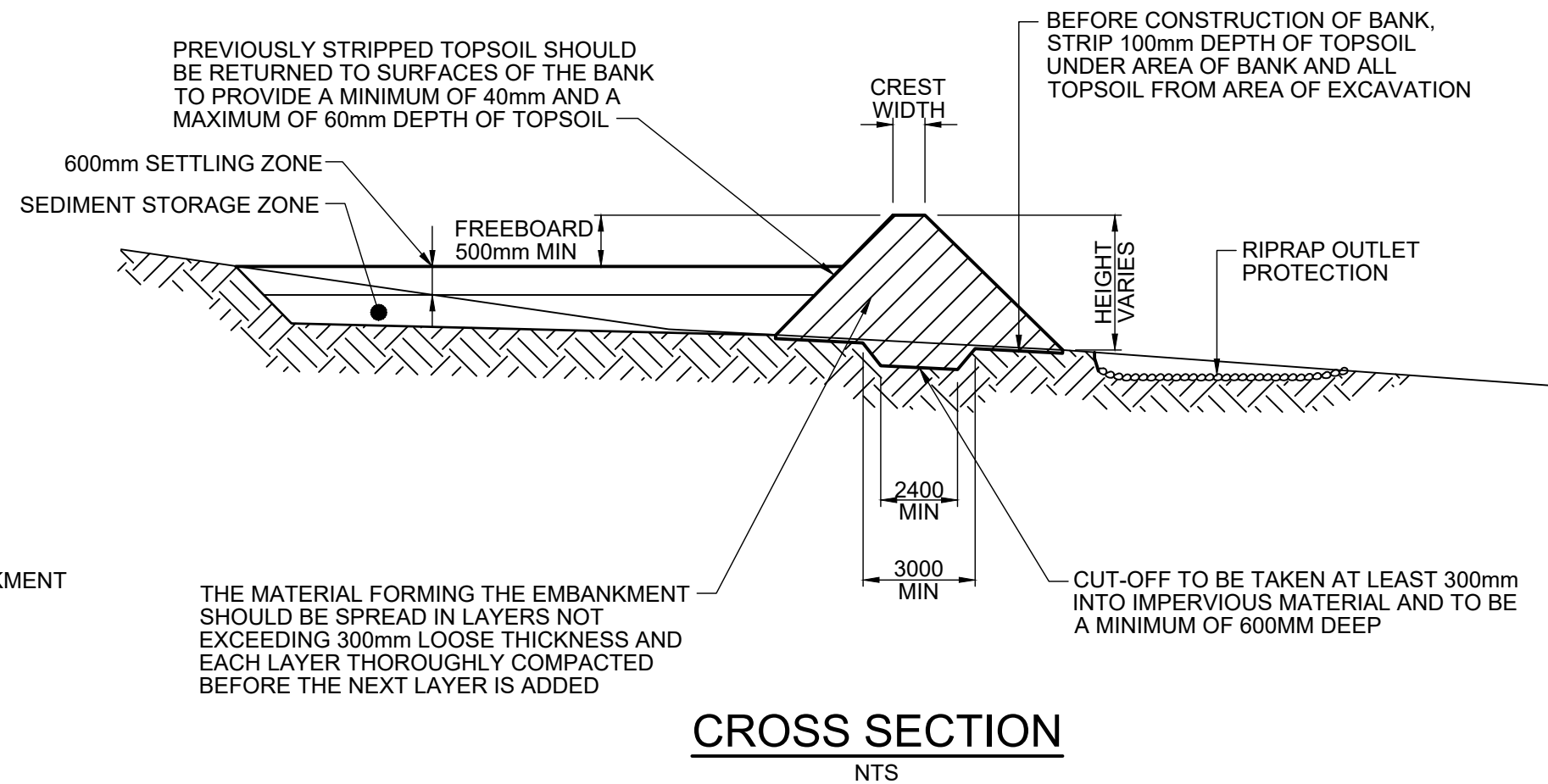
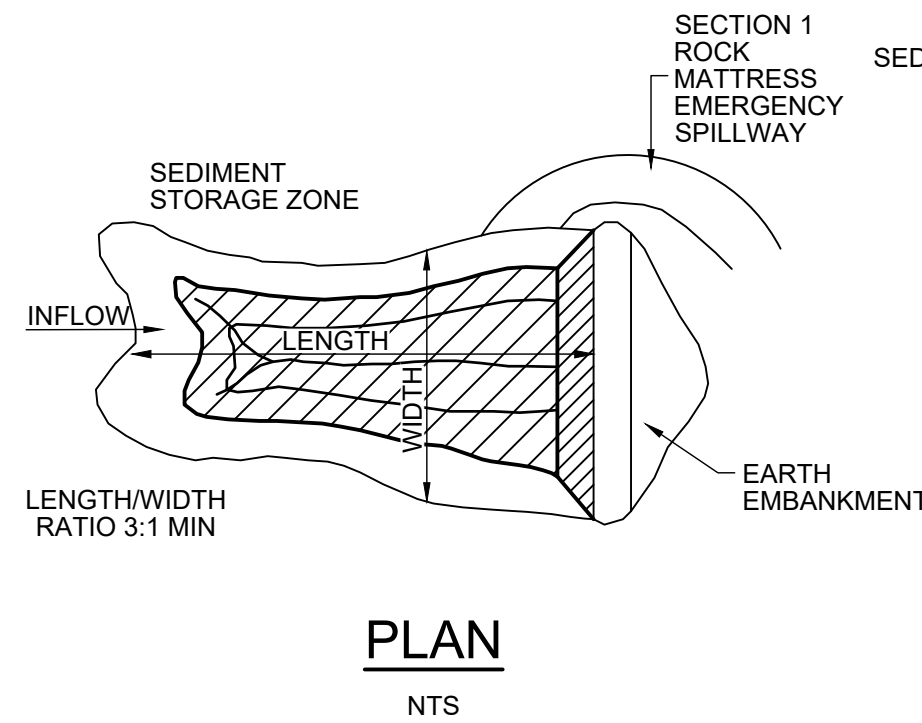
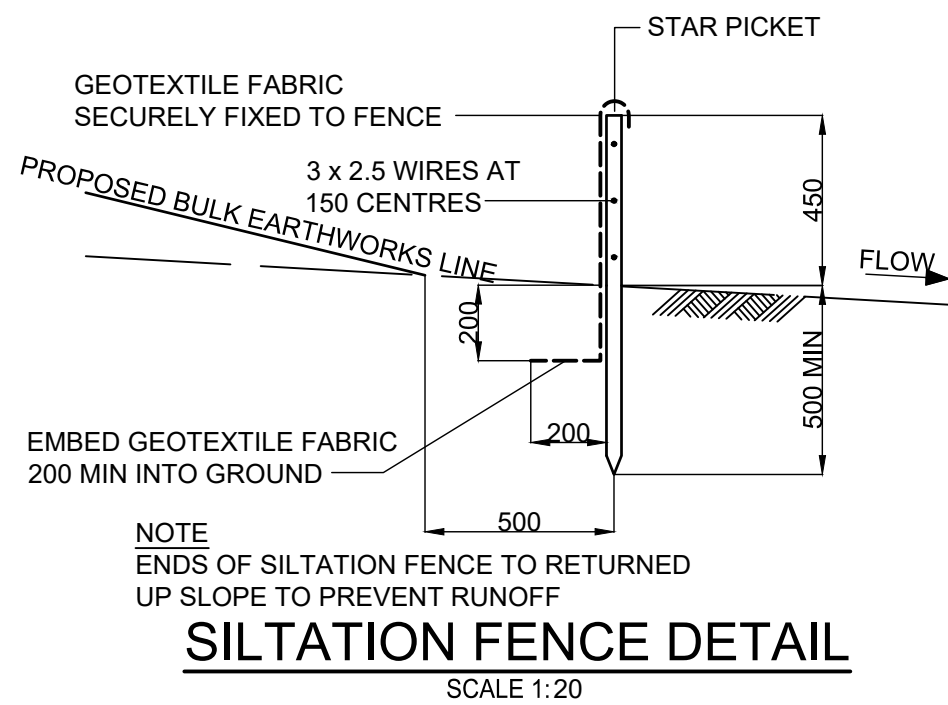
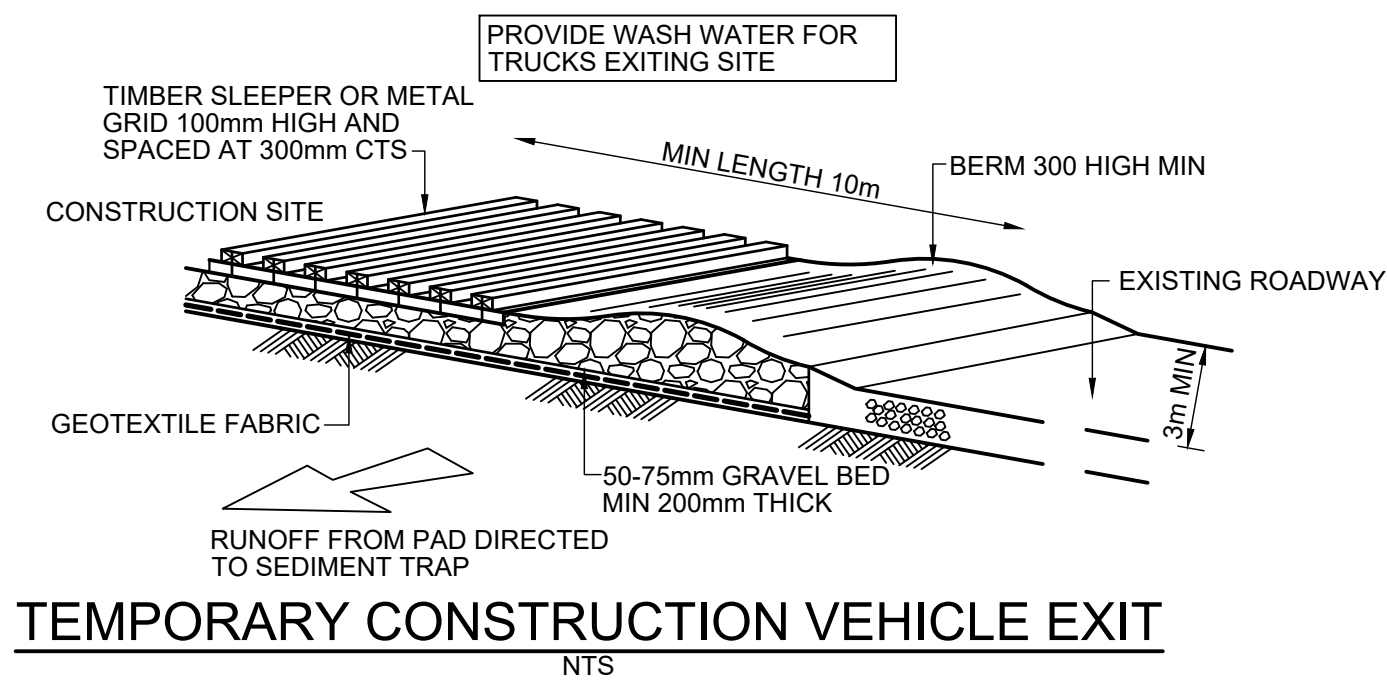
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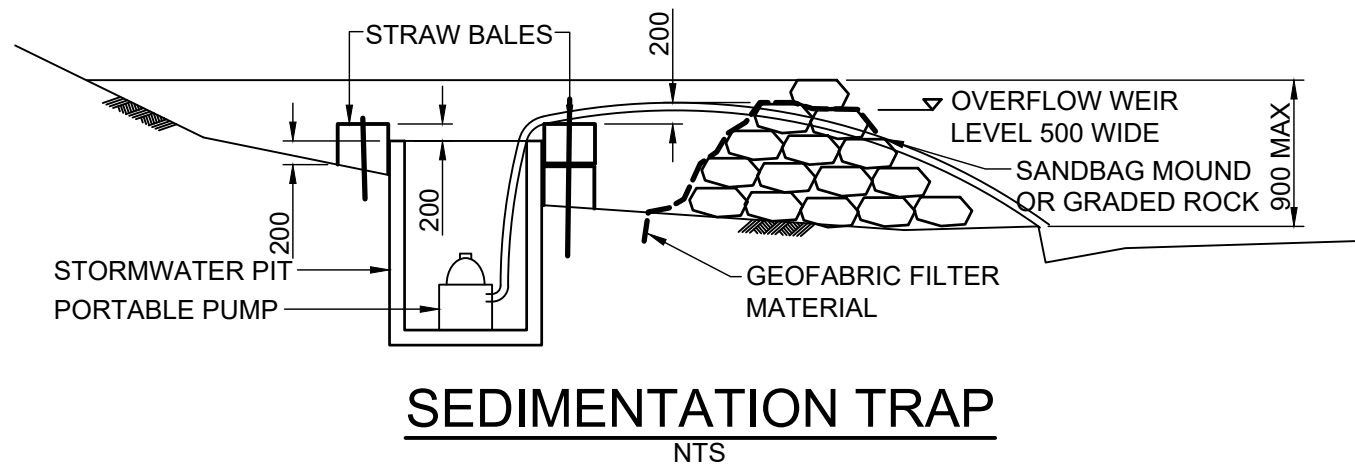
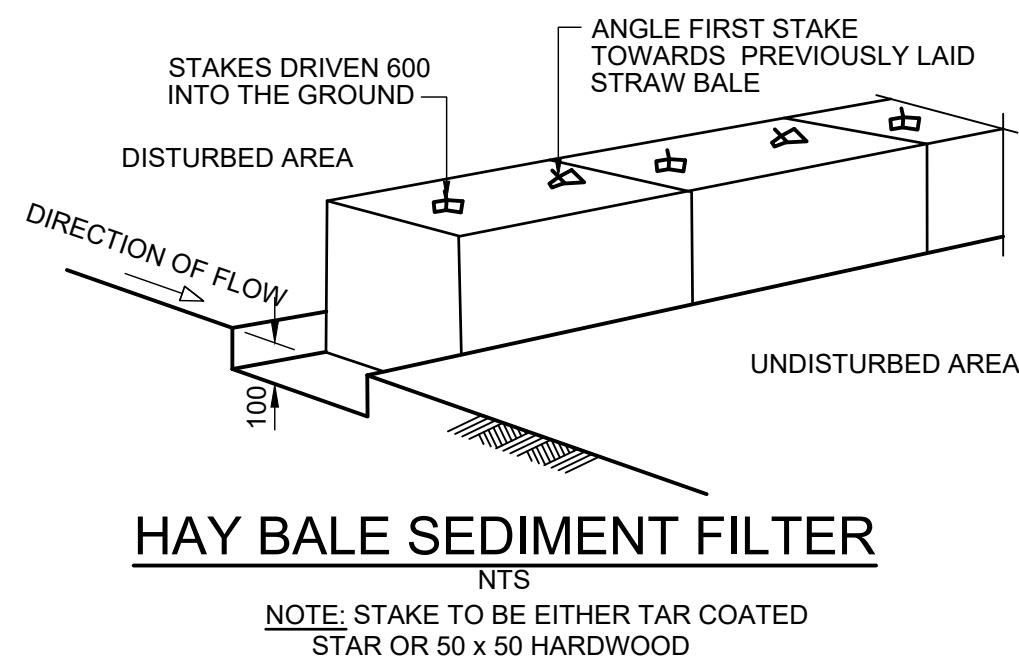
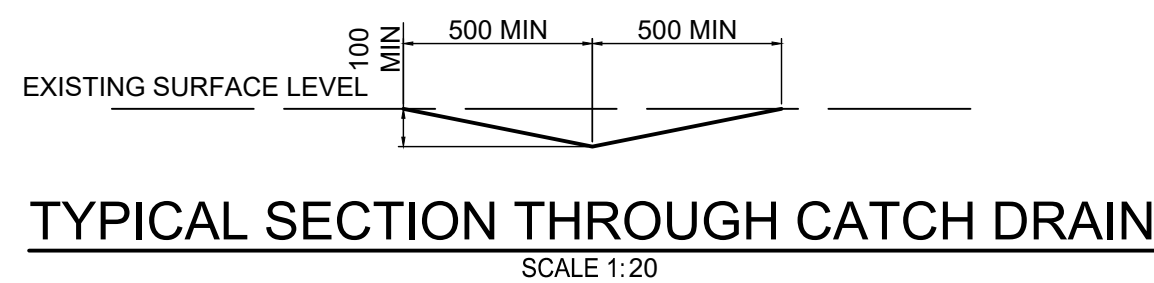
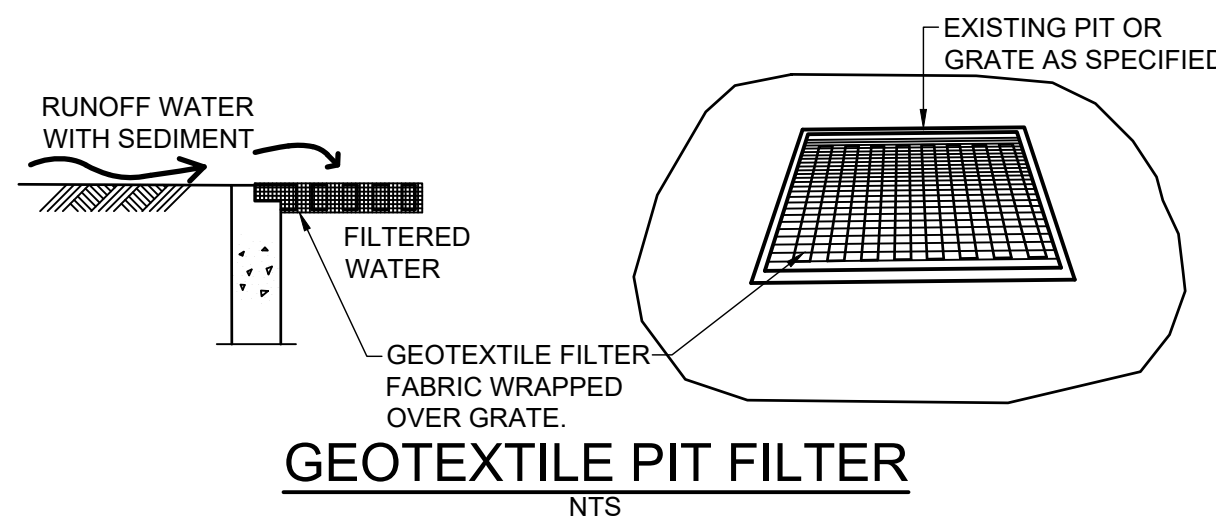
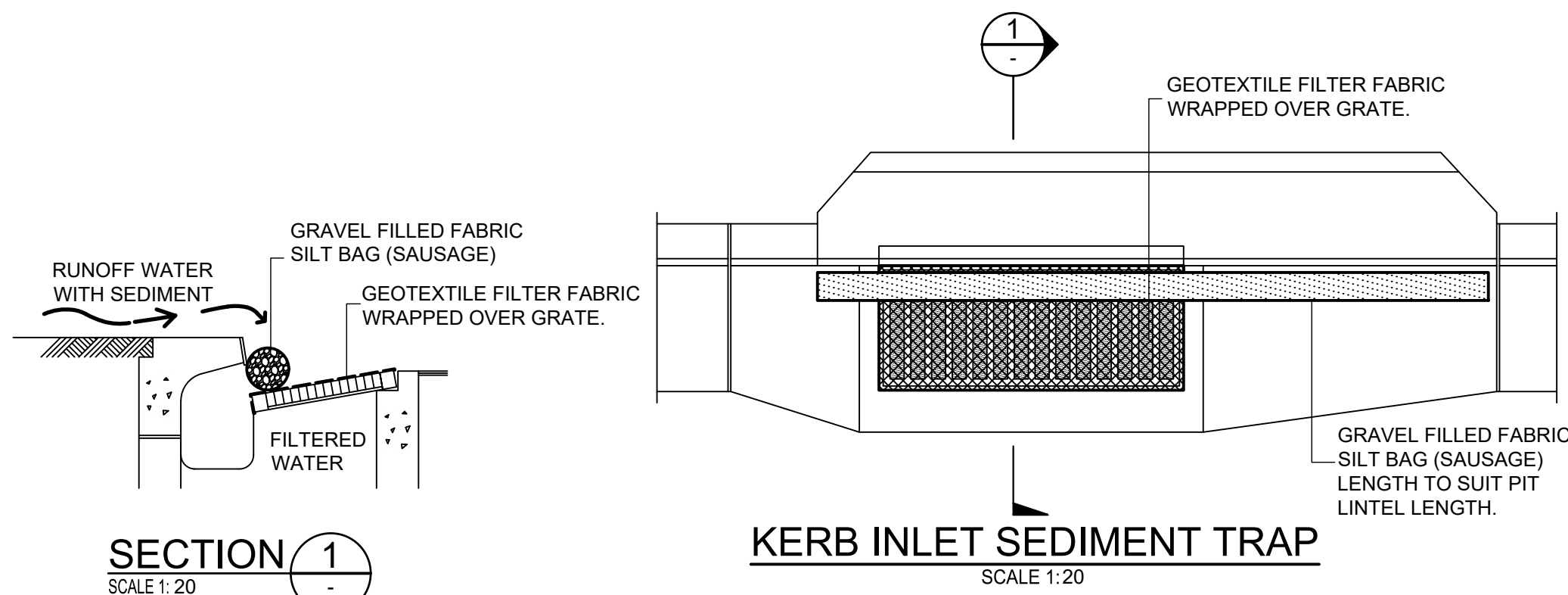
project	GLENWOOD HIGH SCHOOL
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drawing title	EROSION AND SEDIMENT CONTROL PLAN
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status	
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drawn by	NKK
checked	KEH
project no.	6393
drawing no.	CV-0101
rev.	E



SEDIMENT BASIN (TYPICAL) CROSS SECTION - TYPE D AND F SOILS



rev	date	description	dm	ch/k
E	24/11/21	100% SD	CBH	KEH
D	28/10/21	95% SD	CBH	KEH
C	19/10/21	DRAFT 95% SD	PAD	KEH
B	17/09/21	50% SD	KEH	KEH
A	23/07/21	95% CONCEPT DESIGN	BEJ	KEH

rev	date	description	dm	ch/k



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project	GLENWOOD HIGH SCHOOL
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drawing title	EROSION AND SEDIMENT CONTROL DETAILS
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AS SHOWN	PAD	KEH	
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6393		CV-0105	E

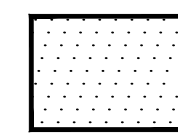
APPENDIX F

BULK EARTHWORKS PLAN

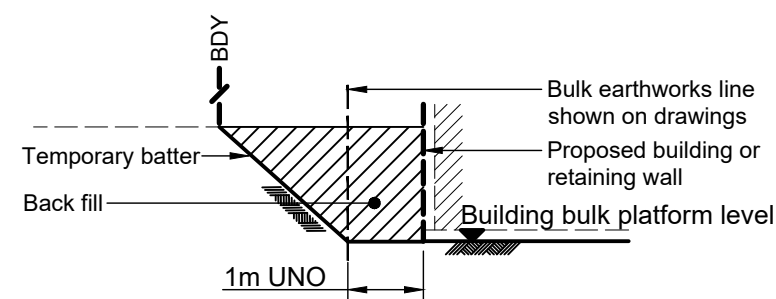
SITEWORKS LEGEND

- | | |
|---|----------------------------------|
|  | Site Boundary |
| | ExSEW Existing sewer line |
| | ExE=ExE Existing electrical line |
| | ExSW Existing stormwater line |
|  | ExT Existing telstra line |
|  | ExCOM Existing comms line |

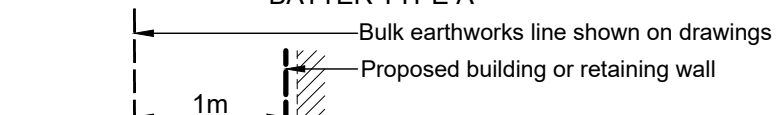
BULK EARTHWORKS LEGEND



Flat platforms shown with dots



BATTER TYPE A



BATTER TYPE B

- NOTE
1. * Bulk Earthwork level = Finish surface - (Slab thickness + Void former)
 2. Refer architects drawings for building setout
 3. Bulk Earthwork drawings are for bulk excavation only. They are not to be used for detailed excavation such as: lift shafts, footings, pits, footpaths, landscaping etc.
 4. Bulk Earthwork setout refers to bulk excavation only. They are not to be used for building, kerb or any other setout.

BULK EARTHWORKS NOTES

1. All bulk earthworks setout from grid lines U.N.O.
2. All temporary batters at a slope of 1.0(H) : 1(V) U.N.O.
3. All permanent batters at a slope of 3(H) : 1(V) U.N.O.
4. Excavated material may be used as structural fill provided,
 - (i) it complies with the specification requirements for fill material,
 - (ii) the placement moisture content complies with the Geotechnical Consultants requirements, and allows filling to be placed and proofrolled in accordance with the specification. Where necessary the Contractor must moisture condition the excavated material to meet these requirements.

4. Compact fill areas and subgrade to not less than:

Location	Standard dry density (AS 1289 5.1.1.)	Moisture (OMC)
Under building slabs on ground:	98%	±2%
Under roads and carparks:	98%	±2%
Landscaped areas:	95%	±2%

5. Before placing fill, proof roll exposed subgrade with a 10 tonne minimum roller to test subgrade and then remove soft spots (areas with more than 3mm movement under roller). Soft spots to be replaced with Engineered fill U.O.O.
6. Contractor shall place safety barriers around excavations in accordance with relevant safety regulations.
7. For interpretation of bulk earthworks foot print line shown on the bulk earthworks drawings refer to the bulk earthworks construction legend.
8. Bulk earthwork drawings are not to be used for detailed excavation.
9. Refer to Geotechnical Report prepared by - Douglas Partners, Report No. 94626.00.R.001 Rev'd, dated 17 September 2021.

PRELIMINARY

BULK VOLUMES: 40m³ CUT
2270m³ FILL

Bulk Earthworks volume does not include stripping of top soil, trenching and backfill, excavation for tanks, piling or other foundation works

A	09/11/21	ISSUE FOR APPROVAL			BEJ KEH
rev	date	description			drn ch'k

rev	date	description	drm	ch/k



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drawing title

BULK EARTHWORKS PLAN

status

scale at A1
1:250

drawn by
REI

checked

KFH

project no.

6393

drawing no.

SSDA-CV-0120

rev.

A

APPENDIX G

HYDRAULIC REPORT and discussion on rainwater reuse and treatment